

**Technical Specifications for the
Continuous Environmental Monitoring System**

1. Continuous Environmental Monitoring System

- 1.1. The Proponent proposed integrated Continuous Environmental Monitoring system will provide measurement, analysis, record recording, data transfer and report preparation to include, as a minimum, the following gaseous components for both existing stack flues:
- 1.1.1. Sulfur dioxide - SO₂
 - 1.1.2. Nitric Oxide - NO
 - 1.1.3. Nitric Dioxide - NO₂
 - 1.1.4. Carbon Monoxide - CO
 - 1.1.5. Carbon Dioxide - CO₂
 - 1.1.6. Hydrogen Chloride - HCl
 - 1.1.7. Water - H₂O
 - 1.1.8. Mercuric(II) Oxide - Hg₀
 - 1.1.9. Oxygen - O₂
 - 1.1.10. Total Mercury - Hg
 - 1.1.11. Dioxins
 - 1.1.12. Flue gas temperature measurement and recording
- 1.2. The required measuring parameters for the CEMS equipment are detailed in Table 1 - Equipment Performance Requirements.
- 1.3. The Continuous Environmental Monitoring system is also to include an integrated computerized platform for signal handling, connectivity, data transfer and report preparation to meet the reporting requirements for the Facilities Operating License. The computer shall located in the Main Control Room on Level 4 of the Facility.

Table 1: Equipment Performance Requirements

<u>UV/IR DOAS Analyser</u>			
Compound	Maximum measurement range (1 m path) ⁽¹⁾	Lowest measurement range according to EN 15267	Minimum detectable quantities (monitoring path 1m, measuring time 30 sec.)
Hg ⁰	0–1000 µg/m ³	0–45 µg/m ³	0.5 µg/m ³
THg	0–1000 µg/m ³	0–45 µg/m ³	0.5 µg/m ³
NO ⁽²⁾	0–2000 mg/m ³	0–150 µg/m ³	0.5 µg/m ³
NO ₂	0–100% Vol.	0–20 µg/m ³	0.5 µg/m ³
SO ₂	0–100% Vol.	0–75 µg/m ³	0.5 µg/m ³
NH ₃	0–1000 mg/m ³	0–10 µg/m ³	0.5 µg/m ³
H ₂ O	0–100% Vol.	0–30% Vol.	0.1% Vol.
HCl	0–10000 mg/m ³	0–1000 mg/m ³⁽⁵⁾	10 mg/m ³⁽⁴⁾
HF	0–1000 mg/m ³	0–100 mg/m ³⁽⁵⁾	5 mg/m ³

CO ₂	0–100% Vol.	0–30% Vol. ⁽⁵⁾	0.5% Vol.
Benzene	0–1000 mg/m ³	0–20 mg/m ³⁽⁵⁾	0.5 µg/m ³
<u>FTIR DOAS Analyser</u>			
Compound	Maximum measurement range (1 m path) ⁽¹⁾	Lowest measurement range according to EN 15267	Minimum detectable quantities (monitoring path 1m, measuring time 30 sec.)
CO	0–100% Vol.	0–75 mg/m ³	2 mg/m ³
H ₂ O	0–100% Vol.	0–30% Vol.	0.1% Vol.
HF	0–100% Vol.	0–1.5 mg/m ³	0.1 mg/m ³
NH ₃	0–100% Vol.	0–100 mg/m ³⁽⁵⁾	2 mg/m ³
N ₂ O	0–100% Vol.	0–500 mg/m ³	5 mg/m ³
CH ₄	0–100% Vol.	0–20 mg/m ³	0.5 mg/m ³
CO ₂	0–100% Vol.	0–20% Vol.	0.1% Vol.
<u>Laser Diode Gas Analyser</u>			
Compound	Maximum measurement range (1 m path) ⁽¹⁾	Lowest measurement range according to EN 15267	Minimum detectable quantities (monitoring path 1m, measuring time 30 sec.)
CO	0–100% Vol.	0–5% Vol. ⁽⁵⁾	0.1% Vol.
H ₂ O	0–100% Vol.	0–30% Vol. ⁽⁵⁾	0.1% Vol.
HF	0–100% Vol.	0–1.5 mg/m ³⁽⁵⁾	0.1 mg/m ³
NH ₃	0–100% Vol.	0–10 mg/m ³⁽⁵⁾	0.5 mg/m ³
CO ₂	0–100 g/m ³	0–30% Vol. ⁽⁵⁾	0.1% Vol.
O ₂	0–21%	0–20% Vol. ⁽⁵⁾	0.1% Vol.
Temperature	0–1400 °C ⁽⁵⁾	—	5 °C
(1) This data refers to a light path of 1 m.			
(2) Maximum SO ₂ concentration 5 g/m ³ × m.			
(3) Maximum SO ₂ concentration 500 mg/m ³ × m.			
(4) Monitoring path 5 m, measurement time 30 sec.			
(5) Lowest measurement range.			

2. Optical Cross Duct Measurements

2.1. The optical cross duct measurements shall measure, analyze, record, transfer data and report preparation to include, as a minimum, the following gaseous components for both existing stack flues:

2.1.1. Analysis by Differential Optical Absorption Spectroscopy (DOAS) for the following compounds;

- 2.1.1.1. Sulfur dioxide - SO₂
- 2.1.1.2. Nitric Oxide - NO
- 2.1.1.3. Nitric Dioxide - NO₂
- 2.1.1.4. Mercuric(II) Oxide - Hg⁰

- 2.1.2. Analysis by Differential Infrared Spectroscopy (FTIR) for the following compounds;
 - 2.1.2.1. Carbon Monoxide - CO
 - 2.1.2.2. Carbon Dioxide - CO₂
 - 2.1.2.3. Hydrogen Chloride - HCl
 - 2.1.2.4. Water - H₂O
 - 2.1.2.5. Oxygen - O₂
- 2.2. DOAS and FTIR measurement technology shall be based on a single cross-duct light beam. The Light Beam Source will contain a Xenon lamp powered by a 150W power supply. A collimated light beam is generated in the source and the signal is captured in a receiver which has one focusing mirror for UV and one mirror for IR. The signal shall be carried to the DOAS and FTIR spectrometers in fiber optic cables.
- 2.3. The system will be designed for analysis of two (2) flue gas duct by with a fiber optic multiplexer.
- 2.4. System provides function for automated zero and span calibration checks.
3. Oxygen Analyzer
 - 3.1. Oxygen measurement by zirconium oxide element in in-situ probe.
4. Dust Monitor
 - 4.1. The dust monitor shall be an in-situ probe that obtains measurements based on the tribo-electric principle with continuous measurement and a lower range between 0-7.5 mg/m³.
5. Total Mercury – Total Gaseous Mercury (TGM)
 - 5.1. TGM measurement shall be a continuous measurement using an extraction method with in-line converter for reduction of oxidized mercury. The samples will be drawn using an air ejector pump.
 - 5.2. The probe assembly will be located on the duct and it will contains a temperature controlled heated ceramic filter. A heated sample line connects probe with converter. The sample flow enters the temperature-controlled DOAS measurement cell and the mercury concentration is recorded as Hg⁰ with the CEMs DOAS analyzer.
 - 5.3. The data shall be transferred to the computer system and used in the reporting results.
6. Dioxin Sampling
 - 6.1. Dioxin sampling shall be by an automated continuous sampling monitor with sampling times ranging from eight (8) hours up the eight (8) weeks. Sampling must be isokinetic and in conformance with EU standard EN1948.
 - 6.2. Samples shall be collected in cartridges located in the sampling cabinet which is attached to stack/duct port in sorbent material. System handles all signals in order to regulate flow rate to stack velocity (isokinetic sampling).

- END -