Clean Affordable Energy Alliance

Box 931
Corunna, Ontario
N0N 1G0
(519) 862-9296
caealliance@sympatico.ca

www.caealliance.com

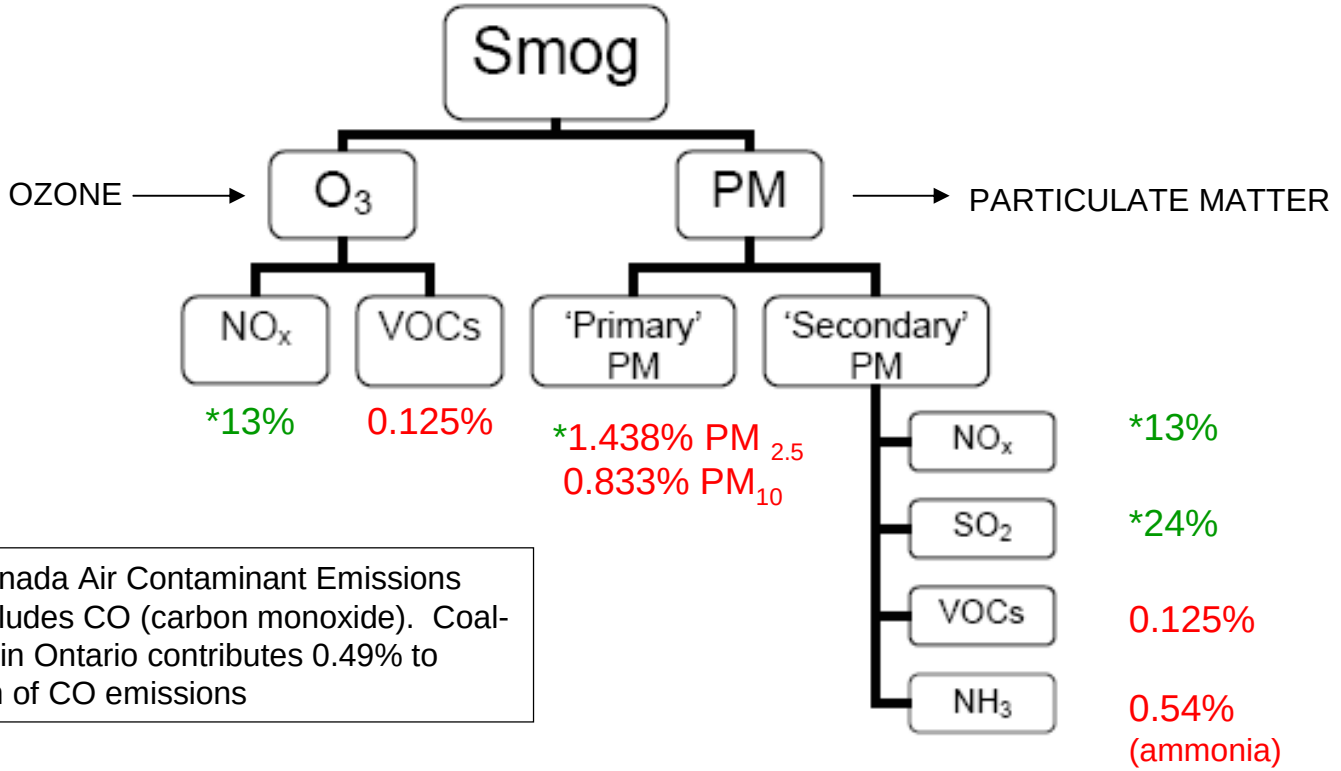
Who We Are

- Volunteer organization - a cross section of backgrounds, professions and interests
- Brought together by mutual concern for the perceived negative impacts resulting from energy restructuring in Ontario – reliability and affordability of power
- Have followed the evolving energy policy and significant changes that have taken place in the electricity sector over the past few years
- Ongoing research of energy and environmental information
- Reviewed and responded to Ontario Power Authority (OPA) reports and discussion papers
- Participate in conferences and public forums on power supply
- Submissions and presentations to the public, media, MPPs, Ministry of Energy, Ministry of the Environment and Legislative Committees
- Rely on statistics from informed, unbiased, and credible energy sources – not special interest groups

Misinformation and Missing Information

- Contribution of emissions from coal-fired power plants to Ontario air quality
- Proposed use of natural gas for power generation
- Coal use will be required past 2014
- Options for power supply

Contribution of our Coal-Fired Power Plants 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 emissions can be reduced 85-95% using current available emissions reduction technology.

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

(These figures include Lakeview GS, now closed.)

Impact Of Transborder Air Flow On Ontario Air Quality

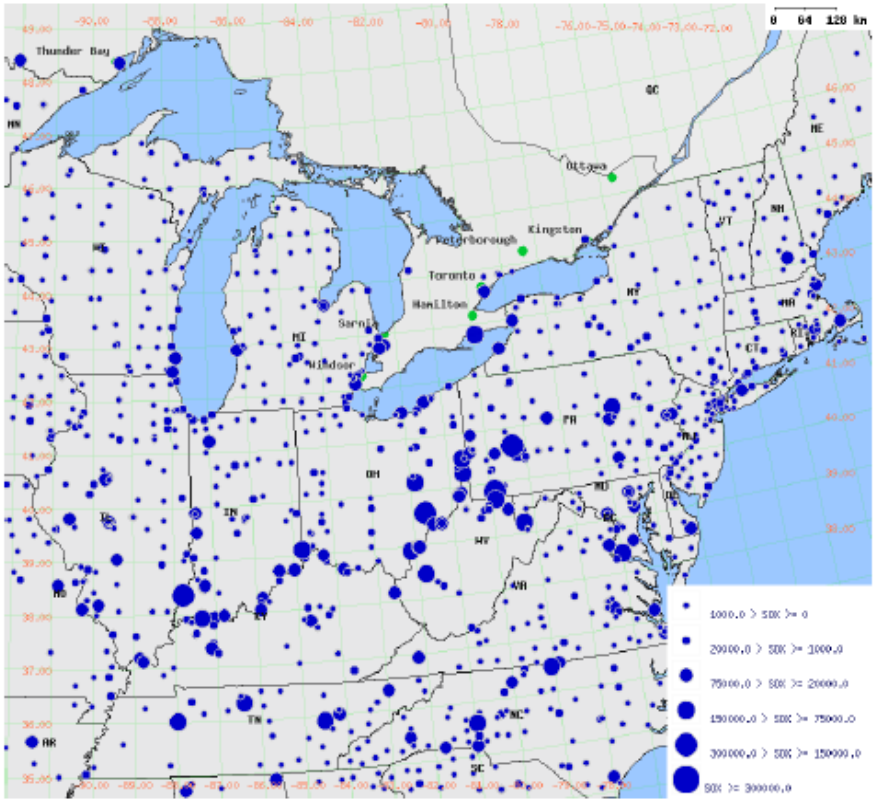
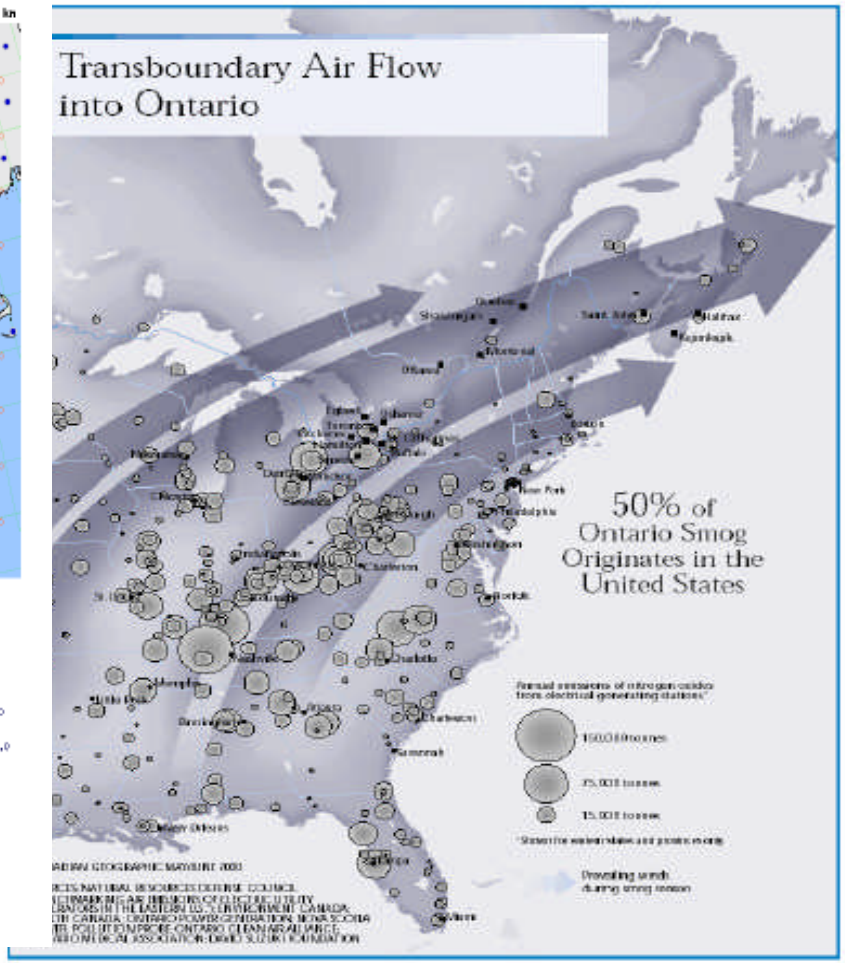


Figure A-4: Sulphur dioxide emissions from power plants shown as dots that vary in size according to their emission inventories
U.S. 1995 (with 2001 updates) and Canada 1999 Emission Inventories
(source: Ontario Ministry of the Environment)



55% of Ontario's air contaminant emissions originate in the U.S.
(Ministry of the Environment)

Impact Of Transborder Air Flow On Ontario Air Quality

OZONE

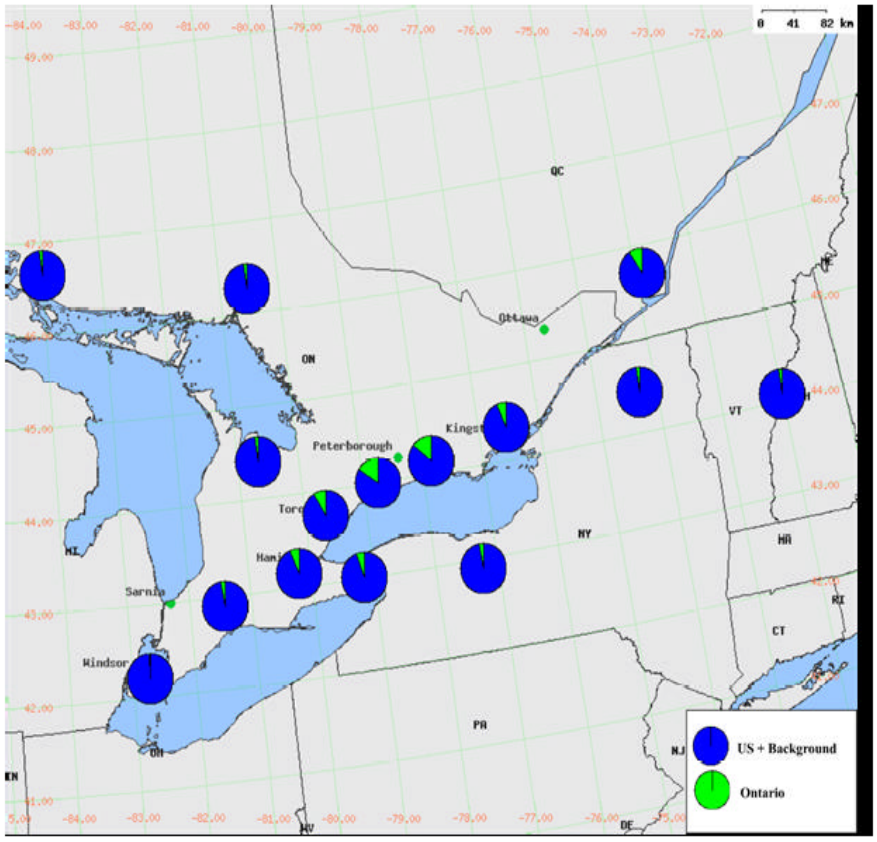


Figure 3.4: Graphic of Transboundary vs. Ontario Contribution for Ozone on High Concentration Days during 1998 Spring/Summer Season.
(source: Ontario Ministry of the Environment)

PM $_{2.5}$

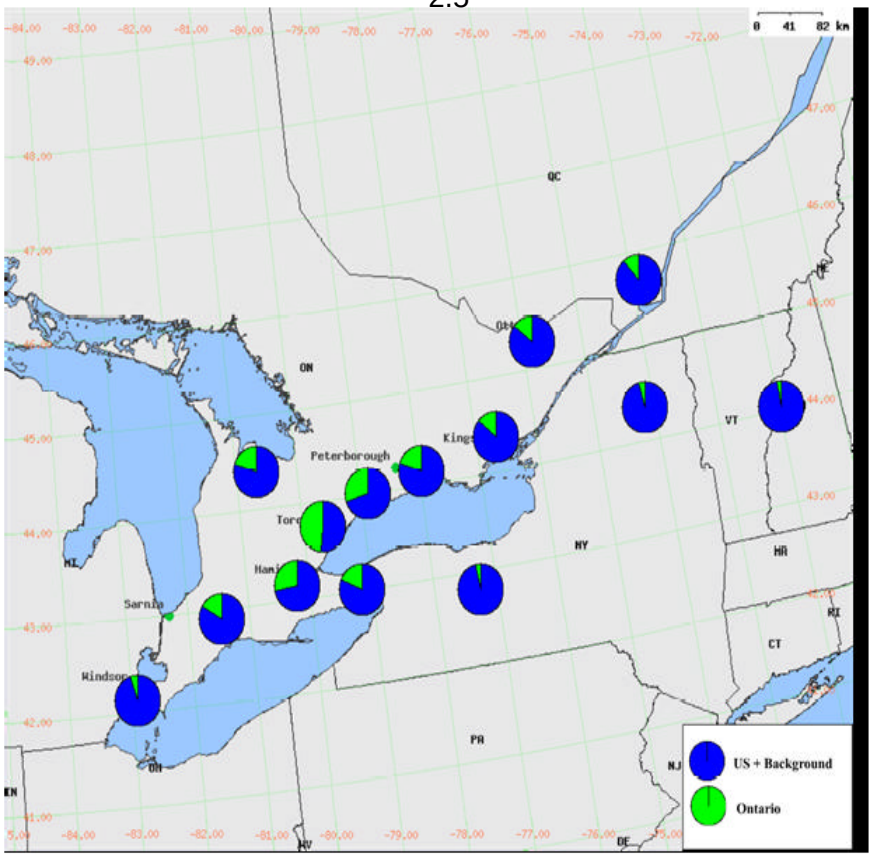


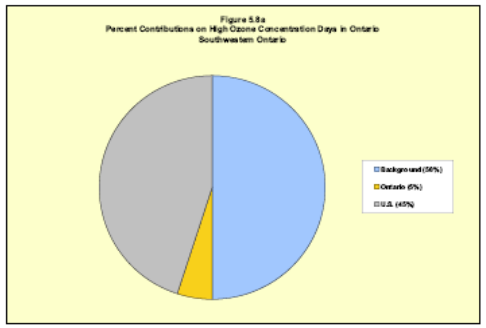
Figure 3.5: Graphic of Transboundary vs. Ontario Contribution for $PM_{2.5}$ on High Concentration Days during 1998 Spring/Summer Season.
(source: Ontario Ministry of the Environment)

- ONTARIO SOURCES
- US CONTRIBUTION

% Contribution on High Ozone Days In Ontario

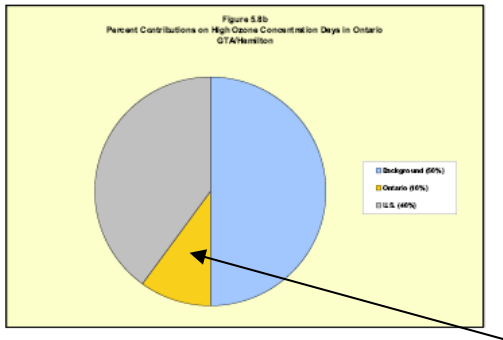
On days of low ozone, background ozone concentrations are expected to dominate, and manmade sources would not contribute as much. Background contributions were estimated to be about 75-80% for the GTA/Hamilton and 80-85% downwind of GTA/Hamilton. (Ministry of the Environment)

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



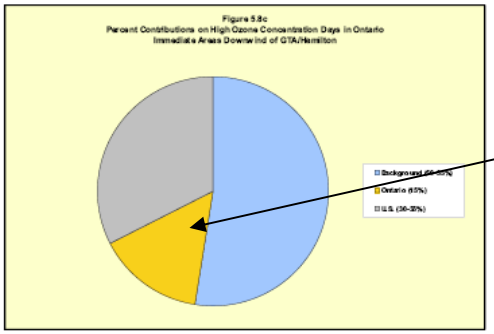
Southwestern Ontario

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



GTA/Hamilton

* Background - 50%
US Sources - 30-35%
All Ontario Sources – 15%



Downwind of the GTA/Hamilton

Coal emissions represent a small portion of this amount

*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)

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

- Small (less than 5%)

- 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)

- During smog season coal plants contribute less than 1% to Toronto ozone levels. (0.03 ppb) (Ontario's Cost-Benefit Analysis - Replacing Ontario's Coal-Fired Electricity Generation, prepared for the Ontario Ministry of Energy, April, 2005)

- "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." (University of Waterloo Centre for Atmospheric Sciences, May 26, 2006)

- "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." (Ontario's Cost-Benefit Analysis prepared for the Ministry of Energy April, 2005)

Ontario Air Quality – Health & Environmental Impacts

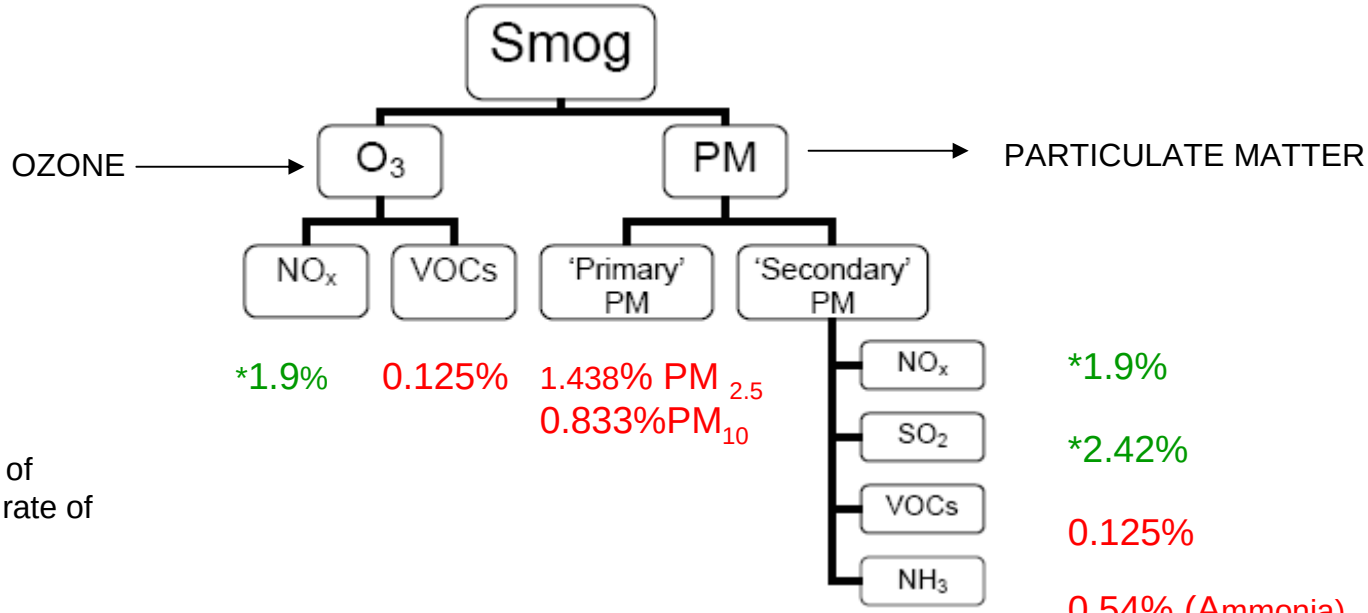
- The Ministry of the Environment operates an extensive network of air quality monitoring sites across the province.
- The Air Quality Index is based on a recording of pollutants that have adverse effects on human health and the environment.
- Example - Results from 2005 (particularly hot, smoggy summer – higher use of coal power due to decreased availability of hydroelectric power -lower water levels- and increased air conditioning use) show 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 - “may have some adverse effects for very sensitive people” – for 99% of the time most people would not be impacted

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
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
Coal’s contribution			1.438%	13%	0.49%	24%	

Source: Ontario Ministry of the Environment, Air Quality in Ontario, 2005

It is simply impossible to claim that coal fired generation is “killing people every day” (Ms. Broten, Minister of the Environment), or that “Nanticoke contributes significantly to poor air quality and adverse health effects – specifically respiratory and cardiac illness in Hamilton.” (Ontario Clean Air Alliance)

Contribution of Emissions From Coal-Fired Power Plants – With Pollution Abatement Technology**



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

(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)

Particulate Matter can be reduced 99%; Mercury and other heavy metals can likewise be reduced 60%-90%
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 at Lambton Generating Station Units 3 & 4.

**Available, affordable emissions reduction technology – proven effective at Lambton GS – making 2 of those units the 4th and 9th cleanest of about 500 plants in North America

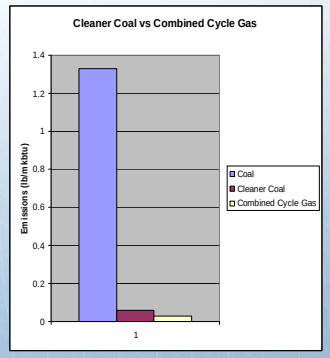
Emissions Reduction Technology

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 Canadians 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 acid rain and smog causing emissions by more than 96%. This would reduce the electric generation contribution to these emissions below the 1% level of all other sources in Ontario. The costly alternative of replacing coal … with gas… would improve emissions less than 1%." Babcock & Wilcox

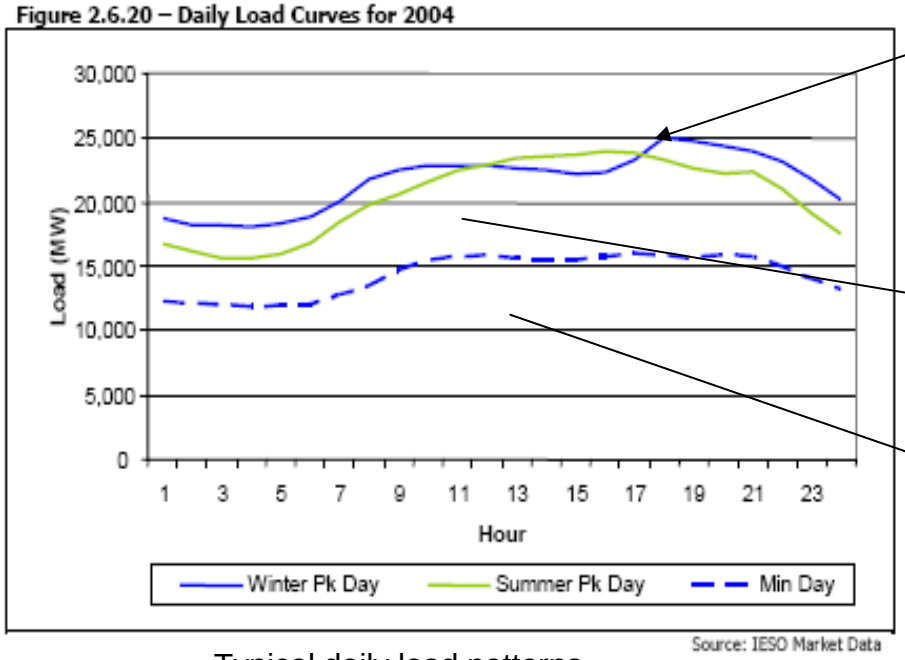
Replacement Generation

♦ Renewable resources (wind, solar) – costly; intermittent; cannot be relied upon for continual electricity production

♦ Insufficient hydro electric availability. (i.e. water power)

♦ Nuclear facilities - suitable for base load power; typically run between 85%-100% load.

♦ Coal fired generation provides flexible power ; quick response to load fluctuations; optimum load following/load balancing abilities; 24/7 dispatchable power; not impacted by weather or seasons; high probability (90.66%) of availability when needed.



Typical daily load patterns

Peak power resources -capable of ramping up quickly to pick up spikes in demand, unexpected outages from other resources, or during particularly hot or cold days.

As electricity needs increase and decrease during the day (6 am to 9 am; 4 pm – 7 pm), following lifestyle and work patterns of the province, intermediate generation provides additional power as required, then reduces it accordingly.

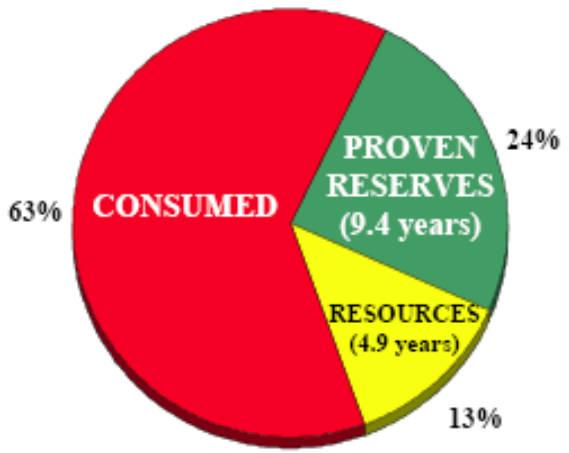
Base load generation - primarily nuclear and certain run-of-the-river hydroelectric - represents 50% of Ontario's power production - generate continuously, - do not cycle on and off, but operate to meet the minimum daily demand at constant rates of production.

Proposed Use of Natural Gas for Power Generation

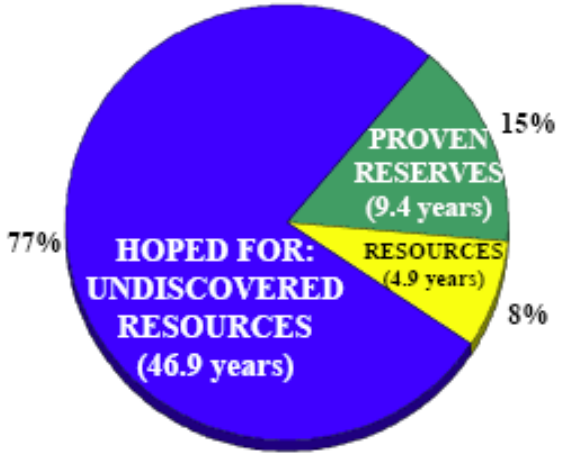
- Government has rejected the opportunity to implement proven, available technology on coal fired power plants
- Instead, significant natural gas fired generation is being procured
- Marginal, if any, environmental benefit
- "... if currently existing remediation technology were used, the air quality 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." (University of Waterloo)
- All particulate from natural gas turbines is on the order of 1 micron, and therefore of greater concern. (Ministry of Energy report)
- Increases in ozone concentrations are forecast for Toronto using gas turbines in the city.
- Natural gas prices are high and volatile due to diminishing supply and rising demand.
- Billions of dollars more to consumers ($1.5 billion for fuel costs alone had gas been used in place of coal in 2005)
- Billions for infrastructure changes – We'd better make sure there are sufficient resources if we are going to make changes that will last 30-40 years
- Less than 10 years supply of natural gas – reserves to production ratio
- Impact on other gas users – homes, industries – 95% efficiency
- Natural gas generation in Ontario will consume more gas - at less than 50% efficiency - than currently used by all residential consumers combined

Natural Gas Reserves - Canada

Canada's Remaining Discovered and Undiscovered Conventional Marketable Natural Gas Resources According to NEB (2006) Estimates including Lifetime assuming 2005 Production Rates



Discovered Resources

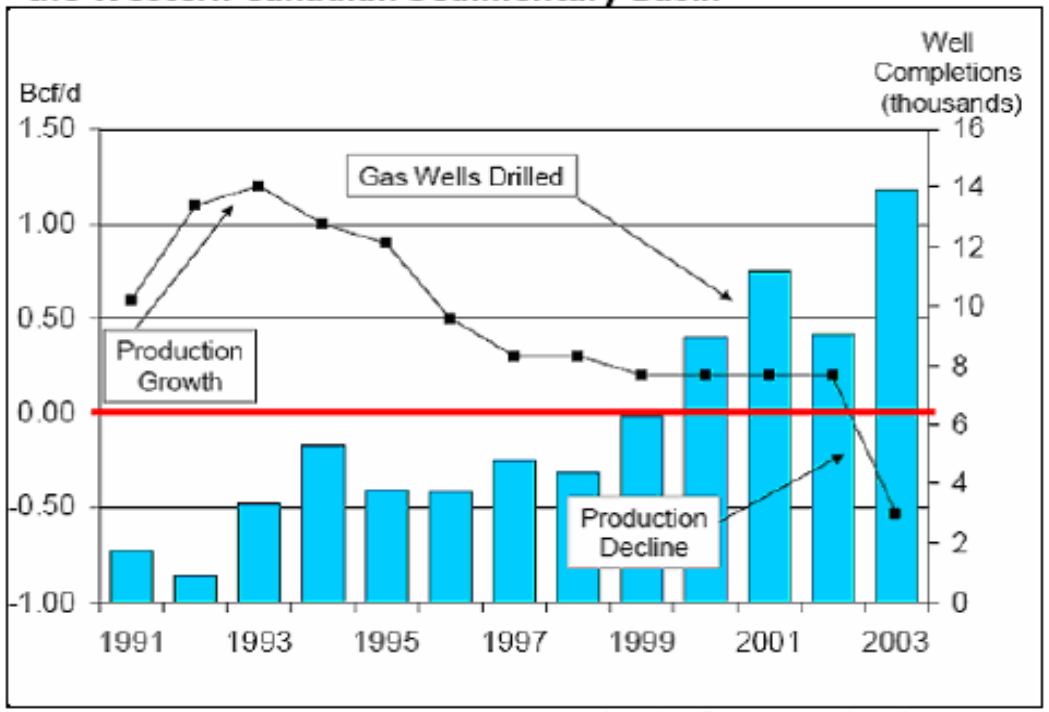


Remaining Discovered and Undiscovered Resources

(Resource estimates from National Energy Board, March, 2006, Report 2006-A, as at December 31, 2004; 2004 Proven Reserves from CAPP, 2006; 2005 Production from Statistics Canada, 2006)

Declining Natural Gas Supplies – Rising Demand

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

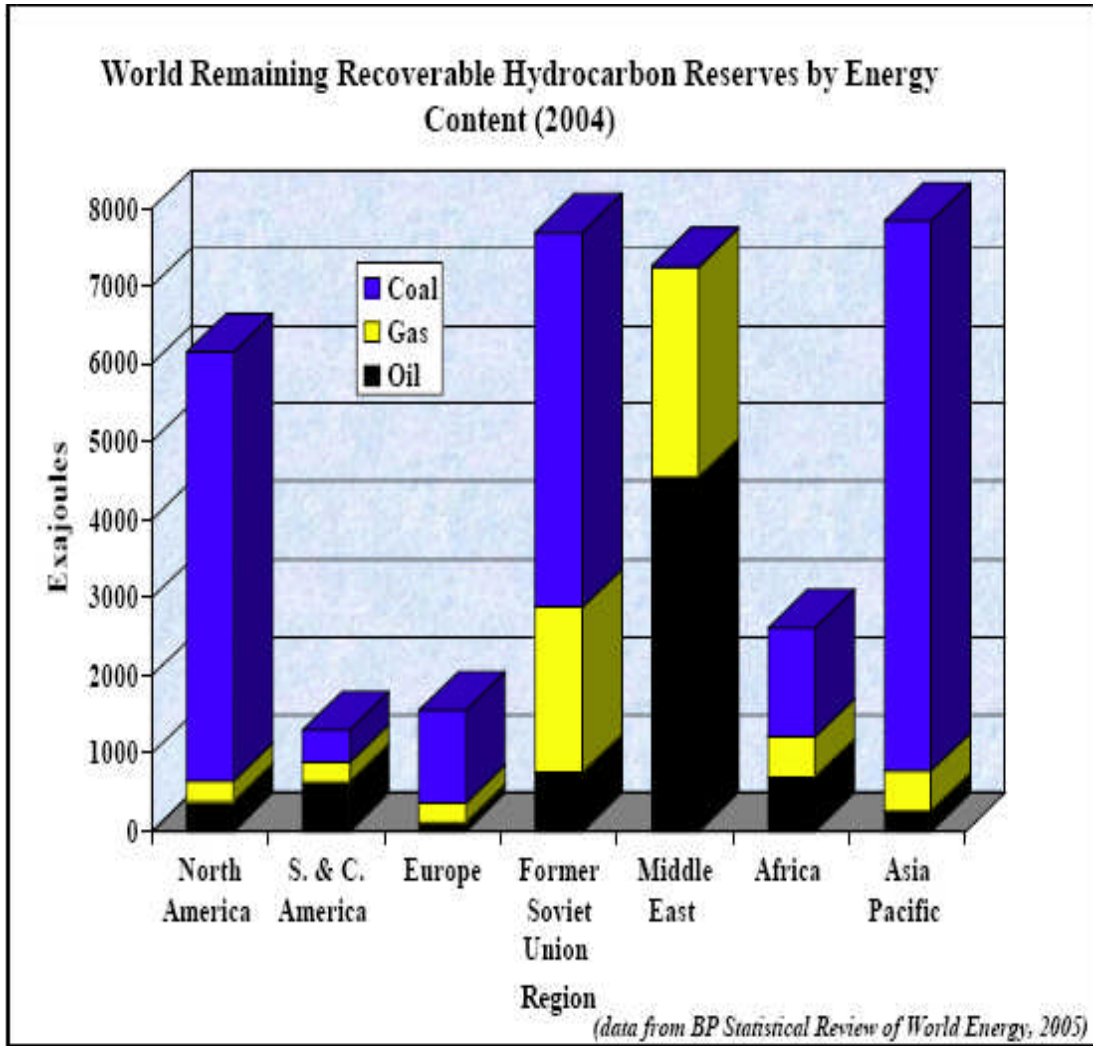


Sources: StatsCan, CAPP, Daily Oil Bulletin, reproduced in NRCan

"More than 95% of the gas consumed in Ontario comes from outside the province, mostly from the WCSB" "Total Canadian natural gas production declined 4% in 2003" in spite of the fact that "…almost 14,000 wells were drilled in the WCSB, setting a new record … average of over 38 wells per day." (Ontario Power Authority)

By 2017, natural gas prices are expected to rise due to depletion of conventional gas resources in the Western basin. (Ontario Power Authority)

World Reserves of Fossil Fuels



♦ "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)

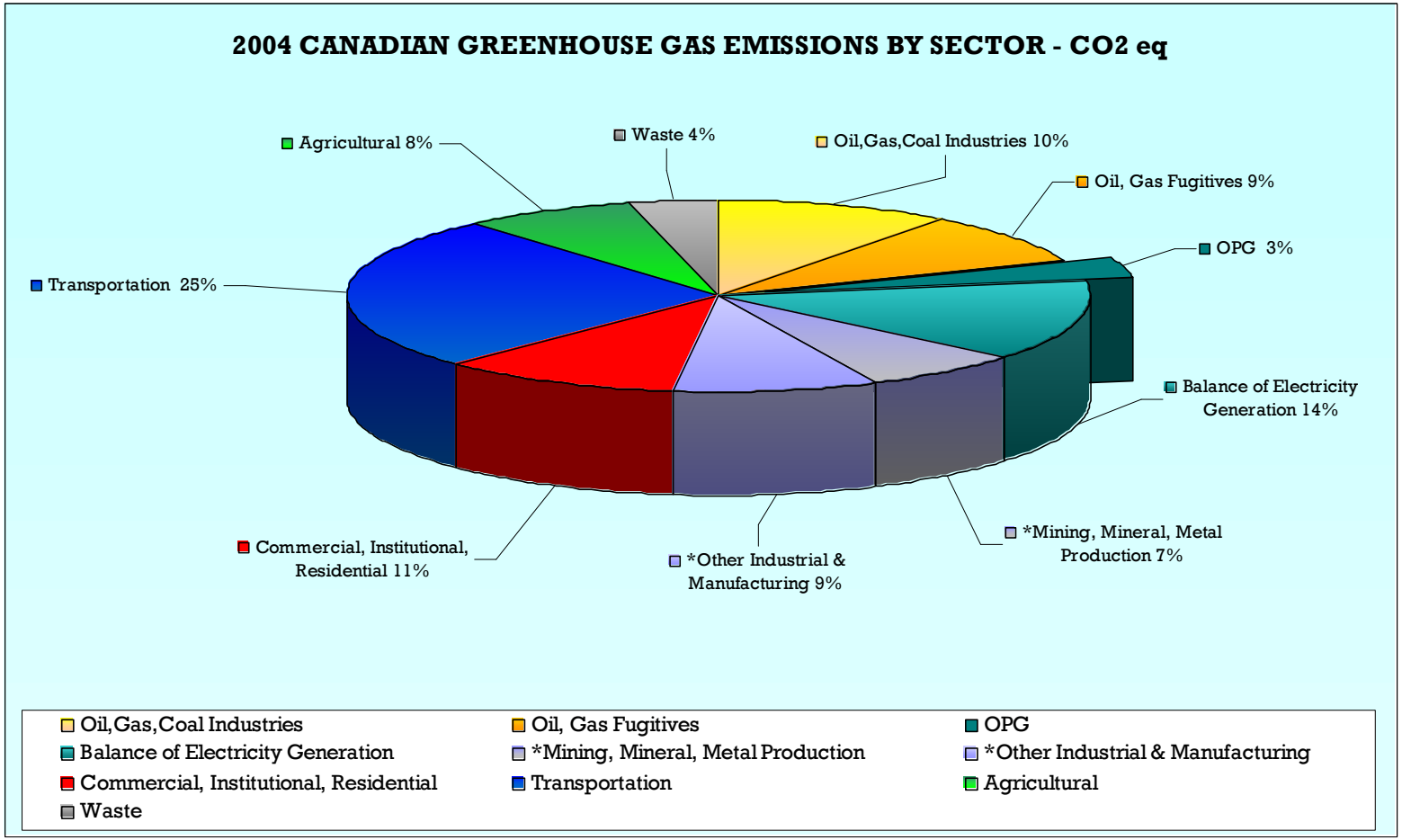
♦ "North America is to coal what Saudi Arabia is to oil.. ... in the context of growing concern about geopolitical tensions and security of energy supply, indigenous sources of supply will become increasingly attractive." (Ontario Power Authority)

♦ Natural gas reserves in North America - less than 10 years - More abundant reserves in Middle East countries

♦ 250+ years of coal reserves in North America

♦ Global reserves dispersed in non-Middle East nations – no cartel or geopolitical impacts

Greenhouse Gas Emissions



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

- Canadian Contribution to Global Man Made Greenhouse Gases (758 MT) - 2.18%
- % OPG of Global Man Made Greenhouse Gas Emissions - 0.006%

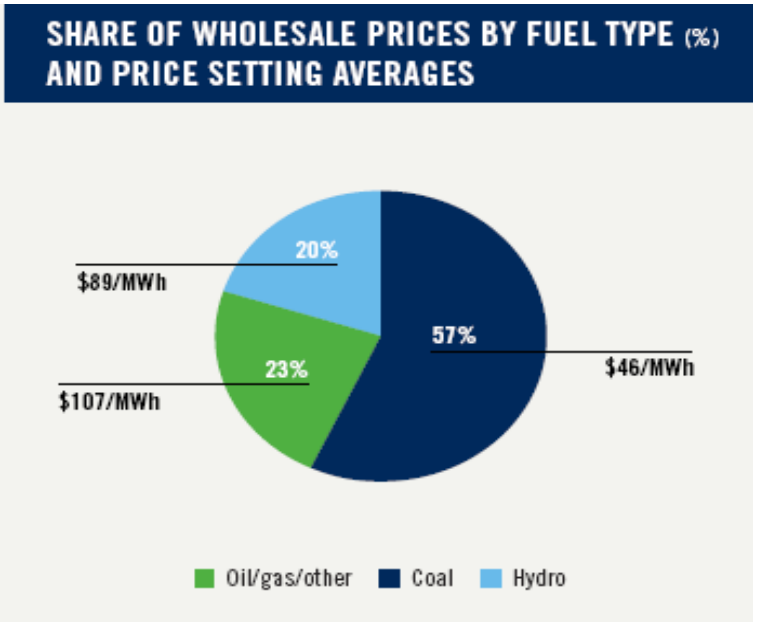
- % OPG (coal) of all Canadian GHG emissions approx. 3% (includes Lakeview Generating Station, since removed from service)
- % Nanticoke GS of Canadian Emissions 1.9% (14.72 MT)
- % Lambton GS of Canadian Emissions 0.95% (7.2 MT)

Greenhouse Gas Emissions

- Ontario's coal plants contribute less than 3% to national greenhouse gas emissions.
- Natural gas emits about 55 % the CO_2 of coal generation at point of combustion
- Additional significant emissions associated with production, flaring, processing and transport of natural 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)
- "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." (Dr. James Lovelock)
- Co-firing coal with biomass - successfully done in Europe and in preliminary stages at Nanticoke – resulting in 30% reduction in CO_2
- Therefore, no benefit from a climate change perspective, in switching from coal to natural gas

Does this make sense?

- Removal of publicly owned, paid-for assets
- With retrofit and upgrades these plants could run “indefinitely” (Ministry of the Environment)
- Replacement with high priced power – 2-3 times that of coal – primarily private investors, for-profit (Merchant power is always more expensive)
- Industry is warning that too much reliance on natural gas for electricity will cause irreparable harm to the Ontario economy



♦ Removal of Coal which sets market price more than 50% of the time.

♦ Natural Gas at 2-3 times the cost will set market price

♦ 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)

Coal Fired Power Will be Required Past 2014

- Too many contingencies and uncertainties – timing for integration of new resources is too constrained to allow for reliable delivery

- Removing 20% of **affordable** power supply at a critical time
  -existing baseload nuclear units reach end of life 2013-2022 (2016-2022 most critical when a number of units are simultaneously on refurbishment outages)
  -most ambitious conservation targets ever undertaken anywhere
  -enormous uncertainties regarding potential new resources and transmission requirements
  -projected higher natural gas prices but OPA contracts are making GTA & Golden Horseshoe dependent on gas fired power
  -expiration of many non-utility generating contracts during this time

- Addition of more renewable resources requires optimum load balancing and quick dispatch

- 80% of power supply is to be replaced or refurbished all at higher cost/MWh than current supply resources – retaining affordable coal power would offset these higher costs

- Most ambitious conservation targets every undertaken anywhere (6,300 MW – ¼ of power needs) – We will be undersupplied if these targets cannot be met – underestimation of growth in power demand

- Major transmission investments & reconfigurations needed to bring new generation on line (wind in the Bruce Peninsula area; nuclear from the Bruce)

Options …

Ontario is a large province, with colder winters and hotter summers. Our economy is based on industry, manufacturing and agriculture. These factors combine to make us an energy intensive province. Realistic options for sufficient electricity production must be considered. Renewable resources –wind and solar – can offset and complement power production from conventional sources, but are insufficient at this time to replace conventional generation. Emerging technologies are ignored – money is being expended on programs and resources with little impact on net requirements.

- Coal Gasification
- Gasification with Biomass (Switchgrass) – offset CO2 emissions
- TIPS (Thermal Energy Integrated Power System) – promising new technology
- Carbon Sequestration
- Biomass – Ontario has large peat resources
- CHP (Combined Heat & Power) – underutilized