CANADA-WIDE STANDARD FOR MERCURY EMISSIONS FROM COAL-FIRED ELECTRIC POWER GENERATION PLANTS

2009 PROGRESS REPORT

Table of Contents

Pages 46-48 revised February 2013

Introduction

This report presents an update on progress toward meeting the targets of the Canada-wide Standard for Mercury Emissions from Coal-fired Electric Power Generation Plants. Only those jurisdictions with coal-fired electric power generation plants are required to report progress under this Canada-wide standard. More information on the Canada-wide Standards for Mercury may be found on the CCME website at www.ccme.ca.

Summary

In 2006 the Canadian Council of Ministers of the Environment (CCME) endorsed Canada-wide Standards (CWS) for Mercury Emissions from Coal-fired Electric Power Generation Plants. The CWS set targeted caps for each signatory jurisdiction for the year 2010. In 2009 there were 1617.8 kilograms of mercury emitted in total from coal-fired power generation plants in signatory jurisdictions. In 2003, the coal-fired electric power generation sector emitted an estimated 2,695 kilograms of mercury from an estimated 3,725 kilograms of mercury in coal burned.

Province	2008 Mercury Emissions	2009 Mercury Emissions	2010 cap
Alberta	481 kg	579 kg	590 kg
Saskatchewan	648 kg	730 kg	430 kg (early actions to be used to meet cap)
Manitoba	9.6 kg	2.8 kg	20 kg
Ontario	191 kg	59 kg	Under discussion*
New Brunswick	41 kg	107 kg	25 kg
Nova Scotia	161 kg	140 kg	65 kg
Total	1532 kg	1617.8 kg	1130*

*Ontario cap to be added to total

Jurisdiction Reports

The following information was submitted by signatory jurisdictions in accordance with Section 2.1 of the *CCME Monitoring Protocol in Support of the Canada-Wide Standards for Mercury Emissions from Coal-Fired Electric Power Generation Plants.*

ALBERTA

The seven coal-fired power plant facilities in Alberta are the Battle River Generating Station, the Genesee Thermal Generating Station – Units 1 and 2, the Genesee Thermal Generating Station – Unit 3, the Keephills Generating Plant, the H.R. Milner Generating Station, the Sheerness Generating Station, the Sundance Generating Plant and the Wabamun Generating Station. All facilities were in operation in 2009.

	Total Mass Mercury		
Facility	**Emissions (kg)**	**In coal burned (kg)**	**Retained in ash and residue (kg)**
Battle River Unit 3	16.7	23.6	29.9 (station total)
Battle River Unit 4	16.8	23.7	
Battle River Unit 5	39.2	55.4	
Genesee Unit 1 & 2	107.20	163.55	56.35
Genesee Unit 3	51.83	92.25	41.12
H.R Milner	3.3	19.18	27.0
Sheerness	108.71	136.33	27.61
Sundance	165.8	281.1	115.3
Keephills	29.3	109.8	80.5
Wabamun	40		

BATTLE RIVER GENERATING STATION

a) Annual Mercury Emissions

The annual mercury emissions calculated in 2009 was 72.7 kg.

b) Mercury Capture Rates

The rate of capture, based on captured mercury to total inlet mercury was 29.2%

c) Monitoring Methods Use for All Parameters

- Stack Testing and Flow Monitoring (CEMS)
- Mass Balance
- Other equivalent method

d) Justification for Alternative Methods

N/A

e) Supporting Data

N/A

f) Mercury Speciation (Averages)

Particulate and Oxidized Mercury: 15.8%
Elemental Mercury: 84.2%

g) Mercury Content of Coal

Mercury content was 43.07 µg/kg
Coal Mass Burned 2,377,104,000 kg.

h) Combustion Residues Mercury Content, Mass & Management Method

Raw Flyash – 109.95 µg/kg – 236,872,000kg – classifier rejects to landfill
Classified Ash – 124.63 µg/kg – 19,557,000 kg – marketed for concrete & other uses
Bottom Ash – 6.92 µg/kg – 206,764,000 kg - landfill

GENESEE THERMAL GENERATING STATION

In 2009, there was one planned outage at Unit 1, which lasted 19 days. In 2009, Unit 3 had no planned outages

a) Annual Mercury Emissions

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	Genesee Unit 1 &/2	**Genesee Unit 3**	**Total**
Year	***Hg Emissions to Air (kg)***	***Hg Emissions to Air (kg)***	***(kg)***
2009	107.20	51.83	159.03

b) Mercury Capture Rate

N/A

c) Monitoring Methods Used for All Parameters

- Stack Testing and Flow Monitoring (CEMS)
- Other equivalent method
- Mass Balance - The annual emissions of total mercury and the capture rate for Genesee were calculated using the mass balance method detailed in the *Canadian Uniform Data Collection Program for Mercury from Coal-fired Electric Power Generation.*

Coal Monitoring Methods	
Component	**Analysis Method**
Sample Preparation	ASTM D2013 and ASTM D3302
Ash Content	ASTM D3174/ASTM D5142
Sulphur Content	ASTM D4239C
Chlorine Content	ASTM D4208
Moisture	ASTM D3174
Mercury	ASTM D6722
Heating Value	ISO 1928
Residue (Fly Ash, Bottom Ash) Monitoring Methods	
Ash Content	ASTM D3174/ASTM D5142
Sulphur Content	ASTM D4239C
Chlorine Content	ASTM D4208
Moisture	ASTM D3174
Mercury	ASTM D6722
Loss-on-Ignition	ASTM D7348
Flue Gas	
Mercury (total and speciation)	Ontario Hydro Stack Test

d) Justification for Alternative Methods

For Genesee Units 1 and 2, the weight of the bottom ash and fly ash returned to the mine is based on an estimated weight per load which is on a wet basis. The ratio of fly ash and bottom ash to total ash includes both the disposed ash and the total ash. Moisture for the fly ash and bottom ash disposed at the mine were assumed (20% for the fly ash and 25% for the bottom ash) to calculate the ratio of fly ash and bottom ash on a dry basis.

To determine the accuracy of the calculation used to determine the split between fly ash and bottom ash, a comparison between the amount of ash disposed and sold and the amount of ash calculated using the average ash content of the coal and total amount of the coal combusted was calculated. The variance between sold/disposed and calculated ash content of the coal was -3.1%.

Based on the method outlined above, the total amount of ash sold and disposed of was within 10% of the amount calculated using the ash content of the weekly composite coal samples.

e) Supporting Data

N/A

f) Mercury Speciation (Averages)

Mercury and total speciation were sampled as part of the Ontario Hydro Stack Test conducted once a year on each stacks (Stack 1 – Unit 1&2; Stack 2 – Unit 3). Mercury samples were collected and analyzed following the protocols in the *Canadian Uniform Data Collection Program (UHDCP) for Mercury from Coal-fired Electric Power Generation, January 2003*.

On June 3 and 4, 2009, Maxxam Analytics conducted a source emission survey on Unit 1/2 Stack at Genesee for mercury speciation in flue gas. On June 1 and 2, 2009, Maxxam Analytics conducted a source emission survey on Unit 3 at Genesee for mercury speciation in flue gas. Stack testing was conducted in accordance with the requirements of the Ontario Hydro Method.

Genesee Unit 1&2:
Total Mercury: 12.28 g/h
Particulate Mercury: 0.0061 g/h
Oxidized Mercury: 1.89 g/h
Elemental Mercury: 10.38 g/h

Genesee Unit 3:
Total Mercury: 6.13 g/h
Particulate Mercury: 0.019 g/h
Oxidized Mercury: 0.027 g/h
Elemental Mercury: 6.08 g/h

g) Mercury Content of Coal

Genesee Units 1&2 = 163.55 kg/yr
Genesee Unit 3 = 92.25 kg/yr

Average Mercury Content in Coal:
Genesee Units 1&2 = 54.94 ppb
Genesee Unit 3 = 54.29 ppb

h) Combustion Residues Mercury Content, Mass & Management Method

Annual Average Mercury Content in Fly Ash:
Genesee Unit 1&2 = 128.74 ppb
Genesee Unit 3 = 141.00 ppb

Annual Average Mercury Content in Bottom Ash:
Genesee Unit 1&2 = 10.22 ppb
Genesee Unit 3 = 12.02 ppb

Total Mercury in Ash (includes fly ash and bottom ash):
Genesee Unit 1&2 = 56.35 kg/yr
Genesee Unit 3 = 41.12 kg/yr

Genesee Unit 1 and Unit 2 sale a portion of the fly ash and bottom ash residues for use in concrete production, and the remainder of ash is returned to the mine to be land filled.

Genesee Unit 3 ash residue is not suitable for use in concrete production and all ash is returned to the mine to be land filled.

According to the EPEA approval for the Genesee mine, the ash returned to the mine is to be buried no less than 1.2 meters below the surface of the reconstructed land and must be deposited at least 1.5 meters above the level of the re-established water table of the reconstructed land.

SUNDANCE, KEEPHILLS AND WABAMUN GENERATING PLANTS (TRANSALTA)

a) Annual Mercury Emissions

	Sundance	**Keephills**	**Wabamun**	**Total**
Year	***Hg Emissions to Air (kg)***	***Hg Emissions to Air (kg)***	***Hg Emissions to Air (kg)***	***(kg)***
2009	165.8	29.3	40	229.4

b) Mercury Capture Rate

N/A

c) Monitoring Methods Use for All Parameters

- Stack Testing and Flow Monitoring (CEMS)
    - Mass Balance (used for Keephills and Sundance).
- Other equivalent method

- Wabamun totals are calculated using a method based on the coal burned and the mercury content of the coal from the weekly coal analysis and based on a capture rate of 26% based on our existing equipment.

d) Justification for Alternative Methods

N/A

e) Supporting Data

N/A

f) Mercury Speciation (Averages)

Sundance - Ontario Hydro Stack Test Results

Stack	Date	Elemental Mercury	Oxidized Mercury	Particulate Mercury
Sundance 2 (Units 3&4)	June 2000	86.0%	11.5%	2.48%
Sundance 3 (Units 5&6)	April 2004	94.9%	5.1%	0%
Sundance 1 (Units 1&2)	May 2006	77.2%	22.6%	0.26%
Sundance 2 (Units 3&4)	April 2008	83.0%	14.0%	3.00%
Sundance 3 (Units 5&6)	May 2009	86.1%	13.6%	0.3%

Keephills - Ontario Hydro Stack Test Results

Stack	Date	Elemental Mercury	Oxidized Mercury	Particulate Mercury
Keephills Stack 1	December 2005	76.0%	23.8%	0.12%
Keephills Stack1	June 2009	86.2%	13.3%	0.46%

g) Mercury Content of Coal

Sundance - 281.1 kg
Keephills - 109.8 kg

h) Combustion Residues Mercury Content, Mass & Management Method

Sundance
110.1 kg (Flyash)
5.13 kg (Bottom Ash)

At Sundance ~73% of flyash is disposed of in the mine. The remaining 27% is sold. Bottom Ash is disposed in the mine.

Keephills
76.8 kg (Flyash)
3.78kg (Bottom Ash)

Keephills ash is all transported via pipeline to the Keephills Ash Lagoon. Mercury totals have to be calculated based on Ash content of the coal and by using the % split that was derived using the Sundance Plant.

All of the data provided for the Sundance and Keephills plants is available in more detail in the Sundance and Keephills 2009 Annual reports submitted to AENV in April 2010.

H.R. MILNER GENERATING STATION

	Total Mass Mercury		
Facility	**Emissions (kg)**	**In coal burned (kg)**	**Retained in ash and residue (kg)**
H.R. Milner 2008	3.3	19.18	27.0

a) Annual Mercury Emissions

The annual mercury emissions in 2009 were 3.3 kg.

b) Mercury Capture Rate

N/A

c) Monitoring Methods Use for All Parameters

- Stack Testing and Flow Monitoring (CEMS) Ontario Hydro Method/Stack Testing data used for emissions to air
- Mass Balance
- Average of CanMet test analysis for coal, fly ash and bottom ash.

d) Justification for Alternative Methods

Samples were collected and tested once/month as per the Canadian Uniform Data Program (UDCP) for Mercury. The data for coal, fly ash and bottom ash were averaged over the year. The averages were multiplied by the coal consumed, fly ash and bottom ash produced to calculate total mercury in the coal burned, fly ash and bottom ash retained.

e) Supporting Data

The fly ash and bottom ash data are as reported in the NPRI

f) Mercury speciation

Parameter	**Test 1**	**Test 2**	**Test 3**	**Average**
Test Date Test Time	Sept. 18/09 08:57 - 10:10	Sept. 28/09 10:25 - 11:35	Sept. 28/09 11:50 - 13:01	
Particle Bound Mercury mg/m3 (dry basis)	0.000067	0.000063	0.000069	0.000066
Oxidized Mercury mg/m^3 (dry basis)	0.00016	0.00017	0.00030	0.00020
Elemental Mercury mg/m^3 (dry basis)	0.00021	0.00029	0.00030	0.00027
Total Mercury mg/m^3 (dry basis) kg/year	0.00044 2.73	0.00053 3.31	0.00067 4.16	0.00054 3.40
Particulate Concentration mg/m3 (dry basis) mg/m3 (wet basis)	113.0 106.3	109.6 102.4	103.6 497.3	106.7 102.0
Particulate Emission Rates Tonnes/hr (dry basis) g/Kg (dry basis) g/Kg (dry basis) @ 50% EA	0.080 0.091 0.092	0.078 0.088 0.091	0.074 0.084 0.086	0.077 0.088 0.090
Flow Rate m^3/sec Actual m^3/sec	197.3 343	199.0 349	198.4 349	198.2 347
Temperature °C Moisture Vol % Oxygen Vol % Carbon Dioxide Vol % Excess Air %	160 5.9 7.2 12.5 51.8	161 6.5 8.5 12.5 55.0	163 6.1 7.5 12.5 54.4	161 6.2 7.4 12.5 53.7

g) Mercury Content of Coal

2009 Mercury content = 19.18 kg

h) Combustion Residues Mercury Content, Mass & Management Method

Both ash waste streams were managed at the Flood Creek Ash Disposal Facility

2009 Mercury content of Fly Ash and Bottom Ash = 27.0 kg

SHEERNESS GENERATING STATION

a) Annual Mercury Emissions

The annual mercury emissions in 2009 as calculated by the mass balance method was 108.71 kg

b) Mercury Capture Rate

N/A

c) Monitoring Methods Used for All Parameters

- Stack Testing and Flow Monitoring (CEMS)
  The protocol of ASTM Method D6784-02 was followed to test for the emission of Mercury.
  Alberta Stack Sampling Code, Method #2, Determination of Stack Gas Velocity and Volumetric Flow Rates.

- Flow and Sample Level Temperature.
  The protocols of Method 1, 2, 3, and 4 of the Alberta Stack Sampling Code were used to test Volumetric Flow and Sample Level Temperature.

- Mass Balance
  Weekly Mass Balance: Equation 1.1b from the CCME Monitoring Protocol in Support of the Canada-Wide Standards for Mercury Emissions from Coal-Fired Power Generation Plants

d) Justification for Alternative Methods

N/A

e) Supporting Data

N/A

f) Mercury Speciation

The ASTM Method D6784-02 was followed to test for the emission of Mercury.

Table 1 – 2009 Mercury Stack Survey Summary Data

Category	Unit of Measure	Averages	% of Total Mercury
Total Mercury	g/h	23.55	-
Particulate Mercury	g/h	<MDL	0.0%
Oxidized Mercury	g/h	7.35	31.2%
Total Particulate and Oxidized Mercury	g/h	7.35	31.2%
Elemental Mercury	g/h	16.2	68.8%

MDL - Minimum Detection Limit

g) Mercury Content of Coal

Total mercury in coal was 136.33 kg.

h) Combustion Residues Mercury Content, Mass & Management Method

Raw Waste Flyash: 295,017 kg, disposal in engineered landfill.
Sales Flyash: 63,275 kg, recycled for use in concrete production.
Bottom Ash: 123,959 kg, disposal in engineered landfill.

Mass of Residues:
The annual mass of fly ash generated by the facility was 360,394 tonnes. The annual mass of bottom ash disposed of by the facility was 160,993 tonnes.

Management Method:
80,192 tonnes of fly ash was sold for use in concrete manufacturing. The remaining ash was sent to the ash management site.

SASKATCHEWAN

Saskatchewan has three coal-fired electric power generation plants including Boundary Dam Power Station, Poplar River Power Station, and Shand Power Station. All three plants are operated by SaskPower.

Saskatchewan Ministry of Environment and SaskPower have entered into a draft Memorandum of Understanding (MOU) on monitoring mercury emissions from coal-fired power plants in support of the Canada-wide Standards (CWS). As part of the MOU, the ministry has also received and accepted a proposed mercury monitoring plan the utility prepared with the assistance of the *Monitoring Protocol*. In accordance with the MOU requirement, mercury monitoring at the SaskPower's coal-fired power plants started on January 1, 2007.

The mass balance approach is the method being followed in Saskatchewan. In 2009, the total amount of mercury emitted from all the coal-fired power plants in Saskatchewan is 730 kg. Saskatchewan's early actions will be used to meets its provincial cap of 430 kg/yr for the years 2010 to 2013. Examples of early actions include a mercury switch collection program and early mercury controls at the Poplar River Power Station.

Saskatchewan's overall approach to managing emissions from coal-fired power plants is to incorporate the CWS into the conditions of permit to operate issued pursuant to Saskatchewan's *Clean Air Act* and Clean Air Regulations. If the construction of a new coal-fired power plant is considered a "development", management of mercury emissions will be introduced through *The Environmental Assessment Act* process.

Over the years, SaskPower has carried out significant research and development (R&D) on mercury to ensure the other information provision of the CWS is met. Some of the SaskPower's mercury control activities include:

- SaskPower's Emission Control Research Facility, which has established a mercury capture rate of 75% at Poplar River Power Station, received a national stewardship award in 2008.
- A commercial system including full-scale injection of enhanced activated carbon into the electrostatic precipitator was installed for both Poplar River units and handed over to the plant on June 5, 2009 making it the first permanent utility mercury control system in Canada.
- 43 kg of mercury was recovered from mercury switches and thermostats in 2008 with 29.5 kg eligible as an offset toward the CWS for mercury emissions requirement. Additional credits have been achieved as a result of mercury captured from Poplar River Power Station.
- Collaboration with lignite burning facilities in North Dakota to get various tests done on coal.
- Investigation of several coal treatment approaches in order to remove significant amount of mercury and other pollutants from lignite coal.

Achievement of the CWS

Saskatchewan's existing plants are well positioned to meet the provincial mercury cap of 430 kg starting in 2010 as a result of SaskPower's above noted control activities. For existing units, the annual mercury emissions from each unit will be totaled and compared to the Saskatchewan annual mercury limit of 430 kg. Any credits for early actions will be applied to reduce total annual emissions to 430 kg.

No new units have come on line during this reporting period. Any new units that may be installed in the future will clearly be designed to meet these limits. For any new units, the mercury emissions will be compared to the amount of mercury content of coal to determine whether 75% reduction required for lignite coal is achievable. The mercury emissions will also be compared to the amount of electricity generated by the unit to determine whether the emission rate limit of 15 kg/TWh for lignite is achieved.

The following information on Saskatchewan coal-fired electric power generating plants was provided by SaskPower.

Boundary Dam (BDPS), Poplar River (PRPS) and Shand (SHPS) Power Stations

a) Annual Mercury Emissions (kg)

	BDPS	**PRPS**	**SHPS**	**Total**
Year	*Hg Emissions to Air (kg)*	*Hg Emissions to Air (kg)*	*Hg Emissions to Air (kg)*	*(kg)*
2003	301	293	116	710
2007	270	311	107	688
2008	292	240	115	648
2009	288	332	110	730

b) Mercury Capture Rates

N/A

c) Monitoring Methods Used for All Parameters

SaskPower uses the mass balance approach where over a given period of time the masses of mercury entering the unit in the coal stream and leaving the unit in solid by-product residue streams are determined. The difference between these masses represents the amount of mercury emitted from the unit. The methods for mass balance determinations are based on the successful program in which SaskPower and Saskatchewan MoE (at the time Saskatchewan Environment) worked together to determine the mercury inventories from SaskPower's coal-fired units during the development of the Canada Wide Standards for Mercury Emissions from Coal-Fired EPG Plants.

Under normal plant coal sampling equipment availability, three daily samples are collected over a two week period and analyzed for mercury according to ASTM D-6722. One sample per week is analyzed if the equipment availability is reduced. If the sampling equipment is not available, feeder samples are collected and analyzed considering the recommendations of the CCCI report. The mercury mass entering the unit is determined from the mercury concentration of the coal analyzed and the amount of coal fed to the unit over the period of time represented by the analyzed coal. The mercury mass leaving the unit in the combustion residues is determined from the mercury concentration of the combustion residues analyzed and the amount of combustion residues leaving the unit over the period of time represented by the analyzed combustion residues.

d) Justification for Alternative Methods

Any modifications from the previously used methods are based on the requirements of MOU between MoE and SaskPower plus recommendations from the report, “Review of and Comments on SaskPower’s Past and Future Sampling Protocols for Mercury in Coal and Coal Combustion By-Products” prepared by Champagne Coal Consulting Inc. (CCCI).

e) Supporting Data

The mercury sampling program is based on the recommendations of CCCI, which performed detailed analysis of the data collected during the determination of the mercury inventories from SaskPower’s coal-fired units during the development of the Canada Wide Standards for Mercury Emissions from Coal-Fired EPG Plants. The CCCI report has been submitted to Saskatchewan Ministry of Environment

SaskPower keeps all the analytical data collected from the mass balance determinations in a secure fashion on its corporate computer network. This data includes the raw data from the individual analyses of the mass balance samples as well as the data from the various checks and standards used to verify the sample data.

f) Mercury Speciation

In accordance with the draft MOU between the Saskatchewan Ministry of Environment and SaskPower on mercury monitoring, SaskPower has agreed to conduct annual speciated mercury testing at all of its stacks annually starting in 2009. The results for 2009 testing are summarized in the following table:

Stack	Test Dates	Contractor	Particulate Mercury	Oxidized Mercury	Elemental Mercury
Boundary Dam 1 & 2	Aug 25 - 30, 2009	SRC	0.3%	23.7%	75.9%
Boundary Dam 3	July 9 - 12, 2009	SRC	0.3%	11.8%	87.5%
Boundary Dam 4	Aug 25 - 30, 2009	SRC	< 0.1%	36.6%	63.4%
Boundary Dam 5	Aug 25 - 30, 2009	SRC	0	30.5%	69.1%
Boundary Dam 6	Aug 25 - 30, 2009	SRC	0	27.0%	73.0%
Shand	Sept 15 - 16, 2009	Maxxam	0.14%	5.8%	94.0%
Poplar River 1	N/A	N/A	N/A	N/A	N/A
Poplar River 2	N/A	N/A	N/A	N/A	N/A

Speciated mercury was determined by the Ontario Hydro Test in all cases. Ontario Hydro testing was scheduled for Poplar River in the fall of 2009. However, favourable test conditions could not be obtained before winter weather prevented any testing by the end of the year. In order to make up for this, two sets of speciated mercury testing are planned for 2010.

g) Mercury Content of Coal (kg)

	BDPS	PRPS	SHPS	Total
Year	*Hg in Coal (kg)*	*Hg in Coal (kg)*	*Hg in Coal (kg)*	*(kg)*
2003	331	315	122	766
2007	288	372	113	773
2008	310	309	119	738
2009	303	364	115	781

h) Combustion Residues Mercury Content, Mass & Management Method (Mg)

Mercury in Coal Combustion Residues:

	BDPS	PRPS	SHPS	Total
Year	*Hg in Residues (kg)*	*Hg in Residues (kg)*	*Hg in Residues (kg)*	*(kg)*
2003	31.8	22.9	7.4	62.1
2007	18.1	59.9	5.8	83.7
2008	17.9	68.8	4.6	91.3
2009	15.4	31.5	4.3	51.2

Total Coal Combustion Residues:

	BDPS	PRPS	SHPS	Total
Year	*Combustion Residues (kg)*	*Combustion Residues (kg)*	*Combustion Residues (kg)*	*(kg)*
2003	589,599,000	480,239,000	214,568,000	1,284,406,000
2007	663,841,811	495,027,180	232,005,135	1,390,874,126
2008	621,352,021	439,876,972	204,364,212	1,267,141,999
2009	584,540,969	532,964,331	206,553,354	1,324,058,654

Fly ash and bottom ash are hydraulically transported to ash lagoons at both Boundary Dam and Poplar River and the transport water is circulated back to the plant to collect more ash. Lagoons at both plants are lined and monitored to ensure ash constituents do not migrate into the environment. Extensive testing of by-products resulting from the test work at the ECRF have demonstrated that any mercury captured by activated carbon is effectively fixed and that less mercury is released than when activated carbon is not present. Consequently ashes containing carbon at Poplar River are also placed in the lagoons. None of the ash produced at Poplar River is currently utilized, although interest in this by-product is increasing. About 12-15% of the ash produced at Boundary Dam is utilized, but greater demand is being experienced and SaskPower is planning to upgrade the infrastructure at Boundary Dam to accommodate the anticipated added activity.

At Shand, fly ash and bottom ash are dry hauled to a dedicated placement site that is designed to minimize any contact with water. The site is also lined and monitored to prevent ash constituents from entering the environment. Recent fly ash utilization at Shand has been about 20-30% and this is expected to increase significantly. Applications for most, if not all, of the fly ash produced at Shand are expected to occur in the next few years.

% Fly Ash Sales to Total Ash Produced:

	BDPS	**SHPS**	**PRPS**
Year	*% fly ash sales*	*% fly ash sales*	*% fly ash sales*
2003	10%	19%	none
2007	16%	14%	none
2008	15%	28%	none
2009	13%	23%	none

MANITOBA

Manitoba has only one small coal-fired electricity generation plant located in Brandon. As of January 1, 2010, Manitoba Hydro operated this facility in accordance to Regulation 186/2009, *Coal-fired Emergency Operations Regulation*, under Manitoba Statute *The Climate Change and Emissions Reduction Act*, C.C.S.M. c. C135. This statute and Regulation limits the facility operation to use coal to generate power only to support emergency operations.

Information for 2009 generated in accordance with the *Monitoring Protocol in support of the Canada-wide Standards for Mercury Emissions from Coal-fired Electric Power Generation Plants* follows. Manitoba total emissions of 2.8 kilograms mercury are well within its 2010 cap of 20 kilograms per year.

BRANDON GENERATING STATION

a) Annual Mercury Emissions

The annual emissions of total mercury in calendar year 2008 were 9.575 kilograms via the air and 0.750 kilograms in the ash.

	Brandon Unit 5	**Total**
Year	***Hg Emissions to Air (kg)***	***(kg)***
2003	20.122	20.122
2008	9.575	9.575
2009	2.822	2.822

b) Mercury Capture Rates
This is not a requirement as Brandon Unit 5 is not a new generating unit. However, during 2009 the percent mercury capture rate was 12.11%.

c) Monitoring methods used for all parameters

Manitoba Hydro utilizes the Mass Balance method of determining their total annual mercury emissions. Mass balance calculations are made following the UDCP guide for mercury from coal-fired electric power generation. An annual stack testing program for mercury emissions, conducted in November 2009, provides mercury speciation data to support the mass balance calculations. The results of the 2009 stack testing program are within ±20% of the mass balance results, thereby corroborating the mass balance results reported.

The mercury speciation in flue gas sampling program was designed to comply with the requirements of "*The Canadian Uniform Data Collection Program (UDCP) for Mercury from Coal-Fired Electric Power Generation*", developed by the Canadian Council of Ministers of the Environment Mercury Canada-Wide Standards Development Committee in January 2003. This test program employed wet chemistry stack testing in accordance with the Ontario Hydro Method. Table 3.1 outlines the test matrix that was followed in completing this objective.

Test Matrix

Sampling Locations	**No. of Runs**	**Sample/Type Pollutant**	**Sampling Method**	**Sample Run Time (min)**	**Analytical Method**	**Analytical Labora-tory**
Precipitator Inlet	3	Speciated Mercury	Ontario Hydro Method	144	CVAAS(1) or CVAFS(2)	ALS(3)
Precipitator Outlet	3	Speciated Mercury	Ontario Hydro Method	150	CVAAS(1) or CVAFS(2)	ALS(3)

(1) CVAAS – Cold vapour atomic absorption spectrometry
(2) CVAFS – Cold vapour atomic fluorescence spectromety
(3) ALS – ALS Laboratory Group, Burlington, Ontario

The speciated mercury samples were collected isokinetically which allowed the simultaneous determination of stack gas temperatures and velocities, stack gas composition and moisture content.

Mercury content of coal and coal combustion residues (fly ash, bottom ash) are determined routinely by Manitoba Hydro throughout the year. The sampling protocol is outlined in the document submitted to Manitoba Conservation entitled "Manitoba Hydro Brandon Generating Station Site Specific Test Plan for Mercury in Coal, Ash & Residue Sampling and Analysis Program". The program is designed to collect and analyze coal and residue composite samples every week during the year when Brandon Unit #5 is generating. Weekly composite samples are comprised of three daily samples taken during the week. Bottom ash samples were not obtained this year due to the low mercury ash content levels in 2008. The weekly coal and residue sampling program employs the following test methods:

Applicable Reference Methods

COAL

TOPIC	STANDARD	TITLE
Sampling	ASTM D6609	Standard Guide for Part-Stream Sampling of Coal
Sample Preparation	ASTM D2013	Standard Practice of Preparing Coal Samples for Analysis
% Moisture	ASTM D3302	Standard Test Method for Total Moisture in Coal
% Moisture	ASTM D3173	Standard Test Method for Moisture in the Analysis Sample of Coal and Coke
Mercury	ASTM D6722	Standard Test Method for Total Mercury in Coal and Coal Combustion Residues by Direct Combustion Analysis
Mercury	EPA Method 7473	Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry
% Ash	ASTM D3174	Standard Test Method for Ash in the Analysis Sample of Coal and Coke from Coal
% Sulphur	ASTM D4239C	Standard Test Methods for Sulfur in the Analysis Sample of Coal and Coke Using High Temperature Tube Furnace Combustion Methods
Higher Heating Value	ASTM D5865	Standard Test Method for Gross Calorific Value of Coal and Coke
Higher Heating Value	ISO 1928	Solid mineral fuels -- Determination of gross calorific value by the bomb calorimetric method, and calculation of net calorific value

FLY ASH

TOPIC	STANDARD	TITLE
Sampling	No Standard	Not Applicable
Sample Preparation	No Standard	Recommended size reduction is 150-um (No. 100) U.S.A. standard sieve
% Moisture	ASTM D3302	Standard Test Method for Total Moisture in Coal
% Moisture	ASTM D3173	Standard Test Method for Moisture in the Analysis Sample of Coal and Coke
Mercury	ASTM D6722	Standard Test Method for Total Mercury in Coal and Coal Combustion Residues by Direct Combustion Analysis
Mercury	EPA Method 7473	Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry
% Sulphur	ASTM D5016	Standard Test Method for Sulfur in Ash from Coal, Coke, and Residues from Coal Combustion Using High-Temperature Tube Furnace Combustion Method with Infrared Absorption

BOTTOM ASH

TOPIC	STANDARD	TITLE
Sampling	No Standard	Not Applicable
Sample Preparation	No Standard	Recommended size reduction is 150-um (No. 100) U.S.A. standard sieve
Mercury	ASTM D6722	Standard Test Method for Total Mercury in Coal and Coal Combustion Residues by Direct Combustion Analysis
Mercury	EPA Method 7473	Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry

Additionally, coal and ash composite samples were collected in conjunction with the speciated mercury emission testing to allow mercury mass balance calculations per the UDCP for mercury guide. Coal composite samples from the pulverizer pipes were collected, prepared and analyzed for ultimate and proximate analysis, calorific value, % chlorine, % sulphur, % ash, % moisture and mercury. Composite samples from the coal feeders were also collected, prepared and analyzed for % moisture and mercury. Composite combustion residue (fly ash and bottom ash) samples were collected for analysis of mercury, % chlorine, % carbon, % sulphur and % moisture.

d) Justification of Alternative Methods

No alternative methodologies are employed by Manitoba Hydro for the determination of total annual mercury emissions.

Minor modifications to the speciated mercury emissions testing methodologies were employed for the November 2009 source testing program. These modifications were discussed with and presented to Manitoba Conservation in a Pre-test Plan. Approval to proceed with the sampling program and minor test method modifications was received from Manitoba Conservation prior to testing. The test method deviations are discussed in Section 3.2 of the Dillon mercury source testing report.

e) Supporting Data

No supporting data was requested by Manitoba Conservation.

f) Mercury Speciation

Mercury speciation of the total annual mercury air emissions is available from the results of the mercury source testing program. The Ontario Hydro Method allows for the determination of elemental mercury and oxidized mercury (both particle-bound and non-particle-bound). Table 3.2 summarizes the results of the electrostatic precipitator inlet / outlet triplicate source testing program and the results of mercury analyses performed on coal, fly ash and bottom ash samples collected concurrently with the air emissions testing. Based on the flue testing results, the majority of mercury loading to the electrostatic precipitator and emissions from the electrostatic precipitator is in the elemental form. The quantity of particle-bound mercury is approximately 3 times higher than the oxidized mercury in the upstream flue while the amount of particle-bound mercury is approximately fifty times lower than the oxidized mercury in the downstream flue.

On a percentage basis, elemental mercury represents just over 89% of the total mercury emissions and oxidized mercury represents just below 11% of the total mercury emissions, based on the downstream flue results.

Summary of Results				
Sample Location	**Elemental Mercury (g/hr)**	**Oxidized Mercury (g/hr)**	**Particle-Bound Mercury (g/hr)**	**Total Mercury (g/hr)**
Coal				
Run 1	Not applicable	Not applicable	Not applicable	2.51
Run 2				2.24
Run 3				2.19
Average				2.31
Bottom Ash				
Run 1	Not applicable	Not applicable	Not applicable	0.006
Run 2				0.006
Run 3				0.006
Average				0.006
Fly Ash				
Run 1	Not applicable	Not applicable	Not applicable	0.46
Run 2				0.37
Run 3				0.38
Average				0.40
Downstream Flue				
Run 1	1.01	0.19	0.004	1.21
Run 2	1.50	0.18	0.003	1.68
Run 3	1.34	0.06	0.003	1.41
Average	1.28	0.15	0.003	1.43
Upstream Flue				
Run 1	1.26	0.13	0.536	1.93
Run 2	1.64	0.13	0.186	1.96
Run 3	1.54	0.08	0.225	1.84
Average	1.48	0.11	0.316	1.91

Note: All bottom ash mercury contents were non-detect.

g) Mercury Content of Coal

The mercury content of the coal during the 2009 calendar year (weekly sampling periods) ranged between 0.043 and 0.080 parts per million with and average of 0.054 (the weighted average mercury content was 0.051 ppm). The mass amount of mercury in the coal was 3.104 kilograms. The mercury content of the coal during the annual stack test (comprised of three test runs) was 0.063, 0.057 and 0.056 parts per million.

h) Combustion Residues Mercury Content, Mass & Management Method

The coal combustion residue mercury content and mass amounts are provided in the following table:

Coal Combustion Residue Type	Number of Samples	Mercury Content (ppm)	Average (ppm)	Mass Amounts (tonnes)	Total Mercury Released in the Ash (kg)
Fly ash	16	0.037 to 0.222	0.111	2,712	0.282
Bottom ash	0	0	0	904	0.000

Combining the amount of mercury in bottom ash and fly ash released results in a total release of mercury in the combustion residue of 0.282 kilograms.

The coal combustion residues are sent to an ash lagoon for storage. The Brandon Generating Station has approval to utilize the coal combustion residues for various purposes, including, but not limited to; unstabilized sub-base or base course in roads, as a component of cement-stabilized road bases and as an embankment material for roads, area fills and dikes. However, no coal ash was utilized at Brandon in 2009.

Contact
Climate Change and Environmental Protection Division, Manitoba Conservation
Tel 204-945-8443; Fax 204-945-1211

ONTARIO

Ontario currently has four operating coal-fired electric generating stations. Ontario is legally required by regulation to phase out coal use at all four coal-fired generating stations by the end of 2014 and has initiated a series of measures including announcing the phasing out of four coal-fired units in 2010. For 2009, Ontario's total mercury emissions from coal-fired electric generating stations were 59 kilograms.

Generation Station	Kilograms emitted in 2009
Lambton	19 kg
Nanticoke	27 kg
Thunder Bay	4 kg
Atikokan	9 kg
Total	59 kg

Since the 2003 baseline year Ontario has reduced its mercury emissions from coal-fired electric power generation plants by 86%. Closing the Lakeview coal-fired electricity generating station in April 2005 was an important first step in reducing Ontario's mercury emissions. Since the coal phase-out was announced, Ontario has not and will not be initiating any new coal-fired electric power generation.

LAMBTON GENERATING STATION

a) Annual Mercury Emissions

Year	Mass Mercury Emissions – to Air (kg)
2000	174
2001	164
2002	130
2003	122
2004	46
2005	67
2006	53
2007	107
2008	58
2009	19

b) Monitoring Methods Used for All Parameters

The sampling and analytical procedures used to compile the mercury emission figure are described in the accepted Mercury Monitoring Reporting Program (MMRP) dated October 2009.

c) Justification for Alternative Methods

Three of the monthly mercury concentrations were estimated as described below.

Unit 1&2 –April Coal & Fly Ash Hg Concentration

April 2009 coal and fly ash mercury concentrations are based on a simple average of all the monthly values. This was done as a result of very low operational time for the unit pair which did not allow for the collection of adequate samples. (15.5 hours for the entire month).

Unit 3&4 – June FGD Sludge Hg Concentration

June 2009 FGD sludge mercury concentration is based on an average of the May and July sludge mercury samples. This was done because the FGD Effluent Water Treatment Plant was not in operation for the majority of June 2009. Operational oversight for the periods of time the plant was in operation lead to no sample being collected for the month.

Unit 3&4 – October Fly Ash Hg Concentration

October 2009 fly ash mercury concentration is based on an average of the September and November fly ash mercury samples. This was done because Lambton was not able to collect a sample for this period.

d) Supporting Data

The following tables show the monthly total mass consumed of coal and production of its various residues and average mercury concentrations for each unit pair used to calculate the 2009 mercury emissions. Note: Due to rounding, re-computation of the values in this table may not yield the exact results.

Unit 1&2 Mass and Mercury Concentration

Unit 1&2	Coal		Fly Ash		Bottom Ash	
	Mass (Mg)	Hg (mg/kg)	Mass (Mg)	Hg (mg/kg)	Mass (Mg)	Hg (mg/kg)
January	47538	0.100	4273	0.377	2535	0.043
February	29781	0.081	2695	0.355		
March	10979	0.090	977	0.331		
April	648	0.079	57	0.328		
May	18187	0.099	1650	0.354		
June	29442	0.073	2880	0.261		
July	4878	0.052	468	0.309		
August	10349	0.073	990	0.036		
September	14013	0.061	1233	0.373		
October	12894	0.068	1191	0.363		
November	6357	0.093	596	0.391		
December	6051	0.076	525	0.454		

	Coal		Gypsum		EWPT Sludge		Fly Ash		Bottom Ash	
	Mass (Mg)	Hg (mg/kg)	Mass (Mg)	Hg (mg/kg)	Mass (Mg)	Hg (mg/kg)	Mass (Mg)	Hg (mg/kg)	Mass (Mg)	Hg (mg/kg)
January	173054	0.127	27510	0.274	208	6.500	12249	0.226	13271	0.043
February	155885	0.101	20612	0.322	308	11.134	10581	0.269		
March	139261	0.109	19617	0.230	196	17.379	9845	0.242		
April	91481	0.106	17924	0.257	86	32.827	9914	0.306		
May	96591	0.109	14107	0.252	201	19.904	6778	0.219		
June	29688	0.098	14080	0.161	85	17.556	2069	0.357		

July	46131	0.094	13541	0.119	194	15.209	3270	0.273		
August	105311	0.099	17609	0.213	392	20.542	7595	0.320		
September	39588	0.102	8411	0.137	181	23.281	2884	0.327		
October	59542	0.093	7425	0.212	128	13.870	4498	0.309		
November	88909	0.082	16356	0.178	184	25.662	6584	0.291		
December	149478	0.089	21823	0.306	265	15.756	10991	0.129		

The following tables show the calculated mass of mercury in coal and its various residues for each unit pair used to calculate the 2009 mercury emissions. Note: Due to rounding, re-computation of the values in this table may not yield the exact results. Also note that the effluent from the FGD sludge dewatering process was not included in the mass balance as analysis shows that no mercury is captured in the aqueous effluent.

Unit 1&2 Mercury Mass (kg)

Month	Coal	Fly Ash	Bottom Ash
January	4.7	1.6	
February	2.4	1.0	
March	1.0	0.3	
April	0.1	0.0	
May	1.8	0.6	
June	2.2	0.8	
July	0.3	0.1	
August	0.8	0.0	
September	0.9	0.5	
October	0.9	0.4	
November	0.6	0.2	
December	0.5	0.2	
Total	15.9	5.8	0.1
Total Released to Air	10.0		

Unit 3&4 Mercury Mass (kg)

Month	Coal	Fly Ash	Bottom Ash	Gypsum	Sludge
January	22.0	2.8		7.5	1.4
February	15.8	2.8		6.6	3.4
March	15.1	2.4		4.5	3.4
April	9.7	3.0		4.6	2.8
May	10.5	1.5		3.6	4.0
June	2.9	0.7		2.3	1.5
July	4.3	0.9		1.6	3.0
August	10.4	2.4		3.8	8.0
September	4.0	0.9		1.2	4.2
October	5.5	1.4		1.6	1.8
November	7.3	1.9		2.9	4.7
December	13.2	1.4		6.7	4.2
Total	120.9	22.2	0.6	46.8	42.4
Total Released to Air	8.9				

Two final issues around calculating FGD sludge mass needed to be resolved before we could confidently report our total release of mercury. First, an un-measureable portion of the FGD sludge is sent to a lagoon during periods when the filter press is out of service. Second, the FGD sludge mercury concentration is measured on a dry basis while the mass of land filled sludge is measured on a wet basis.

The following assumptions and justifications are made to account for these two issues.

Estimating FGD Sludge Moisture

Nominally, FGD sludge ranges from 50% - 60% moisture. A moisture value of 57% was selected to reasonably represent the average moisture of the sludge. This value was chosen partially based on our understanding on how the filter press operated during the year. It was also chosen based on the results of Source Test Verification that were generated using this value. Mass of dry sludge was calculating using the following formula.

$$\text{Mass Sludge (dry)} = \text{Mass Sludge Land Filled (wet)} \times (1 - \text{Moisture Content})$$

Estimating FGD Sludge Sent to the Lagoon

Periods when the EWTP is in service and filter press is bypassed can be estimated using two operational flow data streams. Half hour average flow data was gathered from the archival system and evaluated on a monthly basis. Each half hour period in the month when the EWTP was in service with filter press operational and when the sludge was sent to the lagoon was tabulated and a percent total period of time the sludge was sent to the lagoon was calculated (Equation 1). The average monthly flow when the EWTP was in service with filter press operational and when the FGD sludge went to the lagoon was also calculated.

Using this data the monthly mass of sludge (dry) sent to landfill per unit flow when the EWTP was in service with filter press operational was calculated (Equation 2). This value was then multiplied by the monthly flow to the EWTP when the FGD sludge was sent to the lagoon and the percentage of total time the FGD sludge was sent to the lagoon to calculate the mass of sludge (dry) sent to the lagoon (Equation 3).

This monthly mass of sludge (dry) sent to the lagoon was then added to the monthly mass of sludge land filled (dry) to estimate the total mass of sludge (dry) generated during the year (Equation 4).

The following data table shows the final mass of sludge including the intermediate calculations as described above.

Estimation of FGD Sludge sent to Lagoon & Calculation Total FGD Sludge Generated

Month	Sum of Periods Sludge Sent to Lagoon	Sum of Periods EWTP Operational	% Total Time Sludge Sent to Lagoon	Avg. Flow to EWTP when Filter Press Operational (m3/hr)	Avg. Flow to EWTP when Sludge sent to Lagoon (m3/hr)	Mass Sludge Land Filled (dry) (Mg)	Mass Sludge Land Filled (dry) per Unit Flow to EWTP when Filter Press Operational (Mg / m3/hr)	Mass Sludge sent to Lagoon (dry) (Mg)	Mass Total Sludge (dry) (Mg)
January	19	1473	1%	17.4	21.2	205	11.8	3.2	208
February	58	1343	4%	21.4	20.0	296	13.8	12.0	308
March	3	1435	0%	16.9	7.3	196	11.5	0.2	196
April	42	1380	3%	14.0	12.4	84	6.0	2.3	86
May	230	1295	18%	14.1	29.1	147	10.5	54.1	201
June	23	569	4%	6.1	21.9	75	12.3	10.9	85
July	18	1358	1%	22.5	10.6	193	8.6	1.2	194
August	146	1482	10%	24.2	25.2	355	14.7	36.4	392
September	139	1056	13%	13.2	26.7	143	10.8	38.0	181
October	150	1177	13%	13.1	18.0	109	8.3	19.0	128

November	116	1423	8%	19.7	19.5	170	8.6	13.8	184
December	119	1473	8%	17.2	23.5	238	13.9	26.3	265

Equations used in the table above:

Equation 1

$$\text{Total Time Sludge Sent to Lagoon} = \frac{\text{Sum of Periods Sludge Sent to Lagoon}}{\text{Sum of Periods EWTP Operational}} \times 100\%$$

Equation 2

$$\begin{matrix}\text{Mass Sludge Land Filled (dry) per Unit Flow} \\ \text{to EWTP when Filter Press Operational}\end{matrix} = \frac{\text{Mass Sludge Land Filled (dry)}}{\text{Avg. Flow to EWTP when Filter Press Operational}}$$

Equation 3

$$\text{Mass Sludge Sent to Lagoon (dry)} = \begin{matrix}\text{Mass Sludge Land Filled (dry)} \\ \text{per Unit Flow to EWTP} \\ \text{when Filter Press Operational}\end{matrix} \times \begin{matrix}\text{Avg. Flow to EWTP when} \\ \text{Sludge Sent to Lagoon}\end{matrix} \times \begin{matrix}\text{\% Total Time Sludge} \\ \text{Sent to Lagoon}\end{matrix}$$

Equation 4

$$\text{Mass Total Sludge (dry)} = \text{Mass Sludge Land Filled (dry)} + \text{Mass Sludge Sent to Lagoon (dry)}$$

Source Test Verification

To show that these assumptions are reasonable, a verification was performed on the measured total mass of mercury released (as shown by the mass balance) versus a calculated total mass of mercury for each unit pair. This calculated total mass of mercury is based on the mercury emission rate measured during the mercury emission source tests. The following formula was used to calculate this value.

$$\begin{matrix}\text{Calculated Annual} \\ \text{Hg Release (kg)}\end{matrix} = \frac{\text{Annual Generation for unit pair}(\text{Gw - hr}) \times \text{Source Test Measured Hg Emission Rate}\left(\frac{\text{mg}}{\text{s}}\right)}{\text{Avg. Load During Source Test for unit pair}(\text{Gw})} \times \frac{3600\left(\frac{\text{s}}{\text{hr}}\right)}{1{,}000{,}000\left(\frac{\text{mg}}{\text{kg}}\right)}$$

The table below shows the inputs as well as the resultant calculated annual release of mercury.

Hg Source Test Verification	Unit 3&4	Unit 1&2
Annual Generation (Gw-hr)	3451.6	479.9
Average Load during Source Test (Gw)	0.482	0.313
Mercury Emission Rate from Source Test (mg/s)	0.39	1.72
Annual Hg Release – From Source Test (kg)	10.1	9.5
Annual Hg Release – From Mass Balance (kg)	8.9	10.0
Difference (kg)	1.1	0.5
% Difference	12.9%	5.5%

The annual release of mercury calculated from the source test was compared to the annual release of mercury from the mass balance on Unit 3&4. As shown in the table above, there was only a 1.1 kg (12.9%) difference between the two values which shows excellent correspondence.

This source test verification was performed on Unit 1&2 as well as an independent evaluation of the annual release of mercury calculated from the mass balance. As shown in the table above, there was only a 0.5 kg (5.5%) difference between the two values which shows excellent correspondence.

The excellent correspondence between the annual measured Hg emissions and the annual calculated Hg emissions based on source testing for both unit pairs shows that:

- The estimated mercury concentrations as described in section (c) are reasonable
- The estimated moisture content of the FGD sludge is reasonable
- The technique used to estimate the monthly mass of FGD sludge sent to the lagoon and the resulting total dry mass of FGD sludge is reasonable
- All assumptions made are within the accepted range of error inherent to a mass balance of this scale

<u>e) Mercury Speciation</u>

The following table summarizes the results of mercury tests conducted to date.

Emission Source	Unit	Sample Date	Particulate Mercury (mg/s)	Oxidized Mercury (mg/s)	Elemental Mercury (mg/s)	Total Mercury (mg/s)	Emission Concentration (ug/Rm3 dry)
<u>Group 4</u>							
Lambton	2	July, 2000	0.04	2.88	0.91	3.83	7.1
			1%	75%	24%		
Lambton	1	October, 2008	0.27	2.13	0.06	3	6
			9%	71%	20%		
Lambton	2	June, 2009	0.003	1.3	0.42	1.72	4.7
			0.2%	75.4%	24.4%		

Emission Source	Unit	Sample Date	Particulate Mercury (mg/s)	Oxidized Mercury (mg/s)	Elemental Mercury (mg/s)	Total Mercury (mg/s)	Emission Concentration (ug/Rm3 dry)
Group 5							
Lambton	3	May, 2001	<0.01	0.06	0.64	0.7	1.3
			<1%	9%	91%		
Lambton	4	September, 2003	<0.01	0.07	0.14	0.21	0.4
			<1%	32%	67%		
Lambton	4	November, 2004	<0.01	0.02	0.13	0.16	0.3
			1%	15%	84%		
Lambton	3	September, 2005	0.01	0.09	0.18	0.27	0.5
			4%	33%	67%		
Lambton	3	September, 2008	0.01	0.18	0.33	1.37	2.7
			3%	34%	64%		
Lambton	4	April, 2009				0.39	0.75

f) Mercury Content of Coal; and,
g) Combustion Residues Mercury Content, Mass & Management Method

Please see the section d) above which details the amount of the different types of coal consumed and the amount of by-products generated as well as the associated mercury content.

In 2009, bottom ash was sold as a gravel substitute and gypsum was sold into the wallboard industry. Fly ash was either land filled on site or sold to various industries.

Ash Type	Quantity Diverted from Disposal (Mg)	Quantity Land Filled on Site (Mg)	Total (Mg)
Bottom Ash	15,806	0	15,806
Fly Ash	34,819	69,974	104,793
Gypsum	199,014	0	199,014

(h) Various Tables Summarizing Historical Stack Sampling, Fuel, and Residue Analytical Results

The historical stack sampling results are reported in section e on Mercury Speciation or Total Mercury Stack Test Results. A summary of the coal, ash and gypsum data from the year 2005 – 2008 follows.

Note: Re-computation of the values in this table may not yield the exact results due to rounding.

Year	Material	Mercury Concentration (mg/kg)	Moisture (%)	Amount Consumed or Produced (Mg)	Total Mercury (kg)	Mercury Emitted to Air (kg)
2008	Low Sulphur Bituminous Coal	0.08	8.1	651737	56	58
	Mid-Sulphur Bituminous Coal	0.1	5.8	1692915	175	
	Bottom Ash	0.043		28764		
	Fly Ash	U1&2 - 0.328 U3&4 - 0.272		63,511 128712		
	Gypsum	0.222		219,284		
2007	Low Sulphur Bituminous Coal	0.1	7.8	1,377,309	132	107*
	Mid-Sulphur Bituminous Coal	0.1	6.7	1,761,267	161	
	Bottom Ash	0.06		38,358		
	Fly Ash	U1, 2 – 0.23 U3, 4 – 0.27		133,997 134,510		
	Gypsum	0.04		241,305		
2006	Low Sulphur Bituminous Coal	Type 1 – 0.05 Type 2 – 0.10	6.4 8.8	219,293 459,964	10 43	53*
	Mid-Sulphur Bituminous Coal	0.1	7.1	1,803,755	165	
	Bottom Ash	0.08		29,193		
	Fly Ash	U1, 2 – 0.21 U3, 4 – 0.29		66,951 137,401		
	Gypsum	na		243,983		
2005	Low Sulphur Bituminous Coal	Type 1 – 0.03 Type 2 – 0.11	8.7 8.7	769,565 460,816	20 48	67*
	Mid-Sulphur Bituminous Coal	0.11	6.8	2,127,994	211	
	Bottom Ash	0.07		39,388		
	Fly Ash	U1, 2 – 0.15 U3, 4 – 0.29		113,243 162,361		
	Gypsum	0.02		268,870		

* Assume 90% retained by FGD units, and 31 % retained by non-FGD units

A summary of the ash & other residues disposition data from the year 2005 - 2008 follows:

Year	Ash Type	Quantity Diverted from Disposal (Mg)	Quantity Land Filled on Site (Mg)	Total (Mg)
2008	Bottom Ash	28,763	0	28,763
	Fly Ash	23,395	168,828	192,223
	Gypsum	219,284	0	219,284
2007	Bottom Ash	38,358	0	38,358
	Fly Ash	3,228	265,279	268,507
	Gypsum	241,305	0	241,305
2006	Bottom Ash	29,193	0	29,193
	Fly Ash	1,264	203,088	204,352
	Gypsum	243,983	0	243,983
2005	Bottom Ash	39,388	0	39,388
	Fly Ash	0	275,603	275,603
	Gypsum	268,870	0	268,870

NANTICOKE GENERATING STATION

a) Annual Mercury Emissions

Year	Mass Mercury Emissions – to Air (kg)
2009	27
2008	84
2007	148
2006	145
2005	156
2004	134
2003	205
2002	250
2001	226
2000	229

The decrease in mass mercury emissions in 2009 is due to a decrease in mercury concentration in sub-bituminous coal, and a decrease in coal burned.

b) Monitoring Methods Used for All Parameters

The sampling and analytical procedures used to compile the mercury emission figure are described in the accepted MMRP dated September 2008.

c) Justification for Alternative Methods

No alternate methods were used in 2009.

d) Supporting Data

The following table shows the coal consumption, ash production, and average mercury concentrations used to calculate emissions for 2009.

Note: Due to rounding, re-computation of the values in this table may not yield the exact results.

Material	Mercury Concentration (mg/kg) H_c/H_a	Moisture (%)	Amount Consumed or Produced (Mg) T_c/T_a	Total Mercury (kg) C_m/A_m
Sub-bituminous Coal (PRB)	0.067	28.3	2,390,197	115.1
Bituminous Coal (USLS)	0.069	7.8	607,403	38.8
Bottom Ash	0.09		28,200	2.4
Fly Ash	0.79		157,588	124.3
			Emitted to Air	27

(e) Mercury Speciation

The reports for the mercury source tests conducted on Unit 2 (Group 1), Unit 5 (Group 2) and Unit 8 (Group 3) in 2009 are attached. The 2009 source testing on Units 2 & 5 measured speciated mercury emissions, and the source testing on Unit 8 measured total vapour phase mercury emissions.

The following table summarizes the results of mercury tests conducted to date.

Emission Source	**Unit**	**Sample Date**	**Particulate Mercury (mg/s)**	**Oxidized Mercury (mg/s)**	**Elemental Mercury (mg/s)**	**Total Mercury (mg/s)**	**Emission Concentration (ug/Rm3 dry)**
Group 1							
Nanticoke	2	July 2009	0.0034	0.34	0.56	0.89	1.9
			0.4%	37.5%	62.1%		
Nanticoke	3	June	0.0044	0.89	1.31	2.2	4.2

Emission Source	Unit	Sample Date	Particulate Mercury (mg/s)	Oxidized Mercury (mg/s)	Elemental Mercury (mg/s)	Total Mercury (mg/s)	Emission Concentration (ug/Rm3 dry)
		2008	0.2%	40.4%	59.4%		
Nanticoke	2	April 2007	0.018	0.84	1.0	1.86	3.4
			1.0%	45.6%	54.3%		
Nanticoke	2	April 2005	0.021	0.86	1.24	2.12	4.2
			1.0%	40.5%	58.5%		
Nanticoke	3	June 2007	0.00	0.89	1.31	2.20	4.2
			0.2%	40.3%	59.5%		
Nanticoke	3	April 2005	0.16	0.65	0.47	1.28	2.4
			12.5%	50.8%	36.7%		
Nanticoke	6	Aug 2004	0.02	0.59	0.63	1.24	2.5
			1.9%	47.4%	50.7%		
Nanticoke	6	June 1999	0.04	0.44	0.54	1.03	2.1
			4.1%	43.0%	52.9%		
Group 2							
Nanticoke	5	Dec 2009	0.004	0.52	0.70	1.22	2.3
			0.3%	42.9%	57.1%		
Nanticoke	5	March 2009	0.012	0.38	0.73	1.12	2.1
			1.0%	33.6%	65.2%		
Nanticoke	5	March 2007	0.23	0.53	0.43	1.18	2.3
			19.2%	44.5%	36.3%		
Nanticoke	5	Sept 2004	0..02	1.02	0.28	1.32	2.5
			1.7%	76.9%	21.4%		
Nanticoke	5	April 2002	0.54	0.73	0.23	1.50	2.8
			35.9%	49.0%	15.1%		
Group 3							
Nanticoke	8	July 2009	-	-	-	0.96	2.2
Nanticoke	7	June 2008	0.01	2.04	0.63	2.68	5.1
			0.4%	76.0%	23.6%		
Nanticoke	7	April 2005	0.09	1.10	0.11	1.31	2.4

Emission Source	Unit	Sample Date	Particulate Mercury (mg/s)	Oxidized Mercury (mg/s)	Elemental Mercury (mg/s)	Total Mercury (mg/s)	Emission Concentration (ug/Rm3 dry)
		Test 1	6.9%	84.4%	8.7%		
Nanticoke	7	April 2005	0.20	0.89	0.09	1.18	2.3
		Test 2	16.5%	75.7%	7.8%		
Nanticoke	7	Aug 2004	0.03	1.46	0.36	1.85	3.7
			1.9%	78.8%	19.3%		
Nanticoke	7	July 2004	0.01	2.17	0.13	2.31	4.6
			0.6%	93.9%	5.5%		
Nanticoke	7	May 2004	0.01	1.16	0.20	1.37	2.7
			0.6%	84.7%	14.7%		
Nanticoke	7	April 2004	0.17	1.05	0.08	1.30	2.5
			12.8%	81.2%	6.0%		

<u>f) Mercury Content of coal; and,</u>
<u>g) Combustion Residues Mercury Content, Mass & Management Method</u>

Please see section (d) on Supporting Data. It details the amount of the different types of coal consumed and the amount of ash generated as well as the associated mercury content.

In 2009 fly ash and bottom ash was sold to the cement making and concrete industries. The remainder was land filled on site.

Ash Type	Quantity Diverted from Disposal (Mg)	Quantity Land Filled on Site (Mg)	Total (Mg)
Bottom Ash	0	28,200	28,200
Fly Ash	118,288	39,300	157,588

(h) Tables Summarizing Historical Stack Sampling, Fuel, and Residue Analytical Results.

The historical stack sampling results are reported in section (e), Mercury Speciation or Total Mercury Stack Test Results section.

A summary of the coal and ash data from the year 2005 follows. Re-computation of the values in this table may not yield the exact results due to rounding.

Year	Material	Mercury Concentration (mg/kg)	Moisture (%)	Amount Consumed or Produced (Mg)	Total Mercury (kg)
2008	Sub-bituminous Coal	0.060	28.0	6,385,386	277
	Bituminous Coal	0.070	7.1	1,427,466	92
	Bottom Ash	0.01		72,793	<1
	Fly Ash	0.70		406,739	285
			Emitted to Air		84
2007	Sub-bituminous Coal	0.071	28.8	7,564,352	382
	Bituminous Coal	0.071	8.1	1,496,324	98
	Bottom Ash	0.02		83,557	2
	Fly Ash	0.70		472,955	330
			Emitted to Air		148
2006	Sub-bituminous Coal	0.071	28.8	6,551,991	332
	Bituminous Coal	0.071	8.1	1,535,669	100
	Bottom Ash	0.01		74,714	0
	Fly Ash	0.69		422,929	287
			Emitted to Air		145
2005	Sub-bituminous Coal	0.068	28.8	6,190,571	300
	Bituminous Coal	0.065	8.1	2,206,795	131
	Bottom Ash	0.03		82,276	2
	Fly Ash	0.59		465,702	273
			Emitted to Air		156

A summary of the ash disposition data from the year 2005 follows:

Year	Ash Type	Quantity Diverted from Disposal (Mg)	Quantity Land Filled on Site (Mg)	Total (Mg)
2008	Bottom Ash	55,330	17,463	72,793
	Fly Ash	253,168	153,571	406,739
2007	Bottom Ash	110,314	*	83,557
	Fly Ash	320,934	152,021	472,955
2006	Bottom Ash	106,233	*	74,714
	Fly Ash	279,023	143,906	422,929
2005	Bottom Ash	118,975	*	82,276
	Fly Ash	256,640	209,062	465,702

* indicates that sales exceeded production; the remainder was recovered from storage

THUNDER BAY GENERATING STATION

a) Annual Mercury Emissions

Year	Mass Mercury Emissions – to Air (kg)
2000	56
2001	78
2002	72
2003	57
2004	37
2005	37
2006	39
2007	24
2008	31
2009	4

b) Monitoring Methods Used for All Parameters

The sampling and analytical procedures used to compile the mercury emission figure are described in the accepted MMRP dated September 2008.

c) Justification for Alternative Methods

No alternate methods were used in 2009.

d) Supporting Data

The following table shows the coal consumption, ash production, and average mercury concentrations used to calculate emissions. Due to rounding, re-computation of the values in this table may not yield the exact results.

Material	**Mercury Concentration (mg/kg dry)**	**Coal Consumed (Mg wet)**	**Coal Consumed or Ash Produced (Mg dry)**	**Total Mercury (kg)**
Sub-bituminous Coal	0.055	91,193.86	67,902.95	3.8
Lignite Coal	0.067	555.61	358.70	0.02
Bottom Ash	0.022	854.35	843.75	0.02
Fly Ash	<0.005	2,563.04	2,554.25	0.01
Mercury Emitted to Air				4

e) Mercury Speciation

No additional stack testing was conducted in 2009. The following table summarizes the results of mercury tests conducted to date.

Emission Source	**Unit**	**Sample Date**	**Particulate Mercury (mg/s)**	**Oxidized Mercury (mg/s)**	**Elemental Mercury (mg/s)**	**Total Mercury (mg/s)**	**Emission Concentration (ug/Rm3 dry)**
Group 6							
Thunder Bay	2	June, 1998	<0.01	0.07	1.76	1.83	10.7
			1%	4%	96%		
Thunder Bay	2	Dec, 2006	<0.01	0.16	1.59	1.75	10.0
			0%	9%	91%		
Thunder Bay	3	Dec, 2008	<.01	0.05	1.09	1.14	6.3
			0%	4%	96%		

f) Mercury Content of coal; and,
g) Combustion Residues Mercury Content, Mass & Management Method

Please see section d) above which details the amount of the different types of coal consumed and the amount of ash generated as well as the associated mercury content.

In 2009, fly ash was sold to the cement making and concrete industries. The remainder was land filled on site.

Ash Type	Quantity Diverted from Disposal (Mg)	Quantity Land Filled on Site (Mg)	Total (Mg)
Bottom Ash	767	87	854
Fly Ash	3,116	*	2,563

* indicates that sales exceeded production; the remainder was recovered from storage

(h) Various Tables Summarizing Historical Stack Sampling, Fuel, and Residue Analytical Results.

The historical stack sampling results are reported in the Mercury Speciation or Total Mercury Stack Test Results section.

A summary of the coal and ash data from the year 2005 follows. Re-computation of the values in this table may not yield the exact results due to rounding.

	Material	Mercury Concentration (mg/kg dry)	Coal Consumed (Mg wet)	Coal Consumed or Ash Produced (Mg dry)	Total Mercury (kg)
2008	Sub-bituminous Coal	0.085	243,075	181,212	15
	Lignite Coal	0.112	212,913	142,183	16
	Bottom Ash	0.034		7,463	0
	Fly Ash	<0.005		22,385	0
	Mercury Emitted to Air				31
2007	Sub-bituminous Coal	.063	89,673	66,849	4
	Lignite Coal	.086	345,230	231,493	20
	Bottom Ash	0.035		8,383	0
	Fly Ash	0.010		25,146	0
	Mercury Emitted to Air				24
2006	Sub-bituminous Coal	.050	55,865	41,450	2
	Lignite Coal	.085	662,449	446,481	38
	Bottom Ash	0.038		15,716	1
	Fly Ash	0.01		47,148	0
	Mercury Emitted to Air				39

2005	Sub-bituminous Coal	0.050	108,589	80,573	4
	Lignite Coal	0.085	597,323	401,243	34
	Bituminous Coal	0.05	4,548	3,400	0
	Bottom Ash	0.043		15,205	1
	Fly Ash	0.010		45,616	0
				Mercury Emitted to Air	37

A summary of the ash disposition data from the year 2005 follows:

Year	**Ash Type**	**Quantity Diverted from Disposal (Mg)**	**Quantity Land Filled on Site (Mg)**	**Total (Mg)**
2008	Bottom Ash	0	7,463	7,463
	Fly Ash	24,099	*	22,385
2007	Bottom Ash	0	8,383	8,383
	Fly Ash	18,819	6,327	25,146
2006	Bottom Ash	11	15,705	15,716
	Fly Ash	35,834	11,314	47,148
2005	Bottom Ash	0	15,205	15,205
	Fly Ash	44,444	1,172	45,616

* indicates that sales exceeded production; the remainder was recovered from storage

ATIKOKAN GENERATING STATION

a) Annual Mercury Emissions

Year	Mass Mercury Emissions to Air (kg)
2000	35
2001	37
2002	38
2003	39
2004	42
2005	40
2006	26
2007	25
2008	18
2009	9

b) Monitoring Methods Used for All Parameters

The sampling and analytical procedures used to compile the mercury emission figure are described in the accepted MMRP dated September 2008.

c) Justification for Alternative Methods

No alternate methods were used in 2009.

d) Supporting Data

The following table shows the coal consumption, ash production, and average mercury concentrations used to calculate emissions. Due to rounding, re-computation of the values in this table may not yield the exact results.

Material	**Mercury Concentration (mg/kg dry)**	**Coal Consumed (Mg wet)**	**Coal Consumed or Ash Produced (Mg dry)**	**Total Mercury (kg)**
Lignite Coal	0.110	123,351	81,165	8.90
Bottom Ash	0.007	2,721	2,715	0.02
Fly Ash	0.013	10,849	10,839	0.14
			Emitted to Air	8.90

e) Mercury Speciation

The following table summarizes the results of mercury tests conducted to date.

Emission Source	**Unit**	**Sample Date**	**Particulate Mercury (mg/s)**	**Oxidized Mercury (mg/s)**	**Elemental Mercury (mg/s)**	**Total Mercury (mg/s)**	**Emission Concentration (ug/Rm3 dry)**
Group 7							
Atikokan	1	Sep, 1998	<0.01	0.18	2.46	2.64	10.1
			0%	7%	93%		
Atikokan	1	June, 2009	<0.01	0.21	2.08	2.29	11.6
			0%	9%	91%		

f) Mercury Content of coal; and,
g) Combustion Residues Mercury Content, Mass & Management Method

Please see section d) above which details the amount of the different types of coal consumed and the amount of ash generated as well as the associated mercury content.

In 2009 fly ash was sold to the cement making and concrete industries. The remainder was land filled on site.

Ash Type	Quantity Diverted from Disposal (Mg)	Quantity Land Filled on Site (Mg)	Total (Mg)
Bottom Ash	0	2,721	2,721
Fly Ash	10,414	435	10,849

h) Various Tables Summarizing Historical Stack Sampling, Fuel, and Residue Analytical Results

The historical stack sampling results are reported in the Mercury Speciation or Total Mercury Stack Test Results section.

A summary of the coal and ash data from the year 2005 follows. Re-computation of the values in this table may not yield the exact results due to rounding.

	Material	Mercury Concentration (mg/kg dry)	Coal Consumed (Mg wet)	Coal Consumed or Ash Produced (Mg dry)	Total Mercury (kg)
2008	Lignite Coal	0.112	242,459	160,241	18
	Bottom Ash	<0.005		5,115	0
	Fly Ash	0.027		20,395	1
				Emitted to Air	18
2007	Lignite Coal	.086	454,274	297,320	26
	Bottom Ash	0.008		9,028	0
	Fly Ash	0.019		35,999	1
				Emitted to Air	25
2006	Lignite Coal	.079	518,441	339,358	27
	Bottom Ash	0.008		10,115	0
	Fly Ash	0.016		40,337	1
				Emitted to Air	26
2005	Lignite Coal	0.092	670,364	439,332	41
	Bottom Ash	0.008		13,276	0
	Fly Ash	0.016		52,937	1
				Emitted to Air	40

A summary of the ash disposition data from the year 2005 follows:

Year	Ash Type	Quantity Diverted from Disposal (Mg)	Quantity Land Filled on Site (Mg)	Total (Mg)
2008	Bottom Ash	0	5,115	5,115
	Fly Ash	11,829	8,566	20,395
2007	Bottom Ash	0	9,028	9,028
	Fly Ash	28,659	7,340	35,999
2006	Bottom Ash	0	10,115	10,115
	Fly Ash	39,688	649	40,337
2005	Bottom Ash	0	13,276	13,276
	Fly Ash	45,642	7,295	52,937

NEW BRUNSWICK

Through the CWS, New Brunswick has committed to reducing mercury emissions from existing coal-fired power plants within the province to 25 kilograms per year by 2010.

GRAND LAKE AND BELLEDUNE GENERATING STATIONS

There are two existing coal-fired power plants in New Brunswick (Grand Lake and Belledune Generating Stations). Mercury emissions from these two power plants totalled approximately 107 kg. NB Power has committed to take the Grand Lake Generating Station out of service by June 2010, which will enable New Brunswick to meet the mercury emission cap of 25 kilograms per year.

	Belledune	Grand Lake	Total
Year	***Hg Emissions to Air (kg)***	***Hg Emissions to Air (kg)***	***(kg)***
2000	43	105	148
2001	44	112	156
2002	12	106	118
2003	13	105	118
2004	17	101	118
2005	12	88	100
2006	7	56	63
2007	7	88	95
2008	11	33	44
2009	23	84	107

b) Mercury Capture Rates

N/A

c) Monitoring Methods Used for All Parameters

Stack Testing
Mass Balance

d) Justification for Alternative Methods

N/A

e) Supporting Data

N/A

f) Mercury Speciation

Comparison of Mercury Stack Test Results at the Belledune Generating Station

Year	2008	2004	2000
Parameter			
Hg Emission Rate (g/hr)	2.12	2.13	5.47
Fuel Flow during Testing (kg/hr)	166,139	161,700	158,050
Hg Concentration in Fuel (mg/kg)	0.020	0.033	0.09
Particulate Bound Mercury (%)	0.5	3	0
Oxidized Mercury (%)	16.2	16	21.5
Elemental Mercury (%)	83.2	81	78.5

Comparison of Mercury Stack Test Results at the Grand Lake Generating Station

Year	2003	2000
Parameter		
Hg Emission Rate (g/hr)	16.29	14.8
Fuel Flow During Testing (kg/hr)	23,350	22,007
Hg Concentration in Fuel (mg/kg)	0.62	0.5
Particulate Bound Mercury (%)	0.25	1.73
Oxidized Mercury (%)	78.83	58.73
Elemental Mercury (%)	20.92	39.55

g) Mercury Content of coal

Belledune Generating Station

Year	Fuel Consumption (tonnes)	Avg. Hg Conc. in Fuel (mg/kg)	Mass of Hg in Fuel (kg)
2009	1,321,536	0.040	53
2008	1,286,804	0.018	23
2007	1,199,772	0.018	22
2006	1,213,418	0.021	25
2003	1,387,879	0.05	69

Grand Lake Generating Station

Year	Fuel Consumption (tonnes)	Avg. Hg Conc. in Fuel (mg/kg)	Mass of Hg in Fuel (kg)
2009	133,532	0.57	76
2008	75,234	0.41	31
2007	177,992	0.46	82
2006	109,193	0.48	52
2003	156,395	0.74	116

h) Combustion Residues Mercury Content, Mass & Management Method

Belledune Generating Station:

Year	Combustion Residue	Quantity of Residue (tonnes)	Avg. Hg Conc. in Residue (mg/kg)	Mass of Hg in Residue (kg)	Destination/Disposal of Residue
2009	Gypsum	144,830	0.09	13.0	Wallboard manufacturing
	Bottom Ash	32,267	0.008	0.3	Landfill
	Fly Ash	57,896	0.02	1.2	Concrete additive

2008	Gypsum	139,441	0.09	12.5	Wallboard manufacturing
	Gypsum	1,052	0.09	0.1	Landfill
	Bottom Ash	22,920	0.008	0.2	Landfill
	Fly Ash	72,583	0.02	1.5	Concrete additive

Grand Lake Generating Station:

Year	Combustion Residue	Quantity of Residue (tonnes)	Avg. Hg Conc. in Residue (mg/kg)	Mass of Hg in Residue (kg)	Destination/Disposal of Residue
2009	Bottom Ash	6,249	<0.01	0	Landfill
	Fly Ash	24,997	0.01	1.7	Landfill
2008	Bottom Ash	2,799	<0.01	0	Landfill
	Fly Ash	11,195	0.01	0.66	Landfill

NOVA SCOTIA

Nova Scotia has four coal-fired electric power generation plants which utilize a combination of coal and petroleum coke for fuel. Mercury emissions for these plants are regulated through a fleet-wide cap under the Air Quality Regulations. The Air Quality Regulations established a mercury cap of 168 kg for emissions from coal-fired plants in 2005. The Air Quality Regulations were amended to reduce this cap to 65 kg in 2010 to comply with the Canada-Wide Standards.

LINGAN, POINT TUPPER, TRENTON AND POINT ACONI POWER STATIONS

a) Annual Mercury Emissions (kilograms)*

Facility	**Year**							
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Lingan	104	83	87	55	86	82	95	92.0
Point Tupper	15	24	24	13	23	31	24	16.5
Trenton	43	49	56	35	49	41	40	28.8
Point Aconi	1.0	2.5	2.1	2.1	2.5	2.6	2.9	2.7
Total Annual Emissions	**163**	**158.5**	**169.1**	**105.1**	**160.5**	**156.6**	**161.9**	**140.0**

*Source: Environment Canada NPRI

There have been no new coal-fired EPG units constructed in Nova Scotia since endorsement of the CWS.

b) Mercury Capture Rates
N/A

c) Monitoring Methods Use for All Parameters
The monitoring method used at all units for the collection of 2009 data was mass balance.

d) Justification for Alternative Methods
There was no alternative monitoring methods used.

e) Supporting Data
There was no supporting data necessary to verify emissions.

f) Mercury Speciation
There was no mercury speciation data collected in 2009. Speciation data will be collected in 2010.

g) Mercury Content of Coal
The mercury content of coal from each existing coal-fired EPG plant in 2009 is provided in the following table:

Mercury Content of Coal Burned

Coal-Fired EPG Plant	**Mercury Content of Coal in 2009(kg)***
Lingan	112.81
Point Aconi	23.48
Trenton	36.50
Point Tupper	22.10
Total	194.89

* Nova Scotia Power is required to comply with a fleet-wide mercury emission cap under the Air Quality Regulations. Unit specific inlet mercury content will vary each year.

h) Combustion Residues Mercury Content, Mass & Management Method
The mercury content of coal combustion residues from each coal-fired EPG plant in 2009, segregated by disposal method, is provided in the following table:

Mercury Content of Coal Combustion Residue

	Mercury Content of Coal Combustion Residues in 2009		
	Sales (kg)	**Landfill (kg)**	**Total (kg)**
Lingan	0.14	20.67	20.81
Point Aconi	0.33	20.45	20.78
Trenton	3.62	4.08	7.70
Point Tupper	0.51	5.09	5.60
Total	4.60	50.29	54.89