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The Regional Municipality of Durham
Information Report

From:	Acting Commissioner of Works
Report:	#2024-INFO-17
Date:	March 22, 2024

Subject:

Durham York Energy Centre 2023 Compliance Source Test Update

Recommendation:

Receive for information

Report:

1. Purpose

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

2. Background

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

3. Compliance Source Test

3.1 The Compliance Source Test was conducted between September 19, 2023, and October 4, 2023, for all test contaminants on Boiler #1 and Boiler #2.

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

3.3 The full Compliance Source Test Report was sent 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 Compliance Source Test data and the MECP approved CALPUFF model. The results of the contaminant concentrations at the maximum point of impingement were then compared to the limits within the Ontario Regulation 419/05 Air Pollution – Local Air Quality, which is set to protect human health and the environment.

3.5 All of 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 January 30, 2024. Ausenco concluded that from their review of the draft Source Testing Report, combined with on-site observations, there are no major concerns with regards to the conduct of the source testing, the analytical analysis, or the analytical calculations and therefore, no concerns about the validity of the source testing data reported by Ortech especially with regard to comparisons to the relevant in-stack limits.

4.2 Ausenco's report highlighted minor discrepancies in the air modelling and recommended a review of the model outputs and a revision of the modelling results as needed. The report has been shared with Covanta to follow up with WSP accordingly. Ausenco also noted that the minor discrepancies found in the modelling are not likely to change the compliance status of the facility and that revisions of the dispersion modelling are recommended for completeness only.

4.3 HDR personnel were also present during the Source Tests. In their report (Attachment #3**),** they noted that their representatives were present at the DYEC to observe the sampling procedures and facility operations during a portion of the testing period between September 19 and October 4. HDR observed that ORTECH followed the approved stack sampling procedures and test methods outlined in the test plan. HDR also observed Covanta's plant personnel operating the DYEC under normal operating conditions and in accordance with the ECA and generally accepted industry operating standards. HDR concluded that based on the results summarized in ORTECH's final test report, dated December 19, 2023, the air emission results of the Fall 2023 Mandatory Test demonstrated that the DYEC operated below the ECA's Schedule C limits.

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

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

4.6 A table comparison of the latest source testing results against the ECA limits and A-7 guideline is presented in Attachment #5, which shows DYEC consistently operates and performs below regulatory limits.

5. Conclusion

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

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

5.3 Using approved dispersion modelling techniques, the predicted maximum point of impingement concentrations, based on the average test results for both boilers, show Durham York Energy Centre 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.

5.4 For additional information, contact: Andrew Evans, Director, Waste Management Services, at 905-668-7711 extension 3445.

6. Attachments

Attachment #1: Compliance Source Test Results Summary

Attachment #2: Ausenco 2023 Compliance Source Test Final Report

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

Attachment #4: Source Test Results 2019-2023

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

Respectfully submitted,

Original signed by:

Ramesh Jagannathan, M.B.A, M.ENG., P.ENG., P.T.O.E.
Acting Commissioner of Works

EXECUTIVE SUMMARY

ORTECH Consulting Inc. (ORTECH) completed the annual compliance emission testing program at the Durham York Energy Centre (DYEC) located in Courtice, Ontario between September 19 and October 4, 2023. The emission testing program was performed to satisfy the requirements of the Ontario Ministry of the Environment, Conservation and Parks (MECP) Amended Environmental Compliance Approval (ECA) No. 7306-8FDKNX. Section 7(1) of the ECA 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
2023 Compliance	September/October 2023	22235

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 August 2023, 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 (September 19 to September 22, 2023 for Boiler No. 1, and September 20 to September 21 and October 3 to October 4, 2023 for Boiler No. 2) was used to determine the minimum, average and maximum concentrations of the combustion gases listed in the ECA. Concentration data measured by ORTECH on September 19 and September 20, 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 on April 27, 2018, 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)*	-	-	-	386	-
Average Combustion Zone Temp. (°C)*	-	-	-	1308	-
Steam (tonnes/day)*	-	-	-	792	-
MSW Combusted (tonnes/day)*	-	-	-	211	-
NO_X Reagent Injection Rate (liters/day)*	-	-	-	733	-
Carbon Injection (kg/day)*	-	-	-	128	-
Lime Injection (kg/day)*	-	-	-	3778	-
Filterable Particulate (mg/Rm^3) (1)	0.34	0.78	0.58	0.57	9
PM_{10} with Condensable (mg/Rm^3) (1)	<3.44	2.52	<3.88	<3.28	-
$PM_{2.5}$ with Condensable (mg/Rm^3) (1)	<3.16	2.45	<3.69	<3.10	-
Hydrogen Fluoride (mg/Rm^3) (1)	<0.11	<0.11	<0.11	<0.11	-
Ammonia (mg/Rm^3) (1)	0.52	0.47	0.37	0.45	-
Cadmium (µg/Rm^3) (1)	0.025	2.39	0.076	0.83	7
Lead (µg/Rm^3) (1)	0.49	0.58	0.60	0.56	50
Mercury (µg/Rm^3) (1)	<0.090	<0.085	<0.092	<0.089	15
Antimony (µg/Rm^3) (1)	<0.041	0.063	0.095	<0.066	-
Arsenic (µg/Rm^3) (1)	<0.041	<0.041	<0.043	<0.042	-
Barium (µg/Rm^3) (1)	0.33	1.58	0.38	0.77	-
Beryllium (µg/Rm^3) (1)	<0.041	<0.041	<0.043	<0.042	-
Chromium (µg/Rm^3) (1)	1.55	1.77	1.35	1.56	-
Cobalt (µg/Rm^3) (1)	0.055	0.025	<0.043	<0.041	-
Copper (µg/Rm^3) (1)	1.96	2.19	2.06	2.07	-
Molybdenum (µg/Rm^3) (1)	6.74	6.99	6.76	6.83	-
Nickel (µg/Rm^3) (1)	0.94	0.92	1.28	1.05	-
Selenium (µg/Rm^3) (1)	<0.20	0.71	<0.21	<0.37	-
Silver (µg/Rm^3) (1)	<0.041	<0.041	<0.043	<0.042	-
Thallium (µg/Rm^3) (1)	<0.041	<0.041	<0.043	<0.042	-
Vanadium (µg/Rm^3) (1)	<0.020	0.033	0.036	<0.030	-
Zinc (µg/Rm^3) (1)	4.78	6.81	6.86	6.15	-
Dioxins and Furans (pg TEQ/Rm^3) (3)	<11.2	<11.9	<9.66	<10.9	60
Total Chlorobenzenes (ng/Rm^3) (1)	<242	<216	<258	<239	-
Total Chlorophenols (ng/Rm^3) (1)	<317	<325	<329	<324	-
Total PAHs (ng/Rm^3) (1)	<197	<344	<201	<247	-
VOCs (µg/Rm^3) (1)	<37.8	<28.5	<27.9	<31.4	-
Aldehydes (µg/Rm^3) (1)	465	347	420	411	-
Total VOCs (µg/Rm^3) (1) (4)	<503	<376	<448	<442	-
Quench Inlet Organic Matter (THC) (ppm, dry) (2)	0.7	0.5	0.4	0.5	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)*	-	-	-	360	-
Average Combustion Zone Temp. (°C)*	-	-	-	1280	-
Steam (tonnes/day)*	-	-	-	798	-
MSW Combusted (tonnes/day)*	-	-	-	210	-
NO_X Reagent Injection Rate (liters/day)*	-	-	-	504	-
Carbon Injection (kg/day)*	-	-	-	127	-
Lime Injection (kg/day)*	-	-	-	3827	-
Filterable Particulate (mg/Rm^3) (1)	0.41	0.50	<0.37	<0.43	9
PM_{10} with Condensable (mg/Rm^3) (1)	<4.86	<3.56	<3.31	<3.91	-
$PM_{2.5}$ with Condensable (mg/Rm^3) (1)	<4.59	<3.43	<3.25	<3.76	-
Hydrogen Fluoride (mg/Rm^3) (1)	<0.11	<0.10	<0.11	<0.11	-
Ammonia (mg/Rm^3) (1)	0.52	0.53	0.49	0.51	-
Cadmium (µg/Rm^3) (1)	0.80	0.021	0.28	0.37	7
Lead (µg/Rm^3) (1)	0.31	0.24	0.21	0.25	50
Mercury (µg/Rm^3) (1)	<0.075	<0.085	<0.089	<0.083	15
Antimony (µg/Rm^3) (1)	<0.043	<0.042	0.062	<0.049	-
Arsenic (µg/Rm^3) (1)	<0.043	<0.042	<0.043	<0.043	-
Barium (µg/Rm^3) (1)	1.49	1.25	1.31	1.35	-
Beryllium (µg/Rm^3) (1)	<0.043	<0.042	<0.043	<0.043	-
Chromium (µg/Rm^3) (1)	0.86	0.84	1.20	0.97	-
Cobalt (µg/Rm^3) (1)	<0.022	<0.021	<0.022	<0.021	-
Copper (µg/Rm^3) (1)	1.63	1.58	1.68	1.63	-
Molybdenum (µg/Rm^3) (1)	7.81	7.23	7.60	7.55	-
Nickel (µg/Rm^3) (1)	0.43	0.53	0.83	0.60	-
Selenium (µg/Rm^3) (1)	0.32	<0.21	0.23	<0.25	-
Silver (µg/Rm^3) (1)	<0.043	<0.042	<0.043	<0.043	-
Thallium (µg/Rm^3) (1)	<0.043	<0.042	<0.043	<0.043	-
Vanadium (µg/Rm^3) (1)	0.031	0.033	0.032	0.032	-
Zinc (µg/Rm^3) (1)	3.78	3.84	3.98	3.87	-
Dioxins and Furans (pg TEQ/Rm^3) (3)	<2.92	<2.35	<8.01	<4.43	60
Total Chlorobenzenes (ng/Rm^3) (1)	<238	<265	<290	<264	-
Total Chlorophenols (ng/Rm^3) (1)	NQ	NQ	NQ	NQ	-
Total PAHs (ng/Rm^3) (5)	<192	<617	<481	<430	-
VOCs (µg/Rm^3) (1)	<66.2	<56.1	<50.8	<57.7	-
Aldehydes (µg/Rm^3) (1)	<738	<461	<544	<581	-
Total VOCs (µg/Rm^3) (1) (4)	<804	<517	<595	<639	-
Quench Inlet Organic Matter (THC) (ppm, dry) (2)	0.8	0.3	0	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).

(5) Total chlorophenols were not quantifiable (NQ) due to spike recovery loses during the extraction of the samples by the analytical laboratory.

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)	3.5	8.1	13.5	40
	Hydrogen Chloride (mg/Rm^3) (2)	0.7	1.0	1.5	9
	Nitrogen Oxides (mg/Rm^3) (2)	108	109	111	121
	Sulphur Dioxide (mg/Rm^3) (2)	0	0	0	35
Boiler No. 2	Carbon Monoxide (mg/Rm^3) (1)	6.3	9.9	14.3	40
	Hydrogen Chloride (mg/Rm^3) (2)	3.0	3.1	3.3	9
	Nitrogen Oxides (mg/Rm^3) (2)	110	111	111	121
	Sulphur Dioxide (mg/Rm^3) (2)	0	0.03	0.1	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. (formerly Golder Associates). 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.

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 766 tonnes of steam per day for each Boiler (approximately 94.9% 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.

Peer Review of Compliance 2023 Source Testing

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

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Disclaimer

Attachment #2 to Report #2024-INFO-17

This work was performed in accordance with the Consulting/Professional Services agreement between Ausenco Sustainability ULC, 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.

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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. Compliance Source Testing was conducted the week of September 18th, with testing for semi-volatile organic compounds (SVOCs) and dioxins/furans occurring on September 21st and 22nd. However, due to repairs required on Boiler 2, dioxin and furan sampling for Unit 2 occurred on October 3rd and 4th. 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 January 16th, 2024. 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

The auditor was stationed with Covanta's environmental engineer in a conference room equipped with a screen to display real-time data related to parameters being monitored. In addition, Excel files containing one-minute data corresponding to the stack testing periods were provided to the auditor. The one-minute data included parameters monitored in previous audits, except for the quench-tower inlet/outlet temperatures and moisture levels. The temperatures were provided separately, reporting at 10-minute intervals; however, moisture data could only be accessed directly from the system monitors in the control room. Moisture levels are not considered a significant parameter for the purpose of this audit and have not been recorded for the audit since June 2020. AES staff were in regular contact with Covanta's environmental engineer, who is the primary contact for production issues, should they have arisen.

The auditing process involved reviewing the Excel files, monitoring the real-time display of trending data, taking note 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:

- O2 – 60-minute rolling average
- CO – 4-hour rolling average
- NOx – 24-hour rolling average (in this case, portion of day that data was collected)

Source tests for dioxin and furans for both Units 1 and 2 are typically run concurrently. However, it was necessary to take Unit 2 offline due to plugging of the feed chute for Boiler 2. The timing of this incident prevented Unit 2 from being tested concurrently with Unit 1. Unit 1 was tested on September 21st and 22nd, while Unit 2 was tested on October 3rd and 4th, 2023.

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

1. As a general observation, parameters being recorded for this review 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. Oxygen concentrations, calculated as a 60-minute rolling average, ranged from 7.1 to 8.0%. The ECA specifies that the 60-minute average oxygen concentration shall not be less than 6% as recorded by the Continuous Emission Monitoring (CEM) system.
3. CO concentrations were generally stable throughout the tests, ranging between 1.7 and 58.1 ppm. The calculated 4-hour average ranged from 6.7 to 11.1 ppm, well below the in-stack emission limit of 35 ppm. Occasional spikes in CO concentration were less than 59 ppm and were likely cold CO spikes that may be attributed to incomplete combustion. Generally, the CO spikes returned to typical CO concentrations within one to three minutes. The occurrence of CO spikes is normal, and the immediate suppression of spikes indicate that the systems are operating effectively.
4. The combustion zone temperatures for each boiler were maintained above the minimum temperature of 1000°C.
5. The average NOx concentrations for the hours of testing each day ranged between 109 and 111 ppm which is below the emission limit of 121 ppm calculated as a 24-hour rolling arithmetic average.
6. The quench tower inlet and outlet temperatures showed consistent control, reducing inlet temperatures by 9.4°C to 11.2°C on average. The inlet temperatures varied within a 7-degree band, with daily averages ranging from 76°C to 78°C (169°F to 172°F). A gradual rise in temperature over the day was observed for both Units. The outlet temperatures remained within 65°C to 69°C (approximately 150°F to 156°F).
7. As a result of consistent outlet temperatures from the Quench tower, the baghouse inlet temperatures remained steady, generally between 140°C and 145°C for Unit 1 and between 143°C and 147°C for Unit 2. This is approximately the midpoint of the performance range 120°C to 185°C required as 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.
8. Production at the plant is often evaluated in terms of steam flow. Steam flow was typically in the range of 31 to 35 tonnes/hour per boiler, with recorded readings ranging between 31.3 and 35.0 tonnes/hour. This is within range of the nominal steam generation rate 72 tonnes/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.
9. Carbon and lime dosage were generally consistent with the previous testing campaigns. Carbon doses typically ranged between 5 to 6.5 kg/hour, which is similar to previous years.

10. The lime feed rate ranged between 152 and 170 kg/hour, averaging about 159 kg/hr for both units. This is 5 to 10% less than in previous years due in part to the absence of conditions, such as elevated HCl concentrations, that would trigger an increase in the lime feed rate. No elevated lime feed rates were observed. 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.
11. 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. The field observations are provided in a series of tables in **Appendix A**.

1. Dioxin and furan testing was initially delayed during the week of September 18, 2023. Testing reconvened on Boiler 1 on September 21, 2023, but the audit team was only present to witness the testing on September 22, 2023. Sampling on Boiler 2 was delayed to October 3rd and 4th, 2023. The audit team was present for all three dioxin and furan sampling tests for Boiler 2.
2. 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. The summary of field observations is shown in the tables below. 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**.
3. Previous aberrations in the velocity measurements, mainly due to the negative pressure conditions, were reduced by using metal plates and rubber sealer plates to eliminate these problems.
4. Impinger/XAD temperatures were checked approximately every half hour at each sampling train. Ortech supplied plenty of ice to the crews. The temperatures were maintained in the 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.
5. The audit team also recorded dry gas meter correction and pitot factors for comparison with the final report.
6. 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.

Based on audit staff observations, 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 final report (the "Report") to Ausenco on January 4th, 2024. The following sections provide Ausenco's 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) The recoveries of Extraction Standards for all D/F samples 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.
    c) The recoveries of Cleanup Standards of all D/F samples were within the acceptable range of recoveries provided in Environment Canada Reference Method EPS 1/RM/2 (40% – 130%).
    d) 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 46).
    e) 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 48).
    f) 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 48) 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) The analytical reports indicate that 13C6-chlorobenzene was not adequately recovered for the field blank. Consequently, no data for chlorobenzene has been provided for this sample. However, as indicated below, samples were not blank corrected. Therefore, this will not impact the conclusions of the report.
    b) The analytical reports also indicate that the method blank and laboratory control sample (LCS) had recoveries of labelled standards below typical values. However, no significant bias to the sample results is expected given that the target analyte recoveries are all in control for the LCS. This is a valid assumption; therefore, the poor recoveries of labelled standards in these samples will not impact the conclusions of the report.
    c) 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.
    d) Ausenco has conducted a review of the chlorobenzene emission rate calculations (μg/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 49).
    e) 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 Compliance 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) Ortech (January 2024: p. 35) noted that "Di- to penta- chlorophenol data could not be reported on the Boiler No. 2 samples due to an absence of recovery on the corresponding extraction standards." A review of past sampling events indicated that CP samples have been consistently reported as below the detection limit, which is consistent with the samples collected here. Therefore, the current samples could also be anticipated as having levels below the detection limit. Consequently, there is no concern that CP POI values may be over and above relevant ambient air quality standards.
    c) 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.
    d) Ausenco has conducted a review of the chlorophenol emission rate calculations (μg/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 50).
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 all tests 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, the target analyte recoveries are all in control for the LCS. Therefore, as discussed above, no significant bias to the sample results is expected. Furthermore, 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. Consequently, 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 (μg/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 51).

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. As noted above, the emission rates of multiple chlorophenol compounds could not be reported for Boiler No. 2. To account for this missing data, WSP doubled the emission rate data from Unit No. 1. This is an acceptable approach to estimate facility-wide emissions given that, historically, CP samples have been consistently reported as below the detection limit.
2. 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.
3. Ausenco confirmed that the CALPUFF options outlined in Table 2 of WSP's memorandum matches Table B1 of the ADMP.
4. Ausenco also confirmed that for modelling years 2014 and 2017 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.
5. Ausenco confirmed the source parameters provided in Table 3 of WSP's memorandum relative to the source testing results.
6. For the 2015 and 2017 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).
7. 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]	48.08	34.97	29.14	1.24	0.17	0.06
Output File Dispersion Factor without meteorological anomaly removal [µg/m³ per g/s]	48.13	35.38	29.14	1.24	0.17	0.06

8. 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. Naphthalene
    c. Chlorobenzene
    d. Dioxins, Furans, and Dioxin-like PCBs

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.

With regard to monochlorobenzene recoveries, Ausenco has been informed that Ortech has engaged discussions with ALS about alternate analytical methods to recover monochlorobenzene. We recommend these discussions continue, and any alterations to the method for the 2023 source testing be clearly outlined in Ortech's report, including the potential implications on the analytical results for other SVOCs.

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	Sept. 22/23		Oct. 3/23	
Observation	Boiler #1		Boiler #2	
Nozzle Size/Type	0.2501		0.2498	
Meter Cal/ID	Aug. 30/23 1.049		Sept. 11/23 0.992	
Pitot cal	0.843		0.843	
Calc Moisture	16			
Static	-9.78			
Pitot Leak Check	Yes		Yes	
Pre-traverse Leak Check			0.003@ 15”	
SVOC Test Start Time	7:52		8:08	
Running On Insertion			yes	
Stack temperature ºF	288,289		294	
Trap temperature ºF			47, 48, 48	
Running on removal	9:52		yes	
Traverse Completed			10:08	
Post-traverse Leak Check			0.004@ 15”	
Pre-traverse Leak Check		0.005@15”		0.002 @15”
Running On Insertion		yes		yes
SVOC Traverse Start Time		9:59		10:18
Trap temperature ºF		47,47,45		49, 50, 48
Traverse Completed		11:59		12:19
Final Leak Check		0.002@ 15”		0.002 @ 15”
Running on removal		yes		yes

	Semi-Volatiles-2		Semi-Volatiles-3	
Date	Oct. 3/23		Oct. 4/23	
Observation	Boiler #2		Boiler #2	
Nozzle Size/Type	0.2510		0.2498	
Meter Cal/ID	Sept. 11/23 0.992		Sept. 11/23 0.992	
Pitot cal	0.848		0.843	
Calc Moisture				
Static				
Pitot Leak Check	yes		yes	
Pre-traverse Leak Check	0.003@ 15”		0.004@ 15”	
SVOC Test Start Time	12:56		8:16	
Running On Insertion	yes		yes	
Stack temperature ºF	266, 267		292, 293, 294	
Trap temperature ºF	53, 50		56, 54, 55, 55, 53, 51	
Traverse Completed	14:55		10:15	
Post-traverse Leak Check	0.003@ 15”		0.003@ 15”	
Running on removal	yes		yes	
Pre-traverse Leak Check		0.004@ 15”		0.003@ 15”
SVOC Traverse Start Time		15:04		10:23
Stack temperature ºF		292, 292, 293, 293, 298		292, 292, 293, 291, 285
Trap temperature ºF		51, 51, 48, 49, 49		55, 54, 53, 51, 53, 50
Traverse Completed		17:05		12:23
Final Leak Check		0.002@ 15”		0.002@ 15”
Running on removal		yes		yes

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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: February 13, 2024 **(Revised March 11, 2024)**

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

Introduction

During the period from September 19th through October 4th, ORTECH Consulting, Inc. (ORTECH) conducted the Mandatory Source Test at the Durham York Energy Center (DYEC) for the Regions of Durham and York. This mandatory 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 September 21st and September 22nd. 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 December 19, 2023.

HDR Observations during the Compliance Source Test

The tentative testing schedule for the September/October 2023 Mandatory 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 September 21st and September 22nd to observe the source test sampling activities with particular focus on the Method 23 tests for Dioxins/Furans on Unit 1. On September 16, 2023, Unit 2 experienced an unscheduled outage to clear and repair the boiler feed chute that resulted in an upset to isokinetic testing conditions in the unit. As a

result of this outage, source test sampling on Unit 2 for the Method 23 tests for Dioxins/Furans was rescheduled and completed on October 3rd and October 4th. During HDR's time on site, we observed Covanta's operation of the boiler and air pollution control systems for compliance with the ECA and Project Agreement during the test periods. The following is a summary of the key events and observations made by HDR during the sampling days we were on site. Attachment A shows the start and stop times of each test.

Day 3: Thursday, September 21st

Stack testing commenced at 08:07 and was completed at 16:40. All tests for Unit 1 and Unit 2 were completed as scheduled.

The Units 1 and 2 operating parameters listed in the table below (average of data collected at several times over the course of the day) were observed to be within the normal range for both units, with the exception of ammonia flow of Unit 2 for a portion of the day observed by HDR.

Parameter	Normal Range	Unit 1	Unit 2
Steam Load (kg/hr)	32,000-35,000	33,964	33,394
Ammonia (kg/hr)	25-80	29	17
Carbon (kg/hr)	4.5-5.5	5.4	5.2
Steam Outlet Temp (°C)	495-502	504	508
Steam Pressure (bar)	86-90	90	90
Combustion Temps (°C)	>1,000	1,175	1,107
Baghouse dp (mBar)	10-20	20	16

The actual ammonia flow for the testing period (as shown in Attachment B) was 0.52 litres per minute (lpm) and 0.37 lpm on Units 1 and 2 (or 28 kg/hr and 20 kg/hr), respectively. Unit 2 may have operated at a lower ammonia flow versus Unit 1 for a number of reasons, including but not limited to having slightly different operating setpoints for the Low NOx (or LN) system. For example, a higher LN setting, which means adding more tertiary air to the system, will result in the need for less ammonia to meet the NOx emission setpoint. Despite the difference in ammonia flows, both units were observed to be operating below the 121 mg/Rm^3 ECA limit.

Day 4: Friday, September 22nd

Stack testing commenced at 07:52 and was completed at 11:59. The Dioxin/Furan tests for Unit 1 were completed as scheduled. Due to a garbage chute plug, the Dioxin/Furan testing on Unit 2 was delayed until October 3rd and October 4th.

The Units 1 and 2 operating parameters listed in the table below (average collected throughout the day) were observed to be within the normal range for both units, with the exception of ammonia flows in Unit 2 for the same reason explained previously.

Parameter	Normal Range	Unit 1	Unit 2
Steam Load (kg/hr)	32,000-35,000	33,512	35,292
Ammonia (kg/hr)	25-80	38	10
Carbon (kg/hr)	4.5-5.5	5.5	5.3
Steam Outlet Temp (°C)	495-502	501	502
Steam Pressure (bar)	86-90	89	90
Combustion Temps (°C)	>1,000	1,149	1,189
Baghouse dp (mBar)	10-20	18.4	14.5

October 3rd and October 4th

The start and stop times for the Unit 2 Dioxin/Furan tests are listed in the table below:

	Run 1	Run 2	Run 3
Unit 2	October 3rd 8:08-12:19	October 3rd 12:56-17:05	October 4th 8:16-12:24

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 appeared to conduct the testing in accordance with the approved test plan and all 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 appeared to be assembled properly and in accordance with testing procedures, 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 sample 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 was 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

Table 1 and Figures 1 and 2 below provide a summary of the DYEC's emissions test results corrected to 11% oxygen as provided in ORTECH's final test report, dated December 19, 2023. . As shown in Table 1, DYEC's emissions from all pollutants 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. Based on this review, HDR did not find any errors in the calculations in Ortech's report.

Table 1 – Summary of September/October 2023 Mandatory Source Test Results

Parameter	Units(1)	ECA Limit	Unit 1		Unit 2	
			Result	% of Limit	Result	% of Limit
Particulate Matter (PM)	mg/Rm^3	9	0.57	6.3%	0.43	4.8%
Mercury (Hg)	$\mu g/Rm^3$	15	0.089	0.6%	0.083	0.6%
Cadmium (Cd)	$\mu g/Rm^3$	7	0.83	11.9%	0.37	5.3%
Lead (Pb)	$\mu g/Rm^3$	50	0.56	1.1%	0.25	0.5%
Hydrochloric Acid (HCl)(2)(3)	mg/Rm^3	9	1.0	11.1%	3.1	34.4%
Sulphur Dioxide (SO_2)(2)(3)	mg/Rm^3	35	0	0.0%	0.03	0.1%
Nitrogen Oxides (NO_x)(2)(3)	mg/Rm^3	121	109	90.1%	111	91.7%
Carbon Monoxide (CO)(2)(4)	mg/Rm^3	40	8.1	20.3%	9.9	24.8%
Total Hydrocarbons (THC)(5)	ppm	50	0.50	1.0%	0.40	0.8%
Dioxins and Furans(6)	pg TEQ/Rm^3	60	10.90	18.2%	4.43	7.4%

(1) All concentration units are corrected to 25ºC and 1 atmosphere, adjusted to 11% oxygen by dry 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

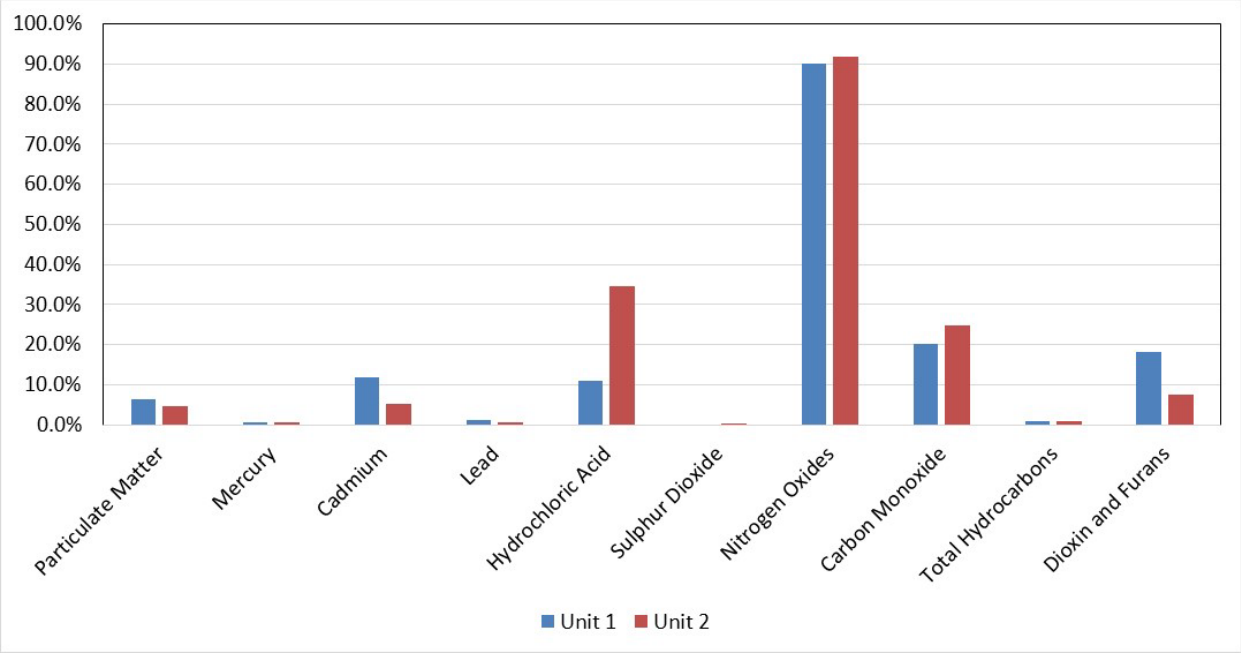
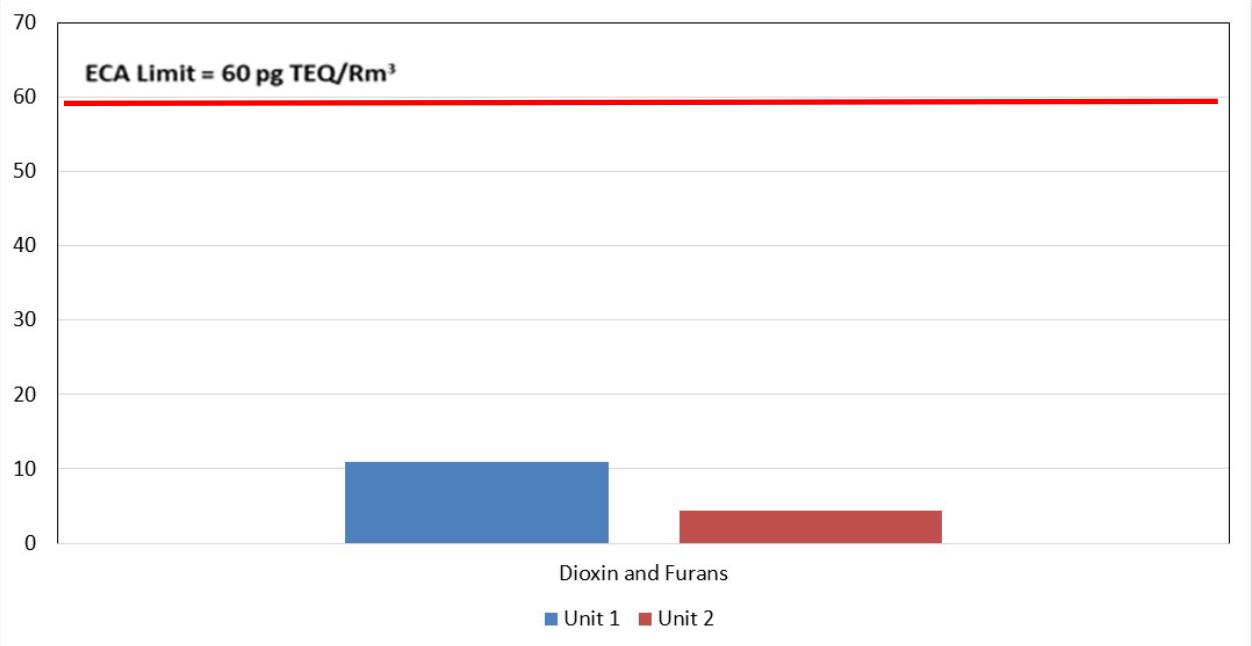


Figure 2 – Test Results for Dioxins and Furans



Conclusions and Recommendations

HDR has completed our review of the final results of the air emissions testing performed during the DYEC Fall 2023 Mandatory Test. Representatives from HDR were present at the DYEC to observe the sampling procedures and facility operations during a portion of the testing period that occurred between September 19th and October 4th. HDR observed that ORTECH appeared to follow the approved stack sampling procedures and test methods as outlined in the test plan. HDR also observed Covanta's plant personnel operating the DYEC under normal operating conditions and in accordance with the ECA and generally accepted industry operating standards. Based on the results summarized in ORTECH's final test report, dated December 19, 2023, the air emission results of the Fall 2023 Mandatory 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.

DYEC Test Schedule Provided by Ortech.

Tentative Test Schedule

Day/Location		Parameter	Method	# of Runs	Duration
Mon. Sept. 18	#1 & #2 APC	Setup and Prelim. Particulate	Ontario M5	2	60
Tues. Sept. 19	#1 APC Outlet	Particulate/Metals	Ontario M5/EPA M29	2	180
		Hydrogen Fluoride	EPA M26A	3	60
	#2 APC Outlet	Particulate/Metals	Ontario M5/EPA M29	1	180
		PM_{10}, $PM_{2.5}$ & Condensables	EPA Method 201A/202	3	120
Wed. Sept. 20	#1 APC Outlet	PM_{10}, $PM_{2.5}$ & Condensables	EPA Method 201A/202	3	120
		Particulate/Metals	Ontario M5/EPA M29	1	180
	#2 APC Outlet	Particulate/Metals	Ontario M5/EPA M29	2	180
		Hydrogen Fluoride	EPA M26A	3	60
Thurs. Sept. 21	#1 APC Outlet	Dioxin/Furan	EPS 1/RM/2	2	240
		VOST	SW846-0030	3	40
		Aldehydes	NCASI Method ISS/FP-A105.01	3	60
	#2 APC Outlet	Dioxin/Furan	EPS 1/RM/2	2	240
		VOST	SW846-0030	3	40
		Aldehydes	NCASI Method ISS/FP-A105.01	3	60
Fri. Sept. 22	#1 APC Outlet	Dioxin/Furan	EPS 1/RM/3	1	240
	#2 APC Outlet	Dioxin/Furan	EPS 1/RM/2	1	240

Summary of Testing Observed by HDR.

Day 3: Thursday, September 21, 2023

Unit	Test	Run 1		Run 2		Run 3	
		Start	Stop	Start	Stop	Start	Stop
Unit 1	Dioxins/Furans	8:07	12:14	12:31	16::40	-	-
Unit 2	PM10, PM2.5 Cond	8:22	10:26	11:21	13.25	14:26	16:30

Day 4: Friday, September 22, 2023

Unit	Test	Run 3	
		Start	Stop
Unit 1	Dioxins/Furans	07:52	11:59

NOTE: Dioxin/Furans testing on Unit 2 was postponed until October 3rd and 4th due to a process upset that affected testing conditions. HDR was on-site to observe the rescheduled tests.

Unit	Test	Run 1	Run 2	Run 3
Unit 2	Dioxins/Furans	October 3rd 8:08-12:19	October 3rd 12:56-17:05	October 4th 8:16-12:24

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

Sept/Oct 2023 Mandatory Dioxin Testing
Operations Data and Results

Operating Parameter	Boiler 1			Boiler 2		
	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
	21-Sep	21-Sep	22-Sep	3-Oct	3-Oct	4-Oct
MSW Combusted (tonnes/day)						
Steam (kg/hr)	33,374	33,564	33,517	33,441	33,417	33,326
Steam temp	505	504	504	508	507	507
Primary Air Flow	33,408	33,622	32,376	35,937	35,688	35,961
Overfire Air Flow	8,438	8,403	8,358	8,445	8,423	7,030
Tertiary Air (Fresh LN Air)	9,249	8,929	9,577	8,586	8,540	8,522
Tertiary air temperature °C	35.2	38.5	35.2	36.7	40.2	38.7
Lime Injection (kg/day)	159.2	159.1	159.5	159.7	159.8	160.0
Ammonia Injection Rate (liters/m)	0.5	0.5	0.5	0.4	0.4	0.3
Carbon Injection (kg/hr)	5.3	5.3	5.3	5.3	5.3	5.3
Combustion air preheat temp	114.5	117.0	115.0	114.2	110.0	120.0
Average Combustion Zone Temp °C	1,157	1,128	1,128	1,200	1,212	1,200
Superheater #3 Flue gas inlet Temp °C	565	566	563	591	594	591
Economizer Inlet Temp °C	346	347	346	347	348	348
Economize Outlet Temp °C	170	172	169	172	173	171
Quench Outlet Temp °C	153	152	152	149	149	150
Reactor Outlet (BH Inlet) Temp °C	144	143	144	144	145	145
Baghouse Outlet Temp °C	141	141	141	141	142	141
Tertiary Air Header Pressure mbar	60	60	60	64	63	65
Tertiary Air Left mbar	28	26	31	29	29	29
Tertiary air Right mbar	30	30	32	29	29	29
Baghouse Differential Pressure mbar	21	20	18	15	15	15
Oxygen (%) - Boiler Outlet	8.2	7.6	7.9	7.6	7.6	7.6
Oxygen (%) - Baghouse Outlet	8.1	7.9	7.9	8.3	8.2	8.3
CO -Boiler Outlet - mg/Rm3	7.7	8.2	12.5	7.1	9.6	12.5
CO - Baghouse Outlet - mg/Rm3	5.5	5.7	9.8	5.3	7.8	9.4
NOx - mg/Rm3	110.7	108.5	111.2	109.2	108.9	110.3
NH3 mg/Rm3	12.0	11.9	11.6	12.2	11.6	12.3
Flue gas moisture	21%	21%	20%	20%	19%	19%
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

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		Fall 2023 Compliance	
		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	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	0.83	0.37
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	8.1	9.9
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	10.9	4.43
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	1	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	0.56	0.25
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	0.09	0.08
Nitrogen Oxides	121 mg/Rm^3	110	110	111	110	109	109	110	110	109	110	111	110	110	110	112	111	110	110	109	111
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	0.5	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	0	0.03
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	0.57	0.43

Attachment 5 to Report #2024-INFO-17

Table 2: Comparison Table: 2023 Compliance 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	109	111	110	**121**	90.9%	**198**
Total Suspended Particulate Matter	mg/ Rm^3	0.57	0.43	0.5	**9**	5.6%	**14**
Sulphur Dioxide	mg/ Rm^3	0	0.03	0.0	**35**	0.04%	**56**
Hydrogen Chloride	mg/ Rm^3	1.0	3.10	2.1	**9**	22.8%	**27**
Carbon Monoxide	mg/ Rm^3	8.10	9.90	9.0	**40**	22.5%	**40**
Mercury	µg/Rm^3	0.09	0.08	0.1	**15**	0.6%	**20**
Cadmium	µg/Rm^3	0.83	0.37	0.6	**7**	8.6%	**7**
Lead	µg/Rm^3	0.56	0.25	0.4	**50**	0.8%	**60**
Dioxin/Furans	pg TEQ/Rm^3	10.9	4.43	7.7	**60**	12.8%	**80**