If this information is required in an accessible format, please contact 1-800-372-1102 ext. 3540.

The Regional Municipality of Durham
Information Report

From:	Acting Commissioner of Works
Report:	#2023-INFO-85
Date:	October 6, 2023

Subject:

Update on Durham York Energy Centre 2023 Voluntary Source Test

Recommendation:

Receive for information.

Report:

1. Purpose

1.1 The purpose of this report is to provide an update on the 2023 Voluntary Source Test results at the Durham York Energy Centre (DYEC).

2. Background

2.1 As directed by Regional Council, the Owners of the DYEC are to perform an annual Voluntary Source Test in accordance with the procedures and schedules outlined in Schedule “E” of the Environmental Compliance Approval (ECA). The Voluntary Source Test measures the emission rate of the measurable contaminants from the stack.

3. Voluntary Source Test

3.1 The Voluntary Source Test was conducted between April 24, 2023, and April 27, 2023, for all test contaminants on Boiler #1 and Boiler #2.

3.2 The Voluntary Source Test results summary demonstrated that all emissions were within the limits detailed in the ECA (**Attachment #1**).

3.3 The full Voluntary Source Test Report was provided to the Ministry of Environment, Conservation and Parks (MECP) and posted to the project website.

3.4 The DYEC emissions dispersion was modelled utilizing the Voluntary Source Test data and the MECP-approved CALPUFF model. The results of the contaminants concentrations at the maximum point of impingement were then compared to the limits within the Ontario Regulation 419/05 Air Pollution – Local Air Quality. Ontario Regulation 419/05 Air Pollution – Local Air Quality limits are set to protect human health and the environment.

3.5 All the calculated impingement concentrations were well below the regulatory limits.

4. Owners' Consultant Reviews

4.1 Ausenco, the Source Test peer reviewer, provided their final report (**Attachment #2**) to the Region on September 15, 2023. Ausenco concluded that the review of the Source Testing Report, combined with their on-site observations, have not revealed any major concerns regarding the conduct of the source testing, the analytical analysis, or the analytical calculations. There is also no concern about the validity of the source testing data reported by Ortech, especially regarding comparisons to the relevant in-stack limits.

4.2 Ausenco identified some inconsistencies with regard to the air modelling and suggested a review of the model input files. However, the review determined that the modelling was conducted in accordance with the facility's ECA and O. Reg 419/05. Ausenco noted that a revision will not change the facility's compliance status.

4.3 HDR personnel were also present during the Source Tests. In their report (**Attachment #3),** HDR indicated that they observed the sampling procedures and facility operations throughout most of the testing period between April 24th and April 27th, 2023, and noted ORTECH following the approved stack sampling procedures and test methods. HDR also observed Covanta's plant personnel operating the DYEC under normal operating conditions and in accordance with acceptable industry operating standards. HDR concluded that based on the results summarized in ORTECH's final test report dated July 25, 2023, the air emission results of the Spring 2023 Voluntary Test demonstrated that the DYEC operated below the ECA's Schedule "C" limits.

5. Continued Demonstrated Performance

5.1 DYEC demonstrates consistent performance with the appropriate controls and monitoring, which provide safety and protection to human health and the environment.

5.2 The results of testing completed from 2019 to 2023 are presented in **Attachment #4**. The data indicates that the DYEC has consistently demonstrated that it can safely and effectively operate within the ECA Schedule "C" limits.

5.3 A table demonstrating a comparison of the latest source test results against the ECA limits and A-7 guidelines is presented in **Attachment #5**. It indicates that the DYEC consistently operates and performs below regulatory limits.

5.4 The chart in Figure 1 below shows how far below the regulatory limits each contaminant average falls. The dotted line represents the limits, and the arrows represent the per cent average below the limits.

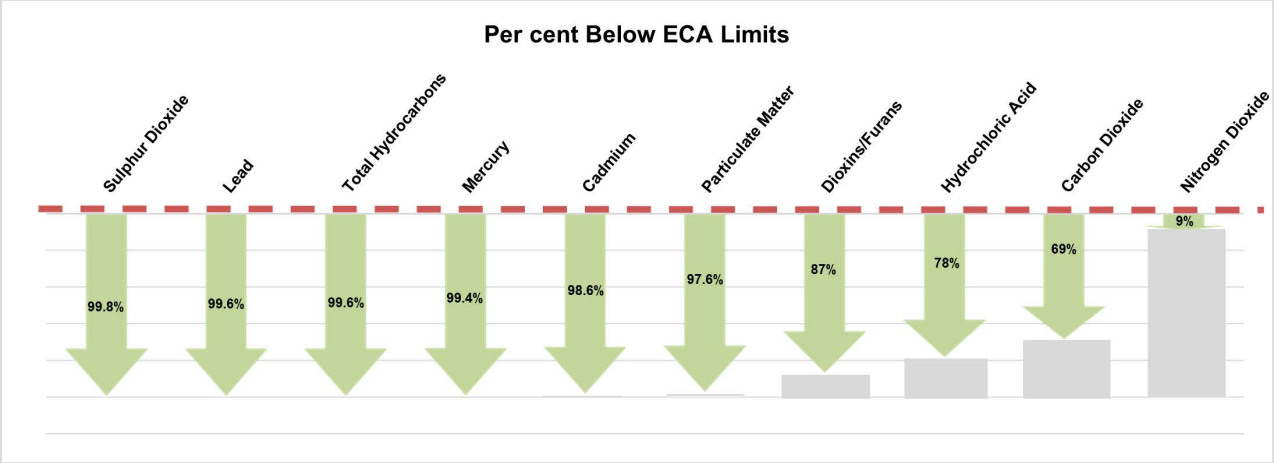


Figure 1: Average Result expressed as a percentage below the regulatory limits.

6. Conclusion

6.1 The Owners' technical consultants and peer reviewers have confirmed that the Voluntary Source Test was conducted in accordance with the Ministry of the Environment, Conservation and Parks' guidelines.

6.2 All results of the Voluntary Source Test were below the concentration limits prescribed in Schedule C of the Environmental Compliance Approval.

6.3 Using CALPUFF dispersion modelling techniques, the predicted maximum point of impingement concentrations, based on the average test results for both boilers, show Durham York Energy Centre to be operating well below all current standards in Regulation 419/05 under the Environmental Protection Act and other Ministry of the Environment, Conservation and Parks criteria including guidelines and upper risk thresholds.

7. Attachments

Attachment #1: Voluntary Source Test Executive Summary

Attachment #2: Ausenco 2023 Voluntary Source Test Final Report

Attachment #3: HDR Inc. 2023 Voluntary Source Test Technical Memorandum

Attachment #4: Source Test Results 2019-2023

Attachment #5: Comparison Table: 2023 Voluntary Source Test Results Compared to ECA limits and Ontario A-7 Guideline

Respectfully submitted,

Original signed by:

Ramesh Jagannathan, M.B.A., P.Eng., PTOE
Acting Commissioner of Works

EXECUTIVE SUMMARY

ORTECH Consulting Inc. (ORTECH) completed a voluntary compliance emission testing program at the Durham York Energy Centre (DYEC) located in Courtice, Ontario between April 24 and April 27, 2023. The voluntary emission testing program was performed at the request of the Regions of Durham and York. The current test program is the eighth voluntary test program conducted at the facility.

Ontario Ministry of the Environment, Conservation and Parks (MECP) Amended Environmental Compliance Approval (ECA) No. 7306-8FDKNX Section 7(1) states that "the owner shall perform annual source testing, in accordance with the procedures and schedule outlined in the attached Schedule E, to determine the rates of emissions of the test contaminants from the stack. The program shall be conducted not later than six months after the commencement date of operation of the facility/equipment and subsequent source testing programs shall be conducted once every calendar year thereafter". A list of the test programs conducted by ORTECH to date is provided below:

Test Program	Test Date	ORTECH Report No.
2015 Compliance	September/October 2015	21546
2016 Voluntary	May 2016	21656
2016 Compliance	October/November 2016	21698
2017 Voluntary	May 2017	21754
2017 Compliance	October 2017	21800
2018 Voluntary	May/June 2018	21840
2018 Compliance	September 2018	21880
2019 Voluntary	June 2019	21936
2019 Compliance	September 2019	21960
2020 Voluntary	June 2020	22001
2020 Compliance	November 2020	22050
2021 Voluntary	June 2021	22081
2021 Compliance	November/December 2021	22085
2022 Voluntary	May 2022	22158
2022 Compliance	November/December 2022	22160
2023 Voluntary	April 2023	22230

Source testing was performed on the Baghouse (BH) Outlet of Boiler No. 1 and BH Outlet of Boiler No. 2 for the test contaminants listed in Schedule D of the ECA.

Triplicate emission tests were completed for particulate matter, metals, semi-volatile organic compounds, acid gases, volatile organic compounds, aldehydes and combustion gases at the BH Outlet of each Boiler. Triplicate emission tests were also completed for total hydrocarbons at the Quench Inlet of each Boiler. The contaminant groups included in the emission test program and the reference test methods used are summarized below:

Test Groups	Reference Method
Particulate and Metals	US EPA Method 29
$PM_{2.5}$/PM_{10} and Condensable Particulate	US EPA Methods 201A and 202
Semi-Volatile Organic Compounds	Environment Canada Method EPS 1/RM/2
Volatile Organic Compounds	US EPA SW-846 Method 0030 (SLO VOST modification)
Aldehydes	NCASI Method ISS/FP-A105.01
Halides and Ammonia	US EPA Method 26A
Combustion Gases:	
Oxygen and Carbon Dioxide	Facility CEM
Carbon Monoxide	Facility CEM
Sulphur Dioxide	Facility CEM
Nitrogen Oxides	Facility CEM
Total Hydrocarbons	ORTECH per US EPA Method 25A

Schedule C of ECA No. 7306-8FDKNX lists in-stack limits for the emissions of various compounds. In-stack emissions limits are given for particulate matter, mercury, cadmium, lead, dioxins and furans and organic matter for comparison with the results from compliance source testing. In-stack emission limits are also given for hydrochloric acid, sulphur dioxide, nitrogen oxides and carbon monoxide calculated as the rolling arithmetic average of data measured by a continuous emission monitoring system (CEMS).

Since relative accuracy and system bias testing was conducted in September 2022, the data recorded by the DYEC CEMS was used to assess against the in-stack emissions limits detailed in Schedule C of the ECA for hydrochloric acid, sulphur dioxide, nitrogen oxides and carbon monoxide. Note the DYEC CEMS data for the days when isokinetic testing was performed at each unit (April 24 to April 27, 2023) was used to determine the minimum, average and maximum concentrations of the combustion gases listed in the ECA. Concentration data measured by ORTECH on April 24 and April 25, 2023 was used to assess against the total hydrocarbons (organic matter) in-stack emissions limit detailed in Schedule C of the ECA.

Consistent with the approach commonly required by the MECP for compliance emission testing programs, the following results are conservative in the sense that when the analytical result is reported to be below the detection limit, the full detection limit is used to calculate emission data and is shown by a "<" symbol. Also, when one or both Boiler results are reported to be below the detection limit, the detection limit was used to conservatively estimate the total emission rate for the Main Stack.

The MECP "Summary of Standards and Guidelines to Support Ontario Regulation 419/05 – Air Pollution – Local Air Quality", dated April 2012, provides an updated framework for calculating dioxin and furan toxicity equivalent concentrations which includes emission data for 12 dioxin-like PCBs. This document was replaced by "Air Contaminants Benchmarks List: standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants", with the most recent version published in April 2023, however the dioxin and furan toxicity equivalent calculation methodology remains the same. The dioxins, furans and dioxin-like PCBs toxicity equivalent emission data was also calculated using half the detection limit for those compounds not detected. The half detection limit data was used to assess against the dispersion modelling Point of Impingement limit. The toxicity equivalent concentrations calculated using the full detection limit, for those compounds less than the reportable detection limit, were used to assess against the in-stack limit detailed in Schedule C of the ECA.

The average results for the tests conducted at Boiler No. 1, along with the respective in-stack emission limits, are summarized in the following table:

Parameter	Test No. 1	Test No. 2	Test No. 3	Average	In-Stack Limit
Total Power Output (MWh/day)*	-	-	-	392	-
Average Combustion Zone Temp. (°C)*	-	-	-	1267	-
Steam (tonnes/day)*	-	-	-	802	-
MSW Combusted (tonnes/day)*	-	-	-	221	-
NO_X Reagent Injection Rate (liters/day)*	-	-	-	718	-
Carbon Injection (kg/day)*	-	-	-	127	-
Lime Injection (kg/day)*	-	-	-	4033	-
Filterable Particulate (mg/Rm^3) (1)	<0.11	<0.18	<0.29	<0.20	9
PM_{10} with Condensable (mg/Rm^3) (1)	<2.88	<4.19	<5.66	<4.24	-
$PM_{2.5}$ with Condensable (mg/Rm^3) (1)	<2.81	<4.11	<4.68	<3.87	-
Hydrogen Fluoride (mg/Rm^3) (1)	<0.098	<0.11	<0.11	<0.10	-
Ammonia (mg/Rm^3) (1)	0.74	0.78	0.74	0.76	-
Cadmium (µg/Rm^3) (1)	0.15	0.049	0.16	0.12	7
Lead (µg/Rm^3) (1)	0.33	0.31	0.21	0.28	50
Mercury (µg/Rm^3) (1)	<0.086	<0.085	<0.084	<0.085	15
Antimony (µg/Rm^3) (1)	<0.046	<0.046	<0.041	<0.044	-
Arsenic (µg/Rm^3) (1)	<0.046	<0.046	<0.041	<0.044	-
Barium (µg/Rm^3) (1)	0.39	0.24	0.60	0.41	-
Beryllium (µg/Rm^3) (1)	<0.046	<0.046	<0.041	<0.044	-
Chromium (µg/Rm^3) (1)	0.90	0.88	0.82	0.87	-
Cobalt (µg/Rm^3) (1)	<0.046	<0.046	<0.041	<0.044	-
Copper (µg/Rm^3) (1)	2.63	2.01	1.81	2.15	-
Molybdenum (µg/Rm^3) (1)	8.31	8.41	7.49	8.07	-
Nickel (µg/Rm^3) (1)	0.79	0.63	0.84	0.75	-
Selenium (µg/Rm^3) (1)	<0.23	<0.23	<0.21	<0.22	-
Silver (µg/Rm^3) (1)	<0.046	<0.046	<0.041	<0.044	-
Thallium (µg/Rm^3) (1)	<0.046	<0.046	<0.041	<0.044	-
Vanadium (µg/Rm^3) (1)	<0.023	<0.023	<0.021	<0.022	-
Zinc (µg/Rm^3) (1)	7.12	7.17	5.49	6.60	-
Dioxins and Furans (pg TEQ/Rm^3) (3)	<2.70	<4.77	<12.4	<6.61	60
Total Chlorobenzenes (ng/Rm^3) (1)	<275	<227	<300	<267	-
Total Chlorophenols (ng/Rm^3) (1)	<161	<159	<161	<161	-
Total PAHs (ng/Rm^3) (1)	<378	<805	<249	<477	-
VOCs (µg/Rm^3) (1)	<261	<165	<969	<465	-
Aldehydes (µg/Rm^3) (1)	<95.5	<95.5	<104	<98.4	-
Total VOCs (µg/Rm^3) (1) (4)	<357	<261	<1073	<563	-
Quench Inlet Organic Matter (THC) (ppm, dry) (2)	0	0.1	0	0.03	50

* based on process data provided by Covanta

(1) dry at 25°C and 1 atmosphere, adjusted to 11% oxygen by volume

(2) dry basis as equivalent methane (average of each 60 minute test with data recorded in 1-minute intervals)

(3) calculated using the NATO/CCMS (1989) toxicity equivalence factors and the full detection limit for those isomers below the analytical detection limit, dry at 25°C and 1 atmosphere, adjusted to 11% oxygen by volume

(4) Includes all components from the volatile organic compounds test list in the ECA (i.e. Volatile Organic Sampling Train and Aldehyde Sampling train components).

The average results for the tests conducted at Boiler No. 2, along with the respective in-stack emission limits, are summarized in the following table:

Parameter	Test No. 1	Test No. 2	Test No. 3	Average	In-Stack Limit
Total Power Output (MWh/day)*	-	-	-	392	-
Average Combustion Zone Temp. (°C)*	-	-	-	1270	-
Steam (tonnes/day)*	-	-	-	798	-
MSW Combusted (tonnes/day)*	-	-	-	222	-
NO_X Reagent Injection Rate (liters/day)*	-	-	-	707	-
Carbon Injection (kg/day)*	-	-	-	128	-
Lime Injection (kg/day)*	-	-	-	3978	-
Filterable Particulate (mg/Rm^3) (1)	<0.34	0.24	0.13	<0.24	9
PM_{10} with Condensable (mg/Rm^3) (1)	<8.93	<3.64	<4.97	<5.85	-
$PM_{2.5}$ with Condensable (mg/Rm^3) (1)	<8.86	<3.49	<4.34	<5.56	-
Hydrogen Fluoride (mg/Rm^3) (1)	<0.11	<0.10	<0.10	<0.10	-
Ammonia (mg/Rm^3) (1)	0.80	<0.28	0.36	<0.48	-
Cadmium (µg/Rm^3) (1)	0.056	0.081	0.11	0.083	7
Lead (µg/Rm^3) (1)	0.070	0.20	0.18	0.15	50
Mercury (µg/Rm^3) (1)	<0.083	<0.093	<0.091	<0.089	15
Antimony (µg/Rm^3) (1)	<0.045	0.074	0.067	<0.062	-
Arsenic (µg/Rm^3) (1)	<0.045	<0.044	<0.043	<0.044	-
Barium (µg/Rm^3) (1)	0.19	1.43	0.15	0.59	-
Beryllium (µg/Rm^3) (1)	<0.045	<0.044	<0.043	<0.044	-
Chromium (µg/Rm^3) (1)	0.90	1.48	0.76	1.05	-
Cobalt (µg/Rm^3) (1)	<0.023	<0.022	<0.021	<0.022	-
Copper (µg/Rm^3) (1)	1.93	1.95	1.53	1.80	-
Molybdenum (µg/Rm^3) (1)	8.57	8.31	7.84	8.24	-
Nickel (µg/Rm^3) (1)	1.08	0.54	0.41	0.68	-
Selenium (µg/Rm^3) (1)	<0.23	<0.22	<0.21	<0.22	-
Silver (µg/Rm^3) (1)	<0.045	<0.044	<0.043	<0.044	-
Thallium (µg/Rm^3) (1)	<0.045	<0.044	<0.043	<0.044	-
Vanadium (µg/Rm^3) (1)	<0.023	0.091	<0.021	<0.045	-
Zinc (µg/Rm^3) (1)	4.26	3.80	6.77	4.94	-
Dioxins and Furans (pg TEQ/Rm^3) (3)	<9.24	<8.67	<9.63	<9.18	60
Total Chlorobenzenes (ng/Rm^3) (1)	<352	<297	<351	<333	-
Total Chlorophenols (ng/Rm^3) (1)	<169	<169	<169	<169	-
Total PAHs (ng/Rm^3) (1)	<312	<371	<194	<292	-
VOCs (µg/Rm^3) (1)	<69.6	<63.1	<64.2	<65.6	-
Aldehydes (µg/Rm^3) (1)	<135	<107	<136	<126	-
Total VOCs (µg/Rm^3) (1) (4)	<205	<170	<200	<192	-
Quench Inlet Organic Matter (THC) (ppm, dry) (2)	0.5	0.4	0.3	0.4	50

* based on process data provided by Covanta

(1) dry at 25°C and 1 atmosphere, adjusted to 11% oxygen by volume

(2) dry basis as equivalent methane (average of each 60 minute test with data recorded in 1-minute intervals)

(3) calculated using the NATO/CCMS (1989) toxicity equivalence factors and the full detection limit for those isomers below the analytical detection limit, dry at 25°C and 1 atmosphere, adjusted to 11% oxygen by volume

(4) Includes all components from the volatile organic compounds test list in the ECA (i.e. Volatile Organic Sampling Train and Aldehyde Sampling train components).

A summary of the minimum, average and maximum concentrations for the combustion gases measured by the DYEC CEMS with in-stack limits listed in the ECA is provided below for the two units.

Boiler No.	Parameter	Minimum	Average	Maximum	In-Stack Limit
Boiler No. 1	Carbon Monoxide (mg/Rm^3) (1)	6.8	9.0	13.3	40
	Hydrogen Chloride (mg/Rm^3) (2)	0.7	0.8	1.3	9
	Nitrogen Oxides (mg/Rm^3) (2)	110	110	111	121
	Sulphur Dioxide (mg/Rm^3) (2)	0	0.02	0.04	35
Boiler No. 2	Carbon Monoxide (mg/Rm^3) (1)	10.3	16.1	27.3	40
	Hydrogen Chloride (mg/Rm^3) (2)	2.7	3.1	3.3	9
	Nitrogen Oxides (mg/Rm^3) (2)	109	110	112	121
	Sulphur Dioxide (mg/Rm^3) (2)	0	0.13	0.3	35

(1) 4-hour average measured by DYEC CEMS, dry at 25°C and 1 atmosphere adjusted to 11% oxygen by volume
(2) 24-hour average measured by DYEC CEMS, dry at 25°C and 1 atmosphere adjusted to 11% oxygen by volume

The emission data measured at each Boiler BH Outlet during the testing program was combined and used to assess the emissions from the Main Stack against the current point of impingement criteria detailed in Ontario Regulation 419/05.

Dispersion modelling was completed using the CALPUFF model (using Version 7.2.1 level 150618 as approved by the MECP in December 2021) by WSP Canada Inc. A summary of the results are provided in the tables appended to this report (Appendix 27) based on calculated ground level Point of Impingement (POI) concentrations for the average total Main Stack emissions. As shown in the tables, the calculated impingement concentrations for all the contaminants were well below the relevant MECP standards. Note the Ontario Regulation 419/05 Schedule 3 limits were updated in April 2023.

In summary, the key results of the emission testing program are:

- The facility was maintained within the operational parameters defined by the amended ECA that constitutes normal operation during the stack test periods. Testing was conducted at a steam production rate of greater than 794 tonnes of steam per day for each Boiler (approximately 98.3% of maximum continuous rating). The maximum continuous rating for the facility is 1614.7 tonnes of steam per day for the two Boilers combined (33.64 tonnes of steam per hour or 807.4 tonnes per day for each Boiler).
- The in-stack concentrations of the components listed in the ECA were all below the concentration limits provided in Schedule C of the ECA.
- Using CALPUFF dispersion modelling techniques, the predicted maximum point of impingement concentrations, based on the average test results for both boilers, show DYEC to be operating well below all current standards in Regulation 419/05 under the Ontario Environmental Protection Act and other MECP criteria including guidelines and upper risk thresholds.

Tables referenced in this report for the tests conducted at Boiler No. 1 and Boiler No. 2 are provided in Appendix 1 and Appendix 2, respectively.

Ausenco

Peer Review of DYEC Air Emissions Source Testing
Peer Review of Voluntary 2023 Source Testing

Photo Credit: https://www.plant.ca/features/cleaner-burn/

Prepared for:

The Regional Municipality of Durham
605 Rassland Road East, Box 623
Whitby, ON L1N 6A3

Project No. 106916-02

September 15, 2023

Prepared by

Ausenco Sustainability Inc.
100 - 1016B Sutton Dr.
Burlington, ON L7L 6B8
T: 905.319.1698
F: 905.319.1801
ausenco.com

Disclaimer

This work was performed in accordance with the Consulting/Professional Services agreement between Ausenco Sustainability Inc., a wholly owned subsidiary of Ausenco Engineering Canada Inc. (Ausenco), and The Regional Municipality of Durham (Client), dated April 3, 2023 (Contract). This report has been prepared by Ausenco, based on fieldwork conducted by Ausenco, for sole benefit and use by The Regional Municipality of Durham. In performing this work, Ausenco has relied in good faith on information provided by others and has assumed that the information provided by those individuals is both complete and accurate. This work was performed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the report was produced. The conclusions and recommendations contained in this report are based upon the applicable guidelines, regulations, and legislation existing at the time the report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

Table of Contents

List of Appendices

List of Acronyms and Abbreviations

Acronym / Abbreviation	Definition
ADMP	Air Dispersion Modelling Plan
AES	Adomait Environmental Services
CARB	California Air Resources Board
CB	Chlorobenzenes
CEM	Continuous Emissions Monitoring
CO	Carbon Monoxide
CP	Chlorophenols
D/F	Dioxins and Furans
DYEC	Durham York Energy Centre
ECA	Environmental Compliance Approval
HCl	Hydrogen Chloride
HF	Hydrogen Fluoride
MECP	Ministry of the Environment, Conservation and Parks
NOx	Nitrogen Oxides
O_2	Molecular Oxygen
O. Reg. 419/05	Ontario Regulation 419/05
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
POI	Point of Impingement
QA/QC	Quality Assurance/Quality Control
SO_2	Sulfur Dioxide
SVOCs	Semi-volatile organic compounds
TEQ	Toxic Equivalents
THC	Total Hydrocarbons

List of Symbols and Units of Measure

Symbol / Unit of Measure	Definition
g/s	gram per second
kg/hour	kilogram per hour
ppm	parts per million
m^3/hour	cubic metre per hour
tonnes/hr	tonnes per hour
µg/s	microgram per second
ng/s	nanogram per second
ng TEQ/s	nanogram of toxic equivalents per second
pg TEQ/Rm^3	picogram of toxic equivalents per reference cubic metre
°F	degrees Fahrenheit
°C	degrees Celsius
%	percent

1.0 Introduction

Ausenco Sustainability Inc. (Ausenco) was retained by The Regional Municipality of Durham (the Region) to provide oversight and expertise in air emissions source testing at the Durham York Energy Centre (DYEC) for the 2023 operating year. Voluntary Source Testing was conducted during the week of April 24th, with testing for semi-volatile organic compounds (SVOCs), including dioxins/furans, occurring on April 27th and 28th. Source testing was completed by ORTECH Consulting Inc. (Ortech), while laboratory analysis of the samples was completed by ALS Canada Ltd. (ALS).

As per the agreement between Ausenco and the Region, the entire scope of the peer review of the report produced by Ortech included the following:

1. Review of Laboratory Procedures and Results (excluding audit review of actual laboratory work).
2. Review of Ortech report[1], including results and discussions from testing campaign.
3. Review of Dispersion Modelling conducted as part of ECA condition 6.1 and Schedule B (excluding odour modelling). This included:
    a. Ensuring that emission estimates were calculated correctly from stack testing samples and laboratory results.
    b. Ensure that dispersion modelling was conducted in accordance with O. Reg. 419/05, and related guidance, such as the MECP's "Air Dispersion Modelling Guideline for Ontario, Version 3.0", dated February 2017 (Updated: April 17, 2023).

This report completes and summarizes all the above required tasks.

[1] Ortech, July 25, 2023. Covanta Durham York Renewable Energy Limited Partnership, Durham York Energy Centre, 2023 Voluntary Compliance Emission Testing Program. Report No. 22230. 804 pp.

2.0 On-Site Source Testing Observations

On-site auditing of the testing was sub-contracted to, and completed by, Adomait Environmental Solutions Inc. (AES), led by Martin Adomait, M.Sc., P.Eng. AES staff were on on-site during stack testing for the two (2) days of sampling for SVOCs, including dioxins and furans (D/F). The on-site review of the Stack Sampling Protocol ensures that it follows sampling methods described in the Ontario Source Testing Code and includes a review of:

1. On-site assessment of testing,
2. Sampling locations,
3. Sampling procedures,
4. Sample recovery and analysis, and
5. Process parameter review.

The following sections were provided to the Region in a memorandum dated May 10th, 2023. They are replicated here for completeness and to provide the Region with a single document summarizing the entirety of the peer review.

2.1 Observations of Process Operations Centre

Current policy, precipitated by COVID-19 pandemic health and safety measures to reduce the risk of infection, placed the control room off-limits to the auditor. Instead, the auditor was stationed in a conference room equipped with a screen to display real-time and recent data related to parameters being monitored. In addition, Excel files containing one-minute data were provided to the auditor at intervals during the stack testing events. The one-minute data corresponded to times of the stack tests for parameters monitored in previous audits, except for the quench-tower inlet/outlet temperatures and moisture levels. The temperatures were provided separately, reported at 10-minute intervals; however, moisture data could only be accessed directly from the system monitors in the control room. Therefore, the April 2023 Voluntary Source Testing audit does not include the monitoring of moisture levels.

The auditing process involved reviewing the Excel files, monitoring the real-time display of trending data, taking notes of anomalies and discussing deviations with facility staff and any measures taken as a result. In addition, rolling averages were calculated from the 1-minute data, consistent with performance requirements, as a measure of the unit's performance during the testing. The rolling averages included:

- O_2 – 60-minute rolling average
- CO – 4-hour rolling average
- NOx – 24-hour rolling average (in this case, portion of day that data was collected)

The following observations of the Process Operations Center were made during the stack testing:

1. As a general observation, parameters being recorded maintained stable readings throughout the observation periods. The few deviations that were observed, such as CO spikes, were typical of previous tests and generally did not persist beyond one minute.
2. The real-time display of carbon dosing for Boiler Unit 1 indicated periods of erratic fluctuations in the dosing on the first day, April 26. Despite the erratic fluctuations, the average feed rate remained stable. Periods of fluctuation occurred from about 9:16 to 10:38, and 11:22 to 11:28. On the second day, April 27, the erratic fluctuations recurred on Unit 1 carbon dosing at about 8:50 and persisted.

At 10:11 the third SVOC stack test on Unit 1 was paused to conduct maintenance on the carbon feed system. The conveyor screw shaft was removed from the hopper and examined. During the examination it was determined to be slightly out of alignment. The shaft was straightened and reinstalled in the hopper. The carbon feed system was allowed to run for a period of time to monitor carbon dosing, and it was confirmed that the problem had been resolved. The SVOC test resumed at 14:05 and was completed without incident at 16:20.

3. The DYEC's Environmental Compliance Approval (ECA) specifies that the O_2 concentration shall not be less than 6% as recorded by the CEM system. O_2 concentrations, calculated as a 60-minute rolling average, ranged from 7.4 to 8.3%, and are, therefore, compliant with the facility's permit.
4. CO concentrations were generally stable throughout the tests, ranging between 2.0 and 68.5 ppm. The calculated 4-hour average ranged from 8.4 to 16.9. Occasional spikes in CO concentration were less than 69 ppm and were likely cold CO spikes that may be attributed to incomplete combustion. In most cases, the CO concentrations immediately returned to typical CO concentrations. However, in one instance the CO spike lasted six minutes within the range of 34 to 63 ppm. The occurrence of CO spikes is normal, and the immediate suppression of spikes indicate that the systems are operating effectively.
5. The combustion zone temperatures for each boiler were maintained above the minimum temperature of 1000°C.
6. The average NOx concentrations during each day of testing ranged between 109 and 110 ppm, which is below the emission limit of 121 ppm calculated as a 24-hour rolling arithmetic average.
7. The quench tower inlet and outlet temperatures showed consistent control, reducing inlet temperatures by 14 to 17°F on average on both monitoring days during sample collection. The inlet temperatures gradually increased each day, from about 165°F in the morning to approximately 170°F by late afternoon. The outlet temperatures generally remained in the low to mid 150's°F.
8. As a result of consistent outlet temperatures from the Quench tower, the baghouse inlet temperatures remained steady, generally between 141°C and 145°C. This is near the midpoint of the performance requirement of 120°C to 185°C set out in the ECA (Section 6(2)(h)). These readings were consistent with observations from previous stack tests (typically in the range of 138°C to 145°C). Consistent temperatures in the baghouse allow comparison between data sets at different times. It is also important when considering the volatilization of various dioxins and furans that may be in particle-bound form in the baghouse. Increased temperatures could volatilize dioxins and furans already captured by the baghouse in particle-bound form.
9. Production at the plant is often evaluated in terms of steam flow. Steam flow was typically in the range of 31 to 35 tonne/hour per boiler, with recorded readings ranging between 29.3 and 35.0 tonne/hr. This is within range of the nominal steam generation rate 72 tonnes per hour of steam listed in the ECA. The production was similar to levels observed during other stack testing campaigns at this plant. Similar production also makes the comparison between different stack tests possible.
10. Carbon doses averaged ~5 to 6 kg/hour, which is consistent with the previous testing campaigns. However, it was increased slightly in the morning of April 27 for Unit 1 during the period of erratic fluctuations. For this period, the average feed rate was about 6.0 kg/hr. During the afternoon, after the problem was resolved, the feed rate was reduced, averaging about 5.2 kg/hr.

11. The lime feed rate generally ranged between 160 and 170 kg/hour, averaging about 165 kg/hr for both units. In one instance the lime feed rate jumped to 197 kg/hr but dropped back to normal levels within minutes. As noted by Covanta personnel, the lime control and wetting mixer systems are set up to respond to certain setpoints and criteria to ensure the outlet emissions are well below permit limits. The acquired 1-minute data for HCl concentrations demonstrate levels well below the permit limits, indicating that the lime control and wetting mixer systems are operating effectively.
12. Airflow remained stable throughout the stack tests. Airflow for Unit 1 generally ranged between 90,000 to 97,000 m^3/hour, and Unit 2 ranged between 93,000 and 97,000 m^3/hour.

2.2 Observations of the Stack Testing Operations

Observations of the stack testing procedures were undertaken during the SVOC sampling part of the program. On the first day of the field observations, the operations of the final Total Suspended Particulate/metals train on Boiler 2 was also observed. The field observations are provided in a series of tables in **Appendix A**.

1. Where possible, leak checks were observed at both the start, traverse change, and at the conclusion of all SVOC tests conducted. When the leak checks were successful, the tests could be regarded as valid. Leak checks were always performed in a systematic and non-rushed manner to ensure good QA/QC. The summary of AES field observations is provided in **Appendix A**.
2. Previous aberrations in the stack velocity measurements were reduced by using metal plates and rubber sealer plates to reduce and almost eliminate these problems. This set-up was similar to previous stack testing exercises.
3. Impinger/XAD temperatures were checked repeatedly at each sampling train. Ortech supplied plenty of ice to the crews. The temperatures were maintained in the range of 3.9°C to 8.3°C (39°F to 47°F). Maintaining low XAD temperatures improves adsorption of dioxins/furans on the sampling media. The temperatures were maintained at reasonably low levels and were deemed acceptable.
4. The audit team also recorded dry gas meter corrections and pitot factors for comparison with the final report.
5. All trains operating at the baghouse outlet locations were inserted and withdrawn from the stack while the sampling train was running. Given the high negative pressure at these locations, it was important to ensure that the filter was not displaced prior to sampling beginning. It also limits loss of any sample from the train.
6. No review of the sample recovery procedures conducted by Ortech staff were performed due to COVID-19 protocols being in effect.

Based on audit staff observations, it was confirmed that Ortech staff followed all appropriate sampling and recovery procedures as noted by the sampling methods (EPS 1/RM/2 and US EPA Method 23).

3.0 Report Review

The Region provided Ortech's draft report to Ausenco on July 11th, 2023, and the finalized report on August 4th, 2023 (the "Report"). Ausenco and AES provided preliminary comments, via email, to the Region dated July 17th, 2023, based on a high level read through of the draft report. The following sections include and expand upon that initial review, and subsequent review of the Report, and include an opinion regarding the sufficiency and accuracy of the submitted analyses.

3.1 Review of Source Testing Protocols

AES has conducted a thorough review of the source testing report and has found no discrepancies between the methods described in the report compared to the observations made during testing. AES is satisfied that all sampling protocols were followed according to appropriate methodologies. Consequently, AES has no concerns over the validity of collected samples, prior to shipment to the laboratory for analysis.

3.2 Review of Analytical Reporting

Ausenco has conducted a thorough review of the source testing report. As per the contract with the Region, focus was given to SVOCs. Based on this review, Ausenco provides the following comments:

1. As per the contract with the Region, the processing, handling, and analysis of laboratory samples were not audited as part of this peer review. Therefore, no statement of efficacy is provided regarding the processing, handling, and analysis of laboratory samples.
2. It is noted that both Ortech and ALS methods for collecting and analyzing SVOCs deviate slightly from reference methods. However, the potential biases and complications from these deviations have been discussed in previous source testing reviews and, therefore, are not discussed further here.
3. Dioxins and Furans

    a) The recoveries of Field Spike Standards of all D/F samples were within the acceptable range of recoveries provided in Environment Canada Reference Method EPS 1/RM/2 (70% – 130%).

    b) For the most part, the Extraction Standards for D/F are within the acceptable range of recoveries provided in Environment Canada Reference Method EPS 1/RM/2, which is either 40% – 130% or 25 – 130%, depending on the specific D/F. However, a few samples had Extraction Standard recoveries of some isomers outside the acceptable range, including Test #3 on APC Outlet #1 and BLANK2. As a result of the low extraction recoveries, the error associated with the determined concentrations may be larger than the standard error associated with the method. However, based on modelling results the D/F plus coplanar PCB TEQ values are more than 250x below the corresponding standards. Therefore, a correction factor for the decreased recoveries would still indicate D/F levels well below the standard. While the reduced recoveries may result in increased error in the determined concentrations, there is currently no concern that the error may lead to values that would have approached or exceeded the relevant in-stack or ambient standards.

    c) The recoveries of Cleanup Standards of all but one of the D/F samples were within the acceptable range of recoveries provided in Environment Canada Reference Method EPS 1/RM/2 (40% – 130%). Test #3 on APC Outlet #1 and BLANK1, at 16% and 153% recovery, respectively, were the only samples to have a recovery outside the method requirement. As described above with the Extraction Standards, the low Cleanup Standards recoveries on these samples are not expected to impact the facility's compliance.

d) Ortech (July 2023: p. 45) noted that "The amounts of dioxin and furan congeners detected in the blank sampling trains and in the laboratory blank were significant when compared to the amounts detected in the test trains". D/F samples, however, were not blank corrected based on the blank sampling train and laboratory blank results. Use of D/F congener concentration data that has not been blank corrected is an acceptable methodology, and consistently results in a concentration estimate that is higher than the true concentration within the samples.

e) Ausenco has conducted a review of the D/F congener group emission rate calculations (ng/s). Starting with the reported laboratory data, Ausenco was able to trace and confirm the calculations presented by Ortech provided in Section 7.9.1 (Page 45).

f) Ausenco has conducted a review of the D/F and dioxin-like PCB toxic equivalents (TEQ's) emission rate calculations (ng TEQ/s). Starting with the reported laboratory data, Ausenco was able to trace and confirm the calculations presented by Ortech provided in Section 7.9.1 (Page 46).

g) A review of the in-stack D/F dry adjusted TEQ concentration was conducted. Ausenco was able to trace and confirm the in-stack TEQ concentration calculations presented by Ortech (see Section 7.9.1, Page 47) and confirm that the D/F TEQ concentrations are below the maximum in-stack limit of 60 pgTEQ/Rm^3.

4. PCBs

   a) The recoveries of the Extraction Standards for PCBs are within the acceptable range of recoveries provided in US EPA Method 1668C (10% – 145%).

   b) The recoveries of Field Spike Standards of all PCB samples were within the acceptable range of recoveries provided in US EPA Method 1668C (70% – 130%).

   c) The recoveries of Cleanup Standards of all PCB samples were within the acceptable range of recoveries provided in US EPA Method 1668C (5% – 145%, or 10% – 145%).

   d) PCB samples were not blank corrected based on the blank sampling train and laboratory blank results. This is an acceptable methodology and will provide an over-estimate of the true concentrations within the samples.

5. Chlorobenzenes

   a) Chlorobenzene samples were not blank corrected based on the blank sampling train and laboratory blank results. This is an acceptable methodology and will provide an over-estimate of the true concentrations within the samples.

   b) Ausenco has conducted a review of the chlorobenzene emission rate calculations (mg/s). Starting with the reported laboratory data, Ausenco was able to trace and confirm the calculations presented by Ortech provided in Section 7.9.2 (Page 48).

   c) Ausenco was previously informed that Ortech had engaged in discussions with ALS about alternate analytical methods to improve recovery of monochlorobenzene. Based on those discussions, an alternative analytical method was chosen for analysis for this Voluntary Source Testing campaign to improve monochlorobenzene recovery. We have reviewed the correspondences between ALS, Ortech and Covanta. Based on this review, we believe that all due diligence was done to ensure an appropriate method was used to analyse for monochlorobenzene. This included informing the Standards Development Branch at the MECP of the proposed alternative analytical method. The MECP noted the change and had no concerns provided monochlorobenzene was reported from an acceptable test method. Furthermore, given that the modelled concentrations for monochlorobenzene are seven to eight orders of magnitude below the corresponding guidelines over the past three testing

campaigns, the variation in analysis method does not impact the conclusion regarding potential exposures to monochlorobenzene, which is extremely small.

6. Chlorophenols

   a) All CP samples experienced low Extraction Standard recoveries (i.e., outside the accepted window of 50 – 150%) for at least one standard, which indicates a potential low bias on the samples. CP sample concentrations were not corrected for this low bias; however, all CP sample concentrations were found to be below the detection limit. Therefore, correction for this bias would not have been statistically meaningful. While the reduced recoveries may result in increased error in the determined concentrations, there is currently no concern that the error may lead to values over and above relevant ambient air quality standards.

   b) Given that CPs in all samples were found to be below detection limit, emission rates for each compound were estimated based on the assumption that each analyte was at a concentration equal to the detection limit. This is an accepted methodology and provides a worst-case assumption to determine potential impacts.

   c) Ausenco has conducted a review of the chlorophenol emission rate calculations (mg/s). Starting with the reported laboratory data, Ausenco was able to trace and confirm the calculations presented by Ortech provided in Section 7.9.2 (Page 48).

7. Polycyclic Aromatic Hydrocarbons

   a) The recoveries of Field Sampling Standards for PAHs are within the acceptable range of recoveries provided in CARB method 429 (50% – 150%).

   b) The recoveries of the Extraction Standards for multiple PAHs were outside the acceptable range of recoveries provided in CARB method 429, which is 50% – 150%. This includes Tests #2 and #3 on APC Outlet #1 and all tests on APC Outlet #2. In all cases the recoveries were biased low, which indicates a potential low bias on the sample results. PAH sample concentrations were not corrected for this low bias. This may result in an underestimation of facility emission rates for PAHs. However, based on modelling results all PAH values are well below the corresponding standards. Therefore, a correction factor for the decreased recoveries would still indicate PAH levels well below the standard. While the reduced recoveries may result in increased error in the determined concentrations, there is currently no concern that the error may lead to values that would have approached or exceeded the relevant in-stack or ambient standards.

   c) PAH samples were not blank corrected based on the blank sampling train and laboratory blank results. This is an acceptable methodology and will provide an estimate of worst-case concentrations within the samples.

   d) Ausenco has conducted a review of the PAH emission rate calculations (mg/s). Starting with the reported laboratory data, Ausenco was able to trace and confirm the calculations presented by Ortech provided in Section 7.9.3 (Page 49).

3.3 Review of Dispersion Modelling

To complete the review of the modelling conducted as part of the source testing, the Region provided the most recent "Air Dispersion Modelling Plan" prepared by Golder, dated July 2020 (the "ADMP"). This report was prepared to outline the proposed dispersion modelling approach for the DYEC for future ECA amendment applications. This plan report was used for comparison to the source testing modelling, which was completed by WSP. WSP's modelling memorandum is provided as Appendix 27 of Ortech's report. The Region provided Ausenco with all relevant modelling files (e.g., input files, output files, etc.) for review.

Based on this review, Ausenco provides the following comments:

1. Ausenco confirmed that the CALPUFF and CALPOST version numbers and level numbers used in the model (as indicated in the corresponding input file) matches those provided in WSP's memorandum.
2. Ausenco confirmed that the CALPUFF options outlined in Table 2 of WSP's memorandum matches Table B1 of the ADMP.
3. Ausenco also confirmed that for modelling years 2017 and 2018 all CALPUFF options and flags within the supplied input files matched Table B1 of the ADMP. The 2017 year was chosen for review as it provided the highest 1-hr, 24-hr, and annual Point of Impingement (POI) values.
4. Ausenco confirmed the source parameters provided in Table 3 of WSP's memorandum relative to the source testing results.
5. For the 2017 and 2018 years, Ausenco confirmed that the CALPUFF input file contained one (1) point source with stack height, and diameter corresponding to the values in Table 3 of WSP's memorandum. The input file also utilized a unit emission rate (i.e., 1 g/s). There is a minor discrepancy with the exit temperature of the point source not matching the value listed in Table 3 of WSP's memorandum. However, this discrepancy is minor and will not materially impact the modelling results.
6. As a worst-case scenario, Ausenco reviewed the Dispersion Factors (without meteorological anomaly removed) provided in Table 4 of WSP's memorandum to confirm that they matched the maximum value provided in the CALPOST output files for all five years modelled. The values provided in the report agreed extremely well with the output files.

Averaging Period	10-min	½-hr	1-hr	24-hr	30-day	Annual
WSP Dispersion Factor before meteorological anomaly removal [µg/m³ per g/s]	51.52	37.47	31.23	1.32	0.17	0.06
Output File Dispersion Factor without meteorological anomaly removal [µg/m³ per g/s]	51.57	37.92	31.23	1.32	0.17	0.06

7. To review the Emission Summary Table provided (Appendix B of WSP's memorandum), a small number of critical chemicals were chosen to ensure that emission rates were multiplied by the Dispersion Factor shown in Table 4. In all cases, POI values were appropriately estimated for the corresponding averaging time. The list of substances reviewed were:
   a. Benzo(a)pyrene
   b. Chlorobenzene
   c. Dioxins, Furans, and Dioxin-like PCBs
8. The D/F emission rate used to estimate POI values appears to be using D/F concentrations estimated using the full detection limit approach. However, Section 7.9.1 of the report indicates that the half detection method limit approach was used for modelling. Given that the use of assumed concentrations at the detection limit would provide a conservative assessment of facility impact, we have no concern over this apparent discrepancy. Furthermore, the POI value for Dioxins, Furans, and Dioxin-like PCBs is well below the standard.

Based on the above review, there are no concerns with the conduct of the modelling. POI values presented in Appendix B of WSP's memorandum of the report provide a conservative estimate of potential impacts and are well below MECP criteria.

4.0 Conclusions

In conclusion, the review of the Source Testing Report, combined with our on-site observations, has not revealed any major concerns with regard to the conduct of the source testing, the analytical analysis, or the analytical calculations. Therefore, at this time, there are no concerns about the validity of the source testing data reported by Ortech especially with regard to comparisons to the relevant in-stack limits.

Ausenco has confirmed that WSP conducted the modelling in accordance with the facility's ECA (Condition 6.1 and Schedule B), as well as O. Reg. 419/05. However, some minor discrepancies were found between the model input files and the source testing data. We recommend that WSP review our comments and revise the modelling as needed. These revisions, however, are not expected to change the compliance status of the facility, as the facility's POI values are well below the specified MECP standards, based on the provided analysis.

5.0 Closure

We have appreciated the opportunity of working with you on this project and trust that this report is satisfactory to your requirements. Please feel free to contact the undersigned regarding any questions or further information that you may require.

Report prepared by:
Ausenco Sustainability Inc.

ORIGINAL SIGNED

Lucas Neil, PhD
Project Manager, Atmospheric Services

Report prepared by:
Adomait Environmental Solutions Inc.

ORIGINAL SIGNED

Martin Adomait, M.Sc., P.Eng.

Appendix A

AES Field Notes

	Semi-Volatiles-1		Semi-Volatiles-1	
Date	April 26-23		April 26-23	
Observation	Boiler #1		Boiler #2	
Nozzle Size/Type	0.251 glass		0.251 glass	
Meter Cal/ID	CAE 20090 1.000		CAE 20083 1.002	
Pitot cal	0.843		0.841	
Calc Moisture	-		-	
Static	-10.7		-10.8	
Pitot Leak Check	Yes good		Yes good	
Pre-traverse Leak Check	0.008@16”		0.009@15”	
SVOC Test Start Time	8:24		8:50	
Running On Insertion	Yes		Yes	
Stack temperature °F	280,282,284		220,284,283,287	
Trap temperature °F	39,41,44,43,44		42,44,43,43,43	
Running on removal	Yes		Yes	
Traverse Completed	11:01		10:50	
Post-traverse Leak Check	0.003@13”		0.009@17.5”	
Pre-traverse Leak Check		0.003@13”		0.004@17”
SVOC Traverse Start Time		11:08		11:13
Stack temperature °F		283,286,284		285,287,286
Trap temperature °F		43,43,44,45,46		42,43,44,45,45
Traverse Completed		13:08		13:15
Final Leak Check		0.002@15”		0.006@17”
Running on removal		Yes		Yes

Note: The Boiler 1 console lost power at 9:22. The probe was pulled without running. Moved probe to manual power and restarted test at 9:59. Manual power to probe was replaced with controlled power at 11:15.

	Semi-Volatiles-2		Semi-Volatiles-2	
Date	April 26-23		April 26-23	
Observation	Boiler #1		Boiler #2	
Nozzle Size/Type	0.251 glass		0.251 glass	
Meter Cal/ID	CAE 20090 1.000		CAE 20083 1.002	
Pitot cal	0.843		0.841	
Calc Moisture	-		-	
Static	-10.7		-10.8	
Pitot Leak Check	Yes good		Yes good	
Pre-traverse Leak Check	0.012@15”		0.006@17”	
SVOC Test Start Time	14:43		14:09	
Running On Insertion	Yes		Yes	
Stack temperature °F	245,281,282,282		285,285,285,285	
Trap temperature °F	43,44,40,38,40		43,44,42,43,43	
Traverse Completed	16:42		16:09	
Running on removal	Yes		Yes	
Post-traverse Leak Check	0.002@14”		0.002@17”	
Pre-traverse Leak Check		0.003@17”		0.002@17”
SVOC Traverse Start Time		16:53		16:19
Stack temperature °F		280,283,281		286,285,277
Trap temperature °F		43,43,44,44,39		44,46,43,43,43
Traverse Completed		18:53		18:19
Final Leak Check		0.003@14.5”		0.001@17”
Running on removal		Yes		Yes

	Semi-Volatiles-3		Semi-Volatiles-3		Metals/Particulate-3	
Date	April 27-23		April 27-23		April 26-23	
Observation	Boiler #1		Boiler #2		Boiler #2	
Nozzle Size/Type	0.251 glass		0.251 glass		0.212 glass	
Meter Cal/ID	CAE 20090 1.000		CAE 20083 1.002		ORTECH 20094 0.961	
Pitot cal	0.843		0.841		0.842	
Calc Moisture	-		-		16.3%	
Static	-10.7		-10.8		-10.8	
Pitot Leak Check	Yes good		Yes good		Yes good	
Pre-traverse	0.004@15”		0.005@16.5”		0.002@13”	
SVOC Test Start	8:06		8:06		8:47	
Running On	Yes		Yes		Yes	
Stack	279,281,284,284		282,284,285,285		286,285,284	
Trap	45,44,43,45,45		47,44,46,44,45			
Traverse	14:09		10:06		10:17	
Post-traverse	0.005@18”		0.007@17”		0.003@13”	
Running on	Yes		Yes		Yes	
Pre-traverse		0.004@16”		0.007@17”		0.004@13”
SVOC Traverse		14:20		10:15		11:18
Stack		282,284,284,280		285,286,287,288		285,284,282
Trap		39,41,40,41,42		48,44,50,52,48		
Traverse		16:20		12:15		12:48
Final Leak Check		0.001@19”		0.006@17		0.007@13”
Running on		Yes		Yes		Yes

Note: Boiler #1 test paused at 10:01. Probe removed running. Carbon feed system repaired and tested. Restart test at 14:04.

Ausenco

Find a better way.

www.ausenco.com

Technical Memorandum

To: Andrew Evans, PEng, Region of Durham

Cc: Lipika Saha, PEng (Region of Durham)

Muneeb Farid, PEng (Region of York)

Annette Scotto, Kirk Dunbar, Alan Cremen, John Clark (HDR)

From: Bruce Howie, PE

Date: August 22, 2023

Re: **Durham York Energy Centre: Spring 2023 Stack Test**
HDR Observations During Testing and Summary of Results

Introduction

During the period from April 24 through April 27, 2023, ORTECH Consulting, Inc. (ORTECH) conducted the Voluntary Source Test at the Durham York Energy Center (DYEC) for the Regions of Durham and York. This voluntary testing has been performed annually since the start of Commercial Operation in 2016. Testing was performed in accordance with the reference methods required under Section 7(1) of the Amended Environmental Compliance Approval (ECA) No. 7306-8FDKNX, originally issued by the Ontario Ministry of Environment, Conservation and Parks (MECP) on June 29, 2011. HDR personnel were on-site to observe DYEC operations and stack sampling procedures during the testing on April 25th to April 27th. The purpose of this technical memorandum is to summarize the observations made by HDR personnel during the testing as well as to summarize our review of the results for the Source Test based on the information provided in the ORTECH Test Report dated July 25, 2023.

HDR Observations during the Compliance Source Test

The tentative testing schedule for the April 2023 Voluntary Source Test is included in Attachment A to this Technical Memorandum. Also included in Attachment A is a summary of the testing observed by HDR. HDR's role on-site was to observe Covanta's operations of the DYEC during test sampling, and to observe ORTECH's sampling procedures and activities. HDR personnel were on-site during the air emission testing on April 25th to April 27th to observe the source test sampling activities with particular focus on the Method 23 tests for Dioxins/Furans on both Units 1 and 2. HDR observed the operations of the boiler and air pollution control systems to verify the DYEC was being operated under normal operating conditions during the test periods. The following is a

summary of the key events and observations made by HDR during the sampling days that we were at the DYEC. Attachment A shows the start and stop times of each test.

Day 1: Monday, April 24th

Stack testing commenced at 09:56 and was completed at 18:04. Tests for both Units were completed as scheduled without any observed or reported upsets.

Day 2: Tuesday, April 25th

Stack testing commenced at 7:55 and was completed at 20:04. All tests for Unit 1 were completed as scheduled. The Unit 2, Run 1 for Particulate/Metals was discontinued due to the glass filter breaking, which resulted in broken glass in the filter. Particulate/Metals Runs 2 and 3 were completed as scheduled and a re-test of Run 1 was scheduled for the following day (April 26).

HDR observed a leak test of the sampling train on Unit 2 on April 25th and noted that it passed.

- Unit 2 at 13:35 during the Particulate/Metals Run 2 port switch.

The parameters below (data collected at 09:45) were observed to be within the normal range.

Parameter	Normal Range	Unit 1	Unit 2
Steam Load (kg/hr)	32,000-35,000	34,105	32,355
Ammonia (kg/hr)	25-80	35	23
Carbon (kg/hr)	4.5-5.5	NA	5.3
Steam Outlet Temp (°C)	495-502	502	504
Steam Pressure (bar)	86-90	89.9	90.0
Combustion Temps (°C)	>1,000	1,348	1,303
Baghouse dp (mBar)	10-20	18.9	14.9

Day 3: Wednesday, April 26th

Stack testing commenced at 8:25 and was completed at 18:53. Tests for both Units were completed as scheduled, as well as the Unit 2 Particulate/Metals re-test (identified as Run 4) that was originally scheduled for Day 2.

HDR observed three leak tests on April 26th and they all passed:

- Unit 1 at 14:44 during the Dioxins/Furans, Run 2
  - 0.006 cubic feet in 17 inches of vacuum
- Unit 2 at 14:09 during the Dioxins Furans, Run 2
  - 0.012 cubic feet in 15 inches of vacuum
- Unit 2 at 18:19 during the Dioxins Furans, Run 2
  - 0.003 cubic feet in 14.5 inches of vacuum

NOTE: Leak tests should not exceed 0.02 cubic feet in at least 13 inches of vacuum.

The parameters below (data collected at 12:11) were observed to be within the normal range.

Parameter	Normal Range	Unit 1	Unit 2
Steam Load (kg/hr)	32,000-35,000	33,982	33,727
Ammonia (kg/hr)	25-80	38	29
Carbon (kg/hr)	4.5-5.5	6	5.2
Steam Outlet Temp (°C)	495-502	506	511
Steam Pressure (bar)	86-90	89.9	90.0
Combustion Temps (°C)	>1,000	1,290	1,305
Baghouse dp (mBar)	10-20	19.9	15.8

Day 4: Thursday, April 27th

Stack testing commenced at 8:06 and was completed at 16:20. Tests for both Units were completed as scheduled.

HDR observed one leak test on April 27th and it passed:

- Unit 2 at 12:15 during the Dioxins/Furans Run 3

The parameters below (data collected at 11:00) were observed to be within the normal range. The Unit 1 carbon flow was higher than normal due to reported issues with the feed system. As a result, the Unit 1 Dioxins/Furans test was temporarily paused until the issue was resolved and the test was successfully completed.

Parameter	Normal Range	Unit 1	Unit 2
Steam Load (kg/hr)	32,000-35,000	33,148	33,150
Ammonia (kg/hr)	25-80	33	37

Carbon (kg/hr)	4.5-5.5	10	5.2
Steam Outlet Temp (°C)	495-502	506	510
Steam Pressure (bar)	86-90	89.9	90.0
Combustion Temps (°C)	>1,000	1,238	1,254
Baghouse dp (mBar)	10-20	20	15.4

HDR noted that Covanta's Rick Koehler was on-site throughout the testing period to assist in the coordination and to observe the Compliance Source Testing.

Based on HDR's observations of the Source Testing, ORTECH conducted the testing in accordance with the applicable standards and procedures. ORTECH was careful during each port change to ensure that the probe was not scraped inside the port during insertion and removal of the probe. In addition, sampling equipment was assembled properly, the ice used in the sample box was replenished in a timely manner, and all required leak checks were conducted. After each completed test, the sampling trains were transported to a trailer located outside the boiler building for recovery and clean up to avoid potential contamination at the test location. It should be noted that the actual clock times associated with each run, are slightly longer than the run lengths indicated in the test plan. This difference is due to the time required for ORTECH to pull the probe out of the first port, leak check the sampling equipment, and insert the probe into the second port. This is typical of stack sampling practices and is done in accordance with the test plan and approved procedures.

Attachment B provides a summary of the DYEC operating data recorded by Covanta's distributive control system (or DCS) during the Dioxins/Furans tests. As previously noted, HDR did not observe any deviations from the approved test protocol or applicable stack test procedures and based on the operational data and HDR's observations, the boilers and APC equipment were operated under normal conditions during the testing.

Summary of Results

The results of the testing program, based on ORTECH's July 25, 2023 report, are summarized in Table 1 and Figures 1 and 2. As shown, emissions of all pollutants are corrected to 11% oxygen and were below the ECA's Schedule "C" limits. As a part of HDR's review of the ORTECH report, we completed a review of the data presented and calculations. There were no errors in calculations found during this review.

Table 1 – Summary of April 2023 Voluntary Source Test Results

Parameter	Units	ECA Limit	Unit 1		Unit 2	
			Result	% of Limit	Result	% of Limit
Particulate Matter (PM)(1)	mg/Rm^3	9	0.2	2.2%	0.24	2.7%
Mercury (Hg)(1)	$\mu g/Rm^3$	15	0.085	0.6%	0.089	0.6%
Cadmium (Cd)(1)	$\mu g/Rm^3$	7	0.12	1.7%	0.083	1.2%
Lead (Pb)(1)	$\mu g/Rm^3$	50	0.28	0.6%	0.15	0.3%
Hydrochloric Acid (HCl)(2)(3)	mg/Rm^3	9	0.8	8.9%	3.1	34.4%
Sulphur Dioxide (SO_2)(2)(3)	mg/Rm^3	35	0.02	0.1%	0.13	0.4%
Nitrogen Oxides (NO_x)(2)(3)	mg/Rm^3	121	110	90.9%	110	90.9%
Carbon Monoxide (CO)(2)(4)	mg/Rm^3	40	9	22.5%	16.1	40.3%
Total Hydrocarbons (THC)(5)	ppm	50	0.03	0.1%	0.40	0.8%
Dioxins and Furans(6)	pg TEQ/Rm^3	60	<6.61	11.0%	<9.18	15.3%

(1) dry at 25ºC and 1 atmosphere, adjusted to 11% oxygen by volume

(2) based on process data or CEM data provided by Covanta

(3) maximum calculated rolling arithmetic average of 24 hours of data measured by the DYEC CEMS, dry at 25ºC and 1 atmosphere, adjusted to 11% oxygen by volume

(4) maximum calculated rolling arithmetic average of 4 hours of data measured by the DYEC CEMS, dry at 25ºC and 1 atmosphere, adjusted to 11% oxygen by volume

(5) average of three one hour tests measured at an undiluted location, reported on a dry basis expressed as equivalent methane

(6) calculated using the NATO/CCMS (1989) toxicity equivalence factors and the full detection limit for those isomers below the analytical detection limit, dry at 25ºC and 1 atmosphere, adjusted to 11% oxygen by volume

Figure 1 - DYEC Test Results as a Percent of ECA Limit

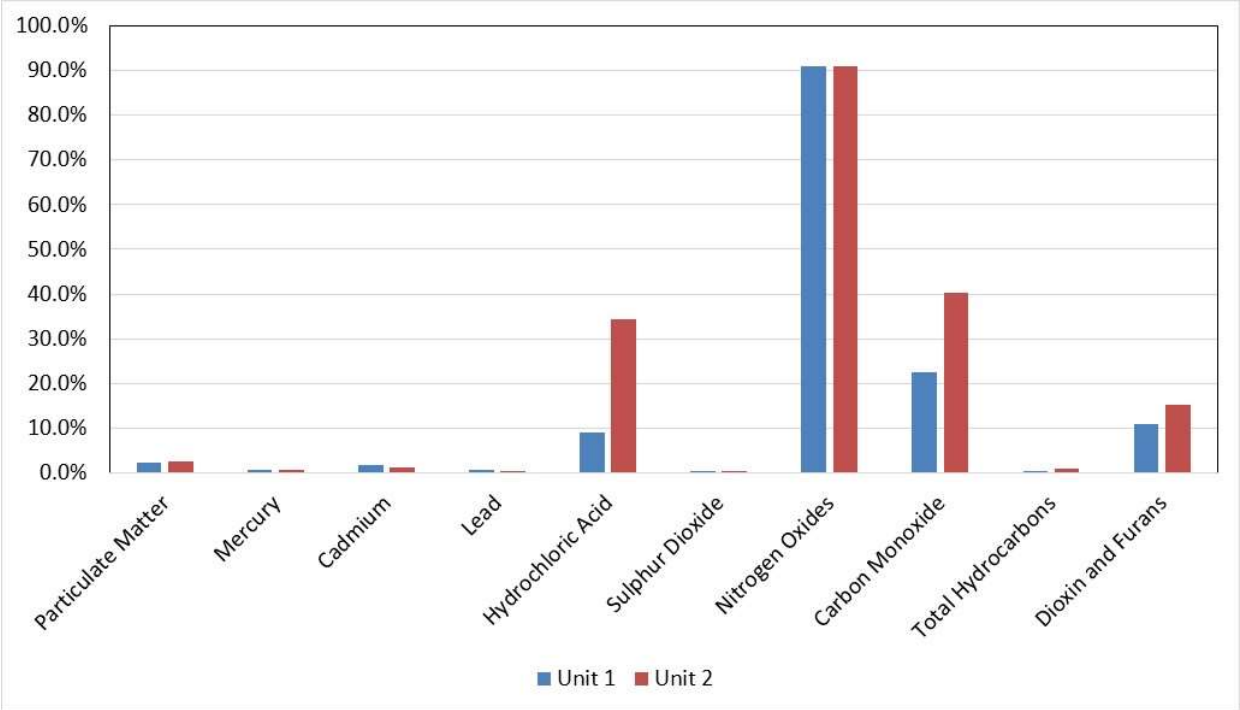
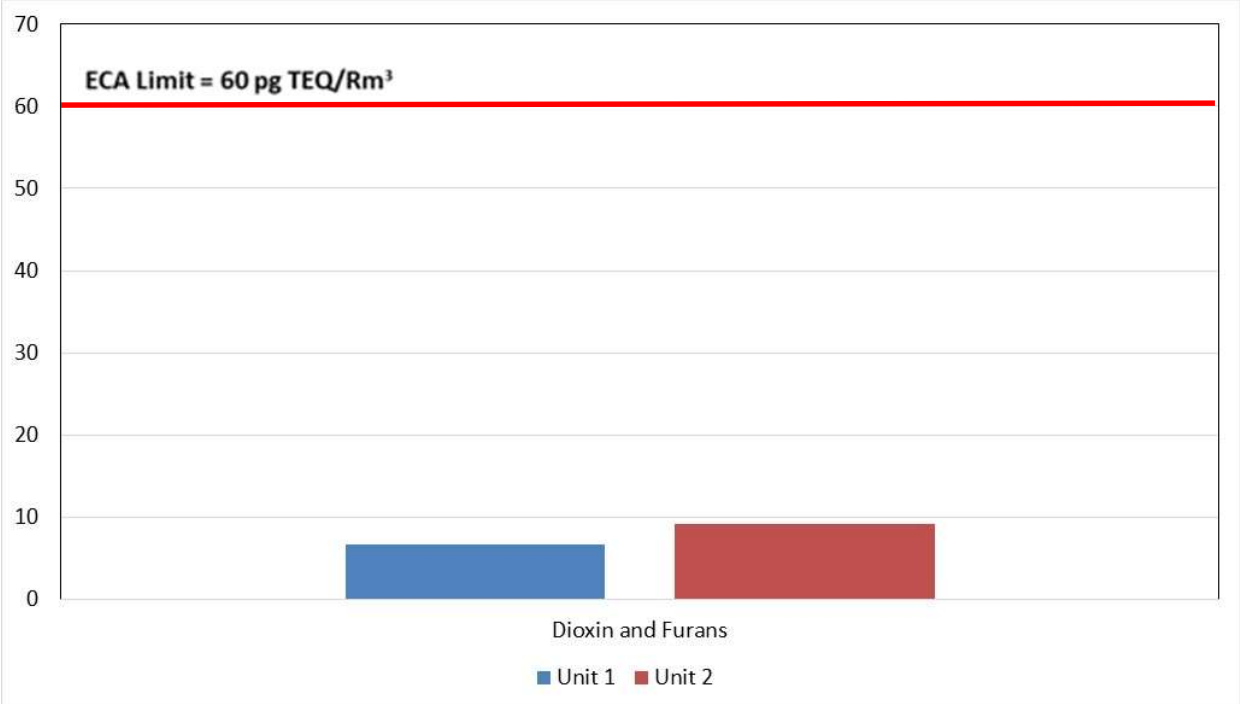


Figure 2 – Test Results for Dioxins and Furans



Conclusions and Recommendations

HDR has completed our review of the preliminary results of the air emissions testing performed during the DYEC Spring 2023 Voluntary Test. Representatives from HDR were present at the DYEC to observe the sampling procedures and facility operations throughout the majority of the testing period that occurred between April 24th through April 27th, 2023. HDR observed ORTECH following the approved stack sampling procedures and test methods. HDR also observed Covanta's plant personnel operating the DYEC under normal operating conditions and in accordance with acceptable industry operating standards. Based on the results summarized in ORTECH's final test report (dated July 25, 2023), the air emission results of the Spring 2023 Voluntary Test demonstrated that the DYEC operated below the ECA's Schedule "C" limits.

Attachments:

Attachment A – Tentative Stack Test Schedule and Summary of Testing Observed by HDR

Attachment B – Summary of Operating Data during Dioxins/Furans Tests

Attachment A: Tentative Stack Test Schedule & Summary of Testing Observed by HDR.

Summary of Testing Observed by HDR.

Day 1: Monday, April 24th

Unit	Test	Run 1		Run 2		Run 3	
		Start	Stop	Start	Stop	Start	Stop
Unit 1	Particulate/Metals	9:56	13:07	14:48	17:56		
Unit 1	Hydrogen Fluoride	9:57	10:57	11:39	12:39	13:42	14:42
Unit 2	PM10, PM2.5 Cond	9:56	11:57	13:05	15:05	16:04	18:04

Day 2: Tuesday, April 25th

Unit	Test	Run 1		Run 2		Run 3	
		Start	Stop	Start	Stop	Start	Stop
Unit 1	Particulate/Metals					15:14	18:21
Unit 1	PM10, PM2.5 Cond	8:06	10:09	10:53	12:56	13:37	15:40
Unit 2	Particulate/Metals*	~~7:55~~	~~11:04~~	12:01	15:09	16:54	20:04
Unit 2	Hydrogen Fluoride	7:56	8:56	10:28	11:28	11:55	12:55

* Particulate/Metals Run 1 Test Discontinued- When removing the filter trap from the probe, the glass filter broke and broken glass pieces ended up on the filter. As a result, the run was discounted and completed on Day 3.

Day 3: Wednesday, April 26th

Unit	Test	Run 1		Run 2		Run 3		Run 4	
		Start	Stop	Start	Stop	Start	Stop	Start	Stop
Unit 1	Dioxins/Furans	8:25	13:09	14:44	18:53				
Unit 2	Dioxins/Furans	8:50	13:13	14:09	18:19				
Unit 1	VOST	8:25	9:05	9:11	9:55	10:00	10:40	10:45	11:25
Unit 2	VOST	8:48	9:28	9:33	10:13	10:19	10:59	11:05	11:45
Unit 1	Aldehydes	11:48	12:48	12:53	13:53	13:58	14:58	-	-
Unit 2	Aldehydes	12:16	13:16	13:54	14:54	14:47	15:57	-	-
Unit 2	Particulate/Metals							8:47	12:48

Day 4: Thursday, April 27th

Unit	Test	Run 1		Run 2		Run 3	
		Start	Stop	Start	Stop	Start	Stop
Unit 1	Dioxins/Furans*					8:06	16:20
Unit 2	Dioxins/Furans					8:06	12:15

*The Unit 1 Run 3 Dioxins/Furans test was paused due to issues with the carbon feed system. The carbon feed system was partially emptied and taken offline for repairs. The issue was resolved, and the test was able to continue.

Attachment B: Summary of Operating Data during the Dioxins/Furans Tests

April 2023 Voluntary Dioxins Testing
Operations Data and Results

	Boiler 1			Boiler 2		
	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
Operating Parameter	26-Apr	26-Apr	27-Apr	26-Apr	26-Apr	27-Apr
MSW Combusted (tonnes/day)						
Steam (kg/hr)	33,542	33,258	33,497	33,490	33,527	33,481
Steam temp	507	503	507	510	510	510
Primary Air Flow	34,978	35,155	34,976	36,815	36,335	36,826
Overfire Air Flow	8,374	8,724	8,191	7,442	7,610	7,904
Tertiary Air (Fresh LN Air)	9,464	9,287	9,435	9,411	9,385	9,376
Tertiary air temperature °C	29.8	30.3	29.9	24.0	25.4	25.3
Lime Injection (kg/day)	164.9	164.9	164.8	164.7	164.7	164.7
Ammonia Injection Rate (liters/m)	0.5	0.5	0.5	0.4	0.6	0.7
Carbon Injection (kg/hr)	5.3	5.3	5.3	5.2	5.3	5.3
Combustion air preheat temp	101.9	95.3	112.7	106.3	99.9	96.9
Average Combustion Zone Temp °C	1,131	1,119	1,109	1,155	1,142	1,124
Superheater #3 Flue gas inlet Temp °C	538	535	537	544	547	543
Economizer Inlet Temp °C	320	320	319	341	341	341
Economize Outlet Temp °C	167	169	168	167	168	167
Quench Outlet Temp °C	152	152	152	151	150	151
Reactor Outlet (BH Inlet) Temp °C	143	143	144	143	143	143
Baghouse Outlet Temp °C	140	139	140	138	138	138
Tertiary Air Header Pressure mbar	60	60	60	60	60	60
Tertiary Air Left mbar	28	25	27	33	32	32
Tertiary air Right mbar	33	33	33	32	32	32
Baghouse Differential Pressure mbar	20	20	20	16	16	15
Oxygen (%) - Boiler Outlet	8.0	8.2	8.4	8.0	8.0	8.2
Oxygen (%) - Baghouse Outlet	9.0	8.8	8.9	9.3	8.7	9.2
CO -Boiler Outlet - mg/Rm3	11.9	8.1	8.5	16.3	16.2	11.2
CO - Baghouse Outlet - mg/Rm3	7.4	5.2	5.4	15.2	15.2	10.0
NOx - mg/Rm3	108.4	107.5	109.3	108.4	108.6	108.4
NH3 mg/Rm3	12.3	12.3	12.2	14.7	14.0	15.2
Flue gas moisture	20%	19%	19%	21%	21%	22%
Outlet/Stack Dioxin - NATO - (pg TEQ/Rm^3)	3.90	3.62	3.53	2.05	7.79	1.90

[1]Average Unit data for the periods corresponding to the test run times.

Attachment 4

Attachment #4 to Report #2023-INFO-85

Table 1: DYEC Source Test Emission Results 2019-2023

Parameter	Emission limit	Spring 2019 Voluntary		Fall 2019 Compliance		Spring 2020 Voluntary		Fall 2020 Compliance		Spring 2021 Voluntary		Fall 2021 Compliance		Spring 2022 Voluntary		Fall 2022 Compliance		Spring 2023 Voluntary	
		Boiler 1	Boiler 2	Boiler 1	Boiler 2	Boiler 1	Boiler 2	Boiler 1	Boiler 2	Boiler 1	Boiler 2	Boiler 1	Boiler 2	Boiler 1	Boiler 2	Boiler 1	Boiler 2	Boiler 1	Boiler 2
Cadmium	7 µg/Rm^3	0.1	0.08	0.18	0.08	0.056	0.11	0.075	0.056	0.068	0.045	0.064	0.02	0.023	0.39	0.063	0.03	0.12	0.08
Carbon Monoxide	40 mg/Rm^3	13.1	12.2	11.2	12.1	15.2	11.4	11.4	14.1	12.6	12.7	9.7	11.7	10.7	15.3	9.1	9.4	9.0	16.10
Dioxins and Furans	60 pgTEQ/Rm^3	4.55	4.58	1.51	3.24	1.82	2.53	28.7	7.26	4.10	7.35	14.7	2.56	7.28	4.10	3.68	3.91	6.61	9.18
Hydrogen Chloride	9 mg/Rm^3	1.9	4.2	3	5.1	4.5	5.1	3.8	3.2	3.1	2.9	2.2	1.8	1.0	3.6	0.4	3.8	0.8	3.1
Lead	50 µg/Rm^3	0.59	0.46	0.54	0.57	0.55	0.61	0.37	0.34	0.44	0.32	0.46	0.17	0.55	0.28	0.23	0.15	0.28	0.15
Mercury	15 µg/Rm^3	0.35	0.1	0.29	0.1	0.13	0.1	0.34	0.045	0.086	0.081	0.053	0.05	0.089	0.09	0.093	0.09	0.09	0.09
Nitrogen Oxides	121 mg/Rm^3	110	110	111	110	109	109	110	110	109	110	111	110	110	110	112	111	110	110
Organic Matter	50 ppmdv	1.8	0.5	0.8	0.3	0.2	1.7	0.5	1.1	1.0	0.4	0	0	0.7	1.5	0.1	0.3	0.03	0.4
Sulphur Dioxide	35 mg/Rm^3	0.03	0.02	0	0.01	0	0	0.1	0.1	0.3	0.7	0.3	0.2	0.02	0.9	0.5	0.6	0.02	0.13
Total Suspended Particulate Matter	9 mg/Rm^3	0.62	0.38	0.61	0.54	1.14	1.04	2.6	2	0.78	0.25	0.48	0.31	0.87	1.58	0.27	0.2	0.20	0.24

Attachment 5 to Report #2023-INFO-85

Table 2: Comparison Table: 2023 Voluntary Source Test Results Compared to ECA limits and Ontario A-7 Guideline

Parameter	Units	Boiler #1	Boiler #2	DYEC Average	DYEC ECA limit	% of ECA limit	Ontario A-7 Guideline
Nitrogen Oxides	mg/ Rm^3	110	110	110	**121**	90.9%	198
Total Suspended Particulate Matter	mg/ Rm^3	0.20	0.24	0.2	**9**	2.4%	14
Sulphur Dioxide	mg/ Rm^3	0.02	0.13	0.1	**35**	0.2%	56
Hydrogen Chloride	mg/ Rm^3	0.80	3.10	2.0	**9**	21.7%	27
Carbon Monoxide	mg/ Rm^3	9.0	16.10	12.6	**40**	31.4%	40
Mercury	µg/Rm^3	0.09	0.09	0.1	**15**	0.6%	20
Cadmium	µg/Rm^3	0.12	0.08	0.1	**7**	1.4%	7
Lead	µg/Rm^3	0.28	0.15	0.2	**50**	0.4%	60
Dioxin/Furans	pg TEQ/Rm^3	6.61	9.18	7.9	**60**	13.2%	80