

Particularly Harmful

*Particulates carry toxic brew from
Nanticoke Generating Station*

Mercury

Sulphuric acid

Particulate Matter

Nickel Selenium

Nitrogen oxides

Hydrochloric acid

Arsenic

Dioxins and furans

PM₁₀ Hydrogen fluoride

Lead Vanadium



Acknowledgements

The Ontario Clean Air Alliance gratefully acknowledges the generous financial support of the George Cedric Metcalf Charitable Foundation, the Laidlaw Foundation and the Toronto Atmospheric Fund.

George Cedric
Metcalf Charitable
Foundation



 **TORONTO** Atmospheric Fund

Thanks to Kim Perrotta of the Ontario Public Health Association who reviewed the report and provided very helpful comments.

Photograph of the coal-fired power plant stack is by Peter Lusetyk.



About the Ontario Clean Air Alliance

The Ontario Clean Air Alliance (OCAA) is a coalition of health, environmental and consumer organizations, municipalities, utilities, faith communities, unions and individuals working for cleaner air through strict emission limits and the phase-out of coal in the electricity sector. Our partner organizations represent over six million Ontarians.

The OCAA can be contacted at:

Ontario Clean Air Alliance
625 Church Street, Suite 402
Toronto M4Y 2G1

Tel: (416) 926-1907 ext. 245

Fax: (416) 926-1601

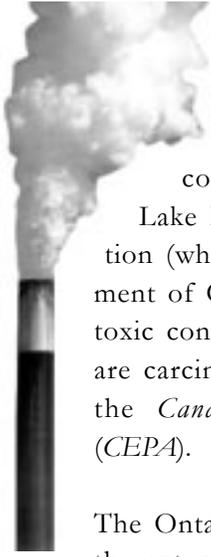
E-mail: info@cleanairalliance.org

Web Site: www.cleanairalliance.org

TABLE OF CONTENTS

Executive Summary	2
Introduction	4
Results	6
1. Releases and Transfers from the Nanticoke Generating Station – 2002	6
2. Nanticoke in the Provincial Context – Releases and Transfers from the Nanticoke Generating Station in Relation to the Province of Ontario Totals	6
3. Air Emissions of Criteria Air Contaminants from the Nanticoke Generating Station -- 2002	8
4. Time Trends in Releases and Transfers from the Nanticoke Generating Station from 1994-2002	11
• Mercury and its compounds	11
• Acid gases: hydrochloric acid, hydrogen fluoride	12
• Dioxins and furans	12
• Polycyclic aromatic hydrocarbons	13
• Metals: arsenic, chromium, cobalt, copper, lead, manganese, nickel, selenium, vanadium, zinc and their compounds	13
References	20





EXECUTIVE SUMMARY

The Nanticoke Generating Station, a coal-fired power plant on the shores on Lake Erie owned by Ontario Power Generation (which in turn is owned by the Government of Ontario), is a significant source of many toxic contaminants in Ontario, some of which are carcinogenic and/or considered toxic under the *Canadian Environmental Protection Act (CEPA)*.

The Ontario Clean Air Alliance has documented the extensive emissions from the Nanticoke station as recorded in the National Pollutant Release Inventory (NPRI) in previous reports. A new finding of this year's report is the identification of the Nanticoke Generating Station as the largest source of particulates in Ontario in 2002, as reported to the NPRI.

Particulates are one of seven "criteria air contaminants" for which reporting to the NPRI became mandatory in 2002. Criteria air contaminants have been associated with adverse health effects including cardiac and respiratory problems, chronic diseases and premature mortality and adverse environmental effects such as acid rain.

In addition to particulates, the Nanticoke Generating Station emits large amounts of many other criteria air contaminants including sulphur dioxide, nitrogen oxides and carbon monoxide.

Based on our review of the NPRI data, the Nanticoke Generating Station remains the #1 air polluter in Ontario and also #1 air polluter in Canada for NPRI contaminants in 2001.

Based on 2001 NPRI data from Pollutionwatch.org, the Nanticoke Generating Station ranks #1 for emissions of suspected respiratory toxicants in Ontario and also #1 in Canada in 2001. (The list of chemicals considered suspected respiratory toxicants are a subset of NPRI chemicals that have adverse effects on

the structure or functioning of the respiratory system.)

The air releases emitted by this single facility, the Nanticoke Generating Station, in 2001 (6,934,136 kilograms) remain greater than that reported by the *combined* NPRI facilities in each of the following provinces: New Brunswick, Nova Scotia, Manitoba, Saskatchewan, Newfoundland, Prince Edward Island, Nunavut and Northwest Territories. Ontario Power Generation is the largest corporate air polluter in Canada and in Ontario (using 2001 NPRI data from Pollutionwatch.org).

The Municipality of Nanticoke is ranked the #1 municipality in Ontario and the #1 municipality in Canada for air releases in 2001. This was a result of the large releases from the Nanticoke Generating Station (6,934,136 kilograms; using 2001 NPRI data from Pollutionwatch.org). The Municipality of Nanticoke has since been amalgamated into Haldimand County.

The NPRI data identifies the Nanticoke Generating Station as a significant emitter in Ontario of all three types of air contaminants: toxics, acid gases and criteria air contaminants such as particulates. In fact, when compared to other NPRI facilities in Ontario, the Nanticoke Generating Station stands out as the province's largest source of many chemicals. In Ontario in 2002, air releases from the Nanticoke station rank:

- #1 for mercury and its compounds
- #1 for hydrochloric acid
- #1 for hydrogen fluoride
- #1 for nitrogen oxides
- #1 for total particulates
- #1 for particulates less than 10 microns (PM₁₀)
- #2 for particulates less than 2.5 microns (PM_{2.5})
- #2 for sulphur dioxide
- #2 for selenium and its compounds
- #3 for cobalt and its compounds
- #3 for HCFC-22 (spill of refrigerant)
- #4 for arsenic and its compounds
- #4 for sulphuric acid
- #5 for vanadium and its compounds
- #5 for chromium and its compounds
- #5 for carbon monoxide

- #8 for copper and its compounds
- #8 for nickel and its compounds
- #12 for lead and its compounds
- #14 for zinc and its compounds

Of the total releases reported to the NPRI in Ontario, releases from the Nanticoke Generating Station in 2002 accounted for:

- 94% of 1,4-dioxane
- 67% of hydrogen fluoride
- 65% of hydrochloric acid
- 43% of vanadium and its compounds
- 39% of cobalt and its compounds
- 34% of selenium and its compounds
- 16% of mercury and its compounds
- 10% of chromium and its compounds
- 8% of copper and its compounds

Of the criteria air contaminants reported to NPRI, air releases from the Nanticoke Generating Station account for:

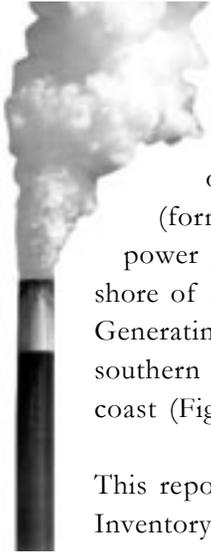
- 25% of nitrogen oxides reported in Ontario
- 15% of sulphur dioxide reported in Ontario
- 14% of particulate matter less than 10 microns (PM₁₀)
- 13% of total particulate matter reported in Ontario
- 10% of particulate matter less than 2.5 (PM_{2.5}) microns
- 4% of carbon monoxide reported in Ontario

The large emissions of particulates, combined with acid gases and other toxic contaminants from the Nanticoke Generating Station, are of concern for all Ontarians. For the first time, NPRI data identifies the Nanticoke station as a significant emitter of particulates, both PM₁₀ and PM_{2.5}, which contribute to cardiac and respiratory diseases, increased hospitalizations and premature mortality. Particulates are an effective delivery mechanism for toxic contaminants, allowing toxics to penetrate deep into the lung and enter the blood and tissue.

From 1995 to 2002, air releases from the Nanticoke Generating Station of a common set of core chemicals have increased by 248%. These nine chemicals have been reported by the Nanticoke Generating Station under the same NPRI reporting thresholds.

Particularly Harmful





INTRODUCTION

The Nanticoke Generating Station, owned by Ontario Power Generation (formerly Ontario Hydro) is a coal-fired power plant near the town of Nanticoke on the shore of Lake Erie. Emissions from the Nanticoke Generating Station can travel throughout much of southern Ontario and even as far as the Atlantic coast (Figure 1).

This report uses the National Pollutant Release Inventory (NPRI) data to analyze the:

- releases and transfers from the Nanticoke Generating Station in 2002;
- ranking of the Nanticoke Generating Station relative to provincial totals; and
- trend of releases and transfers from the Nanticoke Generating Station from 1995 to 2002.

Each year, the Nanticoke Generating Station — along with more than 4,000 other facilities — must report its releases and transfers of 273 chemicals to the federal National Pollutant Release Inventory. Each facility reports the amounts of chemicals released to the air, land, and water and injected underground at the facility site. The amount of each chemical that a facility transfers off-site for treatment, sewage, disposal, recycling or energy recovery must also be reported.

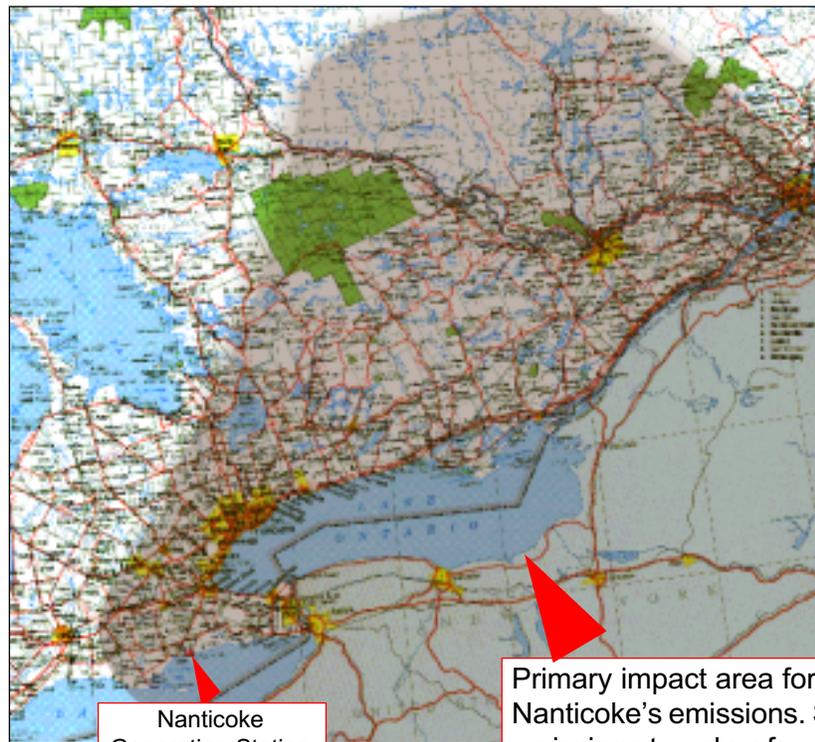
The NPRI is the only nationwide, publicly accessible program that provides information on pollutants being released and transferred.

However, there are several limitations to the NPRI data:

- it does not cover all chemicals known to be of health or environmental concern (such as greenhouse gas chemicals);
- it does not cover all sources, only those meeting certain thresholds (generally facilities with at least 10 employees and 10 tonnes of chemicals manufactured, processed or otherwise used);
- it is self-reported and a variety of different methods can be used to estimate emissions; and
- it does not include emissions from area sources such as gas stations and dry cleaners, mobile sources such as cars or trucks, or from natural sources such as forest fires.

For some chemicals, sources such as small facilities, area sources, mobile sources and natural sources can be significant percentages of the total emissions to the environment. For other chemi-

Figure 1. Map of where the Nanticoke Generating Station's emissions travel



Nanticoke Generating Station

Primary impact area for Nanticoke's emissions. Some emissions travel as far as the Atlantic coast!

cals, the NPRI data from larger, mainly industrial sources is the largest percentage of total emissions. For example, industrial sources contribute about 90% of Ontario's sulphur dioxide emissions, whereas industrial sources contribute only about 35% of Ontario's nitrogen oxide emissions (estimates from human activity in 2000, MOE 2003).

Of the 273 chemicals that needed to be reported to the NPRI in 2002, 58 have been declared toxic under the *Canadian Environmental Protection Act (CEPA)*. There are 241 substances where the original reporting threshold is used (10 tonnes, manufactured, processed or otherwise used with 1% concentration exemption except for byproducts), and there are 32 substances that now have alternate reporting thresholds, including some of the metals and persistent bioaccumulative compounds such as dioxins and furans. This year, for the first time, air emissions of seven criteria air contaminants (CACs) are also required.

This report is based on the preliminary 2002 data as posted on the NPRI website in January 2004. This data was provided by facilities and is under review and analysis by Environment Canada. The data used for this report was downloaded in January 2004, however, the NPRI data is evolving as facilities update their emissions and new facilities report. The 2002 preliminary data is presented in query format only, which makes some analyses difficult. Therefore, for some rankings, we've used the 2001 NPRI data as presented on the Pollutionwatch website (www.pollutionwatch.org).

For more information on the NPRI, see the Environment Canada website at www.ec.gc.ca/pdb/npri. For more information on ranking of facilities or health and environmental effects of chemicals, please see the Pollutionwatch website (a joint project of the Canadian Environmental Law Association, Canadian Institute for Environmental Law and Policy and Environmental Defence Canada) at www.pollutionwatch.org.

For this report, we have used the NPRI data to answer the following questions:

1. What are the releases and transfers of toxic contaminants from the Nanticoke Generating Station in 2002?
2. How do releases and transfers from the Nanticoke Generating Station rank compared to other facilities in Ontario?
3. What are the releases of criteria air contaminants from the Nanticoke Generating Station reported for the first time in 2002?
4. How do the 2002 release and transfer data from the Nanticoke Generating Station compare to results from previous years?





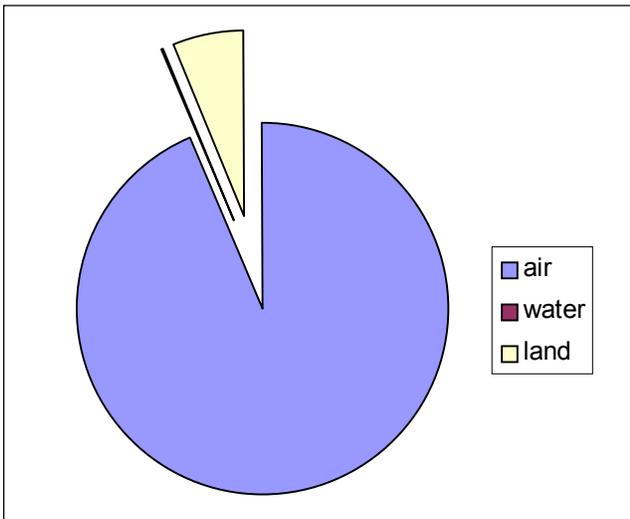
RESULTS

1. Releases and Transfers from the Nanticoke Generating Station — 2002

In 2002, the total amount of chemicals reported released on-site from the Nanticoke Generating Station was 8,000.01 tonnes (see Table 1).

Most of the total on-site releases (94%) were emitted into the air. The air releases from the Nanticoke Generating Station in 2002 were 7,491.07 tonnes. Less than 0.1% (10.47 tonnes) of the total on-site releases were released into the water. About 6% (498.45 tonnes) of the total on-site releases were sent to land disposal on-site.

Figure 2. On-site releases of the Nanticoke Generating Station



In addition to the on-site releases, 347.17 tonnes of chemicals were sent off-site for recycling.

These amounts do not include the emissions of criteria air contaminants, which are described in Section 3, or greenhouse gas emissions, which are not yet reported to the NPRI. According to the latest Ontario Power Generation report, *Towards Sustainable Development 2002 Progress Report*, the Nanticoke station emitted 21,370,000 tonnes of carbon dioxide, one of the greenhouse gases, in 2002.

2. Nanticoke in the Provincial Context Releases and Transfers from the Nanticoke Generating Station in Relation to Province of Ontario Totals

The Nanticoke Generating Station remains the #1 air polluter in Ontario and also the #1 air polluter in Canada for NPRI contaminants in 2001 (using 2001 NPRI data from Pollutionwatch.org). A previous report, *Up the Stack: Coal-Fired Electricity's Toxic Impact*, ranked the Nanticoke station #1 for air releases in Ontario and Canada using 1999 NPRI data.

The Nanticoke Generating Station ranks #1 for emissions of suspected respiratory toxicants in Ontario and #1 in Canada in 2001 (using 2001 NPRI data from Pollutionwatch.org). Respiratory toxicity is defined as adverse effects on the structure or functioning of the respiratory system that result from exposure to chemical substances. The list of chemicals considered suspected respiratory toxicants is a subset of NPRI chemicals and can be downloaded from the Scorecard website (www.scorecard.org).

The air releases emitted by the Nanticoke Generating Station in 2001 (6,934,136 kilograms) as a single facility are still greater than the combined facilities reporting in many individual provinces: New Brunswick, Nova Scotia, Manitoba, Saskatchewan, Newfoundland, Prince Edward Island, Nunavut and Northwest Territories (using 2001 NPRI data from Pollutionwatch.org).

Pollutionwatch provides rankings by corporation, aggregating the releases of individual facilities controlled by a single corporation. Ontario Power Generation has the largest air releases of any corporation in both Canada and in Ontario in 2001 (using NPRI data from Pollutionwatch.org).

Of municipalities, the Municipality of Nanticoke is ranked the #1 municipality in Ontario and the #1 municipality in Canada for air releases reported to the NPRI in 2001. This was a result of the large releases from the Nanticoke Generating Station (6,934,136 kilograms; using 2001 NPRI data from Pollutionwatch.org). The Municipality of Nanticoke

has since been amalgamated into Haldimand County.

The 2002 NPRI preliminary data is presented in a format that makes it difficult to assess the provincial ranking of the Nanticoke Generating Station for releases of all contaminants. However, provincial rankings for individual chemicals can be analyzed. When compared to other NPRI facilities in Ontario, the Nanticoke Generating Station stands as the province's largest source of many chemicals (see Table 2). In 2002 in Ontario, air releases from the Nanticoke station rank:

- #1 for mercury and its compounds
- #1 for hydrochloric acid
- #1 for hydrogen fluoride
- #1 for nitrogen oxides
- #1 for total particulates
- #1 for particulates less than 10 microns (PM₁₀)
- #2 for particulates less than 2.5 microns (PM_{2.5})
- #2 for sulphur dioxide
- #2 for selenium and its compounds
- #3 for cobalt and its compounds
- #3 for HCFC-22 (spill of refrigerant)
- #4 for arsenic and its compounds
- #4 for sulphuric acid
- #5 for vanadium and its compounds
- #5 for chromium and its compounds
- #5 for carbon monoxide
- #8 for copper and its compounds
- #8 for nickel and its compounds
- #12 for lead and its compounds
- #14 for zinc and its compounds

The Nanticoke Generating Station was responsible for more than 60% of the total releases of the following chemicals reported in 2002 to the NPRI in Ontario:

- hydrochloric acid
- hydrogen fluoride
- 1,4-dioxane

Breathing hydrochloric acid can irritate the nose and throat. Hydrochloric acid is also a lung irritant, causing coughing or shortness of breath. Repeated exposures may cause bronchitis to develop. Higher exposures can cause a buildup of fluid in

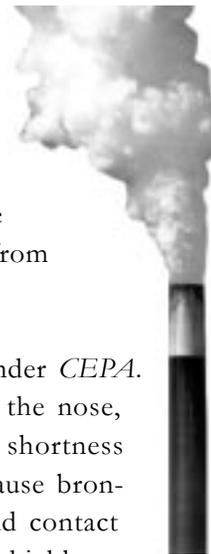
the lungs (pulmonary edema). Longer-term exposure may affect the liver and kidney (New Jersey Fact Sheet, 2001). Air releases of hydrochloric acid from the Nanticoke Generating Station were 6,749.14 tonnes in 2002. These were the highest emissions of hydrochloric acid from any facility in Ontario in 2002.

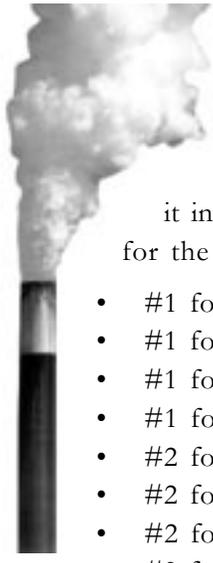
Hydrogen fluoride is considered toxic under *CEPA*. Breathing hydrogen fluoride can irritate the nose, throat and lungs, causing coughing and shortness of breath. Longer-term exposure can cause bronchitis. Hydrogen fluoride is corrosive and contact can cause skin irritation and burns. It is highly soluble in water and can damage aquatic and terrestrial plants and ecosystems. Skeletal damage (fractures, weakness, crippling) to cattle and other wildlife have been associated with exposure to high levels of hydrogen fluoride. Longer-term exposure to hydrogen fluoride may damage liver and kidneys (New Jersey Fact Sheet, 1998). Air releases of hydrogen fluoride from the Nanticoke Generating Station were 425.85 tonnes in 2002. These were the highest emissions of hydrogen fluoride from any facility in Ontario in 2002.

1,4-dioxane is considered a possible carcinogen (Group 2B) by the International Agency for Research on Cancer and a carcinogen on California's Proposition 65 list. Breathing 1,4-dioxane can irritate the throat and nose, causing coughing and shortness of breath. Higher exposure can cause dizziness, lightheadness and passing out. 1,4-dioxane may damage the liver and kidneys (New Jersey Fact Sheet, 2002). The Nanticoke station reported 6.06 tonnes of 1,4-dioxane sent to landfill on-site and 4.22 tonnes sent for recycling off-site in 2002.

The Nanticoke Generating Station also released more than one-third (33%) of the total amount of the following substances released in Ontario in 2002:

- cobalt and its compounds
- selenium and its compounds
- vanadium and its compounds





When compared to other facilities in Ontario, the Nanticoke Generating Station stands out as one of the largest sources of many chemicals. On-site releases from the Nanticoke station rank it in the top five NPRI facilities in Ontario for the following chemicals:

- #1 for 1,4-dioxane
- #1 for hydrochloric acid
- #1 for hydrogen fluoride
- #1 for vanadium and its compounds
- #2 for chromium and its compounds
- #2 for cobalt and its compounds
- #2 for selenium and its compounds
- #3 for HCFC-22 (spill of refrigerant)
- #3 for mercury and its compounds
- #3 for zinc and its compounds
- #4 for arsenic and its compounds
- #4 for copper and its compounds
- #4 for nickel and its compounds
- #4 for sulphuric acid
- #5 for lead and its compounds
- #5 for n-hexane

3. Air Emissions of Criteria Air Contaminants from the Nanticoke Generating Station — 2002

This year for the first time, facilities were required to report emissions of seven criteria air contaminants to the NPRI. This significant expansion of the NPRI gives a better picture of air pollution in Canada. Many criteria air contaminants are associated with smog, acid rain, haze and health effects including cardiac and respiratory disease. These seven criteria air contaminants are*:

Carbon Monoxide

Carbon monoxide (CO) is a colourless, odourless, poisonous gas formed during the incomplete combustion of carbon. CO contributes to the formation of ground-level ozone. The NPRI reporting threshold is 20 tonnes released to air.

*Source: Environment Canada. Supplementary Guide to Reporting Criteria Air Contaminants to the National Pollutant Release Inventory. 2002.

Oxides of Nitrogen (expressed as NO₂)

Fuel combustion and industrial processes produce NO_x. Oxides of nitrogen play an important role in the formation of ground-level ozone. NO_x can react with other air contaminants (e.g., ammonia) to form PM_{2.5} (see particulate matter below). NO_x is also a major component in the formation of acid rain. NPRI reporting threshold is 20 tonnes released to air.

Particulate Matter (TPM, PM₁₀, PM_{2.5})

Particulate matter consists of small airborne solid or liquid particles and can include acid aerosols, metal fumes, organic chemicals and pollen. Particulate matter in the atmosphere reduces visibility and forms haze. PM₁₀ and PM_{2.5} can be inhaled deep into the lung and can contribute to acute and chronic respiratory and cardiovascular illnesses. Particulate matter can be released directly into the atmosphere or formed as secondary air pollutants in the atmosphere from precursors such as sulphur dioxide and nitrogen dioxide.

The NPRI requires reporting for three size fractions of particulate matter: — total particulate matter with a diameter less than 100 microns (TPM); — inhalable particulate matter with a diameter less than or equal to 10 microns (PM₁₀); and — respirable particulate matter with a diameter less than or equal to 2.5 microns (PM_{2.5}). PM_{2.5} is the fraction of particulate matter recognized as having the greatest effect on human health.

Particulate matter is formed in various industrial and non-industrial processes. Some common sources of particulate matter include wood-burning fireplaces, separation processes, construction sites, mine tailings and the use of diesel in off-road equipment. NPRI reporting thresholds are 20 tonnes for TPM, 0.5 tonnes for PM₁₀ and 0.3 tonnes for PM_{2.5} emitted.

Sulphur Dioxide

Sulphur dioxide (SO₂) is a pollutant formed when sulphur is burned and emitted to the atmosphere. Fuels such as coal and oil, which contain sulphur, emit SO₂ when burned. SO₂ is also released during metal smelting and other industrial processes. Like NO_x, SO₂ is a precursor of the acid aerosols that

contribute to particulate matter in smog. It is also a precursor of acid rain. The NPRI reporting threshold is 20 tonnes emitted.

Volatile Organic Compounds (VOCs)

Volatile organic compounds (VOCs) are substances that can photochemically react in the atmosphere. In addition, VOCs are precursors to the formation of secondary particulate matter and ground-level ozone. There are many industrial and commercial sources of VOCs, such as loading and unloading of petroleum products, petroleum spills, process venting, spill remediation, flaring of untreated natural gas, evaporative losses from storage tanks, painting and stripping activities, degreasing activities, burning fuel (e.g., oil, wood, coal, and natural gas), solvents, wood preservatives and stored fuels. The NPRI uses the definition of VOCs as proposed under *CEPA* 1999. There are over 100 individual substances listed on the NPRI that fall under the definition of VOCs. Reporting threshold is 10 tonnes emitted.

The Nanticoke Generating Station stands out as one of the top sources of many criteria air contaminants. In 2002, the Nanticoke station emitted large amounts of criteria air contaminants (see Table 3):

- 86,710 tonnes of sulphur dioxide
- 38,203 tonnes of nitrogen oxides
- 6,566 tonnes of carbon monoxide
- 7,767 tonnes of total particulate matter consisting of
 - ◆ 5,154 tonnes of PM_{10} and
 - ◆ 2,224 tonnes of $PM_{2.5}$
- 312 tonnes of VOCs

The Nanticoke station's emissions are a significant source of criteria air contaminants in Ontario. This one facility, out of the more than 4,000 facilities reporting to the NPRI, accounts for a disproportionate amount of Ontario's emissions of criteria air contaminants. Of the total provincial emissions reported to the NPRI in 2002, the Nanticoke Generating Station is responsible for:

- 25% of Ontario's nitrogen oxides
- 15% of Ontario's sulphur dioxide
- 14% of Ontario's particulate matter less than 10 microns (PM_{10})

Particularly Harmful

- 13% of Ontario's total particulate matter
- 10% of Ontario's particulate matter less than 2.5 microns ($PM_{2.5}$) and
- 4% of Ontario's carbon monoxide

The significance of the Nanticoke Generating Station's emissions can also be seen when compared to other facilities in Ontario. For most criteria air contaminants, the Nanticoke station is a top polluter. In 2002 in Ontario, air emissions of the Nanticoke Generating Station ranked:

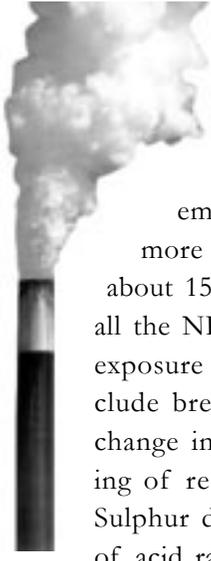
- #1 for total particulate matter
- #1 for particulate matter less than 10 microns (PM_{10})
- #1 for nitrogen oxides
- #2 for sulphur dioxide
- #2 for particulate matter less than 2.5 microns ($PM_{2.5}$)
- #5 for carbon monoxide

(On the NPRI website, one facility, Redpath Sugar, initially reported large amounts of criteria air contaminant emissions. However, according to the company, these emissions figures are in error and have been resubmitted to Environment Canada. These changes significantly reduce the provincial totals for nitrogen oxides, carbon monoxide and total particulates. This report uses the corrected values for Redpath Sugar.)

The Nanticoke Generating Station was the #1 emitter of nitrogen oxides of all NPRI facilities in Ontario in 2002. The station emitted 38,203 tonnes of nitrogen oxides, which was about 25% of the total reported in Ontario from all the NPRI facilities. Nitrogen oxides can combine with VOCs in the presence of sunlight to form ozone, one of the main components of smog.

The Ontario Medical Association (OMA) study, *Health Effects of Ground Level Ozone*, found ozone, together with acid particulates, may be playing a combined role in the worsening of asthma. Ozone in smog causes airway inflammation and higher levels increase the frequency of asthmatic attacks. The increased number of hospital emergency visits for asthma and acute admissions for respiratory illness are related to ground-





level ozone. Nitrogen oxides also contribute to acidification of lakes, soils and ecosystems.

The Nanticoke Generating Station also emits large amounts of sulphur dioxide: more than 86,000 tonnes in 2002. This was about 15% of the total reported in Ontario from all the NPRI facilities. Health effects caused by exposure to high levels of sulphur dioxide include breathing problems, respiratory illness, change in the defences of the lung and worsening of respiratory and cardiovascular disease. Sulphur dioxide is one of the main components of acid rain, can form tiny acid aerosols that enter lungs and can contribute to climate change (MOE, 2003).

The large emissions of particulates from the Nanticoke Generating Station are of concern. For the first time, the NPRI data identifies the station as the largest source of particulates in Ontario in 2002. The Nanticoke Generating Station is ranked #1 in Ontario in 2002 for total particulate matter, #1 for particulate matter less than 10 microns (PM_{10}) and #2 for particulate matter less than 25 microns ($PM_{2.5}$). This single source contributes from 10-14% of the emissions of these compounds in the entire province, as reported to the NPRI.

Particulates (less than or equal to 10 microns) have been classified as toxic under *CEPA* due to their human health effects. Numerous studies have linked particulate matter to aggravated cardiac and respiratory diseases, such as asthma, bronchitis and emphysema, and to various forms of heart disease. Children, the elderly and people with respiratory disorders such as asthma are particularly sensitive to health effects from particulate matter. Children's lungs can be sensitive to impacts from air pollution because their lungs are smaller, they breathe faster and their risks of negative effects can be proportionately greater than for adults (OMA, 1998).

Of greatest health concern is the smallest particulates, those less than 2.5 microns, which can be inhaled deep into the lungs where cells

replenish blood with oxygen. Particulates are an effective delivery mechanism for toxic air pollutants, allowing these toxic pollutants to penetrate deep into the lungs. The toxic contaminants can then be absorbed into the blood and tissue where they can cause irritation, inflammation and damage to the lungs and premature death. Scientists now believe that there is no "threshold" or safe level for exposure to particulate matter.

In 1998, the OMA declared air pollution in Ontario a "public health crisis". In one study reviewed in the OMA's report, *Health Effects of Ground Level Ozone*, elevated PM_{10} pollution was associated with: increased respiratory hospital admissions and increased mortality, especially respiratory and cardiovascular mortality. School absences in grades one to six were significantly associated with PM_{10} levels. The response was greater in those in grades one to three (six to nine years old) than in the older children.

An association between inhalable particulates and increased mortality is found in metropolitan areas in North America, including Toronto and Detroit. The Ontario Smog Plan Workgroup has estimated that in Ontario, approximately 1,800 premature mortalities and 1,400 hospital admissions per year are due to the effects of inhalable particles (OMA, 1998).

Recent studies have found that long-term exposure to fine particulates was likely to cause death from cardiovascular disease. For each unit rise in particulates, the risk of death from cardiovascular disease plus diabetes rose by 12% (Reuters, 2003). The emissions from the Nanticoke Generating Station are high in particulates, including total particulates, PM_{10} and $PM_{2.5}$ as well as acid gases such as sulphuric acid. This combination of high particulate and high acid aerosol levels has been associated with numerous health effects, including premature mortality. In addition, a number of other toxic contaminants are emitted from the Nanticoke station, including mercury and its compounds and lead and its compounds, which may combine with particulates to enter the deep lung tissue. These high emissions from the Nanticoke Generating Station should be of concern to Ontarians.

4. Time Trends in Releases and Transfers from the Nanticoke Generating Station from 1994-2002

The Nanticoke Generating Station has reported to the NPRI since 1994. Over the years, some of the estimation methods have changed, which may have changed reported releases and transfers. For example, the NPRI has added chemicals, lowered the reporting thresholds of many chemicals and improved guidance on submitting emissions data.

To look at trends over time, a common core set of chemicals must be used. For the Nanticoke Generating Station, a common core set of nine chemicals has been reported under the same NPRI reporting thresholds from 1995 to 2002. These chemicals are ammonia, cobalt and its compounds, copper and its compounds, hydrochloric acid, hydrogen fluoride, nickel and its compounds, manganese and its compounds, sulphuric acid and zinc and its compounds. For other chemicals reported by the Nanticoke Generating Station, some have changed reporting thresholds and others have only been reported in more recent years.

Looking at the eight-year time trends for this core set of chemicals, total on-site releases from the Nanticoke Generating Station have increased by 245% from 1995 to 2002. Most of this increase has been in amounts of chemicals released into the air, mainly hydrochloric acid. From 1995 to 2002, air releases from the Nanticoke Generating Station of this common set of core chemicals have increased by 248%.

In the most recent five-year period from 1998 to 2002, on-site releases of this core set of chemicals has increased by 53%, from 5,043 tonnes to 7,723 tonnes. Again most of this increase is a result of increased amounts of chemicals released to the air, mainly hydrochloric acid. From 1998 to 2002, air releases from the Nanticoke Generating Station of this common core set of chemicals increased by 54%.

The trends over time for total and air releases of individual chemicals from the Nanticoke Generating Station show a mixed pattern, with some chemicals increasing, some not changing and some chemicals decreasing. (To see the 2002 preliminary data of releases and transfers of chemicals from the Nanticoke Generating Station from 1994-2002 as reported to NPRI, please visit our website at www.cleanair.web.ca/resource/table4.pdf.)

Ontario Power Generation notes in their comments to the NPRI in 2002 that estimates of some substances sent to landfill on-site have changed (both decreased and increased) due to changes in concentration from ash analysis.

Some notable increases have also occurred in mercury (a persistent bioaccumulative compound), acid gases and some metals that are not part of the common core of chemicals.

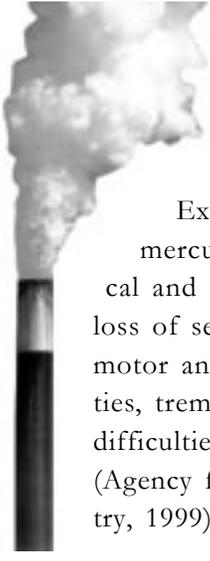
Mercury and its compounds (*CEPA toxic*)

In 2002, the total releases of mercury and its compounds (520 kilograms) were the highest ever reported from the Nanticoke Generating Station. This is a 21% increase from the total releases of mercury in 2000 (428 kilograms). Ontario Power Generation comments that this increase is due to changes in estimation methods. Part of this increase is due to a 5% increase in mercury emissions to the air. However, the majority of the overall increase is due to an increase in mercury sent to landfill on-site, which increased from 198 kilograms in 2000 to 278 kilograms in 2002.

This increase in mercury total and air releases meant that the Nanticoke Generating Station:

- ranked #1 for air releases of mercury in Ontario in 2002;
- ranked #3 for total releases of mercury in Ontario in 2002; and
- was responsible for 16% of total releases of mercury in Ontario in 2002.





Mercury is a developmental toxicant and suspected endocrine disruptor, liver and kidney toxicant and reproductive toxicant. Mercury can pose a threat to human health and wildlife.

Exposure to higher concentrations of mercury has been associated with neurological and developmental damage, including the loss of sensory and cognitive ability, delayed motor and mental development, learning disabilities, tremors, behavioural changes, reproductive difficulties, birth defects and kidney disease (Agency for Toxic Chemicals and Disease Registry, 1999).

12

Mercury, like many metals, can be present in many different forms and can combine with other compounds. Most mercury released into the atmosphere is inorganic mercury. This inorganic mercury can be transformed by soil and water organisms into the more toxic forms of methyl mercury. Methyl mercury can cross the placenta barrier and can affect fetal brain and nervous systems. Harmful effects of mercury that can be passed from the mother to the fetus include brain damage, mental retardation, lack of coordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems with their nervous and digestive systems and kidney damage (Agency for Toxic Chemicals and Disease Registry, 1999).

As mercury bioaccumulates, 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. Because mercury and its compounds are slow to break down, large releases of mercury every year may have a cumulative effect in the environment.

Acid gases

Hydrochloric acid

A number of different substances that have the potential to become acid gases and particulates are reported to the NPRI. These acid gases,

including hydrogen chloride, sulphuric acid, nitric acid and hydrogen fluoride, can be damaging to our health and the environment. These gases can be irritating to the lungs and respiratory systems and play a role in smog formation. They can also cause acid rain, resulting in damage to lakes, rivers, forests and buildings.

Total releases of hydrochloric acid from the Nanticoke Generating Station have increased by 230% from 1995 to 2002. All of this increase has been the result of increasing emissions to air, from 2,042 tonnes in 1995 to 6,749 tonnes in 2002. These hydrochloric air emissions are so large that the Nanticoke station continues to rank #1 in Ontario for hydrochloric acid emissions in 2002 and its emissions represent 65% of the total emissions of hydrochloric acid in Ontario in 2002.

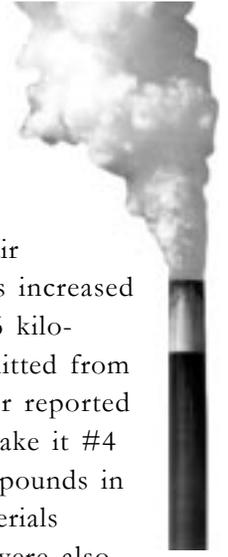
Hydrogen fluoride (CEPA toxic)

Hydrogen fluoride is considered toxic under *CEPA*. It is highly soluble in water and can damage aquatic and terrestrial plants and ecosystems. Skeletal damage (fractures, weakness, crippling) to cattle and other wildlife have been associated with exposure to high levels of hydrogen fluoride.

Total releases of hydrogen fluoride have increased by 324% from 1995 to 2002. All of this increase has been the result of increasing emissions to the air, from 100 tonnes in 1995 to 428 tonnes in 2002. The Nanticoke Generating Station remains the #1 source for air and total releases of hydrogen fluoride in Ontario in 2002. The station accounts for 67% of the total releases in Ontario in 2002.

Dioxins and furans (CEPA toxic/ carcinogen)

Dioxins and furans are a group of chemicals in which 17 members of the group are considered highly toxic. Polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) are considered persistent and bioaccumulative and are classified as toxic under *CEPA*. The Government of Canada has a goal of virtual elimination of releases of PCDD and PCDF to the environment. Dioxins and furans are also targeted for global reduction through the UN-ECE Persistent Organic



Protocol. One member of the group, 2,3,7,8-TCDD is considered a carcinogen and the most toxic of all group members. However, other members of the group may also be carcinogenic. Dioxins and furans are also associated with endocrine disruption, immune system suppression and developmental toxicity, cardiovascular diseases and diabetes.

The total releases of dioxins and furans from the Nanticoke Generating Station have increased by 117% from 2000 to 2002. Ontario Power Generation comments that this increase is due to the increased concentration in the ash analysis. Most of the overall increase is due to the increase in landfill from 0.05 grams of toxicity equivalent (g TEQ) in 2000 to 0.12 g TEQ in 2002. Transfers of materials sent off-site for recycling also contain dioxins and furans — 0.09 g TEQ in 2002. This has also increased 350% from 2000 when 0.02 g TEQ were sent off-site for recycling.

Polycyclic aromatic hydrocarbons (PAHs)

Some PAHs are carcinogens and *CEPA* toxic. From 2000 to 2002, total releases of most PAHs from the Nanticoke Generating Station decreased.

Metals

Arsenic and its compounds (CEPA toxic/carcinogen)

Arsenic and its compounds are considered *CEPA* toxic and carcinogenic. Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels and a sensation of “pins and needles” in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small “corns” or “warts” on the palms, soles, and torso. Several studies have shown that inorganic arsenic can increase the risk of lung, skin, bladder, liver, kidney and prostate cancer (Agency for Toxic Chemicals and Disease Registry, 2003).

The NPRI reporting threshold for arsenic and its compounds was lowered in 2002. This may have changed the reporting for arsenic in 2002.

For the Nanticoke Generating Station, air emissions of arsenic and its compounds increased by 1,393% from 1996 to 2002. The 896 kilograms of arsenic and its compounds emitted from the station in 2002 was the highest ever reported by the plant and was high enough to make it #4 for air emissions of arsenic and its compounds in Ontario in 2002. Large amounts of materials containing arsenic and its compounds were also landfilled on site (9,007 kilograms) or sent off-site for recycling (6,273 kilograms).

Chromium and its compounds

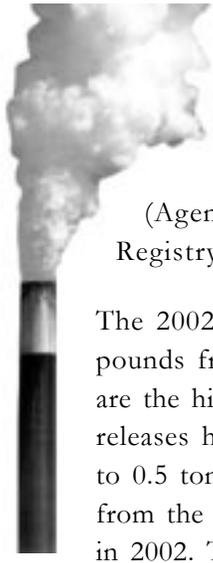
Chromium occurs in the environment primarily as trivalent chromium (Cr III) and hexavalent chromium (Cr VI). Chromium III is much less toxic than chromium (VI). However, the respiratory tract is also the major target organ for chromium (III) toxicity, similar to chromium (VI) (EPA, 2003).

The most toxic form of chromium, hexavalent chromium, was reported separately from chromium and its compounds in 2002. The reporting threshold for chromium and its compounds was also lowered in 2002. These reporting changes may have affected reporting for this compound in 2002.

From 1995 to 2002, air releases of chromium and its compounds from the Nanticoke Generating Station increased by 88%. However in recent years, air releases of chromium and its compounds have decreased from a high of 1.69 tonnes in 2000 to the current 0.92 tonnes in 2002. The Nanticoke station ranked #5 in Ontario for air releases of chromium in 2002 and accounts for 10% of the total releases of chromium and its compounds in Ontario.

Cobalt and its compounds

Exposure to high levels of cobalt can result in lung and heart effects and dermatitis. Liver and kidney effects have also been observed in animals ex-



posed to high levels of cobalt. The International Agency for Research on Cancer has determined that cobalt and its compounds are possibly carcinogenic to humans (Group 2B) (Agency for Toxic Chemicals and Disease Registry, 2001).

The 2002 air releases of cobalt and its compounds from the Nanticoke Generating Station are the highest ever reported to the NPRI. Air releases have increased from 0.05 tonnes in 1996 to 0.5 tonnes in 2002. These air releases of cobalt from the Nanticoke station ranked #3 in Ontario in 2002. The total releases of cobalt and its compounds in 2002 (14.42 tonnes) accounts for almost 40% of Ontario's total releases.

Copper and its compounds

Copper is essential for good health, but high amounts can be harmful. Long-term exposure to copper dust can irritate your nose, mouth, and eyes and cause headaches, dizziness, nausea, and diarrhea (Agency for Toxic Substances and Disease Registry, 2002).

The Nanticoke Generating Station's total releases of copper and its compounds increased steadily from 1995 to a peak in 2000 and then decreased from 2000-2002. Total releases of copper and its compounds remain at 45 tonnes, about double the 1995 releases of 23 tonnes, but lower than the peak in 2000 of 90 tonnes.

Lead and its compounds (CEPA toxic)

Lead is a developmental and reproductive toxicant and considered a carcinogen on California's Proposition 65 list (Scorecard, 2003). Lead is considered toxic under *CEPA*. Lead can affect almost every organ and system in the body. The most sensitive is the central nervous system, particularly in children. Lead also damages kidneys and the reproductive system. The effects are the same whether lead is breathed in or swallowed.

At high levels, lead may decrease reaction time, cause weakness in fingers, wrists or ankles and possibly affect the memory. Lead may cause

anemia, a disorder of the blood. It can also damage the male reproductive system. Lead is particularly hazardous to young children and the developing fetus. The reproductive and developmental effects associated with lead include premature births, smaller babies, decreased mental ability in infants, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead (Agency for Toxic Substances and Disease Registry, 1999).

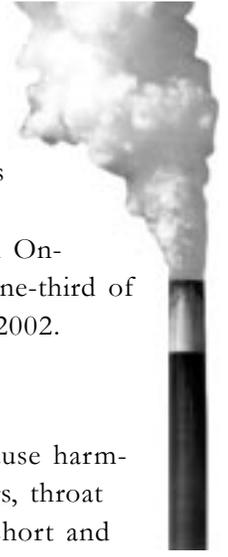
In the NPRI's 2002 reporting, the threshold for lead and its compounds was also lowered from 10 tonnes to 50 kilograms. This reporting change may affect reporting for this compound in 2002.

In 2002, air releases of lead and its compounds were the highest ever recorded from the Nanticoke Generating Station. Air releases of lead and its compounds were 0.08 tonnes in 1996 and have increased almost tenfold to 0.78 tonnes in 2002. Total releases of lead and its compounds have a similar pattern to copper, with steady increases from 1996 peaking in 2000 and a decrease from 2000 to 2002. The Nanticoke station ranked #5 for total releases of lead and its compounds and #12 for air releases of lead and its compounds in Ontario in 2002.

Manganese and its compounds

Exposure to high levels of airborne manganese can affect motor skills such as holding one's hand steady, performing fast hand movements and maintaining balance. Exposure to high levels of the metal may also cause respiratory problems and sexual dysfunction (Agency for Toxic Substances and Disease Registry, 2001).

Air emissions of manganese and its compounds from the Nanticoke Generating Station in 2002 (0.83 tonnes) are the highest ever reported, a 361% increase from 1995. Total releases of manganese and its compounds showed a similar pattern to lead, with steady increases from 1995 peaking in 2000 and decreasing to 2002. Total releases in 2002 remain at 82 tonnes, however, more than double the 1995 release of 36 tonnes. Total releases of manganese from the Nanticoke station ranked it #6 in Ontario in 2002.



Nickel and its compounds (CEPA toxic/carcinogen)

Nickel and its compounds are considered carcinogenic, with human and animal studies reporting an increased risk of lung and nasal cancers from exposure to nickel refinery dusts and nickel subsulphide (EPA, 2003). Nickel and its compounds are also considered toxic under *CEPA* and a developmental toxicant in California Proposition 65 (Scorecard, 2003).

Dermatitis is the most common effect in humans from chronic skin exposure to nickel with symptoms of eczema (rash, itching) of the fingers, hands, wrists and forearms. Chronic inhalation exposure to nickel in humans also results in respiratory effects, including a type of asthma specific to nickel, decreased lung function and bronchitis.

Air releases of nickel and its compounds from the Nanticoke Generating Station increased 445% from 1995 to 2002 (from 0.2 tonnes to 1.09 tonnes). Total releases of nickel and its compounds showed a similar pattern to lead and manganese, with steady increases from 1995, peaking in 2000 and then decreasing in 2002. Total releases of nickel and its compounds from the Nanticoke Generating Station ranked it #4 in Ontario and accounted for 10% of the total releases in Ontario in 2002. Air releases ranked it #8 in Ontario in this category in 2002.

Selenium and its compounds

Short-term exposure to elemental selenium, hydrogen selenide and selenium dioxide by inhalation has respiratory effects, such as irritation of the mucous membranes, pulmonary edema, severe bronchitis and bronchial pneumonia. People exposed to high levels of selenium in food and water over the long term have reported discolouration of the skin, pathological deformation and loss of nails, loss of hair, excessive tooth decay and discolouration, lack of mental alertness and listlessness (EPA, 2003).

The 2002 air emissions of selenium and its compounds from the Nanticoke Generating Station were the highest ever reported, at about 12 tonnes.

Particularly Harmful

Total releases of selenium have increased from 9.4 tonnes in 1998 and peaked at 19.7 tonnes in 2001, subsequently declining to about 17 tonnes in 2002. Total releases of selenium and its compounds from the Nanticoke station ranked it #2 for total and air releases in Ontario. The station accounted for about one-third of Ontario's total releases of selenium in 2002.

Vanadium and its compounds

Inhaling high levels of vanadium can cause harmful health problems that affects the lungs, throat and eyes. Workers who breathed it for short and long periods sometimes had lung irritation, coughing, wheezing, chest pain, runny nose and a sore throat. These effects stopped soon after they stopped breathing the contaminated air (Agency for Toxic Substances and Disease Registry, 1995).

Vanadium was first reported by the Nanticoke Generating Station in 2001. The total releases of vanadium from the station account for 43% of Ontario's total release and ranked it #1 for total releases of vanadium in Ontario and #5 for air releases in 2002.

Zinc and its compounds

Zinc and its compounds are essential nutrients, but large amounts can be damaging to human health. Breathing large amounts of zinc (as dust or fumes) can cause a specific short-term disease called metal fume fever. The long-term effects of breathing high levels of zinc are not known (Agency for Toxic Substances and Disease Registry, 1995).

The Nanticoke Generating Station's total releases of zinc and its compounds in 2002 of 84 tonnes are the highest ever reported to the NPRI. Total releases have increased 377% from 1995-2002. These total releases of zinc and its compounds from the Nanticoke Generating Station rank it #3 in Ontario in 2002. Air releases of about 3 tonnes of zinc and its compounds have increased over tenfold from 1995, but represent a decrease from a peak of about 5 tonnes in 1999. Air releases of zinc and its compounds ranked the Nanticoke station #14 in Ontario in 2002.

Table 1: Releases and Transfers of Chemicals in 2002 from Nanticoke Generating Station – Ontario Power Generation as reported to NPRI - preliminary data

CAS #	Substance Name	Total	On-Site Releases			Transfers for Disposal	Transfers for Recycling	Units	Carcinogen	CEPA toxic
			Air	Water	Land					
123-91-1	1,4-Dioxane	6.06	0	0	6.06	0	4.22	tonnes		
194-59-2	7H-Dibenzo(c,g) carbazole	0	0	0	0	0	0	kg		Y
NA - 16	Ammonia (Total)	0.88	0.80	0.08	0	0	0	tonnes		
NA - 02	Arsenic (and its compounds)	9914	896	11	9007	0	6273	kg	1	Y
56-55-3	Benzo(a) anthracene	0	0	0	0	0	0	kg	2A	Y
218-01-9	Benzo(a) phenanthrene	0	0	0	0	0	0	kg		Y
50-32-8	Benzo(a)pyrene	0	0	0	0	0	0	kg	2A	Y
205-99-2	Benzo(b) fluoranthene	0	0	0	0	0	0	kg		Y
192-97-2	Benzo(e)pyrene	0	0	0	0	0	0	kg		Y
191-24-2	Benzo(g,h,i) perylene	0	0	0	0	0	0	kg		Y
205-82-3	Benzo(j) fluoranthene	0	0	0	0	0	0	kg		Y
207-08-9	Benzo(k) fluoranthene	0	0	0	0	0	0	kg		Y
NA - 04	Chromium (and its compounds)	64.83	0.92	0.04	63.87	0	44.48	tonnes		
NA - 05	Cobalt (and its compounds)	14.42	0.5	0	13.92	0	9.7	tonnes		
NA - 06	Copper (and its compounds)	45.07	1.34	7.3	36.44	0	25.38	tonnes		
224-42-0	Dibenz(a,j) acridine	0	0	0	0	0	0	kg		Y
53-70-3	Dibenzo(a,h) anthracene	0	0	0	0	0	0	kg	2A	Y
189-55-9	Dibenzo(a,i) pyrene	0	0	0	0	0	0	kg		Y
NA - D/F	Dioxins and furans	0.13	0	0	0.12	0	0.09	g TEQ	1*	Y
206-44-0	Fluoranthene	1	0	0	1	0	1	kg		Y
75-45-6	HCFC-22	0.81	0.81	0	0	0	0	tonnes		Y
118-74-1	Hexachloro benzene	0	0	0	0	0	0	grams		Y
7647-01-0	Hydrochloric acid	6749.14	6749.14	0	0	0	0	tonnes		
7664-39-3	Hydrogen fluoride	425.85	425.85	0	0	0	0	tonnes		Y
193-39-5	Indeno(1,2,3-CD) pyrene	0	0	0	0	0	0	kg		Y
NA - 08	Lead (and its compounds)	22896	778	10	22108	0	15397	kg		Y
NA - 09	Manganese (and its compounds)	81.63	0.83	0.14	80.65	0	56.17	tonnes		

continued on next page

continued from previous page

CAS #	Substance Name	Total	On-Site Releases			Transfers for Disposal	Transfers for Recycling	Units	Carcinogen	CEPA toxic
			Air	Water	Land					
NA - 10	Mercury (and its compounds)	519.72	241	0.72	278	0	194	kg		Y
110-54-3	n-Hexane	24.56	0	0	24.56	0	17.11	tonnes		
NA - 11	Nickel (and its compounds)	31.44	1.09	0.05	30.3	0	21.1	tonnes	1	Y
198-55-0	Perylene	0	0	0	0	0	0	kg		Y
85-01-8	Phenanthrene	8	4	0	4	0	3	kg		Y
129-00-0	Pyrene	2	0	0	2	0	1	kg		Y
NA - 12	Selenium (and its compounds)	16.95	12.44	0.01	4.5	0	3.14	tonnes		
7664-93-9	Sulphuric acid	290.27	290.27	0	0	0	0	tonnes		
7440-62-2	Vanadium (except when in an alloy) and its compounds	130.85	1.78	0.1	128.96	0	89.82	tonnes		
NA - 14	Zinc (and its compounds)	83.91	3.38	2.73	77.79	0	54.18	tonnes		
TOTAL		8000.01	7491.07	10.47	498.45	0.00	347.17	tonnes		

CEPA toxic = toxic under the Canadian Environmental Protection Act

Carcinogen = as classified by the International Agency for Research on Cancer

Group 1= is a carcinogen to humans

Group 2A= is a probable carcinogen to humans

*= classification applies to 2,3,7,8 TCDD

Table 2: Total on-site releases and air releases in 2002 from Nanticoke Generation Station in relation to the Province of Ontario as reported to NPRI (preliminary data) Dec-03

CAS #	Substance Name	Ontario Releases	Nanticoke Releases	Nanticoke Air Releases	Nanticoke Releases Ranking	Nanticoke Air Releases Ranking	% of Ontario Releases	Units
123-91-1	1,4-Dioxane	6.45	6.06	0	#1	NA	94%	tonnes
194-59-2	7H-Dibenzo(c,g) carbazole	5.48	0	0	NA	NA	NA	kg
NA - 16	Ammonia (Total)	28,943.14	0.88	0.80	>#50	>#35	0%	tonnes
NA - 02	Arsenic (and its compounds)	142,852.03	9,914	896	#4	#4	7%	kg
56-55-3	Benzo(a) anthracene		0	0	NA	NA	NA	kg
218-01-9	Benzo(a) phenanthrene		0	0	NA	NA	NA	kg
50-32-8	Benzo(a)pyrene		0	0	NA	NA	NA	kg
205-99-2	Benzo(b) fluoranthene		0	0	NA	NA	NA	kg
192-97-2	Benzo(e)pyrene		0	0	NA	NA	NA	kg
191-24-2	Benzo(g,h,i) perylene		0	0	NA	NA	NA	kg
205-82-3	Benzo(j) fluoranthene		0	0	NA	NA	NA	kg
207-08-9	Benzo(k) fluoranthene		0	0	NA	NA	NA	kg
NA - 04	Chromium (and its compounds)	673.24	64.83	0.92	#2	#5	10%	tonnes
NA - 05	Cobalt (and its compounds)	37.15	14.42	0.5	#2	#3	39%	tonnes
NA - 06	Copper (and its compounds)	570.91	45.07	1.34	#4	#8	8%	tonnes
224-42-0	Dibenz(a,j) acridine		0	0	NA	NA	NA	kg
53-70-3	Dibenzo(a,h) anthracene		0	0	NA	NA	NA	kg
189-55-9	Dibenzo(a,i) pyrene		0	0	NA	NA	NA	kg
NA - D/F	Dioxins and furans	47.17	0.13	0	#23	>#50	0%	g TEQ
206-44-0	Fluoranthene	6372.07	1	0	>#20	NA	0%	kg
75-45-6	HCFC-22	17.27	0.81	0.81	#3*	#3*	5%	tonnes
118-74-1	Hexachloro benzene		0	0	NA	NA	NA	grams
7647-01-0	Hydrochloric acid	10,343.96	6,749.14	6,749.14	#1	#1	65%	tonnes
7664-39-3	Hydrogen fluoride	637.02	425.85	425.85	#1	#1	67%	tonnes
193-39-5	Indeno(1,2,3-CD) pyrene		0	0	NA	NA	NA	kg
NA - 08	Lead (and its compounds)	1,440,911.56	22,896.00	778	#5	#12	2%	kg
NA - 09	Manganese (and its compounds)	2,435.55	81.63	0.83	#6		3%	tonnes
NA - 10	Mercury (and its compounds)	3,193.65	519.72	241.00	#3	#1	16%	kg
110-54-3	n-Hexane	1,625.52	24.56	0	#5	NA	2%	tonnes
NA - 11	Nickel (and its compounds)	319.7	31.44	1.09	#4	#8	10%	tonnes
198-55-0	Perylene		0	0	NA	NA	NA	kg
85-01-8	Phenanthrene	12,522.37	8	4	>#25	>#15	0%	kg
129-00-0	Pyrene	5,481.71	2	0	>#20	NA	0%	kg
NA - 12	Selenium (and its compounds)	50.19	16.95	12.44	#2	#2	34%	tonnes
7664-93-9	Sulphuric acid	6,121.61	290.27	290.27	#4	#4	5%	tonnes
7440-62-2	Vanadium (except when in an alloy) and its compounds	302.5	130.85	1.78	#1	#5	43%	tonnes
NA - 14	Zinc (and its compounds)	3978.97	83.91	3.38	#3	#14	2%	tonnes
TOTAL			8000.01	7491.07				tonnes

* HCFC22= is reported as a spill of refrigerant

**Table 3: Air Emissions of Criteria Air Contaminants from
Nanticoke Generating Station in 2002 as reported to NPRI (preliminary data)**

	Criteria Air Contaminants – tonnes						
	CO	NO _x *	PM	PM ₁₀	PM _{2.5}	SO ₂	VOC
Nanticoke Generating Station	6,566	38,203	7,767	5,154	2,224	86,710	312
Province of Ontario Total	152,914	155,351	61,783	36,773	22,703	563,119	126,664
Nanticoke as % of Ontario Total	4%	25%	13%	14%	10%	15%	0%
OPG Nanticoke as # in Ontario	#5	#1	#1	#1	#2	#2	>#25

*= oxides of nitrogen expressed as NO₂

To see the 2002 preliminary data of releases and transfers of chemicals from the Nanticoke Generating Station from 1994-2002 as reported to NPRI, please visit our website at www.cleanair.web.ca/resource/table4.pdf.



REFERENCES

- Agency for Toxic Chemicals and Disease Registry. Tox FAQs for Arsenic. 2003.
<http://www.atsdr.cdc.gov/tfacts2.html>
- Agency for Toxic Chemicals and Disease Registry. Tox FAQs for Cobalt. 2001.
<http://www.atsdr.cdc.gov/tfacts33.html>
- Agency for Toxic Chemicals and Disease Registry. Tox FAQs for Copper. 2002.
<http://www.atsdr.cdc.gov/tfacts132.html>
- Agency for Toxic Chemicals and Disease Registry. Tox FAQs for Lead. 1999.
<http://www.atsdr.cdc.gov/tfacts13.html>
- Agency for Toxic Chemicals and Disease Registry. Tox FAQs for Manganese. 2001.
<http://atsdr1.atsdr.cdc.gov/tfacts151.html>
- Agency for Toxic Chemicals and Disease Registry. Tox FAQs for Mercury. 1999. Available from www.atsdr.cdc.gov/tfacts46.html
- Agency for Toxic Chemicals and Disease Registry. Tox FAQs for Vanadium. 1995.
<http://www.atsdr.cdc.gov/tfacts58.html>
- Agency for Toxic Chemicals and Disease Registry. Tox FAQs for Zinc. 1995.
<http://www.atsdr.cdc.gov/tfacts60.html>
- Environment Canada. Supplementary Guide to Reporting Criteria Air Contaminants to the National Pollutant Release Inventory. 2002. Available from www.ec.gc.ca/pdb/npri
- Environmental Protection Agency. Hazard Summary. Chromium Compounds. Air Toxics website. 2003. Available at <http://www.epa.gov/ttnatw01/hlthef/chromium.html>
- Environmental Protection Agency. Hazard Summary. Nickel Compounds. Air Toxics website . 2003. Available at <http://www.epa.gov/ttnatw01/hlthef/nickel.html>
- Environmental Protection Agency. Hazard Summary. Selenium Compounds. Air Toxics Website. 2003. available at <http://www.epa.gov/ttnatw01/hlthef/selenium.html>
- Ministry of the Environment. Air Quality in Ontario. 2000 Report. 2003.
- New Jersey Department of Human Health and Senior Services: Hazardous Substance Fact sheet. 1,4- Dioxane. March 2002.
- New Jersey Department of Human Health and Senior Services: Hazardous Substance Fact sheet. Hydrogen Chloride. June 2001.
- New Jersey Department of Human Health and Senior Services: Hazardous Substance Fact sheet. Hydrogen Fluoride. May 1998.
- Ontario Clean Air Alliance. Up the Stack: Coal-Fired Electricity's Toxic Impact. June 2002. Available at www.cleanairalliance.org
- Ontario Medical Association. Health Effects of Ground Level Ozone. May 1998. Available at www.oma.org/phealth/smogmain.htm
- Ontario Power Generation. Towards Sustainable Development 2002 Progress Report. Available at www.opg.ca/
- Reuters. Air pollution even worse for heart than lungs. Monday December 15, 2003, citing the American Heart Association Journal, Circulation, December 16 rapid access issue, 2003



Ontario Clean Air Alliance Member List

MUNICIPALITIES

Guelph
Kitchener
Markham
Peterborough
Regional Municipality of Durham
Hamilton
Regional Municipality of Peel
Regional Municipality of Waterloo
Stratford
Toronto
Windsor

COMPANIES

AIM PowerGen Corporation
Breathe Smog Masks Inc.
Enwave District Energy Limited
Hydro 2000
Mississippi River Power Corporation
Oshawa Power and Utilities Corporation
Peterborough Utilities Services
Sudbury Hydro
Toronto Hydro
Torrie Smith Associates
Veridian Corporation
Vertebrae Technologies Inc.
Wellington Electric Distribution Company
Whitby Hydro Energy Services Corp.

ORGANIZATIONS & ASSOCIATIONS

Algoma Manitoulin Environmental Awareness
Algoma Manitoulin Nuclear Awareness
Allergy/Asthma Information Association
Association of Local Public Health Agencies
Canadian Association of Physicians for the Environment
Canadian Institute for Environmental Law and Policy
Canadian Institute of Child Health
Cashmere Avenue Public School EnviroClub
CAW Canada*
CAW Durham Regional Environment Council
CAW Windsor Regional Environment Council
Canadian Unitarians For Social Justice, South Peel Chapter
Citizens Advisory Committee on Air Quality - Waterloo
Citizens Advocating Renewable Energy
Citizens Environmental Alliance of Southwestern Ontario**
Citizens Network on Waste Management
Community Action Parkdale East

Community Environmental Alliance
Conservation Council of Ontario
Conserv Society of Hamilton and District, Hamilton Chapter
Consumers Association of Canada (Ontario)
EarthDay Canada
Earth Works
Echo Lake Association
Energy Action Council of Toronto (EnerACT)**
Energy Probe
Evergreen Foundation
Environmental Defence Canada
Environment North
Federation of Ontario Cottagers' Associations
For A Safe Environment
GASP (Good Air, Safe Power)
Grassroots Woodstock
Green Channel
Greenest City
Hearthmakers Energy Cooperative
Kingston Environmental Action Project
Lakeshore Area Multi-Services Project Inc.
Learning Disabilities Association of Ontario
Metro Toronto Pesticide Action League
North Toronto Green Community
Ontario College of Family Physicians
Ontario English Catholic Teachers' Association
Ontario Forestry Association
Ontario Lung Association
Ontario Public Health Association
Ontario Public Interest Research Group
McMaster University
Ontario Public Interest Research Group
Guelph University
Ontario Public Interest Research Group
University of Toronto
Ontario Public Interest Research Group
Queen's University
Ontario Society for Environmental Education
Pesticide Action Group/Waterloo
Pollution Probe
South Riverdale Community Health Centre
Thames Region Ecological Association
The United Church of Canada
Wastewise
Wildlands League
Youth Challenge International

* CAW Canada is opposed to the privatization of Hydro One and Ontario Power Generation

** Citizen's Environmental Alliance of Southwestern Ontario and EnerACT support a full phase-out of nuclear energy



Ontario Clean Air Alliance

625 Church Street, Suite 402

Toronto M4Y 2G1

Tel: (416) 926-1907 ext. 245

Fax: (416) 926-1601

E-mail: info@cleanairalliance.org

Web Site: www.cleanairalliance.org