

**CEA MERCURY PROGRAM:
SAMPLING & ANALYSIS IMPLEMENTATION PLAN**

Plan Development Template - July 12, 2002

Note: This document was created for the purposes of providing guidance to companies in the development of a Sampling and Analysis Implementation Plan. Implementation plans will vary from company to company in terms of methodologies and timelines to account for variances in circumstances. The company plans will be approved by their respective Provincial Environment agencies.

TABLE OF CONTENTS

**SECTION 1 CEA MERCURY SAMPLING & ANALYSIS PROGRAM
OVERVIEW**

SECTION 2 COAL AND RESIDUE SAMPLING GUIDELINE

SECTION 3 STACK SAMPLING GUIDELINE

SECTION 4 REPORTING GUIDELINE

**CEA MERCURY PROGRAM:
SAMPLING & ANALYSIS IMPLEMENTATION PLAN**

SECTION 1: OVERVIEW

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

SECTION 1: OVERVIEW

Introduction

Eight coal-fired electricity generating companies have joined forces to develop and implement the CEA Mercury Program aimed at improving the information base around mercury inventories, measurement and control in Canada. This document is developed to provide guidance to the participating CEA member companies on the implementation of the coal and residue sampling component of the Program. Each company will tailor this document to meet individual requirements, in co-operation with their respective Provincial Environment Agencies.

Mercury and electricity

Mercury is a naturally occurring metallic element that is released into the environment through both human and natural activities. Mercury released into water from either the air or soil is a concern as it can be transformed into its most common organic form, methyl mercury. In this form, mercury can bioaccumulate and pose a risk to human health when there is exposure to high enough levels through fish consumption.

Mercury is found in coal to varying degrees. When coal is burned to produce electricity, mercury is released into the environment. As one of the largest sources of Canadian anthropogenic mercury emissions, the companies in Canada's coal-fired electricity generation sector are committed to reducing these releases as part of their emission management strategies. The first priority is to reduce the significant scientific uncertainties around the measurement and control of mercury emissions from coal-fired electricity generation.

Reducing uncertainties – The CEA Mercury Program

Building on significant efforts over the past few years, coal-fired electric generation companies in Canada, in co-operation with governments, are embarking on a three-year program to reduce these uncertainties. The program will:

1. Improve emission inventories and the development of management options through an intensive two-year coal, residue and stack sampling program;
2. Promote effective stack testing through the development of guidance material and the support of on-site training on the Ontario Hydro Method for employees, government representatives and contractors, on an as-needed basis;
3. Strengthen laboratory analytical capabilities through analysis and quality assurance programs;
4. Create and maintain an information-clearing house to ensure that all parties can keep informed on global mercury research and development activities.
5. Conduct mercury research and development.

The findings of this program will provide critical information for establishing and reviewing a mercury standard for Canada, and finding cost-effective and efficient management options for mercury emissions over the long-term.

Improving the mercury emission inventory through Coal & Residue Sampling & Analysis

The CEA believes one of the first priorities is to improve the inventory of mercury emissions from coal-fired power plants across the country. Companies have already put significant effort into achieving this objective. To augment this ongoing work and to support discussion of effective mercury management and standards achievability, CEA members have committed to a program of mercury measurement and analysis. This document outlines a mutually agreed upon set of guidelines has been developed for an intensive program to

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

sample and analyse the mercury in coal, residue and flue gas at the generation facilities over a two year timeframe.

Coal, fly ash and bottom ash will be sampled and analysed for key substances, including mercury. The Implementation Plan Template provides guidance on process, sampling and analysis methodologies and reporting requirements.

The program is designed with quality-assurance and information value as the principal drivers. Sample collection, handling, and storage will follow standard procedures, where practicable, as agreed among the companies and the respective provincial governments. Quality-assured analyses will be conducted on mercury and other key substances associated with mercury.

Program Management & Communication of Findings

The coal, residue and stack sampling and analysis program elements are being delivered and reported through agreements between individual companies and their respective Provincial Agencies. Program information will be collected through CEA's data management department and disseminated on the CEA Mercury Program Website. Utilities will report the findings of the coal, residue and stack sampling and analysis to the CEA and provincial governments on a quarterly basis. These findings will be compiled into quarterly reports and two annual reports that will be available to governments and other stakeholders. Other program findings will likewise be made publicly available in a timely manner.

**CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION
PLAN**

SECTION 2

**COAL & RESIDUE
SAMPLING & ANALYSIS GUIDELINE**

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

SECTION 2 COAL & RESIDUE SAMPLING & ANALYSIS GUIDELINE

INTRODUCTION

The purpose of this document is to define in general terms a process, consistent with recognised industrial standards, for representative sampling of coal and fly ash for the purpose of performing mercury analyses within the limitations specific to each coal fired generating station.

Sampling Frequency and Duration

The basic program design is to collect and analyse 36 coal and 36 residue weekly composite samples per year, over a 2-year period. The weekly composite samples may be made up of one or more daily samples taken during the week or a composite of the daily composite samples taken during the week as deemed appropriate. The sampling program will be reviewed on a quarterly basis, and sampling frequencies changed if appropriate.

SECTION 2.1 COAL SAMPLING & ANALYSIS

General

Samples should be collected from each generating station via either of the two methods described below. Wherever possible, ASTM standards for coal and ash sampling and analysis should be followed.

Since this coal will be analysed for mercury, special care should be taken throughout the procedures to ensure that mercury contamination does not occur.

Sample Collection

Method 1 – Automatic Sampler

Daily composite samples will be collected from generating stations that have automatic samplers based on ASTM D2234 (examples of typical automatic samplers are the Heath and Sherwood or Ramsey two stage samplers) normally located at the utility plant.

NOTE: All stations need to follow this standard carefully if they are looking for an actual representative sample for the study.

A sample will be collected continuously based on the ASTM standard. The daily composites (24-hour composites) will be combined into a single weekly composite for analysis. The mass of coal collected on a daily basis for analysis should be between 2 – 4 kilograms.

Method 2 – Manual Sampling

For those stations without automatic samplers, samples can be taken in one of two ways: 1. A minimum of three times a week using either a “stop-belt” sampler (samples are typically taken off one of the main belts into the station or as close as possible) or a “thief” sampler (a slotted pipe that captures coal as the coal drops off the plant belt) to provide a representative sample or 2. A minimum of three times a week from the coal feeders.

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

NOTE: Representative stop belt and thief sampling can be a labour intensive and time-consuming job.

The daily samples will be combined into a single weekly composite for analysis as in Method 1 above. The amount of coal collected on a daily basis for analysis should be between 2 – 4 kilograms.

Sample Identification

Each sample will be properly labelled for tracking and reporting purposes. Each daily (composite) sample shall be provided with a sample ID that will indicate the station/boiler unit #, coal type and date.

A sample ID format is: Station unit-fuel-Date-Comments

Station – 2 or 3 characters to ID station

Unit – unit # = 2

Fuel – fuel type (bituminous coal = CB; sub-bituminous coal = CS etc.)

Date – year month day = 020315

Comments = daily comp, weekly comp etc.

An example is: the Battle River Generating Station unit #5 burns sub-bituminous coal and the sample was a daily composite taken April 10, 2002 as follows:

“BR5-CS-020410-daily comp”

Sample Preparation

Method 1 – At Station

Sample preparation is done in the preparation lab at the station. During preparation the samples are air-dried and the air-dry moisture loss is calculated (ASTM D2013). At that point they are reduced to 60-mesh size (or less if required). Approximately 250 grams of sample are required for analysis.

Method 2 – At Approved Laboratory

For those stations that do not do sample preparation, the composite coal sample will be sent to an approved lab for preparation as described in Method 1 above. If using an external lab for any preparation it would be required to provide a carefully written procedure for what is expected from them.

Sample Analysis

The weekly composite coal sample will be split into two or three equal sub-samples. All the coal sub-samples will be sent either to the CANMET lab or one of the laboratories participating in the Laboratory Round Robin from the utilities. Each station may also ship a split of the sample to Dr. Fari Goodarzi of Geological Survey of Canada in Calgary for preservation. At the station's discretion, a split of the sample may also be retained at the station for future use.

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

Method 1 – CANMET or a Participating Laboratory

These samples will be analysed for ash (ASTM D3174), sulphur (ASTM D4239C), total moisture (ASTM D3302 or ASTM D3173) and higher heat value analysis (ASTM D5865 or ISO 1928), mercury (EPA Method 7473 or ASTM D6414), and chlorine (ASTM D4208-88). This will ensure more consistent analysis across the board as well as credibility of the project. Other standard methods may be acceptable if the utility can defend the method.

Referenced materials or recognised standards will periodically be sent to the labs (including the CANMET lab that will initially be used for analysis) as part of the QA/QC of the program of the Laboratory Round Robin.

If after three months of analyses, the chlorine values are less than 100 ppm further analyses will not be required.

Method 2 - At Station

The stations coal analytical laboratory can be used for ash (ASTM D3174), sulphur (ASTM D4239C), total moisture (ASTM D3302) and higher heat value analysis (ASTM D5865).

Note: Tests for moisture and sulphur are not restricted to those listed above but may be done using any standard analytical method and service provider the utility chooses.

Sample Shipment to CANMET or a Participating Laboratory

Samples sent out to CANMET or one of the participating laboratories (in the Laboratory Round Robin) would leave the site at the 60 mesh size (or less), in appropriately labelled containers, with the air dry moisture loss recorded on the sample vial for later calculation of total moisture. Samples will be sent by courier to the laboratory.

Note: It is assumed that utilities will assemble four weeks worth of samples before sending them for analysis to CANMET or other participating laboratory. This is at the discretion of the utilities.

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

SECTION 2.2 FLY ASH SAMPLING & ANALYSIS

Sample Collection

Method 1 – At the Fly Ash Silo(s)

Samples from the waste and/or sales fly ash (sample size would be based on the approximate split between waste and sales ash where both are sampled) would be collected once or twice weekly from the fly ash silo. A reasonable option is to collect the fly ash in the station prior to conveyance of the fly ash to the ash lagoon (prior to the addition of water for sluicing) for those situations where it is more practicable. If more than one weekly sample is collected, it would be combined with the other weekly sample into one weekly composite sample.

Method 2 - At the ESP (Baghouse) Hoppers

Fly ash samples will be taken from one row in the first field of the hoppers under the Electrostatic Precipitator or baghouse weekly. Collection of a mid-week sample seems appropriate. Fly ash may be collected from all fields, at the discretion of the utility, for a short period to determine if there is significant capture of mercury in the later fields to warrant continuation of this method.

NOTE: This is not the most practical method of sampling flyash and will be extremely labour intensive. It may also require sampling points be installed at the hoppers. It is also not expected to render any better sample collection than Method 1.

Sample Identification

Each sample will be properly labelled for tracking and reporting purposes. Each sample shall be provided with a sample ID that will indicate the station/boiler unit #, ash type and date.

A sample format is: Station unit-fuel-Date-Comments

Station – 2 or 3 characters to ID station

Unit – unit # = 2

Ash type – fly ash = FA

Date – year month day =020315

Comments = daily comp, weekly comp etc.

An example is: the Battle River Generating Station unit #5 and the sample was a daily composite fly ash sample taken April 10, 2002 as follows:
“BR5-FA-020410-daily comp”

Sample Analysis

The weekly composite fly ash sample will be split into two or three equal sub-samples. All the fly ash sub-samples will be sent either to the CANMET lab or one of the laboratories participating in the Laboratory Round Robin from the utilities. Each station can also ship a split of the fly ash sub-sample to Dr. Fari Goodarzi of Geological Survey of Canada in Calgary for preservation. At the station's discretion, a split of the sample may also be retained at the station for future use.

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

Method 1 – CANMET or a Participating Laboratory

The fly ash will be analysed for mercury, unburned carbon (loss of ignition) and moisture (ASTM C 311), chlorine and sulphur (ASTM D5016-98).

NOTE: If the analysis shows a very small, almost negligible amount of any of the parameters after a reasonable number of samples have been analysed, then that parameter can be eliminated at the discretion of the utility.

Referenced materials or recognised standards will periodically be sent to the labs (including the CANMET lab that will be initially used for analysis) as part of the QA/QC of the program of the Laboratory Round Robin.

Method 2 – At Station

The fly ash will be analysed at the station analytical lab for unburned carbon, chlorine, sulphur (ASTM D5016-98) and moisture (ASTM C 311).

NOTE: If the analysis shows a very small, almost negligible amount of any of the parameters after a reasonable number of samples have been analysed, then that parameter can be eliminated at the discretion of the utility. If after three months of analyses the values for unburned carbon are less than 0.5 %, and the values for chlorine are less than 100 ppm, further analyses will not be required.

Sample Shipment to CANMET or a Participating Laboratory

Samples sent out to CANMET or one of the participating laboratories (in the Laboratory Round Robin) would leave the site in appropriately labelled containers. Samples will be sent by courier to the laboratory.

Note: It is assumed that utilities will assemble four weeks worth of samples before sending them for analysis to CANMET or other participating laboratory. This is at the discretion of the utilities.

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

SECTION 2.3 BOTTOM ASH SAMPLING & ANALYSIS

Sample Collection

Three weekly samples of bottom ash will be obtained during the beginning of the coal and ash sampling program (one per week). If during that time, the samples show that the mercury content in the bottom ash is less than 5% of the total mercury input in the coal, the requirement for bottom ash sampling may be eliminated.

Sample Identification

Each sample will be properly labelled for tracking and reporting purposes. Each sample shall be provided with a sample ID that will indicate the station/boiler unit #, ash type and date.

A sample format is: Station unit-fuelDate-Comments

Station – 2 or 3 characters to ID station
Unit – unit # = 2
Ash type – bottom ash = BA
Date – year month day =020315
Comments = grab, daily comp, weekly comp etc.

An example is: the Battle River Generating Station unit #5 bottom ash and the sample was a grab sample taken April 10, 2002 as follows:
“BR5-BA-020410-grab”

Sample Analysis

The weekly bottom ash sample will be split into two or three equal sub-samples. All the bottom ash sub-samples will be sent either to the CANMET lab or one of the laboratories participating in the Laboratory Round Robin from the utilities and will be analysed for mercury. Each station may also ship a split of the bottom ash sub-sample to Dr. Fari Goodarzi of Geological Survey of Canada in Calgary for preservation. At the station's discretion, a split of the sample may also be retained at the station for future use.

Sample Shipment to CANMET or a Participating Laboratory

Samples sent out to CANMET or one of the participating laboratories (in the Laboratory Round Robin) would leave the site in appropriately labelled containers. Samples will be sent by courier to the laboratory.

Note: It is assumed that utilities will assemble a minimum of three bottom ash samples before sending them for analysis to CANMET or other participating laboratory. This is at the discretion of the utilities.

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

REPORTING

Reporting of results will be as per each utility's agreement with their respective provincial governments as outlined in Section 4.

QUALIFICATIONS

Utilities will be expected to follow the guidelines/requirements set out for sample gathering and preparation in the appropriate ASTM or EPA standard. Deviation from or modifications to those standards must be approved by their respective jurisdictions. Participating laboratories (including CANMET) must undergo laboratory verification and be approved by the appropriate jurisdiction for use.

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

SECTION 2.4: SAMPLING & ANALYSIS: APPLICABLE METHODOLOGIES

SAMPLE COLLECTION

The following methods are recommended for collecting samples of coal based on the type of coal shipment and feed configuration:

- ASTM D6315 - Standard Practice for Manual Sampling of Coal from Tops of Barges
- ASTM D6610 - Standard Practice for Manual Sampling Coal from Surfaces of a Stockpile
- ASTM D4915 - Standard Guide for Manual Sampling of Coal from Tops of Railroad Cars
- ASTM D4916 - Standard Practice for Mechanical Auger Sampling
- ASTM D6609 - Standard Guide for Part-Stream Sampling of Coal
- ASTM D2234 - Standard Practice for Collection of a Gross Sample of Coal

In addition to the sampling methods, a few methods related to sampling procedures/protocols that could be used in conjunction with the standard sampling methods are listed here.

- ASTM D4702 - Standard Guide for Inspecting Crosscut, Sweep-Arm, and Auger Mechanical Coal Sampling Systems for Conformance with Current ASTM Standards
- ASTM D6518 - Standard Practice for Bias Testing a Mechanical Coal Sampling System
- ASTM D4182 - Standard Practice for Evaluation of Laboratories Using ASTM Procedures in the Sampling and Analysis of Coal and Coke

SAMPLE PREPARATION

Coal Samples:

- ASTM D2013 - Standard Practice of Preparing Coal Samples for Analysis

Solid Residue Samples:

- Standard practices for the sampling and preparation of residues have not been established. The recommended size reduction is 150-um (No. 100) U.S.A. standard sieve.

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

ANALYSIS OF MERCURY

Coal:

For the analysis of mercury in coal, the following methods are recommended:

- ASTM D3684 - Standard Test Method for Total Mercury in Coal by the Oxygen Bomb Combustion/Atomic Absorption Method
 - This method can achieve lower quantitative limit (LQL) of 60 ng/g (ppb) and hence is suitable for high mercury coals only. The method is unsuitable for ashes and other low-BTU materials.
- ASTM D6414 - Standard Test Method for Total Mercury in Coal and Coal Combustion Residues by Acid Extraction or Wet Oxidation/Cold Vapour Atomic Adsorption
 - This method can achieve a LQL of 30 ng/g (ppb). The method is suitable for ash and can be adopted for high-mercury samples by decreasing the weight of the sample.
- ASTM D6722 - Standard Test Method for Total Mercury in Coal and Coal Combustion Residues by Direct Combustion Analysis
 - This method can achieve a LQL of 20 ng/g (ppb) and is suitable for ash and other solid residues.
CAUTION: In some cases, a coal sample can cause problems with uniform combustion depending on its composition, including moisture content. The sample might explode or spark in the combustion chamber.
- U.S. EPA Method 7473 - Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry
 - The instrument has a LQL at 20 ng/g. This technique can analyse replicate samples in a relatively short time with little or no contamination problems.

Solid Residues:

For the analysis of mercury in solid residues such as ashes, the following methods are recommended:

- ASTM D6414 - Standard Test Method for Total Mercury in Coal and Coal Combustion Residues by Acid Extraction or Wet Oxidation/Cold Vapour Atomic Adsorption
 - This method can achieve a LQL of 30 ng/g (ppb). The method is suitable for ash and can be adopted for high-mercury samples by decreasing the weight of the sample.
- ASTM D6722 - Standard Test Method for Total Mercury in Coal and Coal Combustion Residues by Direct Combustion Analysis
 - This method can achieve a LQL of 20 ng/g (ppb) and is suitable for ash and other solid residues.
CAUTION: In some cases, a coal sample can cause problems with uniform combustion depending on its composition, including moisture content. The sample might explode or spark in the combustion chamber.
- U.S. EPA Method 7473 - Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry
 - The instrument has a LQL at 20 ng/g. This technique can analyse replicate samples in a relatively short time with little or no contamination problems.

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

Other Residues:

For the analysis of mercury in liquid residues, the following methods are recommended:

- EPA 7471A (Acid Extraction CVAA)
- EPA 1631 (Acid Extraction CVAFS¹)
- Microwave Digestion CVAA.

ANALYSIS OF CHLORINE

Coal:

The following methods are available for the analysis of chlorine in coal.

- ASTM D4208 - Bomb Combustion Ion Selective Electrode (ISE)
- Pyrohydrolysis / Ion Chromatography
- ASTM D2361 - Standard Test Method for Chlorine in Coal
- ASTM D6721 - Standard Test Method for Determination of Chlorine in Coal by Oxidative Hydrolysis Microcoulometry

Solid Residues:

- Pyrohydrolysis / Ion Chromatography
- Instrumental Neutron Activation

**CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION
PLAN**

SECTION 3

STACK SAMPLING GUIDELINE

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

SECTION 3 STACK SAMPLING & ANALYSIS GUIDELINE

INTRODUCTION

Mercury emissions from coal-fired boilers have been notoriously difficult to quantify, given the complex chemistry of mercury and the limitations of methodologies at the low concentrations at which mercury exists in typical combustion flue gases. In support of the development of the Canada Wide Standard for Mercury, the Canadian electricity generators are upgrading their estimates of mercury emissions from their boilers. This quality-assured speciated emissions inventory will provide the basis for work among industry, governments, and other stakeholders to improve the management of mercury emissions from coal-fired boilers.

As part of a voluntary mercury program, several Canadian Electricity Association (CEA) members will conduct standardised stack tests, after the pollution control device(s) on a unit at a facility, over the period of 2002 – 2003.

PROGRAM DESCRIPTION

General

The guideline for stack testing provides flexibility for companies with respect to individual differences. Previously conducted tests and similarities among coal, combustion and emission control devices are key factors in determining the need for testing. For instance:

- Stack analyses conducted since 1996 using the Ontario Hydro Method and meeting the criteria for quality assurance and quality control will not require retesting.
- It is not necessary to carry out stack sampling and analysis for each unit. It is recognised that many utilities have boiler configurations and feed coal sources that are equivalent for the purposes of mass balance. In such a case the data from one unit may be used as a proxy for another.

Company requirements for activity will be established on a site-by-site basis with provincial regulators. A stack test plan will be devised and provided to each jurisdiction pending this decision.

Stack Testing

Testing should be conducted in accordance with either the “Standard Test Method for Elemental, Oxidised, Particle-bound, and Total Mercury in Flue Gas Generated from Coal-fired Stationary Sources (Ontario Hydro Method)”, or USEPA Method 29 as appropriate. The Ontario Hydro Method will be employed where speciated mercury emissions are required and Method 29 where total mercury emission data is sought.

Stack testing will be conducted after the last pollution control device. Testing is to consist of three runs at full load. During each stack test, three as-fired coal samples, and three combustion residue samples will also be collected and analysed. The results of the analysis of stack tests, coal samples and residue samples will be reported when final, in a manner consistent with the Reporting Guideline outlined in Section 4.

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

Schedule/Deliverables

The Stack Testing Program is estimated to require 24 months to complete. Utilities will be expected to submit the results of stack testing to their respective jurisdictions in a manner consistent with Section 4 Reporting Guideline. Reports will include data for mercury in coal, mercury in combustion residues and mercury air emissions. All stack testing should be completed by June 2004.

Qualifications

The qualified Company/Contractor must have demonstrated experience with the Ontario Hydro Method or USEPA Method 29 as appropriate.

**CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION
PLAN**

SECTION 4

REPORTING GUIDELINE

**CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION
PLAN
SECTION 4**

**REPORTING GUIDELINE
TABLE OF CONTENTS**

SECTION 4 REPORTING GUIDELINE OVERVIEW

REPORTING TEMPLATES :

- ANNEX A GENERAL FACILITY INFORMATION REPORT**
- ANNEX B STACK TESTING SITE PLAN REPORT**
- ANNEX C COAL & ASH SAMPLING SITE PLAN REPORT**
- ANNEX D QUARTERLY FACILITY REPORT**

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

SECTION 4 REPORTING GUIDELINE FOR THE CEA MERCURY SAMPLING & ANALYSIS PROGRAM: OVERVIEW

INTRODUCTION

This Guideline outlines the rules and procedures for reporting data under the CEA Mercury Sampling & Analysis Program (the “Program”). These rules and procedures represent the agreement of the parties on: 1) how data generated by the program will be reported by individual companies to their governing provincial jurisdiction and the CEA; and 2) how the CEA will, in turn, manage and report the data received from individual companies.

4.1 SUBMISSION OF GENERAL FACILITY INFORMATION AND SITE SPECIFIC SAMPLING/TESTING PLANS

- a) Companies will submit to their respective jurisdiction, no later than _____, a completed form of the “General Facility Information” report, attached as Annex A.
- b) Companies will submit to their respective jurisdiction, no later than _____ days before proposed on-site stack testing, a site specific test plan in conformance with the form in Annex B.
- c) Companies will submit to their respective jurisdiction, no later than _____, a coal and ash sampling plan in conformance with the form in Annex C.

4.2 QUARTERLY REPORTING TO GOVERNING JURISDICTION AND CEA

a) Form and Delivery of Quarterly Report

Companies will use the attached form (Annex D– Quarterly Facility Reporting Form) to report mercury stack testing activity and coal and ash sampling and analysis data for each of their facilities on a quarterly basis. Two copies of the report will be submitted to each of a designated representative of the governing jurisdiction and the CEA according to the schedule described in (b).

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

b) Commencement and Timing of Quarterly Report

October 1, 2002 marks the start of the first reporting period. A facility's sampling, analysis and reporting schedule, however, may change over the period of the program, in accordance with the Coal and Ash Sampling and Analysis Guideline. As a consequence, a date of commencement for a second phase of 36 weeks of coal and ash sampling and analysis, if deemed necessary, must be selected by the parties to this agreement in order to maintain a nationally consistent reporting schedule.

A report will be submitted quarterly for each plant and will reflect the coal and ash sampling and analysis data collected during the previous quarter. For greater clarity, data collected between October 1, 2002 and December 31, 2002 would be reported no later than the last working day of March, 2003, data collected between January and March, 2003 would be reported no later than the last working day of June, 2003. Any applicable mercury stack testing activity will be noted in the quarterly reports. This quarterly reporting schedule is to be applied until completion of the Program in _____, 2004.

c) Content of Quarterly Report

The content of the quarterly report is represented in the sample form attached in Annex D to this guideline. Companies will provide all information on a per unit basis.

i) GENERAL PLANT INFORMATION

Plant Name:
Legal Owner
Legal Operator:
Plant Representative:
Contact Info for Plant Representative
Primary Fuel (Type, %)
Secondary Fuel (Type, %)
Net Generation (GWh)

- Changes to Unit Equipment or Operations during Quarter:
- Changes/Deviations from Coal Sampling and Analysis Program as submitted in _____.
- Changes/Deviations from Ash Sampling and Analysis Program as submitted in _____
- Summary of Stack Testing Activity
- other information relevant to the data reported

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

ii) FOR COAL

Ash - % by weight (dry basis)
Sulphur - % by weight (dry basis)
Moisture - % by weight (dry basis)
Heating Value – mmBtu/ton (and kJ/kg?)
Mercury – ppm
Chlorine – ppm

iii) FOR ASH

Unburned Carbon - % by weight (dry basis)
Moisture - % by weight (dry basis)
Sulphur - % by weight (dry basis)
Mercury – ppm (dry basis)
Chlorine – ppm (dry basis)

The results of a three-week bottom ash sampling program will be reported to the designated jurisdictional representative for each facility no later than _____. If bottom ash indicates quantities of mercury are less than five percent of the predicted mass balance of mercury, no further testing or reporting of bottom ash mercury content is required.

d) Additional Reporting of Mercury Stack Testing Results

In addition to quarterly reporting of any summary results of mercury stack testing performed, facilities will submit two copies of the mercury stack testing report within ____ days of its finalisation to the designated provincial jurisdictional representative and the CEA.

e) Reporting Changes to Plant Equipment, Process, Sampling or Analytical Procedures

In the event that a change or deviation is required from a facility's Mercury Stack Testing and/or Coal and Ash Sampling programs as submitted to the responsible jurisdiction, a facility representative will forthwith notify the designated provincial jurisdictional representative.

f) Public Access to and Availability of Quarterly Reports

Program results will be made available to the public through the CEA.

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

g) Confidentiality

Should a facility wish to claim certain data or information as confidential, it must notify the designated provincial jurisdictional representative and provide reasonable justification for the claim in accordance with the relevant provisions of their jurisdiction's Access to Information legislation.

h) Quarterly Meetings with Jurisdiction

A representative from each company participating in the Program will meet quarterly with the designated representative of the responsible jurisdiction to review the company's progress and findings with its coal and ash sampling and analysis program.

i) Annual National Meetings

Approximately three months after the conclusion of each reporting year under the Program, a national meeting will be convened to review and assess progress and findings under all aspects of the Program. For additional detail, see Part III.

4.3 CEA DATABASE AND PUBLIC REPORTING

a). Role of CEA in Data Management

The CEA will:

- i) Receive and maintain a copy of the quarterly report of each facility participating in the Program;
- ii) Create a central database for the information and data collected throughout the Program
- iii) Create and maintain a public website for the Program. The website will incorporate the data and results of all data gathering programs, as well as information pertaining to the status of all aspects of the Program including the laboratory round robin, training for stack testing, summary of activity of the information clearing house as well as any additional mercury related activity that participating companies wish to report.
- iv) Respond promptly to any public or stakeholder requests for access to the data submitted by facilities participating in the Program.
- v) Within 30 days of receipt of the quarterly reports from participating facilities, prepare a national compilation of the quarterly reports, available in both paper and electronic form.
- vi) Within 120 days of receipt of the third and sixth quarterly facility reports, respectively, prepare an annual report that compiles and analyses

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

the facility data submitted over the course of the year, identifying key trends and observations related to the data gathering program. This annual report to be made available in both paper and electronic form. The annual report will summarise activity related to the laboratory round robin, training for stack testing, developments in ASTM procedures, information clearing house activities, as well as any other utility activity on mercury that companies wish to have reported.

- vii) Host an annual meeting of company representatives, designated jurisdictional representatives and ENGO representatives to the Mercury Canada Wide Standards process to review and assess progress on the Program.
- viii) Monitor and report to participating companies and designated jurisdictional representatives any changes to relevant ASTM procedures.

Ensure open and regular communication, as required, with the appropriate CCME and CEA representatives.

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

**SECTION 4
ANNEX A GENERAL FACILITY INFORMATION REPORT**

Facility Name: _____ Date Prepared: _____

Note: A copy of ANNEX A must be completed for each facility and submitted to the designated provincial jurisdictional representative by_____.

PART I: GENERAL INFORMATION

Name of Legal Facility Owner	
Address of Legal Facility Owner	
Name of Facility Operator	
Address of Facility Operator	
Facility Code	
Facility Address	
Facility Mailing Address (if different from above)	
Designated Facility Contact Person	
Title and Contact Information for Designated Facility Contact Person	
Facility In-Service Date	
No. of Boilers	
Total Nameplate Capacity	

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

PART II – FUEL INFORMATION

a) Fuel Overview

Primary Fuel	lignite sub bituminous bituminous anthracite oil natural gas pet coke
Primary Fuel Used (%)	
Major Source of Primary Fuel	
Secondary Fuel	lignite sub bituminous bituminous anthracite oil natural gas pet coke
Secondary Fuel Used (%)	
Major Source of Secondary Fuel	
Other Fuels Used (check as applicable, indicate %; include only if >5%)	lignite sub bituminous bituminous anthracite oil natural gas pet coke use: ____ %
Major Source(s) of Other Fuels	
Fly Ash Handling	wet dry
Fly Ash Disposal	landfill sale storage
Bottom Ash Handling	wet dry
Bottom Ash Disposal	landfill sale storage

b) General Fuel Characteristics (as received on a weight basis, moisture in):

Boiler ID	HHV (kJ/kg)	Sulphur (%)	Ash (%)	Hg (ppb)	Moisture (%)

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

PART III – POWER GENERATION INFORMATION

a) General Boiler Information

Boiler ID	Status*	Nameplate Capacity (MCR)	Boiler Manufacturer	In Service Date	Type of Firing**

* Operating (OP), Out of Service > 365 days (OS), Retired & not expected to be returned to service (RE), Standby or Inactive Reserve (SB), Cold Standby & requires 3-6 months to reactivate (SC), Other (OT)

** Tangential (TF), Spreader Stoker (SS), Fluidized Bed (FB), Front Firing (FF), Cyclone (CY), Concentric (CO), Side Firing (SF), Downshot (DS), Other (OT)

b) Boiler ID & Capacity (MWe)

Boiler ID	1995	1996	1997	1998	1999	2000	2001	2002

c) Boiler ID & Net Generation (GWh)

Boiler ID	1995	1996	1997	1998	1999	2000	2001	2002

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

PART IV: POLLUTION CONTROL EQUIPMENT

Boiler ID	NO _x Control ¹	SO ₂ Control ²	Particulate Control ³

- 1: low NO_x Burners (LNB), selective catalytic reduction (SCR), selective non-catalytic reduction (SNCR), fluidised bed combustion (FBC), other (OT)
 2: wet flue gas desulphurization, (FGD-wet); dry scrubbing (FGD-dry); compliance coal (CC), fluidised bed combustion (FBC), coal gasification (CG), other (OT)
 3: Fabric filter (FF); cold-side electrostatic precipitator (CS-ESP); hot-side electrostatic precipitator (HS-ESP); cyclone (CYC), other (OT)

PART V: EMISSIONS SUMMARY FOR 2001

Boiler ID	SO _x (tonnes)	NO _x (tonnes)	Total PM (tonnes)	Mercury (kg)

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

PART VI: DATA COLLECTION PROGRAMS

a) Coal and Ash Sampling and Analysis Program

As specified in the Reporting Guideline, each facility is asked to complete the form in Annex C, “Coal and Ash Sampling Site Plan” and submit it to the designated provincial jurisdictional representative no later than _____. Annex C is supplementary to Annex A and details the sampling and analysis program for the facility.

b) Stack Testing Program

i) As specified in the Reporting Guideline, each facility is asked to complete the form in Annex B, “Stack Testing Site Plan Report” and submit it to the designated provincial jurisdictional representative no later than _____ days before each planned testing event. Annex B is supplementary to Annex A and details the stack testing program for the facility.

ii) Please complete the table below for submission with this report (adding rows as needed).

Prior Stack Tests (1996-2001)*			
Boiler ID	Date	Method	Total Hg (g/h)
Preliminary Test Plan			
2002 Testing	<u>Boiler ID:</u>	<u>Proposed Date:</u>	<u>Method:</u>
2003 Testing	<u>Boiler ID:</u>	<u>Proposed Date:</u>	<u>Method:</u>
2004 Testing	<u>Boiler ID:</u>	<u>Proposed Date:</u>	<u>Method:</u>

*Previous report results to be provided.

**CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION
PLAN**

SECTION 4

ANNEX B STACK TESTING SITE PLAN REPORT

NOTE: A COMPLETED COPY OF ANNEX B MUST BE SUBMITTED TO THE DESIGNATED PROVINCIAL JURISDICTIONAL REPRESENTATIVE AT LEAST 60 DAYS PRIOR TO EACH PLANNED STACK TESTING EVENT

Name of Facility			
Testing Dates (dd/mm/yy)			
Boiler ID for Test Unit			
Test Method	Ontario Hydro Method US EPA Method 29		
Plant Representative	Name:	Tel:	Email:
Stack Testing Contractor	<u>Name:</u>	<u>Tel:</u>	<u>Email:</u>
Designated Provincial Representative	<u>Name:</u>	<u>Tel:</u>	<u>Email:</u>
Audit/Process Monitor	<u>Name:</u>	<u>Tel:</u>	<u>Email:</u>
Laboratory 1	<u>Contact Info:</u>		<u>Analysis to be Performed:</u>
Laboratory 2 (if applicable)	<u>Contact Info:</u>		<u>Analysis to be Performed:</u>
Summary of Deviations from the Stack Sampling Guideline s sampling locations			
Summary of Stack Sampling Method Deviations			
Summary of Deviations from the Stack Sampling Method QA/QC requirements			

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

SECTION 4

ANNEX C COAL & ASH SAMPLING SITE PLAN REPORT

NOTE: A COMPLETED COPY OF ANNEX C MUST BE SUBMITTED FOR EACH FACILITY TO THE DESIGNATED PROVINCIAL JURISDICTIONAL REPRESENTATIVE BY SEPTEMBER 16, 2002.

Name of Facility					
Program Start Up (dd/mm/yy)					
Plant Representative	<u>Name:</u>	<u>Tel:</u>	<u>Email:</u>		
Designated Provincial Representative	<u>Name:</u>	<u>Tel:</u>	<u>Email:</u>		
Laboratory 1	<u>Contact Info:</u>		<u>Contact Info:</u>		
Laboratory 2 (if applicable)	<u>Analysis to be Performed:</u>		<u>Analysis to be Performed:</u>		
Coal Sampling Location/Method	<u>Location:</u>		<u>Based on ASTM Method:</u>		
Ash Sampling Location/Method	<u>Location:</u>		<u>Based on ASTM Method:</u>		
Coal Sampling Frequency/Method	daily weekly		manual automatic		
Ash Sampling Frequency	daily weekly				
ASTM methods for coal analysis	<u>HHV:</u>	<u>Ash:</u>	<u>Moisture:</u>	<u>Sulphur:</u>	<u>Chlorine:</u> <u>Mercury:</u>
ASTM methods for ash analysis	<u>U.C.</u>	<u>Moisture :</u>	<u>Sulphur :</u>	<u>Chlorine :</u>	<u>Mercury :</u>
Summary of QA/QC for coal sampling and analysis					
Summary of QA/QC for ash sampling and analysis					

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

SECTION 4

ANNEX D QUARTERLY FACILITY REPORT

QUARTER: _____

GENERAL FACILITY DATA

Name of Facility: _____ Legal Owner: _____ Legal Operator: _____

Facility Representative: _____

Contact Info for Facility Representative (tel; email): _____

Is Data Representative of Facility: y/n?

If no, specify unit(s) represented by data: _____

QUARTERLY FUEL AND GENERATION SUMMARY

Primary Fuel: a) type _____ b) % of quarterly fuel mix _____

Secondary Fuel: a) type _____ b) % of quarterly fuel mix _____

Net Generation (GWh): _____

BACKGROUND INFORMATION

Relevant Changes to Facility Equipment or Operation	
Changes/Deviations from Coal Sampling & Analysis Plan	
Changes/Deviations from Ash Sampling & Analysis Plan	
Summary of Mercury Stack Testing Activity	
Other Information Relevant to Data Collection Program	

CEA MERCURY PROGRAM – SAMPLING & ANALYSIS IMPLEMENTATION PLAN

WEEKLY COAL & ASH SAMPLING RESULTS

Specify units represented by data: _____
 (Attach a separate report for each unit tested at a plant)

MEASURED DATA ↓		WEEKS														
		1	2	3	4	5	6	7	8	9	10	11	12	13	Range	Avg
COAL	Ash															
	Sulphur															
	Moisture															
	HHV															
	Hg															
	Cl															
ASH	U. C.															
	Moisture															
	Sulphur															
	Hg															
	Cl															

NOTES:

UNIT

Fuel Type: Choose from list: BIT, LIG, SUB, WC, SC, RFO, PC, NG, OTH (if combination, indicate ratio of two highest vol. fuel)

COAL**

Ash: % by weight
 Sulphur: % by weight
 Moisture: % by weight
 HHV: mmBtu/ton
 Hg: ppm
 Cl: ppm

ASH**

U.C. (unburned carbon): % by weight
 Moisture: % by weight
 Sulphur: % by weight
 Hg : ppm
 Cl: ppm

**all measurements to be reported on a dry basis

Fuel Types:

BIT: bituminous/anthracite LIG: lignite SUB: subbituminous WC: waste/other coal SC: coal-based synfuel
 RFO: residual fuel oil PC: petroleum coke NG: natural gas DFO: distillate fuel oil OTH: other