**Re Page B-39:**

Q. Provide copies of all submissions and correspondence of Hydro to the Department, and copies of all notices and correspondences of the Department to Hydro, with respect to this Project.

A. See attachments:

1. CEMS Correspondence
2. CEMS Compliance Plan 2006 (Rev, 1)

**From:** Wayne Rice/HO/NLHydro
**To:** Robert Shandera/NLHydro@NLHydro

**Date:** Friday, August 31, 2007 02:00PM
**Subject:** Fw: CEMS Compliance Plan

FYI
----- Forwarded by Wayne Rice/HO/NLHydro on 08/31/2007 01:59 PM -----

| | |
|---|---|
| **Wayne Rice/HO/NLHydro** 08/01/2006 05:02 PM | ToDMaddocks@gov.nl.ca<br>ccTerry LeDrew/HO/NLHydro@NLHydro, "Dan Michielsen" <MichielsenD@gov.nl.ca><br>SubjectCEMS Compliance Plan |

Derrick:

In accordance with the August 2, 2006 deadline stated in the Certificate of Approval for the Holyrood Thermal Generating Station, I submit a plan with proposed timelines for the automated CEMS to meet the requirements of Environment Canada's Report *Protocols and Performance Specifications for Continuous Monitoring for Gaseous Emissions for Thermal Power Generation EPS/1/PG/7 (Revised December 2005).*

The draft QA Program for the CEMS is appended to the plan.

Please return acknowledgement or comments/questions as applicable following your review.

Regards,

Wayne Rice, M.A.Sc., P. Eng.
Environment & Performance, Manager
Holyrood Thermal Generating Station
Ph: (709) 229-2126
Fax: (709) 229-7894
email: wrice@nlh.nf.ca

Attachments:

CEMS Compliance Plan 2006 (Rev. 1).doc ATTAJGFO ATTQ3JDQ

HYDRO
THE POWER OF COMMITMENT

# Newfoundland and Labrador Hydro

# Holyrood Thermal Generating Station

## Continuous Emissions Monitoring (CEM) System
## Plan for Compliance with EPS 1/PG/7

**August 2, 2006**

## 1.0 Introduction

This plan is written in response to the requirements of Certificate of Approval No. AA06-025458 (File No. 716.008) issued by the Government of Newfoundland and Labrador Department of Environment and Conservation (DOEC) on February 2, 2006. As per Appendix A, paragraph 72, outlined below is Newfoundland and Labrador Hydro's (Hydro) intended plan to meet the requirements of Environment Canada's Report *Protocols and Performance Specifications for Continuous Monitoring for Gaseous Emissions from Thermal Power Generation EPS/1/PG/7* (Revised December 2005).

Newfoundland and Labrador Hydro's Holyrood Thermal Generating Station (HTGS) has a capacity of 500 MW and is comprised of two Combustion Engineering boilers (with General Electric Turbines) rated at 175 MW each and a Babcock and Wilcox boiler (with Hitachi Turbine) rated at 150 MW. The plant combusts No. 6 heavy fuel oil at the rate of approximately 6,000 barrels per day, per unit at full load to produce steam at 538 degrees C and 13,000 KPa at a rate of over 0.5 million kilograms per hour.

In 2004, Hydro began operating a Continuous Emissions Monitoring System (CEMS) at the HTGS. The system was originally installed with Public Utilities Board (PUB) approval and to provide plant operations personnel with additional combustion gas data to: enable further characterization of the plant emissions; and, achieve secondary performance benefits through enhanced operator control. The additional data assists operations personnel by providing direct real-time information on the flue gas. This information allows Thermal Plant Operators (TPO's) to make instantaneous adjustments to the combustion process to improve the overall conversion efficiency of fuel to energy. The CEMS data is also used to diagnose mechanical problems with respect to the oil burners.

Although the CEM system was not originally intended to provide data reports under any existing regulatory regime Hydro has cooperated fully with the DOEC to supercede regulatory requirements under the Air Pollution Control Act and Regulations. In addition, Hydro has also committed substantial resources, complemented by a dedicated department of technologists to execute the ambient air and continuous emission environmental monitoring programs. In June of 2006 Hydro also released a Human Health Risk Assessment report, that was compiled using ambient air monitoring data. Going forward the CEM system will be used to correlate modeled plant emissions with ambient site data. Finally, on March 21, 2006 the Holyrood Thermal Generating Station began burning 1% sulphur fuel, based on a three-year evaluation of emissions control technologies, completed by an in-house working group.

## 2.0 System Description

The CEM system is dry extractive system comprised of three major sections; sample handling/conditioning, sample analysis and data acquisition. A single sample probe located at approximately 45 meters above grade extracts sample from the stack. The sample is filtered to remove particulate and drawn hot and wet to a CEM shelter located within the boiler house. The sample is delivered to the CEM cabinet where the moisture is removed with a Pelletier cooler before the sample is delivered to the gas analyzers. In addition, the CEM system is equipped with various temperature/pressure gauges, flow meters, solenoid valves and electronic controls.

Currently, the CEM system has three separate analyzing instruments to measure the pollutant and diluent gases; these are listed below with a brief discussion on the principle of operation.

Western Research Ametek 922 Sulfur Dioxide/Nitrogen Oxide Analyzer ($SO_2$/NOx)

The Western Research Ametek 922 $SO_2$/NOx analyzer operates on the principles of Ultraviolet (UV) photometrics. Ultraviolet light passes through the sample chamber where the sample gas is exposed to UV source at specific wavelengths. When absorptive sample molecules are present in the sample cell a reduction of light passing through the sample cell is observed. The magnitude of the reduction of UV light is directly proportional to the concentration of the absorptive molecules present in the sample cell. The difference in the amount of UV light sent and received by the sample detector is used to determine absorbance of the gas sample that is then developed through the application of the ideal gas laws in concert with the laws of Bouger, Beer and Lambert.

Siemens OXYMAT 61 Oxygen Analyzer ($O_2$)

The Siemens OXYMAT 61 $O_2$ analyzer operates on the principle of paramagnetics. Oxygen molecules in an inhomogeneous magnetic field are drawn in the direction of increased field strength due to their paramagnetism. When two gases with different oxygen concentrations meet in a magnetic field, a pressure difference is produced between them. The pressure, which is proportional to the oxygen concentration, causes a flow. This flow is converted into an electric signal by a microflow sensor. The microflow sensor consists of two nickel grids heated to approx. 120 ºC that form a Wheatstone bridge together with two supplementary resistors. The pulsating flow results in a change in the resistance of the Ni grids. This results in a bridge offset, which depends on the oxygen concentration in the sample gas. The bridge offset is measured and an electronic signal is sent to the Data Acquisition System (DAS).

Siemens ULTRAMAT 23 Carbon Monoxide/Carbon Dioxide Analyzer ($CO/CO_2$)

The Siemens ULTRAMAT 23 CO/CO2 analyzer operates on the principle of molecular infrared radiation absorption. An IR source operating at 600 °C emits infrared radiation, which is modulated with 8 1/3 Hz by a chopper. After passing through a sample cell, the intensity of the radiation is measured by a detector. The detector is composed of layers filled with the component to be analyzed. When passing through the layers of the detector the radiation absorption results in different pressure increases and so to a flow via a capillary hole. A microflow sensor located at the capillary hole generates an electronic signal, which is sent to the DAS.

The CEM system is a time-shared system with a single set of instruments that analyze flue gas on a digitally controlled cycle. The cycle is controlled by a programmable logic controller (PLC) that switches solenoid valves to direct sample gas from an individual emission source to the analyzers. As per PG7, Section 3.5, the required for a complete cycle is 15 minutes. This equates to 5 minutes per stack of which 4 minutes is actual sample time and the remaining minute is allocated for nitrogen purging of the analyzers. The nitrogen purge is required to eliminate cross contamination between stack gas samples. Electronic signals are transmitted to a data acquisition system (DAS) to record emissions data.

**The following is Hydro's proposed plan to meet the requirements of EPS 1/PG/7.**

## 3.0 Relative Accuracy Test Audit (RATA) Certification Testing

Hydro has completed a certification test of Unit #1 to meet the Response Accuracy Test Audit (RATA) performance specifications outlined in Section 5 of PG7. The entire series of certification tests were completed over a two-week period. Hydro technologists completed the 168-hour drift test from May 24-30, 2006. Air Testing Services (ATS) Inc. completed the RATA certification on June 5-6, 2006. Hydro has received the initial draft report of the certification testing on Unit #1 and will submit a copy of the final report to DOEC within 90 days of it becoming available.

Units #2 & #3 certification testing is scheduled for fall 2006. Hydro will retain an independent qualified consultant to conduct RATA certification of Units #2 & #3 in the fall of 2006. The consultants report will be used to finalize a CEMS Quality Assurance (QA) Program.

## 4.0 CEMS QA Program

A draft outline has been submitted with this correspondence (see attached). A complete draft document will be submitted to DOEC for approval 180 days after completion of certification testing of Units #2 and #3.

## 5.0 Training of Technologists

Technologists have received initial instrumentation training for CEMS. As a component of the CEMS QA program all environmental technologists will complete factory certified training for each pollutant and diluent gas analyzer currently installed in the CEM system. Training for all technologists will be completed in 2007.

## 6.0 Performance Evaluation - Conducted within the First Year of Operation

Hydro will retain an independent qualified consultant to conduct a performance audit of the CEMS program to meet the specifications detailed in Section 6 of EPS 1/PG/7.

## 7.0 Conduct Awareness Sessions with Plant Operators

Awareness training with Thermal Plant Operators will be conducted in 2007 to provide operators with basic understanding of the system, awareness of applicability for efficiency monitoring and pollution control.

## 8.0 Reporting CEM System Monthly Data

Upon completion of certification and approval of the CEMS QA/QC plan by DOEC NL Hydro will report monthly emissions data collected from the CEM system. The information will be presented in a format that is acceptable to both Hydro and DOEC.

## 9.0 Full System Certification and Compliance with EPS 1/1PG/7

Upon completion of certification and approval of the CEMS QA/QC plan by DOEC NL Hydro will report monthly emissions data collected from the CEM system. The information will be presented in a format that is acceptable to both Hydro and DOEC.

## 10.0 Equipment Modifications

The following primary equipment modifications will require a period of system operation and monitoring to evaluate the level of compliance prior to implementation:

- Upgrade/replace DAS system and associated software (mandatory for compliance);
- Upgrade from time-shared system to three dedicated extractive systems;
- Tube bundle replacement;
- Upgrade heated filter and sampling probe;
- Building/infrastructure changes.

## 11.0 Schedule Overview

The following is a list of significant milestones and a projected time line for full compliance with EPS 1/PG/7. The schedule proposes independent RATA testing, equipment changes and operational data collection and evaluations/audits to validate that compliance objectives are met in accordance with EPS 1/PG/7. The schedule mixes these milestones with a general period of operation and assessment with a view to plant capacity factor, recognizing that the plant does not operate year round.

**CEMS Milestones:**

| | |
|---|---|
| June 2006 | RATA certification testing of Unit #1 |
| August 2, 2006 | CEMS plan submission to DOEC |
| December 2006 | RATA certification testing of Unit #2 & #3 |
| 2007 -1st Quarter | Quarterly performance evaluation<br>Upgrade/replace DAS system and associated software (mandatory for compliance – subject to budget approval) |
| 2007 - 2nd Quarter | Full Implementation of daily calibration<br>Full Implementation system flow calculation and backfilling of data<br>Quarterly performance evaluation<br>Begin submission of CEMS data reports to DOEC<br>Thermal Plant Operator training sessions<br>Submission of draft CEMS QA program to DOEC |
| 2007 - 3rd Quarter | Quarterly performance evaluation |
| 2007 - 4th Quarter | Semi-annual performance evaluation by independent third party<br>Quarterly performance evaluation<br>Technologist training complete |
| 2008 - 1st Quarter | Annual performance evaluation by independent third party |
| 2009 - 3rd Quarter | Equipment modifications following system-monitoring period |
| January 2010 | Full compliance with EPS/1/PG7 |

# Appendix 1

# CEMS Draft QA Program