

Date April 13, 2015
Our Ref: PEP14-0814

Rod Idenouye
Enbridge Gas Distribution Inc.
2255 Sheppard Avenue, East
Toronto, ON M2J 5C2

Attention: Rod Idenouye
Senior Analyst, DSM Research & Evaluation

Dear Sir:

Re: Independent Review
2014 Industrial Custom Project Savings Verification
Ontario

Attached is our report for the above project. For this assignment, we reviewed sample Enbridge Gas Distribution (EGD) Files for 19 Industrial Custom Projects representing 8.9 million m³/year (combined) for the 2014 DSM Program.

Generally, we found the quality of the reviewed files to be consistent with good engineering practice. Our site investigations identified that the measures were installed and operated as claimed and that Enbridge staff had been helpful in identifying the measure and supporting its implementation.

Cole Engineering Group (CEG) is appreciative to have been involved on this assignment with EGD and for the opportunity to have Optimal Energy Inc. auditing and providing their comments to support the report.

Yours truly,

COLE ENGINEERING GROUP LTD.



Kevin Gray, P.Eng.
Senior Project Manager, Energy

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EB-2015-0267
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Enbridge Gas Distribution Inc.
Ontario

2014 Industrial Custom Project Savings Verification
Independent Review

PREPARED BY:

COLE ENGINEERING GROUP LTD.



Kevin Gray, P.Eng.
Senior Project Manager, Energy

Issues and Revisions Registry

Identification	Date	Description of issued and/or revision
Wave 1 Draft Report	January 19, 2015	For client review
Revised	February 20, 2015	Modified per Auditor's comments
Wave 2 Draft Report (preliminary)	March 13, 2015	For client review
Wave 2 Draft Report	March 18, 2015	For client review, (files RA.IND.RT.038.14 and RA.IND.RT.049.14 added)
Final	April 13, 2015	Inclusive of CPSV comments to Auditor's Wave 1 and Wave 2 comments and teleconferences of April 2 and 7, 2015

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1.0 Introduction

1.1. Background

Enbridge Gas Distribution (EGD) operates Demand Side Management (DSM) programs including programs that involve custom projects savings in the commercial, multi-residential, industrial, agriculture, and new construction sectors.

The industrial DSM programs include:

- Boiler Plant Audits,
- Steam Trap Surveys,
- Industrial HVAC audits,
- Greenhouse Audits,
- Special Process Studies,
- Implementation of Measures, and
- Monitoring and Targeting.

Custom projects cover opportunities where savings are linked to unique building specifications, uses and technologies. Each project is assessed individually for participation in the program. The programs are designed to meet three main objectives:

1. Influence customer behaviour,
2. Accelerate technology development, and
3. Transform the market.

The Ontario Energy Board (OEB) has regulatory oversight and approves the rate impacts associated with the DSM programs. Projects are generally of two types: prescriptive and custom applications. In the Industrial market, most of the projects are custom.

1.2. Objectives of the Independent Review

As part of the annual evaluation, EGD commissions third party firms to undertake Custom Projects Savings Verification (CPSV) engineering reviews of a sample of projects in the Commercial and Industrial sectors. The purpose of this evaluation is to provide;

- An objective third party engineering review of a statistically representative sample (determined by others) of Custom Projects in the Industrial Sector as per Ontario Energy Board Guidelines, and
- An independent objective opinion of the reasonableness of the energy savings and equipment costs claimed by custom projects.

1.3. Scope of Work

The project tasks are described in the 2014 Industrial Custom Project Savings Verification RFP. For this assignment, the tasks performed by Cole Engineering Group (CEG) as the CPSV, generally included the following:

File Review

The CPSV (CEG) reviewed the project files in advance of the site visits.

Site Visits

To commence our efforts with the industrial customer stakeholders, the CPSV prepared an email as follows:

Dear _____

File Reference Number _____

Background

Enbridge Gas Distribution is currently undertaking an independent evaluation audit of its 2014 Industrial Custom Projects. Further to previous correspondence with your Enbridge Representative, your organization was selected (by an independent third party) for a technical evaluation audit (to be performed by Cole Engineering) to independently assess the performance of the energy reduction measure(s) which you implemented with support from Enbridge.

Request for a Site Visit

A site visit is requested to verify the measure's installation and performance versus that which was predicted in the Enbridge analysis. Your participation is requested to;

- *Provide a brief tour of the implemented measure(s) in your facility.*
- *Discuss the production at your facility – is this as predicted for the measure's performance or should an adjustment be considered.*
- *Discuss your thoughts on the success of the measure(s) relative to the predicted results.*
- *Has the measure operated as predicted or have any corrective modifications had to be performed.*
- *Review whether you have tracked any performance data pre / post measure or whether there is local instrumentation which may be reviewed.*
- *Identify any measurements which may be of merit to perform during the visit.*

Proposed Time for Visit

It is anticipated that this site visit may be performed in less than 2 hours.

*Your participation is requested for your facility on **month / day/ time**.*

Please confirm by replying to this email if this is a convenient time. If not, please advise a few alternate timeslots.

Upon concurrence by the customer, the CPSV performed an independent site inspection and interview to review the following:

- Review and verification of physical installation and its operation protocol.
- Discuss the reasonableness of the utility savings results.
- Whether the system has achieved its expected performance. Description of approach (if any) used by the customer to measure and/or verify the savings. Request copies of monitoring software output or customer collected data for review.

- Perform on site instantaneous measurement (where such measurements are anticipated to appreciably improve the accuracy of the savings verification and do not burden the customer).
- Whether plant production/scheduling has changed in a substantial manner that would impact the savings.
- Whether the measure has introduced any unforeseen disturbances to other systems or resulted in any product quality concerns.
- Summary of feedback of performance or any process or configuration modifications subsequent to installation.

Generally, customers were courteous and cooperative to respond to questions during, the interview and site investigation. This is supplemental to the EGD file and enables visual 3rd party assurance that the system was implemented and generally operates as described.

EGD/Auditor Interaction

The CPSV participated in weekly teleconferences with EGD, an independent auditor and the audit committee (AC). During these sessions, project status was discussed, in addition to general discussions pertaining to the technical contents of the files where necessary for clarity of the CPSV to understand the analysis contained within the file.

Report

With the file review and site investigation completed, our report outlines our assessment of the file review relative to utility savings in accordance with good engineering practice. Where necessary to add clarity to our understanding, the CPSV contacted equipment vendors.

1.4. Schedule

The key milestone dates are summarized as follows;

Wave 1

Kick off Meeting at EGD	November 17, 2014
File Review and Analysis	November 18, 2014 to January 15, 2015
Draft Report Submission	January 19, 2015

Wave 2

Launch Meeting at EGD	February 5, 2015
File Review and Analysis	January 26 to March 13, 2015
Draft Report Submission –	March 18, 2015
Final Report Submission –	April 13, 2015

2.0 Sampling

Sampling was performed under separate contract by a separate 3rd party consultant retained by EGD. CEG had no role in this process. The samples were made available to CEG in two Waves as follows,

- Wave 1 (Q1-Q3) 7 files received November, 2014.
- Wave 2 (Q1-Q4) 12 files received February, 2015.

The summary tab of Appendix A summarizes the total number of Industrial projects assessed within the 2014 DSM Program and their claimed savings of natural gas and induced savings of electrical energy and water consumption.

3.0 General Comments for Industrial Files

3.1. Safety During Site Inspection

During site inspections, the CPSV observe that on many occasions a brief safety discussion and / or sign off is required to ensure that personal protective equipment will be worn and safe conduct will be observed at all times. The CPSV is full time escorted and generally instructed not to touch production / process equipment without permission.

3.2. Process Confidentiality

Industrial customers are generally guarded of the specific aspects of their facilities and processes and seek assurance that sensitive information observed is not to be released to third parties. Further, this report is specifically focussed to ensure that customer names shall not be included and process descriptions, etc. do not compromise the customers business.

On the assurance that the information is not contained in the report or released, CEG are often allowed to photograph specific aspects of the implemented measure for the analysis.

3.3. Measured Conditions

It is noted that while production (whether batch or continuous) may have variations during a day, the feedback of the customers generally depict an annual representative average of process conditions. Hence during a brief visit, it is somewhat unlikely that a brief measurement (in whatever form) will be deemed to be credible enough to warrant an adjustment on an annual or measure life basis. Furthermore, other concerns limit the merit of short term testing apparatus including;

- Seeking permission from customer for installation
- Vandalism or tampering by customer staff who may not be aware of the measure and its data logging,
- Concerns of disruptions to process,
- Safety aspects for access and physical application upon (or within) heated and / or inaccessible process equipment.

CEG are often able to observe local instrumentation (i.e. temperature, pressure, flow, etc.,) upon equipment or view the process on the customer's SCADA (supervisory control and data acquisition).

3.4. Analysis of the Measure's Performance

Recognizing the confidentiality of the customer in this report, our analysis and investigation always intends to incorporate as much available and appropriate process and production data from the customer as possible. This is particularly beneficial where the customer's operation includes a single dominant and consistent thermal load / process which is either sub-metered or is confidently defined from production or utility metering.

In certain instances, the CPSV recognizes it is difficult to receive detailed trending information of the process as follows;

- Contains competitive information of a process which can not be described in this report.
- There is no direct metering of natural gas consumption available to the equipment or process where the measure is implemented.
- There are several natural gas loads in the facility – some are addressing space heating and others may be additional thermal processes – some of which are batch and some of which are continuous.
- The process is variable in terms of its output deliverable (i.e. different parts or formulations) which would introduce variability in terms of energy per part statistic.

Generally the EGD applications are comprised of customer input of annual conditions and numerous interactions of EGD representatives to properly defend the analysis (sometimes including medium term data measurement). Unless specifically noted otherwise in the project analyses (which follow), CEG did not undertake further short term site testing and was provided with adequate information from the EGS file, site visit and customer interaction to offer its opinion of the measure's performance.

3.5. Effect of Measure on Product Quality

CEG ask the customer to comment on the post measure implementation relative to the file analysis and also whether any implications of the measure have led to it being abandoned (owing to product non conformities or reject rates) or process / production modifications.

3.6. Measure Life and Condition of Equipment

Owing to the unique nature of the process specific equipment, it is often not possible to identify the condition of the equipment other than a visual judgement of the upkeep and its performance. The short duration of the inspection and the inability to open operational equipment (without a shutdown of the facility) is not possible, or requested /feasible. The CPSV uses professional judgement and discusses with the customer about additional evaluation it may have undertook prior its decision to implement measure.

Relative to the extrapolation of annual savings for the life of the measure, additional aspects apply;

- Gradual decline of efficiency owing to service life deterioration or accumulated fouling of heat transfer;
- Repair or replacement of related components to the measure which result in an efficiency increase or hence reduced savings of the measure assessed in this report. Generally, industrial customers would replace end of life components on a "like for like" basis. Technologies which result in greater efficiencies generally cost a premium and hence this may be a future EGD candidate measure for this customer at a future date.
- Of greater magnitude than the measure life, is the market of the customer and their performance. Production variances of the initial year of the measure may change dramatically throughout the measure's life in service. Industrial equipment is often built to custom and superior standards of robustness and performance.

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Our comments pertaining to measure life in the balance of the report is relative to the reference in the Figure which follows.

Figure 3-1 EGD Measure Life Assumptions

Enbridge Measure Life Assumptions for Custom Measures and Offerings

	Commercial	Industrial	Multi Residential
Boiler Related			
Boilers – DHW	25 ²	n/a	25 ²
Boilers - Industrial Process	n/a	20	n/a
Boilers – Space Heating	25 ²	25 ²	25 ²
Combustion Tune-up	5	5	n/a
Controls	15	15	15
Steam pipe/tank insulation	n/a	15	n/a
Steam trap	5 ³	5 ³	n/a
Building Related			
Building envelope	25	25	25
Windows	25	25	25
Greenhouse curtains	n/a	10	n/a
Double Poly greenhouse	n/a	5	n/a
HVAC Related			
Dessicant cooling	15	n/a	n/a
Heat Recovery	15	15	n/a
Infra-red heaters	10	10	n/a
Make-up Air	15	15	15
Novitherm panels	15	n/a	15
Furnaces (gas-fired)	18 ⁴	n/a	18 ⁴
Re-Commissioning	5 ⁵	n/a	5 ⁵
Process Related			
Furnaces (gas-fired)	n/a	18 ⁴	n/a
Measure Life for Residential and Low Income Offerings			
Enbridge Community Energy Retrofit – without furnace upgrade	25 ⁶		
Enbridge Community Energy Retrofit – with furnace upgrade	15 ⁶		
Enbridge Low Income Weatherization	25 ⁷		

² 2007 ASHRAE handbook, HVAC applications, I-P edition, Chapter 36 section 3, Table 4 (Comparison of Service Life Estimates).

³ Enbridge Gas Distribution Independent Audit of 2010 DSM Program Results, June 30, 2011, p. 54.

⁴ 2007 ASHRAE handbook, HVAC applications, I-P edition, Chapter 36 section 3, Table 4 (Comparison of Service Life Estimates).

⁵ "Measure Life for Retro-Commissioning and Continuous Commissioning Projects", Finn Projects, December 31, 2008.

⁶ Endorsed by Enbridge Audit Committee, February 2014, Applicable to 2014 results only.

⁷ Endorsed by the Technical Evaluation Committee, February 13, 2014

4.0 Review of the Industrial Projects

4.1. Wave 1

4.1.1. RA.IND.NRT.011.14

Project Basics		
1	Sector.	Construction material
2	Type of Building, Building Segment or Process.	Exterior process operation, Asphalt.
3	Efficiency Measure(s) Description.	Customer implemented a program to pave and slope their stockpile yard. The slope and hard surface of the paved yard enables moisture to drain away from the stockpile and yields a dryer product to be added to the process with a resultant decrease in natural gas to heat and dry the aggregate.
4	Date Measure(s) Operational.	This is the final year of a 3 year program - the customer has paved 1/3 of their stock pile yard each year. This final portion of the paving program was completed April / May of 2014.
5	Site Visit?	Yes. December 12, 2014 at 10AM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Stockpile is maintained over a level, gravel base. Over time, due to scraping, the gravel base becomes saturated and a bowl shaped depression develops which traps the moisture within the stockpile at the elevations where the front end loader pick ups are drawn from the stockpile.
10	Agreement with Base Case?	Yes. As this is a somewhat unique project, CEG looked further into this initiative and found a Technical Paper T-129 entitled Stockpiles by George H. Simmons, Jr. http://www.astecinc.com/images/file/literature/T-129_Stockpiles.pdf
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	190,703 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	Yes
14	Where Item 13 is "no": CPSV Calculated Gross Natural	193,265 m ³

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	Gas Savings (for each measure).	
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 L
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	20 Years (20 years per EGD)
18	Measure Life as per OEB Measure Life Guide.	No direct entry for this application.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Yes. EGD used 20 years as industrial equipment.
20	Justification of CPSV Firm's Alternate Measure Life being used.	By review, it appears that a parking lot would be a reasonable comparison as it would be exposed to snow scraping 6 months per year (to compare vs. stockpile scraping). Consensus of reviewed references places the service life of an asphalt parking lot at between 20 to 30 years. http://www.allaboutparkinglots.com/asphalt-parking-lots/ Relative to the efficiency of the burner, it is felt (see item 33) that this is a premium Ecostar unit which is plated in accordance with the Bitumous and Aggregate Equipment Bureau and representative of performance of a replacement unit with best available technology. Further, the reduced moisture content may extend it's in service life. CEG agree with the 20 year service life.
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	CPSV value was found to be 1.34% higher than the value claimed by EGD.
25	CPSV Recommended Annual Gross Natural Gas Savings	190,703 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	3,814,060 m ³
27	CPSV Justification for Final Recommendation	CPSV agree the EGD analysis is appropriate. The difference in the value of enthalpy of vaporization appears to be the reason for the variance between the CPSV and EGD.
28	CPSV Identified IPMVP Option Identified	Option C – Whole facility. Natural gas to process is tracked versus production data on a calendar year basis and made available by customer. This analysis did not differentiate the measure performance based on variability of production modes and product formulation variations in the market. Thereafter Option A, Partially Measured Retrofit

		Isolation, was the basis.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 L
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Spreadsheet entitled "stockpile sloping" • Natural gas and production data for 2012 and 2013 – 2014 data was not yet available. • Production data for 2011 and 2012 • Accumulation of invoices for paving expenses
32	General Comments from Site Visit	2014 operation season had been essentially completed by time of site visit - the paving season typically runs from May to early December. Customer provided production data of tonnes of product vs. natural gas consumption, month by month for 2012 and 2013.
33	Verified Conditions	Paving of stockpile yard had been completed with a slope. Burner is manufactured by Hauck Manufacturing Company of Lebanon, Pennsylvania. It bears a performance nameplate in accordance with the Bituminous and Aggregate Equipment Bureau of the Construction Industry Manufacturers Association; however the performance data inserts of the nameplate have either faded beyond recognition or may not have been added. The Hauck nameplate identifies the unit as an Ecostar ESIT 125 101-01-00-00-20-00, PRN 28578 CY6976/702. By review and industrial burner experience, CPSV accept the claimed 80% efficiency as being reasonable.
34	Unverified Conditions	Moisture content was not verified as the operation has been shutdown for the season and the accumulated snow on top of the stockpile would not be indicative of the rainfall during the warmer operational season. The nature of accumulated snow would not be representative of the shedding / evaporation of rainfall. Further, there was no longer any unpaved stockpile yard at this site to enable a like vs. like comparison. Based on ground snow coverage at time of visit, the stockpile yard was observed to include a slope but the specific slope could not be determined. Further, at the time of the visit, the majority of stockpiles had essentially been depleted.
35	CPSV Analysis	CPSV assessed the customer's production and natural gas data to establish a performance ratio of gas versus

	production. The coefficient had actually demonstrated a higher gas consumption post measure. Upon further discussion with the customer, it was learned that asphalt involves numerous different formulations and secured contracts result in different methods of production. The customer responded that between the years in assessment, different contracts had resulted in more batch production versus the more continuous operation of the previous year. While the burner efficiency would be essentially constant, the energy to return the vessels and components from ambient to process appropriate conditions would be parasitic. CPSV accepted this rationale. To attempt to perform a regression analysis on these variables would be imposing to the customer and would introduce a higher degree of uncertainty to the analysis than it would hope to resolve. To validate the findings of the technical paper, the CPSV reviewed the weather data of Toronto versus Chattanooga which was the basis of the findings. Toronto http://www.theweathernetwork.com/forecasts/statistics/cl6158350/caon0696?intcmp=tw_n_topnav_fx_stats Chattanooga http://www.theweathernetwork.com/forecasts/statistics/c02758/ustn0084?intcmp=tw_n_topnav_fx_stats From the temperature and precipitation profiles of these 2 locations, the warmer average climate and higher average precipitation of Chattanooga is assumed to offset. This suggests to the CPSV that the posted drier aggregate conditions of the paved stockpile yard may be representative versus a yard located in Toronto. CPSV accept the EGD analysis which is based on moisture reduction of paved vs. unpaved stock pile yards from the Technical Paper where a paved stockpile yard was compared to a non paved stockpile yard in close proximity and found to be 2.26% drier (4.84% vs. 7.10%, see link to technical paper T129, Figure 10). For this operation, the overwhelming majority of the product would be sourced from its exterior stockpiles. To remove the water from the asphalt, the analysis focuses on the average production over the last 3 years (as the stockpile yard was paved over 3 year period) and divided by 3 as the yard was paved in full over a 3 year period. For water, the enthalpy of vaporization is 2,260 kJ/kg. http://en.wikipedia.org/wiki/Enthalpy_of_vaporization
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		#Units As mentioned, the operations had ceased for the season and the equipment operation was not witnessed. The customer's specific drying procedures and acceptance criteria could not be witnessed but would be understood to be consistent and hence "cancel out" on pre versus post measure analysis. By general knowledge of this industry, the process is to achieve an essentially dry condition, so the 2.26% moisture reduction is deemed to appropriate. Please refer to Appendix A for CPSV calculations
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4.1.2. RA.IND.NRT.008.14

Project Basics		
1	Sector.	Metal components stamping, welding and finishing
2	Type of Building, Building Segment or Process.	Industrial facility manufacturing stamped metal components for various industries.
3	Efficiency Measure(s) Description.	Facility operates with reduced exhaust fans and make up (100% fresh air) heating units during the winter. This increases the energy efficiency by maintaining heat from process within the workspace and decreasing the negative pressure in the facility with its associated infiltration of cold air and exterior exhaust fumes.
4	Date Measure(s) Operational.	April 2014.
5	Site Visit?	Yes. December 11, 2014 at 2PM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue to operate as current. The air handling equipment is designed to remove excess heat and weld / paint fumes from summer conditions and replace with fresh air. In winter, this process heat is removed from facility and replaced with 100% fresh air heated by natural gas. Further, welding and spray technology, hood design and paint composition has improved over the years to enable improved workspace air quality with reduced exhaust requirements.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	327,170 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	Yes
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	324,590 m ³
15	EGD Claimed Gross Electrical Savings.	60,702 kWh
16	EGD Claimed Gross Water Savings.	0 L
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	10 Years (10 years EGD)
18	Measure Life as per OEB Measure Life Guide.	There is no direct entry for this application as it is an operational procedure adjustment without new components or controls.
19	Measure Life conforms with Filed OEB Measure Life	Not applicable, as above.

	Guide?	
20	Justification of CPSV Firm's Alternate Measure Life being used.	From Figure 3.1, the EGD measure life for make up air units is 15 years. This is a well maintained facility with a procedure for maintenance of building and process related components. By visual assessment of the components, there would appear to be 10 years of reliable and efficient operation remaining from these components. Further it is noted, that by reducing their usage to half of the year, it is reasonable to assume these components could exceed the 10 year life and perhaps reach 15 year measure life. CPSV accepts the conservative 10 year measure life. The sign off and local equipment shut off procedure ensures that the equipment is not activated inadvertently and the beneficial natural gas savings and improved air quality and comfort should ensure the continued adherence to this program.
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	CPSV value was found to be 0.79% lower than the value claimed by EGD.
25	CPSV Recommended Annual Gross Natural Gas Savings	327,170 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	3,271,700 m ³
27	CPSV Justification for Final Recommendation	CPSV agree the EGD analysis is appropriate. The difference appears to originate in a greater precision by EGD to coordinate the BIN hours to the facilities operation (i.e. reconciliation of non production hours in each 5 degree BIN).
28	CPSV Identified IPMVP Option Identified	Option A – Partially Measured Retrofit Isolation. Air quality measurements were undertaken, temperatures were visually assessed on thermometers, and visual confirmation of air equipment not being operated. Natural gas is used at this facility exclusively for space heating but internal process equipment, lighting and worker heat gains, and production variations are variables which introduce complexity to deter a “whole building” analysis.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	60,868 kWh/yr
30	CPSV Final Assessed Water Savings (if noteworthy)	0 L
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms

		• Spreadsheet entitled Ventilation Reduction and base case / measure BIN analysis • Listing of Make Up Air and Exhaust Fan ratings used in base case / measure operation
32	General Comments from Site Visit	The measure has achieved success in terms of natural gas savings as well as improved indoor air quality for employee morale. The measure was implemented in April, 2014. The customer purchased a handheld indoor air quality meter for spot checking of the performance of the air quality to justify the measure. The customer has no complaints filed from workers and has received comments of improved comfort.
33	Verified Conditions	During site visit, a tour was made of the facility. Identified units were verified as being off. Further, the customer indicated there is a sign off process when the units are shut off for the season and the units are switched off locally at the roof level to prevent unauthorized tampering. The switch to reduced units is made during the heating and shoulder seasons when the process heat is not disruptive to the workers. Working space is maintained (by thermostats) at 68F (confirmed by thermometer), 365 days per year x 24 hours per day. To verify the air quality, the customer's Health and Safety representative took their recently purchased handheld CO monitoring device (UEI model AQM4) into 3 locations for air sampling; ▪ Press 1318 CO 0 ppm ▪ High reach racks CO 0 ppm ▪ Multi slab 1638 CO 0 ppm Health and Safety representative confirmed that worker satisfaction is maintained with modified airflows. In fact it has improved because the previous high negative pressure frequently drew in vehicle exhaust fumes from shipping area as well as cold air from outside. Customer confirmed the airflow rates in EGD file by showing an independent Ventilation Study by [REDACTED] Engineering with identical entries. The primary basis of this study was explained to address the building's extreme negative pressure and infiltration of cold exterior air and vehicular exhaust fumes in the warehouse region.
34	Unverified Conditions	On the day of the site visit, owing to the nature of extreme high winds and cold weather (-7C), snowy conditions (>18 cm), the access to the rooftop was discouraged by the customer. As per above, the performance of the units was independently verified.

35	CPSV Analysis	CPSV utilized a BIN analysis to precisely establish the operation on an annual basis in accordance with production. By review of the airflow of the equipment in both the pre measure and post measure (i.e. "winter" mode), the CPSV input these values into the BIN analysis. This analysis demonstrated a reduction in heating load. This load was then modified to account for the efficiency of the direct fired make up air units. The CPSV value is very close to the result proposed by EGD. The BIN analysis was selected to correlate the duration of the operational switchover identified by the customer (i.e. September 1 to March 20). An efficiency of 93% is taken for the direct fired make up air units. While the combustion is 100% efficient in a direct fired component (as no heat is wasted or vented to the atmosphere), 93% is industry accepted owing to the formation of water vapour. To assess the electrical savings of the reduced air handling, the total make up air and exhausted air. To establish the electrical load, an industry standard equation is used (see reference to Loren Cook handbook). The value calculated by the CPSV is again very close to that achieved by the EGD analysis. Please refer to Appendix A for CPSV calculations.
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4.1.3. RA.IND.RT.006.14

Project Basics		
1	Sector.	Manufacturer
2	Type of Building, Building Segment or Process.	Industrial manufacturing facility (built in 1974) which produces [REDACTED] from [REDACTED]
3	Efficiency Measure(s) Description.	Customer has continued in their process to rebuild their molten metal furnaces. The rebuild of Furnace 2 includes relining of the furnace, repair of infiltration, rebuilding the arch, and expanding the furnace body/ adding additional burners to increase the throughput. Relineing the furnace reduces heat loss and infiltration. Rebuilding the arch substantially improves heat transfer efficiency.
4	Date Measure(s) Operational.	The measure was completed and implemented in September, 2013. Commissioning efforts, start up and transition of contracts to this plant (from others) were completed in February 2014. Furnace 2 had increased from 8 burners to 10 burners in July 2012.
5	Site Visit?	Yes. December 23, 2014 at 9AM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue to operate the furnace in its current condition and specific gas consumption.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	168,005 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	Yes
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	168,006 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 L
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	18 years (18 years EGD)
18	Measure Life as per OEB Measure Life Guide.	By review of Figure 4.1, the measure life associated with furnace upgrades is 18 years. Relineing of the refractory of the furnace walls and repair of the arches represent the deterioration of the furnace. The balance of the steel frame structure is deemed to

		satisfactory to support the upgrade. This is not a pressure vessel with a safety concern and there is no visual or deformation evidence that this steel structure is approaching its design life. This process is a steady state constant process which is hence exposed to minimal thermal cycles.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Yes.
20	Justification of CPSV Firm's Alternate Measure Life being used.	Not applicable
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No. Additional burners (July 2012) were identical to performance of existing high efficiency burners and were added to achieve additional furnace throughput.
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	0 %
25	CPSV Recommended Annual Gross Natural Gas Savings	168,005 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	3,024,090 m ³
27	CPSV Justification for Final Recommendation	CPSV agree the EGD analysis is appropriate and were able to achieve an identical savings of the measure.
28	CPSV Identified IPMVP Option Identified	Option B– Retrofit Isolation. Customer utilizes a SCADA system to monitor several parameters throughout the plant. Each furnace is equipped with its own natural gas meter and each ingot of metal is tracked at admission to each furnace. This yields furnace by furnace performance data (namely m ³ natural gas / lb of product) which is trended.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 L
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Email confirmation of the cost of rebuild #2 • Customer report entitled Furnace #2 Upgrades which includes a process description, schematic, burner ratings, description of the base case and the energy performance measure and an analysis of pre versus post measure of furnace performance from September 2013 to October 2014.

32	General Comments from Site Visit	2014 season was still in operation at time of the visit. Furnace was witnessed in operation and by viewing inside the furnace and the exterior, it was apparent that the relining was in place and recent.
33	Verified Conditions	Facility and Furnaces were built in 1974. The facility includes 7 molten metal furnaces. Process is continuous 24 hours per day, 7 days per week and 52 weeks per year (target). Furnace 2 upgrade was to reline the refractory which gets damaged / deteriorates slowly over time. The throughput of Furnace 2 was modified in July 2012 with an increase from a quantity of 8 to a quantity of 10 burners, all identical and each rated 950,000 btu/hr. CPSV did not assess the efficiency of the burners as they are identical and are also metered for each furnace. Customer confirmed that data in Report entitled Furnace #2 Upgrades (as above) was prepared by them with data obtained from their SCADA. By view of the SCADA, the post measure performance data was indicative of current performance in at time of site visit in December 2014. Customer regularly tracks furnace performance.
34	Unverified Conditions	There are no unverified conditions which affect the CPSV analysis.
35	CPSV Analysis	For this analysis, the lbs per year of product are tracked against the m³ of natural gas at Furnace 2 in a pre versus post measure comparison. The CPSV confirmed that the furnace had 2 additional burners added in July of 2012. The Furnace returned to service and resumed operation from September 2012 to June 2013. At that time, the Furnace was modified with the measure and was completed approximately September 2013. Commissioning efforts, start up and transition of contracts to this plant (from others) were completed in February 2014. Base case data is from performance data of September 2012 to June 2013. An hourly average gas consumption and product throughput value was then multiplied by 24 h/d and 365 d/y. Post measure data is from performance data of February 2014 to May 2014. An hourly average gas consumption and product throughput was then multiplied by 24 h/d and 365 d/y to establish annual data. The improved throughput and specific performance compares against the balance of Furnace fleet. Please refer to Appendix A for CPSV calculations.

4.1.4. RA.IND.RT.004.14

Project Basics		
1	Sector.	Packaging
2	Type of Building, Building Segment or Process.	Building is late 1990's / early 2000's vintage. Packing material is cut, formed, printed, etc for distribution to end customers.
3	Efficiency Measure(s) Description.	Facility uses a steam boiler for corrugation machine process only - to maintain the temperature of the cardboard rolls during production and also during downtime. To enable the boiler to be optimized during non production, a linkageless controller was added and it is operated on a time of day basis. This enables improved control to better, and more quickly respond to loading fluctuations with an increased part load turndown ratio.
4	Date Measure(s) Operational.	The measure was completed and implemented in March, 2014.
5	Site Visit?	Yes. December 17, 2014 at 10AM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue to operate the boiler in its current operational mode.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	185,623 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	Yes
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	186,310 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	1339 m ³ /yr
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	15 years (15 years EGD)
18	Measure Life as per OEB Measure Life Guide.	By review of Figure 4.1, the measure life associated with controls upgrades is 15 years.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Yes.

20	Justification of CPSV Firm's Alternate Measure Life being used.	Not applicable. It is not clear that the steam boiler has a remaining life of 15 years. However, it is reasonable that the controls would remain and be integrated with the replacement. Based on the efficiency of the boiler, it is felt the eventual replacement of the boiler would have comparable efficiency and be on a "like for like" basis. The facility would not endure a prolonged downtime to compensate for a design departure and its interconnection modifications and commissioning / training.
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No. Linkageless controls replaced existing mechanical controls. The mechanical controls are removed from the boiler and disposed of. A new boiler would not be ordered with mechanical controls as this technology is nearing obsolescence. Further, the economic benefits of the measure would not be easily justifiable of the customer to its customers.
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	CPSV value was found to be 0.37% higher than the value claimed by EGD.
25	CPSV Recommended Annual Gross Natural Gas Savings	185,623 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	2,784,345 m ³
27	CPSV Justification for Final Recommendation	CPSV agree the EGD analysis is appropriate. Variance appears to be in the assessed average gas consumption rates in pre and post measure as the EGD values are 50.8 / 19.9 and the CPSV values are 51/20 m ³ /hr. The EGD values include a higher level of decimals. The CPSV choose to use values from 12AM to 4 AM and 4PM to 12 AM to be slightly removed / isolated from the observed activation of the boiler into production mode (4:16 AM to 2:56 PM). The specific interval selected by EGD is not indicated but may have been closer to the boiler activation. Nonetheless, the CPSV analysis is very consistent with the analysis of EGD.
28	CPSV Identified IPMVP Option Identified	Option A- Partially measured retrofit Isolation. Customer utilizes metered data of natural gas (inclusive of process and space heating, likely from billing) and correlates this to the monthly production data to establish trends. For the steam system, the water treatment company provides a make-up water and treatment chemical analysis to the customer. The performance of the measure is realized in both the natural gas consumption of the boiler and also the

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		metered make up water consumption. To attempt a “whole building” analysis would require substantial analysis of internal heat gains, operations, production and warehouse variations, etc (as previously mentioned) and the analysis would require assumptions that would negate the intended accuracy relative to the CPSV approach based on insertion gas meters pre and post measure (and more defensible).
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	1713 m³/yr. This value differs from the EGD value. It is based on a make up water readings (provided by [REDACTED] – the water quality provider for the steam system) up to December 2014. This data would be more recent than what EGD would have had when the file was posted.
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Spreadsheet entitled Boiler Controls Upgrade which depicts the performance and operational parameters which form the basis of the claimed savings. • Graph of EGD supplied temporary boiler natural gas insertion meter of November 20, 2013 (pre) and February 26, 2014 (post) measure implementation to depict the gas savings. • Copy of invoice from vendor who supplied, installed and commissioned the boiler control upgrades.
32	General Comments from Site Visit	2014 season was still in operation at time of the visit. Customer has spreadsheets of natural gas (from billings) and make up water flows (from water treatment company) for the facility and has correlated these versus plant production to monitor performance. It is noted that the spreadsheet for natural gas ranges from November 11, 2013 to December 8, 2014 so it has limited data prior to implementation of boiler controls. The CPSV requested any prior data from the customer but was advised that this was not available. Further this data is inclusive of natural gas flow to the rooftop air handling units, so it is diluted in its correlation to the boiler controls. Lastly, the units are labelled ft³/day – it is believed by the CPSV that the units should be m³/day (based on the nameplate rating of the boiler, size of facility and insertion meter data on boiler testing). However, the spreadsheet does demonstrate a dramatic gas reduction post measure. This project has been used by EGD in a Case Study

		publication to demonstrate the capabilities of the energy services group. Customer provided a copy of this promotional material.
33	Verified Conditions	The steam boiler is used exclusively for the process. Rooftop air handling units are used for space heating. The boiler is a Thermogenics steam coil unit with a rating of 300 bhp. By review of its serial number it appears to be a 1988 vintage. By review of published manufacturer's data, the unit is 85% efficient (with an economizer). However, lacking an economizer, it would be approximately 80 to 81% efficient - as installed. http://thermogenicsboilers.com/pdf/thermocoil.pdf It was witnessed that the linkageless controls are installed and operational. http://www.fireye.com/Products/Documents/PPC4000-CS1.pdf EGD file included analysis with a natural gas insertion meter installed temporarily on November 20 2013 (pre-measure) and February 26 2014 (post measure). The customer confirmed these tests and endorsed the results. These are important as these directly depict the gas reduction of the process (independent of the gas to space heating of the facility). Further, the customer provided monthly natural gas (combined facility including rooftop units for space heating) as well as make up water readings (provided by [REDACTED] - who is the water quality provider for the steam system. In both cases, dramatic improvements are noted pre and post measure installation date of March 2014. Production was confirmed 2750 hours per year (as 5 days per week, 11 hours per day and 50 weeks per year). During the site visit, the ambient temperature was 3C.
34	Unverified Conditions	There are no unverified conditions which affect the CPSV analysis.
35	CPSV Analysis	Lacking specific (permanent and continuous) metered gas for the boiler, the CPSV analysis will compare gas consumption for pre and post measure from the EGD temporary boiler gas insertion meter which was installed for 24 hours pre and post. From the EGD insertion meter data log, graphs are prepared to show the clear performance improvement during non production hours when the steam is used to heat the corrugation rolls. Further by use of the data from the insertion flowmeter, the efficiency of the burner is not required to be included in the analysis.

		During the non production time, the benefits are clearly defensible and not subject to production fluctuations. During the non production time, the gas flow is much more stable – about 51 m³/hr (pre-measure) and about 20 m³/hr (Post measure). There may be modest improvement during production hours but based on 2 x 1 days insertion meter dataloggings, it is difficult to isolate the performance of the controls versus the fluctuations in the process. The production starts at about 4:15 AM and ends at about 3 PM and the gas flow during this interval is variable and generally in the 80 to 150 m³/hr range. Customer also indicated that their production is up by 6% 2014 (versus 2013). However, since the production hours have not changed, and the measure is based on efficiencies during non production hours, the CPSV does not intend to make adjustments on this parameter. Please refer to Appendix A for CPSV calculations.
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4.1.5. RA.IND.RT.007.14

Project Basics		
1	Sector.	Manufacturing
2	Type of Building, Building Segment or Process.	Building is from 1994. Process is to manufacture [REDACTED] [REDACTED] Includes processes using [REDACTED] and packaging, warehousing.
3	Efficiency Measure(s) Description.	Facility uses a rooftop gas fired air handling unit together with 4 infrared heaters to maintain its warehouse operations within their facility. Adjacent to this warehouse, in a nearby building is a nitrogen building with an air compressor. Formerly the heat from the compressor was vented to ambient (other than a modest amount to maintain the air compressor building in the winter). To utilize this waste heat in the warehouse, an insulated duct and damper system was interconnected between these buildings. Thereafter, the diverter was adjusted as the compressor building is an uninhabited building which is suitably maintained by the radiant heat of the constantly operating equipment.
4	Date Measure(s) Operational.	The measure was completed and implemented in February, 2014.
5	Site Visit?	Yes. January 6, 2015 at 1PM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue to operate the compressor in its current operational mode.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	54,606 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	No
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	58,329 m ³
15	EGD Claimed Gross Electrical Savings.	-25,022 kWh
16	EGD Claimed Gross Water Savings.	0 m ³ /yr
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	20 years (20 years EGD)

18	Measure Life as per OEB Measure Life Guide.	By review of Figure 3.1, the measure life associated with industrial equipment is 20 years.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Yes.
20	Justification of CPSV Firm's Alternate Measure Life being used.	The air compressor appears to be very well maintained. It is reasonable that the interconnection ducting would remain and be integrated with the replacement compressor. The measure life of clad and insulated exterior ducting in a secured plant site is felt to be greater than 20 years from the CPSV from experience of similar industrial project sites. Further, the heating equipment in the warehouse is well maintained and with its reduced utilization, it would be expected to remain in service for the stated 20 year life of the measure. The environmental and economic benefits of this measure are well communicated with the peer staff for this customer and would suggest continued operation of the measure.
Results		
21	Proprietary Modelling Software?	Not for the energy saving however North American Insulation Manufacturers Association NAIMA 3E Plus 4.0 software is used for heat loss of the interconnection duct. This software is free issue on the internet and is the recognized industry standard for heat loss analysis. http://www.insulation.org/techs/3EPlus.cfm
22	Were any Measures Add-ons?	No. Recovered heat from the air compressor is used to displace the usage of the current heating systems in the warehouse.
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	CPSV value was found to be 6.82% higher than the value claimed by EGD.
25	CPSV Recommended Annual Gross Natural Gas Savings	58,329 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	1,166,574 m ³
27	CPSV Justification for Final Recommendation	CPSV agree the EGD analysis is appropriate; however the EGD analysis for gas savings is based on only 5,448 hr/yr (see Air Compressor Heat Recovery – Energy Savings Calculation Sheet) rather than the stated 5,808 hour per year. See column Heating Days (Jan (31 days), Feb (28 days), Mar (31 days), Apr (30 days), May (31 days), Jun (15 days), Nov (30 days), and Dec (31 days)) - which totals 227 days / year and 5,448 hours /year. The EGD analysis for ducting heat loss and electrical load uses the correct 5,808 hour /year.

28	CPSV Identified IPMVP Option Identified	Option A– Partially Measured Retrofit Isolation. Parameters of the recovered heat are continuous and easily calculated. Temperature of incoming air was measured. Analysis is upon the utilization within the warehouse. A whole building analysis lacking metered gas flow to the warehouse heating operations would introduce more assumptions and uncertainty as it would require detailed assessment of equipment and operations heat gain.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	-25,022 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 L
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Customer report entitled “Heat Recovery from an Air Compressor in a Nitrogen Plant”. This is inclusive of description and photos of the base case and implemented measure, description of the compressor, interconnection duct and warehouse, and an indication of the project cost. In this report, there is analysis of the gas savings, supplemental electrical consumption of the booster fan and heat loss in the duct between the buildings. • Spreadsheet entitled “Air Compressor Heat Recovery – Energy Savings Calculation Sheet” – this is primarily focussed on defining the hours in the year in which the heating is recovered and contrasted the recovered heat versus the required heating in the warehouse. • NAIMA 3E Plus 4.0 analysis of the heat loss of the interconnection ducting.
32	General Comments from Site Visit	2014 season was still in operation at time of the visit. Customer is proactive in energy management as demonstrated by recognition and corporate commitment plaques and energy management champion articles displayed in their foyer. Facility is very well maintained with constant discussion of energy and sustainability. Discussions of additional energy projects upcoming.
33	Verified Conditions	The air compressor operation was continuous (i.e. no cycling) during the site visit and verified by the customer as the basis of the 100% loading factor used in the analysis. The air compressor is a 150 psig, 125 hp unit manufactured by Sullair. By review of the serial number, the unit appears to be 2010 vintage. The interconnection duct was in place and in service

		discharging warm air into the warehouse. The customer confirmed that the discharge temperature varies between 40 to 50C. On this date, the temperature was approximately 45C (based on a hand held infrared thermometer aimed at the inside of the duct). The infrared heaters were not in operation during the site visit and have not been used since the measure was implemented. Customer confirmed they remain in place as emergency backup. Supplemental heat is provided by the rooftop unit. Heat from the compressor is the base load. The compressor building was approximately 65F from the radiant heat of the compressor. Production was confirmed 24 hours per day, 7 days per week and 360 days per year (average). The customer confirmed the heat is recovered for 8 months per year – i.e. 242 days per year. During the site visit, the ambient temperature was -8C.
34	Unverified Conditions	There are no unverified conditions which affect the CPSV analysis.
35	CPSV Analysis	Lacking specific metered gas data on the warehouse building services components (rooftop and infrareds), the recovered heat from the compressor is calculated and compared with the warehouse heating profile over the year. The heat recovery of the air compressor is calculated by knowing the compressor rating and its hours of operation. The equation and the 0.8 factor for heat recovery are described further in the following link. http://www.airbestpractices.com/technology/air-compressors/heat-recovery-and-compressed-air-systems It is noted the analysis includes the operation of the compressor into the service factor regime (operation beyond the 100% design basis) of the nameplate rating, i.e. a 15% increase. This was discussed with EGD who provided numerous independent references that this practice is common in the air compressor industry. - Compressed Air and Gas Institute (CAGI) approved data-sheet for randomly chose Atlas Copco machine (G 110 -125 psi – Air cooled – 2014) - Article from Pal Services magazine dealing with this misunderstanding (Compressor power – Actual vs. nameplate) - Ravi Shankar's post about same topic It is a practice of sales and marketing to distort the

		unit's performance but it is now common practice in this industry. CPSV identified that the heat from the compressor is the base thermal load utilized in the warehouse and the spreadsheet analysis shows the contribution is 11 % of installed heating capacity and used for only 5808 hr/yr (in lieu of a BIN analysis which would defend more than 7000 hr/yr could be realized). CPSV analysis uses industry appropriate procedures to quantify this recovered heat and demonstrate its utilization. The conventional heating equipment is thermostat controlled. The heat loss of the interconnection ducting is accounted for with the NAIMA analysis. The parasitic electrical load of the fans is calculated. Please refer to Appendix A for CPSV calculations.
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4.1.6. RA.IND.RT.001.14

Project Basics		
1	Sector.	Food processing
2	Type of Building, Building Segment or Process.	Processing of livestock into primary and secondary value added food products.
3	Efficiency Measure(s) Description.	Performed a steam trap audit by a professional steam trap vendor which has been pre-qualified.
4	Date Measure(s) Operational.	The steam trap audit and repair program took place in December 2013 and January 2014.
5	Site Visit?	No
6	Justification of why Site Visit Not Required.	Steam trap audit consisted of 161 steam traps. Analysis of steam traps is not possible by visible examination and requires sophisticated ultrasonic equipment and training to identify failures. To assess 161 traps would be onerous and inconvenient to the customer and their government regulated food product manufacture. Several of these traps are 16 to 20 feet above the floor. Further a CPSV assessment in December of 2014 could yield entirely a new sample of steam traps which have since failed. Hence the CPSV would not be able to replicate the findings of this steam trap vendor who is a short listed and reputable vendor in the industry.
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue to operate the steam system with existing steam traps which may be blocked, leaking or defective.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	178,466 m ³ . EGD subsequently revised this finding on January 13, 2015 to 89,233 m ³ .
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	No (vs. original submission)
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	88,231 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 m ³ /yr
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	5 years (5 years EGD)
18	Measure Life as per OEB Measure Life Guide.	By review of Figure 4.1, the measure life associated

		with steam traps is 5 years.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Yes.
20	Justification of CPSV Firm's Alternate Measure Life being used.	Not applicable. From Spirax "Design of Fluid Systems – Hook Ups (12 th Edition, Second Printing), page 57, the mean life of a steam trap is identified as 7 years. Based on this, the 5 year service life used by EGD is more conservative, and appropriate. http://www2.spiraxsarco.com/us/pdfs/training/hookup.pdf
Results		
21	Proprietary Modelling Software?	No.
22	Were any Measures Add-ons?	No.
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	CPSV value was found to be 50.56% lower than the <i>original</i> value claimed by EGD.
25	CPSV Recommended Annual Gross Natural Gas Savings	88,231 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	441,155 m ³
27	CPSV Justification for Final Recommendation	Based on the very close correlation to the <i>revised</i> EGD analysis (1.12%), the CPSV recommends the CPSV value.
28	CPSV Identified IPMVP Option Identified	Option A– Partially Measured Retrofit Isolation (<i>by contractor with results included in their report which was reviewed by CPSV</i>). The steam trap evaluator would utilize a handheld device specifically calibrated to determine the steam loss at the trap. These procedures and devices have undergone continuous development and are accepted as being representative of actual conditions. The size and complexity of this facility, with multiple thermal and clean in place (CIP) processes, and variable product offerings, would not enable the CPSV to use a Whole Building approach to confidently isolate the benefits attributable to this measure.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 L
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms. • EGD analysis – "Steam Trap Audit – Executive Summary". This includes annual gas consumption of customer, together with boiler efficiency, steam trap audit adjustment

		factors, and identified steam loss by the failed traps which were replaced. • EGD analysis summarizing the traps leaking, traps blocked, traps out of service and good traps out of the population of audited traps. • Copy of [REDACTED] Steam Trap Audit. This identifies the findings of each trap assessment (together with its type, sizing, pressure, location and duty) with an indication of steam loss where deficiency is identified. • Copy of [REDACTED] quotation for the annual steam trap audit and replacement of failed traps. It is noted that the original EGD file identified a Gross Volume Saving of 178,466 m³/year. This was later replaced with a modified 89,233 m³/year. The CPSV was directed by the Independent Auditor to use the original EGD value as the basis of comparison for this file.
32	General Comments from Site Visit	Not applicable
33	Verified Conditions	Steam trap data from report is from a reputable, pre-qualified vendor. Steam plant operation at this facility is known to be 24 hours per day, 7 days per week and 365 days per year.
34	Unverified Conditions	The 75% boiler efficiency on an annual basis is reasonable. Further with the adjustment factors applied, this variable is appropriate for a facility where the steam is primarily for a stable and continuous process load. There are no further unverified conditions which affect the CPSV analysis.
35	CPSV Analysis	The findings of the Steam Trap audit are accepted as being representative. The findings of the steam trap audit are further de-rated by EGD with standard factors to reflect the broad experience which EGD has with their pre-approved steam trap audit vendors. EGD has undertaken previous independent findings by third parties to assess this protocol. EGD provided subsequent documentation to substantiate the basis of the applied adjustment factors. By review, CPSV accept these as being representative of appropriate effort by EGD to maintain its due diligence in this measure technology. The CPSV analysis assesses the findings of the audit program versus a mean time to failure of steam traps for the population of traps assessed. Based on only 8.1% of the audited traps being identified as leaking or blocked, this would suggest a mean time between failure as about 12 years (1/0.081), so the trap auditor

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		did not appear to identify an uncommon level of failed traps. Based on a measure life of 5 years, it would be expected that a population of 20% traps could fail at some point during a year (see discussion in item 20 of this analysis). This suggests high quality of feedwater and steam plant operation with appropriate steam trap audit frequency. Please refer to Appendix A for CPSV calculations.
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4.1.7. RA.IND.NRT.002.14

Project Basics		
1	Sector.	Automotive components manufacturing.
2	Type of Building, Building Segment or Process.	Building appears to be 1990's vintage. Process includes fabrication of automotive components together with painting and drying operations. Components are stored in a warehouse for distribution to customers.
3	Efficiency Measure(s) Description.	Facility features substantial warehouse operation with numerous shipping docks. For this measure, 17 of 24 shipping docks had seals replaced to enable a tight seal to be maintained when a truck is being loaded /unloaded at the dock (and the shipping/ receiving door is open).
4	Date Measure(s) Operational.	The measure was completed and implemented in March, 2014.
5	Site Visit?	Yes. December 16, 2014 at 10AM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue to operate the shipping docks as current. In this manner, a gap is present around the perimeter of the truck / shipping door interface as well as the gap on the floor between the floor plate and the door seal.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	21,594 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	Yes
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	21,531 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 m ³ /yr
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	25 years (25 years EGD)
18	Measure Life as per OEB Measure Life Guide.	By review of Figure 4.1, the measure life associated with building envelope upgrades is 25 years.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Yes.
20	Justification of CPSV Firm's Alternate Measure Life	There is minimal data relating to the mean lifespan of a

	being used.	shipping door seal, but it would be dependant on how many times it is inflated, how many trucks interface it per day, susceptibility to driver skill (if dock bumpers are damaged), and vandalism. Based on age of this facility (1990's), and this seal replacement campaign (2014), the predicted measure life may be appropriate. CPSV searched for independent sources but could not establish measure life beyond the variability as discussed. Based on the secure customer site, and the generally well kept facility and landscape architecture, the CPSV feels that staff and trucking operations would use particular care to maintain and not unduly damage the façade and door seals.
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No.
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	CPSV value was found to be 0.29% lower than the value claimed by EGD.
25	CPSV Recommended Annual Gross Natural Gas Savings	21,594 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	539,850 m ³
27	CPSV Justification for Final Recommendation	CPSV agree the EGD analysis is appropriate. Variance appears to be in the assessed remaining crack area per door. This is based on the gap at the bottom of the door between the floor plate and the door seal and is dependant on the skill of the truck driver to fully engage the dock bumper.
28	CPSV Identified IPMVP Option Identified	Option A— Partially measured retrofit isolation. The CPSV is able to measure the door dimensions and the remaining opening gaps and contrast versus base case. The performance of the measure is realized in the natural gas consumption of the unit heaters which are not metered.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 L
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • EGD E Tools outputs performed for the dock seals performed on the east side and west side of building. • Spreadsheet entitled "Dock Door Improvements" to analyse the E Tool calculated infiltrations (east and west) and

		correlate this into gas savings together with operational hours and make up air efficiency parameters. • Copy of invoice from vendor who supplied and installed the shipping door seals.
32	General Comments from Site Visit	2014 season was still in operation at time of the visit. Customer is very impressed with the success of the door seals. Significant reduction in the operation of the makeup air heater and greater worker comfort without the cold air drafts of previous.
33	Verified Conditions	The dimensions of the shipping doors were confirmed to the dimensions in the invoice for the installation. The seal replacements for the shipping doors were verified. It was possible to view the seal in place for a trailer at the dock and it was agreed that a good seal results for the shipping door. On this day, the exterior temperature was 2C, and there was no draft present inside the facility. http://www.dsi-canada.com/products/seals-and-shelters/inflatable-dock-seal Further the shipping door seal inflation was demonstrated for a door at an empty shipping dock. The customer confirmed that on average, 6 of the 24 docks are in service on a continuous basis and that the doors with seals are the priority.
34	Unverified Conditions	There are no unverified conditions which affect the CPSV analysis.
35	CPSV Analysis	Lacking specific metered gas for the make up air heater, the air infiltration heat loss was calculated using ASHRAE analysis, (2005 F27.10, equation 29) which is specifically to calculate crack infiltration. $\text{Infiltration} = 88 \times C_v \times A \times U \times (\% \text{ Time open})$ A = equivalent area of opening (ft²) – in this case, the opening is dependant on specific interface of truck at bay (driver skill) and is the gap on the bottom horizontal surface on either end outside the floor plate. It is also dependant upon the incline of the floor plate to adapt to the differential elevations of the truck floor and loading dock - the horizontal plate may be inclined somewhat and introduce an additional "ramp" gap. Of the observed trucks at the docks at the time of the CPSV visit, the assessed opening is a best case judgment of the potential range of openings. Cv = effectiveness (orientation relative to wind) and based on WYEC2 data and the direction of the prevailing wind.

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	U = wind speed mph – annual average at customer location is confirmed by CPSV from this reference; http://toronto.weatherstats.ca/metrics/wind_speed.html http://toronto.weatherstats.ca/metrics/wind_direction.html With this infiltration, the heat loss is calculated. $Q = 1.08 \times \text{infiltration cfm} \times (T_{in} - T_{amb, \text{ annual average}})$ $T_{amb, \text{ annual average}}$ (during heating season from September to April taken from weather website as close as possible to customer location. http://www.theweathernetwork.com/forecasts/statistics The existing unit heaters were inspected as in “near new” condition and the EGD file assessed thermal efficiency of 75% is accepted as being appropriate based on experience. Based on reduced duty resulting from the measure, it is felt that the unit heater life will be extended. Further, there are no significant developments in the unit heater industry to suggest any different efficiency in a future replacement. Please refer to Appendix A for CPSV calculations.
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4.2. Wave 2

4.2.1. RA.IND.AGR.RT.001.14

Project Basics		
1	Sector.	Agricultural
2	Type of Building, Building Segment or Process.	Greenhouse
3	Efficiency Measure(s) Description.	In the expansion of their greenhouse portfolio, customer installed a double layer of energy curtains to reduce heat loss.
4	Date Measure(s) Operational.	September / October 2014.
5	Site Visit?	Yes. March 6, 2015 at 11 AM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Do not install energy curtains.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	1,990,388m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	Yes
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	1,990,388 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 m ³
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	10 Years. (EGD 10 years).
18	Measure Life as per OEB Measure Life Guide.	10 years
19	Measure Life conforms with Filed OEB Measure Life Guide?	Yes
20	Justification of CPSV Firm's Alternate Measure Life being used.	By review of internet sources, no clear benchmark exists for predicted life of energy curtains in greenhouse settings. In discussions with the customer, they generally achieve between 8 and 15 years in service.
Results		
21	Proprietary Modelling Software?	Yes. Virtual Grower. http://www.ars.usda.gov/services/software/download.htm?softwareid=309

22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	0%
25	CPSV Recommended Annual Gross Natural Gas Savings	1,990,388 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	19,903,880 m ³
27	CPSV Justification for Final Recommendation	CPSV agree that this new greenhouse, complete with energy curtains, is appropriately modeled by EGD using appropriate menu selected criteria and field verified dimensions into the USDA Virtual Grower (V3) Software. By general review of the Software User Manual, and other technical papers and presentations on the internet, it appears that this software represents the best available consensus of greenhouse practices in North America.
28	CPSV Identified IPMVP Option Identified	Option D – Calibrated Simulation was modelled by EGD within the file. This facility is new and lacks operational data in base case mode without energy curtains. On this basis, the rule of thumb data from customer, in cited references and from the Virtual Grower software user's manual is assessed.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 m ³
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Project memo with discussion of measure • Project photographs • Greenhouse engineering drawing to establish dimensions and piping layouts and runs. • Energy measure results from Virtual Grower V3 software analysis. • Manufacturers data of the energy curtains and drive / hanging components • Accumulation of invoices for project expenses
32	General Comments from Site Visit	During site visit, the new greenhouse and the adjacent new greenhouse was toured together with the boiler room and the operations control room. Customer indicated that the new greenhouse was put into service in September/ October 2014 and equipped with double layer (independent) energy curtains. When energy curtains are chosen (they are expensive

		and not required by Building Code), the customer indicates that most greenhouses will select single layer energy curtains, and only a very few use triple layer curtains (for delicate flowers). For this customer, the energy curtains are controlled by computer based on their developed operational expertise. Among the "real time" items tracked and utilized in the algorithm are temperature, sun intensity, wind, precipitation, humidity and all other associated irrigation and heating and plant yield. The curtains are computer controlled and verified with proximity sensors. Customer is very proactive in benchmarking its operations with its local peers and its overseas heritage. The customer indicates that rule of thumb data is for a single layer energy curtain to consume $43 \text{ m}^3/\text{m}^2$ – year and their older (2005 vintage) dual layer energy curtain achieves $37 \text{ m}^3/\text{m}^2$ – year. This new greenhouse is predicted to achieve $35.5 \text{ m}^3/\text{m}^2$-year as it also includes diffuse glass and roof water spray cooling.
33	Verified Conditions	CPSV verified the dimensions of the new greenhouse (in accordance with drawings of the EGD file) and witnessed the dual layer energy curtain in place and its coverage. CPSV viewed the computer program which utilizes weather and performance data to establish the staging and closing of the energy curtains. CPSV verified the hot water boilers with its economizer and its hot water storage. The boilers circulate water to maintain a variable temperature environment to maintain optimum growing and budding conditions for the plant. On this basis, the CPSV verified that the temperature in the greenhouse is maintained at 68F (on average) as per the computer model. General review suggests that the curtain matches the pictorial images for the assessment of air infiltration, etc.
34	Unverified Conditions	Not applicable.
35	CPSV Analysis	The EGD analysis is based on United States Department of Agriculture (USDA) Virtual Grower Software (V3). This software is based on substantial accumulated best practices and development in this sector. This program was first introduced in 2006 as Version 1. CPSV registered for this software and downloaded. By review of the Virtual Grower User Manual for this program, it identifies several weather data locations from across the USA as being within the algorithm. EGD identified that Buffalo, New York was used as

	being closest to the location of the Greenhouse. By review on Google Maps, this would be within about [REDACTED] miles. Statistical weather data for customer location. http://www.theweathernetwork.com/forecasts/statistics/[REDACTED] Statistical weather data for Fort Erie (ON) (closest to Buffalo NY from consistent statistical weather source). http://www.theweathernetwork.com/forecasts/statistics/degreedays/cl6132470/usny0181 From these consistent weather data sources, the heating degree days (based on 18C) were totalled for customer site (3603) and comparable US weather site (3789) used in the software. They were found to be within 5% and hence within the CPSV acceptance criteria to establish the EGD analysis on the software is appropriate. To identify a current Canadian source, the following article from University of Guelph defines a target "rule of thumb" 30% savings of heat loss by use of air curtains. This compares well with the Virtual grower modelling analysis (which includes 81% efficiency for the boiler). A possible comment on the higher percentage may apply to the fairly low peak height (relative to sidewall) which maintains more of the heat generation under the curtain with a limited amount to spill over to the peak. http://www.gtmconference.ca/site/downloads/presentations/4B1%20-%20Theo%20Blom.pdf The analysis of the Virtual Grower software compared well with the customers predicted energy consumption intensity on an annual basis. By review of the software manual and discussion with the customer, the CPSV feels the customer's algorithm is far more precise and based on real time variables (many) rather than a basic simplified analysis in the software based on predicted weather. It would not be possible to predict the variables in a program to any level of accuracy or confidence beyond the basic predicted weather (vs. real time). The Please refer to Appendix A for CPSV calculations
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4.2.2. RA.IND.NRT.023.14

Project Basics		
1	Sector.	Automotive
2	Type of Building, Building Segment or Process.	Building housing injection moulding and warehousing operations.
3	Efficiency Measure(s) Description.	Customer implemented 3 air distribution "socks" to transfer excessive heating from moulding machines workspace to balance of warehousing operations (to offset supplemental heating requirements).
4	Date Measure(s) Operational.	October 2014.
5	Site Visit?	Yes. February 10, 2015 at 9:30 AM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Maintain current operations with local exhaust of moulding machine heat generation and reliance on natural gas heaters for supplemental heat in warehousing operations.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	201,887 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	No
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	253,192 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 m ³
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	20 Years (20 years EGD)
18	Measure Life as per OEB Measure Life Guide.	15 years based on heat recovery.
19	Measure Life conforms with Filed OEB Measure Life Guide?	No
20	Justification of CPSV Firm's Alternate Measure Life being used.	CPSV agrees that 20 year measure life is appropriate as the measure is a heat transfer via distribution sock rather than heat recovery via a heat exchanger. By industrial experience, CPSV agree that an axial transfer fan moving air (at approximately 25 C) should remain in service for at least 20 years. Further the air transfer does not suggest any moisture or particulate which

		could reduce the service life as the process is clean.
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	25.41 %
25	CPSV Recommended Annual Gross Natural Gas Savings	253,192 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	5,063,831 m ³
27	CPSV Justification for Final Recommendation	CPSV agree that the EGD analysis is appropriate based on their participation in working with a consultant to assess heat transfer viability to predict performance. This report was not made available to the CPSV nor was it within the EGD file. CPSV opted to used post measure implementation performance as basis of our analysis to offset reliance of predicted heat generation in workspace from moulding operations.
28	CPSV Identified IPMVP Option Identified	Option C – Whole facility. Natural gas to customer (2012-2014) was provided by EGD in file for Base Case. Customer provided post measure gas consumption and indicated that shipping warehouse heaters are now in off position (front offices of the facility are not associated with this measure and still utilize existing systems for heating). This enables the CPSV to make a valid comparison of base versus post measure by confirmation of heating degree days.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 m ³
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Spreadsheet to describe the measure and its performance • Natural gas consumption of the facility June 2010 to August 2014 • Accumulation of invoices for project expenses
32	General Comments from Site Visit	Customer facility includes injection moulding machines which range from 100 ton to greater than 200 ton. These electric moulding machines have heating and material transfer operations which generate substantial amounts of heat. Adjacent to this work zone is a warehouse and shipping zone which suffers from lack of heating owing primarily to

		operation of shipping bays. In this zone, there were frequent complaints of cold working environment as the customer indicated the temperature would drop by about 12F in about 30 seconds in local zones when shipping doors were opened. Molding machines are operated to produce automotive product – not generate heat – so they are operated to deliver the customer's contracts – which is not seasonal. This was confirmed when the customer advised the facility operates 3 shifts for 52 weeks per year. For a CPSV to attempt to articulate the molding machines production schedules, and specific performance of heat generation versus capacity (at each machine) is unwarranted when a whole facility approach is taken and the socks are located in groupings of machines. Further this specific information approach, would not lend to long term measure savings analysis. Customer confirmed there are no fugitive air emissions around the injection moulding machines to hinder re-utilizing the heat. Post implementation of measure, the customer confirmed that both zones are comfortable with the heat transfer and that the gas heaters in the warehouse and shipping zones have been turned off.
33	Verified Conditions	The CPSV verified the installation and operation of the heat transfer socks to redistribute heat from the injection moulding to the shipping warehouse zone. These socks each convey 19 to 20,000 cfm (per EGD file vendor performance proposal). CPSV observed comfortable workspaces in both zones. Standing below the distribution socks (which collect heat in the high ceiling zone of the moulding and discharge at same elevation in shipping warehouse zone), CPSV could feel a significant velocity of warm air at floor level. Upon opening of a nearby shipping door, CPSV confirmed rapid decrease of workspace temperature (it was -9C at time of visit) with a rapid recovery (30 seconds +/-) to warm conditions (20C) when the door was closed. Moulding machines are electric and do not have any gas fired loads.
34	Unverified Conditions	Owing to separation distance from floor level to discharge point, and the white fabric socks, the CPSV could not achieve a credible reading at a distance with an infrared thermometer to determine discharge temperature. By experience, CPSV estimate this discharge temperature to be 25C.

35	CPSV Analysis	CPSV could not identify any reliable 3rd party documentation to predict heat generation from injection moulding operations. This approach would introduce significant reliance on customer operations of which moulding machines are in service, what plastics are being utilized and what temperatures are being processed in the plastics. Further the CPSV would have to attempt to quantify the installed motor loads for pressing and for material transfer and handling as heat generation. The customer provided supplementary information to the CPSV (a PowerPoint which is featured in the customer's employee information gallery) which depicts the savings pre and post measure based on natural gas meter data. The CPSV used this data with the customer's guidance that production in the past few years has been stable and consistent and the fact that the heating equipment in the warehouse and shipping is off. With this information, the CPSV reviewed the average Base Case natural gas consumption (2012 to 2014) and 2014 heating degree information to compare versus post measure gas consumption and heating degree information. As moulding operations are electric (not gas), the gas consumption of the facility is limited to space heating, domestic hot water and fork truck operations. This is confirmed by the gas consumption profile and the July / August consumptions (when HDD approaches 0) are assessed as the facilities base load for above operations. Heating degree days, using YYZ (Toronto), and 18C, http://www.weatherdatadepot.com/ Gas consumption is dependant on HDD and is the true indication of base case and measure. Additional HDD data (prior to 2013) will not introduce any further confidence in the analysis which is based on actual gas consumption performance of the measure as per the CPSV Whole Facility Analysis. The basis of the claim is that the redistributed heat from these machines satisfied the 2014 / 2015 winter heating season (which is generally accepted as one of the coldest in the past 10 years). Addition of transfer fans offset former load of six local exhaust fans in injection moulding area to remove excessive heat generation on an annual basis. As a result of transfer of heat, rather than exhausting of heat, the customer reports a much less negative building air pressure and associated infiltration. Please refer to Appendix A for CPSV calculations.
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4.2.3. RA.IND.NRT.049.14

Project Basics		
1	Sector.	Automotive
2	Type of Building, Building Segment or Process.	Manufacturing and warehouse operations of automobile components.
3	Efficiency Measure(s) Description.	Replacement of a conventional speed industrial door with a high speed high traffic door.
4	Date Measure(s) Operational.	December 2014
5	Site Visit?	Yes. February 10, 2015 at 1:30 PM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Maintain current high traffic, conventional door which has a longer dwell time in the open position as well as a slower time to open and close.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	118,383 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	No
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	88,963 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 m ³
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	25 Years (25 years EGD)
18	Measure Life as per OEB Measure Life Guide.	25 years based on building envelope.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Not applicable.
20	Justification of CPSV Firm's Alternate Measure Life being used.	Manufacturer's warranty is based on 150,000 cycles / year. Customer indicates 800 activations per 3 shift day is expected and historical expectation. Based on 5 days per week for 50 weeks, this would be 200,000 cycles per year, which is higher, but not unrealistic to the design basis of the industrial manufacturer. However, these doors are primarily targeted for food and pharmaceutical cold storage and would be exposed to a high temperature differential on a consistent basis. In this case, these doors isolate the facility from the

		exterior compound with two high speed doors in series separated by a vestibule. Hence the service conditions are not as severe as the cold storage design basis. These high speed doors are soft material which is designed to return to full service after impact. Vendor website includes videos of this feature. Replacement of this fabric (if needed) would maintain the measure performance and would be considered a maintenance task. In addition, the manufacturer has a local vendor and maintains an ISO 9001 service program with 24 hour service. The CPSV expects that the industrial door will achieve its 25 year service life based on an adherence to an on-going service and maintenance program with replacement of wearable service components. The CPSV further speculates that the door initiation may deactivated during summer months and prolong the measure life. http://www.ritehite.com/en/AM/Services/Service-Repair-and-Maintenance/Industrial-Door-Service-and-Repair
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	24.9%
25	CPSV Recommended Annual Gross Natural Gas Savings	88,963 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	2,224,074 m ³
27	CPSV Justification for Final Recommendation	CPSV agree that the EGD methodology is appropriate and based on ASHRAE formulas. CPSV used the door dimension (see vendor datasheet in EGD file) and a revised opening and closing time and duration time than what was in EGD file. These door settings may have been modified from original settings.
28	CPSV Identified IPMVP Option Identified	Option A – partially measured retrofit isolation.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 m ³
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Project memo to describe the energy saving initiative and basis of analysis • Drawing of door dimensions

		• Output of E Tools analysis • Manufacturer's data sheet for the high speed door system • Accumulation of invoices for project expenses
32	General Comments from Site Visit	Forklifts utilize an un-insulated, un-heated, steel clad vestibule of approximate length 10 metres (height of approximately 6/7 metres at high side, single sloped) to enable bi-directional flow of pallets from exterior storage yard to be utilized in facility. This is adjacent to a reverse sloped (to the building) shipping dock (4 doors) to enable level height access of forklifts at near grade elevation. Upon entry to facility from vestibule, the forklifts encounter an intersection of traffic. This forces the forklifts to slow down and results in an unavoidable dwell for the activation cycle of the doors until the forklift clears the sensor. There may be multiple forklifts on duty which results in disruption of a single access through the vestibule and dual door activation cycles. There were several instances that both doors were open as they would be in different stages of their cycle. The duration of time for the forklift to travel through the tunnel also varied from 5 to 15 seconds depending on loading and driver habit. This also introduced a variable in the duration of both doors being open.
33	Verified Conditions	The CPSV verified the installation and operation of the high speed doors on the south façade of the building. With the customer, the CPSV verified that the inner and outer doors are different dimensions (14'x16' and 15'x17'). The customer mentioned that this was not noted by the vendor initially. On April 8, the customer reviewed the door controller and advised that 70,054 cycles have been tracked between December 14, 2014 and April 8, 2015.
34	Unverified Conditions	The former, slower speed industrial door had been replaced so it is not possible to confirm its time to open / close. It is felt by CPSV from experience that the 30 seconds claimed time of the base case may be slow (by comparison) but perhaps representative of a conventional speed, and older door of the building vintage.
35	CPSV Analysis	As described in the site visit comments, there is variance in the sequencing of the dual doors of the vestibule which results in an analysis which must be reasonable. Either or both may be open for a finite period of time. Most predominant in the analysis is a significant

	reliance on the customer's assurance of the door openings on a daily basis. As per item 33, the actual door cycles were later received and used in the analysis. From the CPSV exposure on site (over a limited duration), there is an element of variability of the forklift operations (on a minute by minute basis) and number of operators, utilizing this passage to convey pallets to and from the outside compound. During the limited exposure of the CPSV, a frequency of approximately 20 openings per hour was witnessed. This may be explained by being early into the afternoon shift. It is presumed that the early and later stages of the shifts would be busier to compensate. Generally by review, the fast industrial doors are well established and are frequently used to isolate the expensive operations of cold storage facilities in an energy savings manner. http://www.ritehite.com/en/AM/Resource-Center/Whitepapers/9D685EC146464C15B35842F3AB852244/CS-Doors-Construction-Specifiers-April-issue http://www.ritehite.com/en/AM/Solutions/Solutions-by-Need/Energy-Savings From the perspective of heat savings, the sequence of the doors would be inner /outer / outer / inner. Hence, heat maintained in the vestibule would be eventually lost. The CPSV analysis was based on the 14'x16' door while the EGD analysis uses 15'x17'. This correlates with the vendor data in the EGD file. This factor represents about 13% difference in analysis between CPSV and EGD. The door speeds and duration times are adjustable. CPSV observed 6 seconds to open and close and 10 seconds duration open. EGD analysis uses 5 seconds to open and close and 8 seconds duration open. The open and close times are easy to assess but the duration open is more subjective as multiple forklifts in different stages through vestibule can affect this. Nonetheless, on cold days, the vestibule is near ambient. Once heat is lost from the inner door, it is soon released through the outer door. CPSV agrees that the full open equivalent time is equal to the duration open plus half open plus half close time is appropriate. For the height of the building (approximately 34') and the height of the door, the CPSV do not feel there is any appreciable stack effect. Please refer to Appendix A for CPSV calculations.
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4.2.4. RA.IND.NRT.036.14

Project Basics		
1	Sector.	Construction material
2	Type of Building, Building Segment or Process.	Exterior process operation, Asphalt.
3	Efficiency Measure(s) Description.	Several process refinements in the drying system as follows; ▪ Dryer flights with improved design and configuration in the drum. This introduces turbulence for enhanced heat distribution. ▪ Optimizing the burner orientation. ▪ Thicker wall exhaust duct to reduce cooling effect.
4	Date Measure(s) Operational.	Installed for 2014 season.
5	Site Visit?	No
6	Justification of why Site Visit Not Required.	Discussion with customer contact. This site is operational from May to November / December and hence it was not possible to view this site in the time frame of Wave 2 file review. Further, the site is located in a quarry and is not habited nor is its access or equipment cleared of snow during the winter.
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Do nothing – continue operation as current.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is “no”: CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	33,304 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	Yes
14	Where Item 13 is “no”: CPSV Calculated Gross Natural Gas Savings (for each measure).	33,304 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 m ³
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	20 Years (20 years EGD)
18	Measure Life as per OEB Measure Life Guide.	No direct entry for process upgrades
19	Measure Life conforms with Filed OEB Measure Life Guide?	Not applicable
20	Justification of CPSV Firm’s Alternate Measure Life being used.	Process upgrades of robust industrial equipment would be typically selected and implemented to achieve 20 year in service life.

Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	0%
25	CPSV Recommended Annual Gross Natural Gas Savings	33,304 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	666,084 m ³
27	CPSV Justification for Final Recommendation	CPSV analysis is as per EGD analysis. Complex measures are assessed within the performance of the entire facility on an average production 2012 to 2014 basis owing to significant variance in production 2013 vs. 2014.
28	CPSV Identified IPMVP Option Identified	Option C – Whole facility. Natural gas to process is tracked versus production data on a calendar year basis and made available by customer.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 m ³
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Memo describing the scope of the measure and basis of savings. • Spreadsheet defining the natural gas consumption and facility production for operational season of May to November 2013 and 2014. • Accumulation of invoices for project expenses
32	General Comments from Site Visit	Not applicable.
33	Verified Conditions	Not applicable.
34	Unverified Conditions	It was not possible to assess any variability in production formulations or batching versus continuous operation.
35	CPSV Analysis	CPSV analysed the daily gas consumption and production outputs for 2013 and 2014. It is noted that the production of 2014 is approximately double the 2013 production. By assessment, it is noted that both production years demonstrate a high variability of the plant's output which assumes it is limited by secured contracts in the region in which it is located or by other process factors which are not apparent. By review of the data provided, there is defensible basis for an efficiency improvement in 2014 (vs. 2013)

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		of 0.39 m³ (natural gas)/tonne (production). Specific gas performance of 2012 was not included owing to the uncertainty of any supplemental measures which the customer may have introduced which would distort the analysis. Please refer to Appendix A for CPSV calculations
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4.2.5. RA.IND.NRT.034.14

Project Basics		
1	Sector.	Automotive.
2	Type of Building, Building Segment or Process.	Steam plant operation – [REDACTED]
3	Efficiency Measure(s) Description.	Conversion of wet fire sprinkler system to a dry system. This enables this uninhabited and unutilized wing of the building to be unheated.
4	Date Measure(s) Operational.	September 2014.
5	Site Visit?	Yes. February 11, 2015 at 10:30 AM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue to heat building to maintain enough heat to avoid freezing the water in the wet sprinkler system.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	441,527 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	No
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	549,990 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 m ³
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	20 Years (20 years EGD)
18	Measure Life as per OEB Measure Life Guide.	20 years based on industrial heating equipment.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Yes
20	Justification of CPSV Firm's Alternate Measure Life being used.	CPSV agree that the steam generation and heating equipment have a remaining in service life of 20 years based on experience in industrial steam plants. CPSV also agree that 20 year measure life is appropriate for a dry fire system.
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No

23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	24.6%
25	CPSV Recommended Annual Gross Natural Gas Savings	549,990 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	10,999,806 m ³
27	CPSV Justification for Final Recommendation	CPSV agrees that the EGD analysis is generally appropriate. Facility includes make up air unit and door heater which are modelled on the premise that both units operate full time at full load to maintain heat in facility to prevent freezing in wet fire sprinkler system. EGD analysis conservatively reduces the operational hours in each BIN to about 73% of the hours. CPSV use 100% of the hours in each BIN on the basis that the building must be maintained at the heated (i.e. safe) condition regardless of production commitments to maintain the integrity of the suppression system. CPSV selected higher system heating efficiency (70 vs. 64) than EGD as the continuous operation of the heating for this wing would be more efficient than if this were remote and distant from the steam plant.
28	CPSV Identified IPMVP Option Identified	Option A – Partially measured isolation retrofit. As this portion of the facility has been completely removed from heating service, the calculated duty of the base case entirely represents the savings. A whole facility approach was not selected as the steam is not sub metered and the entire facility's steam load and production to its market has changed significantly over the past few years. This would camouflage the savings under other parameters beyond the energy assessment of this measure.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	84,562 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 m ³
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • BIN analysis of performance of steam door heater and steam make up air unit. • Manufacturer's datasheets of the steam door heaters. • Shop drawing of steam make up air unit. • Accumulation of invoices for project expenses
32	General Comments from Site Visit	Customer indicated that this facility utilized [REDACTED] to burn packaging and other

		appropriate stock to yield steam and savings in waste processing. This practice was operational from approximately 1989 to 2000 and has been since abandoned. At this point, there is no intention to return to [REDACTED] operation or to demolish the [REDACTED] wing. Customer indicated that industry has seen dramatic production changes in past few years and particularly this site has been similarly affected. In addition to EGD measure, customer is making substantial modifications to its operations.
33	Verified Conditions	CPSV verified that the [REDACTED] wing of the heating plant has been abandoned and removed from heating duty. It is fully isolated from the balance of the steam plant and air compressor facility by locked fire rated doors. CPSV verified that the [REDACTED] wing was essentially at ambient conditions on day of the visit and that the in service portion of the heating plant was at approximately 20C. CPSV verified the wet sprinkler fire system had been converted to a dry system by viewing the dry valve and associated retrofit components generally as presented in the vendor's scope of work / quotation as included in the EGD file. Owing to the relatively compact size of the [REDACTED] wing, and the amounts of heat which would be radiated by this process, the building features light gauge, un-insulated steel skin to enable excessive heat to be removed from the workspace. Steam boilers at this site do not include economizers. Steam system is multi pressure for specific users. For this instance, steam is used within steam plant (versus other users in separate and distant buildings (where condensate return (i.e. energy to return and heat loss) becomes more of concern to the analysis). On this basis, a higher 70% seasonal efficiency is suggested based on CPSV judgment.
34	Unverified Conditions	Owing to cold weather and snow conditions, and the fact that this building is abandoned, the CPSV did not gain access to the upper levels or roof for verification of nameplate data of heating equipment which had been removed from service. CPSV is reliant on customer claim that the base case operation was generally unable to maintain a "warm" condition in extreme ambient conditions.
35	CPSV Analysis	Customer indicated that the operation of the [REDACTED] resulted in substantial amounts of radiated heat from the combustion of packaging as well as the considerable equipment to handle and load.

	Installed heating equipment included a steam make up air unit and a steam door heater to compensate for cold air ingress as waste packaging was received into [REDACTED] via large shipping door. Generally, this equipment was barely able to maintain warmth as it was not intended for long term, full load operation when the [REDACTED] would be down for service. Prior to being removed from service and full time lockdown of the fire doors which isolate this wing, presumably this heat deficiency could be compensated by leaving access to this wing open to enable transfer of radiant heat from operating conventional boilers. CPSV used BIN analysis similar to approach used by EGD except as described in Item 27. Customer indicates that the base case would feature steam heating being operated in the [REDACTED] wing when the ambient temperatures would be below 7 to 10C (45/50 F). The target set point temperature would be 16C (61F) but the undersized equipment would be operating full load / full time. The door heater would have been implemented as a peaking heater to supplement radiant heat from the process or the make up air heater. It would address short term exposure to blasts of cold air when the shipping door was opened. It is controlled by a door switch and thermostat. Further to the natural gas savings as prepared by EGD, the CPSV confirmed that the electrical savings of this measure had not been assessed elsewhere or by others. Electrical savings would result from the fans associated with both systems. Rather than relying on nameplate data, the analysis utilizes a calculation of the fan energy to move the air using the $hp = (cfm \times "wc) / (6356 \times \text{efficiency})$. 1.25"wc is used from shop drawing, 6356 is a constant, and 70% was used as an appropriate motor / drive efficiency which is appropriate for a unit of this vintage. This equation is from page 20 of the engineering guide as below; http://www.eclipsecombustion.co.uk/ Please refer to Appendix A for CPSV calculations
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4.2.6. RA.IND.NRT.035.14

Project Basics		
1	Sector.	Paper
2	Type of Building, Building Segment or Process.	Industrial facility housing a paper machine.
3	Efficiency Measure(s) Description.	Variety of measures including; ▪ Reduction in differential pressure across the drying cans (4 sections) ▪ Installation of bottom felt on first dryer section ▪ Replacement of rotary siphon with a stationary siphon on first dryer stage ▪ Removal of purge valves in section 4.
4	Date Measure(s) Operational.	September 2014
5	Site Visit?	Yes. March 2, 2015 at 10 AM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue paper machine as current protocol.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	1,439,802 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	No
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	1,632,337 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 m ³
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	10 Years (10 years EGD)
18	Measure Life as per OEB Measure Life Guide.	No direct match for these process specific measures.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Not applicable.
20	Justification of CPSV Firm's Alternate Measure Life being used.	The 10 year measure life selected by EGD is conservative and is deemed appropriate. The paper machine originates from approximately 1976. CPSV identifies that the facility and paper machine appear to have appropriate maintenance and the tracked performance demonstrates minimum unplanned downtime.

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Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	13.4%
25	CPSV Recommended Annual Gross Natural Gas Savings	1,632,337 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	16,323,370 m ³
27	CPSV Justification for Final Recommendation	CPSV analysis is as per EGD analysis. Complex measures are assessed within the performance of the entire facility. EGD analysis included measure performance from September to November versus base case of January to August. Customer provided additional measure performance (from December to March) to CPSV which demonstrated improved performance as the operators gain familiarity with modified equipment. Customer uses data to continue to refine and optimize the process for energy savings, and continued product quality and process continuity (for throughput) so the differential pressure has been modified – but is maintained well lower than base case in accordance with the measure.
28	CPSV Identified IPMVP Option Identified	Option C – Whole facility. Natural gas to process is tracked versus production data on a calendar year basis and made available by customer. Process is a single, continuous operation machine and is the dominant load.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 m ³
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Project memo which describes the facility operation and base case as well at the implemented measure and its basis for energy saving. Includes base case and measure performance. • Schematic of facility operations. • Accumulation of invoices for project expenses.
32	General Comments from Site Visit	Process modifications are difficult to quantify on an individual basis but were identified in a report to the customer by a paper machine specialist. Owing to the

		extensive performance data collection of the customer's operations, the measure is quantified by assessing the steam consumption versus production. Steam is provided by a 3rd party [REDACTED] Condensate associated with measures is returned. There is some direct injection in the process and hence about 20% of provided steam is not returned as condensate.
33	Verified Conditions	During the visit, the differential pressures, steam flows and production were visually verified on the screens in the operations room. The customer showed the new felts on the dryer.
34	Unverified Conditions	As the paper machine was in operation, and the siphons are concealed within the paper machine, it was not possible to visually see the siphons. The steam from the remote [REDACTED] third party is metered and tracked. The seasonal efficiency used in the EGD file is used by the CPSV as this plant was not toured but generally seems appropriate based on a prior visit to the [REDACTED]. Per request, EGD provided a performance test of this [REDACTED] to demonstrate the basis of a 70% seasonal efficiency (conservative owing to the separation distance of this customer from the [REDACTED]).
35	CPSV Analysis	No known additional measures were offered by the customer to the CPSV other than as described in this file. Measures are treated collectively as they were implemented as a system optimization – not individual independent measures which may have a body of expectations on a singular basis. The CPSV reviewed the website of the vendor who prepared the audit of the paper machine. In isolation, each measure can not be assessed for individual performance without being a specialist in the sector and with specific knowledge of the complex operations of a paper machine. [REDACTED] [REDACTED] Customer indicated the second stage of the machine still utilizes rotary siphons so it remains difficult to optimize the pressure differential in this stage. Customer provided detailed hourly performance data of the differential pressure, steam flow and machine output. This enabled the CPSV to use a greater duration of operation (September to March) than EGD had (September to November). It is not unexpected that the CPSV identified that the extended information demonstrated that the performance has improved

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		versus that in the first 3 months of the measure. This demonstrates that the customer has gained comfort in the new measures and has continued to optimize the performance as data is collected and assessed. Please refer to Appendix A for CPSV calculations
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4.2.7. RA.IND.RT.011.14

Project Basics		
1	Sector.	Automotive
2	Type of Building, Building Segment or Process.	Industrial building for the manufacture of [REDACTED]
3	Efficiency Measure(s) Description.	Customer implemented two measures. ▪ Upgrade to their reverse osmosis hot water system featuring the addition of a condensing heat exchanger. ▪ Recovery of heat from the air compressor to preheat the city water to process and reduce steam heat required.
4	Date Measure(s) Operational.	April 2014
5	Site Visit?	Yes. March 4, 2015 at 10:30 AM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue to operate as current – no heat recovery from stack and release air compressor waste heat into cooling tower.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is “no”: CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	596,382 (condensing economizer) + 229,104 (heat recovery from compressor) = 825,486 m ³ (total)
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	No
14	Where Item 13 is “no”: CPSV Calculated Gross Natural Gas Savings (for each measure).	1,305,281 m ³ EGD analysis used a predictive mass and energy balance approach. CPSV uses a whole building analysis based on actual achieved performance for base case and post measure. The different measures work together and lacking sub-metering of flows and temperatures, there is no confidence or merit to try to reconcile the subcomponents of savings as per Item 12.
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 m ³
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	15 years EGD 15 years (economizer) / 20 years (compressor heat recovery)
18	Measure Life as per OEB Measure Life Guide.	By review of Figure 4.1, measure life associated with industrial equipment is 20 years and for heat recovery is 15 years.

19	Measure Life conforms with Filed OEB Measure Life Guide?	No
20	Justification of CPSV Firm's Alternate Measure Life being used.	CPSV suggest that the recoveries of the compressor heat and stack flue gas are both reliant on heat exchanger technology and both measures should be assessed with a 15 year measure life as per OEB (heat exchanger).
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	58%
25	CPSV Recommended Annual Gross Natural Gas Savings	1,305,281 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	19,579,212 m ³
27	CPSV Justification for Final Recommendation	CPSV agrees that the EGD heat balance is very detailed and well presented. By review of customer provided data, there is a discrepancy of the basis of the total natural gas used in the facility. From the EGD file, the page entitled "Base Case Overview" establishes total natural gas consumption at 2,647,646 m ³ /year, where as customer provided supplemental pre measure (April 2013 to March 2014) consumption as 5,045,291 m ³ /year and post measure (11 month, April 2014 to February 2015) consumption of 4,100,797 m ³ /year.
28	CPSV Identified IPMVP Option Identified	Option C – Whole facility. Natural gas to process is tracked versus production data on a calendar year basis and made available by customer. Whole facility approach is reasonable as the production of customer product is close enough (base case and post measure), that gas component to furnaces would be assessed by the CPSV to also cancel out base case versus post measure.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 m ³
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Memo summarizing the base case operation and the energy measures implemented. • Etools output of the base case boiler • Process Flow Diagram of the base case operation

		- Stack gas analysis of the base case boiler operation - Screenshot of natural gas consumption of boilers and Ludell direct contact heating system. - Summary of customer's RO water and city water consumption - Process Flow Diagram of the boiler operation with the condensing economizer - Etools output of the boiler operation with the addition of a condensing economizer - Screen shot of the recovery of heat and cumulative utilization of recovered heat - Process Flow Diagram of the air compressor heat recovery - Etools output of the boiler operation with air compressor heat recovery - Accumulation of invoices for project expenses
32	General Comments from Site Visit	CPSV viewed the new economizer and compressor heat recovery exchanger in operation. Previously utilized direct contact water heater remains in place and is decommissioned. Process is continuous and involves a variety of [REDACTED] products and processing variations to meet numerous customer specifications. Facility operates with a significant amount of heat from the process maintaining the plant environment. Customer is preparing a technical paper to present to its head office to enable similar opportunities to be identified at other plants.
33	Verified Conditions	Two measures were implemented and are generally utilized in the thermal processes of the customers operation as presented in the EGD mass and energy balances in the file. On view of local panel of stack economizer, the recovery of stack heat utilizes flue gas; - at 327F to warm 40.7 gpm from 42.5 to 138F (screenshot in EGD file) - at 318F to warm 45.4 gpm from 38.9 to 88.3F (during CPSV visit) - at 365F to warm 36.2 gpm from 53.8 to 134.8F (screenshot in customer information package). This demonstrates a fair amount of variability in the water inlet flow and flue gas temperature to meet the process load and is higher than the 31/32 gpm used in the EGD analysis.

		The stack economizer is connected only to boiler #2 which was retrofitted last year with upgraded controls. Boiler #2 is the base load boiler and has ample capacity to meet all process and space heating loads. Typical flow rates in the plant range from 4500 to 1000 lb/hr and the boiler rating is about 40,000 lb/hr. In previous years, the customer has installed a new boiler feed pump to better handle the reduced ratings of the plant. Boiler #1 is not equipped with stack heat recovery and is generally used only about one day every 2 to 3 weeks. By local instrumentation, steam pressure was 180 psi and feedwater was 232F. Plant operation is 24 hour/day, 48 weeks / year. Weekly plant operates between 6.5 and 7 days per week. Heat exchanger was observed in operation to recover heat from the 350 hp air compressor. http://www.about-air-compressors.com/support-files/quincy-gsi-compressors.pdf
34	Unverified Conditions	Difficult to assess the actual RO and process water flows and their variability over the season. Difficult to distinguish process versus supplemental heating loads upon the steam boiler and assess their variability over the season.
35	CPSV Analysis	CPSV received from customer 12 months of Base Case operation and 11 months of post measure operation. In addition to utility consumptions, this information included production output to ensure the performance is aligned to production and may be correlated. Customer confirmed that gas consumption versus [REDACTED] production parameters are well below anything the plant has ever seen in all its operation history. Despite the 2014/ 2015 season being one of the coldest on record, and also the plants production increasing by about 14.5% over the previous base case 12 months, a substantial improvement is evident owing to the measure. By review of the graph, there is a significant improvement in the thermal performance in the steam / [REDACTED] unit area performance on an annual basis, and most dramatically in the winter months (higher space heating and lower inlet city water temperature conditions). This suggests, there may be a greater amount of heat in the process to maintain production than may have been expected by EGD and may be part of the additional annual load. The CPSV analysis has projected March 2015 data (based on previous 11 months of measure performance) and adjusted for the

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		higher production of 2014/2015 vs. 2013/2014 production. Please refer to Appendix A for CPSV calculations.
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4.2.8. RA.IND.RT.038.14

Project Basics		
1	Sector.	Food and beverage.
2	Type of Building, Building Segment or Process.	Industrial facility for roasting operations.
3	Efficiency Measure(s) Description.	Replacement of 2 older roaster / regenerative thermal oxidizers with 1 SCADA controlled roaster using heat recovery and low temperature abatement. Base case was 5 roasters – (Roasters 1-5). Post measure, there are 4 roasters (Roasters 2-5). The new roaster is named #3 and replaced #1 and the base case #3.
4	Date Measure(s) Operational.	January 2014
5	Site Visit?	Yes. March 2, 2015 at 1:30 PM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue operation with existing roasters.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is “no”: CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	1,359,184 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	No
14	Where Item 13 is “no”: CPSV Calculated Gross Natural Gas Savings (for each measure).	1,362,442 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 m ³
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	20 Years (20 years EGD)
18	Measure Life as per OEB Measure Life Guide.	From Table 4.1, Boilers - Industrial Process would be representative of the design basis life of the new roaster – which is 20 years.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Not directly applicable.
20	Justification of CPSV Firm’s Alternate Measure Life being used.	Customer indicates that the roasters which were replaced originated from the 1950’s / 60’s. This would be a range of 45 years (if 1969 vintage) to 63 years (if 1950 vintage). In either limit, the life greatly exceeds the 20 year measure life of this file. Further the exhaust condition of the roaster (upon which the analysis is based) is a Ministry of

		Environment (MOE) compliance issue and hence must be maintained. The existing roasters were in compliance.
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	0.24 %
25	CPSV Recommended Annual Gross Natural Gas Savings	1,359,184 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	27,183,680 m ³
27	CPSV Justification for Final Recommendation	CPSV agree the EGD analysis is appropriate and based on MOEE exhaust parameters. The precise process is required for compliance and to ensure the customer's product specifications are adhered to.
28	CPSV Identified IPMVP Option Identified	Option A – Partially measured isolation retrofit. A whole facility approach was not selected as the natural gas is not sub metered and the entire facility's roasting is derived from 4 roasters of capacity and vintage (i.e. efficiency). Each Roaster is independently operated to suit production schedules and numerous different customer formulations.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 m ³
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Memo defining the base case operation as well as the energy efficiency measure implementation and basis of savings • Spreadsheet of the savings calculation based on burner ratings and stack conditions in accordance with most recent Ministry of the Environment (MOE) Certificate of Approval Air (C of A). • Supporting documentation from C of A. • Letter from customer's consultant regarding the revised C of A stack conditions. • Manufacturer's data paper on emissions and performance. • Manufacturer's schematic of equipment process operations and heat recovery.

		• Screen shot of new equipment stack conditions. • Memo from AMEC of performance of new equipment relative to previous units it replaced. • Accumulation of invoices for project expenses
32	General Comments from Site Visit	At the time of the site visit, the new roaster was down for service and was isolated as the crews worked upon it. It was viewed from a distance.
33	Verified Conditions	CPSV verified the installation of the new Roaster and the removal of the 2 former roasters. As the roaster was being worked upon, it was viewed from a distance and generally was confirmed to be configured in accordance with the manufacturer's schematic of equipment process operations and heat recovery. Customer confirmed the performance of the previous roasters is as per their target service of 7635 hours per year. Customer also indicated that the roasting process is as thermodynamically established in the EGD file and analysis to meet the MOEE. There are several different [REDACTED] mixtures and minor variations to the process which is bound by confidentiality.
34	Unverified Conditions	The CPSV was not able to view the Base Case (original) Roasters 1 and 3 which have been removed from the facility. The CPSV is reliant on the customer for confirmation of the 2006 MOEE C of A was the basis of the base case performance. As the new Roaster #3 was down for service, the CPSV is reliant on the assurance of the customer that the screenshot of the new exhaust conditions is adhered to per customer specifications and the revised 2014 MOEE C of A for the measure performance.
35	CPSV Analysis	CPSV analysis is based on residual energy in exhaust conditions base case versus measure. Hence, what ever is not going to the product in the roaster is leaving via the stack. CPSV and EGD analysis assume roasting process base case versus measure is maintained to customer's specifications and that heat radiated from roaster to ambient is equivalent (on a weighted basis) between Base and Measure and cancel out. It is noted that the new roaster uses heat recovery to preheat the incoming product. An efficiency of 92% is taken for the direct fired make up air units. While the combustion is 100% efficient in a direct fired component (as no heat is wasted or vented to the atmosphere), 92% is industry accepted

		owing to the formation of water vapour. Tamb, annual average is from weather website. http://www.theweathernetwork.com/forecasts/statistics As the two former roasters (each 2300 lb/hr), have a different capacity versus the new roaster (6300 lb/hr), and there is no indication that the composite plant production is different for the measure year versus the base case year, the duration of the new roaster was adjusted to capacity and known duration of the former roasters. This ensures the production values are equivalent to establish natural gas savings. CPSV analysis confirms the enhanced performance of the new roaster. By review of the AMEC independent analysis in the EGD file, it is evident that it is by far the most efficient roaster in the facility. On this basis, and its superior controls, the customer confirmed that the new roaster will be the base load unit of the fleet. The CPSV prepared an analysis where the higher capacity of Roaster 3 is maximized (as confirmed by the customer). However, on this basis, the previous Roasters (base case) would each have to operate >10,000 hours per year (to address their lower capacity) – which is not possible. This would introduce a reliance on the efficiencies of Roasters 2, 4 and 5 (which are different than Roasters 1 and 3) and it would have to assume these Roasters (2, 4 and 5) would have a remaining life equal to the measure life of the new Roaster (which is not possible as they are already 45 to 63 years old (as per Item 20). On this basis, the CPSV agrees with the conservative methodology (Scenario 1) as utilized by EGD as new future Roasters would be introduced with similar efficiency as per the new Roaster. Please refer to Appendix A for CPSV calculations.
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4.2.9. RA.IND.RT.034.14

Project Basics		
1	Sector.	Packaging and utensils.
2	Type of Building, Building Segment or Process.	Industrial facility with moulding machines and associated production operations.
3	Efficiency Measure(s) Description.	A total of 15 insulation and cladding systems installed on previously un-insulated piping and condensate tank. Pipe diameters range from 2 inch to 12 inch on steam service with lengths ranging from 4 feet to 60 feet. A condensate tank is also included with 50 square feet of insulation applied upon it.
4	Date Measure(s) Operational.	January 4, 2015
5	Site Visit?	Yes. February 13, 2015 at 10 AM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Leave piping and tank as is.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	41,264 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	Yes
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	40,862 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 m ³
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	15 Years (EGD 15 years)
18	Measure Life as per OEB Measure Life Guide.	Per Table 4.1, measure life for steam pipe and tank insulation is 15 years.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Yes.
20	Justification of CPSV Firm's Alternate Measure Life being used.	Facility maintains cleanliness in accordance with food grade facilities. Process is generally clean and numerous safety interlocks ensure there is limited interface with insulated and clad piping systems.
Results		
21	Proprietary Modelling Software?	North American Insulation Manufacturers Association (NAIMA) 3E Plus 4.1 software is used for heat loss. This

		software is free issue on the internet and is recognized industry standard for heat loss analysis. http://www.insulation.org/techs/3EPlus.cfm
22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	1 %
25	CPSV Recommended Annual Gross Natural Gas Savings	41,264 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	618,960 m ³
27	CPSV Justification for Final Recommendation	CPSV agree with EGD and contractor insulation analysis – both of which are based on NAIMA. CPSV analysis uses most recent version downloaded in February 2015. It is uncertain which versions EGD and contractor used, however insulation systems for 2" and 6" systems were spot checked and found within 1%.
28	CPSV Identified IPMVP Option Identified	Option A – Partially measured retrofit. Insulation systems were verified in place, measured and modelled on computer software based on customer provided heating system data within pipes.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 m ³
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Accumulation of invoices for project expenses to depict the insulation systems, lengths and pipe / tank diameters • Spreadsheet using NAIMA 3E Plus to depict the energy savings based on the insulation system, steam and condensate conditions, and hours of operation. This was provided by contractor for their analysis and by EGD for their independent analysis.
32	General Comments from Site Visit	Customer utilizes steam in the production of food packaging products and hence maintains a very clean facility. Owing to service, certain insulation systems had been removed over the years to enable piping modifications, repairs, etc. or when damage had occurred to the insulation or cladding. These systems were recently replaced. CPSV was generally able to identify newly replaced portions of insulation compared to existing in-service portions.
33	Verified Conditions	During site visit, customer introduced CPSV to insulating contractor. This enabled the contractor to

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		confirm the insulation and thickness, and lengths in accordance with the quotation in the EGD file. CPSV viewed the steam plant and noted the boiler's general condition and operation. The boilers feature economizers. The customer indicated that the plant is operational 333 days per year at 24 hours per day. The insulation contractor was on site to provide additional identified insulation systems for other sections of piping with missing or damaged insulation.
34	Unverified Conditions	Not applicable.
35	CPSV Analysis	As new insulation systems have been in place for only one month, and because the majority of the plant had previously insulated piping in place, it was not possible to expect to see defensible savings on gas billings. CPSV used most recent version of NAIMA 3E Version 4.1 software to model energy savings of bare piping versus insulated systems for the customer's process conditions and selected system. CPSV spot checked selected systems to assure the contractor and EGD analysis was appropriate. Our analysis was based on piping in an ambient space of 80F and yielded results within 1 % of the contractor's and EGD's similar modelling efforts (also using NAIMA 3E software). There is still significant process heat from equipment operations and finished product within the workspace to maintain comfortable conditions. Please refer to Appendix A for CPSV calculations

4.2.10. RA.IND.RT.049.14

Project Basics		
1	Sector.	Industrial laundry.
2	Type of Building, Building Segment or Process.	Industrial facility which sorts, cleans, dries and folds various laundry.
3	Efficiency Measure(s) Description.	Customer has converted to a different detergent which yields reduced total dissolved solids (TDS) which enables the opportunity to re-utilize hot water from the latter stages of the multi-stage process for pre-washing.
4	Date Measure(s) Operational.	Washers 4 and 5 were modified in October 2014 and their performance is addressed in a separate EGD file. Washers 1, 2 and 3 were modified in early December 2014 and are the basis of this EGD file analysis.
5	Site Visit?	Yes. February 25, 2015 at 9:30 AM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue operation with previous detergent which requires more water discharge and make up from city water conditions.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	311,510 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	Yes
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	300,705 m ³
15	EGD Claimed Gross Electrical Savings.	581,132 kWh
16	EGD Claimed Gross Water Savings.	50,267 m ³
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	20 Years (20 years EGD)
18	Measure Life as per OEB Measure Life Guide.	There is no direct entry for this application as it is an operational procedure adjustment without new components or controls. As this new detergent offers energy and cleaning performance improvement, there is no expectation that the operation would revert to its former base case mode.
19	Measure Life conforms with Filed OEB Measure Life	Not applicable, as above.

	Guide?	
20	Justification of CPSV Firm's Alternate Measure Life being used.	From Figure 3.1, the EGD measure life for boilers – industrial process - is 20 years. This is a reasonable comparison based on the steam boiler and the direct steam injection into the multi stage washer. This is a well maintained facility with a number of procedures / algorithms for its processing. The strict product quality standards for the end use customer ensures that equipment be operated to continue to achieve compliance. Should any new detergent be introduced at a later date with further performance benefits, then it would be evaluated as a new measure relative to this measure (as the new base case). By visual assessment of the components, there would appear to be 20 years of reliable and efficient operation remaining from these components. The customer is further taking a leadership role by preparing a technical article in an upcoming trade magazine to demonstrate to its customers and its peers of the environmental and financial success of this measure. Savings inherent from this measure will be reflected in this customers pricing to its customers relative to profitability and price increases. This should ensure the continued adherence to this program.
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	3.47%
25	CPSV Recommended Annual Gross Natural Gas Savings	311,510 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	6,230,200 m ³
27	CPSV Justification for Final Recommendation	EGD analysis included measure performance from October 20 to November 16, 2014 versus base case of January to October 12, 2014. For the performance of the measure over this interval, CPSV accept the EGD analysis. Customer provided additional measure performance from January to February 22, 2015. CPSV assessed this data and used a blended average of the natural gas, electrical and water savings over this extended duration.
28	CPSV Identified IPMVP Option Identified	Option C – Whole facility. Natural gas to process is tracked versus production data on a calendar year basis

		and made available by customer.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	425,255 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	41,353 m ³
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Narrative of base case and measure implications of process performance, with pre and post gas, electrical and water consumption parameters measured against production throughput. • Accumulation of invoices for project expenses • Pictures of measure.
32	General Comments from Site Visit	CPSV visited facility as it was operational. There is a significant amount of heat and humidity which originate from this process into the workplace. Facility includes five identical [REDACTED] washing machines. The facility draws from a wide ranging customer base including [REDACTED] laundry. Each customer has its own unique incoming laundry conditions and performance specifications upon the finished product. All incoming product is isolated by customer but may be sorted as needed if it is received in a comingled fashion. While the customer tries to dedicate machines to certain similar products and specifications, the facility will adapt different machines on a production needed basis. This is readily accomplished on the control interface of the washing machine to select a different process specification. There is a significant amount of performance information displayed through the facility to the operators and workers. This includes not only the performance of the equipment but also in the throughput of the staff in the loading, sorting, folding and pressing operations. Facility tracks the total dissolved solids (TDS) of the process wash water in accordance with sewer limitations. As a result of the modified detergent in terms of its composition and dosage, the re-use of warm process water may be further maximized [REDACTED]. The increased cascading re-utilization of the warm water has significant benefit in gas, water and electrical utilities. The facility has not received any complaints from any of its customers since the new detergent was utilized.

		The customer identified that they are achieving best in North America performance, and are preparing to present this project as a technical paper.
33	Verified Conditions	The CPSV was able to view the operational performance (flows, temperatures, etc.) of each of the 5 washing machines during the visit and to view the TDS of the wash. By view of the P&ID of the control panel, the cascading of the wash water was as described in the EGD file. As the washing machine panel was removed during operation, the CPSV verified ▪ Piping modifications – including the interconnection of Tanks 1 and 2, and piping to stage 14. ▪ The CPSV used a handheld infrared thermometer to verify the wash temperature. ▪ Each washing machine is equipped with a water meter and a temperature controller for the process temperature regulation. ▪ Steam is direct injected to the wash water. Owing to the significant reduction in steam, the customer pointed out the steam injector could be touched by hand and that there is a reduction in the duration of time which the steam is injected. By review of the steam plant, the CPSV agrees with the seasonal efficiency as used in the file.
34	Unverified Conditions	Not applicable.
35	CPSV Analysis	Initially the facility converted washing machines 4 and 5 for the new detergent. Information from the performance measure of these machines was then projected for the additional 3 machines. The CPSV reviewed the information provided by the customer to EGD and agree that the analysis is appropriate. Recognizing the natural gas consumptions for the unmodified washing machines would be different, EGD used the metered water flow for machines 4 and 5. Together with known process hot water requirements and inlet water conditions, EGD used a mass and energy balance to assess the natural gas and electrical savings from the known water reduction. This approach eliminates any uncertainty to assess facility natural gas consumption over a split billing month (20 October to 16 November, 2014) and amongst 2 groupings of machines with differing performance. As the natural gas saving analysis is dependent on inlet city water temperature, EGD used 54.5F (October, November) which compares well with the following reference which yields 13C (55.4F). http://publications.gc.ca/collections/Collection/H46-2-96-206E-1.pdf

	With the measure implemented for the remaining 3 washing machines in December, the customer provided the CPSV with whole facility analysis (all 5 machines) for January to February 22, 2015. With this data, the CPSV was able to readily present a comparison of this new measure versus the base case, with particular attention to the January / February portion. Recognizing that the washing machines are exposed to different incoming products and different process specifications, the CPSV utilized a blended composite of the October / November analysis together with the January / February analysis. The enables a greater duration of performance inclusive of partial and full measure analysis techniques. Based on the cleaning performance and feedback from its customers, together with the economic and environmental performance, the CPSV is confident that the customer will not abandon this measure. As per Item 32, the CPSV observed that there is considerable heat and humidity from the washing, drying, pressing and folding operations to maintain the workspace environment without supplemental heating. Please refer to Appendix A for CPSV calculations
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4.2.11. RA.IND.RT.040.14

Project Basics		
1	Sector.	Food and beverage
2	Type of Building, Building Segment or Process.	Facility which manufactures [REDACTED]
3	Efficiency Measure(s) Description.	Facility uses an exterior field biofilter with steam injection to address odorous compounds from [REDACTED] production. Measure involved substituting high pressure condensate (from drip traps of an extended above ground insulated steam distribution header between 2 distant buildings) which was not being returned in lieu of high pressure steam.
4	Date Measure(s) Operational.	December 2014.
5	Site Visit?	Yes. February 13, 2015 at 1:30 PM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue to operate with high pressure steam nozzle injection and allow drip leg high pressure condensate to be wasted.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	286,050 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	No
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	292,200 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	3116 m ³
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	20 Years (20 years EGD)
18	Measure Life as per OEB Measure Life Guide.	There is no direct entry for this application as it is a reconfiguration of nozzle injection into process ventilation ducting.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Not applicable as above.
20	Justification of CPSV Firm's Alternate Measure Life being used.	From Figure 3.1, the EGD measure life for boilers – industrial process may be the closest. The injection of steam or high pressure condensate prior to admission to the biofilter is a Ministry of Environment (MOE)

		compliance issue and hence must be operated to continue to achieve compliance. This should ensure the continued adherence to this program.
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	2.15%
25	CPSV Recommended Annual Gross Natural Gas Savings	292,200 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	5,844,003 m ³
27	CPSV Justification for Final Recommendation	CPSV analysis is as per EGD analysis and within 2.15%. While within the CPSV 5% threshold, the discrepancy is entirely based on operational hours per year. EGD used 8400 hr/yr (50x24x7) and CPSV used 8592 hr/yr ((365-7)x24) based on discussion with customer who indicated 3 days off in May and 4 days off in December.
28	CPSV Identified IPMVP Option Identified	Option A – Partially Measured Retrofit Isolation. Steam flow into nozzles is well defined at operational pressure.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	0 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	3181 m ³
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Spreadsheet to calculate the steam injection and water savings. • Accumulation of invoices for project expenses
32	General Comments from Site Visit	Odorous facility ventilation from [REDACTED] production is transferred via ducting outside to be injected with moisture prior to release into an exterior biomass field in accordance with MOE regulations. This is the first application of the biomass filter in Ontario and has been very successful for over 15 years. Customer indicates that the high pressure condensate substitution has been successful. Customer took CPSV into biomass field, and scrapped away snow and approximately a 150mm layer of biomass to demonstrate that the deeper biomass maintained a warm and wet environment to enable the odour abatement to be achieved as per previous operation with steam. The biomass is rejuvenated every 5 years. Steam plant serves two facilities. Previously each facility had its own steam plant but later abandoned

		one steam plant owing to its boiler selection inability to address rapid loading. This facility was interconnected by an insulated and clad above ground steam line but the customer did not install a condensate return line. Owing to the distance and direction, expansion provisions and drip legs result in significant condensate quantities in the vicinity of the biomass filtration building.
33	Verified Conditions	CPSV verified that the steam flow to the nozzles for injection into ventilation discharge had been abandoned and that the previously wasted high pressure drip leg condensate had been substituted. CPSV visually verified operation, condition and efficiency of steam boilers and pressure by review of local instrumentation.
34	Unverified Conditions	The CPSV did not clarify if the previous ¼" steam nozzles were changed to a different diameter for condensate utilization service. The CPSV focus was upon the biofilters which need to be maintained in a warm and moist condition (via nozzle injection) for the odour abatement process of ventilation air to work. For an exterior biofilter to be maintained warm and moist, the winter months would be the critical assessment period to avoid "freeze-up" of the moisture upon the biomass. The CPSV visit on Feb 13 was a very cold day and the customer and CPSV were able to scrape a few inches to confirm the moist conditions were achieved (as per Item 32). All other necessary conditions were verified.
35	CPSV Analysis	Analysis follows basic methodology of EGD on basis of avoided steam flow into nozzle based on steam pressure and nozzle size. Avoidance of using this steam removes loading from boiler and substitution of non returned high pressure condensate saves water. The critical stage for the biomass biofilter is during the winter to prevent the biomass from freezing. During the summer months (20C) versus winter months (-15/20C), the ambient temperature change from the perspective of the steam (@ +/- 350F/ 175C) is not as significant as would be (for example) the steam velocity for time in transit between buildings. The transit time would be consistent on an annual basis as it is a process steam load without space heating seasonal fluctuation. Please refer to Appendix A for CPSV calculations

4.2.12. RA.IND.RT.052.14

Project Basics		
1	Sector.	Packaging
2	Type of Building, Building Segment or Process.	Industrial facility for manufacture of various [REDACTED]
3	Efficiency Measure(s) Description.	Customer has been expanding their procurement strategy of [REDACTED] and has prepared a [REDACTED] stockpile region. This enables the switchover from [REDACTED] to be more prolonged to justify the measure. As the process is prolonged, the operators are able to use an increasing percentage of [REDACTED] for Furnace A to stay within [REDACTED] specification and realize energy savings.
4	Date Measure(s) Operational.	Customer has always utilized [REDACTED] In August, 2014, established a holding zone for the collection of [REDACTED] to enable more aggressive pursuit of [REDACTED] on the market and to stockpile greater reserves for the process.
5	Site Visit?	Yes. February 17, 2015 at 10 AM
6	Justification of why Site Visit Not Required.	Not applicable
7	Advancement Project?	No
8	Agreement with Advancement Designation?	Yes
Baseline		
9	Utility Claimed Base Case.	Continue to operate with current amount of [REDACTED] Inclusion of [REDACTED] requires a ramp up to achieve maximum amount of [REDACTED] into the process and reduced time at the maximum allowable [REDACTED] percentage. Once steady state is achieved, prolonged [REDACTED] utilization yields efficiency of the measure.
10	Agreement with Base Case?	Yes.
11	Where Item 10 is "no": CPSV Recommended Base Case.	Not applicable
Annual Savings Estimate		
12	EGD Claimed Gross Natural Gas Savings (for each measure).	104,119 m ³
13	Agreement with EGD Claimed Gross Natural Gas Savings (for each measure)?	Yes
14	Where Item 13 is "no": CPSV Calculated Gross Natural Gas Savings (for each measure).	104,119 m ³
15	EGD Claimed Gross Electrical Savings.	0 kWh
16	EGD Claimed Gross Water Savings.	0 m ³
Measure Life		
17	CPSV Recommended Measure Life (for each measure).	10 Years (10 years EGD)
18	Measure Life as per OEB Measure Life Guide.	There is no direct entry for this application as it is an

		operational procedure adjustment without new components or controls.
19	Measure Life conforms with Filed OEB Measure Life Guide?	Not applicable, as above.
20	Justification of CPSV Firm's Alternate Measure Life being used.	From Figure 3.1, the EGD measure life for furnaces – gas fired - is 18 years. This is a well maintained facility with a number of procedures / algorithms for its processing. By visual assessment of the components, there would appear to be conservatively 10 years of reliable and efficient operation remaining from these components. The article in the CPSV analysis section also references additional life expectancy for furnaces using [REDACTED] The strict product quality standards for the end use customer ensures that equipment be operated to continue to achieve compliance. This should ensure the continued adherence to this program. The increased environmental recycling effort also yields greater amounts of [REDACTED] to be available to the manufacturer.
Results		
21	Proprietary Modelling Software?	No
22	Were any Measures Add-ons?	No
23	Where Item 22 applies, provide commentary of Reasonableness of Remaining Useful Life	Not applicable
24	% Difference between CPSV Calculated Gross Natural Gas Savings vs. EGD Gross Natural Gas Savings	0
25	CPSV Recommended Annual Gross Natural Gas Savings	104,119 m ³
26	CPSV Final Recommended Gross Cumulative Cubic Meters (CCM)	1,041,185 m ³
27	CPSV Justification for Final Recommendation	For this measure, both the CPSV and EGD were using the same performance data as provided by the customer. The CPSV agree the approach of the EGD calculation is appropriate and properly extracts the gas savings component from the total energy saving.
28	CPSV Identified IPMVP Option Identified	Option C – Whole facility. Natural gas, electricity, and cullet percentage to process is tracked versus production data on a calendar year basis and made available by customer.
29	CPSV Final Assessed Electrical Savings (if noteworthy)	80,165 kWh
30	CPSV Final Assessed Water Savings (if noteworthy)	0 m ³
Additional CPSV Analysis		
31	Summary of EGD File Contents	EGD file includes; • EGD forms • Spreadsheet to define the production, gas

		consumption and [REDACTED] percentage utilized from 2012 to 2014. Email correspondence to define project expense.
32	General Comments from Site Visit	Customer manufactures [REDACTED] for a variety of users. Most notably, the quality control is most strenuous for the [REDACTED] industry as for the price of the product, the visual [REDACTED] and characteristics of the [REDACTED] is a very key parameter by the consumer. Recycled material [REDACTED] is a key ingredient to the manufacturer as it offers energy savings to the process and environmental benefits to the public [REDACTED]. [REDACTED] However, the [REDACTED] is highly variable in terms of [REDACTED] materials, and other aspects which require specific expertise of this manufacturer to meet the very strict specifications of it's customers to use this [REDACTED]. Further, the availability of [REDACTED] is highly variable. The duration of the process to switch from [REDACTED] and from [REDACTED] is very time consuming and requires considerable operation skill. It is therefore desirable for the manufacturer to have as much [REDACTED] on site as possible to justify the expenses for its inclusion. In the early stage of the process, the [REDACTED] percentage is low (about 50%) and it is slowly ramped up to a maximum of 70% (when all parameters are satisfied) and a suitable remaining reserve of [REDACTED] exists. The efforts to expand its [REDACTED] holding zone, enables the customer to maximize its collection of [REDACTED] and to prolong its use in the process. With the extended duration of [REDACTED] operation, the chance to maximize its stockpile of [REDACTED] is also achieved. The CPSV speculates by having enhanced [REDACTED] storage, the customer maybe able to pursue [REDACTED] acquisition from a more diverse range of suppliers – some of whom may have [REDACTED] but also prefer to not sub contract various [REDACTED].
33	Verified Conditions	The inclusion of [REDACTED] in the process was verified by visual assessment in the loading hopper. The process performance from 2012 to 2014 was made available to assess the [REDACTED] consumption and utility performance.
34	Unverified Conditions	Not applicable.
35	CPSV Analysis	The customer's process operates continuously 350 to 360 days per year. Various shapes and size are

manufactured in [REDACTED] In addition, there are hundreds of unique specifications and parameters which must be achieved for each order delivered by this customer.

The customer has used [REDACTED] in the past and this enlarged storage zone has enabled the [REDACTED] process to be optimized.

Measure is based on this year's achievements to increase its [REDACTED] utilization and as such it is date limited for a continuous, on-going annual process.

It is not possible to define a specific performance of this measure in isolation other than to assess the trending of gas consumption and [REDACTED] percentage utilization. As the [REDACTED] percentage is variable and ramps up as the process reaches its customers specifications, the CPSV took the customer's data for the past 3 years (2012 to 2014) and graphed both the percentage of percentage of [REDACTED] and total gas consumption to the furnace on a time basis. It is readily noted that as [REDACTED] is increased in the process, the amount of gas to the furnace decreases.

The measure performance is based on the 2014 [REDACTED] percentage and it is noted that the [REDACTED] percentage in 2012 and 2013 are very close (within 0.35%). As the CPSV is not aware of any supplemental measures implemented in 2012, the base case is based on 2013.

The article below describes the energy savings from [REDACTED] and offers a prediction of 2.5 to 3% energy reduction of [REDACTED] for 10% of additional [REDACTED]

[REDACTED]

From the CPSV analysis, the savings (combined electrical and gas) are 1.06% for 1.3% increase in [REDACTED]

CPSV also recommend that the electrical savings of the measure be incorporated. EGD took the composite specific energy savings and adjusted by the percentage of energy being supplied by natural gas. CPSV used a similar approach to assess the electrical savings of the measure. Customer explained to CPSV that this represents electrical immersion heaters which are embedded deeper in the furnace and enable heat better gain into the central portion where the gas burners have limited penetration.

Please refer to Appendix A for CPSV calculations

5.0 Discussion

As a result of review of the EGD files and the site inspections, CEG (as the CPSV) was able to assess the predicted savings, based on discussions with the customers and assessment of post measure data collection via SCADA, local instrumentation or implemented data collection. CEG performed independent analysis to offer its professional opinion of the measure's performance (please refer to the spreadsheets within Appendix A of this report and to the preceding section of this report for detailed analysis per file).

The summary tab of Appendix A shows a summary of CEG's analysis together with the EGD analysis and any suggested adjustments. Generally, the files included analysis in conformance with good engineering practice to demonstrate the anticipated performance. It appears that a high degree of consistency and care have been taken in the file assembly and QA/QC in the file review by EGD.

5.1. Considerations of Adjustment

CEG was provided with the following guidance from the AC regarding the adjustment of EGD's claimed savings for custom projects -

- If the CPSV savings number is within 5% of EGD's number AND the CPSV concludes that its methodology is less rigorous then EGD's approach the CPSV contractor can let the EGD number stand without adjustment.
- If the CPSV savings number differs by more than 5% or the CPSV concludes that its methodology is more rigorous the CPSV contractor should recommend adjusting EGD's savings claim and be fully prepared to defend its adjusted savings claim.
- If the CPSV uncovers a clear methodological error, math error or other obvious error then the EGD savings claim should always be adjusted regardless of the percent variance.
- Some of the adjustments recommended by CEG are based on feedback from customers which would not have been available at the time of file submission by EGD.

For all projects the CPSV contractor should provide clear reasoning for all its recommended savings adjustments.

5.2. Natural Gas Analysis

For the 19 Wave 1 and Wave 2 files, the CPSV analysis of the annual natural gas savings;

- Was 8.994 million m³/yr which was 8.64% greater than presented by EGD,
- Was within 5% of the EGD analysis on 13 occasions,
- Yielded a different result than EGD on 15 files. On 9 occasions the CPSV result was higher. On only 6 occasions, the results differed by more than 5%.

For the 6 files where the CPSV value differ by more than 5%;

- 1 file was within Wave 1 and 5 files were within Wave 2,
- 3 of the 6 files were based on supplemental measure performance provided by the customer to enable a greater duration of data to be analyzed.

- For Wave 1 file RA.IND.RT.001.14, the CPSV was directed to use the annual savings contained within the original file submission. This yielded a difference of 50.6%. EGD submitted a revised analysis (on January 13, 2015) which was within 1.1% of the CPSV analysis.
- For Wave 2 file RA.IND.NRT.023.14, the CPSV used a whole facility analysis of additional post measure performance provided by the customer to demonstrate the measure's space heating success. The EGD analysis was based on conservative, predicted heat generation and distribution values.
- For Wave 2 file RA.IND.NRT.049.14, the CPSV used the door dimension (see vendor datasheet in EGD file) and a revised opening and closing time and duration time than what was in EGD file. These door settings may have been modified from original settings.
- For Wave 2 file RA.IND.NRT.034.14, the measure involved the elimination of heating within the EFW portion of the steam plant. EGD analysis conservatively reduces the operational hours in each BIN to about 73% of the hours. CPSV use 100% of the hours in each BIN as the building must be maintained in a safe condition at the heated condition regardless of production commitments for integrity of the suppression system.
- For the Wave 2 file RA.IND.NRT.035.14, the customer provided additional measure performance data from December to March to enable the CPSV have a greater duration of results to analyse. It is noted that the customer has continued to gain experience with the measure as the additional data demonstrates a greater improvement over base measure conditions than the September to November data within the file.
- For the Wave 2 file RA.IND.RT.011.14, the CPSV used a whole facility analysis of additional post measure performance provided by the customer to demonstrate both measure's heat recovery success. Further, the measures have operated for 11 months in a period where the customer has had a projected plant production increase of 14.5% over the period upon which the EGD analysis was based. There is a discrepancy of facility natural gas consumption of the EGD file and the customer provided data for the base case.

5.3. Electrical Analysis

For the 19 Wave 1 and Wave 2 files, the CPSV analysis of the annual electrical savings;

- Identified 4 project files which had electrical implications of the identified measures.
- For project file, RA.IND.RT.007.14, the CPSV agreed with the EGD analysis that the measure incurred an electrical consumption.
- For project file RA.IND.RT.034.14, the CPSV recommended an electrical savings where analysis by EGD did not propose the savings. The CPSV clarified with EGD that to their knowledge there was no other 3rd party (i.e. Ontario Power Authority, Toronto Hydro, etc.) which had claimed this electrical savings.
- For project file RA.IND.RT.052.14, the CPSV recommended an electrical savings where analysis by EGD did not propose the savings.
- For the 19 files, the CPSV analysis for the total electrical savings was within 1.5% of the EGD analysis.

5.4. Water Analysis

For the 19 Wave 1 and Wave 2 files, the CPSV analysis of the annual water savings;

- Identified 3 project files which had water implications of the identified measures.
- For project file, RA.IND.RT.004.14, the CPSV analysis differs from EGD analysis and is based on metered make up water readings by [REDACTED] (who is the water quality provider for the customer).
- For project file, RA.IND.RT.049.14, the CPSV analysis differs from the EGD analysis and is based on metered water consumption data provided by the customer.
- For the 19 files, the CPSV analysis for the total electrical savings was within 15.5% of the EGD analysis.

5.5. Measure Life

For the 19 Wave 1 and Wave 2 files, the CPSV analysis of the measure life is generally in agreement with the value presented by EGD on 18 instances. The only recommended adjustment is for file RA.IND.RT.011.14 – it is felt both of these measures are based on heat exchanger technology and should be over a 15 year measure life.

It is worth noting, that several of these measures involve technologies with no direct correlation to the Figure 3.1 Measure Life Assumptions. In many of these cases, the measures are based on sub components of more complex systems. For this, the CPSV used an opinion of measure life based on professional judgement and experience, readily available technical papers (for example as may be found on appropriate websites of Recognized Technical Associations) and also discussions with the customer.

6.0 Closure

In our opinion, EGD continues to be proactive in its support to its industrial customers in understanding their processes and identifying measures to increase their efficiency and improve their market competitiveness.

It is clear that EGD have implemented consistent reporting of savings using good engineering practice analysis (and in some cases E-tools) together with appropriate quality assurance techniques to support the findings of the ESCs.