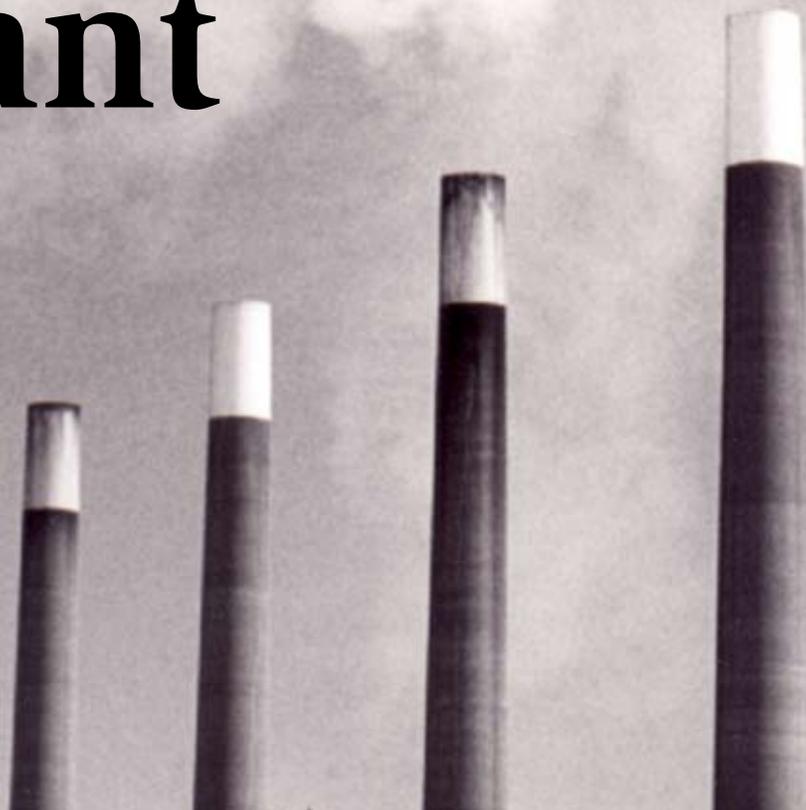


OPG: Ontario's Pollution Giant



Ontario Clean Air Alliance

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Table of Contents

Executive Summary.....	1
Introduction.....	4
Question #1: How much pollution are OPG’s coal-fired plants releasing overall?	7
1.1 Air, water and land.....	7
1.2 Multi-air pollutant approach.....	8
Question #2: How much pollution are OPG’s coal-fired plants releasing into the air?	9
2.1 Criteria Air Contaminants.....	9
2.1.1 Total Particulates.....	9
2.1.2 Nitrogen Oxides.....	13
2.1.3 Sulphur Dioxide	14
2.1.4 Emissions of Chemicals Considered Suspected Respiratory Toxins.....	15
2.2 Toxic Pollutants Released into the Air from OPG Plants	16
2.2.1 CEPA Toxics	17
2.2.2 Mercury	18
2.2.2 Arsenic and its compounds.....	19
2.2.4 Lead and its compounds.....	20
2.3 Greenhouse gases	21
Question #3. How much pollution are OPG’s coal-fired plants releasing into the water?	23
Question #4. How much pollution are OPG’s coal-fired plants sending to landfill and other facilities?	23
4.1 On-site Landfills	25
4.2 Pollutants Sent Off-site to Other Facilities.....	28
Conclusion.....	30
References.....	32
Appendix A: Data Sources	33
Appendix B: Criteria Air Contaminants Released from OPG Coal-fired Plants in 2005	34

The Ontario Clean Air Alliance is a coalition of health, environmental, and consumer organizations, faith communities, municipalities, utilities, unions, corporations and individuals working for cleaner air through a coal phase-out and the shift to a renewable electricity future. Our partner organizations represent more than six million Ontarians.



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Executive Summary

The amount of pollution created by Ontario Power Generation's four coal-fired power plants is staggering. For many pollutants, Ontario Power Generation's coal-fired plants tower above thousands of other facilities in the province of Ontario, and, in some cases, emit more pollution than certain entire provinces. Together, Ontario Power Generation's coal-fired plants really are Ontario's Pollution Giant.

An air pollution giant

Ontario Power Generation's (OPG) coal-fired plants are a major source of three different types of air pollution:

- criteria air contaminants associated with acid rain, smog, respiratory and cardiovascular diseases and premature death,
- toxic pollutants associated with environmental contamination and reproductive and developmental disorders among humans, and
- greenhouse gases associated with climate change.

According to National Pollutant Release Inventory (NPRI) data, which report emissions from industrial sources, in 2005 OPG's coal-fired plants released into the air:

- 22% of Ontario's criteria air contaminants, including
 - 22% of total particulates;
 - 28% of nitrogen oxides;
 - 23% of sulphur dioxide.

Of the toxic contaminants reported from industrial sources to NPRI, OPG's coal-fired plants released into the air:

- 36% of total mercury and its compounds in 2005;
- 24% of Ontario's emissions of Canadian Environmental Protection Act (CEPA) classified toxic chemicals in 2004.

Of the greenhouse gases, OPG's coal-fired plants released into the air in 2005:

- 40% of Ontario's emissions of carbon dioxide from industrial sources.

A big solid waste footprint

Air emissions are only one part of the story when it comes to OPG's coal-fired power plants. Burning coal in OPG plants also produces large amounts of waste that requires disposal and other management. In 2005, OPG's coal plants produced a total of 7,454,009 kilograms (kg) of toxic pollutants (toxic pollutants are those reported under Part 1, 2 and 3 of the NPRI reporting system). About half of the total pollutants reported were released directly into the air (3,880,697 kg). OPG also sent about one-quarter of the remainder to landfills on-site at its plants, with the final one-quarter sent off-site to other facilities such as cement plants. OPG released less than 1% of the total reported pollutant amount directly to water (36,810 kg).

So in addition to huge amounts of pollutants released into the air, OPG also generates large amounts of solid waste that requires disposal and other management. All four OPG facilities landfill pollutants on-site with OPG generating more than 1.7 million kilograms of pollutants that are landfilled in this fashion. This practice also makes OPG a significant landfill operator in Ontario, especially for Canadian Environmental Protection Act (CEPA) toxic metals such as arsenic and mercury, as well as for hexachlorobenzene. In fact, for a number of pollutants, OPG is second only to licensed hazardous waste facilities for the total amount of the substance it landfills.

In 2005, OPG's coal-fired plants landfilled on-site:

- 15% of Ontario's arsenic and its compounds;
- 17% of Ontario's mercury and its compounds;
- 100% of Ontario's hexachlorobenzene.

OPG generates another 1.7 million kg of wastes, which are sent off-site, often to cement kilns. Mercury, arsenic and other metals are often contained in these wastes and may contribute to mercury and other polluting emissions from these facilities. In 2005, OPG's coal-fired plants accounted for 8% of the arsenic and its compounds sent off-site to other facilities in Ontario. Meanwhile, the amount of metals sent off-site from Nanticoke, in particular, to cement kilns is increasing: mercury by 92% from 2000-2005; arsenic by 39% and lead by 16% from 2002-2005.

Nanticoke: Head and shoulders above the rest

The Nanticoke Generating Station, on the shores of Lake Erie and within the Hamilton and Toronto airshed, releases the largest amounts of pollutants of all OPG plants. In 2005, the Nanticoke Generating Station released into the air about 105,133,000 kg of criteria air contaminants, 2,557,000 kg of toxic contaminants and 17,585, 856,000 kg of carbon dioxide.

In 2005, the Nanticoke Generating Station **ranked #1 (worst polluter)** of all Ontario's NPRI listed industrial facilities for having the largest air emissions of:

- total particulates;
- nitrogen oxides;
- mercury and its compounds.

Nanticoke was also ranked #1 for having the largest emissions of carbon dioxide from all industrial facilities in Ontario as well as in Canada in 2005.

In 2005, the Nanticoke Generating Station **ranked #2 (second worst polluter)** among all of Ontario's NPRI-listed industrial facilities for having the largest air emissions of:

- particulate matter less than 10 microns (PM₁₀);
- sulphur dioxide.

Cutting down the giant

The enormous amounts of pollutants coming from Ontario's coal plants are cause for concern. OPG releases large amounts of all three categories of air pollutants: criteria air contaminants, which combine to create smog; toxics such as the neurotoxin mercury; and greenhouse gases contributing to climate change.

In addition to producing staggering amounts of air pollution, burning coal also produces large amounts of solid wastes requiring landfilling and other management. Many of these solid wastes contain metals and other pollutants, considered toxic by the federal government. Closing Ontario's coal-fired plants would create enormous reductions in air pollution, reduce the amount of pollutants — including CEPA toxics such as mercury and arsenic — that are sent to landfill, and reduce the amount of pollutants being sent to other facilities, such as cement kilns.

It's time to cut Ontario's Pollution Giant down to size.

Introduction

Ontario Power Generation's (OPG) coal-fired plants are a major source of three different types of air pollution:

- criteria air contaminants associated with acid rain, smog, respiratory and cardiovascular diseases and premature death;
- toxic pollutants associated with environmental contamination and reproductive and developmental disorders among humans; and
- greenhouse gases associated with climate change.

They are also sources of significant amounts of solid waste that is either landfilled on-site or sent off-site for landfilling or other management.

This report builds on previous studies by the Ontario Clean Air Alliance (OCAA) and presents the most recent pollution data available for Ontario Power Generation's coal-fired plants. In this report we also provide some perspective for the emissions from Ontario's four coal plants by ranking these facilities in comparison to other industrial facilities; comparing OPG's emissions to total province-wide emissions; and assessing coal plant emissions using chemical groupings associated with specific health effects.

From previous OCAA reports we know that:

- OPG's coal-fired plants emit large amounts of nitrogen oxides and particulates (*Particularly Harmful*, OCAA, 2004);
- Nanticoke emits large amounts of the neurotoxin mercury (*Mercury Rising*, OCAA, 2004);
- OPG's coal-fired plants also emit a variety of other toxic pollutants (including lead, arsenic, and dioxins and furans) and lung irritants such as hydrochloric acid (*Up The Stack*, OCAA, 2002); and
- OPG's coal-fired plants are also a major source of greenhouse gases in Ontario and in North America — Nanticoke had the largest carbon dioxide emissions of any power plant in North America in 2002 (*More than Hot Air*, OCAA, 2005).

(For copies of these reports and more information on the provincial government's promise to phase-out coal-fired electricity generation, please see the OCAA website at www.cleanairalliance.org.)

This report asks the following questions for OPG coal-fired plants:

1. How much pollution are these coal plants releasing overall?
2. How much pollution are these coal plants releasing into the air?
3. How much pollution are these coal plants releasing into the water?
4. How much pollution are these coal plants sending to landfill on-site and off-site?

To answer these questions, this report uses data from the federal government's National Pollutant Release Inventory (NPRI). NPRI is the only nationwide, publicly accessible program that provides information on pollutants being released to our air, land and water, as well as being injected underground or transferred off-site from industrial facilities¹.

In general, facilities such as power plants are required to report releases and transfers to NPRI for a set list of chemicals if they manufactured, processed or otherwise used 10 tonnes or more of a substance on the list. For criteria air contaminants, facilities are required to report if their air releases exceed a certain threshold. In general, a facility is required to report to NPRI if employees worked a total of 20,000 hours or more a year (equivalent to 10 full time employees). Additionally, there are some specific reporting requirements for certain sectors and some chemicals.

This report uses 2005 NPRI data, downloaded from Environment Canada's NPRI web site in the period October-December 2006. For more information on the NPRI, please see www.ec.gc.ca/pdb/npri.

For greenhouse gases, we have used Environment Canada's Greenhouse Gas Emission Reporting Program for carbon dioxide emissions from large industrial facilities in Canada for 2005, for which information was released in December 2006. For more details, see www.ec.gc.ca/pdb/ghg.

It is important to understand that NPRI data largely reflect releases and transfers of chemicals from large industrial facilities. Other sources of information, including monitoring data, emission inventories and modeling data on emissions may cover more sources or be otherwise wider in scope. Here are some other general limitations to NPRI data:

- It does not cover all sources, only those meeting certain thresholds;
- It does not include emissions from area sources such as gas stations and dry cleaners;
- It does not cover emissions from mobile sources such as cars and trucks or from natural sources such as forest fires;
- It is self-reported and a variety of different methods can be used to estimate emissions;
- It does not cover all chemicals known to be of concern (for example, does not include many pesticides).

For some pollutants, such as particulates, mobile and natural sources can be large contributors to total amounts. For others, such as sulphur dioxide, industrial sources are the main contributors to total amounts.

This report is focused on the coal-fired plants operated by Ontario Power Generation. It does not include the other plants operated by OPG, such as hydro-electric and nuclear facilities. OPG is owned by the government of Ontario. OPG (formerly Ontario Hydro) currently operates four coal-fired power plants in Ontario:

Name	Location	Nearest City
Atikokan Generating Station	Atikokan	Thunder Bay
Lambton Generating Station	Courtright	Sarnia
Nanticoke Generating Station	Nanticoke	Hamilton, Greater Toronto Area
Thunder Bay Generating Station	Thunder Bay	Thunder Bay

A fifth coal-fired power plant, the Lakeview Generating Station in Mississauga, was closed in April 2005 in accordance with a regulation issued in 2001 by Ontario's then Minister of the Environment, Elizabeth Witmer.

This closure eliminated 23,875 tonnes of pollutants associated with respiratory illnesses. Lakeview was also the #6 source in Ontario in 2004 of pollutants considered to be toxic under the Canadian Environmental Protection Act (CEPA)² and was also ranked #7 for carbon dioxide emissions in Ontario in 2004³.

Question #1: How much pollution are OPG's coal-fired plants releasing overall?

1.1 Air, water and land

Pollutants released to the air represent only half the total amount of toxic pollutants reported by OPG coal plants in 2005.

Traditionally, pollution released into the air and water tends to receive more attention than pollution sent to landfill or for treatment. In fact, we often tend to look at each stream of releases, whether to air, land or water, as a separate pollution issue. But this approach limits our understanding of the overall impact of a facility and can obscure important trends, such as a shift in releasing waste from one stream (e.g., air) to another (e.g., land). Fortunately, the NPRI program takes a “multi media” approach and tracks releases from a single facility to air, land, water and underground injection and also transfers to disposal, treatment, recycling and other management facilities.

If we look at pollution from OPG plants as a whole, we will see that coal-fired OPG plants produced a total of 7,454,009 kg of toxic pollutants in 2005. (Toxic pollutants are those reported under Part 1, 2 and 3 to NPRI.) OPG sent more than half of this total amount directly into the air (3,880,697 kg), but also sent about one quarter of the total amount to landfill on-site at its plants. The remaining amount, roughly another one-quarter was sent off-site to other facilities, such as cement kilns. OPG released less than 1% of the total reported amount directly to water (36,810 kg). Figure 1 illustrates the breakdown of the total releases and transfers of toxic pollutants from OPG's coal plants.

Figure1: Toxic pollutants reported to NPRI from OPG coal-fired plants in 2005 by destination (total 7,454,009 kg)

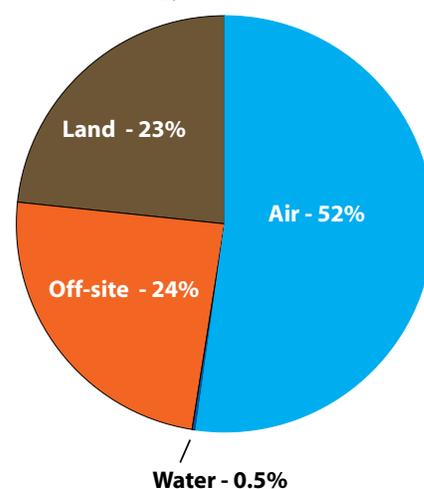


Table 1: Amount of toxic pollutants released into air, water and landfills and sent off-site by OPG in 2005.

Facility	Air releases (kg)	On-site		Off-site To other facilities (kg)	Total reported amounts (kg)
		Water releases (kg)	Landfill (kg)		
Atikokan	22,201	1	48,618	118,057	188,877
Lambton	928,080	6,702	707,513	68,678	1,710,972
Nanticoke	2,556,639	30,104	931,857	1,461,856	4,980,456
Thunder Bay	103,844	3	36,221	137,531	277,600
Lakeview*	269,933	1	0	26,171	296,105
Total OPG	3,880,697	36,810	1,724,209	1,812,293	7,454,009

*Lakeview was closed in April 2005.

1.2 Multi-air pollutant approach

A second common blind spot when discussing air pollution is the tendency to compartmentalize air pollutants and discuss just one type of air pollution at a time. Our laws and government programs are often written to manage one of the three major types of air pollutants. We discuss either:

- air pollutants that cause smog (the criteria air contaminants, such as nitrogen oxides and sulphur dioxide) or,
- air pollutants that can cause contamination and health effects (toxics like mercury) or,
- air pollutants that cause climate change (greenhouse gases like carbon dioxide).

This compartmentalized thinking about air pollution presents a few problems. Many of these air pollutants interact with one another in the atmosphere and some of these atmospheric reactions are temperature dependent, so ozone formation, for example, may increase due to increasing temperature from climate change.

Table 2: Overview of air pollution from OPG coal-fired power plants in 2005.

OPG facility	Criteria Air Contaminants Released to Air in 2005 (kg)	Toxic Pollutants Released to Air in 2005 (kg)	Greenhouse Gases (carbon dioxide) Released to Air in 2005 (kg)
Atikokan Generating Station	6,789,911	22,201	1,105,064,000
Lambton Generating Station	45,318,912	928,080	8,694,815,000
Nanticoke Generating Station	105,132,831	2,556,639	17,585,856,000
Thunder Bay Generating Station	7,480,756	103,844	1,150,029,000
Lakeview Generating Station	6,987,679	269,933	719,348,000
Total – OPG	171,710,089	3,880,697	29,255,112,000
Total- Ontario Industrial facilities	795,282,940	N/A*	72,231,399,220
OPG as % of Ontario NPRI facilities	21.6 %	N/A*	40.5 %

Note: Lakeview Generating Station closed April 2005

Data sources

1) Criteria Air Contaminants (CAC)
CAC data from Environment Canada NPRI www.ec.gc.ca/pdb/npri CAC emissions include NO_x, SO₂, CO and total particulate matter. They do not include volatile organic compounds in order to avoid double counting as some of these compounds may also be reported in the toxic pollutants column.

2) Toxic Pollutants
Toxic pollutants data from Environment Canada NPRI www.ec.gc.ca/pdb/npri. Toxic pollutants are those reported in Part 1, 2 and 3 of NPRI reporting.
N/A means not available at this time. 2005 NPRI data

is draft and total air emissions are not available in query format. 2004 total air emissions of toxic pollutants from all NPRI facilities in Ontario was 47,758,219 kg, OPG coal-fired total was 5,775,804 kg, making OPG approximately 12% of Ontario's total air emissions of toxic pollutants in 2004.

3) Greenhouse gases
OPG and Ontario data from Environment Canada www.ec.gc.ca/pdb/ghg. Greenhouse gas data are for carbon dioxide emissions only.

In addition, different pollutants may have a combined effect on both human and ecosystem health.

As well, a single facility often emits all three types of pollutants and a singular focus on reducing one type of air pollutant can inadvertently cause an increase in another type of air pollutant. For example, scrubbers installed to curb sulphur dioxide emissions can decrease plant efficiency, leading to an increase in carbon dioxide emissions.

Table 2 lists emissions for OPG plants in all three air pollution categories. We can see from this table that coal plants are major emission sources in all three categories and have a staggering cumulative impact.

Question #2: How much pollution are OPG's coal-fired plants releasing into the air?

OPG's coal-fired power plants are a significant source of many air pollutants that cause smog, acid rain, environmental effects, health effects and climate change. This section provides a breakdown of the most significant air pollutant emissions from OPG's coal plants for each of the three major categories.

2.1 Criteria Air Contaminants

Criteria air contaminants are a group of seven pollutants: total particulate matter, particulate matter equal to or less than 10 microns in diameter (PM_{10}), particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$), nitrogen oxides, sulphur dioxide, volatile organic compounds and carbon monoxide. Criteria air contaminants are associated with acid rain, smog, respiratory and cardiovascular diseases and premature death.

The five OPG coal-fired plants emitted 171,710,089 kg of criteria air contaminants in 2005 (Table 2). OPG coal plants are therefore responsible for 22% of Ontario's total criteria air contaminant releases reported by all NPRI facilities.

2.1.1 Total Particulates

Particulate matter consists of small airborne solid or liquid particles. They can be released directly into the air or formed as secondary air pollutants in the atmosphere from precursors such as sulphur dioxide and nitrogen oxides.

NPRI requires reporting on three sizes of particulate matter: total particulate matter with a diameter less than 100 microns (TPM); particulate matter with a diameter equal to or less than 10 microns (PM_{10}) and particulate matter with a diameter equal to or less than 2.5 microns ($PM_{2.5}$). $PM_{2.5}$ is the particulate matter recognized as having the greatest potential impact on human health. (NPRI data are reported from industrial facilities, and do not include particulates from mobile or natural sources.)

OPG's coal plants directly emit almost one-quarter of total particulates reported by all of Ontario's NPRI facilities.

OPG coal-fired power plants are a significant source of total particulates in Ontario as reported to NPRI in 2005. The Nanticoke Generating Station ranks #1 in Ontario for emissions of total particulates, as reported to NPRI in 2005 (Table 3).

Table 3: NPRI facilities in Ontario reporting the largest emissions of total particulate matter in 2005

Provincial Rank	Facility	Location	Total Particulate Matter released into the air in 2005 (tonnes)
1	Ontario Power Generation-Nanticoke Generating Station	Nanticoke	6,723
2	Ontario Power Generation-Lambton Generating Station	Courtright	3,072
3	Inco Copper Cliff Smelter Complex	Copper Cliff	2,482
4	Stelco Lake Erie Steel	Haldimand County	1,782
5	Falconbridge Ltd., Smelter Complex	Falconbridge	1,630
6	Dofasco-Dofasco Hamilton	Hamilton	1,471
7	Neenah Paper Neenah Paper Company of Canada	Terrace Bay	1,448
8	Stelco-Stelco Hamilton	Hamilton	1,398
9	Algoma Steel Inc. Steelworks	Sault Ste. Marie	1,192
10	Domtar Inc. Espanola Mill	Espanola	1,073
	OPG total		10,418
	Total Particulate Matter reported by all NPRI facilities in Ontario		46,490
	OPG emissions as % of all Ontario NPRI facilities		22.4%

Lambton is next, ranking #2. Thunder Bay is #18, while Atikokan falls outside of the top 50 emitters. (The figures in this section represent direct reported releases of particulate matter, but it is important to remember that the large amounts of nitrogen oxides and sulphur dioxide released by the coal plants can also lead to the creation of particulate matter in the atmosphere.)

The five OPG coal-fired plants were responsible for 22% of total particulates reported by all NPRI facilities in Ontario in 2005: OPG reported 10,418 tonnes of total particulates compared to the Ontario NPRI total of 46,490 tonnes. This is especially surprising as the five coal plants (including Lakeview, since closed) do not represent even 1% of the facilities across Ontario reporting total particulate releases in 2005.

Scientists point to the smaller particulates — those that measure less than 10 microns — and the smallest particulates — those that measure less than 2.5 microns — as being particularly of concern. These particulates can reach deep within the lung or can enter the bloodstream and cause damage throughout the body. Particulates are thought to act as blood thickeners, causing strokes and heart attacks. If

these particulates also carry on their surfaces a load of contaminants, such as toxic metals, then they can have an additional range of health effects. PM₁₀ and PM_{2.5} are both considered toxic under the *Canadian Environmental Protection Act*.

Those most at risk from small particulate matter are children and seniors and those with asthma, chronic obstructive pulmonary disease, and other lung diseases, as well as those with stroke damage or heart diseases or diabetes. These high-risk groups face an increased risk of premature death, severe asthma attacks, heart attacks, strokes, and lung cancer⁴.

Pouring out of Nanticoke and Lambton on a daily basis are significant quantities of these smaller particulates. Nanticoke, for example, emitted 2,124 tonnes of PM₁₀ and ranked #2 in Ontario in 2005. This is almost identical to Lambton's emissions, with 2,123 tonnes of PM₁₀ released in 2005, for which the plant ranked #3. OPG stations contribute 15% of the total Ontario emissions of PM₁₀ reported by industrial sources to NPRI (Table 4).

Table 4: NPRI facilities in Ontario reporting the largest emissions of particulate matter equal to or less than 10 microns (PM₁₀) in 2005

Rank	Facility	Location	Particulate matter less than 10 microns released into the air in 2005 (tonnes)
1	Inco Copper Cliff Smelter Complex	Copper Cliff	2,319
2	Ontario Power Generation - Nanticoke Generating Station	Nanticoke	2,124
3	Ontario Power Generation - Lambton Generating Station	Courtright	2,123
4	Neenah Paper Neenah Paper Company of Canada	Terrace Bay	1,219
5	Stelco-Stelco Hamilton	Hamilton	974
6	Imperial Oil - Sarnia Refinery Plant	Sarnia	780
7	Falconbridge Limited - Kidd Metallurgical Division	Timmins/ District of Cochrane	753
8	Grant Forest Products - Timmins Oriented Strand Board Plant	Timmins	730
9	Stelco - Lake Erie Steel	Haldimand County	713
10	Dofasco-Dofasco Hamilton	Hamilton	703
	OPG Total		4,663
	PM ₁₀ reported by all NPRI facilities in Ontario		30,699
	OPG emissions as % of all Ontario NPRI facilities		15.2%

Of the smallest particulates, PM_{2.5}, OPG contributed about 8% of Ontario's particulate emissions reported by NPRI facilities in 2005. Interestingly, Lambton emits more of these health-damaging particulates than Nanticoke: Lambton emitted 756 tonnes compared to Nanticoke's 666 tonnes of PM_{2.5} in 2005. Lambton ranked #4 for PM_{2.5} emissions from Ontario NPRI facilities in 2005, followed by Nanticoke at #5 (Table 5).

Lambton is, therefore, of special concern because it emits the largest amount of all the coal-fired power plants of the most damaging type of particulates. In fact, Lambton has almost double the emission rate of PM_{2.5} particulates compared to Nanticoke. However, the Thunder Bay Generating Station has the highest emission rate of PM_{2.5} of all four stations (0.151 tonnes/GWh) (Appendix B).

Table 5: NPRI facilities in Ontario reporting the largest emissions of particulate matter equal to or less than 2.5 microns (PM_{2.5}) in 2005

Rank	Facility	Location	Particulate matter less than 2.5 microns released into the air in 2005 (tonnes)
1	Inco Copper Cliff Smelter Complex	Copper Cliff	2,195
2	Neenah Paper-Neenah Paper Company of Canada	Terrace Bay	945
3	Stelco-Stelco Hamilton	Hamilton	868
4	Ontario Power Generation - Lambton Generating Station	Courtright	757
5	Ontario Power Generation- Nanticoke Generating Station	Nanticoke	666
6	Falconbridge Limited - Kidd Metallurgical Division	Timmins/ District of Cochrane	594
7	Grant Forest Products- Timmins Oriented Strand Board Plant	Timmins	545
8	Dofasco-Dofasco Hamilton	Hamilton	511
9	Essroc Canada-Picton	Picton	493
10	Imperial Oil - Sarnia Refinery Plant	Sarnia	418
	OPG Total		1,602
	PM _{2.5} reported by all NPRI facilities in Ontario		18,993
	OPG emissions as % of all Ontario NPRI facilities		8.4%

2.1.2 Nitrogen Oxides

Nitrogen oxides (NO_x) react with other compounds to form ground level ozone, one of the components of smog. NO_x can also react with other compounds to form small particulate matter (PM_{2.5}). Nitrogen oxides also contribute to the acidification of lakes, soils and ecosystems. Nitrogen oxides are considered toxic under the *Canadian Environmental Protection Act*.

OPG's coal plants emit more than one-quarter of the nitrogen oxides reported by all of Ontario's NPRI facilities.

OPG's coal-fired plants contributed 28% of the NO_x reported from Ontario NPRI facilities in 2005. The total amount of NO_x emitted from OPG plants was 38,075 tonnes, more than what was reported by all the NPRI-reporting facilities in the entire province of New Brunswick (27,376 tonnes) in 2005.

Nanticoke had the largest emissions of all OPG plants with 23,171 tonnes of NO_x, Nanticoke was ranked #1 in Ontario, followed by Lambton at #3 and Thunder Bay at #11 (Table 6). Nanticoke's emissions were close to 2.5 times those of the next highest emitter, meaning that Ontario's coal giant really is in a league of its own when it comes to NO_x.

Table 6: NPRI facilities in Ontario reporting the largest emissions of nitrogen oxides in 2005

Provincial Rank	Facility	Location	Nitrogen Oxides released into the Air in 2005 (tonnes)
1	Ontario Power Generation- Nanticoke Generating Station	Nanticoke	23,171
2	Essroc Canada-Picton	Picton	9,507
3	Ontario Power Generation- Lambton Generating Station	Courtright	8,991
4	St. Marys Cement – Bowmanville Cement Plant	Bowmanville	5,348
5	Lafarge Canada Inc. - Bath Cement Plant	Bath	3,753
6	St. Marys Cement - St. Marys Cement Plant Quarry	St.Marys	3,384
7	Imperial Oil, Sarnia Refinery Plant	Sarnia	3,225
8	Dofasco-Dofasco Hamilton	Hamilton	3,148
9	Imperial Oil - Nanticoke Refinery	Nanticoke	2,955
10	Lafarge Canada Inc. - Woodstock Plant	Woodstock	2,886
	OPG total		38,075
	NO _x reported by all NPRI facilities in Ontario		135,743
	OPG emissions as % of all Ontario NPRI facilities		28.0%

2.1.3 Sulphur Dioxide

OPG's coal plants emit almost one-quarter of the sulphur dioxide reported by all of Ontario's NPRI facilities.

Sulphur dioxide (SO₂) contributes to acid rain, the formation of smog, and respiratory disease. Like NO_x, SO₂ is a precursor of the acid aerosols that contribute to particulate matter (PM_{2.5}). SO₂ is also considered toxic under the *Canadian Environmental Protection Act*.

Just as with NO_x, OPG's coal-fired plants are a significant source of SO₂ emissions. In 2005, OPG plants contributed 23% of the sulphur dioxide reported by all NPRI facilities in Ontario by emitting 111,139 tonnes of SO₂ in 2005 (Table 7). Nanticoke has the largest SO₂ emissions of all of the OPG plants (67,947 tonnes), emitting more SO₂ than from the other three coal plants combined.

To put the coal plant emissions into perspective, the four OPG plants emitted more SO₂ than from all the NPRI reporting facilities in a number of provinces, including British Columbia and New Brunswick. Nanticoke's SO₂ emissions alone were more than those from all the NPRI reporting facilities in the entire province of B.C. (61,099 tonnes).

Nanticoke ranked #2 in Ontario for emissions of SO₂ from all NPRI facilities in 2005. Lambton ranked #4, followed by Atikokan at #16 and Thunder Bay at #18. Atikokan however, has the highest emission rate of sulphur dioxide of all OPG stations (4.9 tonnes/GWh), followed by Thunder Bay (4.3 tonnes /GWh), Nanticoke (3.8 tonnes/GWh) and Lambton (3.1 tonnes/GWh) (Appendix B).

Table 7: NPRI facilities in Ontario reporting the largest emissions of sulphur dioxide in 2005

Provincial Rank	Facility	Location	Sulphur Dioxide released into the air in 2005 (tonnes)
1	Inco Copper Cliff Smelter Complex	Copper Cliff	189,753
2	Ontario Power Generation-Nanticoke Generating Station	Nanticoke	67,947
3	Falconbridge Ltd., Smelter Complex	Falconbridge	40,839
4	Ontario Power Generation-Lambton Generating Station	Courtright	29,343
5	Imperial Oil, Sarnia Refinery Plant	Sarnia	26,117
6	Shell Canada - Sarnia Manufacturing Centre	Corunna	11,401
7	St. Marys Cement - Bowmanville Cement Plant	Bowmanville	8,127
8	Algoma Steel Inc. - Steelworks	Sault Ste. Marie	6,794

continued next page

Provincial Rank	Facility	Location	Sulphur Dioxide released into the air in 2005 (tonnes)
9	Falconbridge Limited - Kidd Metallurgical Division	Timmins/ District of Cochrane	6,492
10	Cabot Canada Ltd.	Sarnia	6,348
	OPG total		111,139
	SO ₂ reported by all NPRI facilities in Ontario		478,718
	OPG emissions as % of all Ontario NPRI facilities		23.2%

2.1.4 Emissions of Chemicals Considered Suspected Respiratory Toxins

Nanticoke ranked #2 in Ontario for air emissions of suspected respiratory toxins from all NPRI facilities in 2004; Lambton ranked #3.

Chemicals can be classified by their associated health effects. Some chemicals reported to NPRI are associated with health effects such as cancer, reproductive disorders or respiratory illness. A U.S. environmental group, Environmental Defense, has compiled lists of chemicals associated with specific health effects on a searchable website, Scorecard (www.scorecard.org). This section uses the Scorecard list of chemicals associated with suspected respiratory effects to analyze the emissions of chemicals from OPG. Examples of pollutants emitted by OPG plants and considered suspected respiratory toxins include sulphur dioxide, nitrogen oxides, particulates (PM₁₀ and PM_{2.5}), hydrogen fluoride and hydrochloric acid. For a complete list of pollutants considered suspected respiratory toxins, please see the Scorecard website at www.scorecard.org/health-effects)

Scorecard defines respiratory toxicity to include a variety of acute and chronic pulmonary conditions, including local irritation, bronchitis, pulmonary edema, emphysema, and cancer. It is well known that exposure to environmental and industrial chemicals can impair respiratory function. Ground-level ozone, the main component in smog, causes breathing problems, aggravates asthma, and increases the severity and incidence of respiratory infections. Prolonged exposure to respiratory toxicants can cause structural damage to the lungs, resulting in chronic diseases such as pulmonary fibrosis, emphysema, and cancer⁵.

In Ontario, OPG coal-fired plants emitted 20% of the Ontario's total emissions of suspected respiratory toxins (864,387,795 kg) from NPRI reporting facilities in 2004. (Unfortunately, 2005 data is not currently available for this analysis.) Nanticoke ranked #2 and contributed 11% of Ontario's total load of suspected respiratory toxins from NPRI reporting facilities. Lambton ranked #3, Atikokan #20 (8,941,584 kg) and Thunder Bay ranked #21 (8,030,733 kg) in Ontario in 2004 (Table 8)².

Table 8: NPRI facilities in Ontario reporting the largest emissions of suspected respiratory toxins in 2004

Provincial Rank	Facility	Location	Suspected Respiratory Toxics released into the air in 2003 (kg)
1	Inco Copper Cliff Smelter Complex	Copper Cliff	211,901,628
2	Ontario Power Generation-Nanticoke Generating Station	Nanticoke	95,882,277
3	Ontario Power Generation-Lambton Generating Station	Courtright	40,126,051
4	Falconbridge Ltd., Smelter Complex	Falconbridge	34,341,431
5	Imperial Oil, Sarnia Refinery Plant	Sarnia	33,473,333
6	Stelco Inc., Stelco Hamilton	Hamilton	30,228,019
7	Ontario Power Generation-Lakeview Generating Station	Mississauga	23,875,414
8	St.Marys Cement, Bowmanville Plant	Bowmanville	18,057,566
9	Essroc Canada-Picton	Picton	16,231,344
10	Shell Products, Sarnia Manufacturing Center	Sarnia	15,656,330
	OPG Total for 5 plants		176,856,059
	Suspected Respiratory toxics reported by all NPRI facilities in Ontario		864,387,795
	OPG emissions as % of all Ontario NPRI facilities		20.4%

2.2 Toxic Pollutants Released into the Air from OPG Plants

OPG plants are also large sources of many pollutants which may be toxic to humans or the environment. Some of these pollutants are carcinogens, neurotoxins and reproductive toxins. (For the purposes of this discussion, toxic pollutants are considered those chemicals reported in Parts 1, 2 and 3 to the NPRI. Examples of toxic pollutants include mercury, arsenic and lead and their compounds.)

The Nanticoke Generating Station had the largest emissions of all OPG plants, with 2,556,639 kg of toxic pollutants released into the air in 2005. Lambton released about half the emissions of Nanticoke, with 928,080 kg in 2005. Thunder Bay released 103,844 kg and Atikokan released 22,201 kg of pollutants.

2.2.1 CEPA Toxics

OPG emits about one-quarter of the CEPA toxics reported released from all of Ontario's NPRI facilities. Nanticoke ranked #1 for CEPA toxic releases to air in 2005.

Pollutants can be classified as “toxic” under the main federal law governing chemicals, called the *Canadian Environmental Protection Act (CEPA)*. This classification involves a scientific review, an assessment against specific criteria (such as danger to health and/or the environment) and a review of public comments. Once a chemical has been identified as “CEPA toxic,” it is required that steps be taken to reduce or eliminate releases into the environment.

Of the approximately 300 chemicals on the NPRI list, approximately 120 are considered “CEPA toxic.” Examples of CEPA toxic chemicals required to be reported to NPRI include many metals, such as arsenic and cadmium, and some smog precursors, such as nitrogen oxides and particulates. For a list of NPRI substances considered CEPA toxic, please see www.ec.gc.ca/npri-inrp-comm/default.asp?lang=en&n=53E2467F. As the NPRI system does not allow for ranking emitters according to releases of a group of pollutants, we have used the Pollutionwatch website to perform this analysis. The Pollutionwatch rankings are based on 2004 NPRI data.

Nanticoke stands out in Ontario as the #2 source of CEPA toxics released into the air in 2004 from all NPRI reporting facilities⁶. Nanticoke alone accounts for 13% of Ontario's total CEPA toxic emissions from NPRI reporting facilities in 2004.

The Lambton Generating Station ranked #3 in Ontario for CEPA toxics released into the air in 2004 from all NPRI reporting facilities⁶. Atikokan emitted 8,748,354 kg of CEPA toxics into the air in 2004 (ranking #14 in Ontario), while Thunder Bay emitted 7,974,713 kg of CEPA toxics into the air in 2004 (ranking #16 in Ontario). (See Table 9 on next page.)

Together, these five OPG plants contributed 24% of Ontario's total air emissions of CEPA toxic chemicals from all NPRI reporting facilities in 2004⁶.

Table 9: NPRI facilities in Ontario reporting the largest emissions of CEPA toxics in 2004

Provincial Rank	Facility	Location	CEPA Toxics released into the air in 2004 (kg)
1	Inco, Copper Cliff Smelter Complex	Copper Cliff	206,713,427
2	Ontario Power Generation-Nanticoke Generating Station	Nanticoke	86,365,293
3	Ontario Power Generation-Lambton Generating Station	Courtright	36,059,984
4	Falconbridge Ltd., Smelter Complex	Falconbridge	30,730,176
5	Imperial Oil, Sarnia Refinery Plant	Sarnia	29,217,900
6	Ontario Power Generation-Lakeview Generating Station	Mississauga	21,086,497
7	Essroc Canada-Picton	Picton	15,501,462
8	Shell Canada, Sarnia Manufacturing Centre	Sarnia	14,928,702
9	St.Mary's Cement - Bowmanville Plant	Bowmanville	14,855,819
10	Algoma Steel Inc., Steelworks	Sault Ste. Marie	9,775,619
	OPG Total for 5 plants		160,234,841
	CEPA toxics reported by all NPRI facilities in Ontario		679,087,949
	OPG emissions as % of all Ontario NPRI facilities		23.6%

2.2.2 Mercury

OPG emits more than one-third of the airborne mercury emissions released by all of Ontario's NPRI reporting facilities. Nanticoke ranked #1 with the largest airborne mercury emissions in Ontario.

Mercury, present in coal burnt at OPG power plants, can be released into the air or water or can be trapped in dust or ash.

Mercury is a persistent, bioaccumulative chemical that causes reproductive and developmental damage, particularly in children. As we learn more about mercury's harmful effects, the levels considered "safe" have fallen over time ⁷. Women of child-bearing age and pregnant women are now advised to avoid certain types of fish altogether and to limit their consumption of other types of fish because they contain mercury. Children, because of their small size and development stage, are particularly sensitive to mercury. A recent study found that between 316,588 and 637,233 children born in the U.S. each year have umbilical cord blood mercury levels greater than 5.8 micrograms per litre, a level associated with loss of IQ ⁸.

In 2005, Nanticoke was ranked #1 for releasing the largest amount of mercury and its compounds into the air out of all NPRI reporting facilities in Ontario. The four OPG plants all made Ontario's top 10 mercury emitters list. Coal-fired OPG power plants accounted for 36% of the total mercury air releases from all NPRI reporting facilities in Ontario in 2005.

Table 10: NPRI facilities in Ontario reporting the largest air emissions of mercury and its compounds in 2005

Provincial Rank	Facility	Location	Mercury and its Compounds released into the air in 2005 (kg)
1	Ontario Power Generation-Nanticoke Generating Station	Nanticoke	156.436
2	Gerdau AmeriSteel-Whitby	Whitby	137.745
3	Ontario Power Generation-Lambton Generating Station	Courtright	67.429
4	Dofasco-Dofasco Hamilton	Hamilton	47.000
5	Ontario Power Generation-Atikokan Generating Station	Atikokan	39.691
6	Ontario Power Generation-Thunder Bay Generating Station	Thunder Bay	37.180
7	Federal White Cement	Woodstock	34.240
8	Ivaco Rolling Mills Partnership	L'Orignal	24.000
9	Williams Operating Corporation-Willams Mine	Marathon	21.310
10	Stelco-Lake Erie	Haldimand County	20.145
	OPG Total		320.181
	Mercury and its compounds reported by all NPRI facilities to air in Ontario		895.613
	OPG emissions as % of all Ontario NPRI facilities		35.7%

OPG total includes Lakeview Generating Station (19.444 kg), which was closed in April 2005.

2.2.2 Arsenic and its compounds

Some components of the group “arsenic and its compounds” are considered CEPA toxic, carcinogens, suspected respiratory toxins, reproductive and developmental toxins and suspected endocrine disrupters⁹.

Nanticoke ranked #3 in Ontario for air releases of arsenic and its compounds from all NPRI reporting facilities in 2005 (588 kg). Lambton also reported emissions of arsenic and its compounds to the air in 2005 (49 kg), as did Atikokan (6 kg) and Thunder Bay (3 kg) (Table 11).

Table 11: NPRI facilities in Ontario reporting the largest air emissions of arsenic and its compounds in 2005

Provincial Rank	Facility	Location	Arsenic and its Compounds released into the air in 2005 (kg)
1	Inco Copper Cliff Smelter Complex	Copper Cliff	34,810.047
2	Falconbridge Limited - Kidd Metallurgical Division	Timmins/ District of Cochrane	4,451.000
3	Ontario Power Generation- Nanticoke Generating Station	Nanticoke	588.026
4	Falconbridge Limited Smelter Complex	Falconbridge	349.017
5	Inco Copper Cliff Nickel Refinery	Walden	230.000
6	Stelco -Stelco Hamilton	Hamilton	169.000
7	Stelco Lake Erie Steel	Haldimand County	168.684
8	Placer Dome(CLA) Limited- Campbell Mine	Balmertown	65.840
9	Goldcorp- Red Lake Mine	Balmertown	64.503
10	Ontario Power Generation- Lambton Generating Station	Courtright	48.728
	OPG Total		648.608
	Arsenic and its compounds reported by all NPRI facilities to air in Ontario		41,161
	OPG emissions as % of all Ontario NPRI facilities		1.6%

OPG total includes Nanticoke, Lambton, Atikokan (6.488 kg), Thunder Bay (2.849 kg) and Lakeview (2.517 kg)

2.2.4 Lead and its compounds

Some components of the group “lead and its compounds” are considered CEPA toxic, carcinogens, suspected respiratory toxins, reproductive and developmental toxins and suspected endocrine disrupters⁹.

The four OPG plants are a source of air emissions of lead and its compounds. Nanticoke was ranked #8 for releases of lead and its compounds into the air in Ontario from all NPRI reporting facilities in 2005. Nanticoke releases more lead into the air (578 kg) than the steel maker Dofasco (475 kg).

2.3 Greenhouse gases

Examples of greenhouse gases include carbon dioxide, methane and nitrous oxide. Carbon dioxide is the major greenhouse gas emitted from coal-fired power plants.

OPG's coal plants emit more than 40% of Ontario's total carbon dioxide emissions from industrial sources.

OPG coal-fired facilities are a major source of greenhouse gases. Nanticoke, for example, had the largest carbon dioxide emissions of any power plant in North America in 2002¹⁰.

In 2005, Nanticoke was ranked #1 in both Canada and Ontario among industrial facilities for having the country's largest carbon dioxide emissions. In Ontario, Lambton ranked #2, followed by Atikokan at #15 and Thunder Bay at #16 in 2005³.

These four facilities along with the Lakeview Generating Station (which operated for part of 2005) accounted for 40% of the total carbon dioxide emissions reported by 80 industrial facilities in Ontario in 2005 (Table 12 – see next page).

Carbon dioxide emissions from OPG's coal-fired plants are increasing. Emissions of carbon dioxide from Nanticoke and Lambton increased for both plants by 20% from 2004 to 2005. Overall, carbon dioxide emissions for the five OPG plants increased by 10% from 2004 to 2005 and as of 2005, carbon dioxide emissions had increased by 90% since 1995. The emission rate for carbon dioxide from OPG coal-fired plants (tonnes per GWh) has also been increasing, growing by 7% overall from 1995-2005.

Figure 2: CO2 Emission Rate From Ontario Power Generation Plants 1995-2005

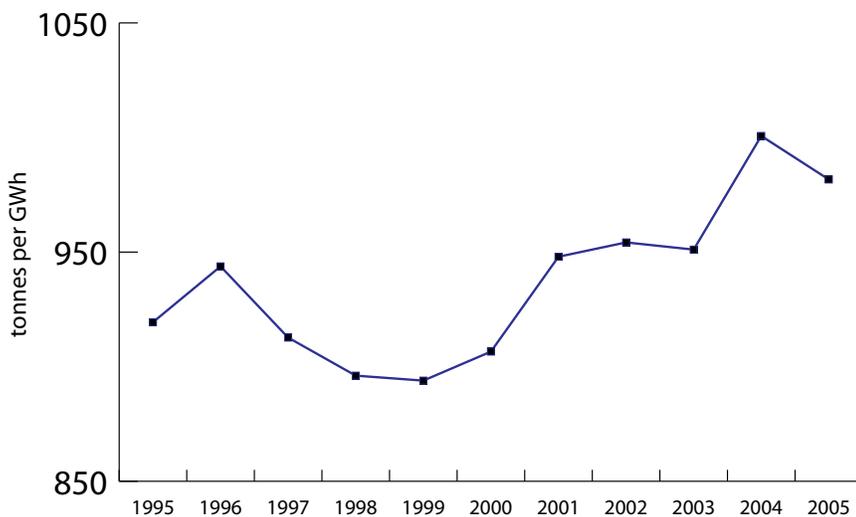


Table 12: Industrial facilities in Ontario reporting the largest emissions of carbon dioxide in 2005

Provincial Rank	Facility	Location	Carbon Dioxide Emissions in 2005 (tonnes)
1	Ontario Power Generation-Nanticoke Generating Station	Nanticoke	17,585,856
2	Ontario Power Generation-Lambton Generating Station	Courtright	8,694,815
3	Dofasco Inc.-Dofasco Hamilton	Hamilton	4,531,495
4	Algoma Steel Inc.	Sault Ste. Marie	3,717,522
5	Stelco Inc.,-Lake Erie Steel, formerly Stelco Lake Erie	Walpole Township	3,569,033
6	Stelco Inc., Hamilton Steel, formerly Stelco Hamilton	Hamilton	3,160,711
7	TransCanada Pipelines Ltd. TransCanada Pipeline System, Ontario	Kenora	2,847,105
8	Imperial Oil-Sarnia Refinery Plant	Sarnia	1,699,554
9	St. Mary's Cement Inc., St. Mary's Cement, Bowmanville	Bowmanville	1,494,081
10	NOVA Chemicals (Canada) Ltd.-Corunna Site	Corunna	1,478,342
	All 5 coal OPG total		29,255,112
	Ontario Total from Industrial facilities*		72,231,399
	OPG as % of Ontario		40.5%

Note: Total amount of carbon dioxide emissions reported in 2005 from large industrial facilities in Ontario under the federal greenhouse gas reporting requirement. The percentage includes the four operating coal-fired OPG plants and Lakeview Generating Station (719,348 tonnes) as this was operating for part of the year in 2005 and is included in the Ontario totals.

Table 13: Carbon dioxide emissions from five coal-fired OPG plants from 1995-2005

Year	Carbon dioxide emissions (tonnes)
1995	15,400,000
1996	17,900,000
1997	22,430,000
1998	29,800,000
1999	30,530,000
2000	37,640,000
2001	35,090,000
2002	35,252,000
2003	34,544,000
2004	26,457,400
2005	29,202,100
% change 1995-2005	90.0%

Note: Data from Ontario Power Generation's annual Sustainability Reports available at www.opg.com, 2005 total differs slightly from that reported under federal greenhouse gas reporting program.

Question #3. How much pollution are OPG's coal-fired plants releasing into the water?

The amount of toxic pollutants released into the water from OPG's coal-fired stations is much smaller, relative to air emissions. However, OPG released to water some compounds considered CEPA toxic, including mercury, arsenic and lead (and its compounds). These are all persistent compounds and do not easily break down in the environment. Mercury is also bioaccumulative, meaning that fish at the top of the food chain can have levels of mercury millions of times higher than in the surrounding water. Mercury contamination is one of the leading causes of fish consumption advisories in the Great Lakes.

Nanticoke discharged just less than 4 kg of mercury and its compounds to Lake Erie in 2005. This is a four-fold increase from 2000. Nanticoke ranked #3 for mercury releases from NPRI facilities in the Lake Erie Basin in 2005, just behind two sewage treatment plants. Nanticoke discharged more mercury into the Lake Erie basin than local steel plants, such as Stelco Steel (3.668 kg), and petroleum refineries.

Question #4. How much pollution are OPG's coal-fired plants sending to landfill and other facilities?

Burning coal leaves behind large amounts of ash. Some ash falls to the bottom of the furnace (bottom ash), other ash is carried up the stack and collected by filters (fly ash)¹¹. This ash contains metals such as mercury, lead, arsenic and cadmium, which are present in the original coal. The amounts of metals will vary with the

type of coal and the combustion system¹¹. Ash can also contain other compounds such as polycyclic aromatic hydrocarbons, hexchlorobenzene, and dioxins and furans which are byproducts of combustion.

In 2005, OPG generated approximately 1,293,000 tonnes of fly ash, bottom ash and gypsum (from scrubbers)¹². OPG has several methods of disposing of these byproducts of coal combustion. Fly ash is either landfilled on-site, sent to a landfill off-site or sent to another facility to be used in making cement. Bottom ash is used as fill in roadbeds. Gypsum is used to make wallboard¹².

All four coal plants dispose of ash and other materials in landfills on-site. At two plants, Lambton and Thunder Bay, more ash and other materials are landfilled on-site than are sent off-site. (See Table 14.)

Table 14: Amounts of NPRI pollutants in coal ash and other materials from OPG in 2005

OPG facility	Amount landfilled on-site in 2005 (kg)	Amount sent to another facility in 2005 (kg)	Location pollutants sent to in 2005	Total amount landfilled and sent off-site (kg)
Atikokan Generating Station	48,618	118,057	Lafarge Canada Inc., Calgary, Alberta	166,675
Lambton Generating Station	707,513	68,678	BF Environmental Consultants, Port Lambton, Ontario (for road building)	776,191
Nanticoke Generating Station	931,857	1,461,856	Lafarge, Alpena Michigan; Lafarge Canada Inc., Bath, Ontario; Blue Circle Cement, St. Mary's, Ontario	2,393,713
Thunder Bay Generating Station	36,221	12,671	Lafarge Canada Inc., Richmond Hill, Ontario	48,892
Total	1,724,209	1,661,262		3,385,471

All four plants also send ash and other materials to facilities off-site. Nanticoke sends large amounts of fly ash and other materials to three cement plants: Lafarge Midwest Inc. in Alpena, Michigan, Lafarge Canada Inc., in Bath, Ontario, and Blue Circle Cement in St. Mary's Ontario. Lambton sends large amounts to a BF Environmental Consultants for road building.

OPG diverted 62% or 801,913 tonnes of its total solid wastes from landfill in 2005.¹² This leaves approximately 38% or 491,000 tonnes that is sent to landfill on-site or sent off site to landfill or another facility.

4.1 On-site Landfills

All of OPG's coal-fired plants dispose of materials containing pollutants in landfills on-site, usually in berms constructed on the property. OPG reports to the NPRI on the types of pollutants and amounts contained in ash and other materials that are landfilled on-site.

In 2005, over 1,724,200 kg of pollutants that were contained in ash and other materials were landfilled at OPG sites. In particular, large amounts of materials are landfilled at both the Nanticoke and Lambton Generating Stations: Nanticoke landfilled 931,857 kg of pollutants contained in ash and other materials on-site in 2005, while Lambton landfilled 707,513 kg on-site.

In 2004, the Lambton Generating Station was ranked #8 in Ontario for pollutants sent to landfill on-site and the Nanticoke Generating Station was ranked #13 in Ontario¹³. The amount of pollutants landfilled at OPG's coal plant sites was approximately 5% of Ontario's total from NPRI reporting facilities.

Many of the pollutants landfilled are considered toxic under the Canadian Environmental Protection Act. On the basis of landfilling CEPA toxic chemicals, Lambton ranked #7 and Nanticoke ranked #14 in Ontario in 2004¹⁴.

Table 15: NPRI Facilities in Ontario reporting the largest amount of arsenic and its compounds landfilled on-site in 2005

Rank	Facility	Location	Arsenic and its compounds landfilled on-site in 2005 (kg)
1	Clean Harbors Canada Lambton Facility	Corunna	122,000
2	Ontario Power Generation- Lambton Generating Station	Courtright	13,332
3	Ontario Power Generation- Nanticoke Generating Station	Nanticoke	8,084
4	Gerdau AmeriSteel-Whitby	Whitby	859
5	Inco- Inco Ltd Port Colborne Refinery	Port Colborne	442
6	Ontario Power Generation- Atikokan Generating Station	Atikokan	308
7	Ontario Power Generation- Thunder Bay Generating Station	Thunder Bay	218
8	Weyerhaeuser Company Ltd-Dryden Operations	Dryden	52
9	Marathon Pulp Inc	Marathon	10
10	Falconbridge Ltd. Smelter Complex	Falconbridge	1
	OPG Total		21,942
	Arsenic and its compounds reported landfilled on-site by all NPRI facilities in Ontario		145,291
	OPG as % of all Ontario NPRI facilities		15.1%

The materials landfilled on-site also contain large amounts of metals such as arsenic, lead and mercury. The Lambton Generating Station ranked #2 in Ontario for landfilling of arsenic and its compounds, followed by #3 Nanticoke in 2005 (Table 15). In fact, OPG landfilled on-site 15% of all the arsenic and its compounds reported from Ontario NPRI facilities in 2005 and 17% of the total mercury and its compounds (Table 15 and Table 17). Ash from the Thunder Bay station buried on-site contained about 7 grams of hexachlorobenzene, a carcinogen and CEPA toxic substance. This is an increase from previous years of about 2 grams.

Lambton and Nanticoke both rank in the top five for lead, cadmium and mercury landfilled on-site in Ontario in 2005 (Table 16). Often the only facilities with larger landfill amounts for these substances than Lambton and Nanticoke are the licensed hazardous waste landfill, Clean Harbors (formerly Safety Kleen) in Corunna, and the steel manufacturer, Gerdau AmeriSteel in Whitby.

Table 16: NPRI Facilities in Ontario reporting the largest amount of lead and its compounds landfilled on-site in 2005

Rank	Facility	Location	Lead and its compounds Landfilled on-site in 2005 (kg)
1	Clean Harbors Canada Lambton Facility	Corunna	485,000
2	Gerdau AmeriSteel-Whitby	Whitby	137,389
3	SMC Canada-McAlpine Mill	Cobalt	14,946
4	Ontario Power Generation- Lambton Generating Station	Courtright	13,546
5	Ontario Power Generation- Nanticoke Generating Station	Nanticoke	12,823
6	Ontario Power Generation- Atikokan Generating Station	Atikokan	861
7	City of Toronto-Highland Creek Treatment Plant	Toronto	458
8	Ontario Power Generation- Thunder Bay Generating Station	Thunder Bay	645
9	Inco Limited-Port Colborne Refinery	Port Colborne	359
10	Shell Canada-Sarnia Manufacturing Centre	Sarnia	218
	OPG Total		27,875
	Lead and its compounds reported landfilled on-site by all NPRI facilities in Ontario		666,772
	OPG as % of all Ontario NPRI facilities		4.2%

Table 17: NPRI Facilities in Ontario reporting the largest amount of mercury and its compounds landfilled on-site in 2005

Rank	Facility	Location	Mercury and its compounds landfilled on-site in 2005 (kg)
1	Clean Harbors Canada Lambton Facility	Corunna	858.000
2	Gerdau AmeriSteel-Whitby	Whitby	222.146
3	Ontario Power Generation- Nanticoke Generating Station	Nanticoke	122.437
4	Ontario Power Generation- Lambton Generating Station	Courtright	102.522
5	Waste Services (CA) Inc. Navan Landfill	Ottawa	19.801
6	NewAlta Industrial Services Inc. Brantford Division	Brantford	9.000
7	Shell Canada-Sarnia Manufacturing Centre	Sarnia	2.031
8	Ontario Power Generation- Thunder Bay Generating Station	Thunder Bay	0.664
9	PetroCanada Oakville Refinery	Oakville	0.500
10	Norampac Red Rock Division	Red Rock	0.319
	OPG Total		225.844
	Mercury and its compounds reported landfilled on-site by all NPRI facilities in Ontario		1337.925
	OPG as % of all Ontario NPRI facilities		16.9%

4.2 Pollutants Sent Off-site to Other Facilities

The other method of managing the huge volumes of wastes produced by OPG coal-fired plants is to send the wastes to other facilities for disposal or management. In 2005, 1.7 million kg of pollutants were shipped from OPG sites, mainly to cement manufacturing plants. Most of these pollutants are contained in ash, either fly ash collected from air pollution control systems or bottom ash collected from the boiler. OPG also produces gypsum (calcium sulphate) from air pollution scrubbers, some of which is used to make wallboard.

Arsenic, cadmium, chromium, cobalt, copper, dioxins and furans, lead, manganese, mercury, phosphorus, polycyclic aromatic carbons and nickel may be contained in ash and other materials sent off-site from OPG plants.

Nanticoke

In 2005, fly ash shipments sent to a cement kiln in Alpena, Michigan, on the shores of Lake Huron, owned by Lafarge Midwest Inc. (a wholly owned subsidiary of Lafarge Corporation), contained 1,372,265 kg of NPRI reported pollutants. The ash sent to the Lafarge plant contains arsenic (10,261 kg), cadmium (216 kg), chromium (239 kg), lead (21,333 kg), mercury (145 kg) and their compounds. (Interestingly, OPG claims carbon dioxide emission credits for its fly ash shipments, as the fly ash replaces shale used in making cement¹⁵.)

The amount of mercury and its compounds contained in ash and other materials sent off-site from Nanticoke has increased 92% from 2000 to 2005 (from 80 to 154 kg). Much of this mercury (145 kg in 2005) is contained in ash shipped to the Lafarge Midwest cement plant in Michigan. This trend is of concern as the mercury in the ash is part of the materials heated during cement manufacturing and which may be subsequently released from the cement plant.

In fact, the high level of mercury emissions from the Lafarge Cement Plant in Michigan has recently been in the news. In 2004, Lafarge Midwest Inc. ranked #14 in Michigan for total air emissions reported to the U.S. Toxic Release Inventory (328,786 kg). This facility released 159 kg of mercury into the air in 2004, making it the #3 industrial source of mercury in Michigan. Mercury air emissions from the plant increased five-fold between 2003 and 2004 (from 30 kg to 159 kg).

The quantity of arsenic and its compounds sent off-site from Nanticoke increased by 39% from 2002-2005. The amount of lead and its compounds sent off-site increased by 16% from 2002 to 2005.

In 2005, Nanticoke also sent pollutants to two other locations: to Lafarge Canada Inc.'s cement kiln in Bath, Ontario (44,797 kg) and to Blue Circle Cement (now called St. Mary's Cement) in St. Mary's, Ontario (44,795 kg). The pollutants sent to Lafarge in Bath and to Blue Circle were similar: Each received ash containing arsenic (327 kg), cadmium (7 kg), chromium (2,434 kg), and mercury (4.6 kg).

Lambton

In 2005, the Lambton Generating Station sent 68,678 kg of pollutants contained in ash to BF Environmental Consultants in Port Lambton, Ontario. BF Environmental Consultants are licensed drainage contractors and used the bottom ash to build a road, partly on and partly off OPG property. This bottom ash contains toxic metals such as mercury (3 kg), lead (819 kg), cadmium (28 kg) and arsenic (432 kg), polycyclic aromatic hydrocarbons, hexachlorobenzene (.018 grams) and dioxins and furans.

Lambton is the only OPG station to report polycyclic aromatic hydrocarbons (PAHs) in ash sent off-site. PAHs are a family of chemicals in which some are considered carcinogens, reproductive toxins and CEPA toxic. Some of the PAHs contained in Lambton's ash are reported in large amounts.

Thunder Bay

In 2005, ash and other materials from Thunder Bay (137,514 kg) was sent to a Lafarge Canada Inc. cement plant in Richmond Hill, Ontario. This ash contained arsenic (1,172 kg), cadmium (29 kg), lead (2,374 kg) and mercury (0.47 kg). Thunder Bay sends large amounts of hexachlorobenzene (17 grams) to Lafarge, the largest amounts of any OPG plant.

Atikokan

In 2005, ash and other materials from Atikokan (118,057 kg) were sent to Lafarge Canada Inc. in Calgary, Alberta. This ash contained arsenic (1,029 kg), cadmium (33 kg), lead (2,838 kg) and mercury (0.72 kg). Fly ash from Atikokan has been previously used as mine backfill. (OPG also claims carbon dioxide emission credits here as the fly ash replaces cement used for backfill.)

Conclusion

OPG's coal-fired plants emit a staggering amount of pollution to the air. Of the industrial facilities reporting to NPRI, the five coal-fired OPG plants emit 22% of Ontario's criteria air contaminants, 36% of the total mercury and its compounds and 40% of the total carbon dioxide.

The amount of air pollution coming out of Nanticoke alone exceeds the air pollution from some entire provinces. In fact, Nanticoke ranked #1 (worst polluter) out of all of Ontario's NPRI-reporting industrial facilities in 2005 for having the largest air emissions of total particulates, nitrogen oxides, mercury and its compounds, and carbon dioxide.

OPG's four coal plants release huge amounts of carbon dioxide, a greenhouse gas that contributes to global warming. In fact, OPG's coal plants are responsible for 40% of the total reported CO₂ emissions from industrial sources in Ontario in 2005. Not only have carbon dioxide emissions increased from OPG coal plants since 1995, but its coal plants released 7% more CO₂ per GWh of energy produced in 2005 compared to 1995.

But OPG's coal plants are also major producers of solid waste, generating an almost equivalent amount of pollutants to what it pumps into the air in the huge quantities of ash and other materials that result from burning coal. It is clear from the numbers that OPG is operating large industrial landfill operations on the sites of all four of its coal-fired facilities and that these landfills are receiving pollutants such as mercury, lead and other CEPA toxics. Lambton ranked in the top 10 among NPRI reporting facilities in Ontario for on-site landfilling of CEPA toxics in 2004. Both Lambton and Nanticoke ranked in the top five for landfilling mercury, arsenic and lead and their compounds in 2005.

OPG's efforts to divert waste from landfill, while laudable, also raises some concerns about the fate of CEPA toxic metals such as mercury, that are contained in ash heated to high temperatures in cement kilns or buried in road beds.

But it is when we step back and consider the full picture of the pollutants in all forms coming from OPG's coal plants that we really begin to grapple with the full implications of burning coal. When we stack up OPG being a leading emitter in all three air pollution categories with being a leading on-site landfiller of solid wastes containing a broad cross section of toxic materials, and, in turn, stack this up with being a shipper of significant quantities of pollutants to other facilities, we start to see more clearly that the giant polluting footsteps of OPG's coal plants lead everywhere and cross many paths.

We also begin to realize the futility of trying to fashion end-of-pipe or solid waste pollution controls for such massive and complex waste streams. We see the pitfalls we can encounter when we try to solve one problem in isolation, such as potentially re-releasing mercury when ash is heated or increasing CO₂ emissions due to losses in plant efficiency due to the addition of pollution controls or the burning of lower sulphur coals.

A far better solution is to start with a clean slate: To complete the phase-out of coal burning for electricity generation and to adopt readily available cleaner options, such as dramatically increasing our end-use energy efficiency, developing our vast renewable power potential, and using cleaner fossil fuels, such as natural gas, much more efficiently. A combined heat and power generator, for example, can be up to 90% efficient compared to the 34% efficiency of a coal generator.

By cutting Ontario's Pollution Giant down to size we can ensure that current and future generations are not saddled with the toxic legacy of our tremendous energy appetites.

References

1. Environment Canada. 2004. Guide to Reporting to the National Pollutant Release Inventory. 2004. Catalogue number En81-1/2004E. ISBN 0-662-39594-8. Available at www.ec.gc.ca/pdb/npri.
2. Pollutionwatch 2007. Ranking facilities in Ontario by Air releases (combined without VOC) in 2004 for suspected respiratory toxics. Downloaded from www.pollutionwatch.org on January 10, 2007.
3. Environment Canada. 2006. Facility Greenhouse Gas Data. Available at www.ec.gc.ca/ghg/.
4. American Lung Association: State of the Air 2006. Available at www.lungaction.org.
5. Scorecard. 2006. Respiratory Toxins. Definition and list of chemicals considered suspected respiratory toxins Available at www.scorecard.org/health-effects/chemicals-2.tcl?short_hazard_name=resp&all_p=t.
6. Pollutionwatch 2007. Ranking Facilities in Ontario and in Canada by Air releases (combined without VOC) in 2004 for CEPA toxics . Downloaded from www.pollutionwatch.org on January 10, 2007.
7. CPCHE, 2005. Child Health and the Environment- a Primer. Available at www.healthyenvironmentforkids.ca.
8. Trasande, Leonardo, Philip J. Landrigan, and Clyde Schechter. 2005. Public Health and Economic Consequences of Methyl Mercury Toxicity to the Developing Brain . Environmental Health Perspectives: Vol.113, No. 5, p 590-596.
9. Pollutionwatch 2007. Health Effects Summary. Available from text at bottom of page at www.pollutionwatch.org
10. Commission for Environmental Cooperation. 2004. North American Power Plant Emissions. Available at www.cec.org.
11. EPRI, 1998. Coal Ash: Its origin, disposal, use and potential health issues. Environmental Focus. Technical Report. 1998. Available at www.epri.com.
12. Ontario Power Generation. Towards Sustainable Development 2005 Progress Report. Available at www.opg.com.
13. Pollutionwatch 2007. Ranking Facilities In Ontario for On-site Landfill for total amounts for 2004. Downloaded from www.pollutionwatch.org on January 10, 2007.
14. Pollutionwatch 2007. Ranking Facilities In Ontario for On-site landfill for CEPA toxics in 2004. Downloaded from www.pollutionwatch.org on January 10, 2007.
15. Ontario Power Generation. Towards Sustainable Development 2003 Progress Report. Available at www.opg.com.

Appendix A: Data Sources

This report is based on several data sources:

1) NPRI data downloaded from Environment Canada web site (www.ec.gc.ca/pdb). The 2005 version for toxic pollutants (those listed in Part 1, 2 and 3 of NPRI reporting) are dated August 26, 2006. Mercury data is dated October 27, 2006 (to reflect a change made by one facility). There are a variety of thresholds for toxic pollutants.

The 2005 version of the criteria air contaminants data (those listed in Part 4 of NPRI reporting) are dated October 27, 2006. The thresholds for reporting CACs are: 20 tonnes for carbon monoxide, NO_x, SO₂, TPM; 10 tonnes for VOCs; 0.5 tonnes for PM₁₀; and 0.3 tonnes for PM_{2.5}. At the time of development of this report, the 2005 data was a draft version, had not been reviewed by Environment Canada, and may change from time to time. Please see Environment Canada's Guide to Reporting to NPRI for more details (www.ec.gc.ca/pdb/npri)

2) Pollutionwatch: Health based lists used in this report (CEPA toxic and suspected respiratory toxins) were obtained from Scorecard (www.scorecard.org/health-effects) and PollutionWatch, (www.pollutionwatch.org) a joint project of Environmental Defence and the Canadian Environmental Law Association. The most recent data published on the PollutionWatch website was 2003 NPRI data, at time of development of this report June-December 2006. PollutionWatch data was also used for some rankings because the 2005 NPRI data was available in query format only, which makes some analyses difficult.

3) Greenhouse Gas data: The 2005 facility data and greenhouse gas inventory data for Ontario were obtained from Environment Canada's web site (www.ec.gc.ca/pdb/ghg). The 2005 data on carbon dioxide emissions was obtained from OPG Sustainable Development reports (www.opg.com)

4) Ontario Power Generation: Information on generation rates, ash amounts, and background information on each facility were obtained from annual OPG Sustainable Development reports (www.opg.com).

Appendix B: Criteria Air Contaminants Released from OPG Coal-fired Plants in 2005

Criteria Air Contaminants	Thunder Bay		Atikokan		Lambton		Nanticoke	
	Emissions (tonnes)	Emission Rate (tonnes/GWh)						
Carbon monoxide	24	0.025	240.5	0.249	3,913.561	0.415	7,291.800	0.413
Oxides of nitrogen (expressed as NO2)	2742.287	2.851	1734.763	1.798	8,990.586	0.954	23,171.155	1.312
PM - Total Particulate Matter	499.969	0.520	40.348	0.042	3,071.665	0.326	6,722.976	0.381
PM 10 – Particulate Matter <= 10 Microns	334.744	0.348	26.808	0.028	2,122.570	0.225	2,124.484	0.120
PM 2.5 – Particulate Matter <= 2.5 Microns	144.823	0.151	11.54	0.012	756.959	0.080	665.588	0.038
Sulphur dioxide	4214.5	4.381	4774.3	4.947	29,343.100	3.114	67,946.900	3.846
Volatile Organic Compounds	21.414	0.022	20.17	0.021	101.532	0.011	260.059	0.015
2005 net generation GWh		962		965		9422		17,666

Source: NPRI data, Environment Canada, version September 22, 2006
Net Generation data from OPG Sustainable Development Report www.opg.com



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