CLEAN, AFFORDABLE ENERGY ALLIANCE

PRESENTATION TO THE LEGISLATIVE STANDING COMMITTEE ON GOVERNMENT AGENCIES

SERVICES AND MANDATE OF ONTARIO POWER GENERATION

MONDAY, FEBRUARY 26, 2007

3:00 P.M.

CONTENTS OF SUBMISSION/PRESENTATION

INTRODUCTION

Good afternoon. I am Carol Chudy, Co-Chair of the CAE (Clean, Affordable Energy) Alliance, Lambton Branch. We are an energy ratepayers' organization which advocates reliability and security of power supply, environmental accountability, and the preservation of economic sustainability.

CAE members have closely followed provincial power restructuring over the past few years. We have reviewed and responded to Ontario Power Authority (OPA) reports, stakeholder submissions, discussion papers, web conferences and workshops. We have spent considerable time researching credible energy and environmental information. Our initial concerns for the future affordability and stability of Ontario's power system have not diminished through this process. We have expressed our concerns to the media, the Ministry of Energy, Ministry of the Environment, opposition critics, the OPA, and Committees such as this.

As a voice for ratepayers, we appreciate this opportunity and wish to address three issues directly related to the services and mandate of Ontario Power Generation (OPG):

1. The Memorandum of Agreement and its Implications on the Minister of Energy, OPG and the Stakeholder;

2. The role and restrictions of OPG in a market-based system;

3. The continued presence of coal-fired power generation in Ontario.

1. THE MEMORANDUM OF AGREEMENT AND ITS IMPLICATIONS ON THE MINISTER OF ENERGY, OPG AND THE STAKEHOLDER

Ontario's publicly owned utility, now known as Ontario Power Generation, has undergone significant changes since it's inception in 1906. The original mandate was to "provide all citizens with electricity at the lowest possible cost". The utility which first brought a modern convenience to early Ontario now provides an essential service, vital to every aspect of our lives. In spite of the changes within the utility, the mandate is essentially the same - "to cost effectively produce electricity from its diversified generating assets, while operating in a safe, open and environmentally responsible manner".

♦ A "Memorandum of Agreement" between OPG and "the Crown", as represented by the Minister of Energy, describes the mandate, governance, performance and communications of the provincial utility. It is intended to "promote a positive and co-operative working relationship". (August 17, 2005)

♦ Both parties to the Agreement - the Minister of Energy and OPG - have responsibilities. Those of OPG are specified; those of the Minister are implied by virtue of his office as representative of Ontario ratepayers.

Implications

(i) The Minister of Energy must not act on his own behalf, nor out of political motivation, but as one who protects the interests of the people of Ontario. His interaction with OPG ought to conform to the Ministry mandate to "ensure that Ontarians have access to safe, reliable and environmentally sustainable energy supplies at competitive prices" (Statement of Environmental Values, Environmental Bill of Rights) and in harmony with the Ontario Energy Board mandate to "protect the interests of consumers with respect to prices and the adequacy, reliability and quality of electricity service".

(ii) The average Ontarian forms opinions primarily from media information and public interest groups. (Public opinion report prepared by Decision Partners for the OPA, December, 2005) Unfortunately, there are recurring reports that, in our opinion, represent partial information as the whole, misinform, or mislead. When sustained and combined, the public forms opinions that are based on perception, not reality. We are concerned that much information regarding the environmental impacts of power generating resources goes uncontested.

OPG has the mandate to operate with transparency, accountability and social responsibility. (Memorandum of Agreement). In fact, Minister Duncan has said that "Ontario Power Generation is a publicly owned company belonging to the people of Ontario. It plays a critical role in all our lives and the people of Ontario pays this company's bills. It must operate and be seen as operating with transparency and accountability to the taxpayers." (Standing Committee on Estimates, October 6, 2004 – Hydro One included in the original quote)

The CAE therefore asserts that OPG has a public duty to counter any misinformation, misrepresentation of information or misperception from any source.

(iii) According to the Agreement, "OPG will operate as a commercial enterprise with an Independent Board of Directors."
(Commercial is defined as "viewed with regard to profit" – Webster; "Pertaining to business; done with a profit motive" – Investorwords.com)
(Independent is defined as "not subject to control by others; self-governing" – Webster; "Free from the influence, guidance, or control of another or others" www.answers.com**)**

♦ As such, OPG operations should be guided by the same market principles as other prospective generators, including fair and unbiased procurement options and subject to competition processes that are open and accessible. (as defined in the OPA Procurement Discussion Paper) If private industry can compete against OPG without concessions, contracts should be awarded. Otherwise, the ratepayer subsidizes private enterprise.

♦ The CAE Alliance believes that Ministry and government involvement with OPG should be characterized by oversight and accountability, not intervention. Although the Agreement grants the Minister the prerogative to direct OPG to undertake special initiatives [(B (2)], the instances to date, we believe, have not been in the public interest. (Reduction of Bruce Power lease payments, $25.5 million/year to $5.5 million/year; Conversion of Thunder Bay Generating Station to natural gas, later cancelled with legal action pending; the direction disallowing OPG to bid in on RFP projects and the coal closure mandate - the latter 2 were pre-Agreement.)

2. ROLE AND RESTRICTIONS OF OPG IN A MARKET-BASED SYSTEM

Throughout the last decade deregulation and market participation was considered by many as an ideal solution to address the massive new infrastructure investment required to replace and enhance Ontario's power supply. Private investment would divert the risks from ratepayers to producers, share in the cost of new power plants and would create a climate of competition guaranteed to lower costs for consumers.

Five years ago Mr. McGuinty (pre election) voiced support for a genuinely competitive market for power generation, but noted that the province needed to break up OPG to ensure competition in electricity generation. (Financial Post, March 15, 2002) At that time it was determined that 4,000 MW of "price-setting" power production should be divested in order develop a competitive marketplace. This "long-term vision" for the "creation of a competitive market" for electricity supply in Ontario is a stated goal of the Ontario Power Authority.

The interim years have seen significant changes in Ontario's power administration, which have not only paved the way for market participation, but have resulted in much more government intervention in power production and distribution.

In spite of this, the OPA notes that insufficient supply-side competition exists and the necessary market features have not developed. A genuinely competitive marketplace has not materialized. (Procurement Discussion Paper, December, 2006) Neither have the desired benefits. The ratepayer is in a worse situation. Consider:

♦ Valuable assets were sold at a fraction of their value. We are now paying higher rates for power generated from those facilities. The divestment of assets consisted of the sale of approximately 500 MW of hydroelectric facilities on the Mississagi River to Brascan, for a fraction of their net worth, including reduction of water fees from $10 million/year to $6 million/year. The result - When Brascan plants "moved to market price, they bid in at a very high price. Brascan boasted about how much money they made off those plants. They said, 'It only cost about 3 cents/kwh to produce electricity but we were selling it at 14 cents, 20 cents a kilowatt hour.'" (Mr. Howard Hampton, Standing Committee on Estimates, October, 2004)

♦ Bruce Power, in 2001, was leased out on a long term basis diverting revenues and profits from the public utility to private investors.

♦ In October, 2005, the government reduced the lease amounts payable to OPG from Bruce Power from $25.5 million to $5.5 million/year.

♦ It has been necessary to provide merchant power producers with subsidies, tax benefits, guaranteed minimum payments and/or bonuses to encourage participation in the Ontario marketplace. When inducements are required to secure investment, true competition does not exist.

Examples: "Producers of clean power enjoy tax advantages if they contribute to the province's supply of green power before January 1, 2008."

"An immediate, 100 percent corporate income tax write-off and a capital tax exemption for assets acquired after November 25, 2002, and before January 1, 2008 that are used to generate electricity from clean, alternative, or renewable energy sources;

A sales tax rebate on building materials purchased after November 25, 2002, and before January 1, 2008 that are incorporated into facilities that generate electricity from clean, alternative energy sources." …

"Natural gas is exempt from Ontario fuel taxes…"
(Ontario's Clean Air Action Plan: Protecting Environmental and Human Health in Ontario, June 21, 2004)

♦ Contracts made between the OPA and some private power producers (St. Clair Energy Centre, Greenfield Energy Centre) guarantee a recovery of costs, regardless of whether they generate. The public is not privy to contract details, although Ontario ratepayers will bear some risk.

♦ Bonuses were promised to some private power producers to encourage timely construction of coal replacement facilities.

♦ When questioned, a senior Ministry of Energy policy advisor told us that there are no pre-existing conditions which would preclude private generators from exporting power markets although Ontario consumers, through one form or another, subsidize their presence in Ontario.

♦ Risk has not been transferred to investors. "Rather than push ahead with fundamental electricity market reforms, the Government of Ontario has opted to focus its efforts on contracting directly with the private sector to build new

generating capacity. This approach entails potentially significant financial risks for the province and, ultimately, for the electricity ratepayers and taxpayers of Ontario, as the province is providing investment guarantees to private-sector electricity generators in an effort to attract investments." (Library of Parliament – Parliamentary Information and Research Service – "Ontario's Electricity System: Is There Light at the End of the Tunnel?" – September 22, 2005)

♦ High administration costs are incurred for power procurement processes and administration of contracts.

♦ The OPA has proposed market mechanisms to "preserve competitive tension", such as to "pay honoraria to losers to offset their costs of preparing and submitting proposals to ensure that a sufficient number of proponents stay involved toward the latter stages of a procurement process."

♦ Capped prices prevent OPG from full commercial advantages enjoyed by merchant power generators.

♦ The report "Levelised Unit Electricity Cost Comparison of Alternate Technologies for Baseload Generation in Ontario" (CERI, August, 2004), concludes that publicly financed generation is less costly than is private, merchant generation. This is evident from the proposed price for power supplies included in the OPA Integration Discussion Paper.

♦ The OPA focus has been on procurement of supply resources from merchant generators. This has the negative ramification of stifling research and innovation in generation planning.

Significant changes have occurred over the past five years that directly impact our energy choices, including:

♦ higher, volatile costs of natural gas due rising demand coupled with dwindling internal supplies and uncertainty of future supply sources;

♦ advances in technology to keep pace with environmental guidelines;

♦ geopolitical concerns impacting security of supply resources;

♦ emergence of international economies that impact Canadian competitiveness, for both our goods and services, and external fuel resources.

Summary

The CAE Alliance is concerned that the government's vision for a strong presence of merchant generation in Ontario is driving their current energy policy. There does not appear to be an assessment or evaluation of the merits of proceeding or what it is costing the consumer to get there. It is our opinion that this is an outdated agenda and is not in the public interest, nor prudent to pursue significant private investment.

We need to recognize that "OPG owns one of the most diversified, low cost and low emission portfolios in North America.", with a "commitment to continually improve the efficiency of our generating stations so that Ontario has the power it needs, when it needs it." **(**www.opg.com**)** The government needs to reassess the market model and role of OPG in power production.

3. THE CONTINUED PRESENCE OF COAL-FIRED POWER GENERATION IN ONTARIO

After extensive research, the CAE Alliance has concluded that the coal-replacement strategy is based more on political will than on science and economics.

AIR QUALITY IMPACTS

1. Current Emissions Contribution

♦ The CAE Alliance has used Ministry of the Environment and Environment Canada information to conclude that coal fired generation produces less than 7% of the emissions associated with poor air quality in Ontario, when taking cross border pollution into consideration.

♦ According to the Ministry of the Environment, the main components of SMOG are O_3, i.e. ground level ozone (NO_x + VOCs) + SO_2, CO, particulate matter + hot stagnant air.

♦ Coal fired generation contributes primarily to 2 of these 5 main pollutants, i.e. NO_x and SO_2, approximately 12.5% and 24% respectively. (However, 80% - 95% reduction of these emissions can be and are being reduced.)

♦ Of the other 3 - CO, particulate matter and VOCs - coal plants contribute an insignificant amount. (Using Environment Canada – Criteria Air Contamination Information for all Electricity Generation in Ontario - CO – 0.488%; $PM_{2.5}$ - 1.438%; PM_{10} - 0.833%; VOCs - 0.125%)

♦ The chart on page 19 shows, by sector, the smog contributors, including contribution from the electricity generating sector. The information on our chart, "Emissions from Ontario Coal Fired Power Plants", page 20 shows the same information, adjusted to include transboundary air pollution, which is, according to the Ministry of the Environment, about 55%. (Transboundary Air Pollution in Ontario, June, 2005) VOCs were excluded due to small contribution from electricity generation.

♦ During smog episodes, "Ontario's NO_X 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 …"
The 2004 Canadian Acid Deposition Science Assessment report reaffirmed the significant contribution to acid deposition in eastern Canada (which includes the province of Ontario) from U.S. sources. Canadian sources in the region emit less than 10 percent of total sulphur dioxide (SO_2) and NO_x emissions." (Transboundary Air Pollution in Ontario, June, 2005)

Therefore, during smog days, coal fired generation contributes about 2.5% and 1% to SO_2 and NO_x respectively, in our air shed.

♦ Modeling results during smog season indicate that "…the Toronto ozone level from the Ontario coal plants is only 0.03 ppb". That is less than 1%. (Ontario's Cost-Benefit Analysis - Replacing Ontario's Coal-Fired Electricity Generation, prepared for the Ontario Ministry of Energy, April, 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)

2. Air Emissions Reductions Technology

♦ The Minister of Energy directive to the OPA, June 13, 2006, specifically called for "coal fired generation in Ontario to be replaced with cleaner sources in the earliest practical time frame."

♦ The IESO has advised that coal replacement resources should closely resemble the withdrawn resources, i.e. in load following, load balancing, and quick dispatch abilities. Natural gas fired generation is the only close substitute for coal fired power. Therefore, although the OPA acknowledges that there are considerable risks associated with price, volatility and supply of natural gas for electricity generation, the IPSP (Integrated Power System Plan) includes the installation of an additional 7,000 MW of natural gas fired generation (approximately 12,000 MW total installation of gas fired capacity).

♦ The OPA refers to the all-party Select Committee on Alternate Fuels as a basis for the coal closure mandate. However, the recommendations from that Committee, in 2002, state that, "The Committee believes that Ontario should work to eliminate its reliance upon coal based power generation, unless future technological advances result in dramatically reduced air emissions that are equivalent to or lower than emissions from natural gas generation."

♦ Studies and reports indicate that emissions from coal fired power plants can be reduced to about 1% with current, available emissions control technology. This is within that of natural gas.

♦ For example, 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."

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". ("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)

♦ "Building new gas generation facilities closer to urban centers will cause some local degradation of air quality in terms of ozone concentrations." (Ontario's Cost-Benefit Analysis - Replacing Ontario's Coal-Fired Electricity Generation) This is acknowledged by the OPA.

♦ The Ontario Ministry of the Environment acknowledges the successful use of emissions reduction technology, as noted below.

(i) "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")

(ii) 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)

♦ 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.)

♦ "The scientific evidence demonstrating that the $PM_{2.5}$ fraction accounts for many health damages has increased substantially over the last five years. … All particulate from gas turbines is on the order of 1 micron, hence all PM is assumed to be $PM_{2.5}$." (Ontario Ministry of the Environment, "Coal-Fired Electricity Generation in Ontario")

♦ Examples of commercially available remediation technology statistics are included, page 22 of this information.

3. 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.
Reduction of other metals is likewise achievable, as noted in the chart on page 22.

SUMMARY

The Ontario government mandate to close coal-fired power generation will come at great cost to the Ontario public. Natural gas power production, the only viable replacement, will cost at least 2-3 times that of coal. By analogy, that is comparable to funding private in place of public schools at triple the cost. There are significant supply issues associated with natural gas. These issues are detailed in pages 27 to 35 of this report.

We concur with the Electricity Conservation and Supply Task Force (ECSTF), a Committee of "19 leaders from all parts of the electricity industry that met weekly and heard presentations from nearly 100 experts". They concluded "… energy market experts no longer see natural gas as a stable and affordable fuel ... Some members of the Task Force believe that the phase out (of coal) poses large economic costs and that the environmental benefits can be achieved by other means (than phasing out coal)." (Tough Choices, Addressing Ontario's Power Needs – Final Report – Process & Recommendations, January, 2004)

CLIMATE CHANGE POTENTIAL

♦ According to Environment Canada statistics for 2004, OPG coal plants contribute about **13%** to Ontario greenhouse gas emissions; about 3% to the national total; 0.006% globally. (see Charts, pages 23 and 24) Information contained includes Lakeview Generating Station, no longer operating.
Emissions were lower in 2006 due to lower power demand, higher nuclear output, and demand destruction in the manufacturing sector.

♦ As part of the coal replacement strategy, the OPA notes that natural gas fired generation will "in effect" replace coal.

♦ According to Environment Canada, the greenhouse gas intensity for electricity generation per kWh is 503 g CO_2 eq for natural gas and 960 g CO_2 eq for coal at point of combustion. (Canada's Greenhouse Gas Inventory, 1990-2003 Annex 9: Electricity Intensity Tables) Therefore, natural gas emissions are 52.4% those of coal per kWh.

♦ The following chart from Natural Resources Canada indicates that natural gas fired generation produces 56.67% the emissions from electricity generation, as compared to coal fired power.

Table2: Direct and indirect GHG emission factors for Electricity generation, by fuel type	
Fuel Type	*Direct CO_2 emissions*
Coal	*1.20 kg CO_2-eq./kWh*
Fuel Oil	*1.10 kg CO_2-eq./kWh*
Natural Gas	*0.68 kg CO_2-eq./kWh*
Nuclear	*0.0052 kg CO_2-eq./kWh*
Hydroelectricity	*0.0024 kg CO_2 -eq./kWh*
Source: NRCan Office of Energy Efficiency, June 2005	

♦ The chart below identifies the global warming potential of a gas fired facility with consideration given to life cycle emissions, including a conservative estimate of 1.4% fugitive emissions.

GWP Contribution For Each System Component

Process step	GWP value (g CO_2-equivalent /kWh)	Percent contribution to GWP (%)
Power plant operation	372.2	74.6
Natural gas production & distribution	124.5	24.9
Construction & decommissioning	2.0	0.4
Ammonia production & distribution	0.4	0.1
Total	499.1	100.0

Source: Life Cycle Assessment of a Natural Gas Combined-Cycle Power Generation System , U.S. Department of Energy Laboratory

♦ This chart indicates that production and distribution represents about 1/3 (33.35%) of the total global warming potential of the overall life cycle of natural gas fired power production. Therefore, we must assess natural gas climate change potential as point of combustion emissions, plus an additional 33.35%.

♦ Estimates in other areas for life cycle emissions (i.e. Russia) are higher. The U.S. Department of Energy also reports emissions from natural gas generation assuming 4% fugitive emissions as 586.6g/CO2 eq /KWh.

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

♦ We must consider the emissions from production and refining. 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.

♦ "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)

♦ "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)

♦ CO_2 emissions from coal plants can be reduced by:
(i) Co-firing with biomass - Mixing biomass, or "carbon dioxide neutral fuel" is widely used in Europe to reduce greenhouse gas emissions by 30%. Added benefits include additional modest reductions in SO2, NOx and mercury. We support and encourage the use of biomass in our coal fired power plants, as has recently proposed for Nanticoke Generating Station;
(ii) Implementing emissions control technology to increase unit efficiency – less coal burned, therefore less carbon emissions;
(iii) Re-establishing emissions trading (A practice of OPG prior to coal closure mandate);
(iv) Acknowledging the contribution of fly ash from coal combustion that is diverted from land fill and used in place of cement for concrete production, which as the statistics show, is carbon intensive. (More than 1 ton of CO_2 is emitted for each ton of cement used.);
(v) Combined Heat & Power operations using coal fired generation would cut ½ the CO_2;
(vi) Sequestration – a rapidly developing process for dealing with CO2 from power plants.

Summary

♦ 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, the margin is narrowed significantly.

REQUIREMENT OF COAL FIRED GENERATION BEYOND 2014

From our assessment of the OPA's proposals for the IPSP (Integrated Power System Plan), the CAE Alliance believes that insufficient resources will be in place to ensure reliable power production through to 2020. (See page 18, Appendix 1) We conclude that greater than anticipated coal fired generation will be required in past 2014.

Also, many changes and uncertainties are anticipated through the next decade. Retaining the reliability of coal fired generation will stabilize the power system as significant changes are made in the supply portfolio.

The OPA acknowledges coal fired generation to be "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." It meets all the criteria of reliability, cost-effectiveness, flexibility, robustness, and with emissions abatement technology, can conform to environmental performance demands.

Therefore, it is imperative that the coal fired plants be maintained in optimum condition, and that BEST available emissions reduction technology be installed without delay on all remaining coal fired generating units.

SUMMARY OF RECOMMENDATIONS

1. In keeping with Minister Duncan's comments that "our government believes that transparency and accountability are the best safeguards of public service", we recommend that OPG be directed to respond, by media release, to any public information that is misleading, incomplete or misinformed.

2. Minister Duncan has acknowledged the use of emissions technology to reduce NOx and SO2, and has indicated that if somebody could develop the technology to remove particulate and mercury, he would be compelled to review the information. (Focus Ontario, May 18, 2005) We assume that OPG has relevant information, or access to commercial information regarding technology available for emissions reductions of these substances. We request that any relevant information be made available to the Minister.

3. The CAE Alliance is convinced that coal fired generation will be required beyond 2010. Years have been wasted already. For the health of Ontarians and benefit of our environment, we request that the Ministry of Energy direct that the best available emissions control be installed on all remaining coal fired units.

4. According to the OPA, market participants have voiced "the presence of a dominant generator" (which the CAE Alliance assumes to be OPG), as one reason for insufficient market development in Ontario. Private, for profit generation cannot compete with public power production.

The CAE Alliance has concluded that closing OPG's coal fired power plants will not significantly improve air quality in Ontario, neither will it greatly impact climate. What the closure will guarantee however, is the removal of 6,500 MW of affordable power. (Coal fired generation sets the market price over 50% of the time, as noted from the chart below.) Removing affordable power will result in greater competition in the power marketplace, but at much greater cost to the ratepayer.

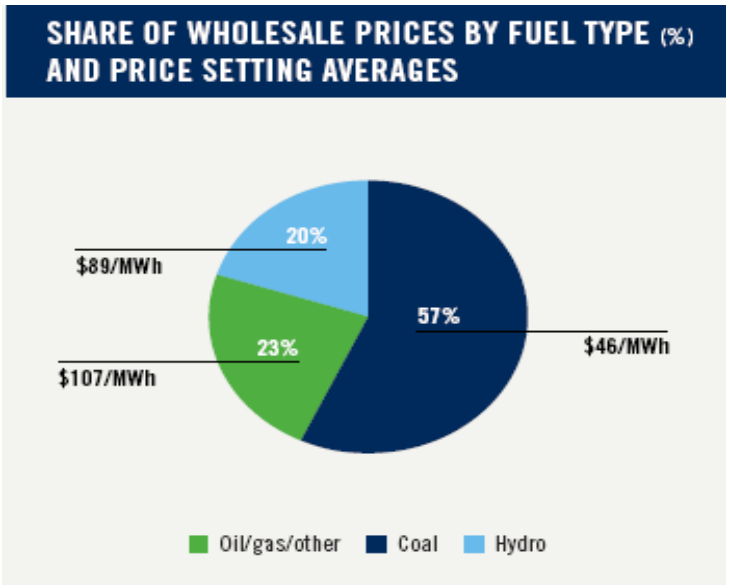


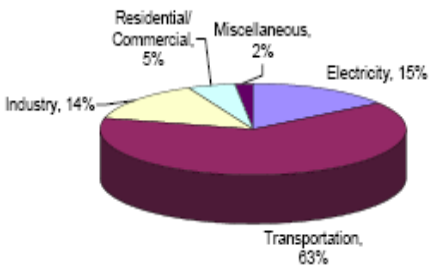
Chart from IESO, 2005 Year in Review

It is important to note that the OPA reports that natural gas fired generation will "in effect" replace coal fired power production. However, the Cost Benefit Analysis of the Coal Replacement prepared for the Ministry of Energy in April, 2005, concludes that "The average annual costs of generation for Scenarios 2 (All Gas) and 4 (Stringent Controls on Coal Fired Power Plants) are similar …" . There is no economic benefit switching to natural gas, even when all of the health and environmental ramifications (including climate change potential) are considered.

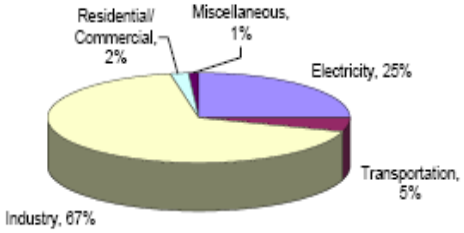
CONTRIBUTION OF ELECTRICITY GENERATION TO AIR QUALITY EMISSIONS IN ONTARIO

The following charts illustrate the sources of the four key smog pollutants in Ontario:

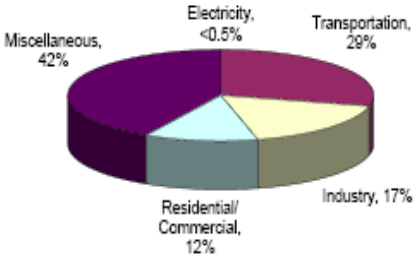
NO_x Emissions



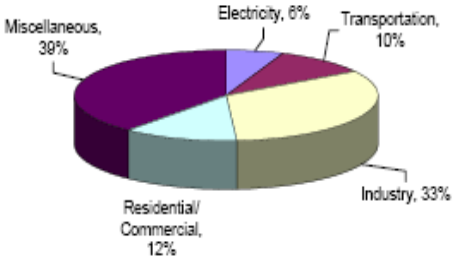
SO_2 Emissions



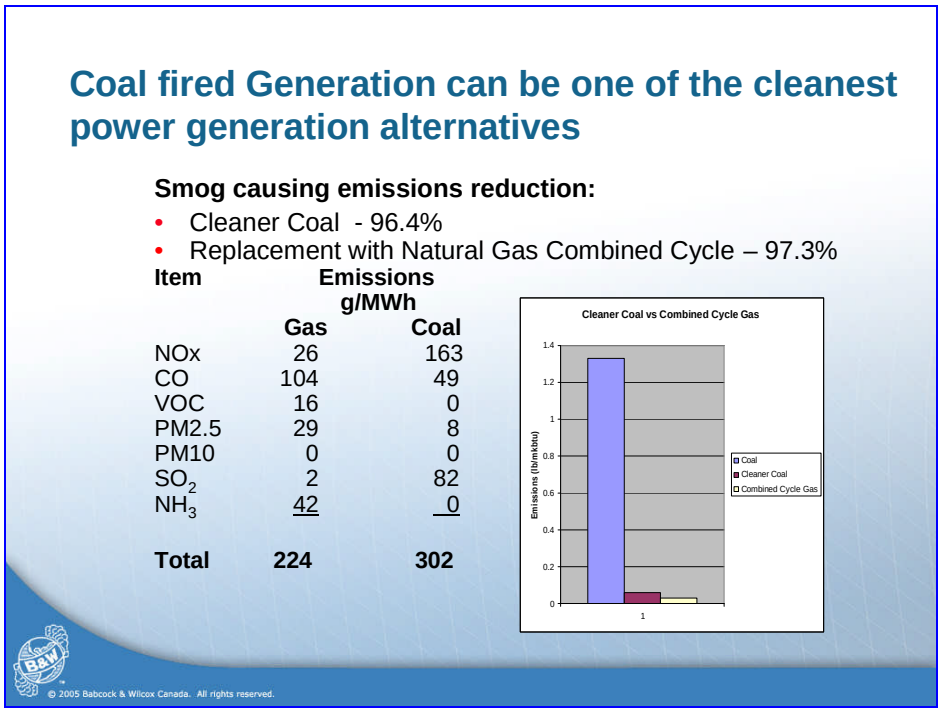
VOC Emissions



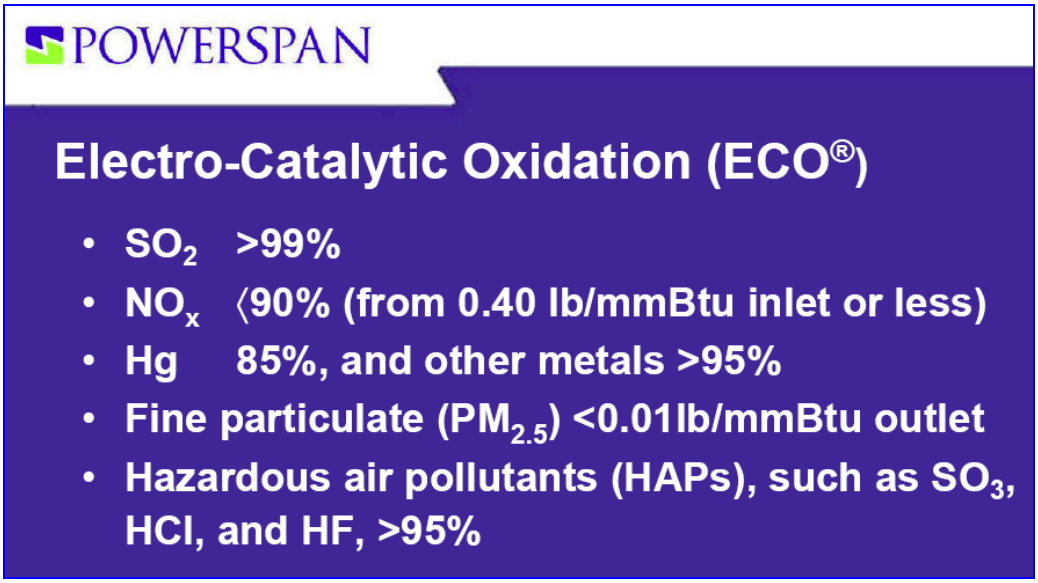
PM Emissions



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



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)**



APPENDIX A

Factors Impacting Coal Closure by 2011-2014

After reviewing the OPA Supply Resources and Integration papers we are convinced that there are insufficient resources to allow for coal elimination by 2014. The timing for integration of new resources is too constrained to allow for reliable delivery of power without utilizing the coal fired units.

♦ Even if all renewable energy hoped for is in place by 2015, it is not possible for these resources to produce the proposed additional 12-15 TWh of power required from them.

♦ Existing nuclear units will reach end of life between 2013 and 2022; availability will be lowest between 2016 and 2020 when a number of units are simultaneously on refurbishment outages.

♦ Regarding nuclear refurbishment, "…the availability of skilled labour, long lead time for equipment and critical material resources can adversely impact scheduled completion dates and cost. … many nuclear units throughout the world also due for refurbishments, coordination will also be vital for Ontario companies to secure their place in line for materials and specialized companies …" (OPA)

♦ The additional power from refurbished Bruce units may not be utilized if interim transmission measures are not effectively implemented. The generation from the Bruce units, and wind power in that vicinity, are dependent upon deliverability from transmission not currently available.

♦ The OPA has indicated that the target CDM is the most ambitious undertaken anywhere, and "…that it will be a challenge for Ontario to deliver the near-term amount of CDM included in the plan."

♦ There are supply and cost concerns associated with natural gas, particularly in the middle of the next decade, due to depleting resources in the Alberta basin (OPA). If coal resources are removed when some nuclear units providing power to the GTA are taken out of service, the Toronto area will be serviced primarily by natural gas will be particularly vulnerable.

♦ According to the OPA, "The period to the end of 2014-2015 sees a dramatic transformation. … Risk around the implementation and performance of new resources is managed by the timing of coal replacement and by imports." The OPA acknowledges supply concerns during the 2016-2019 period when "a short-term hydroelectric purchase is assumed, with potential for a longer-term commitment." The OPA also acknowledges that there are many uncertainties associated with hydro imports, including the fact that it is "contingent on finding mutually acceptable terms and conditions, … and is not contracted for at this time."

♦ A trend to warmer summers will impact hydroelectric availability (such as the summer of 2005), from both Ontario and imported sources.

♦ Large number of transmission projects required – insufficient staffing from Hydro One to service these new projects and upgrades.

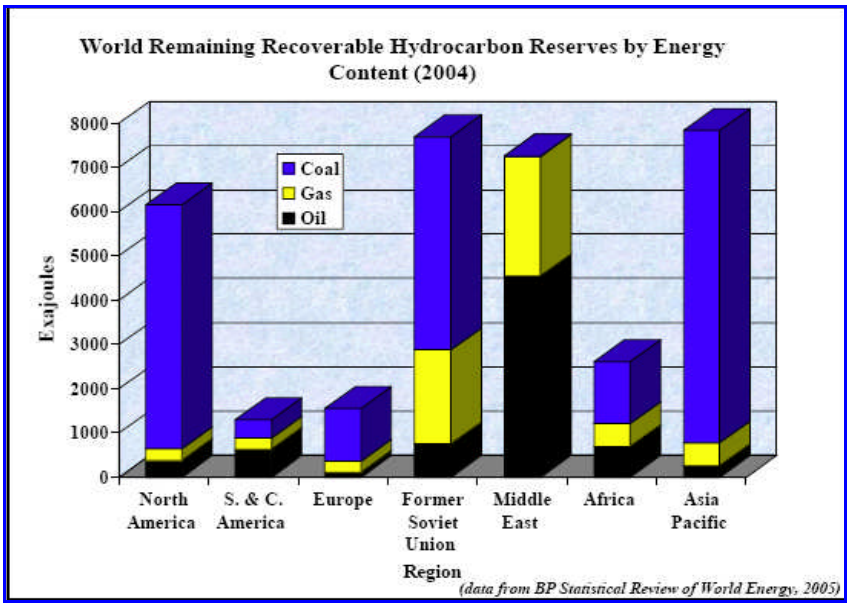
♦ Many of the non-utility generating contracts will expire during this time period.

APPENDIX B

THE CASE TO RECONSIDER COAL

♦ "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)

♦ Coal fired generation is the stability in the current and changing supply mix. Affordable for base load, coal has optimum load following capabilities, quick response balancing capability and dispatch flexibility to supply intermediate and peak needs. These characteristics will be even more valuable as less predictable (i.e. wind) resources are added to the provincial energy portfolio.

COAL IS CLEANER THAN WE ARE LED TO BELIEVE

♦ "...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")

Thermal generation, including natural gas, oil and coal, contributes less than 7% to the provincial air pollution according to Ministry of the Environment information. Clean emissions technology can reduce that amount to 1%.

♦ "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)

APPENDIX C

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.

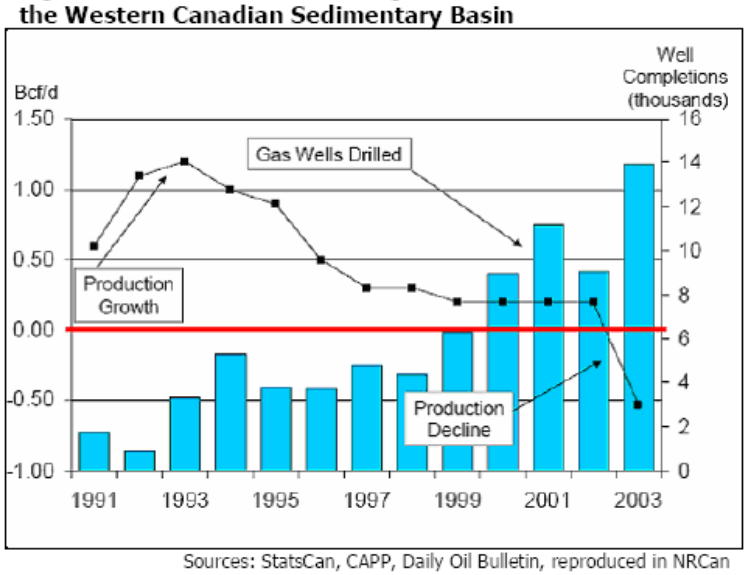
"High natural gas prices resulting from the tight balance between North American gas supply and demand has been a key factor in encouraging more gas drilling. … the producing sector needs to drill more wells each year just to keep production flat." (National Energy Board, "Natural Gas for Power Generation: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

<u>Mackenzie Delta</u>

♦ "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.