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March 7, 2016

VIA RESS, EMAIL and COURIER

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

Dear Ms. Walli

Re: Enbridge Gas Distribution Inc. (the "Company" or "Enbridge")
Ontario Energy Board (the "Board") File: EB-2015-0267
2014 Demand Side Management ("DSM") Clearance of Variance Accounts
Application - Interrogatory Responses of Enbridge

In accordance with the Board's Procedural Order No. 1 dated February 4, 2016, enclosed please find the interrogatory responses of Enbridge.

The submission has been filed through the Board's Regulatory Electronic Submission System (RESS) and will be available on the Company's website under the "Other Regulatory Proceedings" tab at www.enbridgegas.com/ratecase.

Please contact the undersigned if you have any questions.

Yours truly,

(Original Signed)

Stephanie Allman
Regulatory Coordinator

cc: Dennis O'Leary, Legal Counsel, Aird & Berlis LLP

BOMA INTERROGATORY #1

INTERROGATORY

Resource Acquisition Program:

Reference: 2015-0267 Exhibit B Tab 1 Schedule 1 Page 18 of 206

> *Within the Resource Acquisition program, spending in the Commercial and Industrial sectors was lower than 2014 plan budget amounts. As the year unfolded, forecasts of program results clearly indicated that established budgets for both of these sectors could not be fully utilized.*

Interrogatory:

Please provide the reasons why these budgets were not fully utilized.

RESPONSE

The reasons why spending was lower for Commercial and Industrial offers in 2014 relate to changes in the DSM marketplace. The first indicator that influenced the approach to program delivery was the sales funnel projected by the DSM Sales team. The Cumulative Cubic Meter ("CCM") results relating to the Industrial and Commercial offers within the Resource Acquisition program had shown a declining trend over the previous 2 years. In 2012, Enbridge delivered programs that enabled savings of 965 million CCM[1] from Industrial and Commercial program participants. In 2013, results from these offers declined to 728 million CCM[2]. The reduction in results represented a distinct pattern of declining CCM while the number of completed projects remained consistent year over year. At the same time that the yield produced from Commercial and Industrial segments continued this declining trend, Enbridge's Residential programs were demonstrating increasing uptake and yields. Thus, Enbridge made a decision to focus its resources and budget to aggressively pursue successful programs in the marketplace. As a result, Enbridge was able to help more than 5,000 residential customers improve their energy performance. Redirecting the budget from the Commercial and Industrial segments to the Residential segment resulted in a budget that better aligned with marketplace opportunities.

[1] EB-2013-0352, Exhibit B, Tab 1, Schedule 1, p.12, Table 2: DSM Results – Target versus Actual
[2] EB-2014-0277, Exhibit B, Tab 1, Schedule 1, p.17, Table 4: DSM CCM Savings Results – Target vs. Actual

Witnesses: M. Lister
B. Ott

BOMA INTERROGATORY #2

INTERROGATORY

Run it Right Program:

Filed: 2015-10-30 EB-2015-0267 Exhibit B Tab 1 Schedule 1 Page 45 of 206

In comparison to 2013, the number of participants that signed up for the program in 2014 was similar – 202 compared to 217, respectively. However, the number of participants that implemented measures in 2014 compared to 2013 saw a significant decrease – 53 compared to 192, respectively. This decrease was partly due to a new standardized approach implemented by Enbridge in the building investigation phase of the offer. A further review of this process revealed a need to increase the level of engagement between the investigation agents and the customers after Enbridge issued savings reports to customers. Enbridge has implemented improvements to the process as a result of this finding.

In 2014, some customers were not able to participate in the offer because they did not meet the minimum threshold of 5% estimated operational savings. In an effort to improve participation in 2015, Enbridge is removing this criterion.

As was the case in 2013, an analysis of RiR participant results continues to show that average savings levels are significantly lower than the initial targets, which were based on anticipated savings of greater than 10%. The average savings are 2.8% and 2.5% for 2014 and 2013, respectively. It should be noted that, as a result of the 2013 Audit, the average savings of 2.8% and 2.5% includes projects for which an increase in consumption, rather than a reduction, was observed. Consequently, potential savings derived from implemented operational measures for these projects could not be quantified.

Adequately assessing and interpreting actual results remains a challenge. Although metered data reflects building consumption, it does not accurately reflect the building conditions that can change year-over-year. An increase in consumption has a negative impact on the savings realized through the building's participation in the RiR offer.

There are programs in other jurisdictions, such as BC Hydro Continuous Optimization Program, that use deemed savings for each of the operational improvement measures that commercial customers implement in their buildings. This methodology overcomes the challenges in normalizing consumption year-over-year to accurately reflect the savings achieved by implementing operational improvement measures.

Witnesses: R. Kennedy
J. Paris
R. Sigurdson

As noted in 2013, RiR savings results are generated through operational improvements and do not involve implementation of capital measures. Many other utility re-commissioning/retro-commissioning programs, as well as local initiatives such as Greening Healthcare and Race to Reduce, take a broader approach and include both capital and operational measures. For the RiR offer, there are cases where customers have declined to participate due to the offer parameters stating that customers cannot implement capital equipment. Inclusion of capital measures would allow for a more holistic approach and result in an increase in participation as well as potentially additional savings for customers.

Interrogatory:

Given that the Race to Reduce[1] representing more than 42 per cent of the region's commercial office sector, building owners, tenants and their employees reduced their collective energy use by 12.1 per cent, surging past the program's 10 per cent target over its four years, has Enbridge completed a more detailed analysis of that program in order to address the problems in RiR? In particular, how many of the buildings that participated in the Race to Reduce were also included in RiR? Has Enbridge examined the value of longer term relationships with Commercial customers rather than year by year transactions? Is poor performance of RiR related to the number and experience of Enbridge Commercial Reps given that the turnover of staff is mentioned elsewhere in the application?

Examples of superlative achievements in the Race to Reduce follow at the end of the Interrogatories.

[1] http://racetoreduce.ca/awards/2015-awards/

Witnesses: R. Kennedy
J. Paris
R. Sigurdson

Building Performance Awards for Lowest Energy Use in 2014:

Under 250,000 sq. ft.	ENERGY STAR Score	Building Owner/ Property Management
Restoration Services Centre	100	Toronto and Region Conservation Authority
Ennisclare Corporate Centre 1075 North Service Road W.	100	2748355 Canada Inc. / Bentall Kennedy (Canada) LP
Ennisclare Corporate Centre 1235 North Service Road W.	99	2748355 Canada Inc. / Bentall Kennedy (Canada) LP
AeroCentre 1 - 5600 Explorer Drive	97	HOOPP Realty Inc. / Menkes Property Management Services Ltd.
Barrymore Building	97	First Capital Realty Inc. / First Capital Realty Inc.
3115 Harvester Road	97	8750840 Canada Inc. / Bentall Kennedy (Canada) LP

250,000 to 500,000 sq. ft.	ENERGY STAR Score	Building Owner/ Property Management
Yonge Corporate Centre - 4110 Yonge Street	95	Cadillac Fairview Corporation Limited
Northbridge Place	94	Brookfield Office Properties
Mississauga Executive Centre 4	93	Desjardins Financial Security Life Assurance Company and AIMCo Realty Investors LP / ONTARI Holdings Ltd. / Colliers International
77 Bloor Street W.	93	Bay Bloor Equities Inc. & Morguard Realty Holdings Inc. / Morguard Investments

500,000 to 1,000,000 sq. ft.	ENERGY STAR Score	Building Owner/ Property Management
25 York Street	98	Menkes Union Tower Inc. / Menkes Property Management Services Ltd.
One Mount Pleasant	97	Rogers Communications Inc.
PwC Tower at /SFC	96	bcIMC Realty Corporation / GWL Realty Advisors

Witnesses: R. Kennedy
J. Paris
R. Sigurdson

Over 1,000,000 sq. ft.	ENERGY STAR Score	Building Owner/ Property Management
Simcoe Place	97	Simcoe Place Leaseholds Ltd., 799549 Ontario Inc. / Cadillac Fairview Corporation Limited
Bell Trinity Square	93	Northam Realty Advisors Limited
TD North Tower - 77 King W.	89	Cadillac Fairview Corporation Limited
Richmond Adelaide Centre	89	Oxford Properties Group

Building Performance Awards for Greatest Energy Reduction (2011-2014):

Building	Greater than 20% Reduction	Building Owner/ Property Management
Toronto Archives Centre	59.91	City of Toronto
AeroCentre 1 - 5600 Explorer Drive	38.78	HOOPP Realty Inc. / Menkes Property Management Services Ltd.
Richmond Adelaide Centre	35.29	Oxford Properties Group
Caledon Town Hall	34.56	Town of Caledon
77 Bloor Street W.	34.24	Bay Bloor Equities Inc & Morguard REIT / Morguard Investments Limited
161 Eglinton Avenue E.	32.06	Eglinton Redpath Holdings Inc. / Crown Property Management Inc.
155 University Avenue	30.94	Great West Life Assurance Company and London Life Insurance Company / GWL Realty Advisors Inc.
Mississauga Executive Centre 2	29.78	Desjardins Financial Security Life Assurance Company and AIMCo Realty Investors LP / ONTARI Holdings Ltd. / Colliers International
AeroCentre 2 - 5580 Explorer Drive	29.7	HOOPP Realty Inc. / Menkes Property Management Services Ltd.
2920 Matheson Blvd. E.	29.22	Revenue Properties Company Limited & 2920 Matheson Boulevard Holdings Ltd. / Morguard Investments
145 King Street W.	28.97	2748355 Canada Inc. / Bentall Kennedy (Canada) LP
180 Wellington Street W.	27.39	Manulife Canadian Property Portfolio / Manulife Real Estate
600 Cochrane Drive	27.06	Canadian Urban Limited
Oakville Corporate Centre III	26.67	Penlea Investments Ltd. / Morguard Investments
First Canadian Place	25.31	Brookfield Office Properties
TD Bank Tower - 66 Wellington W.	24.75	Cadillac Fairview Corporation Ltd.
19 Allstate Parkway (Markham)	22.93	bcIMC Realty Corporation / GWL Realty Advisors Inc.
AeroCentre 6 - 5500 Explorer Drive (Mississauga)	22.01	HOOPP Realty Inc. / Menkes Property Management Services Ltd.
Toronto City Hall	21.18	City of Toronto
Barrymore Building	20.4	First Capital Realty Inc.
Yonge Corporate Centre - 4100 Yonge Street	20.3	Cadillac Fairview Corporation Ltd.

Witnesses: R. Kennedy
J. Paris
R. Sigurdson

Building	Greater than 15% Reduction	Building Owner/ Property Management
Sun Life Financial Tower	18.97	Sun Life Assurance Company of Canada / Bentall Kennedy (Canada) LP
Toronto Public Health - 277 Victoria Street	18.8	City of Toronto
4 King Street West	18.46	Great West Life Assurance Company and London Life Insurance Company / GWL Realty Advisors Inc.
TD North Tower - 77 King West	18.36	Cadillac Fairview Corporation Ltd.
4880 Tahoe Boulevard (Mississauga)	18.25	Morguard Investments Limited
Yonge Corporate Centre - 4110 Yonge Street	18.02	Cadillac Fairview Corporation Ltd.
1127 Leslie Street	17.78	Rosseau Realty
Simcoe Place	17.32	Simcoe Place Leaseholds Ltd., 799549 Ontario Inc. / Cadillac Fairview Corporation Ltd.
1875 Buckhorn Gate (Mississauga)	16.53	Bentall Kennedy (Canada) LP
Mississauga Executive Centre 4	16.44	Desjardins Financial Security Life Assurance Company and AIMCo Realty Investors LP / ONTARI Holdings Ltd. / Colliers International
200 King Street W.	16.35	BcIMC Realty Corporation / Bentall Kennedy (Canada) LP
Yonge Corporate Centre - 4120 Yonge Street	16.27	Cadillac Fairview Corporation Ltd.
Ennisclare Corporate Centre - 1275 North Service Road W. (Oakville)	16.13	2748355 Canada Inc. / Bentall Kennedy (Canada) LP
415 Yonge Street	15.94	Artis Reit / Crown Property Management Inc.
AeroCentre 3 - 5560 Explorer (Mississauga)	15.92	HOOPP Realty Inc. / Menkes Property Management Services Ltd.
110 Yonge Street	15.53	CREIT Management L.P.

Building	Greater than 10% Reduction	Building Owner/ Property Management
Trillium Executive Centre	14.96	CR3 675 Cochrane Inc. / Crown Property Management Inc.
Canada Life Building	14.6	Canada Life Assurance Company / GWL Realty Advisors Inc.
Metro Hall	14.56	City of Toronto
WaterPark Place	14.39	OMERS Realty Corporation and CPP Investment Board Real Estate Holdings Inc. / Oxford Properties Group
MetroCentre	14.21	Oxford Properties Group
2 Bloor Street W.	14.16	Oxford Properties Group
60 Bloor Street W.	13.76	60 Bloor Equities Inc. / Morguard Investments
Brookfield Place	13.69	Oxford Properties Group (161 Bay) Brookfield Office Properties (181 Bay)
Dynamic Funds Tower	13.58	Oxford Properties Group
2425 Matheson Blvd E.	13.33	Canada Post and OP Trust / Triovest Realty Advisors Inc.
1855 Buckhorn Gate	13.17	Bentall Kennedy (Canada) LP
2233 Argentia Nominee Inc.	12.85	LaSalle Investment Management / Crown Property Management Inc.
Brampton Park	12.83	Rogers Communications
Mississauga Executive Centre 1	12.82	Desjardins Financial Security Life Assurance Company and AIMCo Realty Investors LP / ONTARI Holdings Ltd. / Colliers International
25 York Street	12.69	Menkes Union Towner Inc. / Menkes Property Management Services Ltd.
AeroCentre 4 - 5520 Explorer Drive	12.64	HOOPP Realty Inc. / Menkes Property Management Services Ltd.
4720 Tahoe Blvd.	12.6	Morguard Investments Limited
95 Wellington Tower	12.35	Cadillac Fairview Corporation Ltd.
525 University Avenue	11.99	CREIT Management L.P.
RBC Centre	11.72	Ontrea Inc. and OPB (155 Wellington) Inc. / Cadillac Fairview Corporation Ltd.
200 University Avenue	11.55	Great West Life Assurance Company and London Life Insurance Company / GWL Realty Advisors Inc.
Ennisclare Centre - 1075 North Service Road W.	11.36	2748355 Canada Inc. / Bentall Kennedy (Canada) LP
175 Bloor Street E.	11.15	CREIT Management L.P.
One University Avenue	10.98	Oxford Properties Group
40 University Avenue	10.67	Greystone Investments / Triovest Realty Advisors Inc.
North York Centre	10.25	Great West Life Assurance Company / GWL Realty Advisors Inc.
North York Square	10.08	Crown Property Management Inc.

Witnesses: R. Kennedy
J. Paris
R. Sigurdson

RESPONSE

In the reference noted Enbridge was illustrating its experience with the offer over the 2013 to 2014 time period. The Company would not categorize the participation and savings yielded through the Run it Right program offer as poor performance, as they are similar to the savings achieved in other operational improvement programs offered in other North American jurisdictions.

Enbridge points out on page 46 of the same schedule the distinct difference between the Run it Right offer, which focuses on encouraging customers to implement low cost operational improvements that typically yield 2 to 3% savings, and initiatives like Greening Healthcare and the Race to Reduce, which support the installation of both capital and operational measures and therefore yield greater savings. Further, it is important to highlight that the success experienced by the Race to Reduce program was based on total Energy savings, as opposed to Run it Right's achievement which is based solely on natural gas savings.

As a point of clarity, Enbridge is a partner in the Greening Healthcare and Race to Reduce initiatives and is pleased with the success of these initiatives to date. However, the Company notes that its DSM programs operate with an entirely different governance structure which yields very different analytical outcomes. Through a rigorous evaluation and audit process Run it Right must consider all things that impact the use of energy in a building. Billing analysis for Run it Right should thus consider not only heating degree days, but also occupancy, operating hours, scheduling, and the adverse effects that installing CDM measures can have on building consumption at a minimum.

Based on the data provided in BOMA Interrogatory #2, found at Exhibit I.EDGI.BOMA.2, Enbridge was not able to determine which of the Race to Reduce participants also participated in Enbridge's Run it Right Program offer.

Finally, Enbridge has examined the value of longer term relationships with commercial customers. Enbridge employs Energy Solution Consultants and Channel Consultants within the commercial (including institutional) and industrial sales teams to deliver DSM offers to specific customer segments. A major focus of the sales group is working with key and national accounts to support the customer's short and long term conservation plans, engage with building owners that have the potential to implement capital and/or operational improvements, and to support the business partners community in implementing conservation measures.

Witnesses: R. Kennedy
J. Paris
R. Sigurdson

BOMA INTERROGATORY #3

INTERROGATORY

Run it Right Audit Recommendations:

Reference: EB-2015-0267, Exhibit B, Tab 1, Schedule 1, Page 117- xx of 206

10. Recommendation: Establish a free rider rate for the Run It Right program. Currently, there is no OEB approved free rider rate for this program. As part of this audit process, Enbridge proposed a free rider rate. Optimal conducted an informal review of free rider rates for gas retro-commissioning programs in other jurisdictions and recommended adoption of Enbridge's requested rate for purposes of this audit. Enbridge should formally establish a free rider rate that is subsequently filed and approved by the OEB.

Enbridge Response: This Audit Recommendation will be directed to the TEC, as Union has indicated that they have a similar program. As such, there may be value in developing a free ridership rate for both utilities through the TEC. If it is determined that this is not the case, Enbridge will proceed with establishing its own free ridership rate for the RIR offer.

AC (Intervenor Members) Response: The AC (Intervenor Members) endorses this response.

Status Update: The 2014 AC agreed that Enbridge would proceed on its own to undertake work to confirm the free ridership rate for 2014 RIR results. The AC further agreed that a free ridership rate for the RiR offer should be included as part of the Net-to-Gross Study through the TEC.

11. Recommendation: Survey Run It Right participants. Ideally, Enbridge or its evaluator should survey participants prior to any billing regression analysis. This would ensure better data and avoid noted problems with ex-post adjustments to the sample that resulted from exogenous factors affecting gas usage. The importance of conducting a survey prior to the analysis is that all data is treated equally, and any obvious outliers or other problem data can be removed or adjusted without bias. In addition, this process will allow for removal of any obviously bad or incomplete data. Surveys should accomplish the following:

- *Determine whether the participant implemented the measures recommended in the timeframe indicated.*
- *Determine whether the participant made any significant changes to the facility, its operations, or equipment outside of the Run It Right Program. If changes were made, determine whether changes can be attributed to Run*

Witnesses: R. Kennedy
M. Lister
B. Ott

It Right spillover savings, are completely independent of the Program, or were already counted in another Enbridge program.

- *Collect basic participant characteristics, including building type, occupancy load, usage, and size.*

Based on this information, the analyst can remove or adjust all data in a consistent fashion. For example, if a major piece of equipment was replaced with a more efficient one, it may be appropriate to adjust the ex post data to subtract the expected additional savings. Further, if building usage or operations have changed significantly, the data can be adjusted if the impacts of these changes can be estimated with relative certainty. In some cases, it may be more appropriate to simply remove a participant from the sample.

Enbridge Response: Enbridge agrees that completing a survey with a random sample of participants would be more appropriate in order to gain further insight into results. The random sample would be conducted in a manner similar to the CPSV process. A survey of all participants would be cost prohibitive (this is in line with recommendation #13).

AC (Intervenor Members) Response: The AC (Intervenor Members) endorses this response.

Status Update: Enbridge discussed this recommendation with the 2014 AC and the Auditor and proceeded to engage a third party consultant to complete a survey of participants included in 2014 results with input from the AC and the Auditor.

12. Recommendation: Include a "comparison group" of similar customers that did not participate in the Run It Right program. A comparison group of customers that are matched to the participant group (in terms of building type, major end-uses, size, and consumption) should be included in the analysis. Typically this would be done with a "dummy variable" that indicates whether the customer was a participant or not. The biggest benefit of including a comparison group is that it can more explicitly control for weather and other variations over time. Because all sites will have been exposed to the same weather, the analysis inherently controls for weather without the need to identify balance temperature points for each facility. It also avoids introducing uncertainty from determining a building specific relationship between weather and gas usage. This will significantly simplify the analysis and result in a more accurate isolation of weather effects. A comparison group also can adjust for unknown variables that may be important but are difficult to identify and control for. For example, there may be natural growth in existing buildings' gas usage that would mask some of the true program savings. Comparing participants with similarly situated nonparticipants would automatically control for any such effects.

Witnesses: R. Kennedy
M. Lister
B. Ott

Enbridge Response: Enbridge's proposal for recommendation #11 appropriately addresses the need for increased accuracy and information, without unduly increasing the cost and complexity of the offer.

AC (Intervenor Members) Response: The AC agrees that the revisions associated with Auditor recommendation #11 are a good next step in the evolution of the evaluation of this program,

and that the addition of a control group is not necessary at this point in time. However, that decision should be revisited in the future as more experience with the program (and its evaluation) is gained, particularly if the program grows substantially in size.

13. Recommendation: Consider sampling approaches that balance required resources with level of importance. When performing the analysis and incorporating the two previous recommendations, we recognize that this approach may add additional program costs related to surveying participants and using comparison groups. We also understand that Enbridge intends for this program to expand and hopefully have more participants in the future. As a result, it may be appropriate to analyze a sample of participants rather than a full census of participants. This is appropriate, particularly if the number of participants grows significantly. We recommend that the sample of participants first be stratified by size. The largest usage customers will tend to have a disproportionately high impact on overall savings. As a result, we recommend developing size strata and oversampling the largest stratum (depending on range of usage and number of participants, it may make sense to oversample more than one large stratum). Often, the very largest stratum might only have a few participants, who would all be included in the sample. This approach of devoting more resources to the largest projects will enhance the overall precision of the sample without the need to actually increase the numbers of participants sampled. Once the strata cut points are selected, the samples should be drawn in a randomized way (except for any strata where a full census is used). Similarly, the comparison group should align with the same strata and also be randomly selected.

Enbridge Response: Please refer to the response to recommendation #11.

AC (Intervenor Members) Response: The AC (Intervenor Members) endorses this response.

Witnesses: R. Kennedy
M. Lister
B. Ott

Interrogatory:

BOMA is concerned that the audit recommendations, Enbridge's Responses and the AC (Intervenor Member) Responses fail to recognize the fundamental issue of RiR – that it takes a one dimensional approach to the needs of commercial customers rather than a holistic approach. Why can't Enbridge offer a program similar to its recently developed Strategic Energy Management Program for its Industrial Sector, given that the commercial and institutional represent a larger sector? Further, BOMA suggests that the audit recommendations are overkill for a piecemeal program, but would be informative and valuable if all Commercial Programs were combined under one umbrella. Please comment on how this could be undertaken or the reasons why it can't be done.

RESPONSE

For clarity, the Strategic Energy Management Program is a program offered by Union Gas Ltd. Enbridge's 2015 to 2020 Multi-Year DSM Plan has a similar offer, Comprehensive Energy Management ("CEM"), which targets large and complex commercial and industrial customers. CEM is most relevant to customers with a high degree of complexity in their energy use and requires considerable investments in time and effort from Enbridge Energy Solutions Consultants. As a result, CEM may not be appropriate for all commercial and industrial customers.

Enbridge delivers a variety of offers designed to address the diversity of characteristics, needs, values, priorities, capabilities, and levels of commitment amongst its customers. The sheer variety of customer types, consumption patterns, and decision making processes suggests that a one size fits all approach would likely limit the Company's ability to best serve and meet the needs of customers. The Board has indicated its support for this approach in its Decision and Order regarding the Company's 2015 to 2020 Multi-Year DSM Plan, wherein fifteen distinct program offers have been approved[1].

[1] EB-2015-0049, Decision and Order, Schedule A: Approved Annual Budgets and Targets for All Programs, Jan.20th, pp.1

Witnesses: R. Kennedy
M. Lister
B. Ott

OSEA INTERROGATORY #1

INTERROGATORY

Reference: Exhibit A, Tab 1, Schedule 3, Pages 3-4

The Board's Decision and Order dated February 26, 2015 in the 2013 Clearance Application (EB-2014-0277) indicated the Board's support for the proposed [boiler] study which was anticipated to have been completed in 2015. This Decision anticipated that the results of this study would be incorporated in the evaluation of the 2014 results. This issue was specifically raised by the Company with the Auditor and AC for the purposes of the 2014 audit. The AC acknowledged that the study could not be completed prior to June 2015 and thus could not be incorporated into the 2014 audit process and timelines. Work on this study has been underway through the TEC since April, 2015 and it is likely that despite best efforts, the results of the study will not be available until mid-2016.

Please advise if Enbridge intends to resubmit its claims for 2014 once the boiler study is complete.

RESPONSE

Enbridge does not intend to resubmit claims for 2014. The boiler projects were thoroughly reviewed through the CPSV audit process and appropriate adjustments were made to projects, including base case calculations, which resulted in reduced savings calculations for many projects. Ultimately, these adjustments contributed to an overall adjustment in CCM values for the sampled projects which was utilized to calculate a realization rate and this adjustment factor was applied to all 2014 Commercial custom and Low Income Multi-Residential custom project claims.

Further, as stated in Staff Interrogatory response #3 c) & d), found at Exhibit I.EGDI.STAFF.3, Optimal included commentary in the audit report with respect to the approach taken, in order to provide a reasonable opinion on the savings claimed for boiler projects. The Auditor specifically notes that the approach considered the Board's decision in the 2013 Clearance of Accounts related to a boiler baseline study.

In addition, the Audit Committee endorsed Enbridge's audited 2014 claimed results. As stated in Enbridge's Audit Summary Report:

> Following receipt of the 2013 Clearance Board Decision and Order dated February 26, 2015 which indicated that the Board was "supportive of the proposed [boiler] study in 2015, with the finding being incorporated in the evaluation of the 2014 results", at the AC

Witnesses: D. Bullock
M. Lister
R. Sigurdson

weekly meeting on March 6th, the Auditor and AC contemplated and discussed the Board's decision and its consideration in the 2014 audit. The AC concurred that a heating boiler baseline study should be conducted. However, the AC had questions regarding who should initiate and oversee the study and whether it should be a joint study with Union Gas. It was agreed that the matter should be raised at the upcoming meeting of the TEC at its next meeting on March 10th, 2015. Further, the AC discussed that the study would not be completed prior to June 2015 and thus could not be incorporated into the Year 2014 audit process and timeline. The AC and Optimal agreed that the Auditor should proceed on its current work plan and schedule with the understanding that the boiler study would not be incorporated into the final Audit Report. The Auditor therefore adopted an approach to make adjustments to baseline assumptions that it considered to be the most reasonable. Where applicable, this action caused the base case seasonal efficiency for boiler projects to be higher, thereby resulting in savings estimates that were lower than those calculated by Enbridge.[1]

[1] Exhibit B, Tab 3, Schedule 1, page 7

Witnesses: D. Bullock
M. Lister
R. Sigurdson

OSEA INTERROGATORY #2

INTERROGATORY

Reference: Exhibit A, Tab 1, Schedule 3, Page 6

The Guidelines and the Updated Multi-Year Plan provide the method of calculating the DSMIDA and a cap of $10.872 million for 2014. The Draft Evaluation Report calculated the DSMIDA at $7,500,805 including adjustments from the CPSV review. Following its review of the Company's program results, the independent Auditor made recommendations with regard to the following measures, which the Company and the AC accepted:

(i) Industrial Custom Project Savings (ii) Commercial Custom Project Savings (iii) Low income (Part 3) Custom Project Savings (iv) Custom Project adjustment factor calculation (v) Commercial Prescriptive Savings (vi) Low income (Part 9) Prescriptive Savings This resulted in an auditor-recommended DSMIDA of $7,647,242. The specifics of the recommendations made by Optimal are set out in its Audit Report. This amount was accepted by both the AC and the Company.

Please explain how Enbridge could have achieved greater results with additional funds.

RESPONSE

In theory, while additional results can be achieved with additional funds, in Enbridge's experience these results are not infinite and are likely to be incrementally more expensive. This is particularly true for the commercial and industrial sectors, where the Company has generally seen declining results per project and per dollar throughout its 2012-2014 DSM Plan.

Witnesses: M. Lister
B. Ott

OSEA INTERROGATORY #3

INTERROGATORY

Reference: Exhibit A, Tab 1, Schedule 3, Page 8

The Company's DSM activities in 2014 generated estimated natural gas savings of approximately 719.8 M CCM. The 2014 DSM activities are estimated to have a TRC value of $89,622,342 which is the approximate value of bill savings enjoyed by Enbridge's customers.

Please provide an estimate of the approximate value of bill savings enjoyed by Enbridge's customers since Enbridge began implementing DSM programs in 1995.

RESPONSE

As a result of Enbridge's DSM activities, the aggregate TRC benefits from 1995 to 2014 are estimated to have a value of nearly $2.5 billion.

The TRC benefits noted above represent the net present value of the sum of the avoided costs of gas, electricity, and water that is expected to be conserved over the lifetime of the implemented DSM measures, less the incremental cost of the energy efficient equipment and cost of delivering DSM programs. The avoided costs are calculated using a standardized value for each commodity in lieu of the actual rates that would be experienced by a given participant. Given that these amounts are standardized forecasts of the economic value of future energy and water savings, the TRC value would be best understood as a representation of the economic benefits that DSM brings to society as a whole[1].

[1] The TRC calculation does not include DSM customer incentives as a "cost" because they are both collected from and returned to ratepayers. For this reason society as a whole is held neutral by these costs.

Witnesses: M. Lister
B. Ott

OSEA INTERROGATORY #4

INTERROGATORY

Reference: Exhibit B, Tab 1, Schedule 1, Page 7

The TRC for the Resource Acquisition program was 2.84, while the TRC for the Low Income program was 1.33 – both well above their cost-effectiveness screening thresholds.

Please explain why the post-implementation TRC for the Low Income Program was 1.33, when the approved TRC threshold was 0.7.

RESPONSE

Enbridge continuously strives to maximize the benefits and cost-effectiveness of all its programs. For the Low Income program, this effort resulted in a post-implementation TRC of 1.33.

Witnesses: M. Lister
E. Lontoc
B. Ott

OSEA INTERROGATORY #5

INTERROGATORY

Reference: Exhibit B, Tab 1, Schedule 1, Page 58

The Low Income program focuses on helping to reduce the energy costs facing low income consumers and housing providers through thermal envelope improvements as well as the installation of measures to achieve water and space heating savings.

Please explain if Enbridge considered broadening its Low Income Program to include additional elements which OSEA considers to be sustainable energy such as: conservation, energy efficiency and demand management, renewable heat and electricity generation, high efficiency combined heat and power (CHP) and district energy, energy storage, and green buildings.

RESPONSE

Enbridge's Low Income Program offers a mix of financial incentives and enabling support geared toward integrated energy management for the affordable housing market. Custom projects can incorporate a variety of technologies and practices, including many of the elements OSEA has mentioned in this interrogatory.
The technologies and practices ultimately chosen for implementation are driven by the customer's needs, objectives and circumstances.

Witnesses: M. Lister
E. Lontoc
B. Ott

OSEA INTERROGATORY #6

INTERROGATORY

Reference: Exhibit B, Tab 1, Schedule, 1 Pages 110-127

Given the delay in the Boiler Study referenced above and the transition of responsibilities to the Board and the EAC, please explain what impact Enbridge expects on the future timeliness of the implementation of the recommendations of the Board and Board Staff.

RESPONSE

Implementation of Auditor recommendations that impact only Enbridge can usually be implemented in a shorter time frame than those that impact both Enbridge and Union Gas Ltd. In the previous framework, it was common for Audit recommendations that impacted both utilities to be addressed through the Technical Evaluation Committee ("TEC"). These recommendations would typically take longer to implement as a greater number of parties were involved. However, as the Board-led Audit process has yet to commence and the terms of reference for the EAC have not yet been established, Enbridge is not in a position to speculate on how the new process may impact the implementation of Auditor recommendations.

Witnesses: D. Bullock
R. Idenouye
R. Sigurdson

OSEA INTERROGATORY #7

INTERROGATORY

Reference: Exhibit B, Tab 3, Schedule 1, Page 7

Wave 1 of the 2014 CPSV process commenced in November of 2014.

Please advise if the 2015 CPSV process has begun.

RESPONSE

The 2015 CPSV process has not yet begun. On December 22, 2014, the Board issued a new DSM Framework and DSM Filing Guidelines for the 2015-2020 multi-year period (EB-2014-0134). The Guidelines indicated on page 30 that "the Board is of the view that it is in the best position to coordinate the evaluation process throughout the DSM framework period." Subsequently, on August 21, 2015, the OEB issued a letter to All Participants in the Consultation Process EB-2014-0134 further establishing the audit and evaluation process and the role of the Board. On page 2 it states, "the OEB is responsible for coordinating and overseeing the evaluation and audit process, including selecting a third party Evaluation Contractor…" The Board issued a Request for Proposal to hire the Evaluation Contractor on February 9, 2016, which indicated that proposals would be due on March 7, 2016. The Draft Evaluation Schedule for the 2015 program year, included in the Scope of Work for this contract, indicates that the verification consultants will be hired by late April of 2016.

Witnesses: D. Bullock
M. Lister
R. Sigurdson

STAFF INTERROGATORY #1

INTERROGATORY

Ref: Exhibit A / Tab 1 / Schedule 3 / pp. 3-4

Preamble:

The OEB's Decision and Order on Enbridge's clearance of its 2013 DSM accounts application (EB-2014-0277) stated the OEB is supportive of the proposed boiler baseline study in 2015 to be with the findings being incorporated in the evaluation of the 2014 results. In its application, Enbridge stated that it raised the issue of incorporating the results of the study in the evaluation of 2014 results with Optimal Energy and the Audit Committee (AC). Enbridge noted that the AC acknowledged that the study could not be completed prior to June 2015 and therefore could not be incorporated in the evaluation of 2014 results. Enbridge further noted that work on this study has been underway through the Technical Evaluation Committee since April 2015 and, despite best efforts, it is likely that the results of the study will not be available until mid-2016.

Questions:

a) Please provide the current status of the boiler baseline study.
b) Please provide any documentation providing further insight into the delay in completing the baseline boiler study.
c) Please explain Enbridge's position related to applying the results of the boiler baseline study on a prospective basis following the completion of the study (e.g., not applying the results of the study until 2017) in the context of the OEB's Decision and Order on Enbridge's clearance of its 2013 DSM accounts application (EB-2014-0277) and the OEB's combined Decision and Order on Union and Enbridge's DSM Plans (EB-2015-0029/EB-2015-0049). In your response, please reconcile not applying the results of the boiler baseline study to the program evaluation results of 2014, 2015 and 2016 with the need to ensure that the best and most accurate results are being used when determining lost revenues and shareholder incentive amounts.
d) Please confirm how long the current boiler baseline efficiency figure of 80.5% has been used by Enbridge to evaluate and calculate final program results.
e) Please provide the number of projects that rely on a boiler efficiency base case of 80.5%.

Witnesses: R. Idenouye
M. Lister
B. Ott
R. Sigurdson
T. Whitehead

f) Please provide the total amount of savings and the percentage of savings relative to all programs and to only commercial and industrial programs that were attributable to boilers with a thermal efficiency assumed to be 80.5%.
g) Please quantify the shareholder incentive associated with the savings claimed from commercial boilers with 80.5% efficiency.
h) Please compare the current boiler baseline efficiency figure used by Enbridge to those which are used in other leading jurisdictions.
i) Please re-calculate the 2014 shareholder incentive amount using a boiler baseline efficiency standard of 85%.

RESPONSE

a) The RFP for the Boiler baseline study was issued in November 2015. In a memorandum dated March 4, 2016 issued by the Board in EB-2015-0245 (Memorandum), Enbridge, through the TEC, has been directed to complete the review of the proposals received in response to the RFP and to select the consultant. The Memorandum and its contents will be a topic of discussion at the upcoming March 10th TEC meeting, where alignment on next steps will be sought and confirmed.

b) As described in the OEB's letter on August 21, 2015, regarding the 2015 to 2020 DSM evaluation process (the Letter), the TEC's evaluation activities will be transitioned to the OEB under the new DSM evaluation governance structure. In the Letter the OEB directed the gas utilities and the TEC to continue working on the evaluation projects that they had initiated (the Projects) until the transition takes place. As such, Enbridge and Union continued to work with the TEC to finalize the Boiler Baseline Study RFP which was issued in November 2015. As per the Schedule of Activities below, the intention was to select a proponent on January 15, 2016.

Witnesses: R. Idenouye
M. Lister
B. Ott
R. Sigurdson
T. Whitehead

Activity	**Due**
Issue Date of RFP	November 23, 2015
Intent to Bid and Conflict of Interest Notice	Noon (EST) December 7, 2015
TEC Eligibility Responses Due	December 10, 2015
Proposal Submission Due Date	5pm (EST) December 18, 2015
Proposal Selection	January 15, 2016
Anticipated Project Start-Up Meeting and Review of Initial Documents	January 29, 2016

After the RFP was issued, the TEC was advised by Board Staff that the work will be transitioning to the EAC and that Board Staff will be managing the selection process. This work was therefore placed on hold pending direction from Board Staff. On March 4th, 2016, the Board issued the Memorandum which sets out the process for the transition of TEC activities to the OEB. As stated in the response to a) above, the Memorandum and its contents will be a topic of discussion at the upcoming March 10th TEC meeting, where alignment on next steps will be sought and confirmed.

c) In both the 2015 to 2020 DSM Framework Proceeding (EB-2014-0134) and the 2015 to 2020 Multi-Year Plan proceeding (EB-2015-0049), the Company consistently brought forward evidence and argument which supported the prospective application of input assumptions for the purpose of determining shareholder incentives. Some of this evidence and argument included:

- The practice of applying input assumptions retroactively creates an unrealistic expectation of the utility's ability to anticipate and respond to changes in the wide variety of inputs that influence program performance.[1]
- DSM targets and budgets, and therefore resources, are based upon values such as deemed input assumptions and net to gross ratios.[2]

[1] California Public Utilities Commission (2010) "Decision Regarding the Risk/Reward Incentive Mechanism Earnings True-Up for 2006-2008," Decision 10-12-049, Dec. 16th, p.34
[2] Kushler, Martin; Nowak, Seth; White, Patti (2012) "A National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs", *ACEEE*, Report U122, Feb. p.34, 39

Witnesses: R. Idenouye
M. Lister
B. Ott
R. Sigurdson
T. Whitehead

Changes in these values constitute changes to the foundation on which utilities agreed a given target was achievable under a given budget scenario. If changes to input assumptions will affect DSM results they should logically also affect the DSM targets against which those results are judged.

- The retroactive changing of assumptions, in this case net to gross values, was at the heart of one the most severe regulatory disputes in the history of North American conservation and energy efficiency. California's investor-owned utilities believed their collective incentive payments for 2006-2008 were approximately $400 million, but a retroactive change in assumptions resulted in the evaluator proposing $45 million in collective penalties to shareholders[3]. Years of legal and regulatory disputes ensued.[4]

- The risk created by the retroactive application of assumptions discourages utilities from pursuing innovative programs and technologies. For this reason Massachusetts, identified in the Concentric study as a leading jurisdiction in energy efficiency and conservation, no longer applies changes to assumptions retroactively when measuring results.[5]

- The retroactive application of assumptions does not appear to be the best practice in North America as 31 out of 38 U.S. states analyzed in 2012 applied assumptions on a forward looking basis.[6]

- In EB-2015-0049 Board Staff's consultant, Synapse Energy Economics, noted that maintaining input assumptions used for DSM planning processes for the purpose of determining shareholder incentive amounts was, "…consistent with basic fairness. If all parties have agreed to accepted [net to gross] values based on a given program design and that design is faithfully executed, it is reasonable not to retroactively change the playing field used for crediting energy savings accomplishments."[7]

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[3] Zuckerman, Julia; Dearson, Jeff; Chandrashekeran, Sangeetha. (2013) "Rewarding Efficiency: Lessons from California's Shareholder Incentive," *Climate Policy Initiative, University of Melbourne,* 2013 International Energy Program Evaluation Conference, Chicago, p.4

[4] California Public Utilities Commission (2010) "Decision Regarding the Risk/Reward Incentive Mechanism Earnings True-Up for 2006-2008," Decision 10-12-049, Dec. 16th

[5] Massachusetts Department of Public Utilities.(2012) *Docket 11-120 Order*, Aug. 10th, p.15

[6] Kushler, Martin; Nowak, Seth; White, Patti (2012) "A National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs", *ACEEE*, Report U122, Feb. p.62-63

[7] EB-2015-0049, Enbridge Reply Argument, p.24, October 23, 2015

Witnesses: R. Idenouye
M. Lister
B. Ott
R. Sigurdson
T. Whitehead

Ultimately the Board, in its Decision and Order in EB-2015-0049, ruled that prescriptive input assumptions should be applied on a prospective basis. It is Enbridge's view that this determination by the Board will increase fairness and stability to the benefit of ratepayers through improved process efficiency and DSM results.

In reconciling the Board's recent Decision in EB-2015-0049 with the Decision issued in EB-2014-0277 it is the Company's view that the more recent Decision provides appropriate guidance. While Enbridge can only offer its opinion on the factors which guided the Board's Decision in EB-2014-0277, the Company notes that the Board panel in that proceeding did not have the benefit of the extensive and well-tested evidence relating to this issue which was brought forward in EB-2015-0049. This latter proceeding incorporated thousands of pages of evidence, a lengthy and comprehensive oral hearing and extensive argument. The review undertaken by the panel in this proceeding was far more detailed than that which took place in EB-2014-0277. Enbridge believes that it would be procedurally and logically inconsistent for a practice (i.e., the retroactive changing of input assumptions) to be reviewed in detail by the Board and found to be not best practice and to then, at a subsequent date, continue to apply the practice rejected by the Board.

Enbridge further notes that the Board panel's decision in EB-2014-0277 predated the changes in the evaluation and audit process initiated in EB-2014-0134. These changes have played a role in delaying the boiler base case study well into 2016.

While the application of the results of the Boiler Baseline Study to DSM results in 2015 and 2016 are not matters currently before the Board in this proceeding, Enbridge believes that the findings of the Board in EB-2015-0049 wherein it ruled against changing input assumptions retroactively is the practice that the Board has approved for these years of the 2015-2020 Multi-Year plan.

d) For clarity, Enbridge utilizes a seasonal efficiency value in establishing the baseline which incorporates a thermal efficiency of 80.5%. This value, based on best available information, has been used by Enbridge since 2012 to evaluate and calculate final program results. Please see STAFF Interrogatory #3, found at Exhibit I.EGDI.STAFF.3 for further discussion of this thermal efficiency value.

Witnesses: R. Idenouye
M. Lister
B. Ott
R. Sigurdson
T. Whitehead

e), f), g) Please see below the requested figures.

	Prescriptive HEBOs	Prescriptive School Boilers	Commercial Custom Boilers	Industrial Non Process Boilers [1]
Total # of Addresses	40	19	222	0
Total # of Units Installed [2]	53	19	---	0

	Prescriptive HEBOs	Prescriptive School Boilers	Commercial Custom Boilers	Industrial Non Process Boilers [1]	Total 2014 CCM Post-Audit
Total 2014 CCM derived from Boilers [3]	12,084,856	5,926,316	192,876,767	0	210,887,939
Total Commercial CCM [3]	3.1%	1.5%	49.5%	---	389,415,717
Total Industrial CCM [3]	---	---	---	0.0%	185,261,718
Total Resource Acquisition CCM [3]	1.8%	0.9%	29.0%	0.0%	664,367,997

	Prescriptive HEBOs	Prescriptive School Boilers	Commercial Custom Boilers	Industrial Non Process Boilers [1]
DSMI Impact of CCM derived from Boilers [4 5]	$170,947	$83,831	$2,705,621	$0

Notes:

1. All 2014 Industrial boiler projects consisted of Industrial Process Boilers. Therefore, there were no Industrial Non-Process Boilers in Enbridge's 2014 results.

2. # of Units Installed are only provided for prescriptive offers.

3. All CCM values provided are Post Audit values. However, 2014 results have not been cleared by the Board and could be subject to change.

4. DSMI Impact is provided for illustrative purposes only, as the scorecard calculation and subsequent DSMI achievement is calculated on a weighted scorecard basis, and is not structured to accurately separate DSMI by program, offer, or measure.

5. Illustrative DSMI Impact is a scorecard calculation contingent on the following levels of achievement within the RA scorecard: 5,213 CER participants and 664.37 milion CCM. A change to one of these variables would alter the above illustrative DSMI associated with boilers, even if boiler savings remained unaltered.

Witnesses: R. Idenouye
M. Lister
B. Ott
R. Sigurdson
T. Whitehead

h) Other leading jurisdictions such as Massachusetts, New York, Minnesota, Illinois, California and the Mid-Atlantic use a thermal efficiency of 80% as specified in their respective TRMs.

i) This request would require considerable time and effort and cannot be completed by the deadline set for Interrogatory responses. Before the 2014 shareholder incentive can be recalculated each custom project file, of which there are hundreds, would need to be modified for the revised thermal efficiency to establish a base case. Subsequently, in order to determine the revised base case seasonal efficiency, ETools calculations would need to be re-run project by project after which savings for each project would be re-calculated. In addition, the Company questions the appropriateness and source of a boiler baseline efficiency standard of 85% particularly in light of the fact that leading jurisdictions as noted above use a thermal efficiency of 80%, while Enbridge utilizes a thermal efficiency value of 80.5%.

Witnesses: R. Idenouye
M. Lister
B. Ott
R. Sigurdson
T. Whitehead

STAFF INTERROGATORY #2

INTERROGATORY

Ref: Exhibit A / Tab 1 / Schedule 3 / pp. 5-8
Exhibit B / Tab 1 / Schedule 1 / p. 107

Preamble:

The Lost Revenue Adjustment Mechanism (LRAM) deferral account has a credit balance reimbursable to customers of $0.065 million. Enbridge notes that the LRAM amount is recovered in rates on the same basis as the lost revenues were experienced so that the LRAM ends up being a full true-up by rate class (Guidelines ss. 13.3).

As part of Enbridge's 2014 DSM Annual Report, the LRAM calculations are shown. OEB staff would like to get a better understanding of these calculations.

Questions:

a) Please discuss, and provide the detailed calculations with live excel working files, of Enbridge's load forecast that was used to determine the 2014 LRAM balance of $0.065 million. In particular, please discuss and clearly show the following:

   i. How the load forecast was adjusted to account for DSM activity,
   ii. What assumptions were used related to DSM savings estimates for different programs (and offerings) and how these estimated savings were allocated to the applicable rate classes,
   iii. What level of historic DSM savings (those from previous years that are assumed to persist in the future) were built into the load forecast regression analysis;
   iv. What level of new, estimated DSM savings for future year DSM programs (e.g., those included within the 2015-2020 DSM plan) were built into the load forecast through a manual adjustment, and
   v. Clearly show how Enbridge has applied its final DSM evaluation results to the reductions made to its load forecast in order to calculate the LRAMVA amount.

b) Please discuss and clearly show the programs (and/or offerings) and the final net savings from these programs (and/or offerings) that contributed to the actual net partially effective savings figures for all rate classes outlined in Table 43: LRAM Statement in the 2014 Annual Report.

c) Please discuss the process that Enbridge undertakes in updating its load forecast to account for DSM savings and the regularity of updates made to its forecast to

Witnesses: R. Cheung
M. Lister
K. Mark
B. Ott
H. Sayyan

account for new reductions in natural gas usage attributable to DSM programs (e.g., is this on an annual basis, at the time of Enbridge's cost of service, etc.).

d) Please explain your approach to developing your load forecast and taking into account impacts of DSM activities in the context of Section 12 of the DSM Guidelines (EB-2008-0346) which states:

> "Utilities recover their allowed distribution revenues through both a fixed and a variable distribution rate. These rates are based on forecast consumption levels for their respective franchise area that **take into account, among other things, the expected impact of naturally occurring energy conservation and the impact of planned DSM activities** [emphasis added]. If the actual impact of natural gas DSM activities undertaken by the natural gas utility in its franchise area results in greater (less) natural gas savings than what was incorporated into the forecast, the natural gas utility will earn less (more) distribution revenue than it otherwise would have, all other things being equal.

Further, the DSM Guidelines state:

> "…the LRAM amount is a retrospective adjustment and may be an amount refundable to or receivable from the utility's customers, depending respectively on whether the actual natural gas savings resulting from the natural gas utility's DSM activities are less than or greater than what was included in the forecast for rate-setting purposes."

RESPONSE

a)

i. The 2014 LRAM balance of $0.065 million is contributed by contract market customers. The Contract Market volume budget is generated using an established grass roots approach in which volume forecasts are generated on an individual customer basis by Account Executives in consultation with customers during the budget process. A volumetric adjustment related to the planned DSM for the test year is then layered onto the volumes forecast to incorporate the impacts of incremental DSM activities. The LRAM captures the resulting revenue impacts of volumetric variance due to DSM. The 2014 Board Approved Budget volumes of 1,966.0 10^6m^3 for contract market had incorporated the volumetric adjustment from the planned partially effective DSM component of 10.7 10^6m^3. (Please see Table 1 under the response to d).

ii. The DSM savings estimates used to inform Enbridge's volumetric forecast were those included in the Company's 2013 to 2014 DSM Update (EB-2012-0394).

Witnesses: R. Cheung
M. Lister
K. Mark
B. Ott
H. Sayyan

The relevant tables have been retrieved from that proceeding and reproduced below for convenience. The Company allocated these estimates to rate classes based on historical distribution of results from these offers amongst rates.

Resource Acquisition Program	Annual Savings (m3)	Cumulative Savings (m3)	Annual Electricity Savings (kWh)	Annual Water Savings (m3)
Residential	586,501	11,730,013		
Commercial	46,695,285	633,679,262	5,307,252	311,071
Industrial	23,112,486	346,687,290		
Total	70,394,271	992,096,565	5,307,252	311,071

Low Income Initiative 2014	Annual Savings (m3)	Cumulative Savings (m3)	Annual Water Savings (m3)
Single Family	1,071,266	23,600,000	18,204
Multi-Residential	4,583,676	64,200,000	169,564
Total Low Income	5,654,942	87,800,000	187,768

iii. As consistent with approved methodology, Contract Market volume forecast was generated using the grass roots approach instead of regression analysis. Historical DSM, economic and industry conditions are factored into the volumes forecast provided by Account Executives in consultation with contract customers.

iv. Being a forecast for 2014 system demand and 2014 DSM reductions, no adjustments for the 2015 to 2020 DSM Plan were built into the estimation of 2014 volumes or the calculation of 2014 LRAM.

v. The volumes used to calculate the LRAM amounts requested to be cleared in this proceeding incorporate Enbridge's final DSM evaluation results. This calculation is represented in Exhibit B, Tab 1, Schedule 1, page 107. For convenience, the relevant table has been reproduced below:

Witnesses: R. Cheung
M. Lister
K. Mark
B. Ott
H. Sayyan

2014 Annual Report LRAM Calculation

Based on 57,036,910 FE m3 built into rates

Rate Class	Budget Net Partially Effective (m^3)	Actual Net Partially Effective (m^3)	Volume Variance (m^3)	Distribution Margin (cents/m^3)	LRAM Allocation $	LRAM Allocation %
Rate 110	2,065,678	1,237,361	(828,317)	1.4276	($11,825)	11%
Rate 115	1,314,523	846,042	(468,480)	0.7900	($3,701)	6%
Rate 135	0	51,608	51,608	1.2753	$658	-1%
Rate 145	2,428,288	467,549	(1,960,740)	1.5397	($30,189)	26%
Rate 170	4,942,907	707,329	(4,235,578)	0.4789	($20,282)	57%
Totals	10,751,396	3,309,889	-7,441,507		($65,339)	100%
			Amount to be paid back to Ratepayers		($65,339)	

** Rate 1 and Rate 6 are not included in the LRAM amount for clearance above as these rate classes are covered under the Average Use True-Up Variance Account (AUTUVA)*

b) The table below is taken from Exhibit B, Tab 1, Schedule 1 page 16, and shows the Company's net annual gas savings by program and offer.

Witnesses: R. Cheung
M. Lister
K. Mark
B. Ott
H. Sayyan

	Program	Gross Annual Gas Savings (m^3)	Net Annual Gas Savings (m^3)	Gross CCM (m^3)	Net CCM (m^3)
Resource Acquisition	**Residential**				
	Community Energy Conservation	6,958,684	5,914,881	105,518,309	89,690,562
	Total Residential	**6,958,684**	**5,914,881**	**105,518,309**	**89,690,562**
	Commercial				
	Commercial Custom	19,708,793	16,371,408	373,800,192	307,222,026
	Commercial Prescriptive	6,573,118	5,408,523	97,136,791	79,068,251
	Run It Right	625,088	625,088	3,125,440	3,125,440
	Total Commercial	**26,906,999**	**22,405,020**	**474,062,423**	**389,415,717**
	Industrial				
	Industrial Custom	23,440,752	12,001,904	349,395,582	177,663,455
	Industrial Prescriptive	542,215	472,840	8,887,940	7,598,262
	Total Industrial	**23,982,967**	**12,474,745**	**358,283,522**	**185,261,718**
	Low Income				
	Single Family (Part 9)	1,039,428	1,036,919	25,698,580	25,673,482
	Multi-Residential (Part 3)	1,734,457	1,708,673	30,058,993	29,801,158
	Total Low Income	**2,773,885**	**2,745,592**	**55,757,573**	**55,474,640**
	Grand Total	**60,622,535**	**43,540,237**	**993,621,826**	**719,842,637**

For the purpose of establishing LRAM amounts Enbridge groups its offerings by customer type. Below is a re-creation of the referenced table in which the partially net effective savings for each rate are divided between commercial and apartment customers and industrial customers. For clarity, all Low Income multi-residential projects fall within Rate 6 and are thus not contemplated in the re-created table below.

Witnesses: R. Cheung
M. Lister
K. Mark
B. Ott
H. Sayyan

Net Annual Partially Effective Savings				
Rate Class	Budget Net Partially Effective	Actual Net Partially Effective	Commercial Custom & Prescriptive	Industrial Custom & Prescriptive
Rate 110	2,065,678	1,237,361	30,392	1,206,969
Rate 115	1,314,523	846,042	253,817	592,225
Rate 135	0	51,608	0	51,608
Rate 145	2,428,288	467,549	447,033	20,516
Rate 170	4,942,907	707,329	402,444	304,885
Totals	10,751,396	3,309,889	*1,133,686*	*2,176,203*

c) Enbridge updates its volumetric forecast on an annual basis as part of the Company's Annual Rate Application process under Custom Incentive Regulation using Board-approved methodologies. It incorporates the latest planned DSM savings for the test year.

d) Table 1 below provides the rate class detail for the 2014 Board Approved Volumes (for both General Service and Contract Market) and the respective volumetric adjustments in DSM.

Witnesses: R. Cheung
M. Lister
K. Mark
B. Ott
H. Sayyan

Table 1
2014 Volumes Budget - General Service and Contract Market
(Volumes in 10^6m^3)

Rate Class	2014 Budget Pre New DSM (10^6m^3)	2014 DSM Budget (New Programs) (10^6m^3)	2014 Board Approved Budget (10^6m^3)
General Service			
Rate 1	4 622.0	(0.7)	4 621.3
Rate 6	4 589.7	(19.5)	4 570.2
Rate 9	0.6	0.0	0.6
General Service Total	9 212.3	(20.2)	9 192.1
Contract Market			
Rate 100	0.0	0.0	0.0
Rate 110	619.8	(2.1)	617.7
Rate 115	472.3	(1.3)	471.0
Rate 135	56.5	0.0	56.5
Rate 145	165.4	(2.4)	163.0
Rate 170	467.8	(4.9)	462.9
Rate 200	164.9	0.0	164.9
Rate 300	30.0	0.0	30.0
Contract Market Total	1 976.7	(10.7)	1 966.0

The General Service volume forecast is derived using the forecast of General Service customer unlocks and the normalized average use per customer forecast generated from the average use forecasting models. The average use forecasting models reflect historical natural conservation, historical DSM programs, economic activity, and other contributing factors to generate the average use forecast. In addition, a volumetric adjustment related to the planned DSM for the test year is layered onto the volumes forecast to further reduce the volumes forecast for incremental DSM. At year end, revenue neutral true-up mechanisms allow the Company to capture the average use variance (in the "AUTUVA") and the DSM variance (in the LRAM).

The Contract Market volume budget is generated using the established grass roots approach in which volume forecasts are generated on an individual customer basis by Account Executives in consultation with contract customers during the budget process. A volumetric adjustment related to planned DSM for the test year is then layered onto

the volumes forecast to incorporate the impacts of incremental DSM activities. The LRAM captures the resulting revenue impacts of volumetric variance due to DSM.

To calculate the revenue impacts from average use variance as distinct from DSM programs, the calculation of the volumetric variance in General Service between forecast and actual normalized average use serves to support the removal of the volumetric impact of DSM programs in the year. However, since the audited actual volume savings from DSM activities are not available until after the AUTUVA calculation is required for inclusion in the disposition of deferral and variance accounts, the partially effective 2014 Budget DSM volumes are used as a proxy for Actual DSM volumes. This effectively serves to retain the DSM impact within the AUTUVA calculation as it produces a zero variance for DSM volumes. As a result, the LRAM amount only accounts for the volumetric impact for Contract Market customers as the amount for General Service customers would have implicitly been captured in the AUTUVA.

Witnesses: R. Cheung
M. Lister
K. Mark
B. Ott
H. Sayyan

STAFF INTERROGATORY #3

INTERROGATORY

Ref: Exhibit B / Tab 2 / Schedule 1 / pp. 20-21

Preamble:

The 2014 audit report stated that ASHRAE has yet to finalize guidelines for determining a boiler's seasonal efficiency. The ASHRAE Standard 155P would provide a test method to determine the seasonal efficiency of commercial space heating boiler systems. Given these constraints, the 2014 auditor concluded, and the AC accepted, that it was reasonable for the commercial Custom Project Savings Verification (CPSV) Technical Evaluators to rely on ETools to determine the boiler's seasonal efficiency.

Based on the 2014 audit, the CPSV applied the other boiler features or efficiency related controls that improved the seasonal efficiency of the boiler. The upgrade in base case produced savings that were lower than Enbridge's estimates using ETools. Specifically, the auditor states:

> By raising the base case boiler for facilities that had controls and/or other efficiency features in the existing case, it brings the average base case boiler of the entire population of projects closer to the auditor's reasoned opinion that some of the facilities would have installed controls and/or other efficiency features even in the absence of program intervention. Thus, while it obviously would have been preferable to adjust assumptions based on data from a new boiler baseline study, Optimal believes that its adjustment to baseline assumptions are the most reasonable it could make in the absence of such a study.

Questions:

a) What will be the impact of using the ASHRAE Standard 155P on the estimation of boiler-based savings?
b) Please provide the average baseline efficiency assumption used by the CPSV for evaluating boiler replacement projects.
c) Please provide the projects and the associated savings that were adjusted by a higher base case assumption than the 80.5% thermal efficiency baseline that Enbridge has assumed in its base case.
d) Please provide estimates of savings under c) above using 80.5% as the thermal efficiency baseline.
e) Please discuss the appropriateness of adjusting the 80.5% thermal efficiency baseline in ETools to the new baseline assumption suggested by the CPSV for an average boiler replacement project.

Witnesses: D. Bullock
M. Lister
R. Sigurdson
T. Whitehead

RESPONSE

a) The ASHRAE 155P consensus-based standard for seasonal efficiency of boilers over 300 MBH is intended to replace the BTS2000 standard. It is anticipated that the test standard will be available for public review later this year. Once finalized, the adoption of the ASHRAE 155P standard is anticipated to provide a standardized method to test and rate boilers over 300 MBH in variable load applications found in space heating and domestic hot water applications. This testing standard should then lead to a consistent method of energy efficiency estimation for boilers over 300 MBH.

However, it is important to understand that while this approach will rate and standardize new boilers for installation it will not provide guidance or ratings for presently installed systems. Also, it is not yet clear what assumptions or boiler features may be incorporated into the test standard.

As far as potential impacts to Enbridge in using the ASHRAE 155P standard, since Enbridge's energy savings estimates already consider the boiler features for each specific boiler to arrive at a seasonal efficiency (unlike approaches in other jurisdictions) Enbridge anticipates it will be relatively straight-forward to incorporate the new standard into the Enbridge approach with minimal impacts to savings estimates.

b) The CPSV firm agreed with the boiler base line assumptions used in Enbridge's energy estimates which included a Thermal efficiency of 80.5% and the use of a boiler temperature reset controller in addition to boiler pumping, temperature set-points, and oversizing matching the existing boiler plant. In some instances however, the CPSV deviated from these assumptions for "specific" boiler projects such that all boiler features on the existing boiler are included in the base line boiler assumptions.

The CPSV evaluators made adjustments to the boiler features and related controls based on their review of the Enbridge documents, their site investigation, and their opinion of how a base case might be selected. These adjustments, in some instances, resulted in adjustments to the base case seasonal efficiency for the boiler and therefore resulted in adjusted CPSV recommended savings.

A full explanation of the justification for their approach (which was also fully discussed and vetted by the auditor) is included in MMM's CPSV final report.[1]

[1] Exhibit B, Tab 5, Schedule 1, page 11

Witnesses: D. Bullock
M. Lister
R. Sigurdson
T. Whitehead

c) & d)

As indicated in the response to b) above, the CPSV firm deemed it appropriate to verify the boiler projects using the 80.5% base case thermal efficiency used in Enbridge's energy estimates. However, for clarity, the CPSV firm did make adjustments to the seasonal efficiency base case for some projects.

Ultimately, these adjustments contributed to an overall adjustment in CCM values for the sampled projects which was utilized to calculate a realization rate and this adjustment factor was applied to all 2014 Commercial custom and Low Income Multi-Residential custom project claims. This resulted in a reduction for the 2014 Commercial/Low income Multi-Residential custom projects of 19.2% based on the CPSV firm evaluation. The final post-audit reduction that was applied to all Commercial/Low income Multi-Residential custom projects was 16.3%.
Further, in the Auditor's report (Exhibit B, Tab 2, Schedule 1, p. 21), Optimal included commentary on this approach, to provide a reasonable opinion on the savings claimed for boiler projects. The Auditor specifically notes that this approach was taken with consideration of the Board's decision in the 2013 Clearance of Accounts related to a boiler baseline study.

e) Further to the clarity provided in the responses to c) and d) above, Enbridge currently uses a thermal efficiency of 80.5%, which is higher than the 80% thermal efficiency specified to meet current code requirements and is based on the most recent boiler baseline study that was completed by Marbek in 2011. This thermal efficiency is based on best available information and, as stated in STAFF Interrogatory #1, found at I.EGDI.STAFF.1, is in line with the thermal efficiency used by other leading jurisdictions. Enbridge deems it appropriate to make adjustments to the thermal efficiency, if necessary, at such time as the results of the new boiler baseline study provides recommendations to revise values and these findings are EAC endorsed and Board approved.

Witnesses: D. Bullock
M. Lister
R. Sigurdson
T. Whitehead

STAFF INTERROGATORY #4

INTERROGATORY

Ref: Exhibit B / Tab 1 / Schedule 1 / p. 111

Preamble:

In response to the 2013 auditor's recommendation on conducting a third party review of the ETools software for consistency with acceptable engineering practice, Enbridge stated in its status update that it has engaged an independent third party contractor to review the boiler component of ETools.

Questions:

a) Please provide the results of the third party review with respect to the boiler component of the ETools.
b) Please indicate whether Enbridge's development of the methodology in ETools was informed by best practice or jurisdictional analysis. If yes, please document the sources used.
c) Please clarify whether MMM Group's suggested functionalities to ETools (as noted in Exhibit B, Tab 5, Schedule 1, p. 184) were considered as part of the independent review of the ETools software.

RESPONSE

a) The status update requested in the Preamble above has been provided in evidence and reads as follows:

> Enbridge has engaged an independent third party contractor to review the boiler component of ETools. This work will verify through inspection the ETools algorithms to ensure that there are no mathematical errors and/or Excel spreadsheet computational errors (e.g., errors with macros, links, lookups), and testing to ensure that the cascading effect of various algorithms are operating correctly. Secondly, through the TEC, Enbridge is proceeding with a joint review of commercial boiler seasonal efficiency through an RFP for a third party independent study as well as an RFP to review boiler baseline. Upon completion of these reviews, the ETools boiler module will be independently reviewed to ensure all updated findings are properly reflected in determining savings estimates.[1]

The third party review which focused on the first component of this work as per the excerpt above, confirms that the boiler module is well annotated. Four calculation errors were identified by the third party contractor. Enbridge has corrected these

[1] Exhibit B, Tab 1, Schedule 1, page 111

Witnesses: R. Idenouye
M. Lister
R. Sigurdson
T. Whitehead

errors and can confirm that no claimed projects were impacted. The current status of the balance of the work is addressed in Board Staff Interrogatory #1, found at Exhibit I.EGDI.STAFF.1.

b) The boiler module of ETools was developed through the combined efforts of Enbridge and third party consultants with expert knowledge of boiler systems and operations using concepts from the American Society of Heating Air conditioning and Refrigeration Engineers ("ASHRAE") 155P standard, ASHRAE research and industry data sources. The tool is advanced relative to approaches generally undertaken in other jurisdictions throughout North America. The calculation methodology for the boiler module is supported by Engineering Best Practice based on research developed through ASHRAE. The methodology and references supporting the ETools boiler module were filed with the Board as part of Enbridge's 2015 to 2020 Multi-year DSM application (EB-2015-0049, Exhibit JT1.41, Attachment, p. 64. Filed: 2015-07-14)

c) MMM Group's suggested functionalities to ETools (as noted in Exhibit B, Tab 5, Schedule 1, p. 184) are separate from the work being undertaken to address the 2013 Auditor's recommendation referenced in the Preamble. Nonetheless, the suggested functionalities were reviewed by Enbridge for potential updates to ETools. As a result, an enhancement to ETools to facilitate inputs for DHW tank insulation for combined heating and DHW type systems, as noted in MMM's section 4.1 "Added Functionality to ETools", has been implemented.

Witnesses: R. Idenouye
M. Lister
R. Sigurdson
T. Whitehead

STAFF INTERROGATORY #5

INTERROGATORY

Ref: Exhibit B / Tab 2 / Schedule 1 / p. 31

Preamble:

The 2014 Auditor stated that upon a review of other retro-commissioning gas programs, the free ridership estimates ranged between 8% and 32% and spillover estimates range between 10% and 20%. As a result, when using average or median values of the free ridership or spillover rates, the average net-to-gross (NTG) calculation is 96%. Because the average NTG is close to 1, Optimal supports Enbridge's recommended free rider rate assumption of 0%. However, Optimal has continued to recommend since the 2013 audit that additional efforts be made to better estimate free rider and spillover rates for this offer.

Questions:

a) Please indicate why no effort has been made to estimate free ridership and spillover effects associated with the retro-commissioning gas programs, given the recommendation by the auditor.
b) Please provide evidence to substantiate the 0% free ridership given that this program has been in the market since 2012.

RESPONSE

a) Efforts to address this Run it Right ("RiR") recommendation have in fact been made both through the 2013 and 2014 Audit processes and the Technical Evaluation Committee ("TEC"). For clarity, please see below the recommendation made by the 2013 Auditor and the subsequent response to this recommendation endorsed by the 2013 Audit Committee.

    Recommendation:

    Establish a free rider rate for the Run It Right program. Currently, there is no OEB approved free rider rate for this program. As part of this audit process, Enbridge proposed a free rider rate. Optimal conducted an informal review of free rider rates for gas retro-commissioning programs in other jurisdictions and recommended adoption of

Witnesses: D. Bullock
R. Idenouye
M. Lister
R. Sigurdson

> Enbridge's requested rate for purposes of this audit. Enbridge should formally establish a free rider rate that is subsequently filed and approved by the OEB.[1]

The Audit Recommendation above was raised and discussed with Enbridge's 2013 Audit Committee as well as with Union Gas. The result was endorsement of the following response:

> This Audit Recommendation will be directed to the TEC, as Union has indicated that they have a similar program. As such, there may be value in developing a free ridership rate for both utilities through the TEC. If it is determined that this is not the case, Enbridge will proceed with establishing its own free ridership rate for the RIR offer.[2]

Further, considerable time and effort was spent discussing the RiR offer during weekly 2014 Audit Committee meetings. Many of these discussions focused on the development of a survey of year 2014 RiR project participants. It was agreed that Enbridge should proceed, with input from the Auditor and Audit Committee, to contract an independent third-party firm to develop a survey tool, undertake the survey, and provide findings and recommendation to inform RiR evaluation. Despite attempts to gain insights through the survey, the consultant determined that the survey was inconclusive due to the low number of respondents.

Notwithstanding those efforts, over the course of RiR discussions with the 2014 Audit Committee, as well as the TEC on the above recommendation, it was agreed that the most appropriate way to proceed was to expand the scope of the TEC-led Net-to–Gross ("NTG") study to include an estimation of a NTG ratio for Enbridge's RiR program. Work on the NTG study is currently underway with the final report expected later this year.

b) For the 2014 Audit, as requested by the Auditor and Audit Committee, Enbridge revisited information from other jurisdictions and proposed a Free Ridership ("FR") rate of 0% for the RiR offer. This rate is supported by a similar program offered by Fortis BC/BC Hydro known as the Continuous Optimization Program. Most importantly, as indicated in the preamble, the proposed 0% FR rate was found by the 2014 Auditor (as was the case in the 2013 Audit) to be an appropriate and reasonable value for the RiR offer. As stated in the Auditor's report (Exhibit B, Tab 2, Schedule 1, p. 31) eight different programs were reviewed and considered in making this determination.

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[1] EB-2013-0277, Exhibit B, Tab 2, Schedule 1, page 41
[2] EB-2013-0277, Exhibit B, Tab 3, Schedule 1, page 19

Witnesses: D. Bullock
R. Idenouye
M. Lister
R. Sigurdson

STAFF INTERROGATORY #6

INTERROGATORY

Ref: Exhibit B / Tab 2 / Schedule 1 / p. 22

Preamble:

Optimal's review of prescriptive measures has included checking the input assumption and relevant factors from the largest fraction of total savings against the OEB approved values and industry standards. Based on this review, it appears that there were agreed upon reductions for non-installs or removals.

Questions:

a) Please provide the list of prescriptive measures whose savings were reduced after the audit review. In doing so, please indicate by technology what the savings were before and after the reductions were made to the final claimed savings shown in Table 48 (Exhibit B, Tab 1, Schedule 1, p. 141).
b) Please indicate the source(s) of the agreed upon reductions for non-installs or removals made to the prescriptive measures.
c) Please indicate the extent to which the unit installations of prescriptive savings were confirmed and what the results were.

RESPONSE

a) Please see the table below for the information requested:

2014 Prescriptive Technologies with Audit Reductions	**Pre Audit**	**Post Audit**	**Difference**
	Net Cumulative Cubic Metres (CCM) claimed by EGD	Audit Adjusted Net Cumulative Cubic Metres (CCM)	Difference in Pre/Post Net Cumulative Cubic Metres (CCM)
Commercial - Infrared Heaters	19,005,180	15,639,957	(3,365,222)
Kitchen Faucet Aerators (part of Low Income Part 9)	5,680	5,663	(17)

b) The preamble to this question states "it appears that there were agreed upon reductions for non-installs or removals". However, this assumption is not entirely correct. The reduction to the commercial prescriptive infrared heater savings was a result of a correction in the data entry/tracking for this measure.

Witnesses: D. Bullock
R. Idenouye
M. Lister
R. Sigurdson

In the case of the kitchen faucet aerator measure included in the Low Income Part 9 results, it was identified that the adjustment factor Enbridge had input to determine the net savings needed to be corrected from 66.8% to 66.9%, resulting in a very slight CCM reduction. The source of the 66.9% adjustment factor (removal rate) was an independent third-party verification completed on April 13, 2013 by Quadra Research for the 2012 Enbridge TAPS program which included kitchen aerators as one of the measures in that offer.

c) Unit installations of the Infrared Heaters were confirmed by Enbridge through the collection and tracking of customer invoices.

In the case of the Kitchen Aerators, a minimal number of this particular measure has been installed in Low Income Single Family homes in the last two program years. In 2014 only 149 kitchen aerators were installed contributing just 5,663 CCM. As a consequence, efforts to undertake a subsequent verification study in 2014 were not warranted and the non-install/adjustment factor that was determined in the above noted verification study completed in 2013 was applied.

Witnesses: D. Bullock
R. Idenouye
M. Lister
R. Sigurdson

STAFF INTERROGATORY #7

INTERROGATORY

Ref: Exhibit B / Tab 3 / Schedule 1 / p. 15

Question:

Please file a copy of the CSPV Glossary of Terms as noted in the 2014 Audit recommendation #6.

RESPONSE

For clarity, the 2014 Audit recommendation #6 was to establish a CPSV Glossary of Terms for the future as one does not currently exist today. The Audit recommendation was proposed by Optimal as part of its 2014 audit report at the conclusion of the audit.

The recommendation (Exhibit B, Tab 2, Schedule 1, page 44) reads as follows:

> A CPSV Glossary of Terms (Existing Case, Base Case, Non-Seasonal load, etc.) should be established. The glossary could be included in the CPSV TE Scope of Work. This would provide a consistent and common understanding of technical terms for all parties (Auditor, Enbridge staff, CPSV staff and AC) involved.

In response, as stated in the Audit Summary Report and endorsed by the Audit Committee (Exhibit B, Tab 3, Schedule 1, page 15), Enbridge stated that it agrees with this audit recommendation and intends to raise this recommendation in its capacity as a member of the EAC. It remains Enbridge's intention to bring this recommendation forward to the EAC when the 2015 Audit process commences.

Witnesses: D. Bullock
M. Lister
R. Sigurdson

STAFF INTERROGATORY #8

INTERROGATORY

Ref: Exhibit B / Tab 5 / Schedule 1 / p. 184

Preamble:

In MMM Group's discussion of the commercial/low-income custom projects, MMM Group recommended that additional supporting documentation for the existing case conditions be collected from customers to have more accurate information about the existing condition. Based on MMM Group's report, 41% of the commercial projects (11 of 27 projects audited) did not have enough information on the baseline for the verifier to validate the existing case. OEB staff identified the following projects that could not be validated based on MMM Group's project review:

Commercial/low-income custom project	Existing case validated
RA.MR.EX.001.14	No
RA.MR.EX.019.14	No
RA.MR.EX.035.14	No
RA.MR.EX.080.14	No
RA.REC.EX.002.14	No
RA.HC.EX.024.14	No
RA.MR.EX.026.14	No
RA.MR.EX.152.14	No
RA.PRO.EX.009.14	No
RA.SCH.EX.030.14	No
RA.SCH.EX.034.14	No

The MMM Group provided an example of the type of information (e.g. existing equipment nameplate information, BAS screenshots, and operating parameters of equipment) that could be collected from customers to drastically improve the confidence of the existing case development.

Witnesses: D. Bullock
M. Lister
R. Sigurdson
T. Whitehead

Questions:

a) The issue of inadequate documentation of baseline for commercial/low-income custom projects was not discussed by the 2014 Auditor. Please explain why the Auditor did not address the inadequate base case documentation issues noted by the CPSV for commercial/low-income custom projects.
b) Please provide any comments from the auditor related to the appropriateness of the savings claimed for the projects in the table above.
c) Please indicate if there was a similar lack of baseline documentation in 2012 and/or 2013 for commercial custom projects.
d) For any project where there was insufficient baseline documentation data in 2012 and/or 2013, please provide a list of all those projects where there was insufficient baseline documentation similar to that prepared by OEB staff in the preamble above.
e) Please discuss whether or not Enbridge has developed an approach to solicit proper documentation of the baseline for the review of 2015 custom projects. If yes, please provide details on what base case documentation will be collected, and whether or not Enbridge plans to collaborate with Union to develop similar questions via a standard form to assess base line conditions.

RESPONSE

In order to properly respond to this Interrogatory, Enbridge believes the following clarifications to the preamble above need to be made. Board Staff makes the following statement: “Based on MMM Group’s report, 41% of the commercial projects (11 of 27 projects audited) did not have enough information on the baseline for the verifier to validate the existing case.” This statement requires correction.

MMM’s CPSV report included individual project write-ups for the 11 projects listed above. Under the heading of “Existing Case Commentary”, MMM indicated “there was not enough information on site to validate the existing case. As a result MMM Group has no comment on the existing case and accepts it as submitted with the application.”

MMM did not however indicate it could not verify the baseline, contrary to the wording in the preamble. The savings calculations for these replacement boiler projects are ultimately determined by considering the seasonal efficiency of the new retrofit equipment relative to what MMM refers to as a virtual base case (i.e., what would have been installed in the absence of Enbridge’s program) and not relative to the existing (pre-retrofit) equipment.

The existing case information for each project provides the details of the equipment and conditions that were in place and existed prior to the retrofit – at some point in the past.

Witnesses: D. Bullock
M. Lister
R. Sigurdson
T. Whitehead

Enbridge works with its business partners/customers to record the existing equipment information. These details are recorded in the project file. Most often, this scenario can no longer be physically observed by a verifier when they visit a site "post-retrofit", as the equipment/conditions are no longer physically there.

In Section 2.2 of its report MMM stated the following:

MMM Group completed site visits with project contacts or their representatives. The purpose of the site visits was to:

- Confirm installation details, including:
  - Equipment specifications
  - Equipment configurations
  - System operation parameter
    - Schedule
    - Set-points
    - etc.
- Confirm assumptions used in savings calculations
- Confirm project scope and timing

MMM took this opportunity to interview building personnel to discuss any seasonal operation differences that may exist, but could not be easily confirmed via visual inspection.

Consequently, in 10 of the 11 projects listed above, following the site visits and customer interviews conducted by the verifier to confirm project details, and based on the information provided in the Enbridge project files, MMM indicated in each of the project reviews that it agreed with the existing case parameters outlined by Enbridge.

For the remaining project, there were updates made by MMM to the existing case information. As a result of adjustments to the inputs and resulting seasonal efficiency calculations for the existing case, the base case, and the new retrofit case, the savings claimed by Enbridge for that project were reduced by 25%.

a) As outlined in the preceding clarification, MMM provided a suggestion for future consideration for "customers to provide additional supporting documentation for the existing case conditions" to assist with verification, but did not however disagree with the existing case information provided for the projects reviewed. To be clear, MMM did not indicate there was an issue with base case documentation, and as a result the Auditor would have no cause to address any issue of this nature.

b) Further to the preamble clarifications above, and regarding the 11 projects referenced in this IR, the CPSV firm adjustments resulted in an average gas savings reduction of 35.74% from the Enbridge estimated gas savings.

Witnesses: D. Bullock
M. Lister
R. Sigurdson
T. Whitehead

Custom Project Code	CPSV % Adjustment
RA.MR.EX.001.14	-27.91%
RA.MR.EX.019.14	0.00%
RA.MR.EX.035.14	-23.81%
RA.MR.EX.080.14	-42.74%
RA.REC.EX.002.14	-77.39%
RA.HC.EX.024.14	4.93%
RA.MR.EX.026.14	-77.92%
RA.MR.EX.152.14	-37.11%
RA.PRO.EX.009.14	-25.21%
RA.SCH.EX.030.14	-29.28%
RA.SCH.EX.034.14	-56.70%
Average Adjustment	**-35.74%**

Beginning with a first meeting in November 2014 through to the receipt of the final CPSV report from MMM on April 13th, the Auditor attended 13 meetings/ conference calls with MMM. These meetings allowed the Auditor to ask questions, assess the CPSV firm's approach to projects and provide input and guidance to the CPSV process.

As outlined by Optimal in the Audit Report, "Optimal provided extensive recommendations that improved the overall rigor of the CPSV TE process."[1]

As outlined in the Audit Summary Report, "the Auditor also conducted a review of the draft CPSV reports submitted by MMM providing feedback and their opinion on the reasonableness of the adjustments recommended by the CPSV firms."[2]

Optimal further adjusted the final savings values put forward by the CPSV firms on 9 projects, some of which are included in the projects listed in the preamble above. Commentary from the Auditor providing justification for these adjustments is provided in the Auditor's report at Exhibit B, Tab 2, Schedule 1, page 28.

[1] Exhibit B, Tab 2, Schedule 1, page 5
[2] Exhibit B, Tab 3, Schedule 1, page 7

Witnesses: D. Bullock
M. Lister
R. Sigurdson
T. Whitehead

c) With consideration for the clarification to the preamble above regarding existing vs. baseline documentation, there were no observations provided in the commercial CPSV reports from either 2012 or 2013 that referenced a lack of baseline documentation for commercial custom projects.

d) See response to question c) above.

e) Further to the clarification to Board Staff's preamble provided in the response above, MMM's recommendation addresses the provision of additional supporting documentation for the existing case conditions, and does not comment on suggested changes to documentation to base case conditions.

Enbridge has worked with its business partners for many years to clearly set expectations regarding program requirements and is confident in the efforts these partners take in providing the proper required information, including accurate pre-retrofit equipment details. Nonetheless, Enbridge is committed to continuous improvement in the accuracy and thoroughness of project files and will continue to evaluate the benefits of additional requirements subject to any impacts to customers.

Witnesses: D. Bullock
M. Lister
R. Sigurdson
T. Whitehead

STAFF INTERROGATORY #9

INTERROGATORY

Ref: Exhibit B / Tab 5 / Schedules 1 and 2

Questions:

a) In Enbridge's 2014 custom project reviews, please discuss how the verifiers assessed the potential for advancement.
b) Please discuss the changes to Enbridge's audit process to incorporate annual free ridership assessments in the 2015 CPSV custom project review.
c) Please discuss the issues, if any, in implementing free ridership assessment questions as part of the 2015 custom project review.

RESPONSE

a) As part of its annual evaluation and audit process, a third-party firm was selected to undertake engineering reviews of a random sample of custom projects in each of the Commercial and Industrial sectors.

   In consultation with the 2014 Audit Committee, in November 2014, Enbridge retained MMM Group to conduct the engineering review ("CPSV") for savings claims for the 2014 Commercial/Low Income custom projects. Cole Engineering was retained to conduct the engineering review ("CPSV") for savings claims for the 2014 Industrial custom projects.

   The detailed Terms of Reference for the CPSV was updated and endorsed by the TEC and provided to the CPSV consultant at the outset of the review.
   This document specified that the verifiers would conduct on-site visits and interviews with customers to assess project specifics. Included in the scope of work contained within the Terms of Reference was a list of deliverables which specified information that was expected to be included in the CPSV report for each project, this list included the following (Ref. Exhibit B, Tab 1, Schedule 1, p. 124):

   > Description of the base case scenario used in utility's savings estimate; the reasonableness of the designation of advancement where applicable (i.e. did the utility's program cause old inefficient equipment to be replaced before it otherwise would have been) or replacement (i.e. should savings be based on the efficiency of new standard equipment because the equipment would have been replaced even in the absence of the utility's program) of the claimed base case used in the savings calculation – both for annual savings and measure life.

Witnesses: D. Bullock
M. Lister
R. Sigurdson

In addition, the CPSV reviewers were provided with a checklist of items that were to be assessed. This checklist specifically included a determination regarding whether the project was an advancement.

Subsequently, as indicated in the auditor's report (Ref: Exhibit B, Tab 2, Schedule 1, p. 19):

> Once the final CPSV reports were issued, Optimal took the followings steps…Examined measure lives, persistence, advancement/replacement, and other baseline characterization assumptions. Appropriate revisions were recommended if Optimal determined that OEB-approved or industry accepted methodologies were not utilized in determining baselines or measure lives used for savings calculations.

b) and c)

In the January 20, 2016 EB-2015-0029/EB-2015-0049 Decision and Order from the OEB, the Board stated:

> The OEB does not expect the gas utilities to rely on a predetermined free ridership rate for the duration of the 2017 to 2020 term. In 2016, the free rider rates will be updated based on the results of the net-to-gross study and the annual evaluation process. Annually, the evaluation process will continue to inform the free rider rates for custom programs. At the mid-term review, Enbridge and Union will provide evidence to either demonstrate the effectiveness of its screening efforts or identify the barriers to lowering the free rider rate in commercial and industrial custom programs.

The Company notes that the Net-to-Gross Study that will be completed in 2016 will update free ridership values but, as determined by the Board in the EB-2015-0029/ EB-2015-0049 Decision and Order, these updated values will not be applied retroactively. The Company anticipates that any discussions regarding 2015 net to gross considerations and changes to the CPSV process will take place at the EAC. For 2016 and beyond, the Company is considering what additional steps it can take to screen out additional free riders and to identify any barriers to such efforts as directed by the Board.

Witnesses: D. Bullock
M. Lister
R. Sigurdson

STAFF INTERROGATORY #10

INTERROGATORY

Ref: Exhibit B / Tab 5 / Schedule 1 / Tables 2-3 (Commercial Custom projects) / p. 6

Question:

a) Please provide a new table in Excel format that includes the following:

i. Annual gas savings for each project.
ii. Annual electricity, water and other savings for each project, if any.
iii. Total annual cost savings associated with a) and b) above.
iv. Incremental costs of the project.
v. Incentive amount provided to the customer.
vi. Simple payback based on the information above (before the incentive was provided).

RESPONSE

Please find attached to this interrogatory response a table of a modified version of Exhibit B, Tab 5, Schedule 1, Table 2 as requested above (Attachment 1). A copy of the table will be provided in excel format to all parties in this proceeding via email.

While providing this data in the interest of responsiveness, Enbridge wishes to highlight its concern with the overly simplistic evaluation of custom projects based on simple payback periods. During the proceeding for Enbridge's 2015 to 2020 Multi-Year DSM Plan (EB-2015-0049), (Decision and Order) the Company put forward a variety of reasons that analysis of simple payback was not an appropriate way to evaluate the likelihood that a customer would undertake a given project with or without Enbridge's involvement.

These arguments included:

- Energy efficiency projects are in competition with other projects for a given customer's limited pool of capital / cash. These other projects, even if they have longer simple payback periods, could serve other high priority interests such as improved product mix, health and safety, production, quality or capacity;

Witnesses: M. Lister
K. Mark
B. Ott

- Simple payback periods do not consider the time value of money or the value of alternative future cash flows;

- Customers may face other internal hurdles, such as a lack of trust in a given technology, risks to quality or reliability, a lack of internal resourcing or corporate approval processes; and,

- Customers may not be aware of the energy efficiency projects available to them within their facilities without Enbridge's assistance.[1]

For the reasons outlined above, and given the determination by the Board in its Decision that a payback period threshold should not be applied; Enbridge urges caution when contemplating the relevance of simple payback periods to customer decision-making.

[1] EB-2015-0049, Enbridge Gas Distribution Inc. Reply Argument, Oct. 23rd 2015, pp.17-19

Witnesses: M. Lister
K. Mark
B. Ott

Table 2 Post Audited Savings and Payback

Report Section	DSM Code	Gross Annual Gas Savings [4]	Gross Annual Electricity Savings (kWh)	Gross Annual Water Savings (m3)	2014 Project Gas Cost [1]	2014 Electricty Avoided Cost [2]	Annual Gas Cost Savings	Annual Electricity Cost Savings	Customer Incentive	Gross Incremental Cost [4]	Payback Period based on Incremental Cost [5 6]
3.1	RA.MR.EX.001.14	119,802	0	0	$0.24	$0.11	$28,753	$0	$25,386	$66,991	2.3
3.2	RA.MR.EX.002.14	6,840	0	0	$0.25	$0.11	$1,710	$0	$1,389	$24,784	14.5
3.3	RA.MR.EX.019.14	56,882	0	0	$0.22	$0.11	$12,514	$0	$12,653	$5,284	0.4
3.4	RA.MR.EX.035.14	59,958	0	0	$0.23	$0.11	$13,790	$0	$12,341	$15,706	1.1
3.5	RA.MR.EX.049.14	12,647	6,381	0	$0.23	$0.11	$2,909	$687	$1,511	$9,995	3.4
3.6	RA.MR.EX.060.14	83,145	0	0	$0.35	$0.11	$28,685	$0	$15,069	$30,146	1.1
3.7	RA.MR.EX.075.14	118,965	0	0	$0.23	$0.11	$27,362	$0	$17,948	$64,903	2.4
3.8	RA.MR.EX.080.14	15,658	0	0	$0.24	$0.11	$3,805	$0	$2,581	$6,122	1.6
3.9	RA.MR.EX.094.14	31,406	29,212	0	$0.36	$0.11	$11,306	$3,146	$3,752	$18,732	1.7
3.10	RA.MR.EX.100.14	18,781	0	0	$0.27	$0.11	$5,071	$0	$5,024	$10,774	2.1
3.11	RA.MR.EX.116.14	67,014	0	0	$0.25	$0.11	$16,553	$0	$13,081	$53,687	3.2
3.12	RA.REC.EX.002.14	34,302	0	0	$0.23	$0.11	$7,821	$0	$5,293	$2,688	0.3
3.13	RA.RET.EX.005.14	16,204	0	0	$0.23	$0.11	$3,727	$0	$1,936	$29,039	7.8
3.14	RA.COM.NC.004.14	382,178	673,220	0	$0.25	$0.11	$95,545	$72,506	$15,000	$1,174,783	12.3
3.15	RA.COM.NC.005.14	368,091	1,579,402	0	$0.25	$0.11	$92,022	$170,102	$15,000	$881,202	9.6
3.16	RA.HC.EX.024.14	55,913	0	0	$0.27	$0.11	$15,097	$0	$12,656	$98,128	6.5
3.17	RA.HC.EX.034.14	21,338	0	0	$0.25	$0.11	$5,335	$0	$2,549	$24,791	4.6
3.18	RA.MR.EX.026.14	36,251	0	0	$0.22	$0.11	$7,830	$0	$3,323	$15,129	1.9
3.19	RA.MR.EX.126.14	167,270	0	0	$0.27	$0.11	$45,163	$0	$30,000	$31,416	0.7
3.20	RA.MR.EX.152.14	27,128	0	0	$0.27	$0.11	$7,325	$0	$5,394	$31,364	4.3
3.21	RA.MR.EX.191.14	116,968	41,295	0	$0.26	$0.11	$30,412	$4,447	$13,975	$10,700	0.4
3.22	RA.MR.EX.240.14	73,562	29,952	0	$0.22	$0.11	$16,184	$3,226	$8,789	$28,800	1.8
3.23	RA.PRO.EX.009.14	10,452	0	0	$0.33	$0.11	$3,449	$0	$2,291	$7,008	2.0
3.24	RA.SCH.EX.030.14	76,421	0	0	$0.30	$0.11	$22,926	$0	$14,398	$305,406	13.3
3.25	RA.SCH.EX.034.14	35,054	0	0	$0.27	$0.11	$9,464	$0	$5,455	$2,702	0.3
3.26	RA.UNIV.EX.014.14	248,688	0	0	$0.25	$0.11	$62,172	$0	$1,560	$3,120	0.1
3.27	RA.UNIV.EX.016.14	892,776	1,486,515	0	$0.25	$0.11	$223,194	$160,098	$100,000	$1,821,275	8.2
Total		**3,153,695**	**3,845,977**	**0**	**$0.26**	**$0.11**	**$800,122.02**	**$414,211.72**	**348,353**	**$4,774,674**	**6.0**

1 Actual Cost of Gas customer pays, as per project file
2 Cost of Electricity obtained from Year 1 of 2014 Avoided Cost table
3 Cost of Water obtained from Year 1 of 2014 Avoided Cost table
4 Gross values exclude Free Ridership, as these are the upfront values that the customer uses in their decision making process
5 Payback Period calculated based on Incremental Cost
6 Depending on the nature of the project, customers may be more likely to base their investment decision on the Total Project Cost to their business, as opposed to the Incremental Cost.

STAFF INTERROGATORY #11

INTERROGATORY

Ref: Exhibit B / Tab 3 / Schedule 1 / p. 13

Preamble:

The Auditor's recommendation #2 stated the following:

If pre and post billing regression analysis is to be used to independently calculate savings by the CPSV TEs, an agreed upon methodology should be established to ensure a consistent approach. The methodology needs to properly deal with post installation commissioning periods and also properly factor out any pre and post operational changes that could impact the validity of the savings calculation.

As indicated in the 2014 Audit Summary Report, Enbridge agreed with this recommendation and intends to raise the recommendation to the Evaluation and Audit Committee (EAC).

Question:

a) Please discuss if and how Enbridge has accounted for post-installation commissioning and pre- and post- operational changes in its regression analysis to estimate the custom project savings.
b) If Enbridge has not accounted for post installation commissioning and pre-and post-operational changes in its regression analysis, please discuss the decision not to do so.

RESPONSE

a) For clarity, the Auditor's recommendation #2 re-written in the Preamble above is directed to the "CPSV TEs", and is thus not directed to Enbridge. This recommendation evolved as a result of the Auditor recognizing the challenges associated with the appropriate use of pre and post billing regression analysis and the importance of establishing a consistent methodology and approach. Notwithstanding the clarification that Audit recommendation #2 is directed to the CPSV TE's, in those cases where Enbridge has determined that it is appropriate to use pre and post billing regression analysis, and where sufficient data is available to inform project savings calculations, Enbridge endeavors to account for post-

Witnesses: D. Bullock
M. Lister
R. Sigurdson
T. Whitehead

installation commissioning and pre and post operational changes in its regression analysis to estimate the custom project savings.

b) See response to part a) above.

Witnesses: D. Bullock
M. Lister
R. Sigurdson
T. Whitehead

STAFF INTERROGATORY #12

INTERROGATORY

Ref: Exhibit B / Tab 5 / Schedule 2

Enbridge's 2014 industrial project review included a verification of savings for 19 industrial custom projects based on the CPSV template. The CPSV contractor indicated that project specific calculations could be found in Appendix A.

Questions:

a) Please file a copy of Appendix A that contains the CPSV calculations for the 2014 industrial custom projects.
b) Similar to OEB Staff IR#8, for those projects where there was insufficient base case documentation, please provide a table that lists all industrial custom projects whose base case documentation was not sufficient and indicate how the base case was established for the calculation of savings.
c) Please indicate the studies that were done and financed by Enbridge as part of the industrial custom projects.
d) For all industrial custom projects, please provide a new table in Excel format that includes the following:
    i. Annual gas savings for each project.
    ii. Annual electricity, water and other savings for each project, if any.
    iii. Total annual cost savings associated with a) and b) above.
    iv. Incremental costs of the project.
    v. Incentive amount provided to the customer.
    vi. Simple payback based on the information above (before the incentive was provided).

RESPONSE

a) A copy of Appendix A can be found as Attachment 1 to this response.

b) The CPSV report from Cole Engineering does not state that there was insufficient base case documentation for any of the industrial projects.

Witnesses: D. Bullock
M. Lister
B. Ott
R. Sigurdson

c) Enbridge undertook and financed over 75 studies/audits on behalf of industrial customers in 2014.

In addition, in response to a 2014 Audit Recommendation (Ref: Exhibit B, Tab 2, Schedule 1, p. 44), Enbridge, with input from the audit committee, conducted a study of stockpile moisture reduction due to paving in Enbridge's territory. This study was completed by an independent consultant on February 8, 2016.

d) Please find attached to this interrogatory response a table which includes the items requested in d) above (Attachment 2). A copy of the table will be provided in excel format to all parties in this proceeding via email. Enbridge wishes to highlight its concern with the overly simplistic evaluation of custom projects based on simple payback periods. Please see STAFF Interrogatory #10, found at Exhibit I.EGDI.STAFF.10 for a more detailed restatement of the Company's concerns.

Witnesses: D. Bullock
M. Lister
B. Ott
R. Sigurdson

Natural Gas Analysis

File	Wave	Natural Gas Annual Savings				Measure Life			Gross CCM
		CPSV	EGD	Note 1	Recommend'n	CPSV	EGD	Recommend'n	Note 2
		m^3/yr	m^3/yr	%	m^3/yr	years	years	years	m^3/measure life
RA IND NRT 011 14	1	193,265	190,703	-1.34%	190,703	20	20	20	3,814,060
RA IND NRT 008 14	1	324,590	327,170	0.79%	327,170	10	10	10	3,271,700
RA IND RT 006 14	1	168,006	168,005	0.00%	168,005	18	18	18	3,024,090
RA IND RT 004 14	1	186,310	185,623	-0.37%	185,623	15	15	15	2,784,345
RA IND RT 007 14	1	58,329	54,606	-6.82%	58,329	20	20	20	1,166,574
RA IND RT 001 14	1	88,231	178,466	50.56%	88,231	5	5	5	441,155
RA IND NRT 002 14	1	21,531	21,594	0.29%	21,594	25	25	25	539,850
sub total	**1**	**1,040,262**	**1,126,167**	**7.63%**	**1,039,655**				**15,041,774**
RA IND AGR RT 001 14	2	1,990,388	1,990,388	0.00%	1,990,388	10	10	10	19,903,880
RA IND NRT 023 14	2	253,192	201,887	-25.41%	253,192	20	20	20	5,063,831
RA IND NRT 049 14	2	88,963	118,383	24.85%	88,963	25	25	25	2,224,074
RA IND NRT 036 14	2	33,304	33,304	0.00%	33,304	20	20	20	666,084
RA IND NRT 034 14	2	549,990	441,527	-24.57%	549,990	20	20	20	10,999,806
RA IND NRT 035 14	2	1,632,337	1,439,802	-13.37%	1,632,337	10	10	10	16,323,370
RA IND RT 011 14	2	1,305,281	825,486	-58.12%	1,305,281	15	15/20	15	19,579,212
RA IND RT 038 14	2	1,362,442	1,359,184	-0.24%	1,359,184	20	20	20	27,183,680
RA IND RT 034 14	2	40,862	41,264	0.97%	41,264	15	15	15	618,960
RA IND RT 049 14	2	300,705	311,510	3.47%	311,510	20	20	20	6,230,200
RA IND RT 040 14	2	292,200	286,050	-2.15%	292,200	20	20	20	5,844,003
RA IND RT 052 14	2	104,119	104,119	0.00%	104,119	10	10	10	1,041,185
sub total	**2**	**7,953,782**	**7,152,904**	**-11.20%**	**7,961,732**				**115,678,287**
total	**1+2**	**8,994,045**	**8,279,071**	**-8.64%**	**9,001,386**				**130,720,061**

Associated Utilities (Electrical and Water) Analysis

File	Wave	Electrical Annual Savings			Water Annual Savings		
		CPSV	EGD	Note 1	CPSV	EGD	Note 1
		kWh/yr	kWh/yr	%	m^3/yr	m^3/yr	%
RA IND NRT 011 14	1						
RA IND NRT 008 14	1	60,868	60,702	-0.27%			
RA IND RT 006 14	1						
RA IND RT 004 14	1				1,713	1,339	-27.94%
RA IND RT 007 14	1	- 25,022	- 25,022	0.00%			
RA IND RT 001 14	1						
RA IND NRT 002 14	1						
sub total	**1**	35,847	35,680	-0.47%	1,713	1,339	-27.94%
RA IND AGR RT 001 14	2						
RA IND NRT 023 14	2						
RA IND NRT 049 14	2						
RA IND NRT 036 14	2						
RA IND NRT 034 14	2	84,562	-	#DIV/0!			
RA IND NRT 035 14	2						
RA IND RT 011 14	2						
RA IND RT 038 14	2						
RA IND RT 034 14	2						
RA IND RT 049 14	2	425,255	581,132	26.82%	41,353	50,267	17.73%
RA IND RT 040 14	2				3,181	3,116	-2.07%
RA IND RT 052 14	2	80,165		#DIV/0!			
sub total	**2**	589,982	581,132	-1.52%	44,534	53,383	16.58%
total	**1+2**	625,828	616,812	-1.46%	46,247	54,722	15.49%

Notes

1 Based on (EGD-CPSV)/EGD
2 Does not include any free ridership or other adjustments.

Energy Measure **Paving and sloping of stockpile yard for drainage and drier agrregate**

Approach 1 Performance data for May 2012 to Feb 2013 and May 2013 to Feb 2014 was provided by client.
Measure was implemented 1/3 of stockpile yard per year for 3 years
Final stage of measure was implemented in April and May of 2014, so July to December data is used.

	May 2012 to February 2013 first 1/3 stockpile yard paved		May 2013 to February 2014 second 1/3 stockpile yard paved	
	Natural Gas (m^3)	Product (tonne)	Natural Gas (m^3)	Product (tonne)
July	331,918	41,440	342,604	39,781
August	320,178	39,311	427,118	53,990
September	437,092	52,419	449,778	53,454
October	373,662	45,430	524,644	61,086
November	614,417	66,389	467,258	48,956
	2,077,267	244,989	2,211,402	257,267
heating performance	8.48	m^3/tonne	8.60	m^3/tonne

Notes
1 results do not defend benefit of measure.
2 client confirmed that assessed duration production was different
continuous production intervals for greater heating efficiency in previous year
more nighttime production for highway project and different compositions of product
there are many different formulations of this product

Approach 2 Review of Technical Paper T129 Stockpiles by George H. Simmons Jr.
Paper based on results of testing in Chattanoga, TN, USA
This approach seeks to establish Toronto vs Chattanoga temperature and precipitation profiles.
weather data is from weather network website

	Toronto		Chattanooga	
	Average Temp C	Precip mm	Average Temp C	Precip mm
July	21.3	67	26	123
August	20.5	80	26	90
September	16.3	83	22	105
October	10	65	16	82
November	3.4	76	10	117
	14.3	371	20	517
	Average Temp	Total Precip	Average Temp	Total Precip
			28.5%	28.2% vs. Toronto

Notes
1 By analysis, Chattanooga is 28.5% warmer (July to November) than Toronto.
2 By analysis, Chattanooga is 28.2% wetter (July to November) than Toronto.
3 It is felt these parameters cancel out (relative to evaporation of precip in the stockpile) so the comparison is reasonable.

CPSV Analysis

parameter	*value*	*unit*	*source / CPSV comment*
2011 production	321,310	tonnes	client data
2012 production	366,650	tonnes	client data
2013 production	347,049	tonnes	client data
2014 production	unavailable	tonnes	client data
average	345,003	tonnes	calculated, representative of 3 years previous
moisture reduction	2.26%		Technical paper T129, Figure 10
enthalpy of vaporization	2,260	kj/kg	Steam tables, see Wikipedia link
average production	345,003	tonnes	calculated, representative of 3 years previous
	115,001	tonnes	calculated based on 1/3 of yard being paved in this year
process energy saved	5,873,791,076	kj/year	
	5,521,363,611	btu/yr	
Natural Gas Savings	5,455,893	ft^3/yr	
	154,612	m^3/yr	
burner efficiency	80%		CPSV experience and review of manufacturer's website
Natural Gas Savings	193,265	m^3/yr	

	CPSV	**EGD**	
Gross Volume Saved	193,265	190,703	
Measure Life	20	20	years

Energy Measure **Annual rooftop make up and exhaust fan procedure**

Base Measure	*make up*	RTV 1,4,5,6, C1,2,3,4,5,6,7,8	102,278	cfm	equipment listing, CPSV verified performanace with client
	exhaust		227250	cfm	equipment listing, CPSV verified performanace with client
	total air flow		329,528	cfm	
Energy Efficiency Measure	*make up*	C1,2,3,4,5,8	50,295	cfm	equipment listing, CPSV verified with client
	exhaust	EX 1,3, PEF 1,2,3	49,050	cfm	equipment listing, CPSV verified with client
	total air flow		99,345	cfm	

CPSV Analysis Natural gas savings based on make up air units

Toronto BIN Analysis	BIN data lower F	upper F	average F	annual hours hr/yr BIN	Base Case flowrate cfm	set point F	heat btu/yr BIN	Energy Efficiency Measure flowrate cfm	set point F	heat btu/yr BIN	
	91	95	93	12	102,278	68		50,295	68		
	86	90	88	57	102,278	68		50,295	68		
	81	85	83	168	102,278	68		50,295	68		
	76	80	78	352	102,278	68		50,295	68		
	71	75	73	606	102,278	68		50,295	68		
	66	70	68	618	102,278	68		50,295	68		
	61	65	63	669	102,278	68		50,295	68		
	56	60	58	749	102,278	68	827,347,198	50,295	68	406,846,314	
	51	55	53	724	102,278	68	1,199,598,206	50,295	68	589,899,996	
	46	50	48	624	102,278	68	1,378,543,795	50,295	68	677,896,128	
	41	45	43	629	102,278	68	1,736,987,274	50,295	68	854,159,985	
	36	40	38	741	102,278	68	2,455,531,135	50,295	68	1,207,502,478	
	31	35	33	789	102,278	68	3,050,359,528	50,295	68	1,500,008,139	
	26	30	28	707	102,278	68	3,123,815,587	50,295	68	1,536,130,008	
	21	25	23	463	102,278	68	2,301,439,100	50,295	68	1,131,728,031	
	16	20	18	366	102,278	68	2,021,422,392	50,295	68	994,030,380	
	11	15	13	274	102,278	68	1,664,635,817	50,295	68	818,581,302	
	6	10	8	138	102,278	68	914,610,787	50,295	68	449,758,008	
	1	5	3	67	102,278	68	481,054,345	50,295	68	236,557,503	
	-4	0	-2	6	102,278	68	46,393,301	50,295	68	22,813,812	
	-9	-5	-7	1	102,278	68	8,284,518	50,295	68	4,073,895	
total				8,760	hr/yr, total		21,210,022,984	btu/yr		10,429,985,979	btu/yr
				6,278	hr/yr, in winter (measure) conditions from September until about mid March.						

parameter	*value*	unit	*source / CPSV comment*
natural gas savings	10,780,037,005	btu/yr	from BIN analysis above
	1012	btu/ft^3	EGD, heating value of natural gas
	35.288	ft^3/m^3	conversion factor
	301,869	m^3/yr	
	93%		typical efficiency of direct fired heaters
	324,590	m^3/yr	CPSV
	327,170	m^3/yr	EGD

	CPSV	**EGD**	
Gross Volume Saved	324,590	327,170	
Measure Life	10	10	years

electrical savings based on make up air and exhaust flow reduction

parameter	*value*	unit	*source / CPSV comment*
base case total air flow	329,528	cfm	see above
energy efficiency measure air flow	99,345	cfm	see above
air flow reduction	230,183	cfm	calculated
typical fan static pressure	0.25	inches wc	EGD typical value, CPSV agree value is reasonable from experience
typical fan efficiency	75%		EGD typical value, CPSV agree value is reasonable from experience
offset fan power	12.1	hp fan	equation from Engineering Cookbook (Loren Cook Company), page 83
typical motor efficiency	93%		EGD typical value, CPSV agree value is reasonable from experience
offset motor load	13.0	hp motor	
	9.7	kW	
electrical consumption savings	60,868	kW-hr/yr	CPSV
	60,702	kW-hr/yr	EGD

Energy Measure **Furnace Lining and Arch Rebuild**

CPSV Analysis	*parameter*	*value*	*unit*	*source / CPSV comment*
Pre-measure	natural gas	1,084,120	m^3/yr	client SCADA, Furnace 2, average hour performance (Sept 2012 to June 2013) multiplied by 365 d/y and 24 h/d
	production	10,087,551	lb/yr	client SCADA, Furnace 2, average hour performance (Sept 2012 to June 2013) multiplied by 365 d/y and 24 h/d
	performance	0.1075	m^3/lb	calculated
Post Measure	natural gas	1,181,905	m^3/yr	client SCADA, Furnace 2, average hour performance (February 2014 to May 2014) multiplied by 365 d/y and 24 h/d.
	production	12,560,688	lb/yr	client SCADA, Furnace 2, average hour performance (February 2014 to May 2014) multiplied by 365 d/y and 24 h/d.
	performance	0.0941	m^3/lb	calculated
	gas savings	0.0134	m^3/lb	calculated
	production	12,560,688	lb/yr	client SCADA, Furnace 2
	gas savings	168,006	m^3/year	calculated

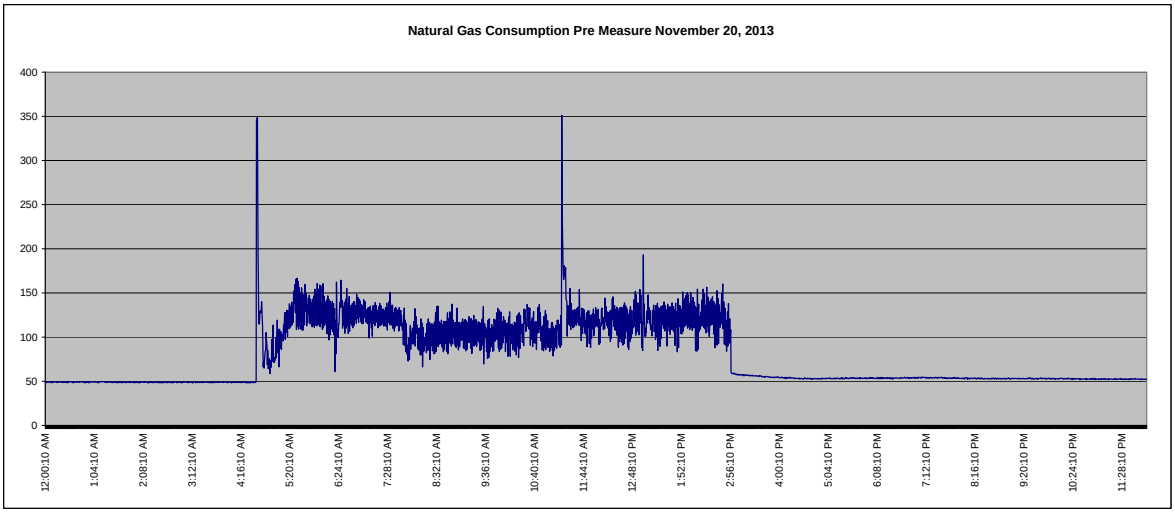
	CPSV	**EGD**
Gross Volume Saved	168,006	168,005
Measure Life	18	18 years

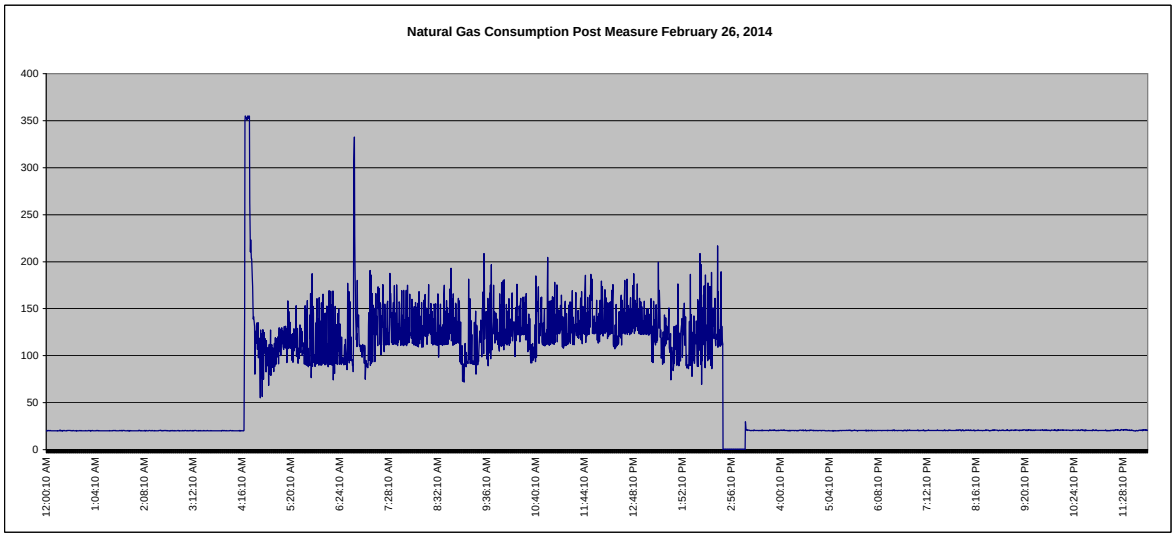
Energy Measure **Linkageless Boiler Controls**

CPSV Analysis	*parameter*	*value*	*unit*	*source / CPSV comment*
gas savings	production hours	2750	hr/yr	
	non production hours	6010	hr/yr	client - confirmed by CPSV
	average gas flow during non production (taken 12AM to 4AM, 4PM to 12 AM)			
pre-measure	gas during non production	51	m^3/hr	insertion meter data of Nov 20, 2013 (provided by EGD) confirmed by Client
post measure	gas during non production	20	m^3/hr	insertion meter data of Feb 26, 2014 (provided by EGD) confirmed by Client
	natural gas savings	31	m^3/hr	
		186,310	m^3/year	

	CPSV	**EGD**	
Gross Volume Saved	186,310	185,623	
Measure Life	15	15	years

water savings					
pre-measure		23-Jan-12	9,199,300	US gallon	water meter reading provided from client (from Klenzoid, water treatment supplier)
		14-Jan-14	11,199,400	US gallon	water meter reading provided from client (from Klenzoid, water treatment supplier)
	average consumption		2,774	US gallon / day	
post measure		10-Mar-14	11,289,000	US gallon	water meter reading provided from client (from Klenzoid, water treatment supplier)
		08-Dec-14	11,707,800	US gallon	water meter reading provided from client (from Klenzoid, water treatment supplier)
	average consumption		1,534	US gallon / day	
	water savings		1,240	US gallon / day	
			452,599	US gallon / year	
			264.2	conversion	US gallons to cubic meter
			1,713	m^3/yr	CPSV
			1,339	m^3/yr	EGD





Energy Measure **Heat recovery from air compressor to heat warehouse in winter**

CPSV Analysis

parameter	*value*	*unit*	*source / CPSV comment*
compressor rating	125	hp	CPSV field verified
loading factor	100%		discussion with client, CPSV verified during site visit
service factor of operation	15%		
operation of compressor	8,760	hr/yr	client
heat recovery of compressor	5,808	hr/yr	client, 8 months, 242 days
	292,675	btu/hr	available heat recovery
	1,699,856,400	btu/yr	
	1012	btu/ft^3	
	35.288	ft^3/m^3	
	47,600	m^3/yr	

Confirm heat load of warehouse relative to heat recovery from compressor for full utilization

parameter	*value*	*unit*	*source / CPSV comment*
warehouse length	160	ft	CPSV general concurrence
warehouse width	80	ft	CPSV general concurrence
warehouse height	30	ft	CPSV general concurrence
area	12,800	ft^2	
volume	384,000	ft^3	
warehouse heating equipment			
4 infrared heaters	236,000	btu/hr	CPSV confirmation with client
1 rooftop	2,370,000	btu/hr	CPSV confirmation with client
total installed heating capacity	2,606,000	btu/hr	

available heat from compressor	11.23%	% of installed warehouse heating capacity	
client indicates heat recovery is 8 months per year	5,808	hr/yr	
BIN profile (to 70F) for the location	7,000	hr/yr, minimum	

based on low percent of heat load from compressor and utilization less than BIN profile, CPSV agree full utilization of recovered heat

Confirm heat loss of interconnection duct between compressor building and warehouse

parameter	*value*	*unit*	*source / CPSV comment*
inner duct diameter	30	inches	per client
insulation	2	inches	per client
cladding	galvanized, bright		
outer duct diameter	34	inches	CPSV verified
duct length (between buildings)	65	feet	CPSV verified
heat loss	515,000	btu/ft/year	NAIMA 3E Plus 4.0, correct values for insulation, cladding, temperature
	33,475,000	btu/year	
	937.4	m^3/yr	

Resultant gas savings from heat recovery

parameter	*value*	*unit*	*source / CPSV comment*
heat recovery of compressor	47,600	m^3/yr	see above
duct heat loss	937.4	m^3/yr	see above
heat utilization in warehouse	46,663	m^3/yr	
efficiency of base heating unit	0.80		per EGD, CPSV agreement as typical seasonal efficiency note - rooftop is supplemental heating, and Infrared are emergency
offset natural gas consumption	58,329	m^3/yr	CPSV
	54,606	m^3/yr	EGD
			EGD analysis only includes 15 days of June 227 days
			5448 hours
			Client confirmed heat recovery 5808 hours
			EGD analysis duct heat loss, electrical based o 5808 hours

	CPSV	**EGD**	
Gross Volume Saved	58,329	54,606	
Measure Life	20	20	years

Assess electrical energy to push warm air to warehouse

parameter	*value*	*unit*	*source / CPSV comment*
nitrogen building fan	7.5	hp	CPSV verified
booster fan at warehouse	0.75	hp	CPSV verified
fan motor load factor	0.7		
electrical load	4.31	kW	
electrical savings -	25,022	kWhr/yr	CPSV
-	25,022	kWhr/yr	EGD

Energy Measure **Annual assessment of steam traps and replacement**

CPSV Analysis

parameter	*value*	*unit*		*source / CPSV comment*
client's annual gas consumption	13,785,625	m^3/yr		EGD executive summary
client's boiler efficiency	75%			EGD file and CPSV agreement
Client operation	8760	hr/yr		EGD file and CPSV known
number of steam traps	161			
leaking	10		6.2%	Spirax steam trap audit
blocked	3		1.9%	Spirax steam trap audit
repaired	13		8.1%	
mean time between failure of traps	7	years		Industry standard (see Spirax Hook ups reference)
statistical predicted failure	14.3%			greater than findings of audit, but within 6%
identified steam loss	357.3	lb/hr		Spirax steam trap audit
annual steam loss	3,129,948	lb/yr		calculated
latent enthalpy of process steam	1000	btu/lb @ 100 psi		steam tables - difference between enthalpy of steam versus liquid at feedwater conditions.
heating value of natural gas	1012	btu/ft^3		
	35.29	ft3/m3		conversion factor
energy savings	87,647	m^3/yr		
adjusted for boiler efficiency	116,862	m^3/yr		
Final Factor	0.5			EGD File - executive summary
Correction Factor	1.51			EGD File - executive summary
Gross Volume Saved	88,231	m^3/yr		CPSV
	178,466	m^3/yr		EGD File
	89,233			revised EGD file received January 13, 2015

	CPSV	**EGD (original)**	**EGD (revised January 13, 2015)**
Gross Volume Saved	88,231	178,466	89,233
Measure Life	5	5	years

Energy Measure **Replacement of Shipping Door Seals**

CPSV Analysis

parameter	*value*		*unit*	*source / CPSV comment*
number of dock seals replaced		17	seals	W6-14, E7-15, site verified by CPSV
total number of shipping doors		24	seals	
average doors active		6	seals	per client, priority for doors with replaced seals, 3 east and 3 west
door dimensions		9.83	ft wide	CPSV verified
		7.83	ft high	CPSV verified
door seal perimeter		25.49	ft linear	seal is 2 x height + 1 x width (note base is a steel plate)
crack surface area for infiltration		2.49	ft^2	per seal, door bottom, distance between steel floor plate and seal
warehouse temperature		72	F	CPSV verified
average annual ambient temperature		38	F	Environment Canada website, statisitics
heating equipment seasonal efficiency		0.75		EGD, CPSV agree
production schedule		24	hr/day	client confirmed
		5	day/week	client confirmed
		49	week/yr	client confirmed
		5,880	hr/year	
wind direction	NW			Environment Canada website, statisitics
wind speed		9.56	mph	Environment Canada website, statisitics
wind effectiveness, west		0.267		WYEC2 data
wind effectiveness, east		0.158		WYEC2 data
infiltration, west		559.3	cfm/ door	ASHRAE, 2005, F27.10, eqn 29
infiltration, east		331.0	cfm/ door	ASHRAE, 2005, F27.10, eqn 29
heat loss		98,074	btu/hr	based on 6 doors (3 east, 3 west)
		576,673,633	btu/year	
		1012	btu/ft^3	
		35.29	ft^3/m^3	
		16,148	m^3/year	
natural gas savings		21,531	m^3/year	CPSV
		21,594	m^3/year	EGD

	CPSV	**EGD**	
Gross Volume Saved	21,531	21,594	
Measure Life	25	25	years

Energy Measure **Energy Curtains on Greenhouse**

CPSV Analysis	*parameter*	*value*	*unit*	*source / CPSV comment*
New greenhouse				
	length	675	ft	client drawing in EGD file, CPSV verified
	width per span	26	ft	client drawing in EGD file, CPSV verified
	number of spans	58		client drawing in EGD file, CPSV verified
	area	1,017,900	ft2	
		94,614	m2	
	height of side	21	ft	client drawing in EGD file, CPSV verified
	height of peak	25	ft	client drawing in EGD file, CPSV verified
	HDD 18 C	Client Site	Closest US (as used in EGD software simulation)	
	January	690	691	see websites in narrative
	February	590	628	see websites in narrative
	March	517	549	see websites in narrative
	April	332	360	see websites in narrative
	May	148	184	see websites in narrative
	June	34	44	see websites in narrative
	July	3	6	see websites in narrative
	August	7	11	see websites in narrative
	September	70	76	see websites in narrative
	October	224	240	see websites in narrative
	November	399	402	see websites in narrative
	December	589	598	see websites in narrative
	total	3603	3789	HDD (18)/yr
	difference		186	HDD (18)/yr
	difference		5%	within 5% tolerance for CPSV
	base case gas consumption	5,022,937	m^3/yr	EGD Virtual Grower (V3) output
		53	m^3/m^2-yr	reasonable, based on client 35.5 (double layer) and 43 (single layer)
	gas consumption with curtains	3,032,549	m^3/yr	
		32	m^3/m^2-yr	within 10% of client predicted performance
	savings	1,990,388	m^3/yr	
		40%		yeild result within range of 3rd party rules of thumb

	CPSV	EGD	
Gross Volume Saved	1,990,388	1,990,388	Based on CPSV acceptance of USDA software and methodology
Measure Life	10	10	

Energy Measure **Redistribution of heat from moulding machines to warehouse**

CPSV Analysis

	Base Case			Post Measure (Implemented October 2014)			
	Natural Gas Average (2012 -2014) m^3*/mth*	*2014 HDD 18C HDD/mth*	*Facility Heating Load assessed* m^3*/mth*	*Natural Gas* m^3*/mth*	*Savings Achieved* m^3*/mth*	*Percent of Average*	*2015 HDD 18C HDD/mth*
January	65,312	822	56,959	17,500	47,812	0.27	789
February	63,346	727	54,993			-	860
March	60,713	683	52,360			-	
April	49,669	353	41,316			-	
May	36,570	143	28,217			-	
June	22,011	79	13,658			-	
July	12,174	101	3,821			-	
August	8,353	94	-			-	
September	9,300	98	947			-	
October	12,237	224	3,884			-	
November	31,455	474	23,102	8,500	22,955	0.27	
December	45,375	552	37,022	10,500	34,875	0.23	
total	**416,515**	**4350**	**316,279**		**105,642**		

parameter	*value*	*unit*	*source / CPSV comment*
Cumulative HDD Measure in Service	1,815	HDD	Using November, December 2014, January 2015
percent of average year HDD	41.7%		In service / annual average HDD
Natural gas savings achieved	105,642	m^3/mth	November 2014 to January 2015
Natural gas savings projected over year	253,192	m^3/year	extrapolated to last full year (2014) HDD annual total

	CPSV	EGD
Gross Volume Saved	253,192	201,887
Measure Life	20	20

	Energy Measure	**High speed industrial door**		
CPSV Analysis	*parameter*	*value*	*unit*	*source / CPSV comment*
	door dimensions	14	ft wide	CPSV verified, vendor data sheet included in EGD file
		16	ft high	CPSV verified, vendor data sheet included in EGD file
	warehouse temperature	68	F	CPSV verified
	average annual ambient temperature	38	F	Environment Canada website, statisitics
	heating equipment seasonal efficiency	0.7		EGD, CPSV accept
	production schedule	24	hr/day	client confirmed
		5	day/week	client confirmed
		50	week/yr	client confirmed
		6,000	hr/year	
	door orientation	south		CPSV verified
	wind direction	NW		Environment Canada website, statisitics
	wind speed	9.56	mph	Environment Canada website, statisitics
	wind effectiveness, south facing	0.205		WYEC2 data
	door cycles	800	per day	per client
		33.3	per hour	per client
		70,054	Dec 14 to Apr 8 2015	from client door PLC
		115	days in interval	
		853	per day	
		36	per hour	
		213,817	prorated for year	
base case	time to open	30	seconds	unverified
	duration	16	seconds	unverified
	time to close	30	seconds	unverified
	full open equivalent duration	46	seconds	duration + 1/2 open and close time
		0.77	minutes/cycle	
	duration open per hour	27.24	minutes/hour	full open equivalent
		45.4%		
	infiltration	17,540.8	airflow rate per hour	ASHRAE, 2005, F27.10, eqn 29
	heat loss	3,409,933,637	btu/yr	
new door	time to open	6	seconds	CPSV verified
	duration	10	seconds	CPSV verified
	time to close	6	seconds	CPSV verified
	full open equivalent duration	16	seconds	duration + 1/2 open and close time
		0.27	minutes/cycle	
	duration open per hour	9.48	minutes/hour	full open equivalent
		15.8%		
	infiltration	6,101.2	airflow rate per hour	ASHRAE, 2005, F27.10, eqn 29
	heat loss	1,186,063,874	btu/yr	ASHRAE, 2005, F30.13, eqn 10
savings	reduced heat loss	2,223,869,763	btu/yr	
		3,176,956,805	btu/yr	adjusting for seasonal efficiency
		1012	btu/ft^3	
		35.29	ft^3/m^3	
	natural gas savings	88,963	m^3/year	CPSV
		118,383	m^3/year	EGD

	CPSV	**EGD**	
Gross Volume Saved	88,963	118,383	
Measure Life	25	25	years

Energy Measure **Process modifications**

CPSV Analysis

parameter	*value*	*unit*	*source / CPSV comment*
production output 2012	88,228.43	mt/yr	EGD file
production output 2013	53,515.25	mt/yr	client data in EGD file CPSV discussed with client
gas consumption 2013	514,903.99	m^3/yr	client data in EGD file CPSV discussed with client
performance	9.62	m^3/mt	
production output 2014	112,272.21	mt/yr	client data in EGD file CPSV discussed with client
gas consumption 2014	1,036,081.51	m^3/yr	client data in EGD file CPSV discussed with client
performance	9.23	m^3/mt	
performance improvement	0.39	m^3/mt	
	4.1%		
average production 2012-2014	84,671.96	mt/yr	
gas savings	33,304.21	m^3/yr	based on average production 2012-2014

	CPSV	EGD
Gross Volume Saved	33,304	33,304
Measure Life	20	20

Energy Measure **Conversion to dry fire suppression system in abandoned facility**

CPSV Analysis Toronto BIN Analysis

BIN data			Thermal Load in Base Case					
lower	upper	average	annual hours	flowrate	set point	heat added		
F	F	F	hr/yr BIN	cfm	F	btu/yr BIN	btu/hr BIN	dT
91	95	93	12	96,500	61			
86	90	88	57	96,500	61			
81	85	83	168	96,500	61			
76	80	78	352	96,500	61			
71	75	73	606	96,500	61			
66	70	68	618	96,500	61			
61	65	63	669	96,500	61			
56	60	58	749	96,500	61			
51	55	53	724	96,500	61			
46	50	48	624	96,500	61			
41	45	43	629	96,500	61	1,179,978,840	1,875,960	-18
36	40	38	741	96,500	61	1,776,221,460	2,397,060	-23
31	35	33	789	96,500	61	2,302,428,240	2,918,160	-28
26	30	28	707	96,500	61	2,431,556,820	3,439,260	-33
21	25	23	463	96,500	61	1,833,646,680	3,960,360	-38
16	20	18	366	96,500	61	1,640,214,360	4,481,460	-43
11	15	13	274	96,500	61	1,370,701,440	5,002,560	-48
6	10	8	138	96,500	61	762,265,080	5,523,660	-53
1	5	3	67	96,500	61	404,998,920	6,044,760	-58
-4	0	-2	6	96,500	61	39,395,160	6,565,860	-63
-9	-5	-7	1	96,500	61	7,086,960	7,086,960	-68
total			8,760	hr/yr, total		13,748,493,960		
			4,181	hr/yr, ON				

parameter	*value*	*unit*	*source / CPSV comment*
steam system seasonal efficiency	0.70		CPSV boiler seasonal efficiency
	0.64		EGD boiler seasonal efficiency
	50	F	limitation of dt
Base Case gas consumption	13,585,468	ft^3/year	
	384,993	m^3/year	
	549,990	m^3/year	
Post Measure gas consumption	-	m^3/year	building is no longer heated
electrical motor load	27	hp	from Eclipse Combustion Engineering Guide (page 20)
	20	kW	
electrical savings	84,562	kWhr/yr	CPSV
	-	kWhr/yr	EGD

	CPSV	EGD
Gross Volume Saved	549,990	441,527
Measure Life	20	20

Energy Measure **Process modifications**

CPSV Analysis verification of differential pressure

		interval	differential pressure (dP) kPa				*source / CPSV comment*
	period	hours	1	2	3	4	
Base Case	January to August	4941	62.90	94.11	100.42	96.90	EGD file
Energy Measure	September to November	1317	56.43	82.67	91.09	70.88	EGD file
	percent reduction		10.29%	12.16%	9.29%	26.85%	to base case
	December to March 2	2238	59.05	91.38	91.72	72.05	additional data from client
	percent reduction		6.13%	2.90%	8.67%	25.64%	to base case

verification of steam performance versus production

		interval	steam	production	Average	performance	*source / CPSV comment*
	period	hours	Mts	Mtp	Mtp/hr	Mts/Mtp	
Base Case	January to August	4941	168,714	97,549	19.743	1.730	EGD file
Energy Measure	September to November	1317	43,378	26,591	20.191	1.631	EGD file
	reduction					0.098	to base case
	December to March 2	2238	56,738	35,146	15.704	1.614	
	reduction					0.115	to base case

parameter	*value*	*unit*	*source / CPSV comment*
steam performance	1.621	Mts/Mtp	weighted average of Sept / Nov and Dec / Mar
steam saving	0.109	Mts/Mtp	weighted average to base case
hours operational	8400	hr/yr	client
average production	19.837	Mtp/hr	weighted average of Jan to Nov
annual production	166,631	Mtp/year	
	2,205	lb/Tonne	conversion factor
steam condition	1200	btu/lb	steam at 200 psi, steam tables
condensate condition	180	btu/lb	condensate at 210F, steam tables
season efficiency of boiler	0.7		from EGD file, 3rd party site, not visited by CPSV
steam savings	18,142.7	Mts/year	
	40,004,583	lb/yr	
	40,804,674,426	btu/yr	
gas savings	58,292,392,037	btu/yr	
	1012	btu/ft^3	
	57,601,177.90	ft^3	
	1,632,337	m^3	

	CPSV	EGD
Gross Volume Saved	1,632,337	1,439,802
Measure Life	10	10

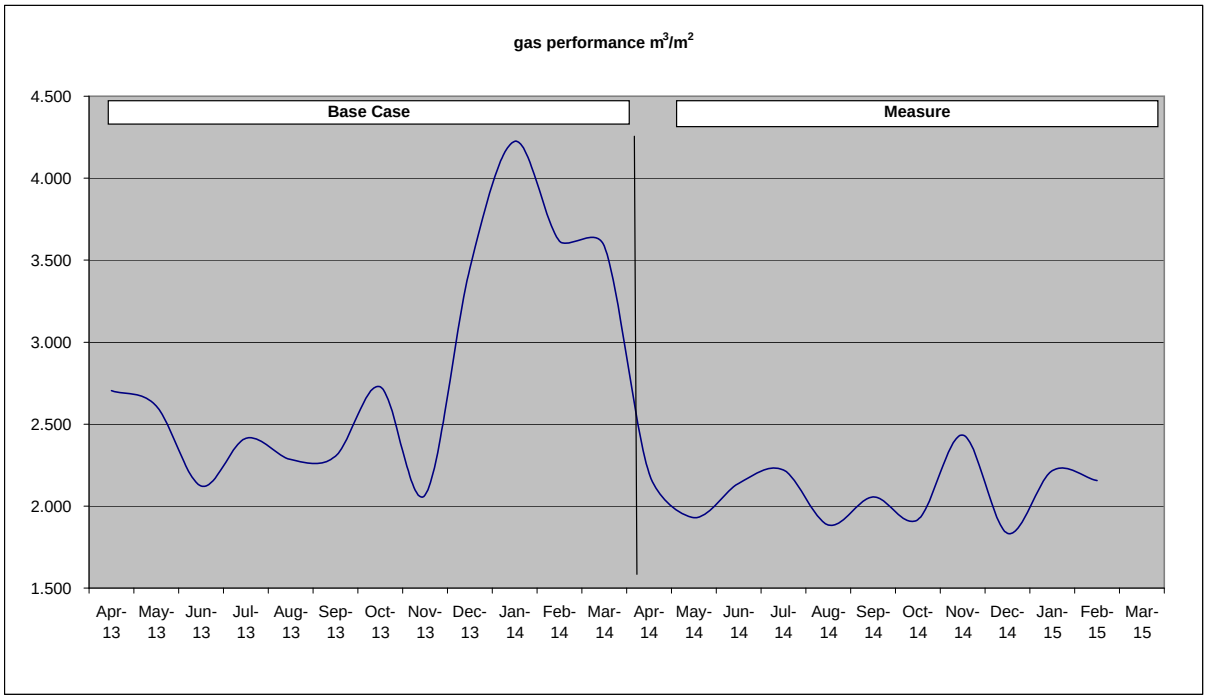
Energy Measure **condensing economizer and air compressor heat recovery**

CPSV Analysis

	Base Case production m^2	gas consumption m^3	gas performance m^3/m^2	CPSV comment
Apr-13	183,363	495,933	2.705	data from client
May-13	147,684	385,526	2.610	data from client
Jun-13	224,404	476,235	2.122	data from client
Jul-13	119,725	288,933	2.413	data from client
Aug-13	200,284	457,646	2.285	data from client
Sep-13	203,911	469,655	2.303	data from client
Oct-13	135,433	369,356	2.727	data from client
Nov-13	227,339	470,179	2.068	data from client
Dec-13	92,408	318,835	3.450	data from client
Jan-14	114,827	485,113	4.225	data from client
Feb-14	110,543	399,745	3.616	data from client
Mar-14	119,370	428,135	3.587	data from client
total	1,879,291	5,045,291	2.685	

	Measure production m^2	gas consumption m^3	gas performance m^3/m^2	
Apr-14	192,383	423,337	2.200	data from client
May-14	200,310	386,360	1.929	data from client
Jun-14	171,093	365,750	2.138	data from client
Jul-14	104,839	232,734	2.220	data from client
Aug-14	174,463	328,687	1.884	data from client
Sep-14	169,587	348,779	2.057	data from client
Oct-14	200,256	384,041	1.918	data from client
Nov-14	166,119	404,210	2.433	data from client
Dec-14	204,971	375,966	1.834	data from client
Jan-15	198,662	440,287	2.216	data from client
Feb-15	190,479	410,646	2.156	data from client
Mar-15				not yet available
total	1,973,162	4,100,797	2.078	11 month analysis
Mar-15	*179,378*	*372,800*	*2.090*	*projected data based on average production and gas performance*
total	*2,152,540*	*4,473,597*	*2.078*	*yearly total with projected March*
	1.145			
	gas savings	1,305,281	m^3	
		1,305,281	m^3	

	CPSV	EGD
Gross Volume Saved	1,305,281	825,486
Measure Life	15	15/20



Energy Measure **Replacement of older roasters with new roaster**

CPSV Analysis

parameter	Base Case roaster 1	Base Case roaster 3	Measure roaster 3	*unit*	*source / CPSV comment*
peak roasting capacity	2300	2300	6300	lb/hr	EGD file, CPSV confirmed with customer
annual avg ambient	38	38	38	F	Environment Canada website, statisitics
Scenario 1 - Measure annual capacity limited to base case production of Roaster 1 and 3					
operation hours - Base	7635	7635	not applicable	hr/yr	
operation hours - Measure Equivalent	not applicable	not applicable	5575	hr/yr	to achieve base case production
direct fired combustion efficiency	92%	92%	92%		
main burner rating	3.3	2.9		million btu/hr	
	3,481,500	3,059,500		kj/hr	
after burner rating	5.3	4.0		million btu/hr	
	5,579,900	4,220,000		kj/hr	
after burner exhaust	1.61	1.5	1.75	m^3/sec	EGD file, MOE COAA August 28, 2006 (base case) Revised COAA (OSB Services, 10, Oct 2014)
	3412	3179	3709	scfm	
	650	600	450	C	EGD file, MOE COAA August 28, 2006
	1202	1112	842	F	EGD file screenshot, customer confirmed
exhaust energy losses	4,289,163	3,687,137	3,220,237	btu/hr	
	32,747,759,689	28,151,288,584	17,952,052,848	btu/yr	
natural gas for exhaust losses	35,595,390,966	30,599,226,722	19,513,100,922	btu/yr	
	995,851	856,074	545,918	m^3/yr	
secondary heat exhaust	not applicable	0.3	not applicable	m^3/sec	EGD file, MOE COAA August 28, 2006
	not applicable	636	not applicable	scfm	
	not applicable	200	not applicable	C	EGD file, MOE COAA August 28, 2006
	not applicable	392	not applicable	F	
exhaust energy losses	not applicable	243,063	not applicable	btu/hr	
	not applicable	1,855,783,270	not applicable	btu/yr	
natural gas for exhaust losses	0	2,017,155,728	0	btu/yr	
	-	56,434	-	m^3/yr	
total natural gas for exhaust losses	995,851	912,508	545,918	m^3/yr	
measure savings			1,362,442	m^3/yr	
Scenario 2 - Measure annual capacity maximized and pro-rated Roasters 1 and 3 (from balance of fleet)					
operation hours - Full measure utilization			7635	hr/yr	confirmed with customer
operation hours - base equivalent utilization	10,457	10,457		hr/yr	to match measure production with base - not possible to operate this duration per year

this scenario requires former Roasters 1 and 3 to operate for an annual duration which can not be achieved.
it also requires the assumption that roasters 2, 4 and 5 would have similar performance as roasters 1 and 3 - which is not true
it also assumes that the roasters 2, 4 and 5 would have a remaining life of the measure life of new Roaster 3 - which is not anticipated.
for these reasons, the CPSV base analysis on Scenario 1

	CPSV	EGD
Gross Volume Saved	1,362,442	1,359,184
Measure Life	20	20

Energy Measure	**Insulation on process piping**				
CPSV Analysis	*parameter*	*value*	*unit*	*source / CPSV comment*	
system 2 S 100	uninsulated pipe	4,072,000	btu/ft/yr	from NAIMA 3E Pl 344F, 80F ambient, 7992 hr/yr	
		22	feet	piping	
		89,584,000	btu/yr		
	insulated	342,000	btu/ft/yr	steel, 2" mineral fibre, canvas jacket	
		22	feet	piping	
		7,524,000	btu/yr		
	savings	82,060,000	btu/yr	CPSV	
		81,340,477	btu/yr	EGD	99.1%
		80,933,600	btu/yr	Contractor	98.6%
	analysis is also valid for 2S101, 2S102,				
system 6 S 100	uninsulated pipe	10,730,000	btu/ft/yr	from NAIMA 3E Pl 344F, 80F ambient, 7992 hr/yr	
		5	feet	piping	
		53,650,000	btu/yr		
	insulated	723,000	btu/ft/yr	steel, 2" mineral fibre, canvas jacket	
		5	feet	piping	
		3,615,000	btu/yr		
	savings	50,035,000	btu/yr	CPSV	
		50,175,500	btu/yr	EGD	100.3%
		49,870,415	btu/yr	Contractor	99.7%
	based on tight correlation of above spot checks, and all based on NAIMA software CPSV accept analysis of EGD file				
combined systems	savings	1,167,375,152	btu/yr		
	seasonal efficiency	0.8		boilers with economizers	
	gas savings	1,459,218,940	btu/yr		
		40,862	m3/yr		

	CPSV	EGD
Gross Volume Saved	40,862	41,264
Measure Life	15	15

Energy Measure **process modifications for washing system**

CPSV Analysis	*parameter*	*value*	*unit*	*source / CPSV comment*
base case	operation	360	day/year	CPSV confirmed
	production	64,058	kg/day	EGD file, client. Data from January to October, 2014
		23,060,880	kg/yr	projected to year
	heating system efficiency	0.75		EGD file, CPSV verified.
	water use	8.820	l/kg	EGD file, client. Data from January to October, 2014, average
		9.202	l/kg	EGD file, client. Data from January to October, 2014, maximum
		8.273	l/kg	EGD file, client. Data from January to October, 2014, minimum
	electrical	0.263634	kWh/kg	EGD file, client. Data from January to October, 2014
measure				
	production	1,715,794	kg	implemented on Washers 4 and 5 - EGD file. 20 Oct to 16 Nov 2014
	duration	26	days	implemented on Washers 4 and 5 - EGD file. 20 Oct to 16 Nov 2014
		65,992	kg/day	implemented on Washers 4 and 5 - EGD file. 20 Oct to 16 Nov 2014
	water consumption	12,648	m^3	implemented on Washers 4 and 5 - EGD file. 20 Oct to 16 Nov 2014
	water use	7.372	l/kg	implemented on Washers 4 and 5 - EGD file. 20 Oct to 16 Nov 2014
	water savings	1.448	l/kg	implemented on Washers 4 and 5 - EGD file. 20 Oct to 16 Nov 2014
		3.621	l/kg	extrapolated for 5 Washers
		50,105,033	l/yr	for Washers 1, 2 and 3
		50,105	m^3/yr	for Washers 1, 2 and 3
		110,461,555	lb/yr	for Washers 1, 2 and 3
	city water inlet temp	54.5	F	EGD file, CPSV verified.
	process water condition	130	F	EGD file, CPSV verified.
	energy required	8,339,847,376	btu/yr	
	gas savings	311,383	m^3/yr	
		311,510	m^3/yr	EGD
	electrical savings	581,132	kWh/yr	EGD

washers 1,2,3,4,5 supplemental information provided to CPSV from client for January and February 2015

	2014		2015			
	January	February	January	February (to F22)	*unit*	*source / CPSV comment*
heating degree day	918.3	615.3	968.2	748.6		client data
duration	31	28	31	22	days	
production	1,576,309	1,683,624	1,647,895	1,322,071	kg/mth	client data
	50,849	60,129	53,158	60,094	kg/day	
water	13,041	14,842	9,703	7,567	m^3	client data
water use	8.27	8.82	5.89	5.72	l/kg	
water savings			2.39	3.09	l/kg	
			55,000,294	71,302,191	l/yr	
			55,000	71,302	m^3/yr	projected on month
			33,000	42,781	m^3/yr	projected on month (washers 1, 2 and 3)
gas	272,838	289,640	253,414	195,393	m^3	client data
gas use	0.173	0.172	0.154	0.148	m^3/kg	
gas savings			0.019	0.024	m^3/kg	
			31,814	32,048	m^3/mth	
			445,209	559,005	m^3/yr	projected on month
			267,126	335,403	m^3/yr	projected on month (washers 1, 2 and 3)
electrical	439,680	460,800	421,680	324,480	kWh	client data
electrical use	0.279	0.274	0.256	0.245	kWh/kg	
electrical savings			0.023	0.028	kWh/kg	
			531,321	651,751	kWh/yr	projected on month
			318,793	391,050	kWh/yr	projected on month (washers 1, 2 and 3)

CPSV Analysis	*parameter*	*value*	*unit*	*source / CPSV comment*
	total days with measure data	79	days	
	water savings	41,353	m^3/yr	blended (washers 1, 2 and 3)
		50,267	m^3/yr	EGD
	electrical savings	425,255	kWh/yr	blended (washers 1, 2 and 3)
		581,132	kWh/yr	EGD
	natural gas savings	300,705	m^3/yr	blended (washers 1, 2 and 3)

	CPSV	EGD
Gross Volume Saved	300,705	311,510
Measure Life	20	20

Energy Measure **conversion from steam to non returned condensate for process air injection for emissions abatement**

CPSV Analysis

parameter	*value*	*unit*	*source / CPSV comment*
steam injection 1/4" orifice	174	lb/hr	at 100 psi per swagelokenergy / CPSV verification from Spirax Hook Ups Table 17
	211	lb/hr	at 125 psi per swagelokenergy / CPSV verification from Spirax Hook Ups Table 18
	203.6	lb/hr	CPSV interpolation for 120 psi
number of injection points	4		per client, CPSV verified - 2 biofilters with 2 injection points per biofilter
plant operation	8592	hr/yr	per client, 3 days off in May and 4 days off in December
steam savings	6,997,325	lb/yr	
steam enthalpy	1193	btu/lb	based on non returned condensate, steam tables, Figure 3 Spirax Sarco Hook Ups
boiler efficiency	80%		CPSV verified
heating value of natural gas	1012	btu/ft^3	
natural gas savings	10,311,028.27	ft^3/yr	
	292,200	m^3/yr	
water savings	3,181	m^3/yr	based on 2.2 lb/kg and 1000 kg/m^3, as water would have been to drain
	3,116	m^3/yr	EGD

	CPSV	EGD
Gross Volume Saved	292,200	286,050
Measure Life	20	20

Energy Measure **increased cullet**

CPSV Analysis

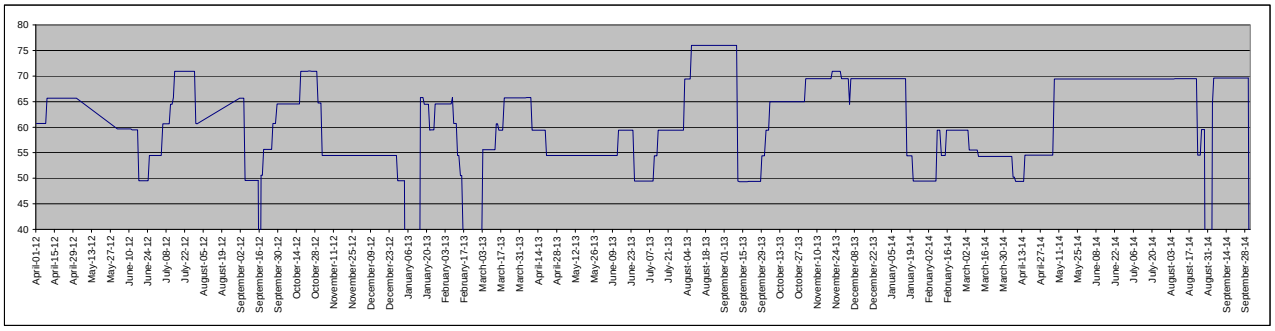
AVG **Column Labels**

Row Labels	AVG Daily Cullet [%]	AVG Daily BOOST [KWH/day]	AVG Daily BOOST [BTU/DAY]	Daily Avg GAS [m³/day]	Daily Avg GAS [BTU/day]	%GAS	Daily Avg Production Tonnage [Tonnes/day]	Specific Fuel BTU/TONNAGE	Performance Improvement	YEARLY TONNAGE [BTU/350DAYS]
2014 Grand Total	60.372	19,968.04	68,132,942	27,841.17	994,868,514	0.9315	262.949	4,042,609	1.062%	92,032.29
2013 Grand Total	59.061	24,560.66	83,803,441	27,247.20	973,643,911	0.9139	258.797	4,086,007		90,579.03
2012 Grand Total	59.432	25,056.03	85,493,678	25,185.79	899,982,036	0.9050	242.142	4,069,833		84,749.54

parameter	*value*	*unit*	*source / CPSV comment*
total energy 2014	372,050,509,796	btu/350 day	with increased cullet
total energy base case	376,044,584,396	btu/350 day	2013 cullet, adjusted for 2014 production yeild
energy savings	3,994,074,600	btu/350 day	combined gas and electrical
	3,720,542,922	btu/350 day	adjusted for gas
	104,119	m3/yr	gas savings
	104,119	m3/yr	gas savings, EGD
	80,165	kWh/yr	electrical savings

	CPSV	EGD
Gross Volume Saved	104,119	104,119
Measure Life	10	10

Percentage of Cullet



Total Gas Furnace A

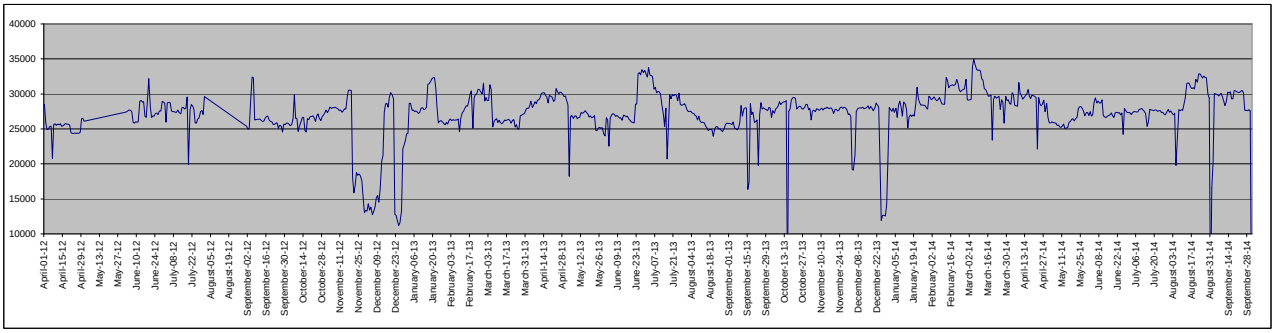


Table 2 Post Audited Savings and Payback

CPSV Wave	DSM Code	Gross Annual Gas Savings [4]	Gross Annual Electricity Savings (kWh) [5]	Gross Annual Water Savings (m3)	2014 Project Gas Cost [1]	2014 Electricty Avoided Cost [2]	2014 Water Avoided Cost [3]	Annual Gas Cost Savings	Annual Electricity Cost Savings	Annual Water Cost Savings	Customer Incentive	Gross Incremental Cost [4]	Payback Period based on Incremental Cost
1	RA.IND.NRT.011.14	197,379	0	0	$0.25	$0.11	$2.59	$49,345	$0	$0	$28,606	$62,569	1.3
1	RA.IND.NRT.008.14	338,621	60,702	0	$0.27	$0.11	$2.59	$90,938	$6,538	$0	$650	$1,300	0.01
1	RA.IND.RT.006.14	173,885	0	0	$0.25	$0.11	$2.59	$43,471	$0	$0	$15,900	$175,821	4.0
1	RA.IND.RT.004.14	192,120	0	1,339	$0.26	$0.11	$2.59	$50,801	$0	$3,474	$7,850	$15,700	0.3
1	RA.IND.RT.007.14	56,517	-25,022	0	$0.27	$0.11	$2.59	$15,260	-$2,695	$0	$9,235	$18,469	1.2
1	RA.IND.RT.001.14	184,712	0	0	$0.22	$0.11	$2.59	$40,637	$0	$0	$2,282	$4,564	0.1
1	RA.IND.NRT.002.14	22,350	0	0	$0.25	$0.11	$2.59	$5,588	$0	$0	$4,319	$12,540	2.2
2	RA.IND.AGR.RT.001.14	2,060,052	0	0	$0.22	$0.11	$2.59	$453,211	$0	$0	$100,000	$1,354,960	3.0
2	RA.IND.NRT.023.14	208,953	0	0	$0.28	$0.11	$2.59	$58,507	$0	$0	$19,439	$38,877	0.7
2	RA.IND.NRT.049.14	122,526	0	0	$0.30	$0.11	$2.59	$36,758	$0	$0	$13,419	$39,469	1.1
2	RA.IND.NRT.036.14	34,470	0	0	$0.25	$0.11	$2.59	$8,617	$0	$0	$6,661	$49,164	5.7
2	RA.IND.NRT.034.14	456,980	0	0	$0.25	$0.11	$2.59	$114,245	$0	$0	$29,576	$82,200	0.7
2	RA.IND.NRT.035.14	1,490,195	0	0	$0.20	$0.11	$2.59	$298,039	$0	$0	$79,490	$166,000	0.6
2	RA.IND.RT.011.14	854,378	0	0	$0.25	$0.11	$2.59	$213,595	$0	$0	$67,609	$297,530	1.4
2	RA.IND.RT.038.14	1,406,755	0	0	$0.30	$0.11	$2.59	$422,026	$0	$0	$75,459	$1,065,000	2.5
2	RA.IND.RT.034.14	42,708	0	0	$0.25	$0.11	$2.59	$10,677	$0	$0	$8,253	$18,950	1.8
2	RA.IND.RT.049.14	322,413	581,132	50,267	$0.30	$0.11	$2.59	$96,724	$62,588	$130,433	$23,075	$46,548	0.5
2	RA.IND.RT.040.14	296,062	0	3,116	$0.25	$0.11	$2.59	$74,015	$0	$8,085	$4,944	$9,887	0.1
2	RA.IND.RT.052.14	107,763	0	0	$0.25	$0.11	$2.59	$26,941	$0	$0	$4,976	$9,951	0.4
Total		**8,568,840**	**616,812**	**54,722**	**$0.26**	**$0.11**	**$2.59**	**2,109,395**	**66,431**	**141,993**	**501,741**	**$3,469,498**	**1.6**

1 Actual Cost of Gas customer pays, as per project file
2 Cost of Electricity obtained from Year 1 of 2014 Avoided Cost table
3 Cost of Water obtained from Year 1 of 2014 Avoided Cost table
4 Gross values exclude Free Ridership, as these are the upfront values that the customer uses in their decision making process
5 Negative electric savings for project RA.IND.RT.007.14 is the result of installation of an industrial fan for heat recovery, which typically increases electricity consumption