Durham York Energy Centre (DYEC)

Acceptance Test Review Report

Prepared for the Regional Municipalities of Durham and York

Courtice, Ontario, Canada

April 20, 2016

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1 INTRODUCTION

The Project Agreement (PA) by and between the Regional Municipality of Durham and the Regional Municipality of York (Regions), as Owners, and Covanta Durham York Renewable Energy LTD. (Covanta), as DBO Contractor, requires Covanta to conduct an Acceptance Test following satisfactory completion of the Commissioning Work. The purpose of the Acceptance Test is to demonstrate that the Durham York Energy Center (DYEC) is capable of meeting the Performance Guarantees pursuant to Appendix 19 and the Acceptance Test Criteria pursuant to Appendix 10 of the PA. All capitalized terms used in this letter and not defined herein are defined in the PA.

Covanta conducted the Acceptance Test of the DYEC from September 27, 2015 through November 2, 2015, and submitted the Acceptance Test Report (Test Report) on November 26, 2015. Covanta also submitted the Acceptance Test Declaration pursuant to Appendix 14 of the PA certifying that they have successfully completed the Facility Performance Test Work in accordance with the Technical Requirements and the Contract Documents including achievement of all of the Performance Guarantees stipulated in Exhibit 2 to Appendix 19 of the PA.

HDR Corporation (HDR) acting as the Region's Consultant, was responsible for monitoring the entire Acceptance Test program to assess whether the DYEC was being operated by Covanta under normal and representative conditions and that the testing was being conducted in accordance with the agreed-upon final Acceptance Test Protocol, submitted January 2015. A summary of the sections of the Test Report and the supporting data that HDR reviewed as part of our assessment of whether Covanta complied with the requirements of the Acceptance Test Protocol and the PA is provided as Attachment 1.

Based on HDR's review of the results presented by Covanta in the Test Report (as shown in column 2 of Table 1, below), the supporting data/documentation, our observations during the testing period, and our independent calculations of the results (as shown in Column 3 of Table 1), we generally concur with the results presented by Covanta in the Test Report, with the exception of the results of the Residue Quantity Tests.

It is HDR's opinion that Covanta demonstrated that the DYEC met or exceeded the Minimum Acceptance Test Criteria as defined in Section 1.15 of Appendix 10 to the PA for Throughput Capacity, Energy Recovery, Metals Recovery, and Environmental Compliance. However, HDR contends that Covanta failed to meet the original Residue Quantity Guarantee during both the 30-Day Reliability Test and the 5-Day Throughput Capacity Test, and therefore did not meet all of the Acceptance Test Criteria as stipulated in the Acceptance Test Protocol and Section 1.14, Appendix 10 of the PA. Subsequent to the completion of the Acceptance Test, Covanta and the Regions adjusted the Residue Quantity Guarantee to allow for the flexibility to add additional reagents to stabilize the fly ash. As a result of this adjustment, Covanta has now satisfied the Residue Quantity Guarantee and successfully met all of the Acceptance Test Criteria.

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2 SUMMARY OF RESULTS

Pursuant to Section 1.14 of Appendix 10 to the PA, *"The Facility shall be deemed to have passed the Acceptance Test Criteria if the Acceptance Test demonstrates that, each of the following criteria has been met or exceeded":*

Table 1 – Summary of Acceptance Test Results

CRITERIA	TEST RESULT	
	AS CALCULATED BY COVANTA	AS CALCULATED BY HDR
The 30-Day Reliability Test has demonstrated during the test period that the Facility has operated at a minimum of 95% of the Demonstrated Design Steam Flow (DDSF) with a Facility availability greater than 95%.	101.6% DDSF 99.9% Availability **PASS**	101.6% DDSF 99.9% Availability **PASS**
The Throughput Capacity Guarantee Test has demonstrated the ability of the Facility to process waste in accordance with the Throughput Capacity Guarantee in Exhibit 2 to Appendix 19 during a consecutive five (5)-day test period, and that the amount of Reference waste (in tonnes) processed during the testing period is 2,180 tonnes (and no less than 1,000 tonnes per unit).	Actual: 2,260 Tonnes at 13.34 MJ/kg Guarantee: 2,124 Tonnes at 13.34 MJ/kg Actual: Unit No. 1: 1,136 Tonnes Unit No.2 1,125 Tonnes Per Unit Guarantee: 974 Tonnes at 13.34 MJ/kg **PASS**	Actual: 2,251Tonnes at 13.36 MJ/kg Guarantee: 2,124 Tonnes at 13.36 MJ/kg Actual: Unit No. 1: 1,131Tonnes Unit No.2 1,120 Tonnes Per Unit Guarantee: 974 Tonnes at 13.36 MJ/kg **PASS**
The Energy Recovery Test has demonstrated that the average net electrical production rate (in kWh/tonne) is not less than the Electrical Production Guarantee identified in Exhibit 2 to Appendix 19	Actual: 840 kWh/tonne at 13.74 MJ/kg Guarantee: 822 kWh/tonne at 13.74 MJ/kg **PASS**	Actual: 846 kWh/tonne at 13.79 MJ/kg Guarantee: 825 kWh/tonne at 13.79 MJ/kg **PASS**
The Residue Quality Guarantee has demonstrated that the unburned carbon content is less than 3%, and moisture content is less than 25%. (Applies to bottom ash and grate siftings only)	16.7% moisture content 0.42% unburned carbon content **PASS**	16.7% moisture content 0.83% unburned carbon content **PASS**

CRITERIA	TEST RESULT	
	AS CALCULATED BY COVANTA	AS CALCULATED BY HDR
The Residue Quantity Guarantee is demonstrated if the quantity of Residue generated (in tonnes) is less than or equal to 30% of Waste processed (in tonnes), adjusted for the measured waste HHV in accordance with Table A10-2. (Applies to total Residue excluding metals recovered) As a result of negotiations between Covanta and the Regions, the Residue Quantity Guarantee was adjusted to allow for the flexibility to add more reagents (i.e. pozzolan and cement and associated water) for stabilization purposes. As a result, Covanta successfully demonstrated compliance with the revised guarantees shown in Table 3 of this report. *(HDR values do not include additional correction for returned or disposed ash from recovered ferrous metal)*	30-Day Test Actual: 26.7% at 13.33 MJ/kg Guarantee: 29.4% at 13.33 MJ/kg **PASS** 5-Day Test Actual: 26.8% at 13.34 MJ/kg Guarantee: 29.4% at 13.34 MJ/kg **PASS**	30-Day Test Actual: 31.3% at 13.34 MJ/kg Guarantee: 34.4% at 13.34 MJ/kg **PASS** 5-Day Test Actual: 31.6% at 13.36 MJ/kg Guarantee: 34.4% at 13.36 MJ/kg **PASS**
The Metals Recovery Guarantee is demonstrated if the measured recovery efficiency percentages for ferrous metals and for non-ferrous metals comply with those identified by the DBO Contractor in Exhibit 2 to Appendix 19.	Ferrous Recovery Actual: 87.8% Guarantee: 80.0% Non-Ferrous Actual: 84.7% Guarantee: 60.0% **PASS**	Ferrous Recovery Actual: 83.0% Guarantee: 80.0% Non-Ferrous Actual: 84.7% Guarantee: 60.0% **PASS**
The Environmental Compliance Guarantee is demonstrated if the results of the air emissions, noise, and general test requirements are in compliance with the CofA	All Environmental Requirements Satisfied **PASS**	MOECC deemed all environmental test reports acceptable - CO spikes were accepted **PASS**

The main sections of the Test Report were provided as printed copies but the Appendices and operating data were provided in electronic format only. It is HDR's understanding that the Regions agreed to accept the Appendices and operating data in electronic format in lieu of paper copies due to the volume of material. While this represents a slight variance from the requirements of the PA, which stipulates that all of the test material be submitted in paper format, HDR concurs that all of the relevant data and reports have been provided by Covanta.

A full copy of the Environmental test results including air emissions compliance and relative accuracy testing were provided under separate cover to the MOECC. In addition, a Residence Time and Temperature Test Report was submitted to document that the minimum flue gas residence time and temperature stipulated in the CofA were achieved. Table 1 and Table 2 in Attachment 1 provide listings of the data and reports that were transmitted to the Regions and HDR, either via hard copy, electronic, or both.

3 DISCUSSION OF TEST RESULTS

3.1 30-Day Reliability Test:

The purpose of the 30-Day Reliability Test was to demonstrate the capability of the DYEC to process waste and produce steam and electricity reliably and at design rates over a 30-Day period. The criteria for passage required:

- Operation of the boilers at or above 95% of the Demonstrated Design Steam Flow (DDSF) for the full 30-Day period;
- Operate with an availability (i.e., the actual operating hours divided by the total hours during test period) of greater than 95% (operate with less than 72 hours of total boiler downtime); and
- Successful passage of the Tests described in Section 1.8 through 1.11 of Appendix 10 to the PA.

Table 2 – 30-Day Reliability Test Results

CRITERIA	TEST RESULT	
	COVANTA	HDR
The 30-Day Reliability Test demonstrates that the Facility has operated at a minimum of 95% of the Demonstrated Design Steam Flow (DDSF) with a Facility availability greater than 95%.	101.6% DDSF 99.9% Availability **PASS**	101.6% DDSF 99.9% Availability **PASS**

- It should be noted that during the 30-Day test period, the DYEC experienced a total of approximately 26 hours of turbine-generator (T-G) downtime, which resulted in a T-G availability of 96.5%. T-G downtime was not considered as part of the 30-Day Availability test criteria.

The 30-Day Reliability Test commenced at 00:00 on September 27, 2015. During the 30-day period, there were two separate Carbon Monoxide (CO) emission excursion events:

- On October 5th there was a 4-hour CO excursion on Boiler 1 and the auxiliary burners were fired to control the CO level. This event affected three (3) CO averaging periods and was fully discussed in the CO Environmental Notification Report provided to the Regions and HDR on October 8th (Included as Attachment 2). During this period the average CO emissions were 45 mg/Rm^3 compared to the permit value of 40 mg/Rm^3.
- On October 18th Boiler 2 tripped on an indication of a high-high drum level. High-high drum levels automatically trip the turbine to protect against potential poor quality steam. During this event there was a CO excursion on Boiler 2 (41 mg/Rm^3), which affected two (2) averaging CO periods, .

It should be noted that Covanta's Test Report only includes operational data for the initial 30-Day period ending October 26 at 23:59. However, based on HDR's review of the plant operating data provided by Covanta during the 37-Day period, Covanta also exceeded the Acceptance Test Criteria for the Reliability Test for the 37-day period.

During the 37-Day period, one hour of boiler downtime was declared for Boiler No. 2 due to a feed chute plug. This plug was the result of the crane operator overloading the feed hopper and required auxiliary operators to work with the crane operator to empty the hopper and clear the plug. During this event there were no emissions violations and the remainder of the DYEC remained in normal operation. In addition, on three separate occasions, Boiler No. 2 tripped offline due to a malfunctioning steam drum level indicator, but each time the operators were able to restart the unit quickly and no downtime was declared.

Overall, the boilers operated very well during the 37-Day Test period. Figures 1 and 2 below show both boilers operated at or above the DDSF (also referred to as the boiler Maximum Continuous Rating or MCR) for a majority of the test period. Some variation in steam flow is normal given the heterogeneous nature of the waste stream. A more detailed explanation of other operating events and downtime is provided in Attachment 3.

Figure 1 – Boiler No. 1 Steam Flow During 37-Day Reliability Test Period

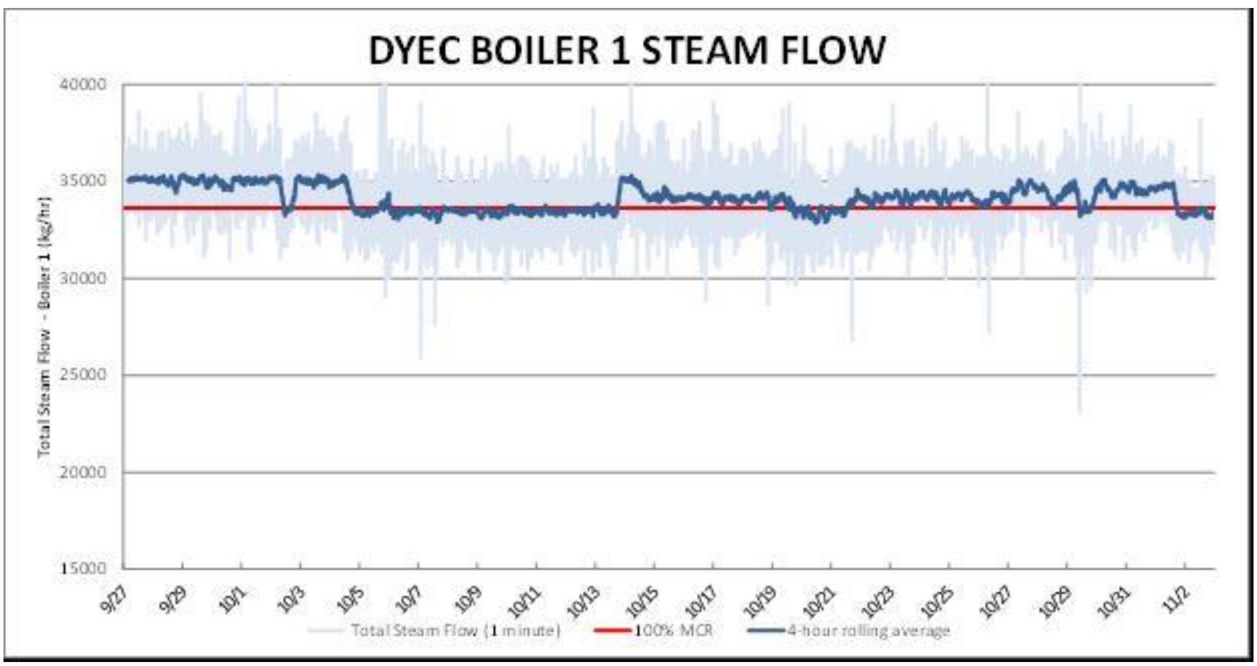
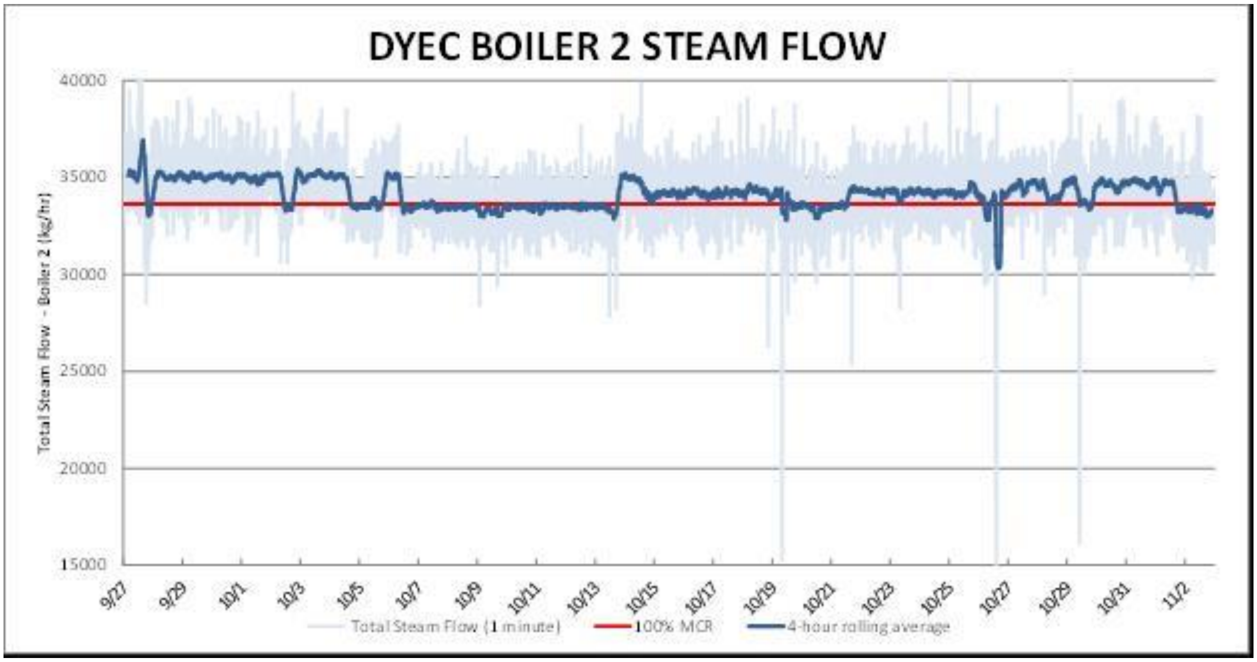


Figure 2 – Boiler No. 2 Steam Flow During 37-Day Reliability Test Period



During the 37-Day Test period, a Specific Steam Rate (SSR) correlation was developed by Covanta based on test data collected during the 8-hour Boiler as a Calorimeter (BAC), and this correlation was used to calculate the average Higher Heating Value (HHV) of the waste during the 37-day period. There are several differences between the data and calculations used for the correlation between Covanta and HDR. These minor discrepancies result in slightly different HHVs being calculated by HDR and Covanta. During the 30-Day period from September 27 through October 26, Covanta calculated an average waste HHV of 13.33 MJ/kg while HDR calculated an average HHV of 13.34 MJ/kg. This represents a difference of only 0.1%, and is within the expected level of accuracy given the data sets used, data averaging, interpolation of inputs, and rounding error.

One of the main differences in the data used for the HHV calculation was Covanta's incorporation of a crane scale correction. Per the Acceptance Test Protocol, Covanta was required to perform a span check of the crane scale at the beginning of each shift (i.e., twice a day) during the 37-day testing period. HDR was present to witness these span checks. In the Test Report, Covanta adjusted the raw crane data to account for the span checks made each day. While there is merit to this correction, the correction was not technically called for under all of the as-tested conditions. If a correction was to be made to account for field conditions, a correction for the crane zero checks may also have been warranted.

As a backup to the crane scales, refuse pit inventory estimates and truck scale data were collected as a means of confirming overall waste throughput during several of the Test Periods. This data had good correlation and demonstrated that the crane scale data from the test periods can be relied upon for accuracy. Therefore, HDR has not analyzed the impact of additional crane scale corrections, and has relied on the actual crane scale data in its analysis. The crane scale correction made by Covanta does not materially impact the test results.

3.2 30-Day Residue Quantity Test:

The purpose of the 30-Day Residue Quantity Test was to demonstrate that the DYEC meets the requirements of Section 4 of Exhibit 2 to Appendix 19 of the PA. Specifically the amount of Residue generated per tonne waste processed, expressed as a percent, must be under the guarantee values shown in Exhibit 2 to Appendix 19 and Table A10-2 of Appendix 10. The Residue Quantity guarantee criterion is adjusted based on the calculated HHV of the waste over the 30-Day Period. For waste HHV values falling between these points, linear interpolation of the data points was required. Subsequent to the completion of the Acceptance Test, Covanta and the Regions agreed to an adjustment to the Residue Quantity Guarantee to allow for the flexibility to add additional reagents to stabilize the fly ash. The Original and Revised Residue Quantity Guarantees are reflected in Table 3 below:

Table 3 – Residue Quantity Guarantee

Waste HHV	PA (Appendix 10 and 19) Residue Quantity Guarantee	
	Original	Revised
11.0 MJ/kg	33.5%	38.5%
12.0 MJ/kg	31.7%	36.7%
13.0 MJ/kg	30.0%	35.0%
14.0 MJ/kg	28.2%	33.2%
15.0 MJ/kg	26.5%	31.5%

Table 4 – 30-Day Residue Quantity Test Results

CRITERIA	TEST RESULT	
	AS CALCULATED BY COVANTA	AS CALCULATED BY HDR
The Residue Quantity Guarantee demonstrates that the quantity of Residue generated (in tonnes) is less than or equal to 35% of Waste processed (in tonnes), adjusted for the measured waste HHV in accordance with Table A10-2. (Applies to total Residue excluding metals recovered) *(HDR values do not include additional correction for returned or disposed ash from ferrous)*	30-Day Test Actual: 26.7% at 13.33 MJ/kg Guarantee: 29.4% at 13.33 MJ/kg **PASS**	30-Day Test Actual: 31.3% at 13.34 MJ/kg Guarantee: 34.4% at 13.34 MJ/kg **PASS**

In the Acceptance Test Report, Covanta included a correction to exclude the amount of cement, pozzolan and water added to the fly ash from the calculation of Total Residue. Based on this correction, Covanta claimed they met the requirements of the 30-Day Residue Quantity portion of the Acceptance Test Criteria as defined in the Acceptance Test Protocol. As a result of the agreement between the Regions and Covanta to adjust the Residue Quantity Guarantee, the definition of Total Residue was amended to include the cement, pozzolan and water that is added to the fly ash.

3.2.1 HDR Adjustment

Subsequent to the development of the Acceptance Test Protocol, Covanta modified the operation of the recovered ferrous metal screen to no longer screen out any minus one inch residue that is carried along with the ferrous product. A cover or “blank” was placed over the screen shortly after start-up in February 2015 to prevent metal from getting caught on the screen, which was causing frequent shutdowns of the entire ash systems to clear material jams on the screen. The “blanking” of this screen increased the amount of ash (Residue) carried over with the recovered ferrous material. Section 1.14 of Appendix 10 to the Agreement defines Residue to be “Residue from the Facility, excluding ferrous and non-ferrous materials recovered, but including any returned or disposed ash resulting from the ferrous and non-ferrous cleanup.” This “returned or disposed ash resulting from ferrous and non-ferrous cleanup” was not considered during development of the Acceptance Test Protocol since the screen would have minimized such amount. It is HDR’s opinion that with the screen blanked, there is a fraction of Residue in the recovered ferrous product that should be accounted for in the calculation for the Total Residue Quantity. Based on Covanta’s Test Report and analysis, the recovered ferrous material contains approximately 20% Residue by weight and 25 kg of ferrous is recovered per tonne of MSW processed (37-Day test average).

HDR’s adjustment to account for the amount of “returned or disposed ash from ferrous cleanup” increases the calculated Residue Quantity from 31.3% to 31.8%, compared to the adjusted revised guarantee of 34.4%. Covanta has met the requirements of the 30-Day Residue Quantity Acceptance Test Criteria based on the revised guarantee.

3.2.2 Covanta Adjustment

In the Test Report, Covanta claims that the calculation for total Residue in the Acceptance Test Protocol incorrectly includes the cement, pozzolan and associated water used to stabilize and treat the fly ash. Based on Covanta’s interpretation of certain parts of the PA, cement, pozzolan and the associated water used in the fly ash mixture, are “other materials” and the weights of these fractions should be subtracted from the ash mixture when calculating the total Residue. Covanta has provided an analysis based on subtracting the estimated cement and pozzolan consumption and additional water from the total Residue. Using this adjustment for cement, pozzolan and water, Covanta reported a 30-Day Residue Quantity of 26.7% compared to an adjusted guarantee of 29.4%, which they claim demonstrates compliance with the Acceptance Test Criteria for the Residue Quantity Guarantee. As stated previously, as a result of the agreement between the Regions and Covanta to adjust the Residue Quantity Guarantee and revise definition of Total Residue to include the cement, pozzolan and water, Covanta’s argument is moot.

Discussion on Adjustments

During meetings pertaining to the results of the Acceptance Test, Covanta and the Regions agreed to a 5% upward adjustment to the Residue Quantity Guarantee based on the following considerations:

- Covanta is responsible for the reagent costs and the costs related to Residue transportation and disposal under the PA.
- The cement, pozzolan, and associated water are included in the Residue and do add significant weight to the total Residue.
- The addition of the reagents improves the stability and characteristics of the Residue.
- The Regions do not desire guarantees that would impose limits on the amount of Reagents used for environmentally beneficial purposes.

It is HDR's understanding that Covanta agreed to the amended definition of Residue to include all of the reagents and all of the moisture, and that the revised guarantee has been increased by 5%. Based on this revised guarantee and Covanta's reported data, Covanta has met the requirements of the 30-Day Residue Quantity Acceptance Test Criteria.

3.2.3 Reagent Requirements

Based on HDR's review of the data and reagent use, HDR makes the following observations and recommendations:

- Based on the data presented by Covanta, the ratio of the cement/pozzolan/fly ash mixture over the 30-day test period was in the range of 1.1/1/4.1 (1.1 kg cement, 1 kg pozzolan and 4.1 kg fly ash)to 1.1/1/4.7;
- Making some assumptions and adjusting for fly ash moisture HDR calculates a mixture ratio in the range of 1.1/1/2.9 to 1.1/1/3.3;
- During ash characterization testing performed September 29 to October 3, Covanta reported that the ratio was 1/1/2. On October 22nd, the ratio was changed to a reported 1/1/4. Covanta performed additional quality and toxicity characterizations after the ratios of reagents were adjusted per the Environmental Compliance Approval (ECA) and Test Protocol requirements, which demonstrated the fly ash was still non-toxic.
- Covanta should demonstrate on an ongoing basis that the cement/pozzolan/fly ash ratios are always maintained at the same or lower (i.e., lower fly ash value) than the ratio used during the ash characterization testing. It is not evident that this was the case for the period from September 27 through October 22.
- Cement, pozzolan and water should be monitored, recorded, and reported on a monthly (or less) frequency to demonstrate to the Regions satisfaction that the ratios of cement/pozzolan/fly ash is at least as low as the ratios during prior ash characterization testing ratios;

3.3 5-Day Residue Quantity Test:

Similar to the 30-Day Residue Quantity Test, the purpose of the 5-Day Residue Quantity Test was to demonstrate that the DYEC meets the requirements of Section 4 of Exhibit 2 to Appendix 19 of the PA and Table A10-2 from Appendix 10.

Table 5 – 5-Day Residue Quantity Test Results

CRITERIA	TEST RESULT	
	COVANTA	**HDR**
The Residue Quantity Guarantee demonstrates that the quantity of Residue generated (in tonnes) is less than or equal to 35% of Waste processed (in tonnes), adjusted for the measured waste HHV in accordance with Table A10-2. (Applies to total Residue excluding metals recovered) *(HDR values do not include additional correction for returned or disposed ash from ferrous)*	5-Day Test Actual: 26.8% at 13.34 MJ/kg Guarantee: 29.4% at 13.34 MJ/kg **PASS**	5-Day Test Actual: 31.6% at 13.36 MJ/kg Guarantee: 34.4% at 13.36 MJ/kg **PASS**

Covanta ran a total of three separate 5-Day Residue Quantity Tests during the extended 37-day period due to unfavorable test results. The first Residue Quantity Test commenced on September 26th at 00:00 and ran simultaneously with the Residue Quality and Throughput Capacity Tests, and ended after 120 hours, on October 1st at 24:00. Covanta only presented complete data for this first test, and the results of the first test are reflected in this Report.

Based on HDR's assessment, during this first 5-Day Residue Quantity Test, the DYEC achieved a 5-Day Residue Quantity of 31.6% at an HHV of 13.36 MJ/kg compared to an adjusted guarantee of 34.4% at 13.36 MJ/kg.. .Accounting for the "returned or disposed ash resulting from ferrous and non-ferrous cleanup" increases the Residue Quantity to 32.1% compared to the guarantee of 34.4%%. Based on the revised Residue Quantity Guarantee, Covanta has demonstrated compliance with the renegotiated Residue Quantity guarantee by achieving a Residue Quantity of 32.1% compared to a Guarantee of 34.4%.

3.4 Energy Recovery Test

The purpose of the Energy Recovery Test was to demonstrate compliance with the Electricity Production Guarantees identified in Exhibit 2 to Appendix 19. Boiler as a Calorimeter (BAC) testing per ASME PTC 34 (an industry accepted test method) was performed during each of the five, 8-hour Energy Recovery Tests to determine the average HHV of the waste processed during each test. The data used for the calculation of HHV, along with the calculations for the various heat inputs, credits and losses are provided in Attachment 4.

Table 6 – Energy Recovery Test Results

CRITERIA	TEST RESULT	
	COVANTA	HDR
The Energy Recovery Test demonstrates that the average net electrical production rate (in kWh/tonne) is not less than the Electrical Production Guarantee identified in Exhibit 2 to Appendix 19	Actual: 840 kWh/tonne at 13.74 MJ/kg Guarantee: 822 kWh/tonne at 13.74 MJ/kg **PASS**	Actual: 846 kWh/tonne at 13.79 MJ/kg Guarantee: 825 kWh/tonne at 13.79 MJ/kg **PASS**

Based on HDR's assessment the DYEC exceeded the Net Electrical Output guarantee by 2.6%. Based on Covanta's assessment the DYEC exceeded the Net Electrical Output guarantee by 2.3%. As discussed previously, there are several discrepancies between the waste HHV analysis completed by HDR and the analysis completed by Covanta. These discrepancies include the crane scale correction made by Covanta, data reduction, interpolations from tables and graphs used for data input, and rounding errors. In addition, HDR has adjusted the data to account for unreasonably high or low oxygen readings resulting from oxygen monitor calibrations and also corrected some minor input errors that we noted in Covanta's calculations. These discrepancies have no impact on the final outcome of the test, but HDR has conveyed these minor input errors to Covanta for their assessment.

Based on the data collected during the BAC tests, and using certain specific plant data, a correlation was developed that can be used to calculate the HHV during any given timeframe. The specific data used for the correlation and the factors applied to the adjustments may slightly impact the HHV calculation during the 5-Day and 30-Day test periods.

While there may be some minor discrepancies, the correlation developed by Covanta for the DYEC's waste HHV calculation is within the tolerances expected for such a calculation and are in close agreement with HDR's values.

In HDR's opinion, there are a number of areas that Covanta can consider to potentially improve plant energy efficiency and potential electricity revenues that include, but are not limited to, the following:

- Increasing Gross electric output:
  - Rectify issues with T-G performance shortfall, estimated at 5-6% lost power (or as much as 50 kWh/tonne improvement potential);
  - Optimize soot blowing sequence to minimize steam losses during the soot blowing cycle;
  - Reduce boiler excess air levels to increase boiler efficiency;
  - Further reduction in boiler outlet temperature to increase boiler efficiency;
  - Optimize air cooled condenser (ACC) performance, and minimize any leaks that may be present.
  - Optimize combustion air heater to increase boiler efficiency; and
  - Steam cycle improvements including eliminating steam leaks and losses.

- Decreasing Plant Parasitic Load:
  - Reduce compressed air consumption (currently two compressors are required to operate concurrently). There could be opportunities to reduce compressed air usage in the baghouses and evaporative cooling towers (ECT);
  - Optimize ACC fan operation to minimize fan motor load; and,
  - Improve efficiency of the tertiary air (or VLN) fans.

3.5 5-Day Throughput Capacity Test:

The purpose of the Throughput Capacity Test was to demonstrate that the DYEC meets the Throughput Capacity Guarantees in Exhibit 2 to Appendix 19 during a consecutive five (5)-day (120-hour) test period.

Table 7 – 5-Day Throughput Capacity Test Results

CRITERIA	TEST RESULT	
	COVANTA	HDR
The Throughput Capacity Guarantee Test has demonstrated the ability of the Facility to process waste in accordance with the Throughput Capacity Guarantee in Exhibit 2 to Appendix 19 during a consecutive five (5)-day test period, and that the amount of Reference waste (in tonnes) processed during the testing period is 2,180 tonnes (and no less than 1,000 tonnes per unit).	Actual: 2,260 Tonnes at 13.34 MJ/kg Guarantee: 2,124 Tonnes at 13.34 MJ/kg Actual: Unit No. 1: 1,136 Tonnes Unit No.2 1,125 Tonnes Per Unit Guarantee: 974 Tonnes at 13.34 MJ/kg **PASS**	Actual: 2,251Tonnes at 13.36 MJ/kg Guarantee: 2,124 Tonnes at 13.36 MJ/kg Actual: Unit No. 1: 1,131Tonnes Unit No.2 1,120 Tonnes Per Unit Guarantee: 974 Tonnes at 13.36 MJ/kg **PASS**

Based on Covanta's assessment as presented in their Test Report, the DYEC processed 2,260 tonnes of waste during the 5-Day Throughput Capacity Test. During this period the average waste HHV was 13.34 MJ/kg, which Covanta calculated to correspond to an adjusted guarantee of 2,124 tonnes. Based on Covanta's analysis, the guarantee was surpassed by 6.4%. During this period, Covanta reported that Boiler Nos. 1 and 2 processed 1,252 and 1,240 tonnes respectively; however these are actually tons, not tonnes. Correcting to tonnes, the DYEC processed 1,136 tonnes in Boiler No.1 and 1,125 tonnes in Boiler No.2 compared to an adjusted minimum requirement of 974 tonnes of waste at 13.34 MJ/kg. In Section 4.1.3 of the 5-Day Capacity Report, Covanta used a curve fit of the data points in the table from item 2 of Exhibit 2 to Appendix 19. The Protocol states "*if the HHV lies between two data points in the table in Exhibit 2 to Appendix 19, a linear interpolation will be performed to determine the waste throughput.*" Correcting Covanta's data for this slight error results in an adjusted guarantee of 2,128 tonnes, which Covanta surpassed by 6.2%.

Based on HDR's assessment, the DYEC processed 2,251 tonnes of waste during the 5-Day Throughput Capacity Test that ran from September 27 at 00:00 to October 2 at 00:00. During the test period, the average waste HHV was 13.36 MJ/kg, which corresponds to an adjusted guarantee of 2,124 tonnes. The guarantee was surpassed by 6.0%. During the testing period, the DYEC processed 1,131 tonnes in Boiler No.1 and 1,120 tonnes in Boiler No.2 compared to an adjusted minimum requirement of 974 tonnes of waste at 13.36 MJ/kg.

Both HDR's and Covanta's calculations show that the Throughput Capacity Guarantees were surpassed by over 6%.

3.6 5-Day Residue Quality Test:

The purpose of the Residue Quality Test was to demonstrate that the unburned carbon content in the bottom ash and grate siftings is less than 3%, and the moisture content of this Residue stream is less than 25%. Covanta ran two separate Residue Quality Tests. The first test was run concurrently with the Throughput Capacity Test and the Residue Quantity Test on September 27 through October 1. The second Test was run concurrently with the Throughput Capacity Test and the Residue Quantity Test commencing on October 27 and running through October 31. Covanta has only reported on the first Residue Quality Test as the second test was only performed in the event the test period was to be used to demonstrate 5-Day Residue Quantity.

Table 8 – 5-Day Residue Quality Test Results

CRITERIA	TEST RESULT	
	COVANTA	HDR
The Residue Quality Guarantee has demonstrated that the unburned carbon content is less than 3%, and moisture content is less than 25%. (Applies to bottom ash and grate siftings only)	16.7% moisture content 0.42% unburned carbon content **PASS**	16.7% moisture content 0.83% unburned carbon content **PASS**

Sampling was completed over a 5-day period with samples collected every 2 hours. Daily composite samples were made by blending the 12 individual samples obtained each day. Sample preparation occurred on the day following collection. Daily bottom ash samples were sent to the laboratory for analysis. The bottom ash was tested for moisture per ASTM Method D-3302 and for equivalent carbon content per ASTM Method D-5865 (adiabatic bomb calorimeter).

The results of the testing indicate that the moisture in the ash averaged 16.7% and the unburned combustible material in the ash was less than 0.83%, reported as percent carbon by dry weight. Both of these results meet the guarantees of 25% moisture and 3% unburned carbon content in the ash, respectively. In their analysis, Covanta has reported 0.42% as the average unburned combustible value. The detection limit was calculated as 0.83%, and since the actual laboratory results were less than the detection limit for all samples, Covanta reported an average of zero and the detection limit (or 0.42%).. HDR has used the more conservative detection limit of 0.83% for reporting purposes, but the results are still far below the regulatory and contractual thresholds of 10% and 3%, respectively.

3.7 Ferrous and Non-Ferrous Metal Recovery Tests

The purpose of the Ferrous and Non-Ferrous Metals Recovery Tests was to demonstrate that metals recovery systems installed at the DYEC can achieve recovery rates specified in the PA when the boilers are operating at full load. A total of three 8-hour Ferrous and Non-Ferrous Metal Recovery Tests were performed on October 7, 8 and 9.

Table 9 – Ferrous and Non-Ferrous Metal Recovery Test Results

CRITERIA	TEST RESULT	
	COVANTA	HDR
The Metals Recovery Guarantee demonstrates the measured recovery efficiency percentages for ferrous metals and for non-ferrous metals comply with those identified by the DBO Contractor in Exhibit 2 to Appendix 19.	Ferrous Recovery Actual: 87.8% Guarantee: 80.0% Non-Ferrous Actual: 84.7% Guarantee: 60.0% **PASS**	Ferrous Recovery Actual: 83.0% Guarantee: 80.0% Non-Ferrous Actual: 84.7% Guarantee: 60.0% **PASS**

Based on HDR's and Covanta's assessments, the ferrous and non-ferrous systems installed at the DYEC demonstrated recovery rates exceeding the guarantees.

During the development of the Acceptance Test Protocol there were discussions pertaining to the cleaning of the unrecovered, or missed, ferrous. During the initial commissioning of the ferrous recovery system, it was determined that ferrous material was getting caught on the 1-inch mesh screen used to screen the ash and was backing up the entire ash system. Covanta elected to place a plate over the screen, which resulted in some fine material (Residue) being included in the recovered ferrous material. This increases the contamination level in the ferrous product, potentially reducing its market value, while also artificially increasing the apparent ferrous recovery rate. The ferrous metal recovery rate was determined by Covanta and HDR using different methods, with HDR's method based on the approved Acceptance Test Protocol

- Covanta calculation methodology:
  - The sample representing the amount of "missed" ferrous in the bottom ash stream was processed to clean the "missed" ferrous of any ash or non-metallic material. This was accomplished with a hammer, hand compactor, and magnets, and used to calculate the "clean missed" ferrous.
  - One of the loads of the "recovered" ferrous product was shipped to the metals vendor to determine the amount of typical contamination in the recovered ferrous. This factor was then applied to the total ferrous recovered during the test to calculate a total "clean recovered" ferrous.
  - The ferrous recovery rate was determined by dividing the amount of "clean recovered ferrous" by the sum of the "clean recovered" ferrous plus the clean missed" ferrous.
- HDR Calculation Methodology (Based on approved Acceptance Test Protocol):

- The sample collected to determine the amount of "missed" ferrous in the bottom ash stream was not processed to clean the ferrous and the total "dirty missed" ferrous was calculated.
- The total ferrous shipped off site to the metals vendor was used as the "dirty recovered" ferrous.
- The ferrous recovery rate was determined by dividing the amount of "dirty recovered ferrous" by the sum of the "dirty recovered" ferrous plus the "dirty missed" ferrous.

The ferrous recovery was 87.8% using Covanta's method and 83% using HDR's method. HDR feels the higher rates in Covanta's method are due in part to the over cleaning of the "clean missed" ferrous. Using the HDR method may bias the results low, since a small piece of metal inside a clump of ash would increase the amount of missed ferrous. However, the Ferrous Recovery Test recovery rates using both methods pass the Ferrous Recovery criteria of 80%

The screen for the non-ferrous remained in service for the testing, and the calculations by Covanta and HDR for the non-ferrous recovery test were identical and indicate passage of the non-ferrous recovery test by a significant margin.

It should be noted that the metal recovery test results discussed above are considered representative for the equipment arrangement in place at the time the tests were performed. Changes in the position of the magnet inside the drum, the distance (gap) between the end of the feed conveyor and the drum magnet shell, and/or the distribution of Residue on the feed conveyor could change the ferrous metal recovery rate. Similarly, changes in the speed of the eddy current separator rotor, speed of the eddy current belt, eddy current amperage, and/or position of the diverter gate could change the non-ferrous metal recovery rate. The as-tested conditions should be maintained by Covanta on an ongoing basis. Any changes to the equipment arrangement may warrant that the ferrous metal and/or non-ferrous metal recovery tests be repeated to ensure that DYEC continues to meet the respective recovery guarantees. During the Metals Recovery Tests, the ferrous and non-ferrous recovery rates (expressed as a percent of the MSW processed) were 2.5% and 0.37% respectively. These values can be tracked and used as surrogates to monitor the performance of the ferrous and non-ferrous recovery systems.

3.8 Environmental Testing

Environmental Testing performed during the Facility Performance Test included the following:

- Source Test (Compliance Emissions Testing);
- Odour Test;
- Noise Test; and
- Residue Environmental Quality Tests specific to the ECA;
  - Bottom Ash Combustibility
  - Fly Ash Toxicity characteristic leaching procedure (TCLP)

3.8.1 Source Testing

The initial Source Testing was completed by ORTECH Consulting Inc. over the 4-day period of September 29 to October 2, 2015. This was during the first week of the Facility Performance Test, which was required in order to demonstrate that the DYEC was in compliance with all ECA air emissions requirements during the Test. HDR was on-site for the testing and monitored the testing to confirm that testing was performed in accordance with Pre-Test Plan and applicable Reference Methods. ORTECH's report to MOECC indicated that the DYEC complied with the ECA emission limits and demonstrated modeled compliance of point of impingement impacts.

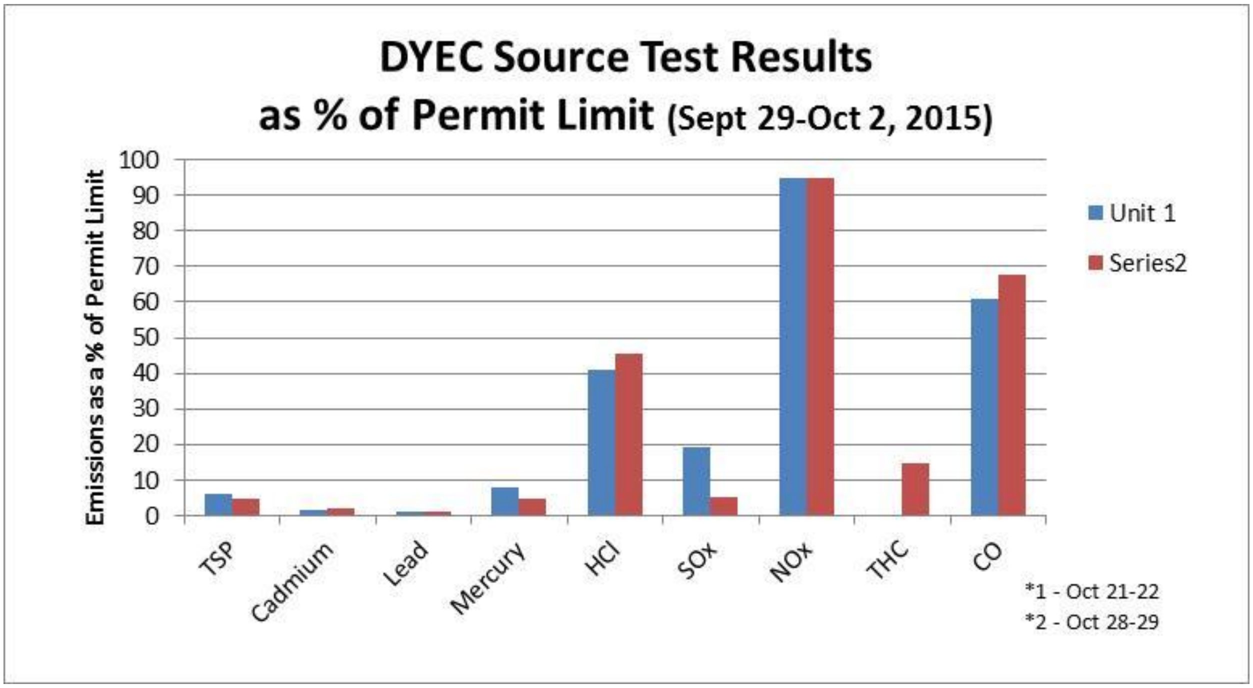
During the initial testing program, Covanta determined, and MOECC concurred, that the samples obtained during the testing for dioxins and furans were invalid because of significant interference by certain organics that was identified by the analytical laboratory. Subsequent dioxin, furan, and dioxin-like PCB testing programs were completed on October 21 and 22 and October 28 and 29. Although the final ORTECH compliance report indicates that the results obtained during the second and third sets of dioxin and furan testing also contained a similar interference, this interference was reportedly less because of enhanced laboratory cleanup procedures that were implemented to reduce the impact of the interference. On December 15, 2015 the MOECC issued a letter indicating that the September 29 to October 2, 2015 testing was not considered representative of emissions, acknowledged the October 21-22, 2015 and October 28-29, 2015 testing, and stated that "DYEC met the twelve emission limits set out in Schedule "E" of the Environmental Compliance Approval (Air) No. 7306-8FDKNX (ECA)". The results of the Source Testing are shown in the following Table 10:

Table 10 – DYEC Source Test Results

			Unit 1			Unit 2		
Parameter	Limit	Units	Result*	% of Limit		Result*	% of Limit	% of Limit
TSP	9	mg/Rm^3	0.53	6	PASS	<0.41	5	PASS
Cadmium	7	µg/Rm^3	0.12	2	PASS	0.15	2	PASS
Lead	50	µg/Rm^3	0.57	1	PASS	0.51	1	PASS
Mercury	15	µg/Rm^3	1.16	8	PASS	0.72	5	PASS
HCl	9	mg/Rm^3	3.7	41	PASS	4.1	46	PASS
SOx	35	mg/Rm^3	6.7	19	PASS	1.8	5	PASS
NOx	121	mg/Rm^3	115	95	PASS	115	95	PASS
THC	33	mg/Rm^3	0	0	PASS	4.9	15	PASS
CO	40	mg/Rm^3	24.4	61	PASS	27.0	68	PASS
Opacity	10	percent	Data not included in draft ORTECH report - opacity is not a Schedule "D" Test Contaminant					
	5	percent						
October 21 to October 22, 2015 Test Results								
Dioxins and Furans	60	pg I-TEQ/Rm^3	< 36.0	60	PASS	< 32.4	54	PASS
October 28 to October 29, 2015 Test Results								
Dioxins and Furans	60	pg I-TEQ/Rm^3	< 27.0	45	PASS	< 22.2	37	PASS

Figure 3 shows each of the parameters expressed as a percentage of the permit limit:

Figure 3 – DYEC Source Test Results



Powdered Activated Carbon (PAC) is injected into the airpPollution control system to control the emissions of dioxins and mercury. The three sets of dioxin, furan, and dioxin-like PCB testing programs were conducted at different carbon injection rates. During the initial test period of September 29 through October 2, the carbon injection rate was set at 4 kg/hour. During the testing the actual activated carbon injection rates averaged 3.97 and 3.78 kg/hour for boiler 1 and 2 respectively. During the October 21, 22 Tests the carbon injection rate was increased to 5.14 kg/hour on both boilers and on October 28, 29 the actual carbon injection rates were 4.94 and 4.97 for Boiler 1 and 2 respectively. Other key operating data recorded during the Dioxin testing is shown in the tables below. The practice of adjusting carbon injection rates is not uncommon in the energy from waste industry and is typically implemented to reduce reagent cost. Typically the rates are adjusted prior to a Stack testing program. If the emissions are acceptable at the lower carbon rate, the lower carbon rate can then be maintained until the next stack testing program.

Table 11 – Boiler 1 Dioxin Emissions and Key Operating Parameters

	Hyd Lime	Carbon	Steam	Throughput	O2 in	O2 out	CO Out	BH Inlet	Heated Air	Dioxin*
	kg/hr	kg/hr	kg/hr	tonnes/day	%	%	mg/Rm^3	ºC	ºC	
Dioxin Test 1										
Run1 Oct 1 10:48 -15:04	144	3.93	35,145	227	8.2	7.8	13.3	144	141	215.0
Run 2 Oct 2 07:40 - 11:57	231	4	33,495	217	8	8	14	144	133	191
Run 3 Oct 2 12:28 - 16:41	206	4	34,161	217	8	8	16	144	133	282
Average	194	3.97	34,267	220	8.0	7.8	14.6	144	136	229.3
Dioxin Test 2										
Run1 Oct 21 14:27 - 19:42	231	5.13	34,313	220	7.7	7.8	19.5	144	74	43.0
Run 2 Oct 22 08:40 - 13:00	239	5.18	34,313	223	7.4	6.6	12.3	144	72	35.1
Run 3 Oct 22 14:41 - 19:01	239	5.12	34,293	223	7.8	6.6	15.0	144	73	30.7
Average	236	5.14	34,307	222	7.6	7.0	15.6	144	73	36.3
Dioxin Test 3										
Run1 Oct 28 13:15 - 17:28	169	4.97	34,244	224	7.3	7.0	13.3	144	105	26.5
Run 2 Oct 29 08:36 - 13:52	167	4.69	33,656	230	7.6	6.5	9.1	145	103	30.3
Run 3 Oct 22 15:25 - 19:45	171	5.12	34,158	230	7.6	6.5	9.1	145	103	25.7
Average	169	4.93	34,019	228	7.5	6.6	10.5	144	103	27.5

* dioxin results in units of pg/TEQ/Rm3 @11%O2 based on WHO2005 TEFs and use of full detection limits for cogeners reported below detection limit. ORTECH's summarized results are based on the use of 1/2 of the detection limit. The use of full detection limits versus half detection limits impacts the results by less than 10%

Table 12 – Boiler 2 Dioxin Emissions and Key Operating Parameters

	Hyd Lime	Carbon	Steam	Throughput	O2 in	O2 out	CO Out	BH Inlet(ºC)	Heated Air	Dioxin
	kg/hr	kg/hr	kg/hr	tonnes/day	%	%	mg/Rm^3	ºC	ºC	
Dioxin Test 1										
Run1 Oct 1 12:14 - 16:31	188	3.74	34,891	222	14.1	7.1	23.8	144	143	126.0
Run 2 Oct 2 07:41 - 11:58	172	4	33,400	216	7	7	10	144	132	77
Run 3 Oct 2 12:27 - 16:39	183	4	34,144	216	7	7	9	144	133	109
Avg	181	3.78	34,145	218	9.6	7.3	14.3	144	136	103.8
Dioxin Test 2										
Run1 Oct 21 14:27 - 18:52	240	5.16	34,603	220	7.4	7.0	10.6	144	122	35.7
Run 2 Oct 22 08:42 - 13:03	240	5.12	34,337	220	6.6	6.9	9.7	144	120	35.7
Run 3 Oct 22 14:38 - 19:03	240	5.14	34,423	220	7.5	7.0	10.6	144	121	29.3
Avg	240	5.14	34,454	220	7.1	7.0	10.3	144	121	33.6
Dioxin Test 3										
Run1 Oct 28 12:28 - 16:40	170	5.07	34,202	225	7.1	7.1	8.2	144	99	20.0
Run 2 Oct 29 08:42 - 13:32	170	4.91	33,845	224	7.3	7.5	11.1	145	96	24.2
Run 3 Oct 29 15:30 - 19:36	170	4.94	34,081	224	7.3	7.4	12.0	146	96	25.5
Avg	170	4.97	34,042	225	7.2	7.3	10.4	145	97	23.2

* dioxin results in units of pg/TEQ/Rm3 @11%O2 based on WHO2005 TEFs and use of full detection limits for cogeners reported below detection limit. ORTECH's summarized results are based on the use of 1/2 of the detection limit. The use of full detection limits versus half detection limits impacts the results by less than 10%

At a minimum, when operating at DDSF conditions Covanta will need to operate with carbon injection feed rates at or above those rates measured during the October 28-29, 2015 testing (4.94 kg/hr Unit 1, 4.97 kg/hr Unit 2) until subsequent testing justifies lower rates. It may be acceptable to operate at reduced carbon injection rates during periods when the boilers are operated below design steam rates. Carbon injection rates can be controlled and continuously monitored through the Facility's Distributed Control System (DCS), which can be further validated with a monthly comparison to the carbon deliveries and inventory in the storage silos at the Facility. Covanta must also continue to continuously monitor and maintain baghouse inlet temperatures in compliance with the ECA. The baghouse inlet temperatures and carbon feed rates are captured by the DCS, as well as the Environmental reporting system (Trace).

Included in Attachment 5 are two separate documents from the MOECC pertaining to the Source testing. The first document is the internal MOECC Evaluation of the Source Testing, and the second is a letter from MOECC to Covanta stating that "The emission testing report is deemed acceptable to the ministry."

One clarification on the internal MOECC evaluation relates to a reference to combustion temperatures being below the ECA requirement of 1,000^{o}C. Based on HDR's review of the operating and CEMS data recorded by the facility's DCS, during the referenced 96-hour period, there was only one hour when the operating (combustion) temperature dropped below the required 1,000^{o}C ±0.015% (hour ending 6:00 AM on October 2). However, during that hour, the data reported by Covanta for compliance was 1121^{o}C. The combustion temperature being reported for compliance is a calculated value and is based on steam flow and a temperature measured with an infrared (IR) camera at a fixed elevation in the boiler. HDR has reviewed the November 2015 Time and Temperature Correlation submittal and agrees with the calculations and derivation of the correlation contained in that document. There appear to be discrepancies related to the correlated temperature and the data reported in the DCS and on the CEMS reports. However, it is not clear from the reported data if the correlation was properly input into the DCS and CEMS recordings. Covanta should confirm that the values from the Correlation report are being properly corrected and reported. Based on the information provided to us, HDR is of the opinion that the 1,000^{o}C is being complied with at the DYEC.

3.8.2 Odour Testing

Covanta performed Odour Testing on October 8 and October 9 in accordance with the Test Protocol. In the MOECC December 15, 2015 letter to Covanta, included in Attachment 5, the MOECC confirms the "test results also demonstrated that the DYEC is capable of operating in compliance with Ontario Regulation 419/05 standards and guidelines including the ECA odour limit", and "the ministry is satisfied that the DYEC is capable of operating in compliance with its ECA limits".

3.8.3 Noise Testing

Acoustic Audit testing was performed on October 6 and October 7, 2015. In an MOECC December 11, 2015 letter to Covanta, included in Attachment 6, the MOECC states, "The Acoustic Audits Reports confirm that the sound levels from the operation of the Durham York Energy Center are in compliance with the noise limits set out in Publication

NPC-300. The ministry acknowledges that the acoustic audit requirements set out in the ECA have been fulfilled."

3.8.4 Residue Environmental Quality Testing

Bottom ash and fly ash at the DYEC are handled and disposed separately and thus have unique compliance criteria and testing procedures. HDR has reviewed the result provided by Covanta and has the following observations.

Fly Ash

The fly ash at the DYEC consists of the solid residue removed in the boiler hoppers and by the air pollution control devices. Fly ash may contain traces of materials burned in the combustion units, products of incomplete combustion and reacted and unreacted reagents from the APC Plant, including lime and carbon. Two testing campaigns were undertaken during the Acceptance Test period that were designed to define the fly ash characteristics.

Fly ash, spent reagents, lime and activated carbon are collected and directed to the fly ash silos for further processing. The fly ash is conditioned with water, cement and pozzolan as a means of managing the characteristics and reducing the toxic leaching potential. The ratio of cement and pozzolan to fly ash was adjusted between the two testing campaigns; each of which required separate tests to determine the toxicity of the fly ash before it could be shipped off site for disposal. The amount of cement and pozzolan was reduced during the second test campaign in an effort to support a reduction in the total quantity of Residue generated.

Each testing campaign was completed over a five-day period with periodic sampling of the mixture over two 8-hour shifts. The samples from the two 8-hour shifts were composited for each day. The ash sample reduction occurred on the day following the sample collection, resulting in a daily representative sample. From the daily sample, laboratory sized samples were collected, packaged and shipped to the laboratory for analysis. The laboratory followed the TCLP analysis steps to process the samples and determine the leaching potential for a lengthy list of organic compounds, including dioxins, and selected metals.

- Based on HDR's observations, the sampling procedures and composite preparation during the Acceptance Test were performed in conformance with accepted testing protocols and procedures.
- All data and analysis performed by the certified laboratory appear to be in conformance with accepted testing procedures.
- Both sets of results achieved the statistical compliance criteria, remaining well below the Guideline Limit for all parameters.

- The metals data included the following results for the ten metals:

Table 13 – Fly Ash TCLP Metals Results

Metal	Guideline Limit mg/L	Test Results October 22 – 26, 2015	
		mg/L	% of Guideline
Arsenic, As	2.5	0.05	2.0%
Barium, Ba	100	2.04	2.0%
Boron, B	500	2.5	0.5%
Cadmium, Cd	0.5	0.005	1.0%
Chromium, Cr	5	0.05	1.0%
Lead, Pb	5	0.182	3.6%
Mercury, Hg	0.1	0.0001	0.1%
Selenium, Se	1	0.25	25.0%
Silver, Ag	5	0.005	0.1%
Uranium, U	10	0.25	2.5%

  - No data points for any of the metals were above the Guideline Limit.
  - A majority of metals test results came below the detectable limits, and were reported as "Non-Detect".
  - Mercury and chromium were detected, but were at levels well below the Guideline Limit.
  - All samples detected some levels of barium, but for all samples the detected value was nearly two orders of magnitude below the Guideline Limit.
  - Cadmium was never detected.
  - Lead was detected in a number of samples during the second testing campaign, but the levels were well below the Guideline Limit.
- PCDD TEQ upper bound averaged 3.1 pg/L, well less than the 1,500 pg/L Total PCDD Guideline.
- The results were nearly all non-detectable for all types of organics, including dioxins, for all characterization tests performed for both testing campaigns.
- There were no significant changes in the tested parameters between the two testing campaigns, indicating that reduced reagent-to-fly ash mixture (i.e. cement and pozzolan) was still more than adequate to ensure environmental compliance.
- During the second test campaign, performed between October 22 and October 26, 2015, the speeds of the rotary valves that dispense the fly ash, cement and pozzolan from each silo were being maintained at 5, 2 and 1.5 revolutions per minute (rpm), respectively. Covanta should continue to operate with the conditioning reagents at or above those levels demonstrated during the most recent test period.

It's important to note that the laboratory analysis of the fly ash samples collected during both testing campaigns began the day after the samples were collected. It would be expected that the environmental characteristics and leachability of the samples would improve even further as the fly ash mixture cures over a longer period and all the reactions are carried out to completion. Therefore, it is possible that the amount of cement and pozzolan added to the fly ash could be further reduced and still show levels of organics and metals below the Guideline Limits

Bottom Ash

In a similar manner, the bottom ash was tested for its criteria. Bottom ash only required testing once and no conditioning agents were required to demonstrate compliance. The criteria for bottom ash is complete combustion as demonstrated by completing a Loss on Ignition (LOI) test. The LOI test demonstrates that the waste is properly combusted in the furnaces. Sampling was completed over a 5-day period with samples obtained over two shifts. Daily composite samples were made by blending the individual samples obtained each day. Sample preparation occurred on the day following collection. Daily bottom ash samples were sent to the laboratory for analysis. One individual sample did exceed the regulatory threshold slightly and three samples had duplicate analysis with one duplicate sample exceeding the threshold. However the bottom ash achieved the statistical regulatory threshold for compliance.

In addition to HDR's review of the report titled "Covanta Durham York Renewable Energy Limited Partnership Commissioning Period Facility Ash Report – Bottom Ash and Fly Ash Characterizations" Dated November 2015 and revised December 16, 2015, the MOECC has reviewed the document and the ash testing report was found to be acceptable to the ministry. A copy of MOECC's December 17, 2015 Letter to Covanta is included in Attachment 6.

4 SUMMARY AND CONCLUSION

Based upon HDR's observations during testing and our review of the test documentation, and taking into account the amended 30-Day and 5-Day Residue Quantity Guarantees, the results of the tests show that Covanta successfully demonstrated compliance with all of the Acceptance Test Criteria.

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ATTACHMENT 1

Acceptance Test Data and Reports Provided by Covanta

DATA RECEIVED DURING ACCEPTANCE TEST

Document Dates	# of Documents	Major 4*	Additional Documents
9/27	49	✓	HHV Data (Ortech)
9/28	53	✓	HHV Data (Ortech)
9/29	34	✓	HHV Data (Ortech)
9/30	54	✓	HHV Data (Ortech)
10/1	65	✓	HHV Data (Ortech)
10/2	14	✓	CEMS Corrected Data
10/3	6	✓	
10/4	4	✓	
10/5	6	✓	
10/6	17	✓	Final Sample/Weights FE and Non-Fe Test
10/7	15	✓	Final Sample/Weights FE and Non-Fe Test
10/8	17	✓	Final Sample/Weights FE and Non-Fe Test
10/9	17	✓	Final Sample/Weights FE and Non-Fe Test
10/10	19	✓	Complete 5-day residue quantity data
10/11	8	✓	Crane Span Check Sheets
10/12	7	✓	
10/13	10	✓	SGS Ash Analysis
10/14	10	✓	SGS Ash Analysis
10/15	8	✓	Manual Net Gross Meter Reading for Capacity Check
10/16	7	✓	
10/17	7	✓	
10/18	6	✓	
10/19	8	✓	
10/20	7	✓	
10/21	7	✓	
10/22	7	✓	
10/23	8	✓	
10/24	16	✓	BA FEL Scalehouse Photos, DYEC Truck Scale Notes
10/25	7	✓	
10/26	18	✓	Feed Hopper Level and Residue Building Photos
10/27	7	✓	
10/28	7	✓	
10/29	7	✓	
10/30	7	✓	
10/31	13	✓	Residue Quality Test BA Sampling, Feed Hopper Photos
11/1	6	✓	
11/2	10	✓	BA Weight Photos
11/3	13		Plant Summaries, Plant Logs, Plant Records and Residue Photos
Total Documents	581		

*Major 4 documents: DCS data, U1 CEMS, U2 CEMS, Crane Weight

Not part of testing period, testing ended Nov. 2nd

Missing Documents

DATA PROVIDED WITH TEST REPORT

Category	Document Description	# of Docs
General Documents		
	Acceptance-Report-Cover-Page.pdf	1
	Appendix-14-Acceptance-Declaration-Executed.pdf	1
	Durham-York-Demonstrated-Performance.pdf	1
	File-Listing.html	1
	Transmittal-Letter-Executed.pdf	1
Opertions Reports		
	Covanta-30Day-Reliability-Residue-Quantity-Report.pdf	1
	Covanta-5Day-Test-Report.pdf	1
	Covanta-8hour-Test-Report.pdf	1
	Covanta-Metals-Recovery-Test-Report.pdf	1
Environmental-Reports		
	AMESA Evalulation FINAL 151125.pdf	1
	Covanta DYEC Compliance RATA_19Oct15.pdf	1
	Environmental Compliance Final 151125.pdf	1
	Odour Source Test Report - Final 151124.pdf	1
	Residence-Time-and-Temperature-Test-Report.pdf	1
	Residue-Report.pdf	1
	Supplemental Acoustic Audit Final 151123.pdf	1
Procedures		
	Durham-York FINAL Acceptance Test Procedures Rev 3.pdf	1
Data		
	Cement and pozzolan Deliveries	2
	CEMS Data - Unit 1 (37 files)	37
	CEMS Data - Unit 1 (37 files)	37
	Crane Span Check (2 files)	2
	DCS Summary Data (39 files)	39
	MWH Meter Reading 0927-10012015.xlsx	1
	Air Temp after Fan (5 files)	5
	Ash Discharger Temp (5 files)	5
	Charg Flr Ambient (5 files)	5
	Ortech flue gas (6 files)	6
	UFA Temp (5 files)	5
	Fer Non Fer Raw Data (3 files)	3
	Instrument Calibration (6 files)	6
	Logs (3 files)	3
	Residue Date Quality (15 files)	15
	Residue Date Quantity (35 files)	35
	Turbine Performance (5 files)	5
	Waste Feed Data - Crane Log (excel) (37 files)	37
	Waste Feed Data - Crane Log (PDF) (37 files)	37
	Total Documents	302

ATTACHMENT 2

CO Environmental Notification Reports

October 5, 2015

October 19, 2015

Environmental Notification Report

Initial Telephone and Email Notification –
The following information will be reported during the calls and in the initial email

Facility Name: Durham York Energy Center

Incident Title: Unit #1 – CO Target Exceedance

SAC Reference Number: N/A

Date and Time of Incident: October 5, 2015 17:00 hrs

Date and Time call was made: N/A

End Date and Time of Incident: October 5, 2015 20:00 hrs

Person completing the notification: ______________________

Location of Incident: ☒ Unit 1 ☐ Unit 2

Choose one of the Following Options:

1) **Option 1:**
Schedule 'C' Performance Requirements (In Stack Emission Limits) ☒ Yes ☐ No
☐ Opacity (6 min.) ☐ Opacity (2 hr.) ☐ SO_2 ☐ NOx ☒ CO ☐ HCl

Emergency Diesel Generator Used: ☐ Yes ☒ No

Total Facility Power Failure: ☐ Yes ☒ No

APC Equipment Failure: ☐ Yes ☒ No

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2) **Option 2**
Performance Requirement as listed in Condition 6

Operational Parameter
☐ Baghouse inlet temperature >185°C ☐ Baghouse inlet temperature <120°C
☐ Combustion zone temperature <1000°C ☐ O_2 economizer outlet <6%

Operator Action:
Reduced Waste Processing Rate: ☐ Yes ☐ No

Waste Feed Cut-off: ☐ Yes ☐ No

Controlled Shutdown Performed: ☐ Yes ☐ No

Emergency Shutdown Performed: ☐ Yes ☐ No

Note: The magnitude (number of averaging periods involved and actual concentration levels) of the event will be reported in written report to follow.

Rev 0: 27-Sep-15

COVANTA Environmental 5 Day Notification Report

Written 5 Day Notification –
Please include initial Environmental Notification Report. The following information must be reported:

Performance Requirement/Operational Incident

Parameter	Averaging Period	Approval Limit	Length of Exceedance (Start/Stop)	# of Periods	Reading(s)
HCl	24 hr (rolling)	9 mg/Rm^3			
SO_2	24 hr (rolling)	35 mg/Rm^3			
NOx	24 hr (rolling)	121 mg/Rm^3			
CO	4 hr (rolling)	40 mg/Rm^3	17:00 – 19:00	3	49/44/43
Opacity	2 hr (rolling)	5%			
Opacity	6 min (rolling)	10%			
Baghouse Temperature	1 hr	>120 and <185°C			
O_2 economizer outlet	1 hr	<6%			
Combustion Zone Temperature	1 hr	1000°C			
NOTE: CO is a target for Year 1 and reportable in Year 2					

Brief description of Incident:

On Oct 5, 2015 Unit 1 experienced CO spikes during the period 16:56 – 17:17 hrs.

Effect of the Incident on the emissions from the Facility:

The 1-hr average CO during the 5:00 hr was 103.1 mg/Rm3. This CO spike in Unit 1 affected the 4hr rolling averages during the 17:00, 18:00 and 19:00 hours.

Measures taken to alleviate the effect of Incident on the emissions from the facility:

The Operator reduced primary air and increased secondary air to both cool the bed and increase furnace O2 to mitigate the hot CO spikes. When the hot CO was abated and cold CO generation became the predominant mechanism, the burner was lit and CO was driven down to 1.3 mg/Rm3.

Time Line:

Date	Time	Description
Oct 5/15	12:00 hrs	Thickening up the refuse bed
Oct 5/15	16:46 hrs	Inlet CEMS taken out of service for maintenance
Oct 5/15	16:56 hrs	Hot CO spikes - start
Oct 5/15	17:03 hrs	Primary Air reduced 30%, secondary air flow increased
Oct 5/15	17:17 hrs	Hot CO spikes - end
Oct 5/15	17:21 hrs	Burner lit off
Oct 5/15	17:23 hrs	Inlet CEMS returned to service
Oct 6/15	03:21 hrs	Burner off, boiler returned to normal operating configuration

Root Cause: **Sub optimal refuse bed configuration coupled with loss of MICC Controller O2 feedback signal due to inlet CEMS maintenance.**

Significant Findings:

1. Refuse bed was thin and when the bed was being thickened, the grate speed applied was insufficient to ensure proper agitation of the trash. This lead to the accumulation of significant unburned fuel. The intermittent, short duration cold CO spikes that were increasing in both frequency and amplitude had lifted the 4hr average into the mid 20 mg/Rm3. Grate speed was gradually increased to improve bed mixing. This fuel lit off, consumed the available O2 leading to the hot CO spikes. The Operator was using the SOP for High CO abatement, specifically hot CO.
2. The Inlet CEMS was put into maintenance mode to repair the THC meter shortly before the CO incident. This evolution takes the O2 feedback signal away from the MICC controller. Standard practice is to use the outlet CEMS O2 signal for combustion monitoring purposes when this occurs, but in order to do this the grate must be run in manual until the inlet CEMS is available. As a result, the MICC controller was not available to contain the hot CO spikes during the incident.

Corrective Actions to prevent the re-occurrence of the Incident:

	Description	Responsible	Est. Completion Date	Status
1.	Develop protocol to ensure no planned work is undertaken on the inlet CEMS system when significant changes to the combustion bed are being undertaken.	K. Coatham	October 5, 2015	Complete
2.	Provide Operator training on refuse bed management best practices (Stoker School)	C. Bradley	October 30, 2015	
3.	Tailgate the findings of this investigation with all Operating crews and Supervision	K. Coatham	October 16, 2015	
4.	Update the DYEC High CO SOP (C ENV 004) to: (1) Eliminate the 1 min 100 mg/m3 burner light off requirement; (2) Reduce the one hour building block from 40 to 30 mg/Rm3; (3) Reduce the "This Average" building block to 30 mg/Rm3; (4) Incorporate CO decision tree into the SOP and ensure consistency in	M. Neild	SOP - October 9, 2015 Operator Training – October 16, 2015	

	limits.(5)Train Operators to the modified SOP.			
5.	Complete inlet/outlet THC correlation to support permanently moving the THC instruments to the outlet. This will improve the availability of the inlet O2 signal for combustion control (requires MOECC concurrence)	L. Brasowski	October 30, 2015	

Attachments:

1. TRACE screen print for the period Oct 5, 2015 4:16pm – 6:27pm
2. CEMS data – 1hr averages Oct 5, 2015 00:00 hrs - 23:59 hrs
3. CEMS data – Compliance averages Oct 5, 2015 00:00 hrs – 23:59 hrs

Signatures/Date:

	Print	Sign	Date
Chief Engineer:	KEN COATHAM	[signature]	Oct 8/15
Environmental Specialist:	Amanda Huxter	[signature]	Oct 8/15
Facility Manager:	MATT NEILD	[signature]	Oct. 8, 2015

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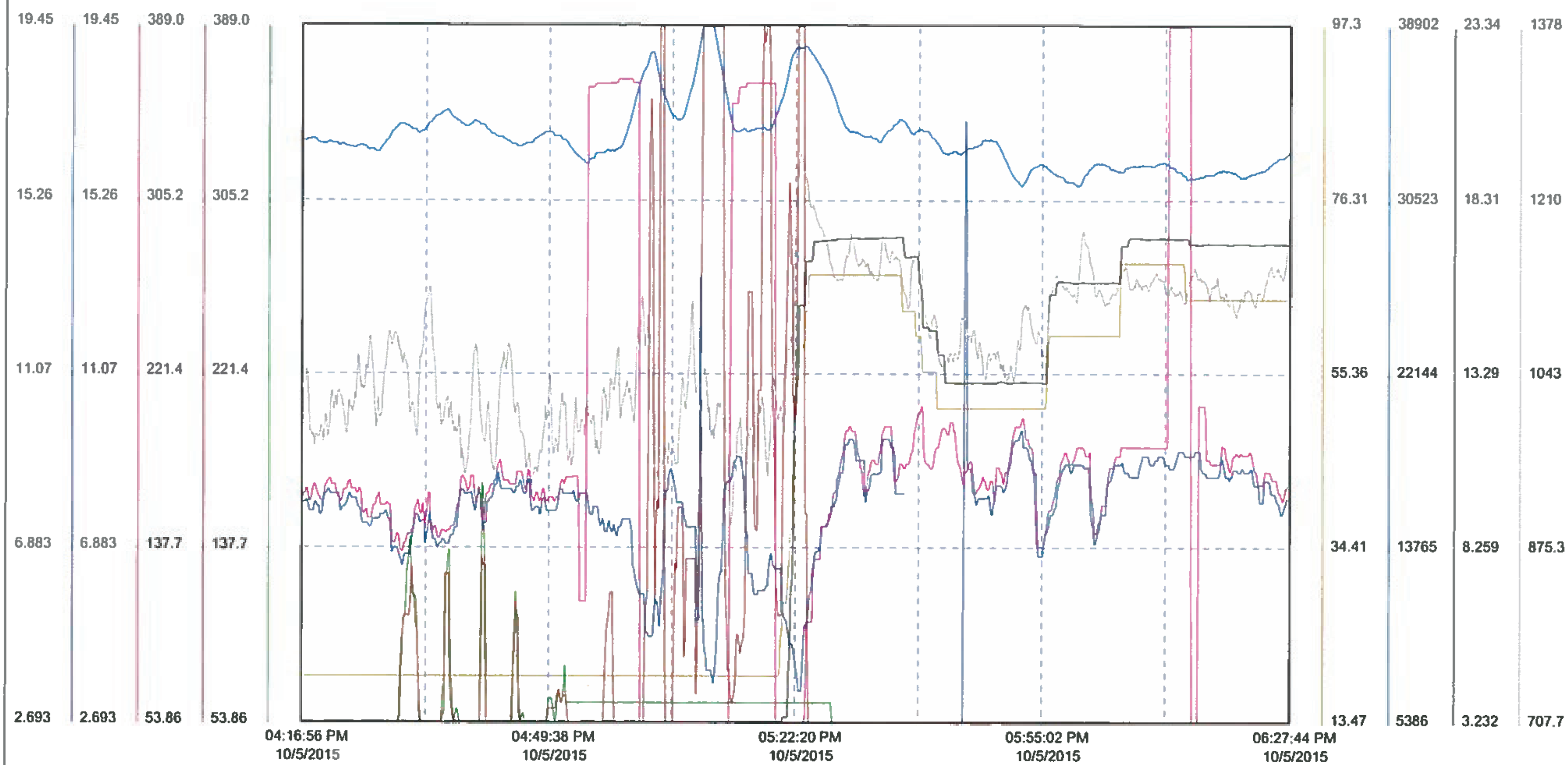

Legend	Trend Name	Comment	Min.	Max.	Avg.	Min. Scale	Max. Scale	Eng. Units
	DURDAS.du_1_AIT_4730_PV	B1 CEMS CO INLET	3.581	168.8	30.78	53.86	389.0	ppm
	DURDAS.du_1_FIC_3601_CO	B1 AUX BURNER FIRING RATE CONTROLLER CO	19.00	68.79	40.43	13.47	97.3	%
	DURDAS.du_1_AIT_4745_PV	B1 CEMS CO OUTLET	1.720	1663	72.81	53.86	389.0	ppm
	DURDAS.du_1_FIR_5250_PV	B1 COMP MN STEAM FLOW	31229	39793	33612	5386	38902	kg/hr
	DURDAS.du_1_AIT_4737_PV	B1 CEMS O2 INLET	0.015	22.32	8.681	2.693	19.45	%
	DURDAS.du_1_FIT_3601_PV	B1 NATURAL GAS FLOW TRANSMITTER	0.007	17.26	9.06	3.232	23.34	m3/min
	DURDAS.du_1_AIT_4790_PV	B1 CEMS O2 OUTLET	1.889	17.18	7.823	2.693	19.45	%
	DURDAS.du_1_TT_4319_PV	B1 IR CAMERA	897.5	1255	1067	707.7	1378	deg C

Data Summary Report

Company: Covanta - Durham York Energy Center
1835 Energy Drive
Clarington Municipality, ON
Source: Boiler #1
Data Group: U1 1-hr Data
Report Name: Daily U1 Hourly Averages
Start of Report: 10/05/2015 00:00 End of Report: 10/05/2015 23:59 Validation: All Available Data

Group#-Channel#	G7-C5	G7-C8	G7-C19	G7-C13	G7-C25	G7-C29	G7-C41	G7-C42	G7-C45	G7-C43	G7-C16
Long Descrip.	U1 Outlet	U1 Outlet	U1 Outlet	U1 Outlet	U1 Outlet	U1 Inlet O	U1 Inlet T	U1 Outlet	U1 Baghous	U1 Steam P	U1 Outlet
Short Descrip.	COs-mc	SO2s-mc	NOxs-mc	HCLs-mc	Opc	O2e-dry	THCe-mc	CombTmp	BagTmp	Steam	HFs-mc
Units	mg/Rm3	mg/Rm3	mg/Rm3	mg/Rm3	%	%	mg/Rm3	degC	degC	10^3kg/hr	mg/Rm3
Range	0-2000	0-500	0-500	0-100	0-100	0-25	0-100	0-2000	0-500	0-80	0-100
10/05/2015 00:00	14.3	0.8	102.4	1.8	0.0	7.98 <	1.7	1129	143.5	32.68	0.00
10/05/2015 01:00	12.9	2.2	99.0	1.7	0.0	8.10	1.9	1140	142.6	33.21	0.00
10/05/2015 02:00	12.6	2.3	115.8	1.6	0.0	7.79	2.4	1154	143.9	33.31	0.00
10/05/2015 03:00	10.2	3.9	105.3	1.6	0.0	8.06 <	2.4	1145	144.0	33.74	0.00
10/05/2015 04:00	16.2	2.0	98.3	1.2	0.0	8.21	1.8	1165	141.1	33.05	0.00
10/05/2015 05:00	9.7	2.1	100.8	1.4	0.0	7.70	1.7	1173	143.1	33.32	0.00
10/05/2015 06:00	15.3	2.0	109.5	1.6	0.0	7.95 <	1.7	1157	143.4	33.23	0.00
10/05/2015 07:00	12.0	0.4	131.4	1.2	0.0 <	8.16 B	1.7 B	1128	143.8	33.16	0.00
10/05/2015 08:00	14.4	0.7	98.0	0.9	0.0	7.84	1.6	1125	143.7	33.36	0.00
10/05/2015 09:00	13.8	1.2	110.2	1.1	0.0	7.93 <	1.5	1114	143.9	33.54	0.00
10/05/2015 10:00	18.9	6.7	109.1	1.4	0.0	8.44	1.7	1128	141.6	33.40	0.00
10/05/2015 11:00	16.2	1.2	101.8	1.3	0.0	7.82	1.7	1109	142.1	33.58	0.00
10/05/2015 12:00	20.7	0.7	100.5	1.5	0.0	7.72 <	1.8	1118	145.2	33.16	0.00
10/05/2015 13:00	29.7	0.4	104.1	1.6	0.0	7.76	1.8	1112	143.8	33.47	0.00
10/05/2015 14:00	21.5	2.5	117.0	1.3	0.0	7.45	1.7	1120	144.0	33.65	0.00
10/05/2015 15:00	20.4	2.3	97.7	1.2	0.0	7.75 <	1.7	1125	143.6	33.80	0.00
10/05/2015 16:00	52.1	6.2	106.5	1.1	0.0	8.01 <	1.8	1112	142.9	33.69	0.00
10/05/2015 17:00	103.1	13.2	96.6	1.1	0.0	8.83 <	1.6	1147	140.7	33.99	0.00
10/05/2015 18:00	1.3	0.0	109.1	1.4	0.0	8.62 <	1.5	1205	146.6	32.98	0.00
10/05/2015 19:00	16.8	0.6	100.5	0.9	0.0	7.61	1.6	1184	144.7	33.98	0.00
10/05/2015 20:00	3.0	0.0	104.9	1.5	0.0	8.84	1.7	1171	140.9	34.37	0.00
10/05/2015 21:00	15.2	0.6	110.6	1.4	0.0	8.80 <	1.6	1143	142.9	33.49	0.00
10/05/2015 22:00	36.3	5.4	107.2	1.7	0.0	8.28	1.7	1040	145.1	34.48	0.00
10/05/2015 23:00	38.7	0.6	88.2	1.4	0.0	8.59	1.8	1055	143.1	34.22	0.00
Period Average =	21.9	2.4	105.2	1.4	0.0	8.09	1.8	1133	143.3	33.54	0.00
Period Max Value =	103.1	13.2	131.4	1.8	0.0	8.84	2.4	1205	146.6	34.48	0.00
Period Min Value =	1.3	0.0	88.2	0.9	0.0	7.45	1.5	1040	140.7	32.68	0.00
Period Totals =	5.2530E+2	5.8000E+1	2.5245E+3	3.2900E+1	0.0000E+0	1.9424E+2	4.2100E+1	2.7199E+4	3.4402E+3	8.0486E+2	0.0000E+0
Period % Recovery =	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Date/Time Printed: 10/08/2015 16:16

Data Summary Report

Company: Covanta - Durham York Energy Center
1835 Energy Drive
Clarington Municipality, ON

Source: Boiler #1

Data Group: All Data Groups

Report Name: Daily MOE U1 Report - Permit Averaging

Start of Report: 10/05/2015 00:00 End of Report: 10/05/2015 23:59 Validation: Valid Data Only

Group#-Channel#	G9-C3	G42-C13	G42-C25	G42-C19	G8-C2	G7-C29	G7-C41	G7-C42	G7-C45
Long Descrip.	U1 Outlet	24hr Reset	24hr Reset	24hr Reset	U1 Outlet	U1 Inlet O	U1 Inlet T	U1 Outlet	U1 Baghous
Short Descrip.	COs-mc	SO2_RRoll	NOX_RRoll	HCL_RRoll	Opc	O2e-dry	THCe-mc	CombTmp	BagTmp
Units	mg/Rm3	mg/Rm3	mg/Rm3	mg/Rm3	%	%	mg/Rm3	degC	degC
Range	0-20000	0-1000	0-1000	0-1000	0-100	0-25	0-100	0-2000	0-500
10/05/2015 00:00	13.0	3	105	1	0	7.98 <	1.7	1129	143.5
10/05/2015 01:00	12.2	3	105	1	0	8.10	1.9	1140	142.6
10/05/2015 02:00	12.4	3	106	1	0	7.79	2.4	1154	143.9
10/05/2015 03:00	12.5	3	106	1	0	8.06 <	2.4	1145	144.0
10/05/2015 04:00	13.0	3	106	1	0	8.21	1.8	1165	141.1
10/05/2015 05:00	12.2	3	106	1	0	7.70	1.7	1173	143.1
10/05/2015 06:00	12.9	3	106	1	0	7.95 <	1.7	1157	143.4
10/05/2015 07:00	13.3	3	106	1	0			1128	143.8
10/05/2015 08:00	12.9	3	106	1	0	7.84	1.6	1125	143.7
10/05/2015 09:00	13.9	3	106	1	0	7.93 <	1.5	1114	143.9
10/05/2015 10:00	14.8	3	106	1	0	8.44	1.7	1128	141.6
10/05/2015 11:00	15.8	3	106	1	0	7.82	1.7	1109	142.1
10/05/2015 12:00	17.4	3	106	1	0	7.72 <	1.8	1118	145.2
10/05/2015 13:00	21.4	2	106	1	0	7.76	1.8	1112	143.8
10/05/2015 14:00	22.0	2	107	1	0	7.45	1.7	1120	144.0
10/05/2015 15:00	23.1	2	106	1	0	7.75 <	1.7	1125	143.6
10/05/2015 16:00	30.9	2	107	1	0	8.01 <	1.8	1112	142.9
10/05/2015 17:00	49.3	3	106	1	0	8.83 <	1.6	1147	140.7
10/05/2015 18:00	44.2	3	106	1	0	8.62 <	1.5	1205	146.6
10/05/2015 19:00	43.3	3	106	1	0	7.61	1.6	1184	144.7
10/05/2015 20:00	31.1	3	106	1	0	8.84	1.7	1171	140.9
10/05/2015 21:00	9.1	2	106	1	0	8.80 <	1.6	1143	142.9
10/05/2015 22:00	17.8	3	106	1	0	8.28	1.7	1040	145.1
10/05/2015 23:00	23.3	2	105	1	0	8.59	1.8	1055	143.1
Period Average =	20.5	3	106	1	0	8.09	1.8	1133	143.3
Period Max Value =	49.3	3	107	1	0	8.84	2.4	1205	146.6
Period Min Value =	9.1	2	105	1	0	7.45	1.5	1040	140.7
Period Totals =	4.9180E+2	6.6000E+1	2.5430E+3	2.4000E+1	0.0000E+0	1.8608E+2	4.0400E+1	2.7199E+4	3.4402E+3
Period % Recovery =	100.0	100.0	100.0	100.0	100.0	95.8	95.8	100.0	100.0

Date/Time Printed: 10/08/2015 16:15

COVANTA
Powering Today. Protecting Tomorrow.

Environmental Notification Report

Initial Telephone and Email Notification –
The following information will be reported during the calls and in the initial email

Facility Name: Durham York Energy Center

Incident Title: Unit #2 – CO Target Exceedance

SAC Reference Number: N/A

Date and Time of Incident: October 19, 2015 08:00 hrs

Date and Time call was made: N/A

End Date and Time of Incident: October 19, 2015 10:00 hrs

Person completing the notification: M. Neild

Location of Incident: ☐ Unit 1 ☒ Unit 2

Choose one of the Following Options:

1) **Option 1:**
Schedule 'C' Performance Requirements (In Stack Emission Limits) ☒ Yes ☐ No
☐ Opacity (6 min.) ☐ Opacity (2 hr.) ☐ SO_2 ☐ NOx ☒ CO ☐ HCl

Emergency Diesel Generator Used: ☐ Yes ☒ No

Total Facility Power Failure: ☐ Yes ☒ No

APC Equipment Failure: ☐ Yes ☒ No

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2) **Option 2**
Performance Requirement as listed in Condition 6

Operational Parameter
☐ Baghouse inlet temperature >185°C ☐ Baghouse inlet temperature <120°C
☐ Combustion zone temperature <1000°C ☐ O_2 economizer outlet <6%

Operator Action:
Reduced Waste Processing Rate: ☐ Yes ☐ No

Waste Feed Cut-off: ☐ Yes ☐ No

Controlled Shutdown Performed: ☐ Yes ☐ No

Emergency Shutdown Performed: ☐ Yes ☐ No

Note: The magnitude (number of averaging periods involved and actual concentration levels) of the event will be reported in written report to follow.

COVANTA Environmental 5 Day Notification Report

Written 5 Day Notification –
Please include initial Environmental Notification Report. The following information must be reported:

Performance Requirement/Operational Incident

Parameter	Averaging Period	Approval Limit	Length of Exceedance (Start/Stop)	# of Periods	Reading(s)
HCl	24 hr (rolling)	9 mg/Rm^3			
SO_2	24 hr (rolling)	35 mg/Rm^3			
NOx	24 hr (rolling)	121 mg/Rm^3			
CO	4 hr (rolling)	40 mg/Rm^3	08:00-09:00	2	41/41
Opacity	2 hr (rolling)	5%			
Opacity	6 min (rolling)	10%			
Baghouse Temperature	1 hr	>120 and <185°C			
O_2 economizer outlet	1 hr	<6%			
Combustion Zone Temperature	1 hr	1000°C			
NOTE: CO is a target for Year 1 and reportable in Year 2					

Brief description of Incident:

On Oct 19, 2015 Unit 2 boiler tripped causing CO spikes during the period 07:54 – 08:07 hrs.

Effect of the Incident on the emissions from the Facility:

The 1-hr average CO during the 07:00 hour was 92.6 mg/Rm3 and during the 08:00 hour was 56.1 mg/Rm3. This CO spike in Unit 2 affected the 4hr rolling averages during both the 08:00 and 09:00 hours.

Measures taken to alleviate the effect of Incident on the emissions from the facility:

Unit 2 was reset and the fans were re-started. Primary air was reduced to 20% to cool the bed and secondary air was increased to mitigate the hot CO spikes as per the SOP. Combustion air flow was then increased and the burner was lit to drive down the CO spike.

Time Line:

Date	Time	Description
Oct 19/15	07:45	Drum level indicator (Eye Hye) taken out of service for leak repair.
Oct 19/15	07:50	During isolation of the indicator column, the indicated water level went high and tripped both #2 boiler and the turbine. #2 boiler fans were reset and combustion air flow was re-established. A burner start was initiated since CO was starting to rise.
Oct 19/15	07:54	Hot CO spikes – start
Oct 19/15	08:06	Burner lit off
Oct 19/15	08:07	Hot CO spikes - end
Oct 19/15	11:30	Burner off, boiler returned to normal operating configuration

Root Cause: **Drum level indicator tripped on hi/hi level during efforts to repair a leak on the unit. This tripped #2 boiler.**

Significant Findings:

1.	No JSA or SOP existed for servicing a leak on the drum level indicator
2.	The key interlock for isolating drum indicator was not enabled (note that this would not have prevented the hi/hi level trip since the key interlock was found to only disable the low/low level boiler trip circuit).
3.	No signage was present on the drum level indicator device referring to JSA/SOP's for servicing.

Corrective Actions to prevent the re-occurrence of the Incident:

	Description	Responsible	Est. Completion Date	Status
1.	Complete JSA for drum level indicator (Eye-Hye) servicing.	K. Coatham	October 26, 2015	Complete
2.	SOP for securing a boiler offline includes for enabling the drum level key interlock to prevent a false hi/hi level from tripping the turbine. Investigate current trip strategy, implement improvements and communicate changes to operating and maintenance crews via updated SOP's.	M. Neild	November 30, 2015	I/P
3.	Label boiler drum level indicator (Eye Hye) covers to state that drum level indicator trips (hi/hi and low/low) must be temporarily jumpered while servicing is being performed.	K. Coatham	October 26, 2015	Complete

Attachments:

1. CITECT screen print for the period Oct 19, 2015 7:11pm – 12:38pm
2. CEMS data – 1hr averages Oct 19, 2015 00:00 hrs - 23:59 hrs
3. CEMS data – Compliance averages Oct 19, 2015 00:00 hrs – 23:59 hrs

Signatures/Date:

	Print	Sign	Date
Chief Engineer:	KEN COATHAM	K Coatham	29/10/15
Maint Supervisor:	JIGAR. VYAS		29/10/15
Environmental Specialist:	Amanda Huxter	A Huxter	29-Oct-15
Facility Manager:	MATT NEILD	M Neild	29-Oct-15

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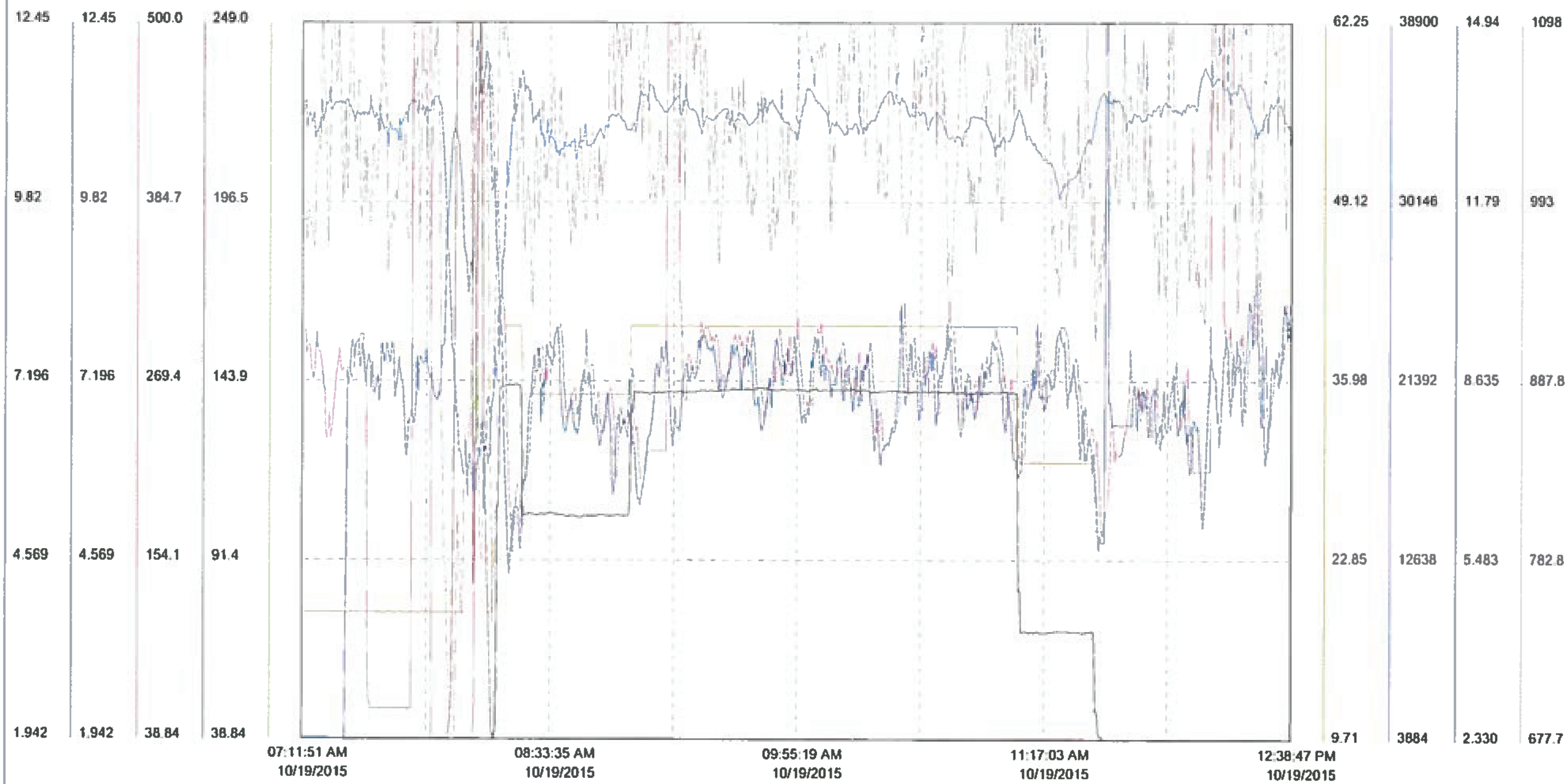


Legend	Trend Name	Comment	Min.	Max.	Avg.	Min. Scale	Max. Scale	Eng. Units
	DURDAS.du_2_AIT_4730_PV	B2 CEMS CO INLET	3.230	489.9	12.21	38.84	249.0	ppm
	DURDAS.du_2_FIC_3601_CO	B2 AUX BURNER FIRING RATE CONTROLLER CO	19.00	40.00	33.50	9.71	62.25	%
	DURDAS.du_2_AIT_4745_PV	B2 CEMS CO OUTLET	0.753	1966	29.35	38.84	500.0	ppm
	DURDAS.du_2_FIR_5250_PV	B2 COMP MN STEAM FLOW	15169	36774	33401	3884	38900	kg/hr
	DURDAS.du_2_AIT_4737_PV	B2 CEMS O2 INLET	0.176	21.58	7.216	1.942	12.45	%
	DURDAS.du_2_FIT_3601_PV	B2 NATURAL GAS FLOW XMTR TO AB-BR-201	0.001	8.577	4.579	2.330	14.94	M3/min
	DURDAS.du_2_AIT_4790_PV	B2 CEMS O2 OUTLET	0.086	22.27	6.906	1.942	12.45	%
	DURDAS.du_2_TT_4319_PV	B2 IR CAMERA	645.8	1227	1022	677.7	1098	deg C

Data Summary Report

Company:	Covanta - Durham York Energy Center 1835 Energy Drive Clarington Municipality, ON
Source:	Boiler #2
Data Group:	U2 1-hr Data
Report Name:	Daily U2 Hourly Averages
Start of Report:	10/19/2015 00:00

End of Report: 10/19/2015 23:59 Validation: All Available Data

Group#-Channel#	G17-C5	G17-C8	G17-C19	G17-C13	G17-C25	G17-C29	G17-C41	G17-C42	G17-C45	G17-C43	G17-C16
Long Descrip.	U2 Outlet	U2 Outlet	U2 Outlet	U2 Outlet	U2 Outlet	U2 Inlet O	U2 Inlet T	U2 Combust	U2 Baghous	U2 Steam P	U2 Outlet
Short Descrip.	COs-mc	SO2s-mc	NOxs-mc	HCLs-mc	Opc	O2e-dry	THCe-mc	CombTmp	BagTmp	Steam	HFs-mc
Units	mg/Rm3	mg/Rm3	mg/Rm3	mg/Rm3	%	%	mg/Rm3	degC	degC	10^3kg/hr	mg/Rm3
Range	0-2000	0-500	0-500	0-100	0-100	0-25	0-100	0-2000	0-300	0-80	0-100
10/19/2015 00:00	8.2	0.2	103.1	2.5	0.0	7.42 <	1.5	1116	136.7	34.01	0.0
10/19/2015 01:00	7.3	0.0	100.0	2.4	0.0	6.97	1.1	1145	138.1	34.04	0.0
10/19/2015 02:00	5.6	0.2	111.0	2.6	0.0	7.10	8.9	1138	139.4	34.40	0.0
10/19/2015 03:00	7.4	0.0	93.8	2.6	0.0	7.34 <	5.2	1112	137.9	34.14	0.0
10/19/2015 04:00	6.3	0.9	99.6	2.6	0.0	7.09	7.7	1113	138.2	34.31	0.0
10/19/2015 05:00	6.5	2.7	105.3	2.7	0.0	7.30	5.5	1118	137.8	34.32	0.0
10/19/2015 06:00	10.2	0.0	86.9	2.4	0.0	6.87 <	3.7	1106	139.1	34.38	0.0
10/19/2015 07:00	92.6	0.2	121.2	2.3	0.0 <	7.41 B	3.5 B	1085	139.3	33.01	0.0
10/19/2015 08:00	56.1	5.3	134.8	3.3	0.0	7.41 <	11.7	1101	134.9	30.75	0.0
10/19/2015 09:00	4.2	1.3	112.7	5.5	0.0	7.53 <	9.8	1095	138.6	34.53	0.0
10/19/2015 10:00	4.2	0.0	100.2	4.2	0.0	7.27	6.7	1120	138.0	34.01	0.0
10/19/2015 11:00	7.1	0.0	93.1	4.0	0.0	6.77	1.7	1120	140.3	33.59	0.0
10/19/2015 12:00	15.0	0.0	83.7	4.1	0.0	7.98 <	2.0	1111	139.9	32.90	0.0
10/19/2015 13:00	12.3	0.0	101.8	3.0	0.0	6.84	1.4	1131	139.2	34.47	0.0
10/19/2015 14:00	16.2	0.0	100.2	3.5	0.0	8.10	1.5	1161	137.6	33.26	0.0
10/19/2015 15:00	12.7	0.0	101.7	2.7	0.0	7.08 <	1.9	1162	135.2	33.35	0.0
10/19/2015 16:00	11.8	0.0	104.7	2.8	0.0	7.05	1.4	1169	138.4	33.57	0.0
10/19/2015 17:00	12.4	0.0	98.5	2.9	0.0	7.21	1.4	1167	139.0	33.54	0.0
10/19/2015 18:00	10.7	0.0	106.5	3.1	0.0	7.12 <	1.8	1154	137.9	33.20	0.0
10/19/2015 19:00	13.9	0.0	98.1	3.1	0.0	7.26	1.5	1174	140.3	33.59	0.0
10/19/2015 20:00	13.1	0.0	87.1	3.2	0.0	7.83	1.5	1168	140.2	33.26	0.0
10/19/2015 21:00	12.1	0.0	111.7	2.9	0.0	7.30 <	2.2	1169	136.9	33.42	0.0
10/19/2015 22:00	11.6	0.0	100.2	2.6	0.0	7.06	1.9	1194	138.8	33.96	0.0
10/19/2015 23:00	10.6	0.0	95.7	3.2	0.0	7.15	1.6	1197	135.9	33.28	0.0
Period Average =	15.3	0.5	102.2	3.1	0.0	7.27	3.6	1139	138.2	33.64	0.0
Period Max Value =	92.6	5.3	134.8	5.5	0.0	8.10	11.7	1197	140.3	34.53	0.0
Period Min Value =	4.2	0.0	83.7	2.3	0.0	6.77	1.1	1085	134.9	30.75	0.0
Period Totals =	3.6810E+2	1.0800E+1	2.4516E+3	7.4200E+1	0.0000E+0	1.7446E+2	8.7100E+1	2.7326E+4	3.3176E+3	8.0729E+2	0.0000E+0
Period % Recovery =	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Date/Time Printed: 10/29/2015 11:49

Data Summary Report

Company: Covanta - Durham York Energy Center
1835 Energy Drive
Clarington Municipality, ON

Source: Boiler #2

Data Group: All Data Groups

Report Name: Daily MOE U2 Report - Permit Averaging

Start of Report: 10/19/2015 00:00 **End of Report:** 10/19/2015 23:59 **Validation:** Valid Data Only

Group#-Channel#	G19-C3	G43-C13	G43-C25	G43-C19	G18-C2	G17-C29	G17-C41	G17-C42	G17-C45
Long Descrip.	U2 Outlet	24hr Reset	24hr Reset	24hr Reset	U2 Outlet	U2 Inlet O	U2 Inlet T	U2 Combust	U2 Baghous
Short Descrip.	COs-mc	SO2_RRoll	NOX_RRoll	HCL_RRoll	Opc	O2e-dry	THCe-mc	CombTmp	BagTmp
Units	mg/Rm3	mg/Rm3	mg/Rm3	mg/Rm3	%	%	mg/Rm3	degC	degC
Range	0-20000	0-1000	0-1000	0-1000	0-100	0-25	0-100	0-2000	0-300
10/19/2015 00:00	10.0	0	103	3	0	7.42 <	1.5	1116	136.7
10/19/2015 01:00	9.3	0	103	2	0	6.97	1.1	1145	138.1
10/19/2015 02:00	7.8	0	103	2	0	7.10	8.9	1138	139.4
10/19/2015 03:00	7.1	0	103	2	0	7.34 <	5.2	1112	137.9
10/19/2015 04:00	6.7	0	103	2	0	7.09	7.7	1113	138.2
10/19/2015 05:00	6.5	0	103	2	0	7.30	5.5	1118	137.8
10/19/2015 06:00	7.6	0	102	2	0	6.87 <	3.7	1106	139.1
10/19/2015 07:00	28.9	0	102	2	0			1085	139.3
10/19/2015 08:00	41.4	0	103	2	0	7.41 <	11.7	1101	134.9
10/19/2015 09:00	40.8	0	103	3	0	7.53 <	9.8	1095	138.6
10/19/2015 10:00	39.3	0	103	3	0	7.27	6.7	1120	138.0
10/19/2015 11:00	17.9	0	103	3	0	6.77	1.7	1120	140.3
10/19/2015 12:00	7.6	0	103	3	0	7.98 <	2.0	1111	139.9
10/19/2015 13:00	9.7	0	103	3	0	6.84	1.4	1131	139.2
10/19/2015 14:00	12.7	0	103	3	0	8.10	1.5	1161	137.6
10/19/2015 15:00	14.1	0	103	3	0	7.08 <	1.9	1162	135.2
10/19/2015 16:00	13.3	0	103	3	0	7.05	1.4	1169	138.4
10/19/2015 17:00	13.3	0	103	3	0	7.21	1.4	1167	139.0
10/19/2015 18:00	11.9	0	103	3	0	7.12 <	1.8	1154	137.9
10/19/2015 19:00	12.2	0	103	3	0	7.26	1.5	1174	140.3
10/19/2015 20:00	12.5	0	102	3	0	7.83	1.5	1168	140.2
10/19/2015 21:00	12.5	0	103	3	0	7.30 <	2.2	1169	136.9
10/19/2015 22:00	12.7	0	103	3	0	7.06	1.9	1194	138.8
10/19/2015 23:00	11.9	0	102	3	0	7.15	1.6	1197	135.9
Period Average =	15.3	0	103	3	0	7.26	3.6	1139	138.2
Period Max Value =	41.4	0	103	3	0	8.10	11.7	1197	140.3
Period Min Value =	6.5	0	102	2	0	6.77	1.1	1085	134.9
Period Totals =	3.6770E+2	0.0000E+0	2.4680E+3	6.4000E+1	0.0000E+0	1.6705E+2	8.3600E+1	2.7326E+4	3.3176E+3
Period % Recovery =	100.0	100.0	100.0	100.0	100.0	95.8	95.8	100.0	100.0

Date/Time Printed: 10/29/2015 11:52

ATTACHMENT 3

Operating Events and Downtime

TESTING SCHEDULE AND OVERVIEW

Prior to the start of the Acceptance Test, HDR, the Regions, and Covanta agreed that all of the preconditions to the Acceptance Test had been satisfied (or for non-critical items, if appropriate, moved to the Punch List).

On September 27th, the 30-Day Facility Performance Test commenced. During the 30-Day Test Period, there were 2 incidences where CO emissions exceeded the operating limit and the parties agreed to extend the test period to 37-Days. The first week of Testing started with the following activities:

- 30-day Reliability Test (commenced at 00:01, September 27),
- 30-day Residue Quantity Test (commenced at 00:01, September 27),
- 5-day Throughput Capacity Test (commenced at 00:01, September 27),
- 5-day Residue Quantity and Quality Test (commenced at 00:01, September 27) and,
- The first Energy Recovery Test (commenced at 08:00, September 27)

Testing for the first week included:

- Completion of five 8-hour Energy Recovery Tests,
- Completion of Compliance Emission Testing (Source testing, including Dioxin),
- Fly ash sampling for environmental demonstration (TCLP),
- 5-day Throughput Capacity Test, concluding at 24:00 on October 1, and
- 5-day Residue Quantity and Quality Tests, concluding at 24:00 on October 1

Testing for the balance of the Test period included:

- Two additional Dioxin/Furan Test runs (October 21 and 22, and October 28 and 29),
- Metals Recovery Testing (October 6 through October 9),
- Acoustic Audit (October 6 and 7),
- Odour Test (October 8),
- 5-day Bottom Ash Environmental Test (October 15 through 19),
- A second fly ash sampling program was completed to demonstrate environmental compliance at a new fly ash conditioning mixture (October 22 through 26),
- A second 5-Day Residue Quantity Test (deemed “unofficial”),
- A third 5-Day Residue Quantity Test, including Throughput Capacity and Residue Quality Tests (October 27 through October 31), (not reported by Covanta in the Acceptance test Reports)
- Completion of the 30-Day Reliability Test (October 26, with an extension to November 2), and
- Completion of the 30-Day Ash Quantity Test (October 26)

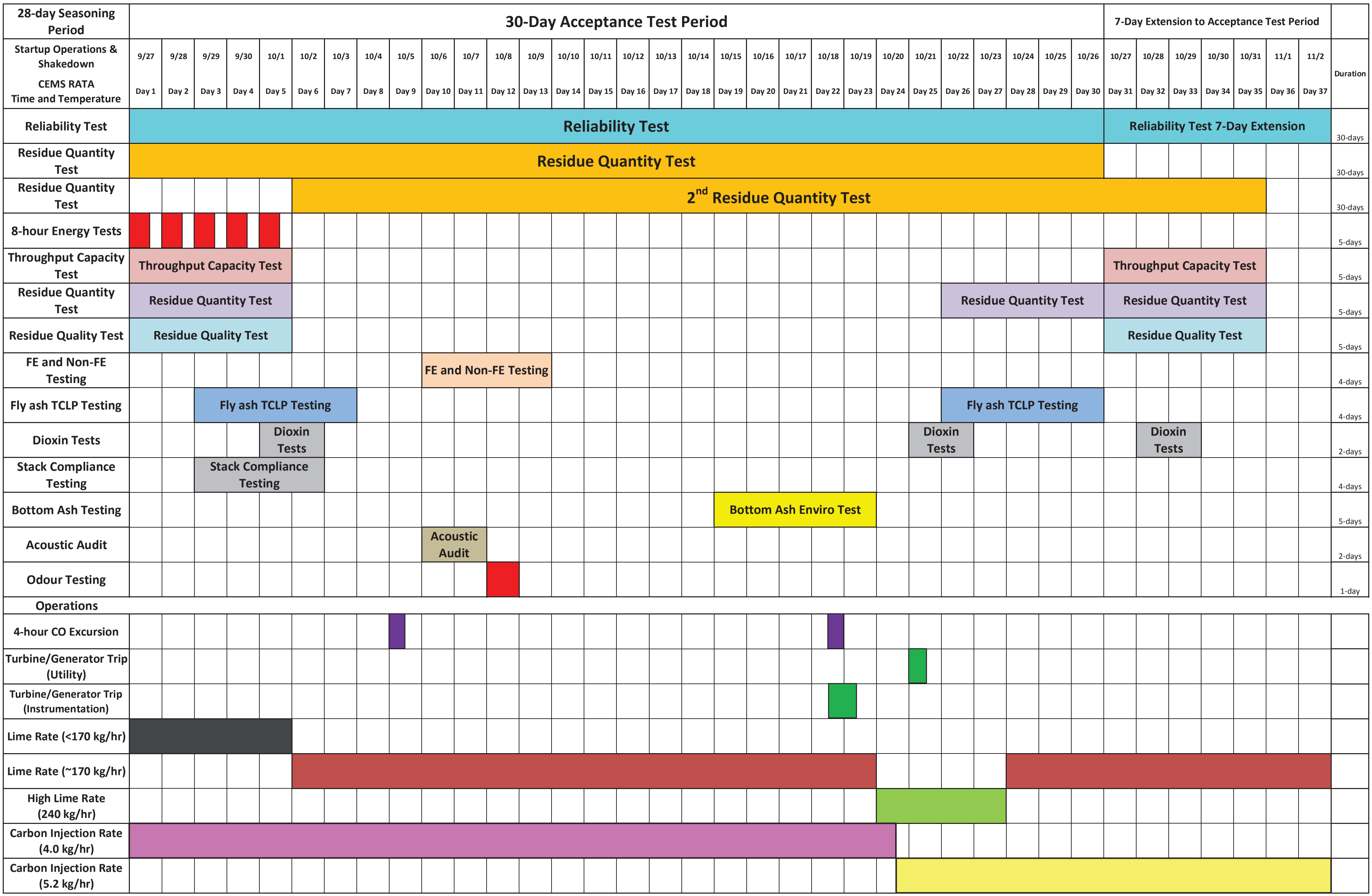
Table 3.1 shows some of the key dates and tests that were completed during the 37-Day Period.

Some observations made during the 37-Day Test period include:

- On September 27th the auxiliary burner was fired for approximately 30 minutes due to an apparent low furnace temperature. This was later determined to be related to the temperature correlation that had been incorporated but not fully implemented. Appropriate changes were made and there were no periods when the combustion zone temperature violated the CofA. Operation of the burner occurred during the first Energy Recovery Test, which per the Protocol would invalidate the Test run. However, the short duration and load of the burner was deemed to be insignificant and the data was maintained for the Test analysis.
- On September 29th an upset with the ammonia injection on Unit 1 caused a short suspension of the source testing.
- During the last Energy Recovery Test on October 1st, 5 to 6 of the 6 preheat coils were put into service on both boilers through out the test. The steam preheat coils improve overall facility efficiency and improve energy recovery.
- On October 5th there was a 4-hour CO excursion and the auxiliary burners were fired on Boiler 1 to control CO level. This event was fully discussed in the CO Environmental Notification Report provided to the Regions and HDR on October 8th (Included as Attachment 2). Based on this excursion, it was agreed that the 30-Day Test would be extended 24-hours.
- During the 37-Day Test period the Reverse Osmosis (RO) system and cation polisher provided sufficient high quality water for the continuous operation of the Facility. The membranes were changed out one time during the 37-Day period (on October 9) without incident.
- On October 9th, a failure of the west crane necessitated firing the auxiliary burners for approximately one hour.
- There were several periods of time when the flyash surge bins plugged and created operational issues with that equipment and in the residue building. Covanta operators worked to clear plugs and in several instances caused significant dusting events within the residue and boiler building. Covanta has committed to incorporating logic and equipment modifications to minimize similar future events.
- On October 18th Boiler 2 tripped on an indication of a high-high drum level. High-high drum levels automatically trip the turbine to protect against potential poor quality steam. During this upset, boiler #1 also tripped. Plant systems were restored and the boilers were placed back into operation. During this period there was a CO excursion which ultimately resulted in extending the test to a 37-Day period to demonstrate satisfactory operation of the boilers. The turbine/generator remained off line for approximately 23 hours to resolve issues with vibration alarms and a faulty high-high level switch in boiler 2.
- On October 21st, the turbine/generator tripped offline for a few hours due to another false High-high level indication on the drum.

- On October 29th, a utility breaker tripped due to local power outages (high winds). The turbine dropped in load from 17.1 MW down to 2.1 MW to carry just the house load. The steam dump valve to the ACC (PCV-003) responded properly and there was very minimal upset during this event. Boiler 1 did trip but was returned to service within 5 minutes with no emissions issues. This event demonstrated in real time that the plant can handle upset conditions and can properly control through a full load rejection.

Table 3.1 - ACCEPTANCE TEST SCHEDULE



ATTACHMENT 4

HHV Data Summary and Results

HHV TEST 1 - HHV DATA

Test Date: **9/27/2015**

Test Start:	8:00
Test End:	16:00

Pertinent Test Data

No.	Parameter	Unit	Value	Measurement Source
1	Test duration	hr	8	-
2	Refuse Feed Rate	kg/hr	18,277	Crane Weigh Scale
3	Total FW/Steam Flow	kg/hr	144,505	Station Instrument
4	Main Steam Flow	kg/hr	70,881	Station Instrument
5	Feedwater Flow	kg/hr	73,624	Station Instrument
6	Superheater 3 Outlet Steam Temp	deg C	501	Station Instrument
7	Superheater 3 Outlet Steam Press	bar	88	Station Instrument
	Superheater 3 Outlet Steam Press (absolute)	bar	89	-
8	Feedwater Temp	deg C	138	Station Instrument
9	Feedwater Press	bar	102	Station Instrument
	Feedwater Press (absolute)	bar	103	-
10	Continuous Blowdown Rate	kg/hr	0	Verify Valve Closed
11	Boiler Drum Press	bar	97	Station Instrument
	Boiler Drum Press (absolute)	bar	98	-
12	Inlet Air Dry Bulb Temp	deg C	23	Psychrometer
22	Moisture in Combustion Air	deg C	-	Calculated - Psych Chart
14	Total Air Flow	CFM	88,218	Station Instrument
15	Overfire Air Flow	CFM	13,522	Station Instrument
16	Seal Air Flow	CFM	3,367	Station Instrument
17	Overfire Air Press	mbar	46	Station Instrument
18	OFA and Seal Air Temp After Fan	deg C	32	Test Thermocouple
19	Heated Underfire Air Temp	deg C	75	Test Thermocouple or Station
20	IGR Fan Current	Amps	105	Station Instrument
21	Barometric Press	mmHg	759	Barometer
	Barometric Press	bar	1	-
22	Moisture in Combustion Air		-	Calculated - Psych Chart
23	CO_2 in Dry Flue Gas	% vol	11	Manually @ Econ Outlet
24	O_2 in Dry Flue Gas	% vol	8	Manually @ Econ Outlet
25	N_2 in Dry Flue Gas	% vol	80	Calculated
26	H_2O in Flue Gas	% vol	16	Manually @ Econ Outlet
27	Flue Gas Flow	ACFM	108,884	Manually @ Econ Outlet
28	Economizer Exit Gas Temp	deg C	166	Station Instrument
29	Sampling Point Gas Temp	deg C	166	Manually @ Econ Outlet
30	Carbon Injection	kg/hr	4	Station Instrument
31	Ash Discharger Water Bath Temp	deg C	45	Test Thermcouples
32	Aqueous Ammonia Consumption	lph	60	Station Instrument
33	Lime Consumption	kg/hr	132	Station Instrument
34	Lime Specific Gravity			Manual Sampling

HHV TEST 1 CALCULATION SUMMARY

BOILER EFFICIENCY CALCULATION - HEAT LOSS METHOD

(ASME PTC 4, SECTION 5.14), As-Tested Conditions

HEAT OUTPUT		
Steam	10,874.48	kJ/kg
Blowdown	0.00	kJ/kg
Total Heat Output	**10,874**	**kJ/kg**
HEAT LOSSES		
Dry Gas	1,001.64	kJ/kg
Moisture from Fuel/Quench Vapor/SNCR Water	2,029.36	kJ/kg
Moisture from Total Fresh Air	19.69	kJ/kg
Ash Discharger Quench Water	3.71	kJ/kg
Sensible Heat in Dry Bottom Residue	5.00	kJ/kg
Sensible Heat in Dry Fly Ash Residue	10.39	kJ/kg
Unburned Combustibles	42.29	kJ/kg
Radiation & Convection Loss	83.12	kJ/kg
Unaccounted For	70.35	kJ/kg
Total Heat Losses	**3,266**	**kJ/kg**
HEAT CREDIT		
Dry Underfire Air Sensible Heat	230.02	kJ/kg
Dry Overfire Air & Seal Air Sensible Heat	8.19	kJ/kg
Moisture in Incoming Underfire Air	4.57	kJ/kg
Moisture in Incoming Overfire & Seal Air	0.16	kJ/kg
Fuel Sensible Heat	-2.84	kJ/kg
Total Heat Credits	**240**	**kJ/kg**
HHV of FUEL	**13,900**	**kJ/kg**
Efficiency	76.9	%

Heat Loss Summary

Dry Gas	7.08%
Moisture from Fuel, Ash Discharger vapor & SNCR	14.35%
Moisture from Total Air	0.14%
Ash Discharger Quench Water Liquid	0.03%
Sensible Heat in Dry Bottom Residue	0.04%
Sensible heat in Dry Fly Ash	0.07%
Unburned Combustibles	0.30%
Radiation/Correction	0.59%
Unaccounted for	0.50%
Total Heat Losses	**23.1%**

HHV TEST 2 - HHV DATA

Test Date: **9/28/2015**

Test Start:	8:00
Test End:	16:00

Pertinent Test Data

No.	Parameter	Unit	Value	Measurement Source
1	Test duration	hr	8	-
2	Refuse Feed Rate	kg/hr	17,887	Crane Weigh Scale
3	Total FW/Steam Flow	kg/hr	142,366	Station Instrument
4	Main Steam Flow	kg/hr	69,961	Station Instrument
5	Feedwater Flow	kg/hr	72,406	Station Instrument
6	Superheater 3 Outlet Steam Temp	deg C	504	Station Instrument
7	Superheater 3 Outlet Steam Press	bar	88	Station Instrument
	Superheater 3 Outlet Steam Press (absolute)	bar	89	-
8	Feedwater Temp	deg C	138	Station Instrument
9	Feedwater Press	bar	102	Station Instrument
	Feedwater Press (absolute)	bar	103	-
10	Continuous Blowdown Rate	kg/hr	0	Verify Valve Closed
11	Boiler Drum Press	bar	96	Station Instrument
	Boiler Drum Press (absolute)	bar	97	-
12	Inlet Air Dry Bulb Temp	deg C	25	Psychrometer
22	Moisture in Combustion Air	deg C	-	Calculated - Psych Chart
14	Total Air Flow	CFM	96,028	Station Instrument
15	Overfire Air Flow	CFM	12,869	Station Instrument
16	Seal Air Flow	CFM	3,175	Station Instrument
17	Overfire Air Press	mbar	46	Station Instrument
18	OFA and Seal Air Temp After Fan	deg C	34	Test Thermocouple
19	Heated Underfire Air Temp	deg C	75	Test Thermocouple or Station
20	IGR Fan Current	Amps	105	Station Instrument
21	Barometric Press	mmHg	754	Barometer
	Barometric Press	bar	1	-
22	Moisture in Combustion Air		-	Calculated - Psych Chart
23	CO_2 in Dry Flue Gas	% vol	11	Manually @ Econ Outlet
24	O_2 in Dry Flue Gas	% vol	8	Manually @ Econ Outlet
25	N_2 in Dry Flue Gas	% vol	80	Calculated
26	H_2O in Flue Gas	% vol	16	Manually @ Econ Outlet
27	Flue Gas Flow	ACFM	112,358	Manually @ Econ Outlet
28	Economizer Exit Gas Temp	deg C	168	Station Instrument
29	Sampling Point Gas Temp	deg C	167	Manually @ Econ Outlet
30	Carbon Injection	kg/hr	4	Station Instrument
31	Ash Discharger Water Bath Temp	deg C	45	Test Thermcouples
32	Aqueous Ammonia Consumption	lph	42	Station Instrument
33	Lime Consumption	kg/hr	142	Station Instrument
34	Lime Specific Gravity			Manual Sampling

HHV TEST 2 CALCULATION SUMMARY

BOILER EFFICIENCY CALCULATION - HEAT LOSS METHOD

(ASME PTC 4, SECTION 5.14), As-Tested Conditions

HEAT OUTPUT		
Steam	10,996.39	kJ/kg
Blowdown	0.00	kJ/kg
Total Heat Output	**10,996**	**kJ/kg**
HEAT LOSSES		
Dry Gas	1,057.93	kJ/kg
Moisture from Fuel/Quench Vapor/SNCR Water	2,041.19	kJ/kg
Moisture from Total Fresh Air	27.06	kJ/kg
Ash Discharger Quench Water	3.48	kJ/kg
Sensible Heat in Dry Bottom Residue	4.61	kJ/kg
Sensible Heat in Dry Fly Ash Residue	10.50	kJ/kg
Unburned Combustibles	43.45	kJ/kg
Radiation & Convection Loss	84.94	kJ/kg
Unaccounted For	71.35	kJ/kg
Total Heat Losses	**3,345**	**kJ/kg**
HEAT CREDIT		
Dry Underfire Air Sensible Heat	262.38	kJ/kg
Dry Overfire Air & Seal Air Sensible Heat	10.36	kJ/kg
Moisture in Incoming Underfire Air	6.77	kJ/kg
Moisture in Incoming Overfire & Seal Air	0.27	kJ/kg
Fuel Sensible Heat	0.10	kJ/kg
Total Heat Credits	**280**	**kJ/kg**
HHV of FUEL	**14,061**	**kJ/kg**
Efficiency	76.7	%

<u>Heat Loss Summary</u>

Dry Gas	7.38%
Moisture from Fuel, Ash Discharger vapor & SNCR	14.23%
Moisture from Total Air	0.19%
Ash Discharger Quench Water Liquid	0.02%
Sensible Heat in Dry Bottom Residue	0.03%
Sensible heat in Dry Fly Ash	0.07%
Unburned Combustibles	0.30%
Radiation/Correction	0.59%
Unaccounted for	0.50%
Total Heat Losses	**23.3%**

HHV TEST 3 - HHV DATA

Test Date: **9/29/2015**

Test Start:	8:00
Test End:	16:00

Pertinent Test Data

No.	Parameter	Unit	Value	Measurement Source
1	Test duration	hr	8	-
2	Refuse Feed Rate	kg/hr	17,193	Crane Weigh Scale
3	Total FW/Steam Flow	kg/hr	143,036	Station Instrument
4	Main Steam Flow	kg/hr	70,206	Station Instrument
5	Feedwater Flow	kg/hr	72,830	Station Instrument
6	Superheater 3 Outlet Steam Temp	deg C	500	Station Instrument
7	Superheater 3 Outlet Steam Press	bar	88	Station Instrument
	Superheater 3 Outlet Steam Press (absolute)	bar	89	-
8	Feedwater Temp	deg C	136	Station Instrument
9	Feedwater Press	bar	101	Station Instrument
	Feedwater Press (absolute)	bar	102	-
10	Continuous Blowdown Rate	kg/hr	0	Verify Valve Closed
11	Boiler Drum Press	bar	96	Station Instrument
	Boiler Drum Press (absolute)	bar	97	-
12	Inlet Air Dry Bulb Temp	deg C	26	Psychrometer
13	Moisture in Combustion Air	deg C	-	Calculated - Psych Chart
14	Total Air Flow	CFM	90,442	Station Instrument
15	Overfire Air Flow	CFM	13,636	Station Instrument
16	Seal Air Flow	CFM	3,211	Station Instrument
17	Overfire Air Press	mbar	46	Station Instrument
18	OFA and Seal Air Temp After Fan	deg C	36	Test Thermocouple
19	Heated Underfire Air Temp	deg C	124	Test Thermocouple or Station
20	IGR Fan Current	Amps	105	Station Instrument
21	Barometric Press	mmHg	750	Barometer
	Barometric Press	bar	1	-
22	Moisture in Combustion Air		-	Calculated - Psych Chart
23	CO_2 in Dry Flue Gas	% vol	11	Manually @ Econ Outlet
24	O_2 in Dry Flue Gas	% vol	8	Manually @ Econ Outlet
25	N_2 in Dry Flue Gas	% vol	80	Calculated
26	H_2O in Flue Gas	% vol	16	Manually @ Econ Outlet
27	Flue Gas Flow	ACFM	110,863	Manually @ Econ Outlet
28	Economizer Exit Gas Temp	deg C	165	Station Instrument
29	Sampling Point Gas Temp	deg C	166	Manually @ Econ Outlet
30	Carbon Injection	kg/hr	4	Station Instrument
31	Ash Discharger Water Bath Temp	deg C	48	Test Thermcouples
32	Aqueous Ammonia Consumption	lph	47	Station Instrument
33	Lime Consumption	kg/hr	172	Station Instrument
34	Lime Specific Gravity			Manual Sampling

HHV TEST 3 CALCULATION SUMMARY

BOILER EFFICIENCY CALCULATION - HEAT LOSS METHOD

(ASME PTC 4, SECTION 5.14), As-Tested Conditions

HEAT OUTPUT		
Steam	11,477.52	kJ/kg
Blowdown	0.00	kJ/kg
Total Heat Output	**11,478**	**kJ/kg**
HEAT LOSSES		
Dry Gas	1,080.92	kJ/kg
Moisture from Fuel/Quench Vapor/SNCR Water	1,992.14	kJ/kg
Moisture from Total Fresh Air	28.76	kJ/kg
Ash Discharger Quench Water	4.08	kJ/kg
Sensible Heat in Dry Bottom Residue	5.48	kJ/kg
Sensible Heat in Dry Fly Ash Residue	10.90	kJ/kg
Unburned Combustibles	43.36	kJ/kg
Radiation & Convection Loss	88.36	kJ/kg
Unaccounted For	73.66	kJ/kg
Total Heat Losses	**3,328**	**kJ/kg**
HEAT CREDIT		
Dry Underfire Air Sensible Heat	493.08	kJ/kg
Dry Overfire Air & Seal Air Sensible Heat	13.28	kJ/kg
Moisture in Incoming Underfire Air	13.46	kJ/kg
Moisture in Incoming Overfire & Seal Air	0.36	kJ/kg
Fuel Sensible Heat	0.88	kJ/kg
Total Heat Credits	**521**	**kJ/kg**
HHV of FUEL	**14,284**	**kJ/kg**
Efficiency	77.5	%

Heat Loss Summary

Dry Gas	7.30%
Moisture from Fuel, Ash Discharger vapor & SNCR	13.46%
Moisture from Total Air	0.19%
Ash Discharger Quench Water Liquid	0.03%
Sensible Heat in Dry Bottom Residue	0.04%
Sensible heat in Dry Fly Ash	0.07%
Unburned Combustibles	0.29%
Radiation/Correction	0.60%
Unaccounted for	0.50%
Total Heat Losses	**22.5%**

HHV TEST 4 - HHV DATA

Test Date: **9/30/2015**

Test Start:	8:00
Test End:	16:00

Pertinent Test Data

No.	Parameter	Unit	Value	Measurement Source
1	Test duration	hr	8	-
2	Refuse Feed Rate	kg/hr	19,123	Crane Weigh Scale
3	Total FW/Steam Flow	kg/hr	141,882	Station Instrument
4	Main Steam Flow	kg/hr	69,621	Station Instrument
5	Feedwater Flow	kg/hr	72,261	Station Instrument
6	Superheater 3 Outlet Steam Temp	deg C	505	Station Instrument
7	Superheater 3 Outlet Steam Press	bar	88	Station Instrument
	Superheater 3 Outlet Steam Press (absolute)	bar	89	-
8	Feedwater Temp	deg C	136	Station Instrument
9	Feedwater Press	bar	101	Station Instrument
	Feedwater Press (absolute)	bar	102	-
10	Continuous Blowdown Rate	kg/hr	0	Verify Valve Closed
11	Boiler Drum Press	bar	96	Station Instrument
	Boiler Drum Press (absolute)	bar	97	-
12	Inlet Air Dry Bulb Temp	deg C	22	Psychrometer
22	Moisture in Combustion Air	deg C	-	Calculated - Psych Chart
14	Total Air Flow	CFM	93,400	Station Instrument
15	Overfire Air Flow	CFM	13,113	Station Instrument
16	Seal Air Flow	CFM	3,346	Station Instrument
17	Overfire Air Press	mbar	46	Station Instrument
18	OFA and Seal Air Temp After Fan	deg C	30	Test Thermocouple
19	Heated Underfire Air Temp	deg C	72	Test Thermocouple or Station
20	IGR Fan Current	Amps	105	Station Instrument
21	Barometric Press	mmHg	753	Barometer
	Barometric Press	bar	1	-
22	Moisture in Combustion Air		-	Calculated - Psych Chart
23	CO_2 in Dry Flue Gas	% vol	12	Manually @ Econ Outlet
24	O_2 in Dry Flue Gas	% vol	8	Manually @ Econ Outlet
25	N_2 in Dry Flue Gas	% vol	79	Calculated
26	H_2O in Flue Gas	% vol	15	Manually @ Econ Outlet
27	Flue Gas Flow	ACFM	115,111	Manually @ Econ Outlet
28	Economizer Exit Gas Temp	deg C	166	Station Instrument
29	Sampling Point Gas Temp	deg C	167	Manually @ Econ Outlet
30	Carbon Injection	kg/hr	4	Station Instrument
31	Ash Discharger Water Bath Temp	deg C	48	Test Thermcouples
32	Aqueous Ammonia Consumption	lph	52	Station Instrument
33	Lime Consumption	kg/hr	152	Station Instrument
34	Lime Specific Gravity			Manual Sampling

HHV TEST 4 CALCULATION SUMMARY

BOILER EFFICIENCY CALCULATION - HEAT LOSS METHOD

(ASME PTC 4, SECTION 5.14), As-Tested Conditions

HEAT OUTPUT		
Steam	10,271.62	kJ/kg
Blowdown	0.00	kJ/kg
Total Heat Output	**10,272**	**kJ/kg**
HEAT LOSSES		
Dry Gas	1,023.39	kJ/kg
Moisture from Fuel/Quench Vapor/SNCR Water	1,947.68	kJ/kg
Moisture from Total Fresh Air	15.81	kJ/kg
Ash Discharger Quench Water	4.30	kJ/kg
Sensible Heat in Dry Bottom Residue	5.75	kJ/kg
Sensible Heat in Dry Fly Ash Residue	9.99	kJ/kg
Unburned Combustibles	45.03	kJ/kg
Radiation & Convection Loss	79.45	kJ/kg
Unaccounted For	67.02	kJ/kg
Total Heat Losses	**3,198**	**kJ/kg**
HEAT CREDIT		
Dry Underfire Air Sensible Heat	222.68	kJ/kg
Dry Overfire Air & Seal Air Sensible Heat	5.89	kJ/kg
Moisture in Incoming Underfire Air	3.53	kJ/kg
Moisture in Incoming Overfire & Seal Air	0.09	kJ/kg
Fuel Sensible Heat	-4.27	kJ/kg
Total Heat Credits	**228**	**kJ/kg**
HHV of FUEL	**13,242**	**kJ/kg**
Efficiency	76.3	%

Heat Loss Summary

Dry Gas	7.60%
Moisture from Fuel, Ash Discharger vapor & SNCR	14.46%
Moisture from Total Air	0.12%
Ash Discharger Quench Water Liquid	0.03%
Sensible Heat in Dry Bottom Residue	0.04%
Sensible heat in Dry Fly Ash	0.07%
Unburned Combustibles	0.33%
Radiation/Correction	0.59%
Unaccounted for	0.50%
Total Heat Losses	**23.7%**

HHV TEST 5 - HHV DATA

Test Date: **10/1/2015**

Test Start:	8:00
Test End:	16:00

Pertinent Test Data

No.	Parameter	Unit	Value	Measurement Source
1	Test duration	hr	8	-
2	Refuse Feed Rate	kg/hr	17,994	Crane Weigh Scale
3	Total FW/Steam Flow	kg/hr	142,449	Station Instrument
4	Main Steam Flow	kg/hr	69,919	Station Instrument
5	Feedwater Flow	kg/hr	72,530	Station Instrument
6	Superheater 3 Outlet Steam Temp	deg C	501	Station Instrument
7	Superheater 3 Outlet Steam Press	bar	88	Station Instrument
	Superheater 3 Outlet Steam Press (absolute)	bar	89	-
8	Feedwater Temp	deg C	136	Station Instrument
9	Feedwater Press	bar	101	Station Instrument
	Feedwater Press (absolute)	bar	102	-
10	Continuous Blowdown Rate	kg/hr	0	Verify Valve Closed
11	Boiler Drum Press	bar	96	Station Instrument
	Boiler Drum Press (absolute)	bar	97	-
12	Inlet Air Dry Bulb Temp	deg C	19	Psychrometer
22	Moisture in Combustion Air	deg C	-	Calculated - Psych Chart
14	Total Air Flow	m3/h	83,489	Station Instrument
15	Overfire Air Flow	m3/h	13,265	Station Instrument
16	Seal Air Flow	m3/h	3,252	Station Instrument
17	Overfire Air Press	mbar	46	Station Instrument
18	OFA and Seal Air Temp After Fan	deg C	29	Test Thermocouple
19	Heated Underfire Air Temp	deg C	144	Test Thermocouple or Station
20	IGR Fan Current	Amps	105	Station Instrument
21	Barometric Press	mmHg	759	Barometer
	Barometric Press	bar	1	-
22	Moisture in Combustion Air		-	Calculated - Psych Chart
23	CO_2 in Dry Flue Gas	% vol	12	Manually @ Econ Outlet
24	O_2 in Dry Flue Gas	% vol	7	Manually @ Econ Outlet
25	N_2 in Dry Flue Gas	% vol	80	Calculated
26	H_2O in Flue Gas	% vol	15	Manually @ Econ Outlet
27	Flue Gas Flow	ACFM	102,573	Manually @ Econ Outlet
28	Economizer Exit Gas Temp	deg C	165	Station Instrument
29	Sampling Point Gas Temp	deg C	166	Manually @ Econ Outlet
30	Carbon Injection	kg/hr	4	Station Instrument
31	Ash Discharger Water Bath Temp	deg C	45	Test Thermcouples
32	Aqueous Ammonia Consumption	lph	59	Station Instrument
33	Lime Consumption	kg/hr	154	Station Instrument
34	Lime Specific Gravity			Manual Sampling

HHV TEST 5 CALCULATION SUMMARY

BOILER EFFICIENCY CALCULATION - HEAT LOSS METHOD
(ASME PTC 4, SECTION 5.14), As-Tested Conditions

HEAT OUTPUT		
Steam	10,923.40	kJ/kg
Blowdown	0.00	kJ/kg
Total Heat Output	**10,923**	**kJ/kg**
HEAT LOSSES		
Dry Gas	971.18	kJ/kg
Moisture from Fuel/Quench Vapor/SNCR Water	1,886.83	kJ/kg
Moisture from Total Fresh Air	10.65	kJ/kg
Ash Discharger Quench Water	4.39	kJ/kg
Sensible Heat in Dry Bottom Residue	5.82	kJ/kg
Sensible Heat in Dry Fly Ash Residue	10.73	kJ/kg
Unburned Combustibles	44.10	kJ/kg
Radiation & Convection Loss	84.43	kJ/kg
Unaccounted For	69.71	kJ/kg
Total Heat Losses	**3,088**	**kJ/kg**
HEAT CREDIT		
Dry Underfire Air Sensible Heat	536.70	kJ/kg
Dry Overfire Air & Seal Air Sensible Heat	5.03	kJ/kg
Moisture in Incoming Underfire Air	6.01	kJ/kg
Moisture in Incoming Overfire & Seal Air	0.06	kJ/kg
Fuel Sensible Heat	-7.40	kJ/kg
Total Heat Credits	**540**	**kJ/kg**
HHV of FUEL	**13,471**	**kJ/kg**
Efficiency	78.0	%

Heat Loss Summary

Dry Gas	6.93%
Moisture from Fuel, Ash Discharger vapor & SNCR	13.47%
Moisture from Total Air	0.08%
Ash Discharger Quench Water Liquid	0.03%
Sensible Heat in Dry Bottom Residue	0.04%
Sensible heat in Dry Fly Ash	0.08%
Unburned Combustibles	0.31%
Radiation/Correction	0.60%
Unaccounted for	0.50%
Total Heat Losses	**22.0%**

ATTACHMENT 5

Source Testing Documents from the MOECC

Ministry of the Environment
Standards Development Branch
40 St. Clair Avenue West
Toronto ON M4V 1M2
www.ene.gov.on.ca

Ministère de l'Environnement
Direction de l'élaboration des normes
40, avenue St. Clair ouest
Toronto, ON M4V 1M2
www.ene.gov.on.ca

Ontario

Via email: celeste.dugas@ontario.ca
TSS File No.: CR:SA:109198:14

December 14, 2015

MEMORANDUM

TO: Celeste Dugas, District Manager
York-Durham District Office
Central Region

FROM: Guillermo Azocar, Source Assessment Specialist
Technology Standards Section
Standards Development Branch

SUBJECT: Comments on the 2015 source testing program conducted at Durham-York Energy Centre E.F.W. facility (Clarington). Amended Environmental Compliance Approval No. 7306-8FDKNX.

Please find enclosed the evaluation of the source testing program report, ORTECH Project No. 21546, dated 2015/11/25, prepared on behalf of Covanta Durham-York Renewable Energy Limited Partnership, and referring to source testing conducted at Durham-York Energy Centre's Energy-From-Waste facility (Clarington, Ontario).

The testing was required by Condition 7 of the Environmental Compliance Approval No. 7306-8FDKNX, issued on 2011/06/28, and the Notice No. 1 of ECA amendment, issued on 2014/08/12.

The objective of this source testing program was to validate that the facility's two thermal treatment trains are capable of meeting their individual performance parameters and their combined emission limits when operating at maximum continuous rating, as required by the source testing definition and conditions listed in the above mentioned ECA.

Sources tested:

- Municipal Solid Waste Energy-From-Waste Incinerator – Thermal Treatment Unit 1
- Municipal Solid Waste Energy-From-Waste Incinerator – Thermal Treatment Unit 2

Combustion Trains
Common Stack

Combustion Trains
Exhaust Duct

Target contaminants:

- Total Suspended Particulate Matter (TSP),
- PM_{10} (filterable and condensable fractions),
- $PM_{2.5}$, (filterable and condensable fractions),
- Metals (18 selected metals, as listed in the ECA's Schedule "D", plus hexavalent chromium),
- Semi-volatile Organic Compounds (7 dioxins and 10 furans isomers, 12 dioxin-like PCBs, 39 selected PAHs, 13 chlorobenzenes, and19 chlorophenols) – as listed in ECA's Schedule "D",
- Volatile Organic Compounds (29 selected VOCs, including 5 aldehydes/ketones, as listed in the ECA's Schedule "D"),
- Hydrogen fluoride (HF),
- Hydrogen chloride (HCl),
- Nitrogen oxides (NO_X),
- Sulphur dioxide (SO_2),
- Combustion gases (oxygen, CO, and CO_2),
- Total organic matter (THC), and
- Odour.

Reference methods used:

- TSP: OSTC Method ON-5,
- $PM_{2.5}$/PM_{10}: OSTC Method ON-7,
- PM condensable: US EPA 40CFR60 Method 202,
- Metals: US EPA 40CFR60 Method 29,
- Hexavalent chromium: US EPA SW-846, Method 0061,
- SVOCs: Environment Canada's Report EPS 1/RM/2,
- VOCs: US EPA SW-846 Method 0030,

- Aldehydes/ketones: State of California Method CARB 430
- HF: US EPA 40CFR60 Method 13B,
- HCl: US EPA 40CFR60 Method 26 (for RATA), and DYEC CEMS (for compliance),
- NOx: US EPA 40CFR60 Method 7E (for RATA), and DYEC CEMS (for compliance),
- SO_2: US EPA 40CFR60 Method 6C (for RATA), and DYEC CEMS (for compliance),
- CO_2: US EPA 40CFR60 Method 3A,
- O_2: US EPA 40CFR60 Method 3A (for emissions normalization at the stack, and RATA undiluted at outlet of combustor), and DYEC CEMS (for compliance – undiluted at outlet of combustor),
- CO: US EPA 40CFR60 Method 10 (for RATA), and DYEC CEMS (for compliance),
- THC: US EPA 40CFR60 Method 25A,
- Odour: OSTC Method ON-6, and
- Stack Gas Parameters: Ontario Source Testing Code's Method ON-1 to ON-4.

Brief Process Description:

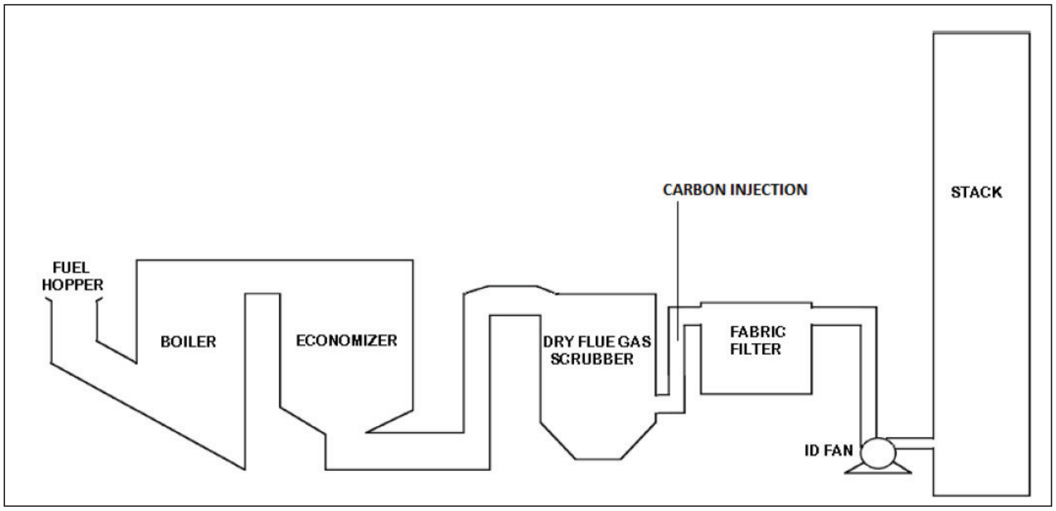
The Durham-York Energy Centre (DYEC) is an energy-from-waste facility built with the aim of processing solid waste from the Regions of Durham and York. The maximum thermal processing rate stated in the ECA is 140,000 tonnes of waste per year. The facility is expected to operate on a continuous basis, 24 hours/day, 7 days/week, 365 days/year, with the waste delivered initially set at 6 days per week between 07:00 and 19:00 hours.

The facility consists of two thermal treatment lines, with each having a MSW processing nominal capacity of 218 t/d of MSW, with a heat content of 13 MJ/kg, to generate 20 MWh of electricity (nominal capacity) and 33,640 kilograms per hour of steam (nominal capacity).

Each thermal treatment line is equipped with independent air pollution control equipment; consisting of a Selective Non-Catalytic Reduction System with ammonia injection (for NOx control), an activated carbon injection system (to reduce mercury and dioxins in flue gas), a dry recirculation lime injection scrubber (to control acid gases), and a pulse jet type baghouse (to control particulate emissions).

The treated exhaust gases from both lines are vented to the atmosphere via a common exhaust stack, having an exit diameter of 1.71 metres, extending 87.6 metres above grade.

Process Diagram:



***Testing Strategy*:**

ORTECH (on behalf of Covanta) conducted the emission testing program at the two thermal treatment lines. Triplicate emission tests were completed for particulate matter, particle size distribution (PM_{10} and $PM_{2.5}$ filterable fraction determination, plus condensables), selected metals, semivolatile organic compounds, aldehydes, acid gases, ammonia, volatile organic compounds and combustion gases.

ZORIX Environmental (on behalf of Covanta) conducted the odour emission testing portion of this source testing program.

During the pre-test plan preparation, it was anticipated that the average hourly non-hazardous waste processing rate for each thermal treatment unit would be 218 t/d, plus or minus 10% (based on the ECA stated maximum nominal capacity of 140,000 t/y); for each unit to produce 33,800 kg/h of steam, to generate 20MWh (~410 MW/d) of electricity.

***Process Information during the source testing*:**

Based on the source testing program conducted from 2015/09/29 to 2015/10/02 the facility's waste throughput averaged 225 t/d for Boiler 1 and 222 t/d for Boiler 2. The steam production was 837 t/d for Boiler 1, and 838 t/d for Boiler 2. The gross power throughput of the facility during that period averaged at 412 MW/d. These process conditions represent ~100% of the thermal treatment lines waste throughput, steam production and power throughput.

Due to integrity concerns with the semi-volatile organic compound samples collected on 2015/09/30 and 2015/10/01; this set of samples were rejected. Two additional triplicate set of samples were collected. The first additional set of samples was collected on 2015/10/21 and 2015/10/22; with the second set on 2015/10/28 and 2015/10/29. During these two additional periods of testing, the facility's waste throughput averaged 222 t/d for Boiler 1 and 220 t/d for

Boiler 2 during the collection of the first set of additional samples; and 222 t/d for Boiler 1 and 227 t/d for Boiler 2 during the collection of the second set of samples.

For Boiler #1, and based on 96 hours of combustion temperature monitoring between 2015/09/29 and 2015/10/02; only 62% of the combustion temperature 1-minute readings were at or above the ECA's 1000°C±1.5% set limit (ECA's Condition 6(2)(a)(ii)); with 91% of those readings at or above the ECA's 1000°C±1.5% limit, when 1-hour averages were calculated (the ECA's Condition 14(4)(c)(viii) requires temperature to be recorded at a minimum on a 1-hour basis).

For Boiler #2, and based on 96 hours of temperature monitoring between 2015/09/29 and 2015/10/02; 83% of the combustion temperature 1-minute readings were at or above the ECA's 1000°C±1.5% set limit (ECA's Condition 6(2)(a)(ii)); with 91% of those readings at or above the ECA's 1000°C±1.5% limit, when 1-hour averages were calculated (the ECA's Condition 14(4)(c)(viii) requires temperature to be recorded at a minimum on a 1-hour basis).

For Boiler #1, and based on 88 hours of residual oxygen monitoring between 2015/09/29 and 2015/10/02; 99% of the residual oxygen 1-minute readings were at or above the ECA's 6% set limit (ECA's Condition 6(2)(b)).

For Boiler #2, and based on 78.7 hours of residual oxygen monitoring between 2015/09/29 and 2015/10/02; 96.3% of the residual oxygen 1-minute readings were at or above the ECA's 6% set limit (ECA's Condition 6(2)(b)).

For the thermal treatment units #1 and #2, the inlet temperature into each baghouse was consistently between 120°C and 185°C, as required by the ECA's Condition 6(2)(h)

The following table summarizes the process conditions during the test periods:

DYEC Energy-From-Waste Facility

ORTECH Report (2015/11/25)

Measurement Parameter		Units	2015-09-29	2015-09-30	2015-10-01	2015-10-02	2015-10-21	2015-10-22	2015-10-21	2015-10-21	Average	Total	Max Allowable
Date													
MSW Usage Rate	Boiler 1	t/d	225	230	227	217	230	223	224	230	226	448	436
	Boiler 2	t/d	213	234	225	216	220	220	225	224	222		
Steam Production	Boiler 1	t/d	841	839	842	827	810	819	824	818	828	1656	1728
	Boiler 2	t/d	841	841	840	828	815	822	822	820	829		
Power Thorughput (gross)	----	MW/d	409	420	417	403	311	405	406	398	396	---	480
Combustion Zone Outlet Temperature	Boiler 1	°C	995	1006	1015	1006					1006	---	1000
	Boiler 2	°C	1031	1037	1030	1010					1027	---	
Baghouse Inlet Temperature	Unit 1	°C	142	142	141	141					142	---	185
	Unit 2	°C	137	138	136	135					137	---	
Combustion Residual Oxygen	Unit 1	%	7.7	7.7	7.6	7.4					7.6	---	≥ 6
	Unit 2	%	8.2	8.3	7.7	7.2					7.8	---	
CO_2 Produced	Unit 1	%	11.3	11.4	11.6	11.7					11.5	---	----
	Unit 2	%	10.9	11.0	11.9	12.2					11.5	---	
Carbon Injection Rate	Boiler 1	kg/d	96	95	95	95	123	124	119	118	108	---	----
	Boiler 2	kg/d	95	91	90	90	123	123	120	118	106	---	
Lime Injection Rate	Boiler 1	kg/d	3968	3973	3940	4417	5653	5644	4140	4090	4478	---	----
	Boiler 2	kg/d	3833	3762	3931	3935	5748	5749	4154	4153	4408	---	
Ammonia Injection Rate	Unit 1	L/d	1212	1315	1438	1368	1180	1218	983	968	1210	---	----
	Unit 2	L/d	1109	1411	1399	1177	1387	1618	1523	1474	1387	---	

Compliance Summary:

The facility met the twelve (12) emission limits set in the ECA's Schedule "C".

The following table summarizes the compliance of the facility during the days when source testing was conducted:

DYEC Energy-From-Waste Facility								
ORTECH Report (2015/11/25)								ECA No. 7306-8FDKNX
Contaminant	**THERMAL TREATMENT**	**Units**	**Test #1**	**Test #2**	**Test #3**	**Average**	**Total**	**Maximum Limit**
IN STACK CONCENTRATIONS								
Total Suspended Particulate Matter	Line 1	mg/Rm^3	0.39	0.49	0.69	0.52	0.47	9
	Line 2		0.46	0.28	0.49	0.41		
Cadmium	Line 1	ug/Rm^3	0.263	0.056	0.080	0.13	0.14	7
	Line 2		0.18	0.09	0.18	0.15		
Lead	Line 1	ug/Rm^3	0.279	0.293	1.13	0.57	0.54	50
	Line 2		0.65	0.43	0.46	0.51		
Mercury	Line 1	ug/Rm^3	1.20	0.976	1.38	1.19	0.95	15
	Line 2		0.90	0.61	0.64	0.72		
Organic Matter (10-minute rolling average)*	Line 1	mg/Rm^3	2.1	1.8	1.7	1.9	----	33
	Line 2		0.0	0.0	4.5	1.5	----	
Dioxins, Furans and Dioxin-Like PCBs**	Line 1	pgTEQ/Rm^3	27.1	26.5	20.1	24.6	24.7	60
	Line 2		24.1	27.6	22.9	24.9		
Hydrochloric Acid (24 hour average)	Line 1	mg/Rm^3	1.69	2.19	3.12	2.33	2.7	9
	Line 2		2.88	3.27	3.12	3.09		
Nitrogen Oxides (24 hour average)	Line 1	mg/Rm^3	112	111	107	110	109	121
	Line 2		112	111	104	109		
Sulphur Dioxide (24 hour average)	Line 1	mg/Rm^3	2.97	6.72	2.90	4.20	2.60	35
	Line 2		1.54	0.61	0.87	1.01		
Carbon Monoxide (4 hour average)	Line 1	mg/Rm^3	15.8	14.8	13.9	14.8	15.3	40
	Line 2		18.3	13.4	15.8	15.8		
Opacity (6 minute average)	Line 1	%	0.0	0.0	0.0	0.0	0.00	10
	Line 2		0.0	0.0	0.0	0.0		
Opacity (2 hour average)	Line 1	%	0.0	0.0	0.0	0.0	0.00	5
	Line 2	%	0.0	0.0	0.0	0.0		

R means that concentrations of the contaminants listed are reported dry basis, and have been normalized to 11% oxygen at a reference temperature of 25^{0}C, and a reference pressure of 101.3 kPa.

* Organic matter as monitor by CEMs, based on 10-minute average.

** Based on WHO 2005 Toxic Equivalent Factors, and on 2015/10/28 and 2015/10/29 testing results.

Emissions Summary:

The source testing was a requirement specified in the amended Environmental Compliance Approval No. 7306-8FDKNX, Condition 7.

Testing was conducted at both thermal treatment lines. No testing was undertaken at the common stack.

An organic matter analysis was conducted to determine the suitability of moving the analyser from the outlet of the combustion chamber to the outlet of the pollution control equipment. Cursory review of the information provided shows some variability; but based on the marginal concentrations reported, the variability is not significant. Further assessment of the data will be undertaken.

A relative accuracy test audit (RATA) was conducted at DYEC CEM systems at both thermal treatment lines. The CEM system for both of the lines passed the audit and it is considered certified to provide traceable and reliable emissions information. No flow stratification or disturbances were reported at the location where the CEM systems' probes were located.

A Pre-test plan for this source testing program was submitted by ORTECH (on behalf of Covanta) and approved by the Technology Standards Section on 2014/10/31, complying with the ECA's Schedule "E".

E-mail notice was received from Covanta on 2015/09/11, indicating that emission testing was scheduled to start on 2015/09/28, complying with the ECA's Schedule "E".

The source testing was conducted from 2015/09/29 to 2015/10/02, complying with the ECA's Schedule "E" stipulated timelines for the conduction of the source testing program.

Staff from the MOECC's Technology Standards Section witnessed (in parts) the source testing program at the thermal treatment units on 2015/09/29, and the odour testing on 2015/10/08.

Due to integrity concerns with the semi-volatile organic compound samples collected on 2015/09/30 and 2015/10/01; this set of samples were rejected. Two additional triplicate set of samples were collected. The first additional set of samples was collected on 2015/10/21 and 2015/10/22; with the second set on 2015/10/28 and 2015/10/29.

The digital version of the source testing report was received on 2015/11/25, complying with the ECA's Schedule "E" condition for submission of the source testing report.

Based on the source testing program conducted from 2015/09/29 to 2015/10/02 the facility's waste throughput averaged 225 t/d for Boiler 1 and 222 t/d for Boiler 2. The steam production was 837 t/d for Boiler 1, and 838 t/d for Boiler 2. The gross power throughput of the facility during that period averaged at 412 MW/d. These process conditions represent ~100% of the thermal treatment lines waste throughput, steam production and power throughput.

During the two additional set of semi-volatile organic compounds samples collected on 2015/10/21 and 2015/10/22; the facility's waste throughput averaged 222 t/d for Boiler 1 and 220 t/d for Boiler 2 during the collection of the first set of additional samples; and 222 t/d for Boiler 1 and 227 t/d for Boiler 2 during the collection of the second set of samples.

At each of the thermal treatment lines, one hundred and sixty-seven (167) contaminants were monitored during the source testing program; including, total suspended particulate matter, PM_{10}, $PM_{2.5}$, condensable particulate matter (inorganic and organic), metals (19), dioxins/furans (17 isomers), dioxin like PCBs (12), polycyclic organic matter compounds (39), chlorophenols (19), chlorobenzenes (12), volatile organic compounds (29), aldehydes and ketones (5), acid gases (3), combustion gases (3), ammonia, organic matter, and odour.

In-stack concentrations at one-minute intervals were monitored by Covanta's CEM systems to validate compliance of the facility based on specified average time (24-hour, 4-hour, 2-hour, 10-

minutes, 6-minute, and 1-minute): twenty-four (24) hour average monitoring reporting for NOx, SO_2, and HCl; four (4) hour average monitoring reporting for CO; two (2) hour and 6-minute average monitoring reporting for opacity; ten-minute average reporting for organic matter; and 1-minute average monitoring reporting for combustion residual oxygen, and carbon dioxide.

The sampling/monitoring equipment calibration was acceptable.

Due to time constraints, a more detailed assessment of emission were conducted only for the thermal treatment line 1.

No issues were reported on the TSP and metals lab analysis report appended. Concentrations above the metals' detection limit were observed for 8 of the 19 target metals for at least one of the test-runs for unit 1.

Particle size distribution conducted successfully for determination of the filterable fraction of PM_{10} and $PM_{2.5}$. The particle size distribution results indicated that particles sizes with an aerodynamic diameter of 10 microns (PM_{10}) and lower represented 79.2% by weight of the sample collected; while particles with an aerodynamic diameter of 2.5 microns ($PM_{2.5}$) and lower represented 44.4% by weight of the sample collected.

Inorganic particulate matter condensable fraction was lost due to analytical mismanagement. This missing fraction is not considered significant as to invalidate the PM_{10} and $PM_{2.5}$ reported emissions. Part of the inorganic condensable particle fraction can be obtained from the metals train, if considered relevant.

Semi-volatile organic compound samples were collected on 2015/09/30 and 2015/10/01. This set of samples was rejected. Two additional triplicate set of samples were collected. The first additional set of samples was collected on 2015/10/21 and 2015/10/22; with the second set on 2015/10/28 and 2015/10/29. For compliance determination the second set of tests was used for this assessment.

Recoveries of the samples were within the reference method specifications. Ionic interference was observed for the tetra furan as well as the tetra dioxin. All the other dioxin and furan isomers were detected during at least one of the test-runs.

Six (6) out of the 12 dioxin- like PCBs were detected during at least one of the test-runs.

No issues were found with the PAHs' lab analysis report. Manual integration of the peaks was performed probably due to ionic background interferences. From the 39 PAHs monitored, 18 were detected during at least one of the test-runs.

No issues were found with the chlorophenols and chlorobenzenes' lab analysis report. From the 13 chlorobenzenes monitored, eight were detected during at least one of the test-runs. Only one of the 19 chlorophenols monitored were detected (4-monochlorophenol).

No issues were found with the VOCs' lab analysis report. Fourteen of the 29 VOCs monitored were detected at least during one of the nine test-runs conducted.

No issues were found with the HCl, HF and ammonia lab analysis' report. HCl and ammonia were detected during the three test-runs conducted. HF was not detected.

No issues were reported for the aldehydes' lab analysis. Acetone, acetaldehyde, formaldehyde and methyl ethyl ketone were detected during at least one of the test-runs. Acrolein was not detected in any of the three test-runs conducted.

Odour emissions were monitored at the tipping floor. It is considered the best location, as it will reflect the worst case scenario odour emissions that can be expected if the emissions are not treated through the boilers. Concerns were identified with the flow rate used for calculating the odour impact. ZORIX used 11 m^3/s; while each line is showing processing flow at a rate of 17 m^3/s. The flow rate to be used in the dispersion modelling should be the aggregate of the wet standard flow handled by the two thermal treatment lines, if the intention is to indicate worst scenario based on all the odorous emissions being treated by the boilers before exhausting to the atmosphere.

The other indicated source of potential fugitives was identified as the trucks transporting the waste to the facility. It is believed that the Covanta odour management plan addresses the potential concerns from the trucks.

Zero opacity was reported during most of the time the source testing program was being conducted.

The emission measurements were conducted satisfactorily according to the Ontario Source Testing Code (OSTC), reference methods used, and following the pre-test plan prepared by ORTECH (ORTECH Project 21546), approved by the Technology Standards Section on 2014/10/31.

ORTECH's stack gas parameters and emissions reported were not significantly different from the one calculated by the MOECC's TSS for the Thermal Treatment Line 1. Consistency with MOECC's TSS calculations was not assessed for Line 2 results.

Combustion temperature analysis was undertaken by Covanta in order to set up the temperature sensor in a less harsh environmental location. A cursory review indicated suitable correlation. Based on the data, a bias factor was incorporated to reflect actual temperatures at the combustion chamber, when displayed at the control room. Further assessment of this information will be conducted.

Combustion temperature was monitored by Covanta's temperature monitoring system, at 1-minute intervals.

Initial phase of the assessment of the AMESA long term dioxins monitoring system was undertaken during this source testing program. Information is considered inconclusive. More information is required to be gathered when the next source testing program takes place. Covanta and the MOECC TSS are required to harmonize the strategy that will be used to assess the reliability of this monitoring system. This strategy should be in place by the time the 2016 source testing campaign takes place.

Point of Impingement (POI) concentrations were reported but not assessed in this review; therefore, the compliance of the facility with O.Reg419/05 set limits was not validated.

Sincerely yours,

cc: P. Dunn – MOECC York-Durham D.O. (via email: philip.dunn@ontario.ca)
S. Thomas – MOECC York-Durham D.O. (via email: Sandra.thomas@ontario.ca)
L. Hussain - MOECC SDB TSS (via email: lubna.i.hussain@ontario.ca)
C. Ruddy – MOECC SDB TSS (via email: caitlyn.ruddy@ontario.ca)
File AQ-02 (Durham-York Energy Centre)

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Ontario

December 15, 2015

Leon Brasowski
Director, Environmental Engineering
Covanta Durham York Renewable Energy Limited Partnership
LBrasowski@covanta.com

Dear Mr. Brasowski:

RE: Durham York Energy Center - Emissions Testing Report

Ministry of the Environment and Climate Change staff have reviewed the report titled "Covanta Durham York Renewable Energy Limited Partnership Compliance Emission Testing in Accordance with Amended Environmental Compliance Approval (Air) No. 7306-8FDKNX", prepared by ORTECH (Project No. 21546-1,) on behalf of Covanta Durham York Renewable Energy Limited Partnership, for the Durham York Energy Center (DYEC) located in the Municipality of Clarington.

The initial emissions (source) testing of the two thermal treatment lines at the DYEC was conducted by ORTECH from September 29, 2015 to October 2, 2015. Due to concerns with the sample integrity the results from this testing were not considered representative of emissions and subsequent source testing was completed. The additional source tests were completed between October 21- 22, 2015 and again between October 28- 29, 2015. The source testing was conducted in accordance with the Ontario Source Testing Code and the ministry approved pre-test plan.

The source testing program included a relative accuracy test audit on the Continuous Emissions Monitoring (CEM) systems for both thermal treatment lines at DYEC. The CEM systems for both of the lines passed the audit and the ministry is satisfied that the CEMs are certified to provide traceable and reliable emissions information.

DYEC met the twelve emission limits set out in Schedule "E" of the Environmental Compliance Approval (Air) No. 7306-8FDKNX (ECA). The test results also demonstrated that the DYEC is capable of operating in compliance with Ontario Regulation 419/05 standards and guidelines, including the ECA odour limit. The ministry is satisfied that the DYEC is capable of operating in compliance with its ECA limits.

The emission testing report is deemed acceptable to the ministry. If you have any questions, please contact Sandra Thomas at 905 427 5607 or by email at Sandra.thomas@ontario.ca.

Regards,

Celeste Dugas
District Manager
Ministry of the Environment and Climate Change
York Durham District Office

C: Mirka Januszkiewicz, P.Eng. Director, Regional Municipality of Durham
Laura McDowell, P.Eng. Regional Municipality of York
Gioseph Anello, P. Eng. Manager, Regional Municipality of Durham
Seth Bittman, P.Eng. Project Engineer, Regional Municipality of York
Matt Neild, Plant Manager, Covanta

ATTACHMENT 6

MOECC Letters to Covanta

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Ontario

December 17, 2015

Leon Brasowski
Director, Environmental Engineering
Covanta Durham York Renewable Energy Limited Partnership
LBrasowski@covanta.com

Dear Mr. Brasowski:

RE: Durham York Energy Center - Ash Testing Report

Ministry of the Environment and Climate Change staff have reviewed the report titled "Covanta Durham York Renewable Energy Limited Partnership Commissioning Period Facility Ash Report- Bottom Ash and Fly Ash Characterizations" dated November 2015, revised December 16, 2015 and prepared in accordance with the Ash Sampling and Testing Protocol required by the Amended Environmental Compliance Approval No. 7306-8FDKNX" (ECA), for the Durham York Energy Center (DYEC) located in the Municipality of Clarington.

The tests used to characterize the ash generated at the site were completed in accordance with the regulatory requirements of *Regulation 347* and Condition 7(7) of the ECA.

The ash testing report is acceptable to the ministry. If you have any questions, please contact Sandra Thomas at 905 427 5607 or by email at Sandra.thomas@ontario.ca.

Regards,

Celeste Dugas
District Manager
Ministry of the Environment and Climate Change
York Durham District Office

C: Mirka Januszkiewicz, P.Eng. Director, Regional Municipality of Durham
Laura McDowell, P.Eng. Regional Municipality of York
Gioseph Anello, P. Eng. Manager, Regional Municipality of Durham
Seth Bittman, P.Eng. Project Engineer, Regional Municipality of York
Matt Neild, Plant Manager, Covanta

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December 11, 2015

Mirka Januszkiewicz, P.Eng.
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The Regional Municipality of Durham
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Laura McDowell, P.Eng.
Director, Environmental Promotion and Protection
The Regional Municipality of York
Laura.McDowell@york.ca

Leon Brasowski
Director, Environmental Engineering
Covanta Durham York Renewable Energy Limited Partnership
LBrasowski@covanta.com

Dear Dear Ms. Januszkiewicz, Ms. McDowell and Mr. Brasowski:

RE: Durham York Energy Center- Acoustic Audit Reports

Staff of the Ministry of the Environment and Climate Change have reviewed the following two reports, prepared for Covanta Durham York Renewable Energy L.P.;

(1) Acoustic Audit Report prepared by Valcoustics Canada Ltd., dated May 8, 2015 and signed by Kathryn Katsiroumpas, P.Eng., and

(2) Supplemental Acoustic Audit Report prepared by Valcoustics Canada Ltd., dated November 23, 2015 and signed by Kathryn Katsiroumpas, P.Eng.

The Acoustic Audits Reports confirm that the sound levels from the operation of the Durham York Energy Center are in compliance with the noise limits set out in Publication NPC-300. The ministry acknowledges that the acoustic audit requirements set out in the Environmental Compliance Approval Number 7306-8FDKNX (ECA) have been fulfilled. The ministry will be issuing a notice of amendment to the ECA in this regard.

If you have any questions, please contact me at 905 427 5607 or by email at Sandra.thomas@ontario.ca.

Regards,

Sandra Thomas

Sandra Thomas
Issues Project Coordinator
Ministry of the Environment and Climate Change
York Durham District Office