ENVIRONMENTAL IMPACTS OF COAL-FIRED GENERATION

There has been a general misconception about the actual environmental impacts of coal-fired generation in Ontario, and about the mitigation measures that could be implemented to reduce contaminant emissions.

(i) An exaggeration of both health and environmental impacts of coal-fired generation in Ontario;

(ii) Emissions could economically and readily be reduced;

(iii) A comparison of replacement generation and the resultant net impact of transitioning to an alternative fossil fuel.

(i) An exaggeration of both health and environmental impacts of coal-fired generation in Ontario

Coal-fired generation in Ontario is responsible for less than 7% of air quality concerns. The health and environmental impacts stated are not in proportion to the emissions released. The coal plants meet or exceed all laws and regulations presently in place to protect the environment.

♦ The Ontario Medical Association indicates that health issues associated with pollution are attributable to **chronic** and **acute** exposure to **5** common pollutants, namely:

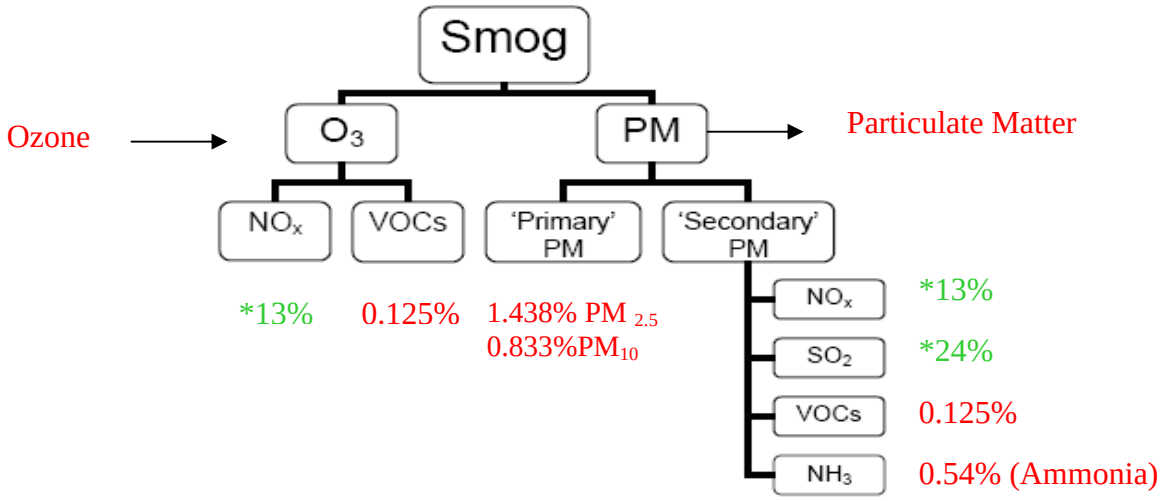
Ozone (O3) which is comprised of NOx (nitrogen oxides) + VOCs (volatile organic compounds); PM $_{2.5}$ (particulate matter); CO (carbon monoxide); and SO_2 (sulphur dioxide). (Ministry of the Environment)

♦ 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)

♦ Coal's contribution to the provincial emissions of the smog precursors, VOCs, and CO are less than 1%. Transportation is by far the greatest contributor.

♦ Coal fired generation in Ontario is responsible for 1.438% of provincial PM $_{2.5}$ and 0.833% of PM_{10} emissions. (Environment Canada)

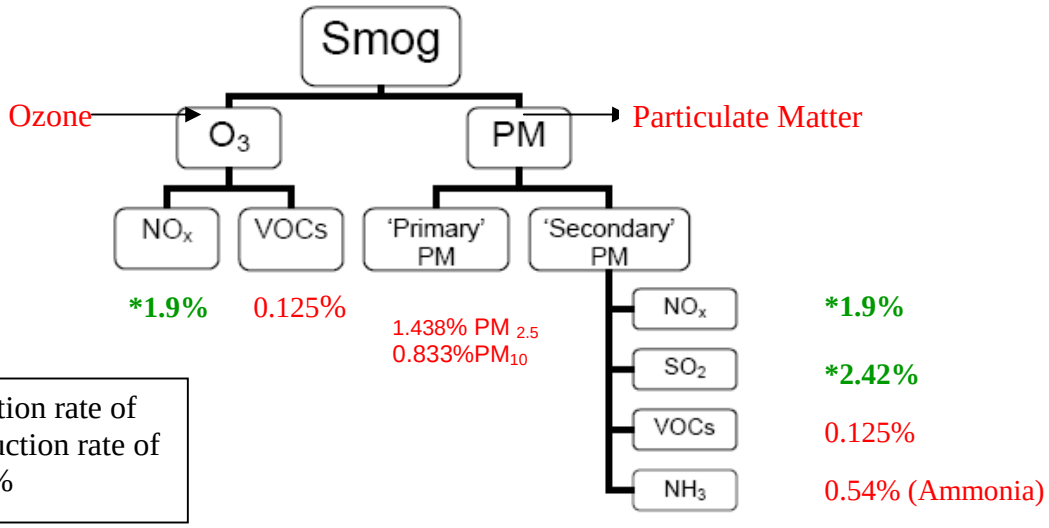
CONTRIBUTION OF COAL FIRED POWER GENERATION TO ONTARIO'S PORTION OF SMOG PRECURSORS



Environment Canada Air Contaminant Emissions tracking also includes CO (carbon monoxide). Coal-fired generation in Ontario contributes 0.49% to Ontario's portion of CO emissions

(These figures include Lakeview GS, now closed.)

CONTRIBUTION OF EMISSIONS FROM COAL-FIRED POWER PLANTS – **WITH POLLUTION ABATEMENT TECHNOLOGY**



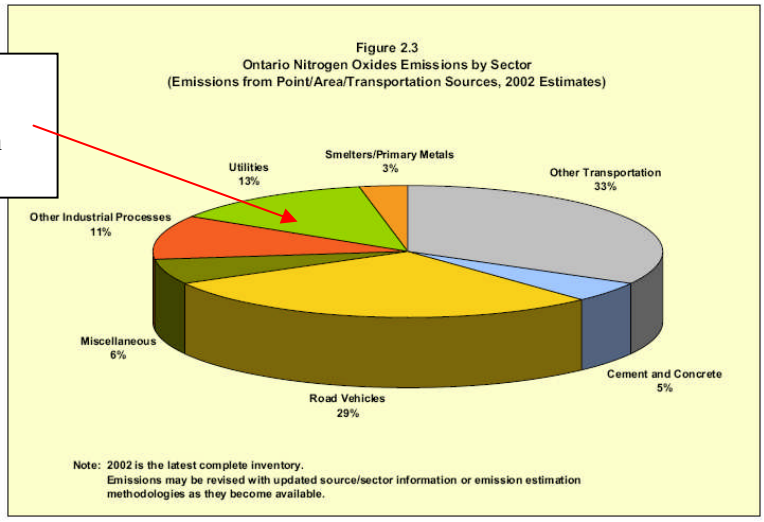
***** NOx reduction rate of 85%; SO2 reduction rate of 90%

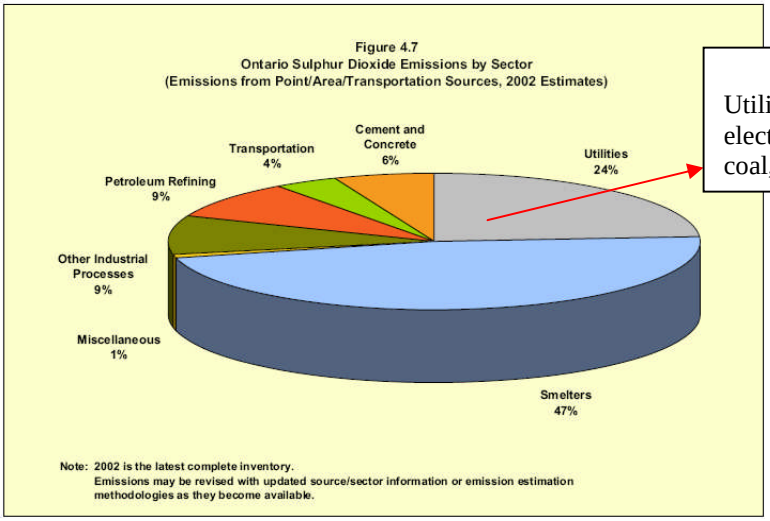
Particulate Matter can be reduced 99%; Mercury and other heavy metals can likewise be reduced 60%-90% (95% Mercury capture at Lambton GS Units 3 & 4)

(Sources: Ontario Ministry of the Environment – Ontario's Clean Air Action Plan: Protecting Environmental and Human Health in Ontario; Environment Canada – Criteria Air Contaminants Emission Summaries)

CONTRIBUTION OF ELECTRICITY GENERATION TO AIR QUALITY EMISSIONS IN ONTARIO

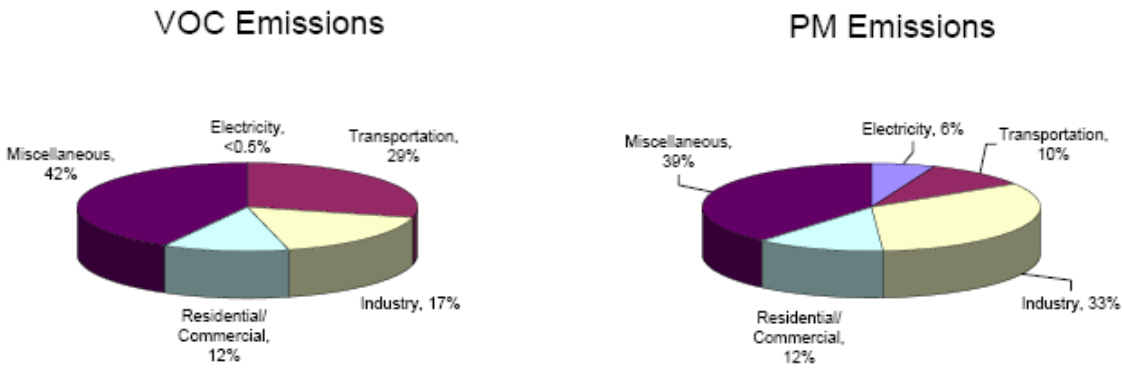
NOx
Utilities - 13% - Includes electricity generation from coal, natural gas and oil





SO2
Utilities - 24% - Includes electricity generation from coal, natural gas and oil

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



("Ontario's Clean Air Action Plan: Protecting Environmental and Human Health in Ontario", June 21, 2004 – Ontario Ministry of the Environment)

♦ Natural gas fired generation, which is being procured to replace coal fired power in Ontario, will be more harmful with regard to particulate matter. "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 $PM_{2.5}$." (natural gas combined cycle facilities)
(Cost Benefit Analysis: Replacing Ontario's Coal-Fired Electricity Generation, prepared for the Ministry of Energy, April 2005)

♦ Ozone concentrations in urban areas (i.e. GTA) 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 OPA.

♦ Coal fired generation contributes more significantly to SO_2 and NO_x emissions (24% and 13% respectively). However, when transborder air pollution, and background emissions are taken into consideration, the coal fired contribution is minimal.

♦ According to the Ministry of the Environment, 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.

For example, Ministry of the Environment information indicates that "Ontario's NOx emissions in the regional air shed … are about 6 % of the total NO_x emitted."
Canadian sources in the region "emit less than 10% of total sulphur dioxide (SO_2) and NO_x emissions." and
"Ontario's SO_2 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)

Coal fired generation therefore accounts for a net 2.4% and 1.3% respectively of total SO_2 and NO_x in the Ontario air shed. (24% and 13% of the Ontario portion which accounts for 10% of the total)

♦ This is confirmed by reports and studies, including a regional modeling study of the effects on air quality of electric power generation, conducted by the University of Waterloo Department of Chemistry, which 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). ("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)

IMPACT OF TRANSBORDER AIR FLOW ON ONTARIO AIR QUALITY

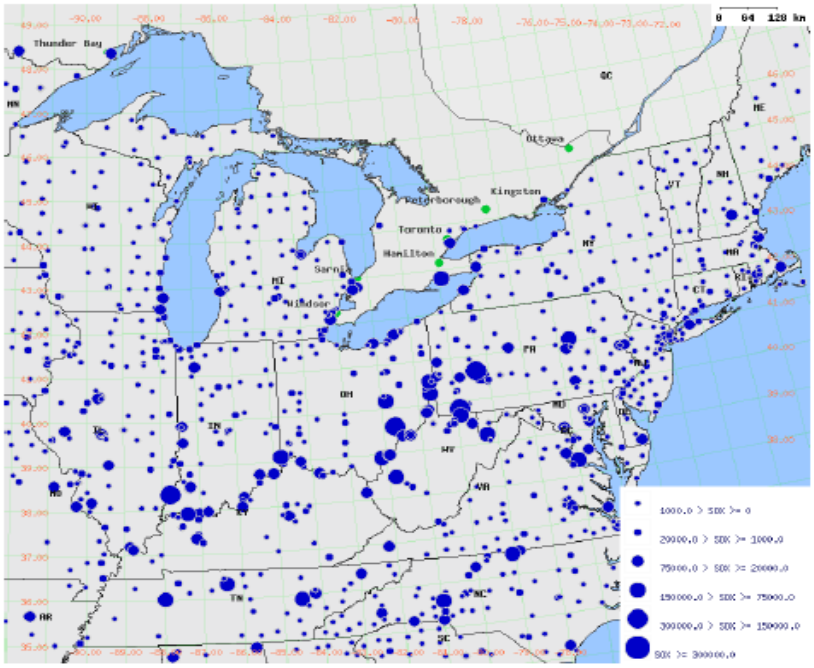
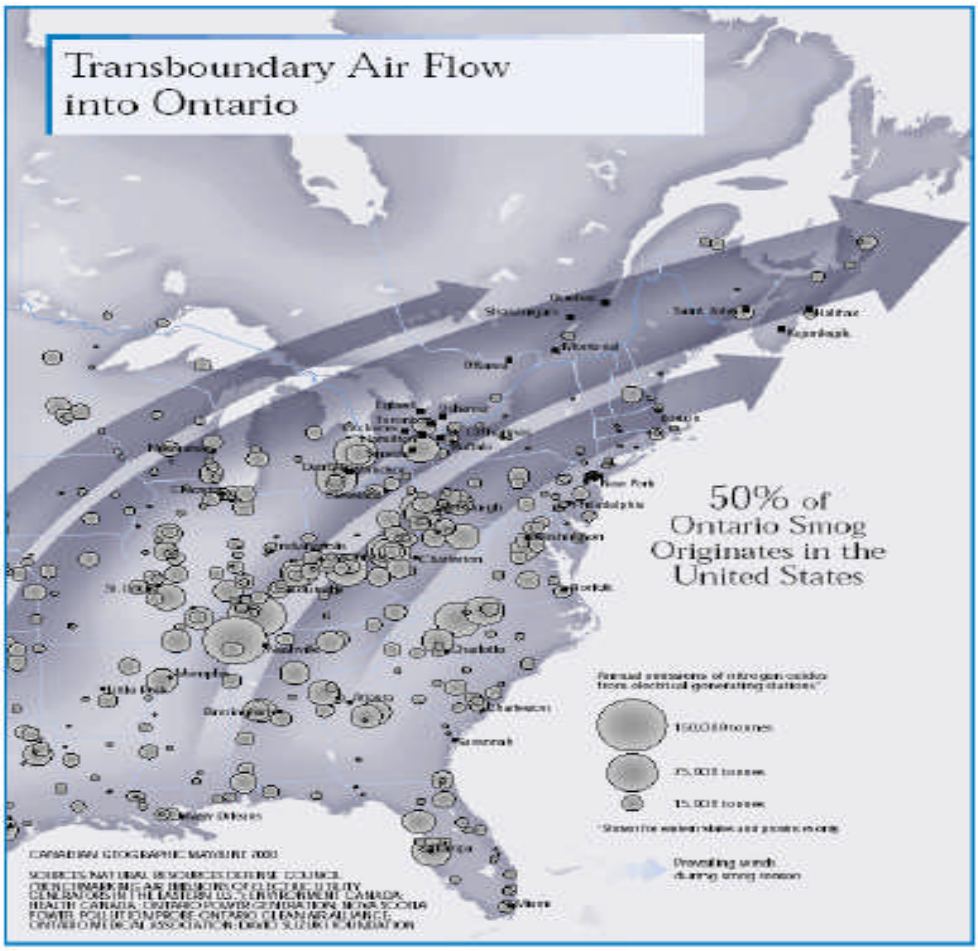


Figure A-4: Sulphur dioxide emissions from power plants shown as dots that vary in size according to their emission inventories
U.S. 1995 (with 2001 updates) and Canada 1999 Emission Inventories
(source: Ontario Ministry of the Environment)



TRANSBOUNDARY EMISSIONS vs ONTARIO CONTRIBUTIONS

● ONTARIO SOURCES ● US CONTRIBUTION

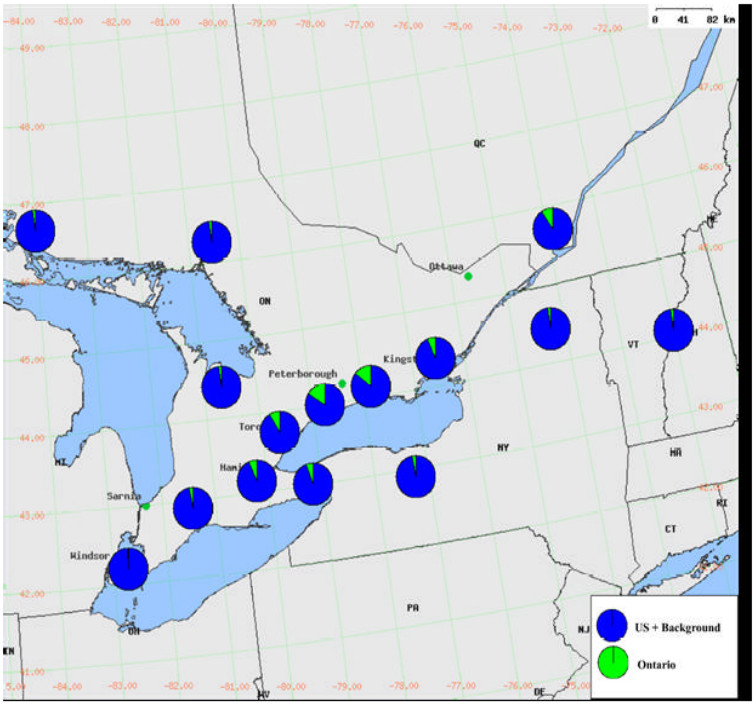


Figure 3.4: Graphic of Transboundary vs. Ontario Contribution for Ozone on High Concentration Days during 1998 Spring/Summer Season.

OZONE

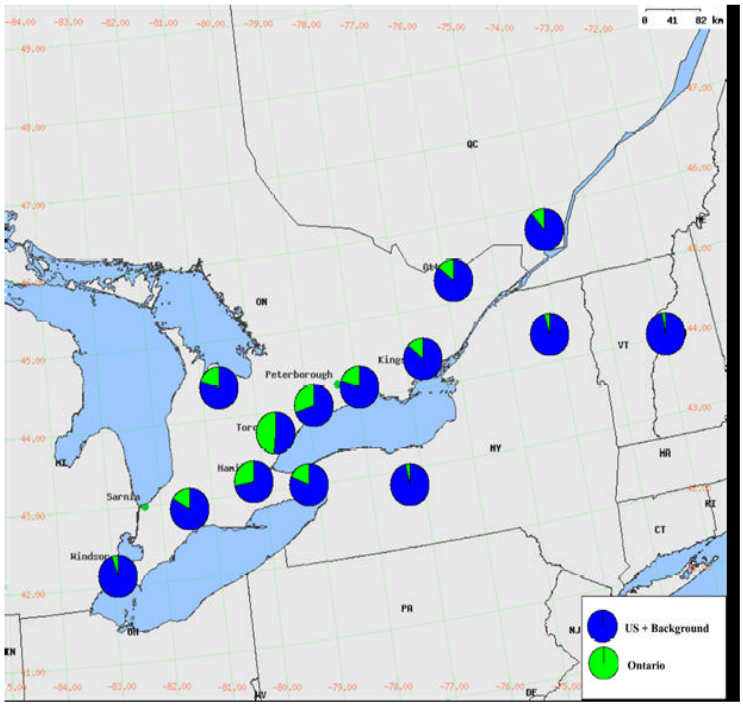


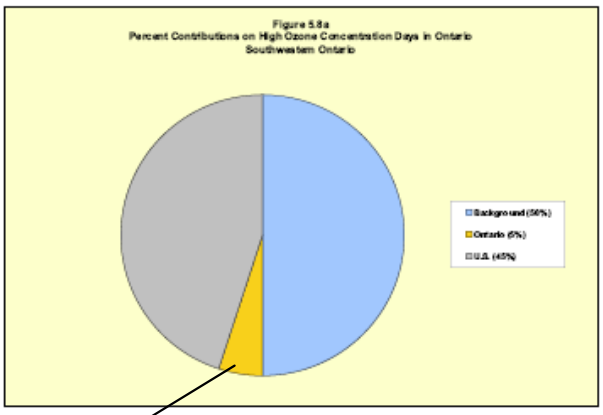
Figure 3.5: Graphic of Transboundary vs. Ontario Contribution for $PM_{2.5}$ on High Concentration Days during 1998 Spring/Summer Season.
(source: Ontario Ministry of the Environment)

$PM_{2.5}$

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

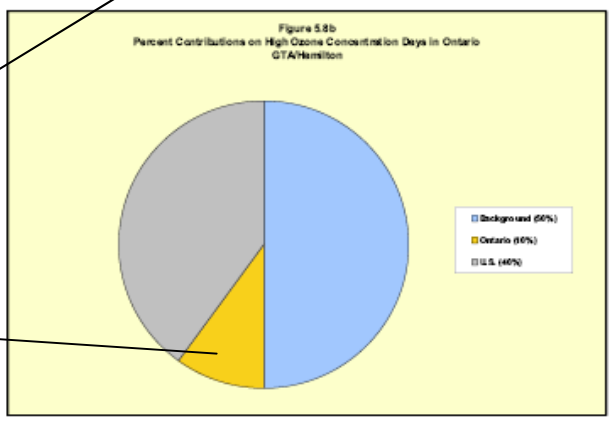
PM 2.5 originates from particles emitted directly from sources and from particles formed in the atmosphere. The precursor gases SO2, NOx, ammonia and certain VOCs react in the atmosphere to form ammonium sulphates, ammonium nitrate and organic particles. Air quality models include all of these components.

% CONTRIBUTION ON HIGH OZONE DAYS IN ONTARIO



Southwestern Ontario

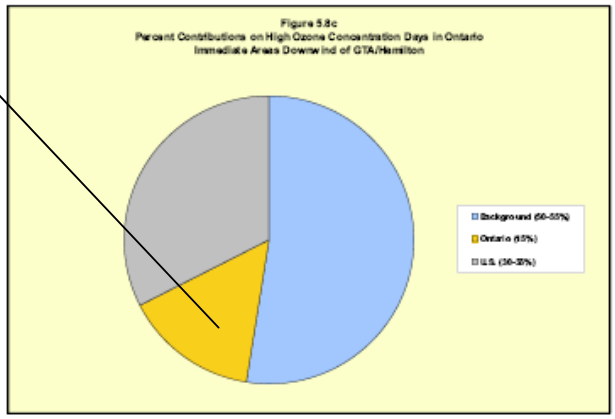
*** Background - 50%**
US Sources - 45%
All Ontario Sources – 5%



GTA/Hamilton

*** Background - 50%**
US Sources - 40%
All Ontario Sources – 10%

Coal emissions represent a small portion of this amount



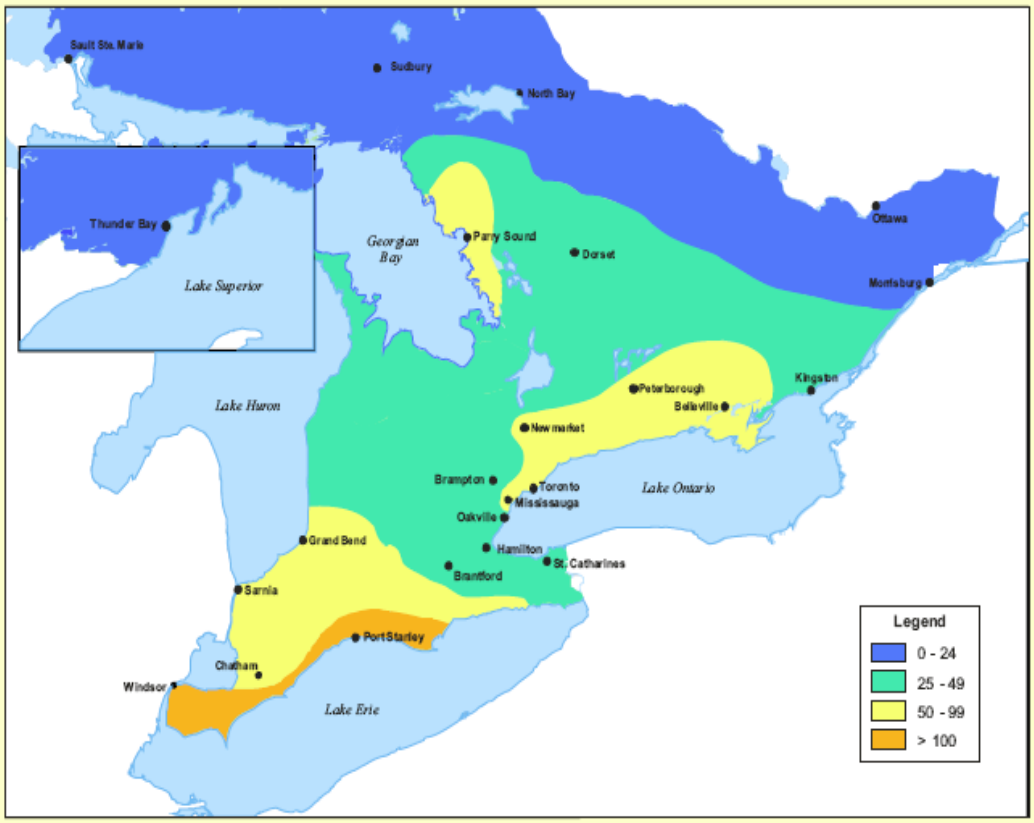
Downwind of the GTA/Hamilton

*** Background - 50%-55%**
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, background ozone concentrations are expected to dominate, and **manmade sources would not contribute as much**. Background contributions were estimated to be about 75-80% for the GTA/Hamilton and 80-85% downwind of GTA/Hamilton. (Ministry of the Environment)

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. … 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)

♦ The government report, prepared to justify the coal closure mandate, did not include either the Thunder Bay or Atikokan coal facilities in their environmental assessment, indicating that they "emit a small fraction of the total provincial coal fired generation emissions (i.e. <5%) and are outside the main airshed in which southern Ontario coal fired generation emissions interact". (Ontario's Cost-Benefit Analysis - Replacing Ontario's Coal-Fired Electricity Generation, prepared for the Ontario Ministry of Energy, April, 2005)

♦ Of the 38 Air Quality monitoring sites in Ontario, Thunder Bay was the only site that did not record any hours of ozone above the one hour ambient air quality criteria. The designated Canada wide Standard reporting sites were all above the 2010 CWS … for ozone in 2005 with the exception of Thunder Bay …" (Ministry of the Environment, Air Quality in Ontario, 2005)

♦ 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.

♦ Air quality monitoring equipment was dismantled in Atitkokan because there was nothing of significance worth monitoring.

Net Impact of Coal-Fired Power Plants on Ontario's Air Quality

♦ Small (less than 7% overall); negligible from Thunder Bay and Atikokan sites

♦ An assessment of contribution of harmful emissions to air quality from Ontario's coal fired power plants was completed as part of the government's Cost-Benefit Analysis. This report demonstrates that coal fired power in Ontario contributes **less than 1% to ozone in southern Ontario; less than 5% to PM_{10}** ("Primary PM_{10}, particulate nitrate, and particulate sulphate concentrations were summed to arrive at total PM_{10} concentrations." (Ontario's Cost-Benefit Analysis - Replacing Ontario's Coal-Fired Electricity Generation, prepared for the Ontario Ministry of Energy, April, 2005)

♦ 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)

♦ "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)

Affects of Coal-Fired Power Generation on Health and the Environment

The "purpose" for this proposed Regulation includes the statement that, "These emissions are associated with major health impacts (e.g., premature death, increased hospital emissions for patients with asthma and chronic lung disease) as well as environmental impacts (e.g., buildings, crops and ecosystems)."

While "these emissions" may be associated with health and environmental impacts, the degree to which coal fired generation contributes, is very minimal. The wording here is designed to mislead, to insinuate that coal fired generation is a significant cause and contributor to these concerns.

Note the following:

♦ The Ministry of the Environment operates an extensive network of air quality monitoring sites - 38 locations - across the province. An AQI (Air Quality Index) is based on recordings from these sites, of pollutants that have adverse effects on human health and the environment.

♦ The data collected is summarized and included in the Ministry's Air Quality report. The most recent is the data from 2005. Most sites showed good or very good air quality 85% of the time; moderate 13%-15%; poor on average, less than 1.5% of the time. (. In spite of the fact that the summer of 2005 was particularly hot and smoggy. Due to decreased availability of hydroelectric power and increased air conditioning use, coal fired power was required more frequently. Lakeview GS was in service for the first quarter of that year.)

♦ The following chart shows the impact of emissions on health and the environment. This chart is from the 2005 Air Quality report. We have included coal fired contribution at the bottom.

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

Coal contribution ^ ^ ^ ^ ^

VOCs 0.125% 1.438% 13% 0.49% 24%

\+ NOx 13%

♦ There were no impacts for healthy people 85% of the time. For 15% of the time, odour and **potential** "respiratory irritation" in **sensitive people during vigorous exercise;** those with heart/lung disorders potentially at some risk. (Noted elsewhere, "moderate" air quality days, according to the Ministry of the Environment, "may have some adverse effects for very sensitive people".)

♦ Environmental impacts include a "potential damage to very sensitive plants; damages some vegetation". Again, however, this is a result of all contributors of NO_x and SO_2, of which coal fired generation is only a smaller portion.

♦ Asthma is most commonly triggered by pollens, dust, pet dander, mould, stress, as well as outdoor air pollution; respiratory viral infection is one of the most common causes. (Canadian Lung Association) Indoor air pollution is 2-5 times higher, occasionally 100 times higher, than outdoor levels. On average, we spend more than 90% of our days indoors. Coal fired generation therefore contributes an insignificant amount to hospital admissions related to asthma.

Greenhouse Gas Emissions

♦ 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.)

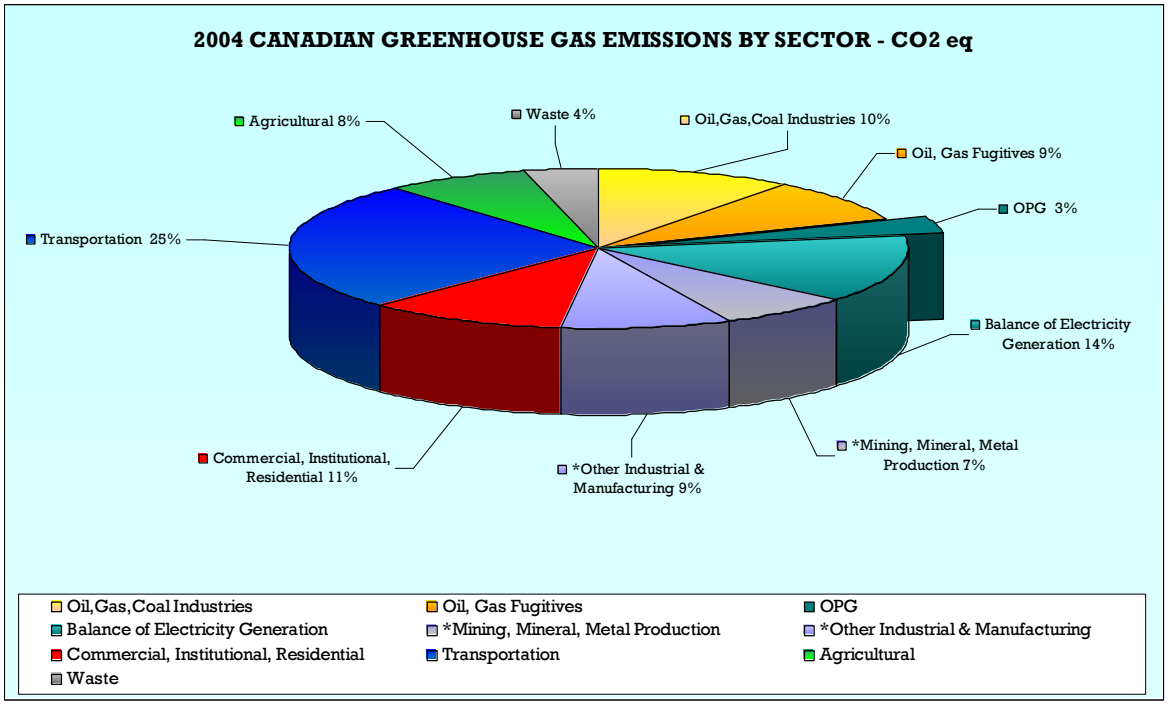
♦ Human contributions represent less than 4% of all greenhouse gas releases. This amount however is increasing and causing concerns regarding climate change potential.
Canadian emissions account for about 1.8% of this 4%, or 0.072% of these global man made emissions. ((Natural Resources Canada - Global Emission Outlook)

♦ According to Environment Canada statistics for 2004, OPG coal plants contribute about 3% to the national total; 0.054% globally (manmade emissions); 13% to Ontario greenhouse gas emissions.
(see Charts, following)

♦ Emissions impacting climate change will not be reduced significantly with the closure of Ontario's coal-fired power plants. Replacement generation is slated to come from natural gas-fired power. Although natural gas emits about 55% the CO_2 of coal generation at point of combustion, there are significant emissions associated with production, flaring, processing and transport of natural gas. There is marginal net benefit of using natural gas in place of coal.
(For comparison, and statistics, see section (iii), Net Impact of Transitioning to an Alternative Fossil Fuel")

Conclusion

The coal fired power plants are large facilities, single source emitters of pollutants of some concern. However, they do not constitute a major portion of air quality concerns in Ontario.

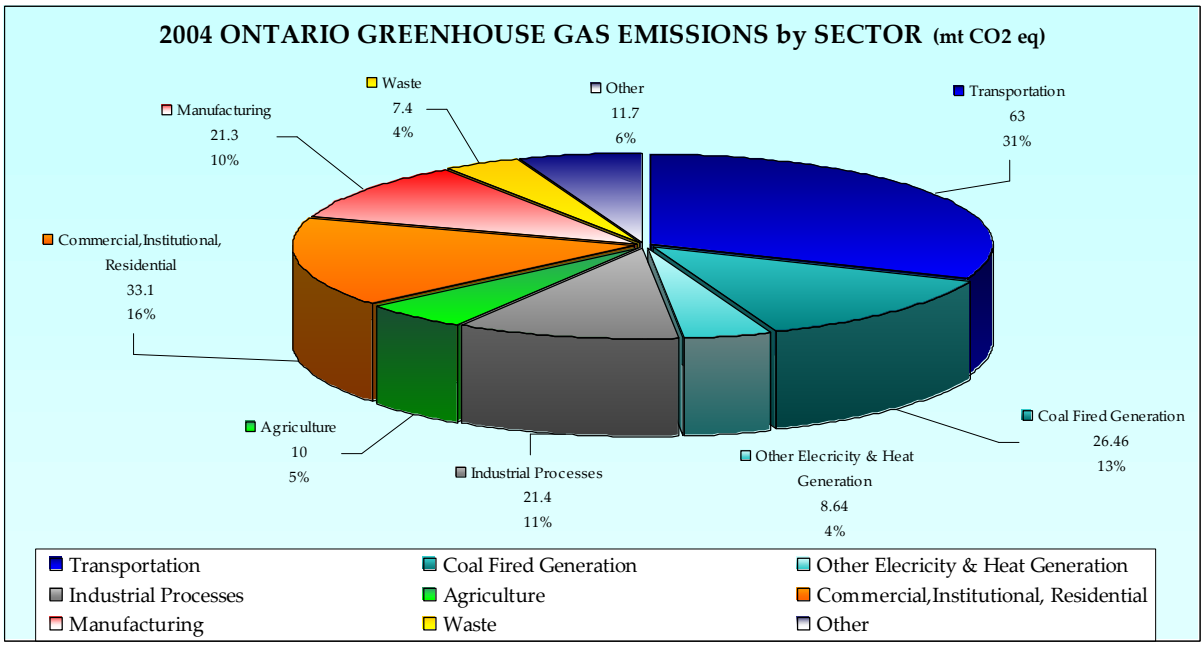


"Environment Canada, Summary of Canada's 2004 Greenhouse Gas Inventory"

*Includes both combustion emissions and process emissions

- Total Canadian Greenhouse Gases 758.0 MT
- OPG (coal) Greenhouse Gas Emissions 26.5 MT
- % OPG (coal) of all Canadian GHG emissions approx. 3%

(includes Lakeview Generating Station, since removed from service)



Environment Canada, National Inventory Report, 1990-2004 – Greenhouse Gas Sources and Sinks in Canada – Annex 12: Provincial/Territorial Greenhouse Gas Emission Tables, 1990-2004" and Ontario Power Generation, 2005 Sustainability Development Report, Appendix B, www.opg.com

(ii) Emissions Can be Economically and Successfully Reduced

The pollutants of greatest concern in relation to coal fired power generation, are the emissions that can be most affordably and successfully reduced. This success is evidenced in reports generated by and for the Ministry of Energy, including the Cost Benefit Analysis Report and the OPA's IPSP Discussion Paper Emission Control Alternatives for Ontario Coal Generators, 1 April 2007. These reports show that the emissions from Lambton Generating Station Units 3 and 4 are approximately 75%-85% less for NO_x and SO_2; 95% less for mercury emissions, as a result of emissions abatement technology installed on these units. Subsequently, they are ranked 4th and 9th cleanest of the 500 coal fired plants in North America. Greater reductions can be obtained, as noted below.

♦ "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 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 reduces emissions by "80-95%", and technology for SO_2 reduction including Dry Flue Gas De-Desulphurization 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)

♦ 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.

♦ "... 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 "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".

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

With regard to mercury and other toxic pollutants:

♦ 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, "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)

♦ 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. (Presentation by the Ministry of the Environment to the Great Lakes Bi-national Toxics Strategy Mercury Work Group on May 17, 2005)

♦ Mercury removal of at least 90% can be achieved by methods developed by Babcock, Wilcox which involves 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.

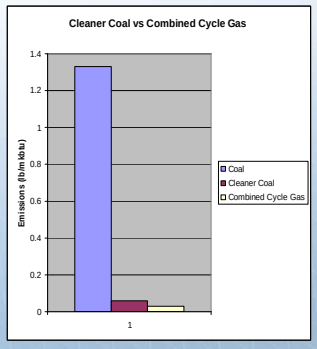
♦ Example:

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)

♦ See Charts, page 11, comparing air contaminant emissions with and without reduction technology

(iii) Net Environmental Impact of Transitioning to an Alternative Fossil Fuel

The proposed coal closure cannot be viewed in isolation of the replacement generation for these resources. The Ontario Power Authority, at the direction of the Ministry of Energy, is in process of procuring 7,000 MW of natural gas fired generation (in addition to the existing 5,000 MW of gas fired power) as replacement for coal fired facilities. Natural gas generation produces emissions, including greenhouse gas emissions that must be taken into consideration when assessing the **net benefit** of ceasing to utilize coal for electricity generation.

♦ As noted in the previous section, air contaminant emissions of concern from coal fired power plants can be reduced to a level comparable with natural gas.

♦ Natural gas "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…" (Suzuki Foundation submission to the Ontario Power Authority, Fall, 2005)

♦ Regarding greenhouse gas emissions, note:

(a) Natural gas emits about 55% - 63% the CO_2 of coal generation at point of combustion. (63.06% the CO2 of coal at point of combustion. - Carbon Dioxide Emissions from the Generation of Electric Power in the United States, July 2000, staff of the U.S. Department of Energy and the U.S. Environmental Protection Agency; Natural Resources Canada, 56.67%).

However, there are significant emissions associated with production, flaring, processing and transport of natural gas.

(b) "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)

(c) "the contribution of natural gas generation to climate change is only slightly less than coal (on an energy basis). ... 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)

(d) Natural gas GHG emissions are about 25% less than coal, on a lifecycle basis. (IAEA Spadaro et al. 2000). This gap could be closed by burning biomass with coal.

(e) TransCanada Pipelines Ltd. reported more than twice the emissions at the Kenora Compressor Station from the compression/recompression of natural gas coming into the Province, than from Atikokan and Thunder Bay coal fired stations combined.

(f) "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)

(g) "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)

(h) Considering the significant amount of new gas fired generation proposed for Ontario, and the future supply concerns, "…liquefied Natural Gas (LNG) is expected to play a critical role in addressing the forecast supply gap." (Navigant Consulting Report to OPA) There are greenhouse gas implications of using LNG. LNG entails an energy loss of 15% - 30% in the transport, liquefaction and regasification processes.

(i) Greenhouse gas emissions have increased in Canada from 1990 to 2003. …42% of the increase is as a result of "fugitive releases (e.g. methane leaks from pipelines)... most of this increase is the result of greater traffic through energy pipelines..." (Environment Canada – Summary of Canada's Greenhouse Gas Inventory)

(j) CO_2 emissions from coal plants can be reduced by:

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

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

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

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;

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

CONCLUSION

Coal fired power generation does not produce a "major" portion of Ontario's air contaminant emissions. The emissions impact from Atikokan and Thunder Bay Generating Stations are minute. Therefore, the health and environmental benefits have been greatly exaggerated. The emissions that do pose concerns can be readily, affordably, and successfully reduced to near par with natural gas fired generation. Switching to natural gas fired generation will not lessen global greenhouse gas emissions from power generation in Ontario.

Replacement generation will come at great cost to the Ontario economy, and to the average ratepayer, at very minimal environmental benefit.

♦ At point of combustion, natural gas produces 35%-45% less greenhouse gas emissions. However, when lifecycle emissions of natural gas for production, refining and transport are considered, natural gas has little benefit and may actually be worse for the environment in terms of climate change. As noted, the Kenora Natural Gas Compression Station alone reported higher GHG than Atikokan and Thunder Bay coal-fired stations, combined.

♦ Methane (primary constituent of natural gas) is 23 times more potent a greenhouse gas than CO_2.

The cost impacts of the coal closure are huge, and will most definitely impact provincial GDP more than 1%.

♦ Significantly more natural gas-fired generation in the GTA and "Golden Horseshoe" will create higher rates of ozone and particulate matter, increasing the health impacts in urban areas. (OPA) With shorter emissions stacks and higher concentrations of smog producing pollutants where pre-ambient conditions for ozone and smog occur, natural gas fired generation may be worse for the environment than the current coal fired generation plants.

♦ The OPA suggests that gas fired power plants may utilize the option for oil fuelled power generation. "to ensure operational capability during winter peak periods when gas demand and electricity demand peak simultaneously." The environmental impacts are greater from oil, than coal-fired generation.

♦ Single cycle natural gas power plants are proposed for peaking periods. The higher emissions associated with these facilities have not been compared to coal-fired generation, for either greenhouse gas, or air contaminant emissions.

♦ The uncertainties and tight resource balance anticipated from 2010 to 2020 will likely force imports of power from coal-fired power plants less environmentally "clean" than existing Ontario coal-fired plants (which are in the top 10% in North America).

♦ If system reliability is compromised, power interruptions may occur, thereby impacting the environment as a result of industrial and manufacturing power losses. For example, NOVA Chemicals reported that unexpected power outages introduce problems, including safety and environmental incidents typically associated with crash shutdowns and start-ups. (Letter to Minister of Economic Development and Trade, April 8, 2005)

♦ The coal closure regulation will increase electricity costs an anticipated 70%. This will cause significant damage to the Ontario economy. The results and implications are manifold, with far reaching impacts to the health and welfare of Ontarians.

♦ Higher energy costs cause disproportionate harm to those least able to cope - the elderly, the infirm, those on fixed and lower incomes. This will translate into issues such as lack of ability to afford air conditioning, or using wood burning for residential heat.

♦ It is reported that many newly constructed homes have installed natural (wood) burning fireplaces, rather than natural gas, due to the rising cost of gas. This impacts the environment, as there is more particulate matter (PM) emitted from residential wood combustion (wood stoves and fireplaces) in Ontario, than from all the provincial coal fired power plants combined. (Environment Canada – Criteria Air Contaminants Emission Summaries)

♦ Less funding will be available to address emissions from sectors of greater environmental impact than coal fired generation. (Transportation is one of the largest sources of Canadian carbon dioxide emissions. Roughly half of the carbon dioxide emissions from the transportation sector are created by the cars and light trucks we drive for personal use. The rise in transportation emissions is attributed to growth in use of SUVs and minivans, which almost doubled between 1990 and 2003.)