The Ontario Clean Air Alliance

Electricity Competition and Clean Air

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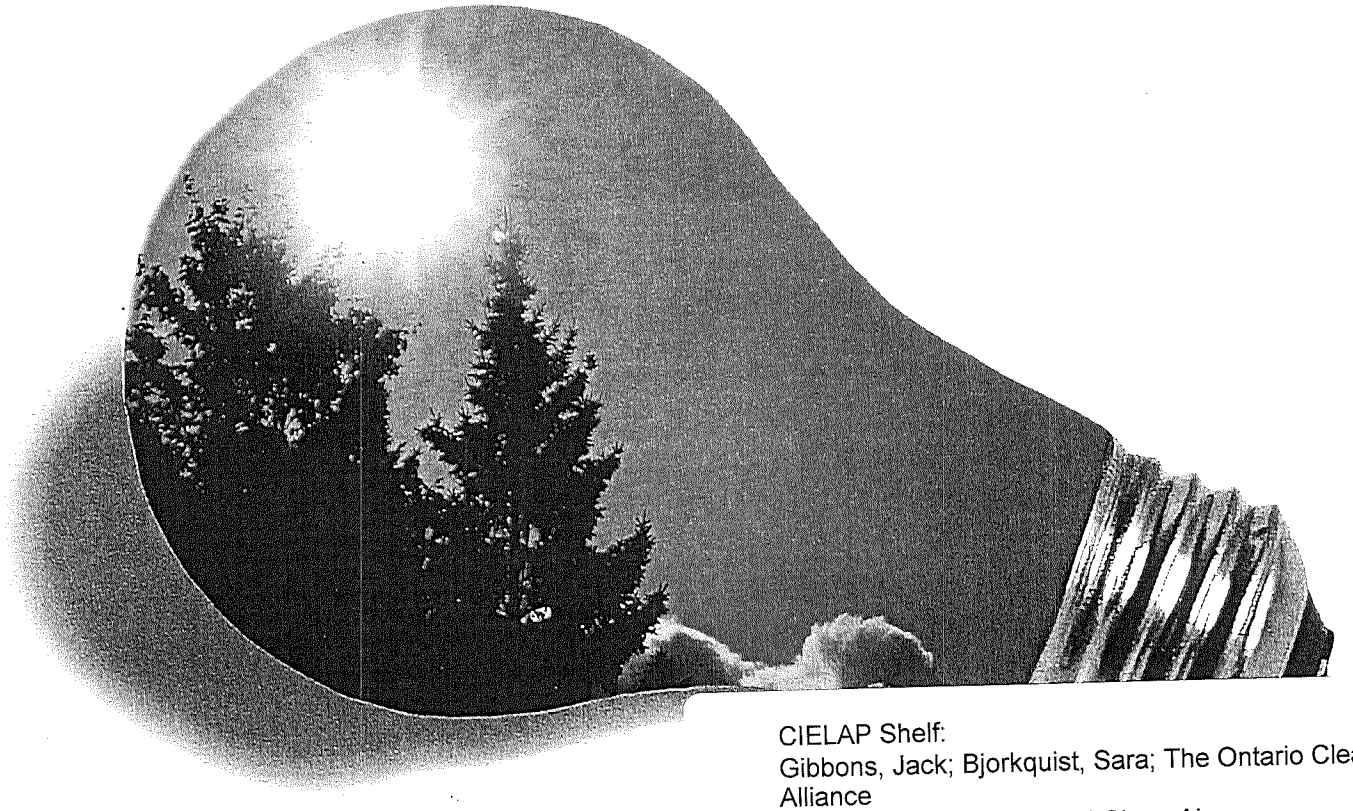

Sponsors: Toronto Atmospheric Fund, George Cedric Metcalf Charitable Foundation, Pollution Probe

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About the Ontario Clean Air Alliance

The Ontario Clean Air Alliance (OCAA) is a coalition of health, environmental and consumer organizations, corporations, associations, and individuals concerned that, without new environmental regulations, electricity competition will lead to an increase in air pollution. Formed in August 1997, the Alliance has 45 member organizations which represent over 3 million Ontarians. The main objectives of the Alliance are to educate the public about the potential health and environmental effects of electricity competition and to show people that there is a solution to this problem: With appropriate environmental regulations, electricity competition can lead to improved air quality.

For more information about the OCAA, or for additional copies of this report, please contact Jack Gibbons or Sara Bjorkquist at (tel.) 416-923-3529, 517 College Street, Suite 400, Toronto, Ontario, M6G 4A2 or visit our web site at http://www.web.net/~ocaa.

TABLE OF CONTENTS

INTRODUCTION

Ontario Hydro, which has generated virtually all of the province's electricity for most of this century, is on the brink of losing its monopoly. According to a plan released by the Government of Ontario in November 1997, a competitive market for the generation and sale of electricity in Ontario will be established by the year 2000.[1]

A competitive electricity market will increase customer choice and, according to many government and industry representatives, may lower electricity prices. The introduction of electricity competition also presents an opportunity for reducing air pollution. If the Government of Ontario implements effective new air quality standards prior to the introduction of competition, air pollution will decrease when competition begins. However, if the Government is not willing to introduce new environmental regulations, the economic benefits of competition could come at a major cost to society -- the cost of human health and the environment.

The introduction of electricity competition presents an opportunity for reducing air pollution.

This paper discusses the impact that a competitive electricity market could have on health and the environment if the Government does not adopt new environmental regulations. The first section provides a general overview of the health and environmental effects of electricity-related air pollution, and the current national and provincial air quality objectives aimed at reducing these effects. The second section explains the government's rationale for moving to a competitive electricity market and details why this move could lead to a significant increase in air pollution. The second section also presents a strategy to improve air quality standards which would enable Ontario to simultaneously achieve the economic benefits of competition *and* reduce air pollution.

SECTION 1: THE HUMAN HEALTH AND ENVIRONMENTAL CONSEQUENCES OF ELECTRICITY GENERATION

Electricity generating stations are one of Ontario's largest sources of industrial air pollution. As a result, they are at the root of some of the province's most serious health and environmental problems, such as climate change, urban smog and acid rain.

The primary sources of electricity-related air pollution are coal-fired electricity generating stations. These stations produce the following pollutants: greenhouse gases, sulphur dioxide, nitrogen oxides and numerous toxic air pollutants (e.g., arsenic, cadmium, mercury and particulates). Each of these pollutants can have serious and potentially devastating effects on human health and the environment, as described below.

Air pollution from power plants causes some of Ontario's most challenging health and environmental problems.

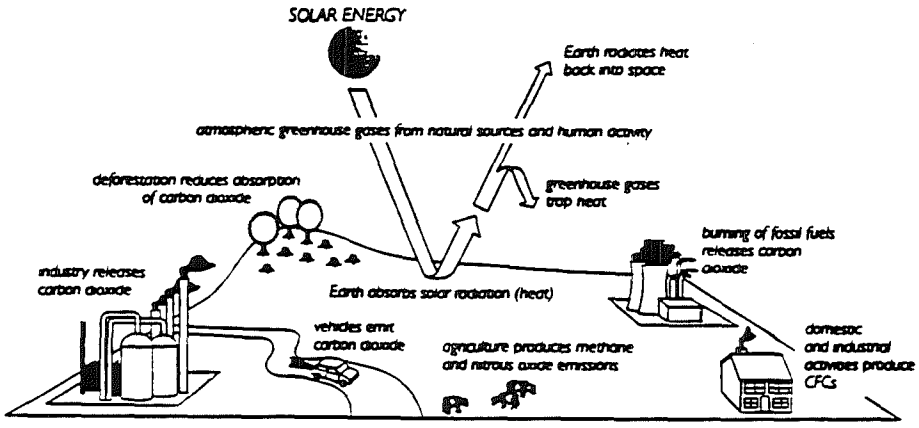
Greenhouse Gases

Coal-fired generating stations are major contributors to the build-up of greenhouse gases, such as carbon dioxide (CO_2), in the atmosphere.

Greenhouse gases trap heat in the earth's atmosphere causing global warming and, as a result, climate change. The David Suzuki Foundation describes climate change as "the most urgent slow-motion catastrophe facing humankind."[2] This statement is appropriate given the predicted health and environmental impacts of climate change. Climate change is expected to undermine economies and communities by: causing more frequent and severe climate extremes such as heat waves, floods, droughts and storms; disrupting

agriculture, forests and ecosystems; increasing the spread of infectious diseases; and raising sea levels.[3]

Figure 1. The Process of Global Warming



Source: United Nations Environment Program, Impact of Climate Change, 1993.

Given the potentially devastating effects of climate change, Canada has signed several international agreements to reduce greenhouse gas emissions. First, in 1992, at the United Nations Conference on Environment and Development in Rio de Janeiro, Brazil, Canada signed the United Nations Framework Convention On Climate Change. The goal of this international agreement is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.[4]

As a first step toward meeting the Convention's goal, developed nations, including Canada, made a commitment to seek to stabilize their greenhouse gas emissions at 1990 levels by the year 2000.[5] This was a modest commitment given that climate scientists from

around the world maintain that a reduction in greenhouse gas emissions of at least 50% from 1990 levels is required to stabilize the concentrations of greenhouse gases in the atmosphere at their present levels.[6] Canada will not, however, be able to reach this target reduction. According to Natural Resources Canada, Canada's greenhouse gas emissions will be 8.2% higher than baseline 1990 levels by the year 2000.[7]

Second, in December 1997, in Kyoto, Japan, more than 150 countries met to take stock of their achievements and failures in reducing greenhouse gas emissions, and to re-affirm their commitments to achieving the Framework Convention On Climate Change objective. In Kyoto, the Canadian government promised to improve its greenhouse gas control record by committing to reduce greenhouse gas emissions by 6%, relative to its 1990 levels, between 2008 and 2012.[8] The federal government has not, however, defined a strategy for meeting this commitment.

At the provincial level, Ontario Hydro (which emits 18% of Ontario's fossil-fuel related CO_2 emissions) has made a commitment to assist Canada's efforts to reduce its greenhouse gas emissions by stabilizing its own greenhouse gas emissions at its 1990 base level by the year 2000, and reducing its emissions by another 10% by the year 2005.[9] This commitment is outlined in Ontario Hydro's Strategy to Manage Greenhouse Gas Emissions.

Sulphur Dioxide

Sulphur dioxide (SO_2) is another major air pollutant emitted from coal-burning electric stations that poses a serious threat to human health and the environment.

SO_2 is a precursor of acid rain, an environmental pollutant formed when sulphur dioxide and nitrogen oxides combine with moist air and fall to the earth as precipitation. Acid rain is responsible for major damage to aquatic ecosystems. In fact, at least 150,000 of the 700,000 lakes in eastern Canada have been damaged by acid rain, resulting in significant losses to aquatic life such as ducks, loons, and fish.[10]

Forest ecosystems are also harmed by acid rain. Acid rain can increase defoliation and the death rate of trees and can deplete important nutrients from forest soils.[11] The effects of acid rain have been noticed in various varieties of trees such as sugar maples, red spruce, white birch, beech, pine and ash trees.[12]

Acid rain also causes considerable damage to the urban environment. It can corrode buildings, bridges and monuments resulting in economic costs as well as cultural and historical losses.[13]

In addition to causing acid rain, sulphur dioxide emissions also transform in the air into tiny sulphate particles which can penetrate deeply into our airways and lungs as we breathe, contributing to a broad spectrum of health effects ranging from breathing discomfort, to bronchitis, asthma attacks, altered lung function, and increased mortality rates.[14] In fact, studies of pollution episodes in North American communities have found significant associations between sulphate concentrations and both respiratory mortality rates and total mortality rates.[15]

Sulphur dioxide contributes to a broad spectrum of health effects ranging from breathing discomfort, to bronchitis, asthma attacks, altered lung function, and increased mortality rates.

Those most at risk from sulphate particles are children, asthmatics and individuals with hyper-responsive airways. The risk is also greater for those who work or exercise

vigorously outdoors.[16]

Both Canada and Ontario have entered into several agreements in attempt to limit sulphur dioxide emissions. In 1985, Canada signed the First Sulphur Protocol under the United Nations Economic Commission for Europe Convention On Long-Range Transboundary Air Pollution (UNECE LRTAP) which committed Canada to cap permanently national sulphur dioxide emissions at 3.2 million tonnes by 1993. Canada met this cap in 1993, with national emissions of 3.0 million tonnes.[17] In 1985, the federal government also initiated a program to limit sulphur dioxide emissions in Eastern Canada. Through this program, Canada committed to cap SO_2 emissions in seven provinces from Manitoba eastward at 2.3 million tonnes by 1994 -- a 40% reduction from 1980 levels. This goal was achieved by 1994, and the cap will remain in place until the year 2000.[18]

Table 1 **Commitments under the Canada-United States Air Quality Agreement**

Commitment	Compliance
Canada	
1. Cap SO_2 emissions in seven eastern provinces at 2.3 million tonnes by 1994 until 2000	24% under cap in 1996
2. Cap national SO_2 emissions at 3.2 million tonnes by 2000 onward	17% under cap in 1995
3. Reduce NO_x emissions from stationary sources by 10% from the year 2000 forecast level	On schedule
United States	
1. Reduce SO_2 emissions by 9 million tonnes by 2000	On schedule
2. Reduce NO_x emissions from 1980 levels by 1.8 million tonnes by 2000	On schedule

SOURCE: THE ACIDIFYING EMISSIONS TASK GROUP, TOWARDS A NATIONAL ACID RAIN STRATEGY, 1997, p. 11.

More recently, in 1991, Canada signed the Canada-United States Air Quality Agreement to control transboundary air pollution (see Table 1). This agreement re-affirmed the targets already outlined in Canadian federal and provincial agreements and in the United States

Clean Air Act.[19] The federal government has also ratified the 1994 UNECE LRTAP Second Sulphur Protocol, which requires the country to work toward achieving "critical loads", which are levels of acid rain that do not harm our lakes and forests.[20]

The Government of Ontario initiated action to control acid rain in 1986 with the Countdown Acid Rain Program. Under this program, regulations were promulgated to control sulphur dioxide emissions from the four major industrial sources of these emissions: the Inco and Falconbridge nickel copper smelters in Sudbury; the Algoma Ore Division's iron ore sintering plant in Wawa; and Ontario Hydro's six fossil-fuel fired generating stations. As a result, the sulphur dioxide emissions of these four companies has fallen from 1993 kilotonnes in 1980 to a maximum permissible level of 665 kilotonnes per year commencing in 1994.[21] The Countdown Acid Rain regulations require Ontario Hydro to cap its sulphur dioxide emissions at 175 kilotonnes per year.[22]

Despite these agreements, studies show that acid rain remains a serious problem. For example, a Globe and Mail story recently outlined a number of alarming facts:

> ...that most lakes in Eastern Canada are not recovering at all or only at one-third the rate expected; that fish populations are not rebounding; that trees located on acid-sensitive soils in Ontario's cottage country are dying; that forest growth in southern Quebec has declined by 30 per cent in the last decade; and that current emission targets are inadequate to protect many lakes and forests.[23]

The Acidifying Emissions Task Group (a multi-stakeholder group consisting of government, industry, health and environmental representatives) recently reported that even with full implementation of Canada-United States programs, by the year 2010, "...almost 800,000 km^2 in southeastern Canada -- an area the size of France and the United Kingdom combined -- will receive harmful levels of acid rain; that is, levels above critical load limits

for aquatic systems."[24] Because current emission standards have not been able to address adequately the acid rain problem, the Acidifying Emissions Task Group concluded that in eastern Canada and the United States, SO_2 emissions must be reduced by a further 75%, relative to the existing legally binding caps to achieve critical loads.[25] The Task Group maintains that such reductions would produce the following benefits for Canadians:

- Only 7,000 km^2 of land in eastern Canada would remain at risk from acid rain.
- Eight hundred and thirty premature deaths and 2,300 emergency room visits would be avoided per year.
- Annualized health benefits would be $890 million to $8 billion.[26]

Despite the significant benefits of reducing sulphur dioxide emissions by a further 75%, the Canadian and U.S. governments have not yet taken the advice of the Acidifying Emissions Task Group and established new emission regulations.

Nitrogen Oxides

Coal-fired electricity generating stations are also major sources of nitrogen oxides (NOx) emissions (during the combustion of coal, oxygen reacts with nitrogen to produce nitric oxide (NO) and nitrogen dioxide (NO_2) -- together referred to as nitrogen oxides) which contribute to several serious health and environmental problems, including acid rain (described above) and smog.

Nitrogen oxides react with volatile organic compounds (VOCs) to form ground-level ozone, which is a major component of smog. Smog is a

Smog is a respiratory irritant which causes breathing problems, reduces lung function, aggravates asthma, and increases the severity and incidence of respiratory infections.

respiratory irritant which causes breathing problems, reduces lung function, aggravates asthma, and increases the severity and incidence of respiratory infections. According to the Government of Ontario:

- Smog aggravates a wide range of serious health ailments, especially respiratory illnesses such as asthma and bronchitis.
- Smog causes about 1,800 premature deaths and 1,400 cardiac and respiratory hospital admissions[27] in Ontario each year.
- Smog exacts a severe toll on the environment by harming vegetation, materials and crops.[28]

Studies show that lowering smog levels can significantly reduce smog-related health effects. A study by the Ministry of the Environment and Energy, for example, estimated the health benefits if 1990 emissions of NO_x and VOCs were reduced by 45% by 2015. This study showed that such a reduction would result in approximately 180 fewer mortalities a year, 190 fewer cardiac and respiratory hospital admissions, 6,200 fewer emergency room visits for asthma, and between three to four million fewer episodes of acute respiratory symptoms.[29]

In addition to its contribution to the formation of smog, nitrogen dioxide affects us by weakening our defenses against respiratory infection.[30] Children are most vulnerable to this effect. In fact, studies suggest that children exposed to high levels of nitrogen dioxide may become more susceptible to critical infections of the lower respiratory tract, the bronchial tubes and lungs.[31]

The Ontario Government has developed several initiatives in attempt to limit nitrogen oxide emissions. For example, Ontario has a low-level ozone target of 80 parts per billion

(ppb) per hour. Ontario's ozone target is, however, often exceeded. In fact, during the summer of 1995, the target was exceeded 600 times at 10 monitoring stations in southwestern Ontario.[32] Moreover, the multi-stakeholder NO_x/VOC Science Program recently concluded that there "is no discernible human health threshold for ground-level ozone. The current one-hour 82-ppb Canadian ozone objective is not fully protective of human health and vegetation."[33] In other words, Ontario's goal of 80-ppb[34] is not low enough to fully protect human health and the environment.

The provincial government also regulates Ontario Hydro's nitrogen oxides emissions. Ontario Hydro's combined maximum legally-permissible emissions of SO_2 and NO_x are 215 kilotonnes per year.[35] In other words, Ontario Hydro's maximum NO_x emissions cannot exceed 40 kilotonnes per year unless its SO_2 emissions are less than 175 kilotonnes (Ontario's current cap for SO_2 emissions) per year. In addition to this limit, Ontario Hydro made a commitment in 1991 to the Ontario Ministry of the Environment to cap its NO_x emissions at 38 kilotonnes per year commencing in the year 2000.[36]

The most recent provincial government initiative to control nitrogen oxides emissions, Ontario's Smog Plan, was released in January 1998. The Smog Plan's target is to achieve a 75% reduction in the number of times the 80 ppb objective is exceeded by 2015. In order to reach this target, Ontario's nitrogen oxides emissions must be reduced by 45%, relative to 1990 levels, by 2015.[37] This Plan is, however, probiematic for several reasons. First, at present, the Ontario Ministry of the Environment has only identified how it will achieve 29 to 33% of the targeted NO_x emission reductions.[38] Second, the Ministry of the Environment is relying on

Ontario's Smog Plan

The Ontario Smog Plan is a partnership between the Government of Ontario and businesses to develop and implement voluntary actions to reduce emissions. The goal of the Plan is to reduce the number of times our air quality fails to meet the provincial smog guidelines by 75% by 2015.

voluntary initiatives rather than mandatory programs to reach the reduction goal. Without regulations and enforcement mechanisms, there may be insufficient incentive for emitters to reduce their pollution. Finally, the plan's deadline for emission reductions -- the year 2015 -- ignores the immediate severity of the smog problem which is causing severe illness and even death.

Toxic Air Pollutants

Coal-fired generating stations also produce air toxics. Ontario Hydro, for example, produces 35 air toxics such as arsenic, lead, and mercury (see Appendix A). These pollutants are persistent and hazardous to human health, plant and animal life. According to the International Joint Commission, air toxics can "bioaccumulate in living organisms and have been associated with immune system dysfunction, reproductive deficits, developmental and neurobehavioral abnormalities, and cancer."[39]

According to the International Joint Commission, air toxics can "bioaccumulate in living organisms and have been associated with immune system dysfunction, reproductive deficits, developmental and neurobehavioral abnormalities, and cancer".

Air toxics can travel for thousands of miles. In fact, most of the air toxics that are deposited in Ontario are emitted in the U.S. or other countries.[40] The health and environmental effects of several air toxics are discussed below.

Mercury

Mercury is one of the most harmful air toxics associated with coal-fired electricity generation. It is both persistent and bioaccumulative, which means that, once it is emitted

into the atmosphere, it continuously recycles through the environment and builds up in the food chain, eventually ending up in humans (see Figure 2).

Figure 2 **The Cycle of Mercury in the Environment**

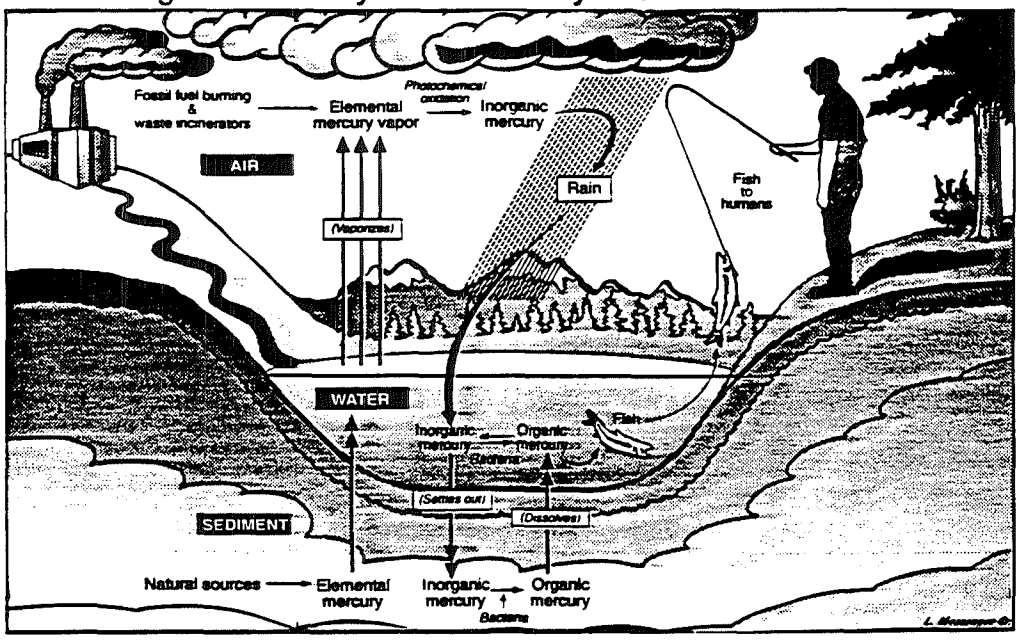


Illustration by Lori Messenger. Reprinted with permission.

Exposure to mercury can have serious and irreversible effects in living organisms. For example, it can cause damage to the central nervous system (e.g. motor disturbances, memory loss); increased risk of reproductive failures; brain damage (high doses can cause cerebral palsy and low doses can cause learning disabilities); neurological disturbances (e.g. abnormal reflexes, loss of consciousness); liver and kidney degeneration; abnormal heart rhythms; tremors and muscle pain.[41]

According to a recent U.S. Environmental Protection Agency (EPA) report, pregnant women, women of child-bearing age and children under 15 years of age are most susceptible to the harmful effects of mercury. Infants and young children are more

Pregnant women, women of child-bearing age and children under 15 years of age are most at risk from mercury poisoning.

susceptible to the harmful effects of mercury because their bodies and brains are still developing. Pregnant women are at risk because of the adverse effects of methylmercury on the fetal nervous system.[42] Some scientists feel that as little as one meal of fish contaminated with high levels of methylmercury (one of the most toxic forms of mercury) eaten by an expectant mother has the potential to cause brain damage to an unborn child.[43]

In natural ecosystems, mercury can inhibit photosynthesis and growth in phytoplankton.[44] Mercury can also cause reproductive failure, impaired growth and development, behavioral abnormalities, and death in fish, birds and mammals. For example, mercury contamination has been documented in the endangered Florida panther and the wood stork, as well as populations of loons, eagles, and furbearers such as mink and otter.[45] Moreover, levels of mercury contamination in freshwater fish have been so high in the Atlantic provinces that advisories limiting the consumption of these fish are in effect in three of five eastern provinces.[46]

Because air toxics, such as mercury, can cause such devastating human health and environmental problems, Canada and Ontario have made a commitment to eliminate toxic substances: The Canada-Ontario Agreement respecting the Great Lakes Basin Ecosystem. The goal of this agreement is "to achieve the virtual elimination of persistent, bioaccumulative and toxic substances from the Great Lakes Basin Ecosystem by encouraging and implementing strategies consistent with the philosophy of zero discharge."[47] In order to reach this goal, Canada and Ontario are required to seek a 90% reduction in the use, generation or release of mercury by the year 2000.[48]

In addition, under The Great Lakes Binational Toxics Strategy: Canada - United States

Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes, Canada is also required to, "seek by 2000, a 90 percent reduction in the release of mercury, or where warranted the use of mercury, from polluting sources resulting from human activity in the Great Lakes Basin."[49]

However, neither the federal nor the provincial government have strategies in place to achieve these mercury reductions.

Carcinogens

Six of the toxic substances emitted by coal-fired generating stations (arsenic, beryllium, cadmium, chromium, lead and nickel) are designated as carcinogens by the Government of Canada and/or the U.S. Occupational Safety and Health Administration.[50]

Neither Canada nor Ontario have emission reduction goals for these carcinogenic substances.

Particulate Emissions

Particulate emissions are also very damaging to human health and the environment. Particulates may cause increased respiratory irritation, more frequent asthma attacks, aggravation of respiratory and cardiovascular diseases, and increased mortality in people suffering from chronic respiratory disease.[51] As the U.S. EPA explains:

Particulates may cause respiratory irritation, more frequent asthma attacks, aggravation of respiratory and cardiovascular diseases, and increased mortality.

> ...community-based health studies show associations between particulate matter (known as PM) and serious health effects. These include premature death of tens of thousands of elderly people or others with heart and/or respiratory problems each year. Other health effects associated with exposure to particles include aggravation of respiratory and cardiovascular disease, including more frequent attacks of asthma in children. The results of these health effects have been significantly increased numbers of missed work and school days, as well as increased hospital visits, illnesses, and other respiratory problems.[52]

Particulate emissions are not only associated with serious health effects, but they also are a major reason for visibility impairment. For example, visibility in the eastern United States should naturally be about 90 miles, but has been reduced to under 25 miles.[53]

Neither Canada nor Ontario have emission caps for particulate emissions.

Summary

Despite the negative health and environmental impacts of coal-fired generating stations, these stations still generate a significant portion of Ontario's electricity supply. According to Ontario Hydro, fossil generation will supply up to 33% of its electricity generation in 1999.[54]

Both the federal and provincial governments have made some progress in reducing emissions from these fossil-fuel fired electricity generating stations. Programs and objectives, such as Countdown Acid Rain, have to some extent improved air quality. In general, though, air quality objectives have been inadequate. Ontario Hydro is still a major source of carbon dioxide, nitrogen oxides, sulphur dioxide, and air toxics emissions – emissions which cause to serious health and environmental problems such as global warming, acid rain, and smog (see Table I).

TABLE 2

ONTARIO HYDRO'S EMISSIONS AS A PERCENTAGE OF ONTARIO'S TOTAL EMISSIONS, 1990

	ONTARIO HYDRO (% contribution)	ASSOCIATED HEALTH AND/OR ENVIRONMENTAL PROBLEMS
SULPHUR DIOXIDE	16%	acid rain, respiratory diseases, premature mortality
NITROGEN OXIDES	12%	acid rain, ground-level ozone (smog), respiratory illnesses, premature mortality
CARBON DIOXIDE	18%	climate change
MERCURY	10%*	brain, liver, and kidney damage; reproductive failure and behavioural abnormalities in wildlife (e.g. loons)
CARCINOGENS	NA	cancer
PARTICULATES	2.4%	aggravation of respiratory and cardiovascular diseases, premature mortality

*THE MERCURY EMISSION ESTIMATE IS WITH RESPECT TO 1995.

SOURCES: FAX FROM IAN SMITH, PROGRAMME DEVELOPMENT BRANCH, ONTARIO MINISTRY OF THE ENVIRONMENT TO JACK GIBBONS, DECEMBER 8, 1997; ONTARIO CO_2 COLLABORATIVE, A CO_2 STRATEGY FOR ONTARIO: A DISCUSSION PAPER, (TORONTO: CANADIAN INSTITUTE FOR ENVIRONMENTAL LAW AND POLICY, 1996), PP. 40, 44; MEMO FROM PATRICK MCINNIS,ENVIRONMENTAL MONITORING AND REPORTING BRANCH, ONTARIO MINISTRY OF ENVIRONMENT AND ENERGY, TO JACK GIBBONS, JUNE 10, 1996.

SECTION II: A COMPETITIVE ELECTRICITY MARKET

The electricity generating sector is now at a critical juncture. Historically, Ontario Hydro has acted as a monopoly, having virtually exclusive control over the generation and transmission of electricity. In the year 2000, however, this monopoly will end as electricity competition is introduced in Ontario.

The restructuring of the electricity utility industry poses both challenges and opportunities for the province. One of the main challenges will be to ensure that electricity competition does not result in increased air pollution in Ontario. Competition also presents an opportunity, however, for the government to develop pollution standards that will actually improve air quality and create a level playing field for all electricity generators that sell power to Ontario consumers.

Competition presents an opportunity for the government to develop pollution standards that will improve air quality.

This section explores these challenges and opportunities, detailing why emission levels could rise in a competitive electricity market and presenting an effective solution which would ensure that electricity competition results in improved air quality, not increased pollution.

The Rationale for Competition

Presently, Ontario Hydro has a virtual monopoly on the generation of electricity in Ontario. The company produces approximately 94% of the electricity consumed in this

province.

The original rationale for Ontario Hydro's monopoly was technological. For most of this century, electricity could be produced at a lower average cost from a small number of large electricity generating stations than from a large number of small electricity generating stations. Therefore, a monopoly utility could provide consumers with lower electricity prices than an industry consisting of many small-scale, competing electricity suppliers.

In recent years, however, there has been a revolution in electricity generation technologies. Small-scale natural gas-fired electricity generating technologies can now produce electricity at an equal, or a lower, cost than new large-scale electricity generating stations. In effect, the original rationale for Ontario Hydro's monopoly no longer exists.[55] According to a study by the Advisory Committee on Competition in Ontario's Electricity System (the Macdonald Committee), a competitive electricity market would cause wholesale electricity prices to fall by 11% to 27% relative to a continuation of Ontario Hydro's monopoly.[56]

Consequently, in May 1996, the Macdonald Committee proposed that Ontario Hydro's monopoly on electricity generation should be eliminated. As well, the Committee recommended that any electricity generator, including those located in the United States, should be allowed to sell electricity in Ontario.

The Effects of Electricity Competition on Air Quality

In the Government of Ontario's recent White Paper concerning electricity competition in

Ontario, the government states that it "is firmly committed to maintaining and enforcing its standards for environmental protection" in a competitive market and that "the existing limits on emissions of sulphur dioxide, nitrogen oxides, and carbon dioxide from electricity generation will remain in place."[57]

Merely maintaining these existing regulations will not, however, be adequate to prevent increased air pollution in a competitive electricity market. As mentioned in section one, Ontario's existing caps on emissions of SO_2, CO_2 and NO_x emissions apply only to Ontario Hydro. Unless these regulations are strengthened, Ontario Hydro's domestic and Ohio Valley competitors will not be subject to CO_2, NO_x or air toxics emission caps (U.S. electricity generating stations are subject to a SO_2 emissions cap). Air pollution will, therefore, increase significantly in a competitive market for the following reasons.

Unless current air pollution regulations are strengthened, none of Ontario Hydro's domestic or foreign competitors will be subject to a comprehensive system of emission caps in a competitive electricity market. Air pollution will, therefore, increase significantly.

First, in a competitive electricity market, municipal utilities and investor-owned corporations will build new electricity generating stations in Ontario. Many of these new facilities will be natural gas-fired because this type of power generation is very cost-efficient. Although natural gas-fired electricity generation is less polluting than other types of fossil electricity generation, such as coal, these new generating stations will face no emission caps. Thus, when the emissions from these stations are combined with Ontario Hydro's output, emission levels in Ontario will increase. In fact, according to a recent Natural Resources Canada forecast, if new environmental policies are not enacted in Ontario, the province's electricity-related greenhouse gas emissions in 2020 will be 2.2 times greater than its 1990 levels.[58]

Second, when competition is introduced, some of Ontario's electricity needs will be met by importing power from Ohio Valley generating stations. One company from this region, American Electric Power (AEP) has already opened an office in Toronto in anticipation of the introduction of competition. AEP's coal-fired electricity stations will be able to offer Ontario consumers very competitive prices. As Daniele Seitz, a U.S. energy analyst, explains "AEP starts with a tremendous advantage...It's a company that has power costs that are very low."[59]

AEP's costs are so low because more than 85 per cent of its power is generated from coal, an inexpensive power source.[60] The company also has long-term contracts at preferred rates with its coal suppliers and its plants are located near coal mines in the Ohio Valley, which drastically reduces transportation costs.[61] These factors place AEP "among the lowest cost-based generating operations in the United States".[62]

Although Ohio Valley coal-fired generating stations will be able to offer Ontario consumers low-cost electricity, there are no emission caps on the greenhouse gas, nitrogen oxides, air toxic, or particulate emissions from these stations.[63] Moreover, coal-fired electricity imports from the Ohio Valley are especially harmful since the NO_x emission rates of many Ohio Valley coal-fired generating stations are significantly higher than those of Ontario Hydro's coal-fired electricity generating stations. For example, AEP's NO_x emission rate per kilowatt-hour of fossil generation is 2.2 times greater than Ontario Hydro's rate.[64] The increased use of low-cost, coal-fired plants located in the U.S. and the commensurate emissions increases would have serious air quality implications for Ontario, as this province is directly downwind from the Ohio Valley.

Summary

Given the human health and environmental effects of electricity generation described above, there is reason to be concerned about the introduction of competition in Ontario's electricity market. In a competitive electricity market, new electricity generating stations will inevitably open in Ontario by companies other than Ontario Hydro. In the absence of new environmental policies, these generating stations will not be subject to emission caps. Moreover, electricity competition will enable Ontarians to purchase electricity from regions beyond Ontario's borders -- regions like the Ohio Valley which have no greenhouse gas, NO_x[65] or air toxics emissions caps for their electricity generators. In effect, electricity competition may lead to a dramatic increase in emissions and, as a result, an increase in the serious health and environmental problems caused by these emissions.

Electricity competition will enable Ontarians to purchase electricity from regions such as the Ohio Valley that have no greenhouse gas, NO_x, or air toxics emissions caps for their electricity generators.

The Government of Ontario must, therefore, establish new environmental regulations that will control the emissions of Ontario Hydro's competitors and ensure that Ontario's total electricity-related emissions of greenhouse gases, SO_2, NO_x and air toxics do not rise when competition begins.

AN EFFECTIVE SOLUTION

In its report to the Government of Ontario, the Macdonald Committee stated that the benefits of a competitive electricity market should not be achieved at the expense of the

environment, but should be combined with stricter environmental controls:

> We believe that the move to a competitive market for electricity in Ontario should not require the sacrifice of environmental goals. If anything, we believe that it will create a situation in which environmental objectives can and should be more, not less, demanding.[66]

The Committee also recommended that the Government of Ontario maintain "a responsibility to define environmental goals and to adopt appropriate measures to achieve them" in a competitive market.[67]

The Government should, therefore, define appropriate new environmental regulations which will enable the province to simultaneously improve air quality and receive the economic benefits of competition.

Specifically, the introduction of competition should be combined with regulations that establish legally binding greenhouse gas, SO_2, NO_x and air toxics emissions caps with respect to all electricity that is generated or sold in Ontario. These caps should be set to ensure that the aggregate emissions due to the generation or sale of electricity in Ontario are less than Ontario Hydro's existing emission limits.

There are a number of mechanisms that could be used to cap Ontario's total electricity-related emissions in a competitive market. For example, the Government of Ontario is planning to establish an Independent Market Operator (IMO) -- a new, non-profit Crown Corporation that will run the electricity exchange, dispatch power, and arrange financial settlements between buyers and sellers.[68] The IMO's primary responsibility will be to ensure that the demand and supply of electricity is balanced throughout the year. As a result, the IMO will determine which electricity generators can supply electricity, and the

quantity that they can supply, to the Ontario electricity grid. The IMO could require each potential supplier to provide its price and the incremental greenhouse gas, sulphur dioxide, nitrogen oxides and air toxics emissions associated with its supplies.[1] With this information, the IMO could select the domestic and the U.S. suppliers with the lowest prices subject to constraint that their total emissions will not exceed Ontario's greenhouse gas, SO_2, NO_X, and air toxics emission caps.

Alternatively, instead of giving the IMO an environmental mandate, the Government of Ontario could allocate emission quotas to each Ontario electricity generator or marketer. Under such a system, an electricity generator or marketer's greenhouse gas, sulphur dioxide, nitrogen oxides, and air toxics emissions could not exceed its quota limits. For example, if Ontario Hydro's greenhouse gas emission quota equals 10,000 kilotonnes per year, the total greenhouse gas emissions of its fossil stations and the incremental greenhouse gas emissions associated with its electricity imports from the U.S. (if any) could not exceed 10,000 kilotonnes per year. The sum of each electricity generator or marketer's emission quotas would equal Ontario's maximum allowable annual electricity-related emissions.

If the Government of Ontario establishes a system of emission quotas to cap Ontario's

[1] If U.S. electricity generator A sells electricity to the IMO, the resulting increase in U.S. greenhouse gas and NO_x emissions is not necessarily equal to generator A's greenhouse gas and NO_x emissions. For example, let's assume generator A is an existing nuclear generating station. As a result, generator A's greenhouse gas and NO_x emissions are zero. However, if generator A exports electricity to Ontario and is no longer serving U.S. customers; the output of a coal-fired electricity generating station (generator C) will be increased to meet the needs of the U.S. electricity consumers that were previously served by generator A. Therefore the rise in U.S. greenhouse gas and NO_x emissions as a result of our electricity imports from generator A will equal the incremental emissions of generator C.

total electricity-related emissions, the quotas could be tradeable or non-tradeable. Furthermore, the government could permit the trading of certain types of emissions (e.g. greenhouse gases) and not others (e.g. air toxics).

Finally, if the U.S. Government establishes legally binding greenhouse gas, nitrogen oxides and air toxics emission caps which require all U.S. electricity generators to reduce their aggregate emissions, Ontario electricity imports from the U.S. would not lead to a net rise in U.S. emissions. Therefore, Ontario could cap its total electricity-related emissions by simply controlling the emissions of domestic electricity generators. This control function could be performed by the IMO and/or a system of emission quotas could be used.

If the Government of Ontario establishes legally binding greenhouse gas, SO_2, NO_x, and air toxics emission caps, compliance can be achieved by utilizing the following market mechanisms:

1. the aggressive promotion of "energy efficiency" energy services by Ontario Hydro, Ontario's large municipal electric utilities (e.g., Toronto Hydro, Windsor Public Utilities Commission) and other energy services companies (e.g., Consumersfirst, Enron, Honeywell) which will reduce the demand for electricity;

2. new investments in renewable energy technologies (e.g., wind-turbines, solar photovoltaic systems) by energy utilities, non-utility investor-owned corporations and consumer co-ops;

3. incremental investments in high efficiency, low carbon intensity technologies, e.g., fuel cells and natural gas-fired cogeneration (the greenhouse gas emissions

per kilowatt-hour of gas-fired cogeneration are 66 to 70% less than those of Ontario Hydro's coal-fired generating stations) by electric utilities and non-utility investor-owned corporations;[69] and

4. the aggressive promotion of end-use fuel-switching from electricity to natural gas (e.g., converting electrically-heated homes and electric water heaters to natural gas) by Consumers Gas and Union Gas.

According to a Royal Society of Canada report, very significant reductions in Ontario's electricity-related emissions can be achieved, at no net cost to consumers, by investing in energy efficiency and by end-use fuel switching from electricity to natural gas. That is, the cost of reducing emissions by investing in energy efficiency and fuel switching would be offset by the resulting reductions in energy bills.[70]

Significant reductions in electricity-related emissions can be achieved, at no net cost to consumers, by investing in energy efficiency and by end-use fuel switching from electricity to natural gas.

Furthermore, as previously noted, the Macdonald Committee estimated that a competitive electricity market would cause wholesale power prices to fall by 11 to 27%. An 11 to 27% reduction in electricity rates would translate into a $930 million to $2.3 billion annual reduction in electricity bills.[71] A portion of this annual bill reduction could be used to finance a reduction in Ontario's electricity-related emissions.

RECOMMENDATIONS

The Government of Ontario has promised that in implementing a competitive electricity

market it "will ensure that the province's environmental protection record is maintained and improved."[72] In order to fulfil this commitment, the Government of Ontario should establish regulations which will ensure that Ontario's total electricity-related emissions will decline when competition begins. Specifically, the Government of Ontario should implement the following regulations with respect to all electricity generated in Ontario or imported into Ontario:

1. Greenhouse gas emission caps which stabilize, at 1990 levels, the greenhouse gas emissions associated with the production or sale of electricity in Ontario by the year 2000 and reduce the greenhouse gas emissions associated with the production or sale of electricity in Ontario by more than 10%, relative to 1990 levels, by 2005;

2. Sulphur dioxide emission caps which reduce the sulphur dioxide emissions associated with the production or sale of electricity in Ontario below 175 kilotonnes per year.

3. Nitrogen oxides emission caps which reduce the nitrogen oxides emissions associated with the production or sale of electricity in Ontario below 38 kilotonnes per year.

4. Air toxics emission caps which reduce the air toxic emissions associated with the production or sale of electricity in Ontario.

This is a critical time for the utility industry as the government is planning to restructure a system that has been in place for over 90 years. The decisions made over the next few years about the electricity market will affect us, our children, and generations to

come. The Government of Ontario has the opportunity to adopt effective new environmental regulations, such as those outlined above, that will improve air quality in a competitive electricity market. Hopefully, the government will seize this opportunity, so that we can enjoy a cleaner and healthier environment in the future.

APPENDIX A: ONTARIO HYDRO'S TOXIC EMISSIONS

Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Phosphorus
Potassium
Rubidium
Selenium
Silicon
Silver
Sodium
Strontium
Tellurium
Thallium
Tin
Titanium
Vanadium
Zinc
Particulate

APPENDIX B: ARE THE ONTARIO CLEAN AIR ALLIANCE'S RECOMMENDATIONS CONSISTENT WITH CANADA'S INTERNATIONAL TRADE OBLIGATIONS?

The General Agreement on Tariffs and Trade (GATT)

The GATT is the world's principal multilateral treaty with respect to international trade.

Article XX of the GATT permits member countries to adopt measures to protect human, animal or plant life or health and to conserve natural resources:

> "Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures:...
> (b) necessary to protect human, animal or plant life or health;...
> (g) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption".

The World Trade Organization (WTO) has been created to resolve trade disputes pursuant to the GATT. In 1996 a WTO disputes resolution panel found that "clean air" is a natural resource within the meaning of Article XX(g).[73]

Moreover, a WTO Appellate Body report has recently reaffirmed that WTO members have a large measure of autonomy to determine their own policies on the environment:

> "Article XX of the *General Agreement* contains provisions designed to permit important state interests - including the protection of human health, as well as the conservation of exhaustible natural resources - to find expression. The provisions of Article XX were not changed as a result of the Uruguay Round of Multilateral Trade Negotiations. Indeed, in the preamble to the *WTO Agreement* and in the *Decision on Trade and Environment*, there is specific acknowledgement to be found about the importance of coordinating policies on trade and the environment. WTO Members have a large measure of autonomy to determine their own policies on the environment (including its relationship with trade), their environmental objectives and the environmental legislation they enact and implement. So far as concerns the WTO, that autonomy is circumscribed only by the need to respect the requirements of the *General Agreement* and the other covered agreements."[74]

Therefore, the implementation of a system of greenhouse gas, sulphur dioxide, nitrogen oxides, and air toxics emissions caps or quotas with respect to the production or sale of electricity in Ontario, as described in this report, would be GATT permissible because:

1. the primary purpose of the emission caps or quotas would be to protect human, animal and plant life and health and the conservation of natural resources;

2. the emission caps or quotas would apply equally to Canadian and U.S. electricity generators; and

3. emission caps or quotas are the least trade-restrictive options to achieve the desired health and environmental benefits.

North American Free Trade Agreement (NAFTA)

Article 2101 of the NAFTA incorporates GATT Article XX and its interpretive notes into the NAFTA. Therefore, the OCAA's recommendations are also NAFTA permissible.

APPENDIX C: ONTARIO CLEAN AIR ALLIANCE MEMBER LIST

The following citizen organizations, associations and utilities have endorsed the OCAA's greenhouse gas, sulphur dioxide, nitrogen oxides and air toxics emissions caps recommendations and joined the Alliance:

Alfred-Plantagenet Hydro
Algoma Manitoulin Environmental Awareness
Algoma Manitoulin Nuclear Awareness
Allergy/Asthma Information Association
Almonte Hydro
Bruce Peninsula Environment Group
Canadian Association of Physicians for the Environment
Canadian Institute for Environmental Law and Policy
CAW Canada*
Chatham Hydro
Citizens Environmental Alliance of Southwestern Ontario
Citizens for Renewable Energy
Citizens' Network on Waste Management
City of Toronto
Clarington Hydro
Clean North
Community Action Parkdale East
Conserver Society of Hamilton and District, Hamilton Chapter
Consumers Association of Canada (Ontario)
Echo Lake Association
For A Safe Environment
Greenest City
Kingston Environmental Action Project
Lucan Hydro
Metro Toronto Pesticide Action League
North Toronto Green Community
Ontario College of Family Physicians
Ontario Forestry Association
Ontario Lung Association
Ontario Public Health Association
Ontario Public Interest Research Group/McMaster University
Paisley Hydro
Pesticide Action Group/Waterloo
Peterborough Utilities Commission

Pollution Probe
Rockwood Hydro-Electric
South Riverdale Community Health Centre
The Sierra Club of Canada
Sudbury Hydro
Torrie Smith Associates
Toronto District Heating Corporation
Toronto Environmental Alliance
Toronto Hydro
The United Church of Canada
Wastewise

*CAW Canada is opposed to the privatization of Ontario Hydro

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