BOX 931, CORUNNA, ONTARIO, NON 1GO
caealliance@sympatico.ca

May 8, 2007

Hamilton City Councillors
c/o Hamilton City Hall
71 Main Street West
Hamilton, Ontario
L8P 4Y5

Dear Councillors:

Re: City of Hamilton Motion 7.1 (b), February 14, 2007
Moratorium on the Construction of any New Nuclear Power Plants within the Municipal Boundaries of the City Of Hamilton

The CAE (Clean, Affordable Energy) Alliance is a volunteer organization representing the interests of Ontario citizens regarding energy issues in our province. We are concerned with maintaining affordable power rates and ensuring continued reliability of electricity without compromise to our environment.

Our members have closely followed provincial power restructuring over the past few years. We have reviewed and responded to Ontario Power Authority (OPA) reports, discussion papers, web conferences and workshops. We have spent considerable time researching credible energy and environmental information. We have presented information to the media, the Ministry of Energy, Ministry of the Environment, opposition critics, the OPA, and to Legislative Committees including the Finance Committee, Judicial Committee and the Committee on Government Agencies regarding the services and mandate of Ontario Power Generation. We have participated in conferences and public forums on power supply.

We appreciate the opportunity to make a summary presentation to Council on Monday, May 14, 2007, with regard to the above stated motion, and in particular the second section regarding the continued operation of the Nanticoke Generating Station.

The motion before Council includes the following statements:

1. "coal-burning electricity generation at Nanticoke contributes significantly to poor air quality and adverse health effects - specifically respiratory and cardiac illness in Hamilton";

2. "replacement of the coal burning equipment at Nanticoke with gas burning equipment would improve air quality in Hamilton and southern Ontario while maintaining capacity";

3. "the Provincial Government and Ontario Power Generation be requested to move with great speed to close Nanticoke or if it is to continue operations, to convert the facility to a gas-burning operation no later than 2009."

In contemplating a resolution calling on the Ontario government to discontinue coal fired generation at Nanticoke, the Council seeks to protect the residents of the Hamilton area. In doing so, it is imperative that a full evaluation of information be undertaken. This letter provides information which specifically addresses the above 3 statements, together with supporting documentation. We hope this will assist you in your assessment of the merit of endorsing or rejecting the motion before you.

1. Contribution of Nanticoke Generating Station to air quality in Ontario, and Hamilton in particular

(i) The Ontario Medical Association indicates that health issues associated with pollution are attributable to chronic and acute exposure to 5 common pollutants, namely –
Ozone (O3) which is comprised of NOx (nitrogen oxides) + VOCs (volatile organic compounds); PM $_{2.5}$ (particulate matter); CO (carbon monoxide); and SO_2 (sulphur dioxide). (Ministry of the Environment - Health and Emissions Impacts, June, 2005)

Coal fired generation contributes less than 1% to VOCs, PM $_{2.5}$, and CO; more significantly to SO_2 and NO_x. However, these latter two can, and are being significantly reduced (85-95%).

(ii) According to statistics compiled by Environment Canada and the Ontario Ministry of the Environment, all coal fired generating plants in Ontario combined produce less than 7% of the emissions related to smog in our province.

(iii) Studies and reports, including those funded by the Ontario government, affirm this information. For example, a regional modeling study of the effects on air quality of electric power generation, conducted by the University of Waterloo Department of Chemistry concluded that Ontario's 4 coal generation facilities contribute "about 3-4% of the total SO_2 and about 1-2% of the total NO_x in southern Ontario. The contributions rise to about 10% and 8% respectively within 20 km of the largest facility." (ie Nanticoke).
It is evident that the impact of Nanticoke Generating Station on the City of Hamilton from the primary pollutants emitted, NO_x and SO_2, is minimal.

(iv) The role of Ontario's power plants in forming ground-level ozone in Ontario was studied in a report by RWDI consultants, 2004. The results indicated that had the power plants been

removed, there would have been almost no difference. "The reduction in ozone formation across the region would have been imperceptibly small." (Pain Without Gain, Fraser Institute, January, 2005)

(v) "Overall, closing down the CFG (coal fired generating) facilities is forecast to improve air quality in most parts of southern Ontario. … However, these improvements are small compared to the overall ambient concentrations of these pollutants. The ambient concentrations of these pollutants are influenced by various sources including transboundary air pollution and vehicle emissions." (Ontario's Cost-Benefit Analysis - Replacing Ontario's Coal-Fired Electricity Generation, prepared for the Ministry of Energy, April, 2005)

(vi) This report produced for the Ministry of Energy, notes that less than 1% of Toronto smog is attributable to Ontario coal plants.

(vii) The Ministry of the Environment reports that ozone and fine particulate matter ($PM_{2.5}$), the major components of smog, continue to exceed air quality criteria and remain the pollutants of most concern. The Ministry notes that on high ozone days all Ontario manmade sources of pollution combined contribute about 10% to the GTA/Hamilton air quality, less on days of low ozone concentration.
Therefore, the contribution of Nanticoke Generating Station to Hamilton air concerns regarding ozone production is less than 1.3%.

(viii) Health impacts from particulate matter are significant. When both primary and secondary particulate emissions are considered, the impact of Ontario sources in the Hamilton area is about 30%. Nanticoke Generating Station contributes less than 1% to that portion of primary particulate emissions (i.e. 0.3%), slightly more to secondary emissions.

(ix) Transboundary air pollution which contributes in excess of 55% to Ontario air contaminants, transportation, and local industry are the greatest concern for the City of Hamilton. (Transportation is by far a greater source of NO_x, VOCs and CO than coal fired power generation.)

Conclusion:

Nanticoke Generating Station does not "contribute significantly to poor air quality and adverse health effects - specifically respiratory and cardiac illness in Hamilton". The degree of impact is not sufficient to cause respiratory and cardiac illness within the City. Of the two pollutants that most impact the area, namely NOx and SO2, reductions of 85-95% could be affordably and readily achieved to bring the emissions contribution from Nanticoke down to 1%.

2. Factors Relating to the Conversion of Nanticoke Generating Station to Natural Gas

(i) The Ontario Power Authority (OPA) has investigated and rejected the possibility of conversion of Nanticoke Generating Station to natural gas fired power, concluding that ""Conversion of existing coal-fired boilers to gas-fired boilers involves the cost of burner tip replacement, the cost of new or expanded gas pipeline capacity, and the cost of natural gas. According to OPG, the conversion of existing boilers at Nanticoke to burn natural gas could cost in the range of $30 million to $50 million per unit ($240 million to $400 million for all eight units) and take about five years to complete. In addition, gas pipeline costs are likely to be in the order of $300 million to $350 million, resulting in a total conversion cost ranging from about $540 million to about $750 million. The fuel cost and low efficiency at Nanticoke will result in operating costs for generating electricity at close to $100 per MWh …. Putting these three factors together (lead time, cost and inefficiency) leads to this option not being recommended." (Current costs for generating electricity from coal are about $38 per MWh.) (Ontario Power Authority Discussion Paper, Integration, November 15, 2006)

(ii) The OPA advises that "Building new combined cycle gas turbine units would represent a higher efficiency solution than conversion of existing boilers (Nanticoke), but has similar long lead times requirements. The Preliminary Plan already has a substantial amount of gas-fired generation, which is a challenge to implement. … the increased use of natural gas is not considered to be a feasible alternative to the continued operation of coal-fired units for a limited period of time." (Integration Discussion Paper, November 15, 2006)

(iii) Conversion to natural gas will provide marginal benefit, for much greater cost both now and in future. Concerns related to gas conversion are summarized by the David Suzuki Foundation. "Although natural gas may be a cleaner fuel than coal, its use still impacts air quality and human health, and its production has significant environmental consequences in the form of wilderness and habitat destruction…. Contrary to its clean image, natural gas contributes to climate change. Although burning natural gas produces fewer greenhouse gas emissions than coal or oil (25–40% lower, per unit of generated electricity), natural gas still creates emissions when it is produced, processed, and transported … Finally, a decrease in natural gas reserves has meant a doubling of its price – with wild price fluctuations – both of which make it a less attractive and more volatile alternative for electricity generation than efficiency strategies and renewable energy. …Canada's reserves are dwindling. Based on proven reserves and 2002 production figures, Canada has only nine years of production unless new reserves are discovered. In the long run, increased supply will not be able to match demand. … 'many of the new fields coming on stream are small and quickly depleted.' This reality will keep natural gas prices high in North America, and may potentially increase them further."
… the option of using natural gas as a "transition fuel" also poses risks. That is because the pipelines required to transport natural gas from its source to power plants are expensive. High pipeline costs have to be spread out by building several gas-fired power plants that last a generation or more." (Suzuki Foundation submission to the Ontario Power Authority, Fall, 2005)

(iv) Emissions reductions technology installed at Nanticoke Generating Station would reduce emissions to a level comparable with natural gas, for 20% of the cost of conversion to gas.
(See pages 22-24)

(v) "... if currently existing remediation technology were used, the air quality effects from coal fired power plants are comparable to those from natural gas plants and neither could be distinguished from the regional background at distances more than a few km from the source. … "currently existing remediation technology on the coal plant reduces both the SO_2 and NO_X contributions to about 0.3% when averaged across southern Ontario and about 1% within 20 km of the largest plant".
("A Regional Modeling Study of the Effects on Air Quality of Electric Power Generation by Fossil Fuels" Waterloo Centre for Atmospheric Sciences, May 26, 2006)

(vi) Currently available emissions reduction technology can successfully remove 85-95% of air pollutants associated with coal fired generating facilities. This is verified by information from the Ontario Ministry of the Environment, the Ontario Power Authority, and OPG statistics from Lambton Generating units 3 and 4, as reported in the government's Cost Benefit Analysis. Likewise, mercury and other metals can be reduced 80-90+%.

(vii) "Proven and cost-effective emission control technologies are available that can be added to existing coal stations to achieve significant reductions. Selective Catalytic Reduction (SCR) can reduce NOx emissions 80%, while de-sulphurization scrubbers can reduce SO_2 emissions by 90+ percent. …" (Ministry of the Environment, "Coal-Fired Electricity Generation in Ontario")

(viii) "...there is a significant difference between coal's perceived image and its real performance." Coal is not part of the problem of sustainable development. "... Coal is part of the solution. Coal can be and will be increasingly clean." (World Energy Council "Sustainable Global Energy Development: The Case for Coal")

(ix) Nanticoke, being a point source of substantial size, "presents an opportunity to substantially reduce emissions" in one action.

(x) Ozone concentrations in urban areas are expected to worsen with the use of natural gas generation. (Cost Benefit Analysis: Replacing Ontario's Coal-Fired Electricity Generation) This is confirmed by the Ontario Power Authority.

"Scientists point to the smaller particulates — those that measure less than 10 microns - and the smallest particulates - those that measure less than 2.5 microns - as being particularly of concern. These particulates can reach deep within the lung or can enter the bloodstream and cause damage throughout the body." (Ontario Clean Air Alliance)
A report prepared for the Ministry of Energy states that "The scientific evidence demonstrating that the $PM_{2.5}$ fraction accounts for many health damages has increased substantially over the last five years. Accordingly, health damages were forecast largely based on PM 2.5 concentrations." This report also states that "All particulate from gas turbines is on the order of 1 micron, hence all PM is assumed to be PM2.5." (natural gas combined cycle facilities)
(Cost Benefit Analysis: Replacing Ontario's Coal-Fired Electricity Generation, prepared for the Ministry of Energy, April 2005)

(xi) Converting Nanticoke Generating Station to natural gas will have marginal, if any, benefit regarding greenhouse gas reduction. Although natural gas produces less CO_2 emissions at point

of combustion, when life cycle emissions are considered natural gas may be worse than coal fired generation. (See pages 26-29)

(xii) Nanticoke Generating Station is a large facility, producing the equivalent power of 8 standard natural gas fired power plants. As such, it is the largest point source of emissions. If converted to natural gas, it would still be Ontario's single largest source of both air contaminant and greenhouse gas emissions.

(xiii) Electricity produced from natural gas costs double to triple that from coal fired power. Costs are expected to accelerate higher due to predicted fuel supply concerns. North American demand for natural gas is outpacing production. The Ontario Power Authority advises that gas prices will climb by the middle of the next decade due to depletion of the Alberta Basin, where most of Ontario natural gas comes from.

(xiv) The Ontario Energy Board indicates that the volume of gas required to replace coal-fired generation will exceed that currently used by all Ontario residential consumers combined. Nanticoke Generating Station would represent 2/3 of that required volume of gas.

(xv) The general public has indicated to the OPA that a healthy provincial economy is the ultimate criteria for power planning decisions. Ratepayers are likewise unwilling to pay significantly more for electricity from natural gas generation. In a poll conducted for the OCAA in March, 2003, respondents were asked whether they would be willing to pay a 3% increase in hydro bills in order to support the conversion of Nanticoke to natural gas. The majority, 52%, were unwilling. In reality, the conversion to gas would cost considerably more than 3%, more likely 30%. "… replacing Ontario's coal fired capacity with solely natural gas-fired plants would cost Ontario consumers between $800 million and $1.3 billion annually, depending on gas price assumptions over the life of the plants." (Ontario's Power Problems", December, 2004, CERA)

Conclusion:

Switching Nanticoke Generating Station to natural gas will provide negligible environmental benefit, to Hamilton and the Province, at great cost to rate and taxpayers. Significant use of natural gas for electricity generation, at 35%- 50% efficiency, will hasten the depletion of this valuable resource more prudently used for home heating and industrial processes, at 95% efficiency. A wiser choice would be to maintain publicly owned, paid-for coal generating assets in optimum condition, with the installation of best available environmental upgrades.

3. Motion to "Move With Speed" to Close Nanticoke, or Convert to Natural Gas

(i) The Ontario Power Authority has been given a government directive regarding the closure of Nanticoke GS at the earliest possible time. It is acknowledged however that the removal of coal power is not as simple as plugging out one form of electricity and inserting another. The power grid is based on science and economics, as well as environmental factors. The complexities and realities overrule political will, however good intentioned it may be.

(ii) The Ontario Power Authority has advised the Premier that without retaining coal fired plants in the generation mix, there are insufficient resources to ensure adequate generating capacity and system reliability through to 2014. Nuclear units will be taken out of service for refurbishment or replacement, new resources and transmission infrastructure simply will not be available to allow for coal replacement any sooner, and probably later. The OPA power plan anticipates many changes and uncertainties through the next decade. Retaining the reliability of coal fired generation, with the implementation of best available emissions reduction technology, will stabilize the power system as significant changes are made in the supply portfolio.

(iii) Nanticoke provides necessary reactive power and voltage support to the system. Nanticoke and sister stations currently provide vital intermediate and peak load power. These plants have optimum load following capabilities, quick response balancing ability and dispatch flexibility which are necessary in meeting the constant fluctuations in power demand throughout the day. The reliability and affordability of coal generation makes it "an important component of the present supply mix … supporting the security of the electricity system and in helping to manage uncertainties caused by the unavailability and/or reduced capacity of other generating plants." (Ontario Power Authority)

(iv) The Premier acknowledges that poor advice led to incorrect assumptions about the coal closure timeline. Power production and planning is a complex procedure with many variables to be simultaneously considered - security, reliability, the economy and the environment.

Conclusion

Moving with "great speed to close Nanticoke" is likely not in the best interests of the province – reliability and security of power supply would be compromised. There are many options which can be considered. We would ask you to not support this resolution on these grounds.

We thank you in advance for your consideration of this input, which we have verified and substantiated in the sections following. Members of the CAE Alliance would be pleased to meet with any Committee or Council members to discuss any of these issues.

Yours truly,

Carol Chudy
Co-Chair, CAE Alliance

SUPPLEMENTARY INFORMATION

AIR QUALITY IMPACT OF ONTARIO'S COAL FIRED POWER PLANTS

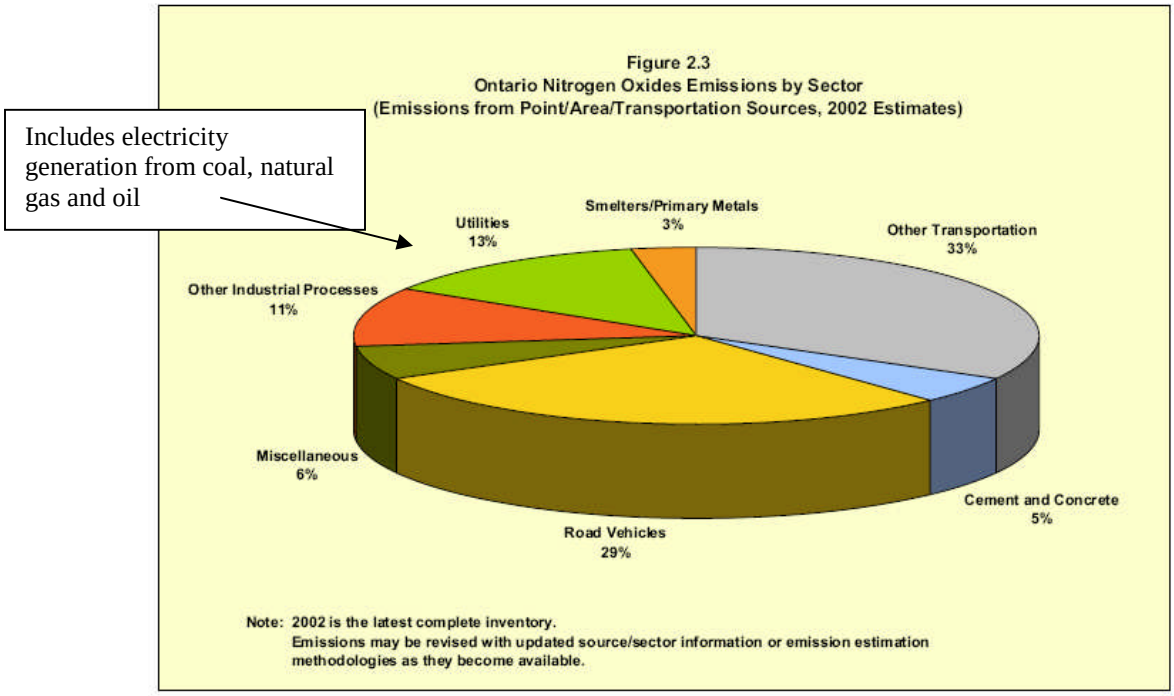
♦ When transboundary pollution is considered, the net impact of Ontario's coal fired power plants on provincial air quality is less than 7%, likely much less.

♦ According to the Ministry of the Environment, the emissions contaminants of concern to health and the environment are O_3, i.e. ground level ozone comprised of nitrogen oxides (NO_x) + volatile organic compounds (VOCs); sulphur dioxide (SO_2); carbon monoxide (CO), and particulate matter (PM).

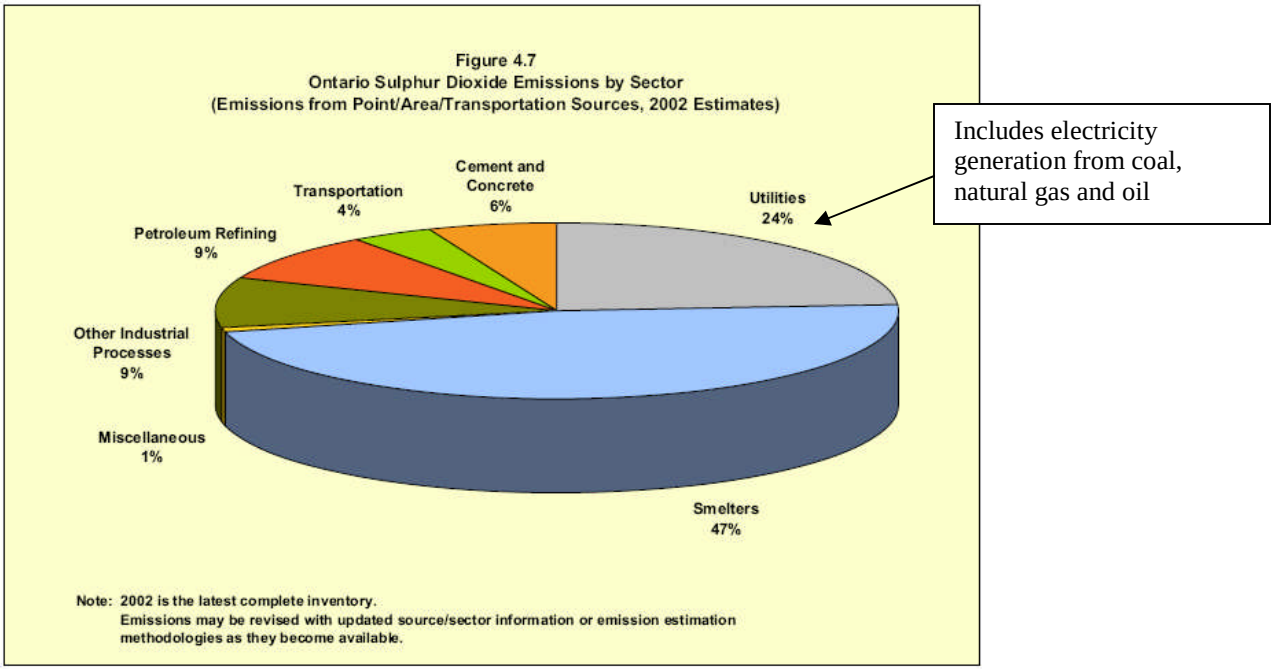
♦ Coal fired generation contributes an insignificant amount to 3 of these pollutants. Using Environment Canada Criteria Air Contamination information, the total contribution from electricity generation in Ontario for CO is 0.488%; PM $_{2.5}$ is 1.438%, PM $_{10}$ is 0.833%; VOCs 0.125%. (Transportation is the main source for CO and VOCs.)

♦ Coal fired power generation contributes more significantly to NO_x and SO_2, approximately <13% and 24% respectively. However, 80% - 95% reduction of these emissions can and are being achieved.

♦ As part of the government initiatives to lessen the impact of air contaminants, "The province has in place a regulation (O. Reg. 397/01) that establishes annual caps with respect to NO_x and SO_2 emissions from Ontario Power Generation's (OPG) fossil fuel power plants and the electricity sector." (Ministry of the Environment) OPG fossil fuel facilities meet these established criteria.



(Ministry of the Environment, Air Quality in Ontario, 2005)



(Ministry of the Environment, Air Quality in Ontario, 2005)

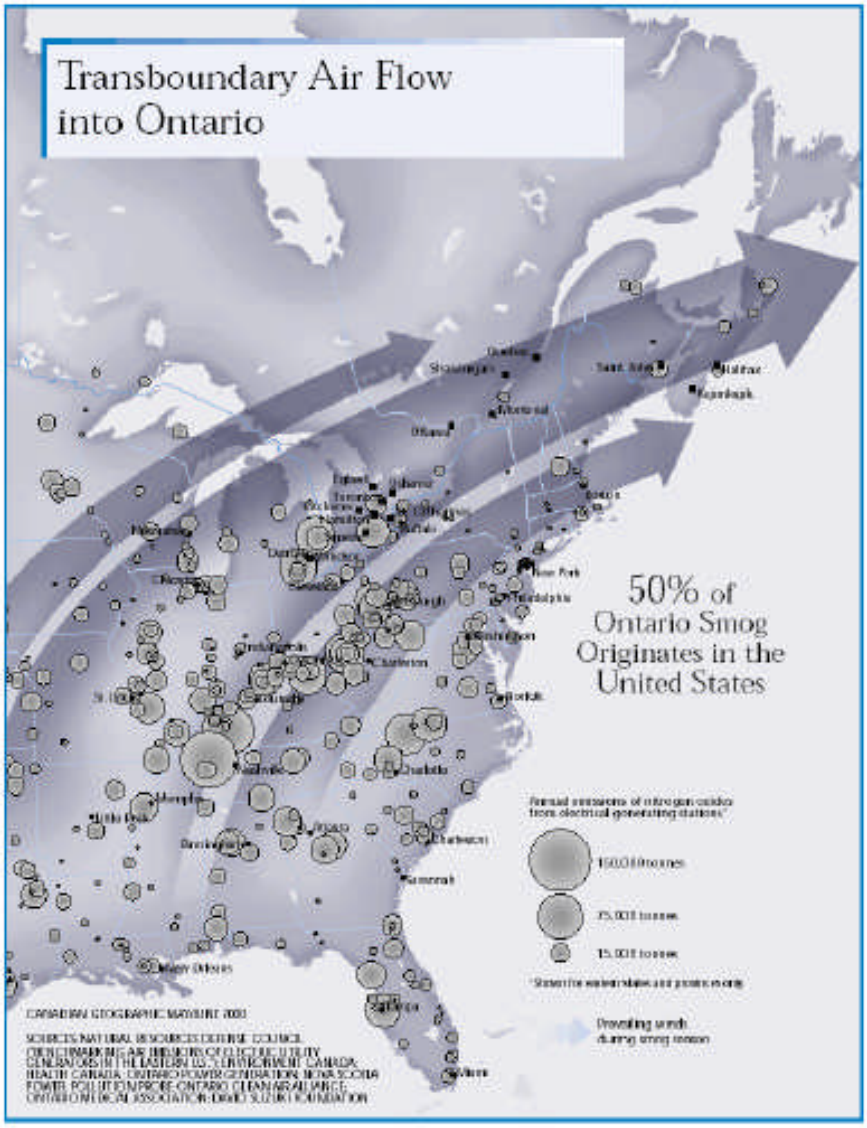
♦ Ozone and fine particulate matter ($PM_{2.5}$), the major components of smog, continue to exceed the ambient air quality criteria and remain the pollutants of most concern. Emissions of NO_x, SO_2 and CO have decreased significantly over the past 35 years and do not exceed government criteria standards. (Ontario Ministry of The Environment, Air Quality in Ontario, 2005 – latest edition)

TRANSBOUNDARY IMPACT

It is important to note that 55% of Ontario's air contaminant emissions originate in the U.S. "Background" emissions, described as "natural and human sources from outside of North America, together with natural sources within North America", also contribute significantly to Ontario air quality.

♦ "Summer smog episodes in Ontario are often a part of a regional weather condition that prevails over much of northeastern North America. Elevated levels of ozone and PM2.5 are typically due to weather patterns that affect the lower Great Lakes region. … and result in the long range transport of smog pollutants from neighbouring U.S. industrial and urbanized states…" (Ministry of the Environment)

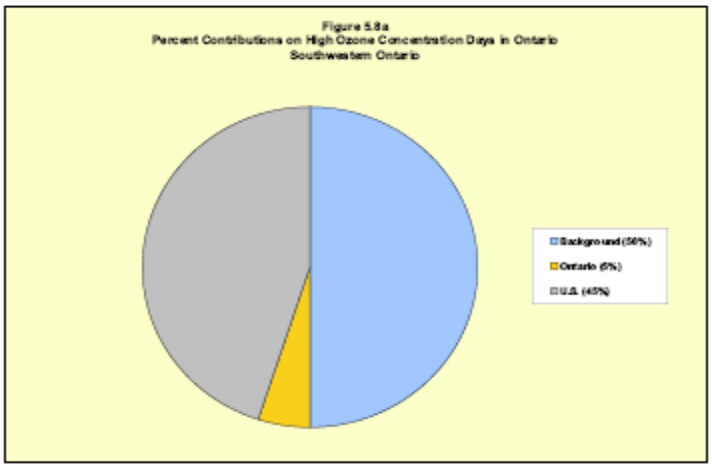
♦ Significant amounts of Ontario's ozone levels during widespread smog episodes are due to long-range transport of ozone and its precursors (NO_x and VOCs) from neighbouring U.S. states. This U.S. contribution, excluding background levels, is expected to be as much as 90 per cent in Ontario cities and towns on the northern shore of Lake Erie including Port Stanley and Simcoe, the eastern shores of Lake Huron and Georgian Bay such as Parry Sound, and in the extreme southwest near the U.S. border such as Windsor. (Ministry of the Environment)



♦ Regarding precursor emissions for ozone, "Ontario's NOx emissions in the regional air shed (comprised of Ontario and 22 neighbouring mid-western and eastern U.S. states) are about 6 % of the total NO_x emitted and about 7% of the total anthropogenic VOC emitted."
Emissions from coal plants are 13% of the 6% NO_x, 0/125% of the 7% VOCs.
(Transboundary, Air Pollution in Ontario, June 2005, Ministry of the Environment)

♦ Acidic pollutants are also transported from the U.S., so that Canadian sources in the region, which includes Ontario, "emit less than 10 % of total sulphur dioxide (SO_2) and NO_x emissions."
(Transboundary, Air Pollution in Ontario, June 2005, Ministry of the Environment)

♦ "Based on U.S. (1999) and Canada (2000) emission inventories, Ontario's SO2 emissions account for approximately 6 % of the combined total in the Ontario and neighbouring U.S. airshed." (Transboundary, Air Pollution in Ontario, June 2005, Ministry of the Environment)

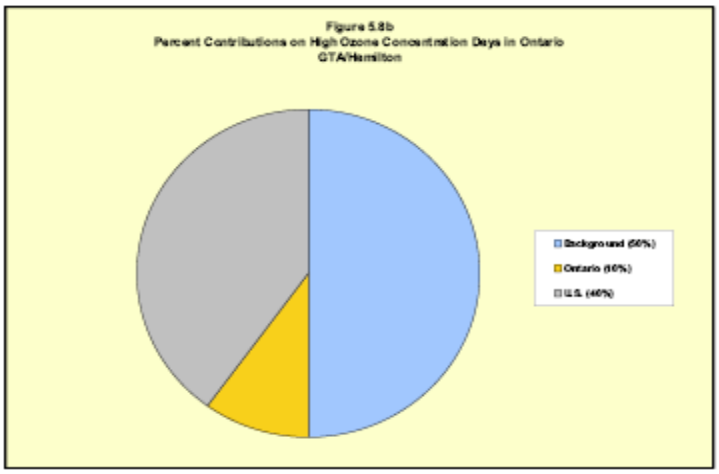


% Contributions on High Ozone Days in Southwestern Ontario

* Background - 50%

US Sources - 45%

All Ontario Sources – 5%

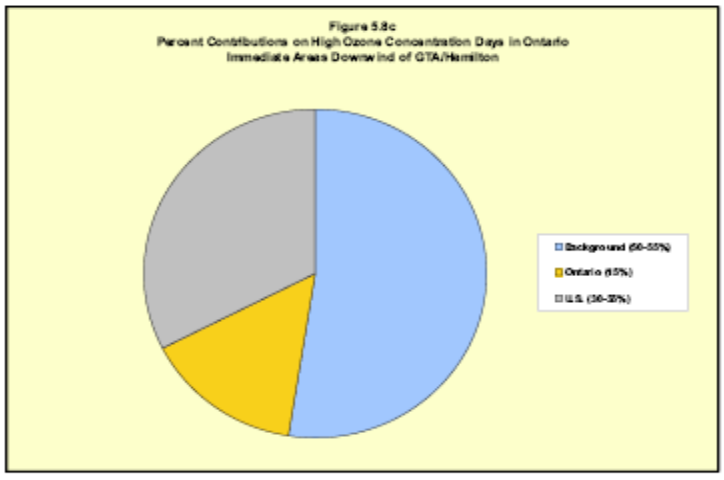


% Contributions on High Ozone Days in GTA/Hamilton

* Background - 50%

US Sources - 40%

All Ontario Sources – 10%



% Contributions on High Ozone Days Downwind of the GTA/Hamilton

* Background - 50%

US Sources - 30-35%

All Ontario Sources – 15%

* Background ozone concentrations refer to the contributions at a given location in Ontario that are primarily the result of manmade and natural emissions from outside North America and natural sources within North America. (Air Quality in Ontario, 2005 - Ontario Ministry of the Environment)

♦ "On days of low ozone concentrations, contributions from background ozone concentrations are expected to dominate, as the anthropogenic sources would not be expected to contribute much to the observed levels. … Background contributions were estimated to be about 75-80% for the GTA/Hamilton and 80-85% downwind of GTA/Hamilton." (Air Quality in Ontario, 2005)

♦ Results from studies performed with atmospheric modeling indicate that when ozone levels in Ontario are above the Canada Wide Standard, Ontario emissions contribute at most 16 % of the problem, about 1% in Windsor, to 9% in the GTA, 16% downwind of the GTA/Hamilton area, and 7% in the Kingston area.

♦ The closure of Lakeview Generating Station has not led to a reduction in smog or smog days in the GTA. In fact, there have been more and heavier smog days since the closure of Lakeview. The primary cause of air pollution in the Toronto area is transportation (together with transborder/U.S. air emissions). The closure of Lakeview just prior to the dry, hot summer of 2005 left the province, and the GTA in particular, vulnerable to load reductions, brown outs and potential blackouts.

♦ "In recent years New York has been particularly critical of emissions from Ontario, and most specifically emissions from Ontario Power Generation's Nanticoke Generating Station on Lake Erie. The question is "to what degree do Ontario emissions impact downwind jurisdictions?
To address those concerns and in particular those of New York, modelling runs done as part of the recent study were assessed for sub-regions representative of U.S. jurisdictions. … Ontario's impacts on high ozone days in the Upper New York state and Vermont/New Hampshire region were small at approximately three per cent." (Transboundary Air Pollution in Ontario)
Ontario emissions contribute up to approximately 20 per cent of the PM2.5 loadings in the upper state New York area on average days and about 7 per cent in Vermont and New Hampshire."
Due to direction of prevailing winds, a significant portion of this would originate from transportation in the GTA and industry in the Nanticoke/Hamilton/Toronto corridor.

CONCLUSION

Ontario air quality is significantly impacted by natural sources of emissions, and by human contributions outside of North America, and from the U.S. that enter our air shed.

Of the air contaminants of particular concern:

NOx and SO2 emissions from manmade Ontario sources are less than 10%.
Coal fired power is responsible for less than 13% and 24% respectively of this 10% portion (total 1.3% and 2.4%.)

Regarding Particulate Matter, both primary and secondary, Ontario contributions account for a maximum of 49% in the GTA. Coal fired power contributes about 1% to the percentage of primary emissions.
Ozone contributions from Ontario sources are reported as less than 16%. Coal fired generation contributes according to chemical mixture of NOx (maximum 13%) and VOCs (0.125%).

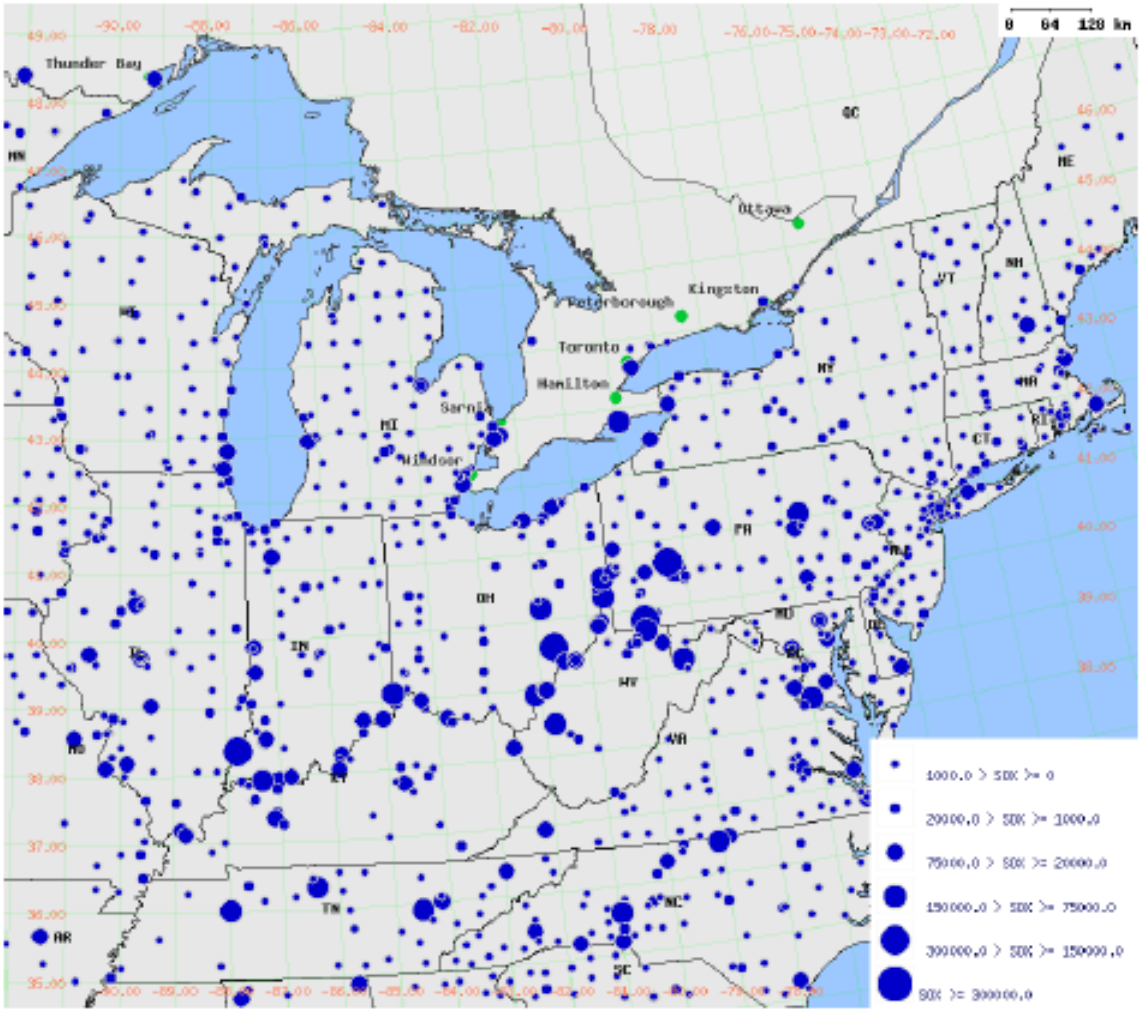


Figure A-4: Sulphur dioxide emissions from power plants shown as dots that vary in size according to their emission inventories
U.S. 1995 (with 2001 updates) and Canada 1999 Emission Inventories
(source: Ontario Ministry of the Environment)

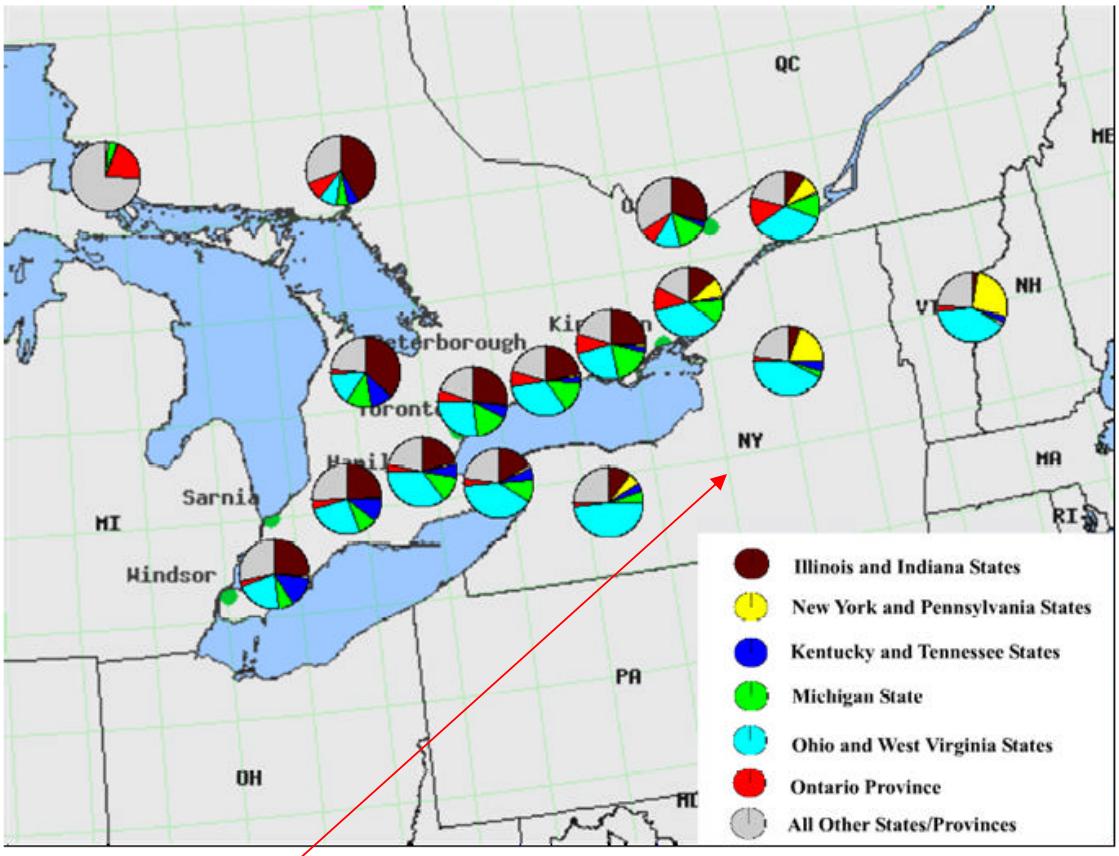


Figure A-3: Regional Contributions to Sulphate at Selected Sites for Predicted Averages on July 16, 1998.
(source: Ontario Ministry of the Environment)

Note: Insignificant portion of Ontario contribution to New York, Vermont, New Hampshire

OZONE

Transboundary Emissions vs Ontario Contributions

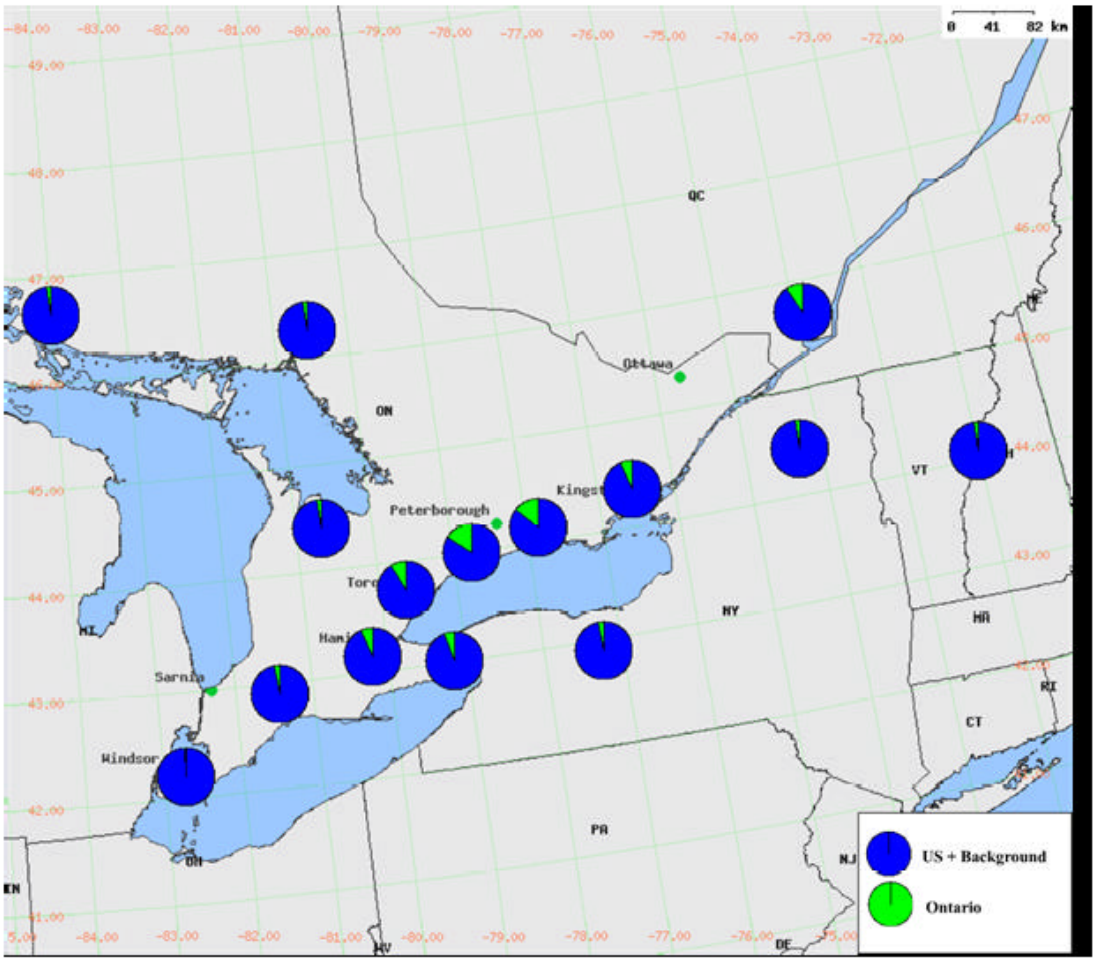


Figure 3.4: Graphic of Transboundary vs. Ontario Contribution for Ozone on High Concentration Days during 1998 Spring/Summer Season.
(source: Ontario Ministry of the Environment)

This period of high ozone occurred at a time when coal fired generation contributed high electricity production due to significant reduction in nuclear generation.

PARTICULATE MATTER

Transboundary Emissions vs Ontario Contributions

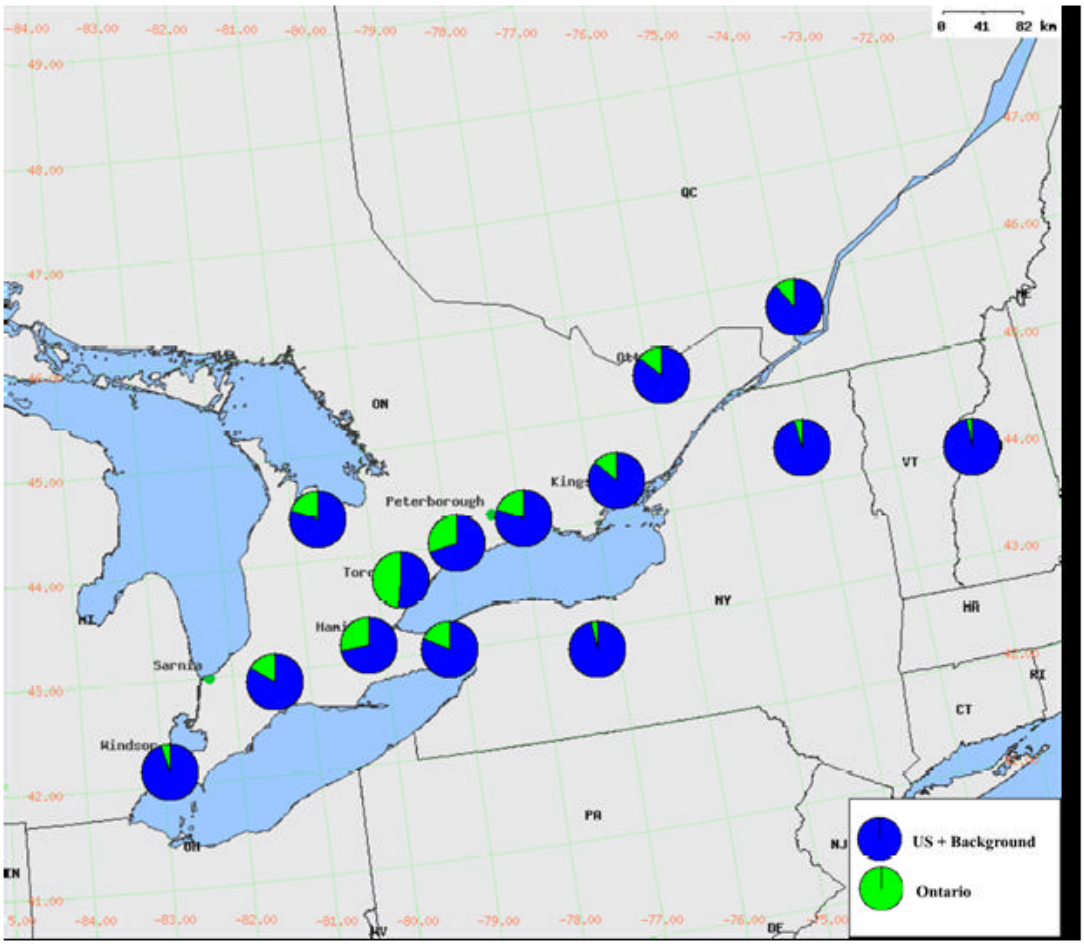


Figure 3.5: Graphic of Transboundary vs. Ontario Contribution for $PM_{2.5}$ on High Concentration Days during 1998 Spring/Summer Season.
(source: Ontario Ministry of the Environment)

This period of high ozone occurred at a time when coal fired generation contributed high electricity production due to significant reduction in nuclear generation.

PM 2.5 originates from particles emitted directly from sources and from particles formed in the atmosphere. The precursor gases SO2, NOx, ammonia and certain VOCs react in the atmosphere to form ammonium sulphates, ammonium nitrate and organic particles. Air quality models include all of these components.

IMPACT OF NANTICOKE GENERATING STATION ON AIR QUALITY IN HAMILTON

The following charts show the various pollutants of concern, together with a summary of health and environmental impacts, and a summary of the overall air quality in Hamilton. The information is compiled from the Ministry of the Environment, which uses an extensive network of air quality monitoring sites across the province to develop the Air Quality Index (AQI).

Table 5.1: Air Quality Index Pollutants and Their Impacts*

Index	Category	Ozone (O_3)	Fine Particulate Matter ($PM_{2.5}$)	Nitrogen Dioxide (NO_2)	Carbon Monoxide (CO)	Sulphur Dioxide (SO_2)	Total Reduced Sulphur (TRS) Compounds
0-15	Very good	No health effects are expected in healthy people	Sensitive populations may want to exercise caution	No health effects are expected in healthy people	No health effects are expected in healthy people	No health effects are expected in healthy people	No health effects are expected in healthy people
16-31	Good	No health effects are expected in healthy people	Sensitive populations may want to exercise caution	Slight odour	No health effects are expected in healthy people	Damages some vegetation in combination with ozone	Slight odour
32-49	Moderate	Respiratory irritation in sensitive people during vigorous exercise; people with heart/lung disorders at some risk; damages very sensitive plants	People with respiratory disease at some risk	Odour	Blood chemistry changes, but no noticeable impairment	Damages some vegetation	Odour
50-99	Poor	Sensitive people may experience irritation when breathing and possible lung damage when physically active; people with heart/lung disorders at greater risk; damages some plants	People with respiratory disease should limit prolonged exertion; general population at some risk	Air smells and looks brown; some increase in bronchial reactivity in asthmatics	Increased symptoms in smokers with heart disease	Odour; increasing vegetation damage	Strong odour
100-over	Very poor	Serious respiratory effects, even during light physical activity; people with heart/lung disorders at high risk; more vegetation damage	Serious respiratory effects even during light physical activity; people with heart disease, the elderly and children at high risk; increased risk for general population	Increasing sensitivity for asthmatics and people with bronchitis	Increasing symptoms in non-smokers with heart diseases; blurred vision; some clumsiness	Increasing sensitivity for asthmatics and people with bronchitis	Severe odour; some people may experience nausea and headaches

* Please note that the information in this table is subject to change.

Table 5.2: Air Quality Index Summary (2005)

City/Town	Valid Hours	Percentage of Valid Hours AQI in Range					No. of Days At Least 1 Hour > 49
		Very Good 0-15	Good 16-31	Moderate 32-49	Poor 50-99	Very Poor 100+	
Hamilton Downtown	8625	42.1	43.7	13.2	1.0	0	20
Hamilton Mountain	8732	31.6	52.6	14.4	1.4	0	24
Hamilton West	8754	43.3	44.5	11.7	0.5	0	15

♦ Air Quality Indices

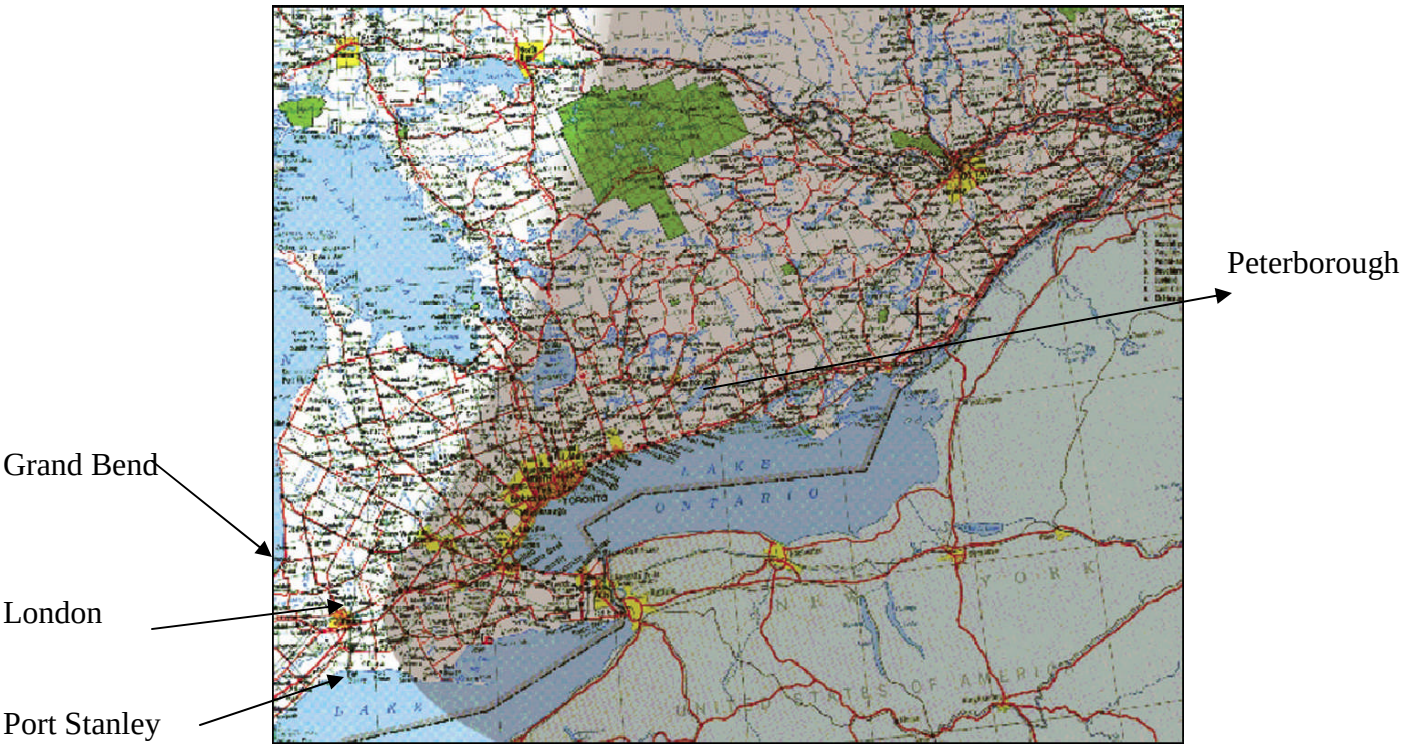
The Ministry of the Environment operates an extensive network of air quality monitoring sites across the province. The AQI (Air Quality Index) is based on a recording of pollutants that have adverse effects on human health and the environment.

If the AQI value is below 32, the air quality is categorized as good. For AQI values in the 32-49 range (moderate category), there may be some adverse effects for very sensitive people. For index values in the 50-99 range (poor category), the air quality may have adverse effects for sensitive members of human and animal populations, and may cause significant damage to vegetation and property. With an AQI value of 100 or more (very poor category), the air quality may have adverse effects for a large proportion of those exposed.

♦ 2005 was particularly hot, smoggy summer. Due to decreased availability of hydroelectric power (lower water levels) and increased air conditioning use, coal fired power was required more frequently. From the chart above (page 18), we note that Hamilton air quality was rated good or very good an average of 86% of the time; moderate 13% of the time. The impact on "moderate" air quality days, as noted above, "may have some adverse effects for very sensitive people". Therefore, for 99% of the time most people would not be impacted.

CONCLUSION:

Considering that total Ontario manmade contributions to provincial air quality are 16% or less in the Hamilton area, and that Ontario coal fired power plants contribute a fraction to that 16% (13% of Ontario NOx totals; 24% of SO2 totals; and less than 1% to PM, CO and VOCs), it is obvious that Nanticoke Generating Station does not "contribute significantly to poor air quality and adverse health effects - specifically respiratory and cardiac illness in Hamilton".



This map, from the Ontario Clean Air Alliance information on Nanticoke Generating Station, purports to show the impact of emissions from Nanticoke.

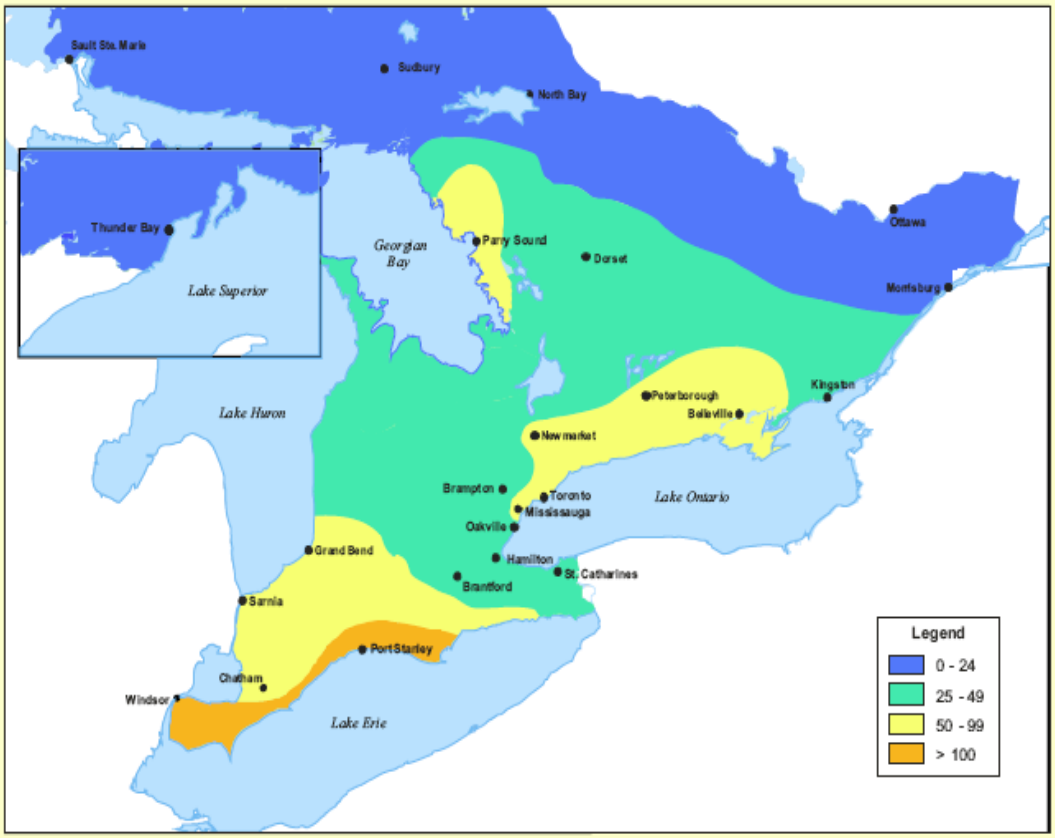
However, as we noted earlier, Nanticoke contributes less than 1% to primary particulate matter emissions, carbon monoxide, and volatile organic compounds.

The emissions of NOx and SO2 are reported as contributing 1-2% and 3-4% respectively in southern Ontario; 8% and 10% respectively within 20 kms of Nanticoke.

The Ontario Ministry of the Environment monitors 38 stations provincially. The reporting on ozone indicates that:
- highest annual mean was 34.6 parts per billion (ppb) at Port Stanley
- for urban sites, highest one hour ozone concentration (116 ppb) was in Chatham; greatest number of ozone instances above air quality allowances was Windsor (150), and highest annual mean was recorded in Peterborough (31.2 ppb)
- for rural sites, Grand Bend had highest one hour concentration (131 ppb); Port Stanley had the most instances (172) above allowable criteria, followed by Grand Bend (98)

The sites are outside of the range of any significant impact of Nanticoke Generating Station. The Ontario Ministry of the Environment concludes that these areas receive higher concentrations of pollution from the U.S.

Figure 2.5
Geographical Distribution of Number of One-Hour Ozone Exceedances Across Ontario
(2005)



Higher ozone excedences were recorded on the northern shores of Lakes Erie and Ontario and the southeastern shores of Lake Huron and Georgian Bay. This is attributed to the long range transport of pollutants from the U.S. ("Transboundary Air Pollution in Ontario", Ministry of the Environment)

"The increases in summer and winter ozone means appear to be largely related to rising global background ozone concentrations throughout Ontario. There are indications that global background ozone concentrations have been increasing by 0.2 2 per cent per year in recent years. Potential contributions to the increases in the summer composite means may be related to meteorological factors and long range transport of ozone and its precursors from the U.S." (Air Quality in Ontario, 2005, Ministry of the Environment)

AIR EMISSIONS REDUCTION TECHNOLOGY

♦ The Ministry of the Environment has acknowledged the significant gains that are available through the use of existing and cost effective emissions abatement technology to reduce contribution of Ontario's coal plants to the 2 smog and acid gas precursors, NO_x, SO_2.

♦ "Proven and cost-effective emission control technologies are available that can be added to existing coal stations to achieve significant reductions. Selective Catalytic Reduction (SCR) can reduce NOx emissions by up to 80%, while de-sulphurization scrubbers can reduce SO_2 emissions by 90+ percent. …" (Ontario Ministry of the Environment, "Coal-Fired Electricity Generation in Ontario")

♦ The Ministry has joined with other agencies to encourage the adoption of technologies that would reduce emissions from U.S. coal fired power plants by up to 90% into the regional air shed.

♦ A recent report completed by the University of Waterloo's Department of Chemistry compared the effects on air quality of coal and natural gas electricity generation. This study concludes that "... if currently existing remediation technology were used, the air quality effects from coal fired power plants are comparable to those from natural gas plants and neither could be distinguished from the regional background at distances more than a few km from the source."
("A Regional Modeling Study of the Effects on Air Quality of Electric Power Generation by Fossil Fuels" Waterloo Centre for Atmospheric Sciences, May 26, 2006)

♦ This study, funded in part by the Ontario Ministry of the Environment, reports that the 4 operating coal plants in Ontario contribute 3-4% of the total SO_2 and about 1-2% of the NO_X in southern Ontario, 10% and 8% respectively within 20 km of the largest facility. However, "currently existing remediation technology on the coal plant reduces both the SO_2 and NO_X contributions to about 0.3% when averaged across southern Ontario and about 1% within 20 km of the largest plant".

♦ The Ministry encourages other industries to employ the same emissions reduction technology that is readily available for coal powered plants, to reduce industrial emissions. The Ministry recognizes the benefit of NO_X abatement technology such as Selective Catalytic Reduction, or SCRs, which reduce emissions by "80-95%", and abatement technology for SO_2 including Dry Flue Gas De-Desulphurization, or "Scrubbers", which reduce emissions "55-95%", as well as Wet Flue Gas Desulphurization systems which reduce emissions "90-98%". ("Appendix II - Ontario's Industry Emissions Reduction Plan: Proposal for a Nitrogen Oxides (NO_X) and Sulphur Dioxide (SO2) Regulation", June, 2004)

♦ "There are sectors in Ontario where a few point sources are responsible for a sizeable percentage of smog pollution. ... Point sources present an opportunity to substantially reduce emissions by encouraging or requiring reductions from a small number of emitters." (Ontario's Clean Air Action Plan: Protecting Environmental and Human Health in Ontario) Therefore, the larger the facility (ie Nanticoke Generating Station), the greater the opportunity to make sizeable reductions in one sweep, for one cost.

♦ Electrostatic precipitators installed at coal fired power plants, including Lambton Generating Station, reduce approximately 99% of particulate matter. A dry ESP removes 99% of particulate, a wet ESP would remove over 95% of the remaining 1%. (This represents superior reduction of PM than natural gas use.)

Mercury Emissions

♦ According to Ontario Power Generation documentation provided to the National Pollutant Release Inventory, pollution reduction technology installed primarily to reduce NO_X and SO_2, has had the co-benefit of capturing 95% of mercury in the flue gas.

♦ The US Department of Energy indicates that mercury can be reduced 80%-90%+ using combined scrubber/SCR technology.

♦ "Essentially all coal-fired power boilers in Germany are equipped with both SCR systems and limestone based wet scrubbers. Total mercury capture in these systems exceeds 80% system-wide." ("How Low Can We Go?", Babcock & Wilcox) Germany uses coal fired generation for 50% of its power needs.

♦ According to Environment Canada, "a review of current literature, suggests that capture of mercury from ... coal-fired power plants ... on the order of 60-90% is achievable. ..." This report lists both current and emerging technologies, with removal rates for each, affirming the conclusion that mercury emissions reductions of 60-90% are achievable by 2010. (Submission filed by Environment Canada to U.S. EPA, March 30, 2004)

♦ In a presentation made by the Ontario Ministry of the Environment to the Great Lakes Bi-national Toxics Strategy Mercury Work Group on May 17, 2005, it was noted that Nanticoke Generating Station "is achieving more than 60% capture of mercury in coal burned through existing pollution control equipment and fuel blending". Nanticoke has not yet been outfitted with scrubbers, as has Lambton Generating Station.

♦ Mercury removal of at least 90% can be achieved by methods developed by Babcock, Wilcox which involve low cost and collection of mercury that ensures that it will not be re-emitted to the environment. ("How Low Can We Go?") Other mercury emissions reduction technologies (Eco System – Power Span Corp.) are in process, or development.

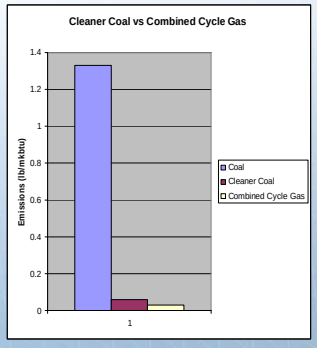
♦ "...many stakeholders do not realize that there is a significant difference between coal's perceived image and its real performance." Coal is not part of the problem of sustainable development. ... Coal is part of the solution. Coal can be and will be increasingly clean." (World Energy Council "Sustainable Global Energy Development: The Case for Coal")

Coal fired Generation can be one of the cleanest power generation alternatives

Smog causing emissions reduction:

- Cleaner Coal - 96.4%
- Replacement with Natural Gas Combined Cycle – 97.3%

Item	Emissions g/MWh	
	Gas	Coal
NOx	26	163
CO	104	49
VOC	16	0
PM2.5	29	8
PM10	0	0
SO_2	2	82
NH_3	42	0
Total	**224**	**302**



Many people are unaware that current technology can be applied to existing coal power plants to make them very nearly as clean as modern, efficient Natural gas turbine combined cycle power plants. Application of these technologies in Ontario would reduce smog and acid rain causing emissions by more than 96%. **BABCOCK & WILCOX (with permission)**

POWERSPAN

Electro-Catalytic Oxidation (ECO®)

- SO_2 >99%
- NO_x ⟨90% (from 0.40 lb/mmBtu inlet or less)
- Hg 85%, and other metals >95%
- Fine particulate ($PM_{2.5}$) <0.01lb/mmBtu outlet
- Hazardous air pollutants (HAPs), such as SO_3, HCl, and HF, >95%

CLEAN AFFORDABLE ENERGY Alliance

OPTIONS FOR NANTICOKE GENERATING STATION

	SHUT DOWN	CONVERT TO GAS	REPLACE WITH NUCLEAR	INSTALL EMISSIONS CONTROLS
TECHNICAL FEASIBILITY	Will create grid transmission problems	• Very inefficient way to burn nat gas • Will require major infrastructure expansion for natural gas	Major technical challenges	• Simple "off the shelf" proven technology • Already in use at NGS and LGS
TIME TO IMPLEMENT	Not before 2014	3 to 5 years	10+ years	3 years
COST OF ELECTRICITY	Replacement is 2 to 3 times that of coal • Low cost coal sets electricity price 50% + of the time	2 to 3 times the cost of coal • Low cost coal sets electricity price more than 50% of the time • Gas will set the market price	Double the price of coal • Gas would be the price setter	Least cost • Project pay back in 3 years • Retains coal as price setter
IMPACT ON GRID	Will create grid transmission problems • Insufficient intermediate resources	Gas best suited for peak load	No load following capability Used for Base load	Excellent load following. Used fo Base, intermediate and peak loading
IMPACT ON COMMUNITY	Significant loss to tax base and jobs	Minor disruption	Significant disruption	Minor disruption
IMPACT ON ONTARIO	• Higher electricity and natural gas prices. • Business closures • Premature disposal of public asset	• Higher electricity and natural gas prices. • Business closures	• Higher electricity prices, but less than cost from natural gas • No impact of price of natural gas	Maintains affordable power • No impact of price of natural gas
AIR QUALITY	• WIll see little change Major source of pollution is cross border and transportation	• WIll see little change Major source of pollution is cross border and transportation	• Minimal emissons to atmosphere	Significantly reduces emissions to levels comparable with natural gas
OTHER ENV. CONCERNS	Requires replacement with natural gas • Little benefit	• CO2 Lifecycle emissions comparable with coal	Disposal of nuclear waste No GHG emissions	Up to 30% reduction in CO2 possible
FEEDSTOCK SUPPLY	Insecure • Natural gas supply will become dependant on on off-shore sources	Approx 10 years proven reserves • Natural gas supply will become dependant on on off-shore sources • Ammount of gas required is equal to that of all Ontario residential users	World wide demand for Uranium increasing	300+ years of supply in N. America
IMPACT OF ACCIDENT/ TERROR ATTACK		Moderate	Significant to catastrophic	Extremely low

GREENHOUSE GASES IN PERSPECTIVE

♦ Reducing CO_2 will not improve smog in our province. CO_2 is not a pollutant or a toxic. (It is an essential component of sustaining life on earth.)

♦ Human contributions represent less than 4% of all greenhouse gas releases. This amount however is increasing and causing concerns regarding climate change potential.
Canadian emissions account for about 2% of this 4%, or 0.08% of these global man made emissions.

♦ Nanticoke Generating Station produces less than 2% of all Canadian greenhouse gases, 0.004% globally. It is a large facility, 4,000 MW, about the size of 7 average natural gas fired facilities combined. If Nanticoke was converted to natural gas, it would still be the largest source of greenhouse gas emissions in Ontario. (See chart 2004 Canadian Greenhouse Gas Emissions, by Sector)

♦ It is acknowledged that replacement resources for coal fired units must closely resemble the generating characteristics of coal in terms of flexibility, load following and balancing ability. (IESO) The only reasonable substitute is natural gas fired generation. Therefore, a "substantial amount" of natural gas generation is committed for intermediate and peaking production that "will, in effect, replace coal-fired generation in Ontario". (OPA) However, this transition to natural gas will not significantly reduce greenhouse gas emissions.

♦ Although natural gas emits about 52.4% - 56.67 % the CO_2 of coal generation at point of combustion. (Environment Canada, Natural Resources Canada), there are significant emissions associated with production, flaring, processing and transport of natural gas.

♦ "Burning gas instead of coal also sounds good and green since it cuts CO_2 emissions in half. In practice it may be the most dangerous energy source of all, because natural gas is 23 times as potent a greenhouse gas as CO_2. … even a 2 percent leak of the natural gas from the production sites to the power stations makes it as bad as burning coal. In practice, the leak rate is 4 percent, so it may be more than twice as bad as burning coal or oil."
(Mr. James Lovelock - address to the Canadian Nuclear Association Annual Seminar, March 10, 2005)

♦ "Although burning natural gas produces fewer greenhouse gas emissions than coal or oil (25-40% lower, per unit of generated electricity), natural gas still creates emissions when it is produced, processed, and transported. These can be significantly higher for natural gas compared to either oil or coal, mostly due to natural gas leaks and the energy required to compress the gas. A full life-cycle analysis shows that greenhouse gas emissions from natural gas-fired power are anywhere from 35% below to 25% above those from coal power … Even using the best-case scenario shows that natural gas is a deficient strategy to address climate change." (David Suzuki Foundation – Submission to the Ontario Power Authority, fall, 2005)

♦ 74% of the methane emissions associated with natural gas are from "production and distribution". (Life Cycle Assessment of a Natural Gas Combined-Cycle Power Generation System National Renewable Energy Laboratory Prepared for the US Department of Energy)

♦ The U.S. Environmental Protection Agency (EPA) reports approximately 19,300 scf/mile/year of natural gas is lost during natural gas pipeline transportation.

♦ Environment Canada reports 1,000 kt CO_2 eq for coal mining; 28,000 kt CO_2 for natural gas mining, plus an additional 27,400 kt CO_2 eq associated with venting and flaring. (2004 Sectoral Greenhouse Gas Emission Summary)

♦ TransCanada Pipelines Ltd. reported 2,148.5 kt CO2 eq emissions at the Kenora Compressor Station from the compression/recompression of natural gas coming into the Province.
♦ "If life cycle analysis was used and other greenhouse gases were taken into account, electricity generation from fuels other than coal would show similar or even higher GHG emissions …" World Energy Council

♦ "In Canada … natural gas is a larger source of carbon dioxide emissions than coal. Natural gas 29.0%; Coal 19.2% (Carbon Dioxide Fact Sheet, 2004)

♦ CO_2 emissions from coal plants can be reduced by:

(i) Co-firing with biomass, as is successfully done in Europe and in preliminary stages at Nanticoke – resulting in 30% reduction in CO_2 ;

(ii) Implementing emissions control technology and other equipment upgrades to increase unit efficiency;

(iii) Re-establishing emissions trading (A practice of OPG prior to coal closure mandate) ;

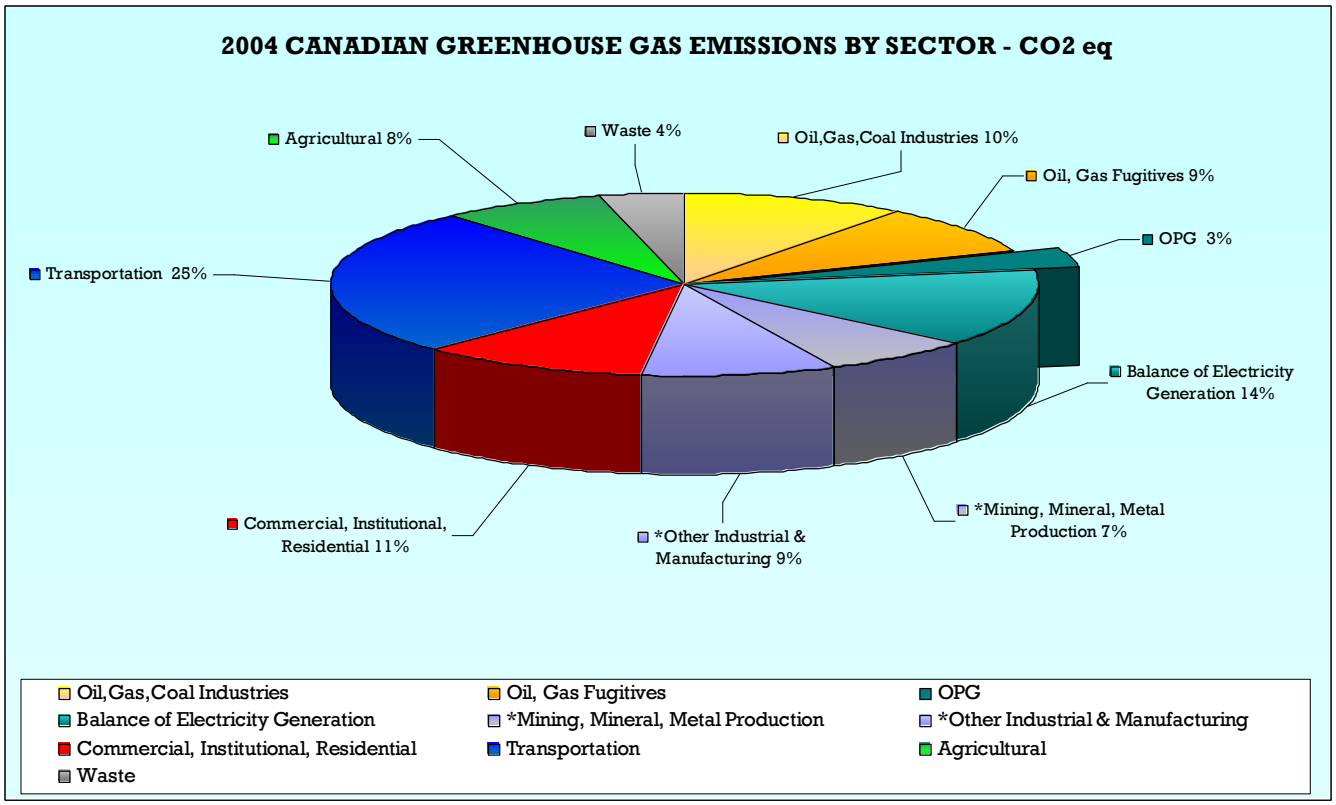
(iv) Using fly ash from coal combustion in cement production. Each tonne of ash used in place of
shale avoids a tonne of carbon dioxide being released into the atmosphere. Nanticoke diverts 300,000 – 400,000 tons of fly ash from land fill to cement companies, offsetting one ton of CO_2 for each ton of fly ash used;

(v) Carbon capture and sequestration, a process that, although still in the developmental stage, is progressing rapidly for market use.

Conclusion

Natural gas fired generation emits about 56% of the CO_2 eq. from coal fired generation at point of combustion. However, when life cycle emissions are considered, and offsets including biomass co-firing with coal are considered, it is debatable whether there is any benefit from switching from coal to natural gas fired generation.

A healthy economy is key to our Kyoto compliance ability. Retaining coal fired generation, with climate change mitigation measures in place, to be used when necessary, will maintain affordable energy while lowering greenhouse gas emissions.



Information obtained from "Environment Canada, Summary of Canada's 2004 Greenhouse Gas Inventory"

*Includes both combustion emissions and process emissions

- Total Canadian Greenhouse Gases 758.0 MT
- OPG (coal) Greenhouse Gas Emissions 26.5 MT

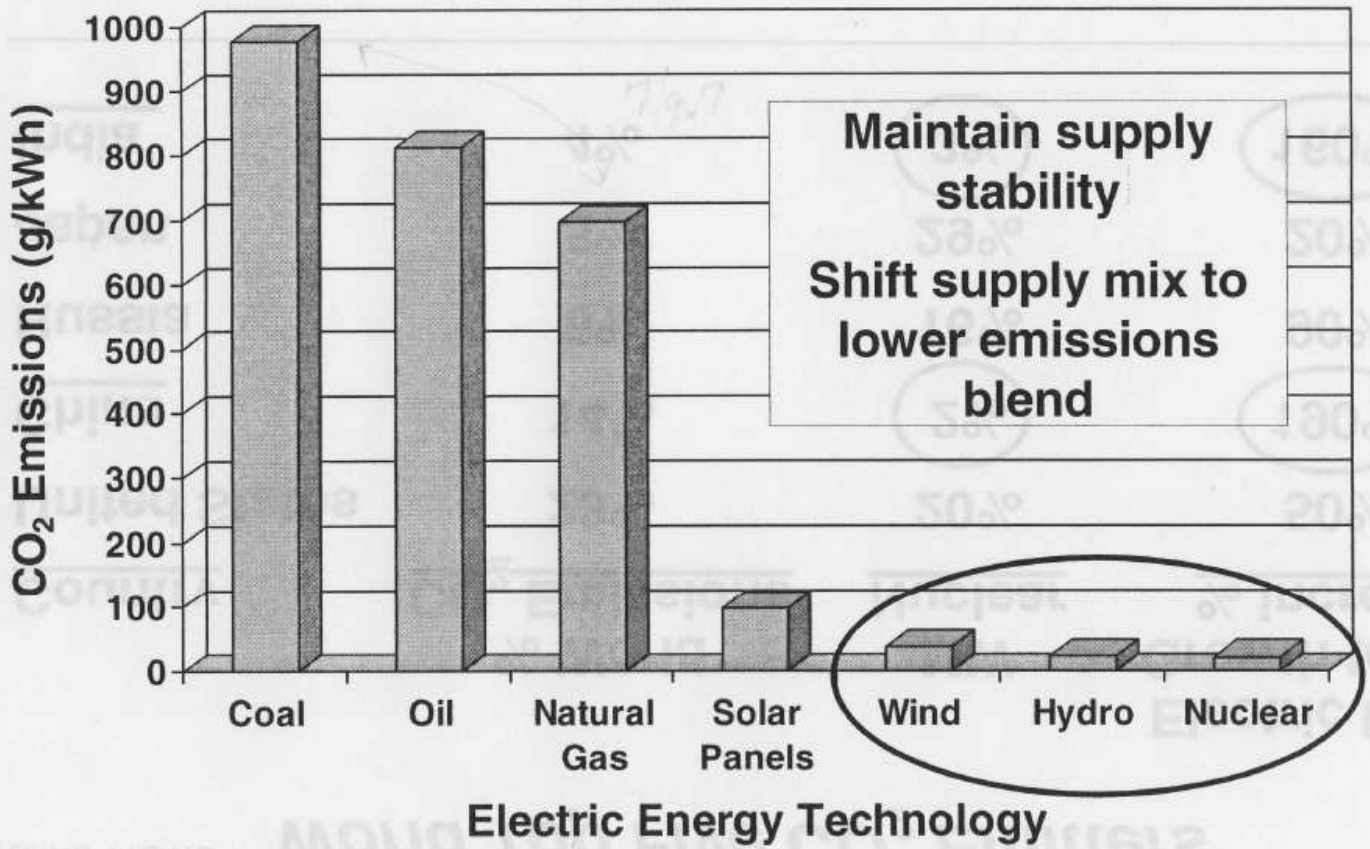
- Canadian Contribution to Global Man Made Greenhouse Gases - 2.18%
  - % OPG of Global Man Made Greenhouse Gas Emissions - 0.006%
    - % OPG (coal) of all Canadian GHG emissions approx. 3%

(includes Lakeview Generating Station, since removed from service)

- % Nanticoke GS of Canadian Emissions 1.9% (14.72 MT)
- % Lambton GS of Canadian Emissions 0.95% (7.2 MT)

Team CANDU
DELIVERING MORE

Full Cycle CO_2 Emission Studies



Source: IAEA Spadaro et al. 2000

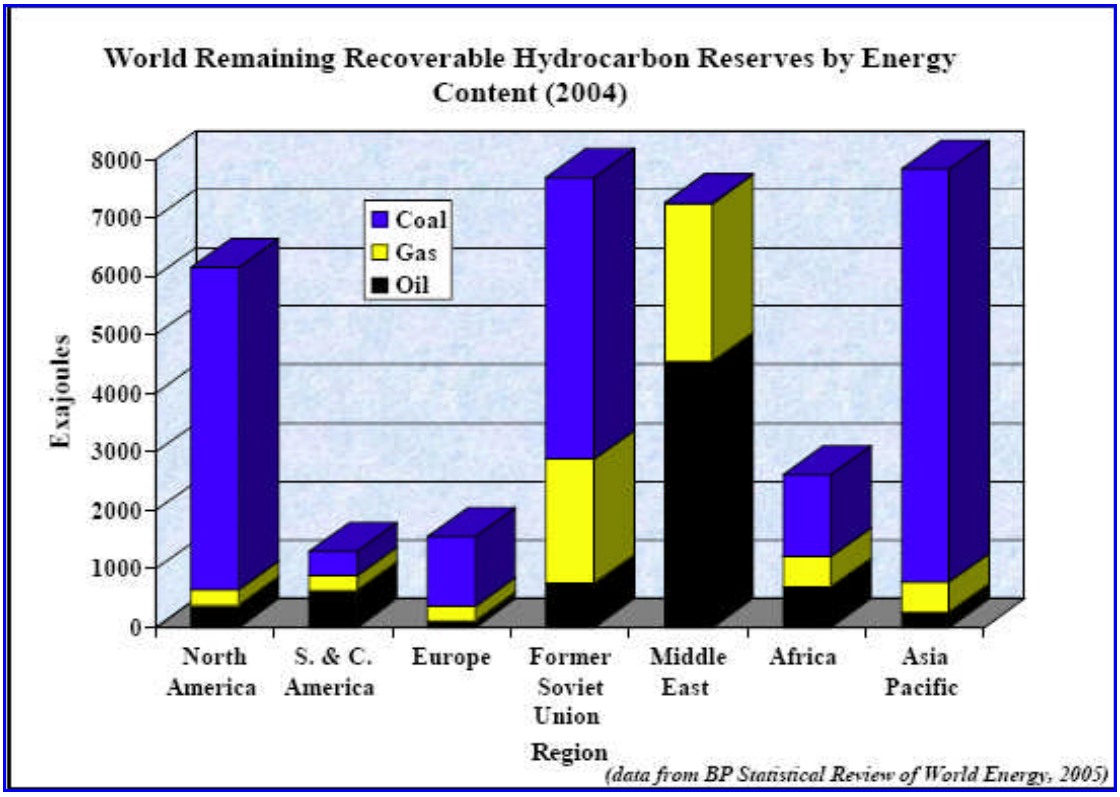
SECURITY OF SUPPLY RESOURCES

♦ "In Canada and globally, there are huge proven reserves of coal which contribute enormously to our energy mix and to our nation's economic prosperity. To not continue to use coal is to deny many Canadians access to an inexpensive, secure and readily available fuel, which is free from price volatility and completely capable of being utilized in an environmentally acceptable manner ..."

(Natural Resources Canada's Canada's "Clean Coal Technology Roadmap")

♦ "... from the perspective of supply reserves, North America is to coal what Saudi Arabia is to oil. We have the world's largest reserves of coal in North America, and much of that is in Canada. ... in the context of growing concern about geopolitical tensions and security of energy supply, indigenous sources of supply will become increasingly attractive." (Jan Carr – OPA, April 28, 2006)

♦ The following chart shows the volume and location of remaining coal and gas reserves.



NATURAL GAS FIRED GENERATION

There are considerable risks associated with price, volatility and supply of natural gas for electricity generation. "While it is impossible to quantify all of the risks at this point, the price and supply risk around gas as a generation source has grown significantly." (OPA) The National Energy Board states that a " barrier that could put the brakes on the growth of gas-fired generation is the availability of adequate gas supplies at competitive prices."

Supply Concerns

All credible government and energy agencies, Canadian and international, confirm that North American natural gas production is in decline. Increasing demand for natural gas is now outpacing supply.

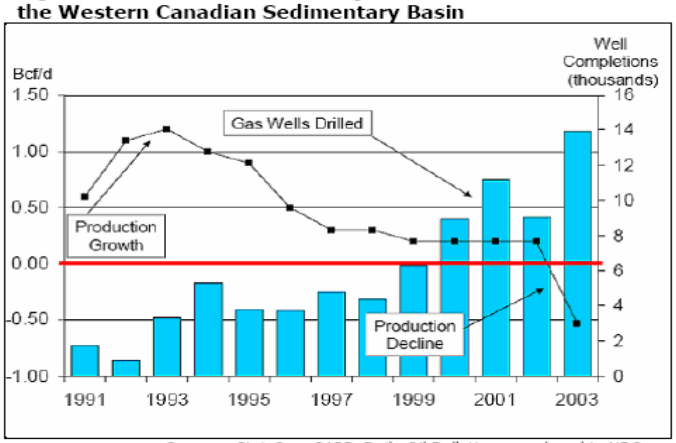
"High natural gas prices resulting from the tight balance between North American gas supply and demand has been a key factor in encouraging more gas drilling. … the producing sector needs to drill more wells each year just to keep production flat." (National Energy Board, "Natural Gas for Power Generation: Issues and Implications, June 2006")

♦ "By 2017, natural gas prices are expected to rise until 2020 due to depletion of conventional gas resources in the Western basin. These conventional resources will need to be replaced by more costly supplies from coal-bed methane and the Mackenzie Delta." (OPA Supply Resources Discussion Paper)

♦The OPA reports that "More than 95% of the gas consumed in Ontario comes from outside the province, mostly from the WCSB". (Western Canadian Sedimentary Basin)

♦ The following chart demonstrates that record drilling is netting less natural gas production in the area where Ontario obtains most of its gas. "Total Canadian natural gas production declined 4% in 2003… almost 14,000 wells were drilled in the WCSB, setting a new record … average of over 38 wells per day." (Alberta produces 80% of Canadian natural gas from wells that are declining in production at a rate of 10-50% per year.)

Figure 3.9.4 – Production Change and Gas Wells Drilled on the Western Canadian Sedimentary Basin



Sources: StatsCan, CAPP, Daily Oil Bulletin, reproduced in NRCan

♦ Production increased slightly over the past year. However, "These production increases alone are not sufficient to meet the projected future requirements for natural gas demand, including power generation. Consequently, any increases in demand for gas-fired generation would necessitate a reduction in gas consumption by other consumers …" (National Energy Board, "Natural Gas for Power Generation: Issues and Implications, June 2006")

♦ "While growing demand for gas in distant markets may increase flows on pipelines, greater consumption of natural gas in supply regions, such as associated cogeneration requirements by oil sands operations in western Canada, may reduce the amount of gas available for other markets and the flow on transmission pipelines." (National Energy Board, "Natural Gas for Power Generation: Issues and Implications)

♦ As noted, conventional resources from the Alberta Basin will need to be replaced by supplies from coal-bed methane and from the Mackenzie Delta.

Coal-bed Methane

♦ According to the Alberta Chamber of Resources, "nobody knows the resource's true potential, or even how much gas is recoverable. … The Alberta Energy and Utilities Board estimate Alberta's reserves at 135 tcf to 410 tcf. …There are several uncertainties when trying to determine the amount of recoverable methane gas. Every CBM project is unique, and while some of the technology from the U.S. experience is helpful, the Canadian coal beds are typically less gassy and less porous, making it harder for the methane to flow to a well bore."

♦ "Speculation is that over the next five years Canada could see as many as 1000 CBM wells and the gas play could be as large as 1 billion cubic feet -- significantly less than the Canadian Gas Potential Committee's estimates of up to 486 tcf leading some to speculate that CBM will not offset North America's dwindling natural gas reserves in any significant way." (Alberta Chamber of Resources)

♦ "The geological and technical risks are huge and make CBM production a capital-intensive proposition on par with Alberta's mega-project oil sands developments." (Alberta Chamber of Resources)

♦ The National Energy Board indicates that "… still significant uncertainty surrounding the future of CBM development … The Horseshoe Canyon play in south-central Alberta was described as an example where developments have been positive. Ultimately some 50,000 wells may be needed to recover the CBM from this area alone." (Looking Ahead to 2010, Natural Gas Markets in Transition. An Energy Market Assessments, 2004)

♦ The Ontario Power Authority must consider the environmental impacts of coal bed methane when determining the sustainability of natural gas use in Ontario. There are serious issues surrounding both the dispersion of dirty water, as well as concerns associated with the large volumes of water produced from the coal seams. Although CBM production in Canada has been a "drier" process to date, drilling has recently begun in areas that will incur greater water concerns, similar to those experienced in the U.S.

Mackenzie Delta

♦ "The Mackenzie Valley Pipeline would bring about 0.80 to 1.5 billion cubic feet per day (Bcf/d) of natural gas from the Mackenzie Delta to pipeline connections in Alberta, which connect to the North American market." ("North America The Energy Picture II - North American Energy Working Group - Security and Prosperity Partnership - Energy Picture Experts Group - January 2006")

(The CAE Alliance has reviewed the National Energy Board report, "Natural Gas for Power Generation: Issues and Implications, June 2006". All quotes in the following section regarding natural gas supply and cost are taken from this document, unless otherwise noted.)

♦ Ontario currently uses an average 2.7 Bcf of natural gas – about 2 Bcf/d in summer to over 4 Bcf/d during winter, about 10% of this is for electricity generation. A significant amount, over 3 Bcf/d, of natural gas piped and stored in Ontario is destined for other areas downstream.

♦ "The Board estimates the range for the incremental natural gas requirement in Ontario will be of about 8 to 20 million m3/d (0.3 to 0.7 Bcf/d) by 2010", depending on the amount of nuclear to be considered in the mix. This was assuming about 2,550 MW of new gas generation in Ontario. At the time the NEB document was prepared, the Board assumption was that most of the coal replacement and new generation required in Ontario would come from nuclear, renewables and CDM. It is obvious that at least double that estimation of natural gas will be required, and that any new resources from the Mackenzie Delta are insufficient to supply Ontario's needs.

♦ What must also be considered is the growing competition for the declining natural gas supplies in Alberta. For example, industrial demand in Alberta averages 1.5 Bcf/d - primarily accounted for by the high demand for natural gas at the oil sands projects, which are expected to continue to grow further. "… natural gas-fired cogeneration facilities are being developed in conjunction with the growing number of oil sands and in situ bitumen projects. As a result, Alberta has experienced the largest growth in gas-fired electricity generation capacity in Canada. In 2004, about 40 percent of installed electricity generation capacity in Alberta was natural gas-fired."

♦ A large portion of the natural gas used in British Columbia and the U.S. Pacific Northwest comes from the WCSB. Gas demand, particularly in California, is expected to increase significantly for both electricity generation and industrial use. Approximately 25% of California gas comes from the WCSB. Lower hydro electric output and growing population is causing higher demand for electricity. Over 9,000 MW of natural gas fired generation is planned for California and Oregon. "All of these new developments will exacerbate natural gas demand."

Other Supply Concerns

♦ The National Energy Board studied the use of natural gas for power generation in the eastern part of Canada, and in relation to U.S., with the conclusion that , "For the U.S. Northeast, during the period 2000–2004, over 20,000 MW of generation capacity was installed with over 80 percent of that capable of using natural gas." As a result, "the growing gas demand and uncertainty in future gas supply have meant high and volatile natural gas prices and have led to greater and renewed focus to develop other non-gas generation." LNG is expected to play a role in lessening some of these concerns, "However, there are significant challenges with respect to the large investment required, uncertainty of supply, environmental impact and siting/acceptance of facilities."
The future impact of this on Ontario, other than the obvious natural gas supply concerns, is that portions of the U.S. Northeast may contract for hydroelectric imports from Quebec and Labrador which Ontario may be banking on to assist us in the middle to late years of the next decade.

♦ The National Energy Board also considered the implications of increased natural gas fired generation in the central geographical region. Findings include:

(i) "The EIA projects that gas demand … for the central region, including Ontario and the U.S. Midwest, are projected to range from 2.8 to 3.4 Bcf/d over the next decade.
The implications of this extend beyond simply having available gas infrastructure and supply capable of providing those additional volumes to the central region. While the region may have adequate pipeline infrastructure to access natural gas supplies, much of the existing supply and infrastructure is currently used to meet requirements in surrounding regions. With demand in the eastern region also projected to increase by more than 1.3 Bcf/d over the same period, competition and requirement for new gas supply and infrastructure will likely increase over the next several years."

(ii) "… the pattern of gas consumption for power generation will become much more weather sensitive and will present a gas load profile with more frequent and substantial variation than would be experienced from many of the traditional industrial gas consumers … especially in locations where natural gas-fired generation facilities become a significant part of the overall gas requirement and are expected to provide the swing or the load-following capability in electricity supply. This may also be exacerbated somewhat where refurbished nuclear facilities may provide more of the base load power generation, leaving natural gas facilities to provide the variable load-following supply of electricity." This will be the case in Ontario.

(iii) "Replacing electricity that is currently supplied from the approximately 7,500 MW of coal-fired generation in Ontario will have significant implications on future gas and electricity … Significant weather-induced variation in gas requirement is to be expected, especially considering the large percentage of homes currently using natural gas and electricity in Ontario. New gas-fired generation will likely exacerbate swings in gas demand and increase requirements on gas infrastructure and operations to meet fluctuating loads." (7,500 MW includes Lakeview Generating Station)

(iv) “According to the IESO, Ontario’s future generation supply mix will place increasing value on the reliability that may be provided from generating assets with flexibility to provide load-following capability, operating reserve and generation control. For gas-fired generation to fulfill this function, gas services from storage and pipelines must also be provided to enable corresponding load-following requirements for natural gas.”

Summary of Supply Issues

Replacing coal fired generation in Ontario with natural gas will, according to the Ontario Energy Board, consume more gas than all natural gas residential customers in the province combined. Natural gas for home heating is used at high efficiency rates, 95%. Natural gas produces power at about 50% that efficiency. The CAE Alliance challenges the wisdom and ability to provide reliable power to Ontario in the critical next decade, considering the dwindling supplies of traditional sources of Ontario natural gas and uncertain expectation of newer and unconventional sources. We are staking our future on something that may not exist or materialize.

Cost Impacts of Natural Gas Use

♦ The National Energy Board’s estimation of cost impacts includes the following comments:

(i) “From the standpoint of power generators using natural gas, however, they are still subject to price and supply risks associated with natural gas. Even if they have an RFP they are still subject to the risk of their plants not being competitive in the Ontario wholesale market. The nature of the risk is that a power generator has to decide if the anticipated power price will cover its costs, at least gas costs and other variable costs.”

(ii) “When gas generation set the price, it is more than twice as high (about $78/MW.h, versus about $33/MW.h for coal). It follows logically that increased gas-fired generation in Ontario will likely result in higher electricity prices due to greater frequency in setting the price of electricity, greater operational flexibility required in gas supply and services to serve the electric power generation sector, and the potential risks inherent with timing differences between gas and electricity markets.”

(iii) “Not only will electricity prices be influenced by that of natural gas but, with power generation becoming the fastest growing sector of natural gas demand, natural gas prices will also be increasingly influenced by electricity markets. This growing interdependency may contribute to higher costs for natural gas and electricity that will have to be absorbed by a range of energy consumers.”

(iv) “The growing share of electricity produced from natural gas will increasingly tie the price of the electricity to that of natural gas.”

(v)“… expectations of higher gas and electricity prices combined with the risk of diminished reliability raise the question as to whether there should be a debate or expanded discussion on the impacts of increasing the use of natural gas to generate electricity. Other consumers of gas, whether small residential and commercial customers or large industrials, may face higher energy costs as a greater portion of natural gas demand becomes increasingly weather sensitive. Further,

some of these consumers may be challenged to compete with gas-fired generators for supplies of natural gas and related transportation services."

♦ Fuel costs represent over 50% of the levelised cost of electricity and 90% of the operating costs for natural gas-fired power generation. Fuel costs impact gas fired generation costs significantly more than any other form of power production.

♦ "Preliminary analyses shows that for every 10% increase in natural gas prices, Ontario electricity spot market prices would increase by approximately 6%." (Navigant Consulting – Monthly Variation Explanation April/05 – October/05)

♦ "North America's natural gas market has entered a new era. Higher natural gas prices, which are now seen as a feature of the natural gas market, at least over the medium-term, primarily reflect the inability of North American natural gas production to keep pace with ever-increasing demand." (Natural Resources Canada – Canadian Natural Gas Review of 2004, Outlook to 2020, January, 2006)

♦ "... natural gas has shifted from the 'fuel of choice' in North America to the 'fuel of risk' – from a plentiful, relatively inexpensive fuel to one marked by uncertainty, volatility and record price levels." (CERA – Oct. 2004)

♦ According to the U.S. government Energy Information Administration, natural gas prices 10 years from now will be "consistently higher" due to resource depletion and increased demand coupled with higher exploration and development costs. (Annual Energy Outlook 2006 with Projections to 2030)

♦ The average cost per unit of energy was over 3 times higher for natural gas than coal, over the 2002-2005 period. (US Energy Information Administration)

♦ "Where the province contracts for gas-fired generation under a commercial arrangement that is indexed to the price of natural gas, Ontario's electricity ratepayers are fully exposed to the volatility of natural gas prices." (Atomic Energy of Canada, Submission to the OPA, August 26, 2005)

♦ Industry is warning that too much reliance on natural gas for electricity will cause irreparable harm to the Ontario economy. "The problem is particularly acute for industries relying on natural gas in their manufacturing process and as a fuel for electricity since they get hit twice by high natural gas prices." (New York Power Authority, Oct. 25, 2005)

♦ "... if we consider the warnings that gas prices can be expected to be extremely volatile in the existing tight supply situation, then (Hurricane) Katrina is only a demonstration of how that volatility arises." (OPA Supply Mix Recommendations and Advice) Global warming is expected to produce another volatile hurricane season in 2008, which may again impact natural gas prices.

CONCERNS OF OTHER NATURAL GAS USERS

In light of the above noted natural gas concerns, the CAE Alliance has extracted portions of submissions provided to the OPA by the industrial, business and the farming sectors – these are the Economic Drivers of our provincial economy.

♦ AMPCO (Association of Major Power Consumers of Ontario), represents the mining, refining, cement, steel, forest products, petrochemical, automotive and general manufacturing sectors, employing over 100,000 people, and indirect employment for an additional 300,000. Comments include:

"... member companies have a strong stake in the long-term security and cost of electricity in Ontario and Ontario in turn depends on the health of the industries ..."

"... members face intense global competition and the low electricity cost advantage they once had has vanished. ... Recent announcements of plant and mill closures are a direct result of high and rising energy prices. Our concern is clear and urgent"

"We are very concerned that current electricity polices are moving Ontario towards greatly increased reliance on natural gas for its electricity supply ... this is a dangerous direction for Ontario"

"The current policy to retire from service the existing coal-fired stations ... is the biggest factor causing upward pressure on rates and increasing risks in Ontario's electricity market. ... Our analysis suggests that the environmental performance of these facilities can be dramatically improved for a relatively modest investment."

♦ The Ontario Mining Association, a vital contributor to the provincial economy reports that "The studies show that current technology can be applied to existing coal plants to make them very nearly as clean as modern, efficient gas turbine combined cycle power plants ... in the 1-2% range ..."

"...experts are telling us demand for natural gas in North America exceeds supply. ... Ontario must decide whether it wants to rely upon an energy source for its future electric power generation that is bound to generate extensive periods of tight supplies with high prices and the potential for extreme volatility. If it does, the result will be reduced industrial activity in the Province."

♦ Industrial Gas Users Association, with 45 members from the pulp & paper, metals, mining & smelting, and chemical industries, warns that "Ontario must decide whether it wants to rely upon an energy source for its future electric power generation requirements that is bound to feature extensive periods of tight supplies with high prices and the potential for extreme volatility. If it does, the result will be reduced industrial activity in the Province."

"If CES contracts are used for future power generation contracts then very large volumes of gas will be purchased at Dawn ... Dawn Index will be pushed higher but there will be

significant price volatility... other purchasers, including industrial consumers may be forced out of that market."

♦ The Ontario Federation of Agriculture, representing Ontario's second largest industry, warns that "Reliable and reasonably priced power is essential to its sustainability", without which, "production and processing of food in Ontario would be uncompetitive and likely extinct."

Switching to natural gas fired generation will result in "... increased gas costs for millions of homes and businesses as well as in fertilizer and chemical costs increases for farmers ... increased unemployment, lost investment and lost production ... (OFA) advocates ... cleaner coal, fully scrubbed so that Ontario has power at a cost we can afford with improved air quality."

♦ The Canadian Manufacturers & Exporters, representing 75% of manufactured output in Ontario and 90% of all exports, employs over 1,000,000 people directly. For every $1.00 invested in manufacturing there is an additional $3.05 in economic activity.

"Recent government policy decisions including the decision to phase out coal-fired generation and RFP contracts will virtually guarantee higher prices for electricity. ... Ontario must not become an island of higher priced electricity relative to other jurisdictions that are competing for investment."

"Cost analysis has been seriously lacking in recent decision including the 2,500MW RFP, the renewables RFP and the decision to phase out coal fired generation in the province."

"Rather than picking sources of fuel on an ideological basis, the government should look to set criteria for generation based on desirable health, social and environmental outcomes. ... CME believes strongly that coal has been dismissed as a fuel source without adequate consideration of the potential for environmental and health improvements and the advantages of coal-fired generation from a cost standpoint."

♦ The Toronto Board of Trade submits to the OPA that "We need to keep the capabilities of various technologies and fuels in mind ... before we consider eliminating any ... coal fired plants continue to have numerous system reliability advantages..."

♦ The Canadian Chemical Producers Association advises the OPA that "This emphasis on using increasingly scarce natural gas for power generation has stretched North American natural gas markets and driven up the price of natural gas. The EIA (US Energy Information Administration) believes that the natural gas for additional power generation will be sourced primarily from new and expanded LNG terminals. ... for Ontario, relying on LNG would be even more problematic."

"...excessive demand has made natural gas so expensive, driving electricity prices higher along with it, that it undermines ability to compete internationally."

The President of the CCPA ... urges provincial policy makers... to revisit energy and electricity policies that have largely eliminated coal as a fuel ... in spite of its low costs. We're

looking for strong leadership on energy ... not platitudes, wishful thinking and naiveté while industry leaves for lower-priced markets."

"Clearly, in order to remain competitive, coal must be part of Ontario's future supply mix."

♦ "Much of the strength of growth of 2004 can be attributed to the resource sectors of the economy." (IESO – 10 Year Outlook, July 2005) The Ontario Mining Association states that "... a large spike in energy pricing greatly changes the feasibility of an Ontario operation."

"Studies show that current technology can be applied to existing coal power plants to make them very nearly as clean as modern, efficient natural gas turbine combined cycle power plants. ... We feel the value to Ontario of supply diversity was not evaluated fully and the option of clean coal, ignored totally."

♦ INCO, world's second largest producer of nickel, is also a significant producer of copper and other metals, expressed similar concerns regarding natural gas costs, electricity and infrastructure change costs. INCO reiterates concerns that "...costs of these changes and who will pay are specifically excluded from the current process."

"... too much reliance on natural gas-fired generation could cause irreparable harm to the Ontario economy and to the mining sector in particular."

♦ The Ontario Chamber of Commerce, representing over 57,000 businesses through 160 local Chambers and Boards of Trade, "urges the Government of Ontario to reconsider its commitment to phase out coal by 2007. Coal represents an abundant and cost competitive source of supply, at a time when we are in short supply of both. The OCC believes that pollution abatement controls can be put in place to achieve air quality improvements ... achieving cleaner air while keeping a reliable fuel source on the table."

♦ The President and CEO of the Canadian Manufacturers & Exporters notes, "Power interruptions are costly and undermine confidence in the system, and as such, reduce Ontario's attractiveness as a location in which to invest." (Speaking notes for Ontario Energy Association Awards Dinner, September 13, 2005)

After reviewing relevant related information, the CAE Alliance concludes that industrial and residential communities have warrant for concern. Potential new gas rates for power generators, transfer of infrastructure costs which benefit merchant power plants, and uncompetitive practices favouring these generators will impact the availability and cost of gas to users other than power generators. They/we will in effect be cross subsidizing private merchant power generators for their gas supply costs.