EXECUTIVE SUMMARY

The former Minister of Energy, Dwight Duncan, has stated that "It has been many years since a comprehensive, long-term plan for electricity has been prepared for the Province of Ontario..." The Ontario Power Authority, a corporation created to conduct independent assessment of demand and subsequent electricity planning, has been tasked with preparing an integrated power system plan. The OPA Supply Mix Advice and Recommendations report released to the public on December 9, 2005, was "the first step" in preparing this plan, "which will guide the development of Ontario's entire power system, including transmission networks".

The importance of this process at this time, arguably the most critical in the history of the provincial electricity needs, cannot be overstated. The IESO reports "severe potential shortfalls" of power generation, at a time when energy costs are an instrumental cause of thousands of job losses, industry and business investment is waning, and there is widespread concern for rising home energy costs.

The CAE Alliance, along with many others, hoped that the OPA would use independent, unbiased and informed strategy in formulating their Plan for Ontario's energy future. We have reviewed the OPA Supply Mix Advice and Recommendations (the "Report"), including Consulting Reports, Stakeholder Submissions and Presentations, as well as the Ontario Energy Board's "Natural Gas Electricity Interface Review".

Our analysis of the OPA Recommendation Report leads us to conclude that the real issues of reliable and affordable electricity planning for future were radically impeded by the coal closure mandate. Equally evident was the knowledge that the OPA precipitously engaged contracts and procurement initiatives for a considerable part of the generation mix before the Supply Mix Process was even underway - before having received the Consultants' reports or stakeholder input. In other words, the OPA has contracted for generation sources before having "done their homework" in terms of what could realistically and affordably be implemented in the near and mid term. This leads us to conclude that their Report was crafted to justify pre-planning decisions.

Although the OPA has a primary function "to plan for the future of Ontario's power system by integrating the broad array of industry, environmental and societal considerations ...", the Energy Minister's directives to the OPA have prejudiced the outcome. The political will is driving the electricity planning, in spite of industrial and societal considerations and without full investigation of the environmental criteria that it purports to champion. Warnings and concerns raised by industrial, farming and the business sectors – the economic drivers in this Province – are not being heeded. In fact, they are blatantly ignored.

The Report recommendations are predictable given the constraints that the OPA had in making decisions. The Ministry of Energy wrote the prescription for the supply mix by identifying the criteria for inclusion in the recommendations, namely, (1) "creation of a conservation culture"; (2) "preference for renewable sources of energy"; and (3) "replacement of coal-fired generation". "In particular, OPA's advice is to include: the

phasing out of coal-fired generating facilities as a goal of the plan." This "goal", defined as "the end to which effort is directed" (Webster), is the removal and replacement of 25% of the provincial power supply, in an unrealistic time frame.

Ontario's power system is strained, as evidenced by the summer of 2005, a record setting season for power consumption. Economic and population growth, aging nuclear facilities, increased power imports and failures in restructuring attempts have weakened our system. Rising energy costs are impacting our economy. The OPA should be seeking to prop up the system, to inject health and strength by adding cost efficient supply and upgrading existing transmission. Instead, the OPA is seeking to remove resources which are considered to be the stability in the generation portfolio in terms of reliability, affordability and load balancing capability. This move is in direct opposition to the Ministry's legislated goal to "protect the interests of consumers with respect to prices and the adequacy, reliability and quality of electricity service".

The CAE Alliance maintains that the 2007-2009 coal closure deadline is an arbitrary and unnecessarily risky time frame to effect secure and reliable replacement power. The OPA records that "... the Select Committee on Alternative Fuels, with all party agreement, recommended that the government replace coal-fired generating stations by 2015 for health reasons ..." The Final Report actually includes, "...reduce Ontario's reliance upon carbon-based fuel sources ... 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." That same report indicates, "The Committee was also concerned that a future re-powering of these (coal-fired) stations with natural gas could cause a major increase in demand for this fuel, and a resulting increase in price. This could affect the long-term supply and price of natural gas within Ontario." and recommended that "oil and natural gas-fired generation should also be phased out."

The OPA justifies the coal phase out decision based on some statements in the above noted report, while ignoring other pertinent recommendations. In spite of cautions regarding increased use of natural gas, the OPA is in fact in the process of procuring 6,000 MW of new natural gas generation. Fuel costs and uncertainty of supply will further weaken the system.

Finally, inclusion of intermittent renewables at too ambitious a pace will escalate power costs and impact supply adequacy.

The major weaknesses of the Recommendations and Advice of the OPA include:

- ♦ Rushed planning – as noted throughout the Report
- ♦ Insufficient resources to offset demand growth and coal removal
- ♦ Inability of planned resources to balance load requirements
- ♦ High investment in unnecessary infrastructure changes
- ♦ Over reliance on high cost natural gas fired generation

♦ Too many contingencies and uncertainties which, if not met, will lead to an increasingly desperate situation

According to the OPA, the current planning procedure "... has been somewhat constrained by the limited time available to perform it – a full IRP typically takes a minimum of one full year, and longer for a first plan. In OPA's case, the analysis has been conducted in a much shorter period..."

The OPA had hundred of pages of stakeholder submissions to review and almost 1,000 pages of Consultants' and Ontario Energy Board reports. Half of the reports, including The OEB Natural Gas Electricity Interface Review report, were not available until 2 weeks before the OPA Report release on December 9, 2005. Insufficient time eventuates in insufficient regard for information provided to the OPA.

The CAE Alliance believes that information has been skewed in favour of natural gas-fired generation and new nuclear development, and decidedly against coal-fired power generation. Had the OPA utilized both the mandate to provide independent power planning, and the directive to subject all other criteria to the provision of reliable supply, the OPA could have concluded that the restrictions imposed in fact impeded reliability of electricity.

Recommendations are made which seem to contradict findings throughout the Report. Although affordable power is a mandate of provincial power planning, costs are discussed only in the most general terms. Costs included in the Report, and those alluded to, will saddle provincial ratepayers with 20 plus years of staggering restructuring debt and escalating electricity prices. Much of this, including $7 - $10 billion in capital costs to accommodate new gas plants, is totally unnecessary.

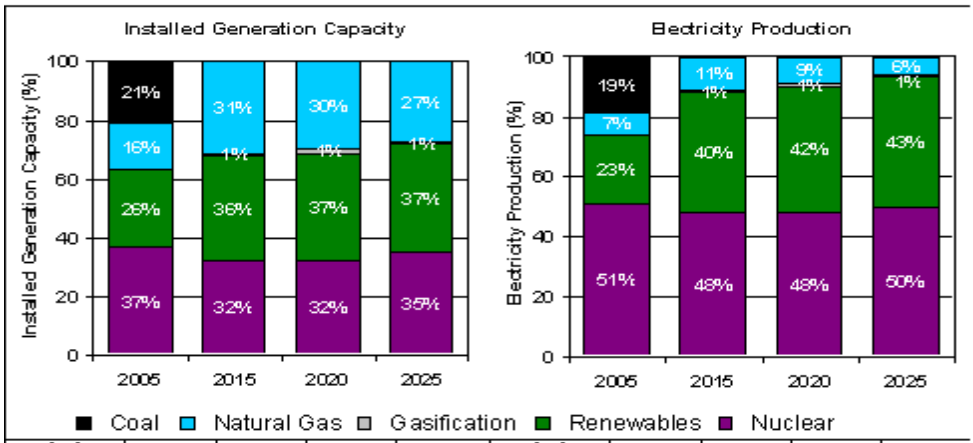
In spite of the considerable time and money that must have gone in to the preparation of this Report, the recommendations are unrealistic, unreliable and unaffordable. The CAE Alliance believes that these recommendations, if followed, will have a substantial and detrimental impact on Ontarians – on our economy, and on the quality of life we currently enjoy. We have major concerns about the workability of the plan which will result from this Report. This document highlights some of those concerns.

Note: All quotes in this Response are taken from the OPA Power System Planning Document, unless otherwise stated.

SUMMARY OF OPA SUPPLY MIX RECOMMENDATIONS

The following chart shows the recommended supply mix for installed generation capacity and the desired electricity production from that mix through to 2025.

Figure 1.1.4: Supply Mix Advice



(%)	2005	2015	2020	2025
Nuclear	37	32	32	35
Renewables	26	36	37	37
Gasification	0	1	1	1
Gas	16	31	30	27
Coal	21	0	0	0

(%)	2005 (Estimate)	2015	2020	2025
Nuclear	51	48	48	50
Renewables	23	40	42	43
Gasification	0	1	1	1
Gas	7	11	9	6
Coal	19	0	0	0

(MW)	2005	2015	2020	2025
Nuclear	11,397	11,000	12,000	15,000
Renewables	7,855	12,000	14,000	15,500
Gasification	0	125	250	250
Gas	4,976	10,500	11,000	11,000
Coal	6,434	0	0	0
Total	30,662	33,625	37,250	41,750

(TWh)	2005 (Estimate)	2015	2020	2025
Nuclear	79	76	81	89
Renewables	36	64	71	77
Gasification	0	2	2	2
Gas	11	17	15	11
Coal	29	0	0	0
Total	155	159	169	179

Source : OPA; Note: Figures shown take into account reduced demand due to conservation activities

The OPA recommendations, to 2025, are summarized as follows:

1. Use conservation and demand management to reduce load requirements
- 1,810 MW was used for planning purposes (5% of requirements)

2. Increase renewable sources
- Wind power 5,000 MW
- Small hydro 1500 MW
- Hydro Imports 1250 MW
- Biomass 500 MW/Solar 40MW

3. Maintain the share of nuclear generation
- Replace aging nuclear with new facilities – 9,400 MW – 12,400 MW (up to 15,500 MW by 2025)

4. Replace coal by increasing gas fired and renewable resources
- Add 6,000 MW of natural gas (currently under procurement), up to 7,500 MW (this is in addition to the current 4,976 MW of natural gas/oil)

5. Demand growth – Growth is estimated at 0.9% per year; 1.3% growth in peak demand

The OPA has determined that conservation and demand management (CDM) plus new renewables will offset growth in electricity demand.

GENERAL CONCERNS

Stakeholder feedback recently solicited for the OPA indicates that availability and reliability of electricity are of primary importance in power planning. Most participants however, "concluded that in the end, the Ontario economy must be the most important priority – the economy is the primary driver of all decisions in the Province." (Decision Partners, Consultants Report to the OPA on Supply Mix Stakeholding, Nov., 2005)

These dual priorities of reliable and affordable power are threatened by an artificial timetable. Recent decisions made by the Ontario Energy Board, the Ministry of the Environment, and now by the OPA, are reactionary to the fierce determination to close coal-fired generating capability by 2007-2009.

The OPA must ensure that Ontario is supplied with electricity considering:

- ♦ Growth in demand for power
- ♦ Critical need for additional power sources
- ♦ Aging nuclear (base load) facilities
- ♦ Long lead times for new generation
- ♦ Changing load patterns

It is not merely a matter of enhancing current supply, of adding new generation to augment a healthy power system, which would be task enough. The OPA mandate is complicated by radical changes required in order to fulfill Ministry of Energy directives, which if implemented too quickly or inefficiently, will create a desperate situation.

The additional matters to be addressed in OPA power planning include:

- ♦ Emphasis on Conservation and Demand Management
- ♦ Aggressive inclusion of Renewable Generation
- ♦ Phase out of coal-fired power by 2007-2009

CONCERNS RELATED TO RELIABILITY

CONCERN:

Reliability is the primary objective of power planning. Reliability must not be compromised. The OPA recommendations and advice jeopardize supply reliability.

CONSIDER:

♦ The OPA solicited input from stakeholders and the general public, advice from industry, environmental and academic experts. Without exception, reliability of supply was the single most important concern. The Government mandate to ensure reliable electricity generation is to take precedence over other directives.

♦ "Reliability has two dimensions – adequacy and security. Adequacy refers to confidence that there is enough capacity to meet needs. Security relates to the confidence that power can be delivered to customers without interruption."

1. Demand Growth

CONCERN:

For planning purposes, the OPA determined power required for anticipated growth in demand, then determined measures to meet the additional demand. OPA concluded that, "Together, conservation and new renewable sources would more than meet all of Ontario's growth in demand for electricity by 2025." Our review of OPA resource recommendations indicates a significant shortfall of supply.

CONSIDER:

Conservation and Demand Management (CDM)

♦ Electricity demand is expected to grow at a rate of about .9% per year, with peak demand increasing at a rate of 1.3% per year.
(Demand in 2004-2005 grew by 1.2% - IESO, Market Year Review, 2005)

♦ Considering 2005 peak requirements, under normal weather conditions, of 24,200 MW, peak demand in 2025 will be at about 30,500 MW. (OPA figures) This results in an estimated 6,300 MW of additional required generation capacity.

♦ The OPA has estimated 1,810 MW of power needs reduction through conservation and demand management by 2025.

♦ Therefore, net requirements - demand growth minus conservation and demand management (CDM) - will be about 4,500 MW by 2025 (6,300 MW – 1,810 MW).

♦ Net requirements in 2015 will be approximately 2,245 MW (3,145 MW demand growth less 900 MW of conservation/demand management).
The OPA expectation is 460 MW from CDM by 2010, plus an additional 450 MW by 2015 when smart meters are expected to reach peak effectiveness.

♦ The balance of electricity needs - demand minus CDM - will come from new renewable generation. (OPA)

CONCERN:

Consultants advice to the OPA suggest that there is much uncertainty about the current consumption patterns of Ontarians and therefore no firm determination of how much potential or actual gains can be relied upon for planning purposes.

♦ The OPA acknowledges that they are not in a position to recommend long term conservation targets, there are too many uncertainties and further studies required.

♦ Industry has already implemented conservation measures to reduce power consumption in order to improve competitive ability.

♦ The best results attained in other jurisdictions have come from continual, long-term information campaigns backed by aggressive and sustained funding. Conservation and load shifting depend on the willingness and ability on behalf of the public.

♦ Load shifting is anticipated to be most effective during hot summer months when air conditioning use is at a maximum. This also happens to be the area of greatest growth in demand. Shifting load in summer may have the adverse impact of flattening the "peak" somewhat, but will create higher and more sustained intermediate need, or in other words, lower and longer peak, already an emerging pattern.

♦ Maximum effectiveness of Smart Meters is not expected before 2014, and will net at best, 400-500 MW of load shift, not increase in power production. This is to be obtained from the residential and small business sector, which represents about 30% of electricity consumption in the province.

♦ The CAE Alliance has produced a separate document on the merits of smart meters. That document will be forwarded with this Response to the OPA.

New Renewable Generation

CONCERN:
Conservation cannot on its own meet growth in demand. Therefore, generation from new renewable sources will be required. The balance of demand growth will consume all additions from new renewable generation.

CONSIDER:

♦ An additional 2,245 MW of power is needed by 2015, and 4,500 MW of power by 2025 to make up the difference in modest demand growth, offset by conservation.

♦ The following is a compilation of OPA recommendations for renewable generation over the term:

Category	Current Procurement (in place by 2010?)	2015	2020	2025 TOTAL
Wind	1400 MW	+3600 MW		5000MW

Small Hydro	150 MW	+1350 MW	1500 MW
Hydro Imports	----------	+1250 MW----------	1250 MW
Biomass	30 MW	+ 470 MW	500 MW
Solar		+40 MW	40 MW
TOTAL ADDITIONAL RENEWABLES			8290 MW

CONCERN:

Installed capacity of wind power does not translate into equivalent electricity production. Unlike other resources – ie coal, or natural gas, or nuclear – whereby the MW designation is a reflection of the amount of production available, the generating capacity of wind is actually 10% to 30% of installed capacity.

♦ Wind must have 100% back up generation. Therefore, if 5,000 MW of wind power is added to the mix, 5,000 MW of conventional resource must be available to supplement when wind is not generating.

♦ Realistically, using a 25% capacity factor, 5,000 MW of wind power translates into 1,250 MW of generation, which is intermittent, and non-dispatchable. The inclusion of wind power actually increases the need for additional conventional resources.

♦ Therefore, total reasonable generating capacity available is more credibly expressed as 4,540 MW of available resource, not 8,290 as the OPA claims. This would be even less on hot, humid days when wind power is noted to be unreliable.

♦ The OPA reports that "a prudent action plan" includes the need to "be ready to adapt for different possible futures, such as up to 1.8% annual growth in demand ..." The recommended resources are barely sufficient to meet even modest projected growth, given the best case scenario. Where is the contingency for additional growth if it does double, from 0.9% as projected to the possible 1.8%?

2. Coal Replacement Resources

CONCERN:

The CAE Alliance compared the dimensions of reliability – confidence of sufficient capacity to meet needs, and confidence in uninterruptible delivery of power – with the replacement supplies. We conclude that there is insufficient capacity included in the plan. Uncertainties and contingencies for securing these resources further jeopardize electricity reliability and availability.

CONSIDER:

♦ Demand growth will cancel out the addition of new renewable resource installments.

♦Using the OPA's "procurement under way" figures, we can view the requirements in 2010, when coal is removed.

New Renewables	+ Natural Gas	= Coal Replacement	+ Balance of Demand Growth
527 MW*	+ 6,000 MW	= 6,500 MW	+ 1,575 MW
6,527 MW		? = ?	8,075 MW

(Note: *New Renewables included 1,390 MW of wind power. However, we used a factor of 25% capacity, to reflect the optimum net benefit of the installed wind turbines. The remaining renewable amount includes 150 MW of water power and 30 MW of biomass (landfill gas). For the coal replacement, we used the current 6,500 MW, not the 7,500 MW which would include Lakeview Generating Station. This represents a rough estimate, due to uncertainties of when conservation and new renewables are effectively implemented.)

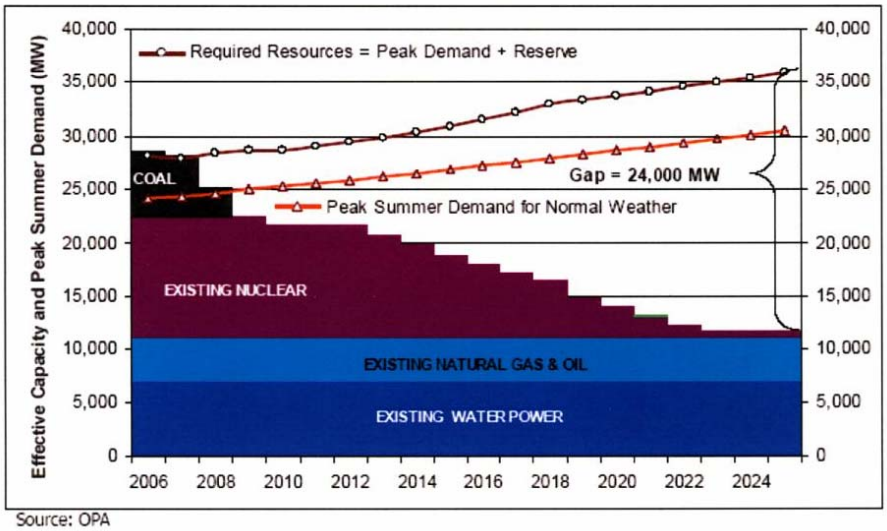
♦ This demonstrates that there is **not** sufficient provision of resources to replace coal-fired generation at the time that it is anticipated to be removed from service. There will be a shortfall of at least 1,500 MW, up to 2,000 MW at times of poor wind speeds.

♦ Renewable resources will be committed to offset demand in growth. Therefore, the OPA recommends that natural gas-fired generation will replace coal-fired power. As there are significant cost and reliability issues with natural gas, we deal with this in a separate segment of our Response.

♦ The coal replacement transition is expected at a critical time in the life of base load nuclear generation. One unit at Bruce A could be shut down as early as 2009. Any premature failure of nuclear capability will severely impact the supply mix strategy. New nuclear, even if initiated this year, would not be available before 2015. Resource planning must be based on firm, secure procurement, not wishing and hoping.

♦ The following chart shows the challenge of aging nuclear units and demonstrates the critical potential shortfalls of power 2010-2015

Figure 1.1.2: Demand Growth and Generation Retirements Define Challenge



Source: OPA

♦ The OPA Report summarizes the reasons for the "challenging" situation facing the electricity sector as a shortfall in shrinking supply combined with growing demand.
"With supply already tight as a result ... the sector faces the loss of a major part of its current supply mix..."
The OPA has not acknowledged the role the current government has played in catalyzing a crisis. Concurring with the decision to remove 7,500 MW of power when supply is "already tight" is irresponsible.

Conclusion:
The OPA suggests that "Together, natural gas and renewable sources can replace coal generation." However, looking to 2010, when coal is expected to be totally removed, and beyond to 2015, there is a significant shortfall of power.

3. Securing Supply Resources

CONCERN:
The resources chosen to meet future needs may not materialize. There is a high degree of uncertainty, with many variables included that may affect future availability and viability.

♦ Renewable generation currently includes existing large and small hydro facilities (7592 MW) and about 265 MW of "woodwaste". (According to the Sygration website, no wind power generation currently feeds into the provincial grid.)

♦ The OPA hopes to increase renewables from 23% to 43%, almost double, by 2025 - 7,855 MW to 12,000 by 2015; 14,000 by 2020 and up to 15,500 MW by 2025.

♦ The OPA has decided to procure renewable generation by way of contract with private developers. This limits resources available, adds to costs, and stifles the research and development of other forms of renewable generation.

♦ Of the proposed new generation, approximately 2/3 is expected to come from wind power. (5,000 MW by 2025; 1,400 MW under procurement) Consider the following:

◊ Some contracts are granted to companies with no proven track record in wind development.

◊ Ontario has very little experience with wind power. A solid plan cannot be built or forecast until capacity measure has been fully determined. Other jurisdictions, New Jersey for example, are taking up to 1 1/2 years to study economic and environmental impacts of wind power before large scale installation is implemented.

◊ A 50 MW turbine farm requires 20+ turbines. 5,000MW of wind will require at least 2,000 turbines. Recent increases in steel prices will impact the overall cost of wind turbines.

◊ "Wind power development requires comprehensive and dependable information about a site's wind resource characteristics including: the strength, regularity and directionality of wind." (CERI – Consultant to the OPA Supply Mix Procedure) The amount of electricity produced is directly related to wind speed and the density of the air (which is determined by air temperature, barometric pressure and altitude). To our knowledge, no detailed studies have been performed to determine these characteristics.

◊ "...roughly 95% of the potential (of wind power) is located north of the 50th parallel of latitude, which lies above the northern most stretches of the Trans-Canada Highway. This puts it effectively out of reach of Ontario's existing electric transmission system. There are significant engineering, environmental and economic issues to harvesting this wind..." (Dr. J. T. Rogers - Professor, Department of Mechanical and Aerospace Engineering, Carleton University – "Options for Coal-Fired Plants in Ontario, Sept/04)

◊ "...even where wind resources are close to distribution or transmission lines, many of the lines and system equipment will need to be upgraded to accommodate the variability of power flows if wind power development is to be significantly increased."

♦ Other additions to renewable resources include a possible 1,250 MW of hydro imports from Manitoba and Quebec. However, concerns and contingencies noted in the OPA Report include:

◊ "... the distances from the sites to the load centers in Ontario are great, up to 2,500 km, and significant transmission connections would be needed, with attendant costs...." (Much of this will traverse the harsh and difficult northern Canadian Shield.)

No study for the extensive transmission lines has yet been commissioned.

◊ "Losses on long transmission delivery paths are also a factor that must be considered." "Line losses in Ontario average about 9%." (CERI)

◊ "Agreements would have to be reached with suppliers of the generation resource and with First Nations and other parties on the economic development and land use issues around transmission. Negotiations for long-term imports are at an early stage."

◊ Ontario's share of the Lower Churchill Falls Project, via Quebec, may net 635 MW, but is not expected until near 2025.

◊ This project is currently at bidding process stage, with no guarantee that the joint Hydro-Quebec/Ontario bid will be accepted. The project is a large, complicated venture with significant engineering complexities.

◊ "The need to connect with Hydro-Quebec through direct current interconnections for major purchases introduces the large costs of conversion from AC to DC and back again." (Quebec has these facilities will all its neighbours, except Ontario.) "A new 1250 MW HVDC ... was planned a few years ago, but did not materialize. A new effort at completing this tie is now underway." (OPA) "At this time, this has high project uncertainty." (IESO – 10 Year Outlook Highlights Jan/06-Dec/15)

◊ "The U.S. market in New England and New York is characterized by high energy prices, so that Ontario needs to compete on price in order to win a contract with Quebec. The Maritimes also have had somewhat higher cost structures."

◊ "Scenarios to include (hydro) imports are therefore based on the possibility of negotiating an agreement that provides value and fit with Ontario's long-term need."

♦ In addition to the proposed wind power and hydro imports, small hydro projects will provide 1500 MW of power by 2025. However, "Site–specific limitations on the potential for waterpower developments are the economics of such characteristics as water flow, head and distance from transmission and environmental concerns."

◊ Hydro One forecast over the next 10 years for construction on new transmission indicates little planning for areas north of Lake Superior, and in the north eastern portion of Ontario. The OPA however is optimistic that this will not "come in the way of the development of the most desirable sites".

♦ "It is important to keep in mind, when looking at potential renewable sources of electricity, that some of these technologies have not already been developed on a large scale because of significant challenges. The theoretical potential for renewable energy is

typically large, but gets narrowed down by technical feasibility, then further by financial feasibility, and still further by social and environmental considerations."

♦ The IESO warns that "The current regulatory approvals process is complex and will impede the installation of new facilities in time to address projected reliability concerns..." (IESO 18 Month Outlook, December 22, 2005)

Conclusion: The Minister of Energy has directed the OPA to "aggressively pursue renewable generation." "It is clear, however, that putting in place the infrastructure needed to harvest the most promising sources, hydro imports and large-scale wind generation, will take considerable time and money." There are"... additional policy and regulatory constraints on some of these opportunities..."
The OPA is relying on these renewable sources, not to augment the power portfolio, but to offset growth in demand. A vital supply of electricity production is being planned without firm commitments or cost evaluations.
The IESO advises that "The move to cleaner forms of generation is not simply about replacing 6,500 MW of supply. Given the inter-dependency of the system, any significant change will affect other parts of the system. Close co-ordination is essential..." (18 Month Outlook – December 22, 2005)

Conclusion:
Failure to secure any source of planned power will impact the functionality of the system as a whole. Due to the length of time required to secure generation resources, counter measures to balance needs may come too late to ensure adequate power supply. In our opinion, there are too many unknowns to be confident of supply procurement.

4. Compatible & Complimentary Characteristics for Reliability

CONCERN:
Resource supply is only part of critical requirements. The characteristics of the planned mix must match the power system needs. The CAE Alliance has no confidence that the blend of resources suggested for the future will effectively do so.

CONSIDER:

♦ Ontario has enjoyed a history of power reliability due in a large measure to the enviable portfolio of generation mix sources. There are deficiencies in each power resource. The best way to optimize reliability is to utilize complementary sources. We have a workable foundation now. If the Ministry of Energy determines to jettison any one source, or bring other less reliable or uncertain options into the mix too quickly, cost and reliability will be adversely impacted. "Energy source diversity, keeping all energy options open, is the bedrock of a robust supply system." (Energy Council of Canada)

♦ The IESO, having "gained valuable insight and expertise on Ontario's longer term electricity needs, ... coupled with operational experience in maintaining the reliability of the Ontario grid..." provides valuable advice to the OPA.

♦ "...the aggregate of the new replacement resources must closely resemble the overall energy capability of existing coal-fired generating stations to ensure that energy is available to serve load with the same level of reliability." (IESO 10-Year Outlook Highlights, Jan/06-Dec/15)

♦ Currently, base load generation, primarily nuclear and certain run-of-the-river hydroelectric, represents 50% of Ontario's generation. Characteristically, these sources generate continuously, and do not cycle on and off in response to the constant changes in demand. As electricity needs increase and decrease during the day, following lifestyle and work patterns of the province, intermediate generation provides additional power as required, then reduces it accordingly. This load following capability is vital in the continuous, instantaneous draw and reduction of power needs. Electricity is unique in that it is produced, transported and consumed in a matter of seconds, at rapidly changing variations throughout the day, every day. There are, however, times of day and times of season where the load is at its height of requirement, traditionally high demand for less time, thus the term peak load. Meeting or reducing electricity production on demand, is imperative. Either case, under or over supply, will cause the system to fail. Black outs will occur.

♦ Therefore, sources are required to provide base, intermediate and peak load. (Needs are generalized by: Base, 60%; Intermediate 15%-60%; Peak 15%)

♦ OPA notes that, "Although all three are required to constitute a reliable power system, the **intermediate** and peaking generation are **critical** to maintaining moment-to-moment regulation of the power system and reliability."

♦ Base load power is characterized by: meeting load that exists much of the time, for continuous operation, at constant rates of production; lower operating costs; and are most economical when operating for longer periods of time.

♦ Peak resources, from an economic perspective, are characterized by high operating costs. (With the exception of hydroelectric plants that are used for peak purpose.)

♦ Peak resources are capable of ramping up quickly in response to demand swings and can be available to pick up higher spikes of need, or unexpected system outages. OPA has determined that peaking plants should be chosen for 20% of total capacity, and are assumed to meet load that exists about 15% of the time. Resource requirements for peak load in 2025 will be 20% of total 36,000 MW needs, or 7,200 MW. (OPA calculations)

♦ The OPA however, makes an interesting, and unorthodox, assessment in the determination process. "... the distinction between peaking and intermediate resources in terms of operational flexibility requirement, is moot. Also, the flat nature of the load duration curve means that targeting specific amounts of intermediate plant is not a useful exercise. Accordingly, the peaking and intermediate categories have been combined."

♦ What is confusing and contradictory, is that the OPA summary warns that natural gas plants should be reserved for peak power output, due to high and variable costs of fuel – 90% of the operating expense of a gas plant. On the other hand, the OPA includes the note that "New intermediate sources, such as combined cycle plants, will be most economic when the plant is used between 25% and 50% of the time." (Methodology & Assumptions) This statement contradicts the overall assumptions provided elsewhere in the report, that gas plants should be limited to peak generation.

♦ OPA analysis "... confirmed the merits of a diversified portfolio of nuclear generation for base load, natural gas-fired generation for peaking, and renewables for energy production." At first reading of this statement, it would be assumed that intermediate generation was omitted from the planning. What is perhaps the case, is that the OPA is now including "intermediate/peaking" under the category "peaking" – definitely misleading, if our assumption is correct.

♦ OPA has determined that base load requirements at 2025 will be 63-65% of total resource requirements, or 23,000MW. Of that, 12,385 to 15,385 will be new nuclear.
The remaining resource for base load has not been specifically identified, but will likely consist of hydro power.

♦ "Peak/intermediate" requirements, 37% of total resource needs, or 13,000 MW will be primarily natural gas and hydro for ramping and load following capability. (OPA)

♦ The following chart demonstrates: 1) severe shortfall of base load power needs as existing nuclear units are decommissioned; 2) shortage of production resources – the numbers are there in terms of MW capacity, but not production ability, ie wind and small hydro is less available summer and winter, therefore must be derated for reliable planning; 3) high reliance on natural gas generation for intermediate and peak capacity.

Table 2.6.3 – Base-Load and Peaking/Intermediate Supply Resource Requirements

Requirement At 2025			
Supply Type			**MW**
Peak & Intermediate (37%)			**13,000**
Base Load (63%)			**23,000**
Service Type	**Requirement At 2025 (MW)**	**Current Fleet Remaining at 2025 (MW)**	**Gap at 2025 assuming only Current Fleet Remaining (MW)**
Peak & Intermediate	13,000	7,000	**- 6,000**
Base Load	23,000	5,000	**- 18,000**
Service Type	**Requirement At 2025 (MW)**	**Current Fleet Remaining + Procurements (MW)**	**Gap at 2025 assuming Current Fleet Remaining + Procurements (MW)**
Peak & Intermediate	13,000	12,000	**- 1,000**
Base Load	23,000	9,000	**- 14,000**

Source: OPA

♦ The IESO identifies specific characteristics that must be met in order to provide power reliability: load following capability; fast-acting balancing capability (available instantaneously and automatically); and dispatch flexibility.

♦ "There must be minimum load following (ramping) capability provided by the resource mix to be able to match supply with demand on a real-time basis. Currently the largest load pick up period is in the order to 3,000 to 3,500 MW/hr or 60 to 70 MW/min." (IESO Submission to the OPA)

♦ The IESO advises that the supply mix portfolio "...must contain load-following capability appropriate for all anticipated demand profiles. This would include intermediate load-following of the sort currently provided by our coal and hydro resources..." (IESO supply mix submission to the OPA)

♦ According to the IESO, "Coal supply makes up a large part of Ontario's flexible generation, and it has traditionally been required to meet changing demand, to supply demand when other supply sources are unreliable, and to balance load and generation at all times."

We must review the supply mix scenarios proposed for 2010, 2015 and forward to 2025. Is there sufficient base, intermediate and peak generation planned? Do the resources have the ability to ramp up and down on demand? Is there quick dispatch ability to offset fluctuations in wind speed?

♦♦ Can the supply resources recommended by the OPA meet this criteria, particularly in the "goal" to replace coal-fired generation? The answers are contained in the information supplied by the OPA.

♦ Coal plants have a high probability, 90.66% availability when needed. (CERI)

♦ "In effect, wind plants cannot really replace coal-fired plants, since they cannot meet the requirements of intermediate-load service, that is, being available on demand to meet varying loads ... wind plants cannot be used for base-load to provide continuous power or for peaking plants to provide peak power on demand." The OPA "has taken 10% of installed wind capacity as being assumed available to meet system peak demands".

♦ Small hydro projects, will be mostly run-of-the-river and therefore primarily base load.

♦ Although hydroelectric can be dispatched as needed and has good load following capabilities, output is impacted by weather conditions – and resulting limitations of drought, water temperature, opacity, which can have a "significant effect on operations" (IESO). "The drought-like conditions in parts of Ontario last summer contributed to a drop in the output from Ontario's hydroelectric facilities in 2005 from the previous year ... to 22% compared to 25% in 2004 (34 Twh down from 37.6 Twh)..." (IESO)

♦ "...daily peaks last longer in summer than in winter and there are more constraints on operation in general, such as cottage use and environmental restrictions, in summer. Waterpower is therefore more limited in its ability to meet peak demands in summer than in winter."

♦ Wind and hydroelectric power are less reliable in the summer, particularly during hot humid days. "The coincidence of wind and peak demand in the summer is only 10% or less, but is roughly 20% in winter. ... wind is not a 'dispatchable' resource ... A related issue is that there will be times when wind velocity drops, reducing supply from this source, but that demand continues. Complementary resources that can be dispatched quickly are needed at those times. ..."

♦ "Wind, solar and some small hydroelectric generation provide power when and if certain natural events occur, which gives them a somewhat unpredictable output. ... require additional generation to ramp up faster, a requirement that can add costs."

♦ "Today, Ontario is almost a balance between summer and winter peaking ... summer peaks tend to span many more hours than winter peaks ... and are effectively energy peaks rather than capacity peaks. In the future the trend to increasing summer peaks will almost certainly continue." (IESO)

♦ There are unaddressed issues regarding impacts of large amounts of intermittent, renewable generation on the grid. Significant additions of wind power create dispatch concerns and heighten the need for load-following and quick response reaction of other resources in the supply mix.

Conclusion: Renewable resources cannot be relied on for constant availability in all seasons. Not enough of the proposed resources have the ability to follow load, or to be added and dropped quickly to balance load moment to moment. Increases in load, eg during morning ramp up can be quite large and require more than what small hydro or wind can provide. Therefore, natural gas will be resourced to fit these needs, at significantly greater cost.

♦ The OPA recommends using natural gas-fired generation to replace coal-fired power production in Ontario. This raises a number of concerns, which are addressed separately below, but note here:

◊"Ontario Power Generation raised the concern that when new gas-fired power generation is added to the Province's generation portfolio, the amount of load-following capability available in the market will decline. This decline will exacerbate the current problem with generators that are capable of ramping up and down. ... Board staff feel that the OPA and IESO should be informed of this situation." (Ontario Energy Board – Natural Gas Electricity Interface Review)

◊ "Coal-fired generators currently play an important role in responding to load changes that occur during five-minute intervals throughout the day. The largest load change typically occurs during the morning pick-up period, and is about 60-70 MW per minute,

at times totaling more than 3,000 MW an hour, with periods of sustained increase or decrease lasting for up to four hours or more. ... Ontario gas-fired generators typically offer load following capability over the upper 25% of their capacity range, whereas coal-fired units can typically achieve load following from minimum load up to maximum output, which represents the upper 80% of each unit's capacity range." (IESO – Highlights of 10-Year Outlook, Jan/06-Dec/15)

◊"Energy demand is greater in the winter than in the summer, since winter heating and lighting more than compensate for summer air conditioning." Reliability of supply will be adversely impacted if natural gas is used for a significant amount of electricity production in the winter when large amount of gas are needed for home heating. The Ontario Energy Board advises that the gas consumed to replace coal fired generation will exceed that currently used for all Ontario residential heating.

◊"Peak demand is now greater in the summer than in winter because of air conditioning load ... stressing the supply/demand balance to the point of load interruption ..." If natural gas is used a great deal in the summer, when gas is traditionally injected into storage, there may not be sufficient in storage to supply the increased winter gas usage.

◊"In future, significant additions of gas-fired cogeneration are also expected to contribute to base load generation. These types of generators have limited dispatch flexibility, and must operate at or near their full capacity."

Conclusion:
The IESO writes that "The transition from coal to replacement ... is an extremely challenging objective ... supply larger than all of the hydroelectric capacity in Ontario must be arranged for, constructed, commissioned and reach a reliable state of operation." (10 Year Outlook Highlights)
Clearly, the OPA has not met the challenge. Replacement resources do not match the characteristics that make coal so valuable a part of the supply mix. Considering that coal fulfills intermediate and peak load needs, the cost factor must be considered.
It has been noted that the OPA intends to replace coal generation with new renewables and natural gas generation. As the new renewable sources will be required to offset demand growth, natural gas-fired power will be used to replace coal. Although there are repeated warnings not to use natural gas for other than peak load generation, it will of necessity be used for significant intermediate and some base load production. Lambton Generating Station, for example, runs at 65-85% capacity, flat out during peak times. If natural gas fills that role, it will do so at **considerable** cost to the ratepayers of Ontario.

5. Imported Power

CONCERN:
Ontario has become a net importer of power. Reserve capacity has declined. Surrounding jurisdictions are reporting their own supply concerns. In spite of this, the OPA has not planned sufficient capacity to meet our own provincial needs. Rather, the plan assumes that imported power will supply critical needs. We will increase our

dependency on other jurisdictions. (Ontario's imports totaled 11 Twh in 2005) This in turn reduces reliability of supply – "confidence that there is enough capacity to meet needs and confidence that power can be delivered to customers without interruption."

CONSIDER:

♦ The OPA has noted that "Our analysis relies on interconnections for meeting extreme weather conditions."

♦ For reliability of electricity supply, adequate resources and sufficient margin are imperative, sufficient to sustain extreme weather conditions. "If we were going to rely heavily on Manitoba and Quebec water power, the risk of common drought needs to be considered and appropriately mitigated. Regional coincidence of gas supply shortages may be another area where our risk and the risk of our neighbours are the same." Fuel shortages "may apply to new gas-fired generation during winter peak periods when gas demand and electricity demand peak simultaneously." (IESO)

♦"Ontario will now have its peak demands in the same season as the major adjacent markets, with the exception of Quebec. We cannot assume that they will be available to make up Ontario's shortfalls when we experience extreme temperatures." (IESO)

♦ The OPA has factored additional imports from Manitoba and Quebec into the resources available in future. Either transmission upgrades will include allowance for additional "extreme power needs", or required imports will come from the U.S.

♦There is a measure of hypocrisy in the panic to close our cleaner units, (particularly when emissions controls can be successfully and cost effectively installed on remaining coal-fired units), in light of the following advice from the OPA:

◊"Saskatchewan ... about half of the generation is coal-fired ... Saskatchewan is blessed with large deposits of lignite, a coal-like fuel, which it uses for much of its generation. Saskatchewan is looking at 'clean lignite' generation in the future." (Lignite is a lower grade coal than what Ontario coal units currently use.)

◊"Purchases from ... as far away as the Alberta tar-sands would ... be an important step in creating an interprovincial grid."

◊"Coal provides 48% of the required capacity (of Alberta) ... Alberta, similarly, has abundant coal resources and is considering 'clean' techniques for exploiting both some of the energy from its tar sand and also its coal."

◊"There are proponents in Alberta that are looking seriously at shipping power from the tar-sands developments all the way to California ... Some strategic planning and negotiating might lead to delivery to Saskatchewan-Manitoba-Ontario instead."

◊"There are still huge reserves of coal in the U.S. and there is a strong push on now to exploit these resources using new 'clean' technologies to reduce the U.S. dependence on imported oil and gas. ... The future purchase of power from the U.S. under a firm contract should therefore be retained as a possibility. Ontario's U.S. neighbours have been good neighbours, providing emergency assistance on many occasions ...."

◊The McGuinty government is quoted in the press as stating that Ontario will not refuse necessary power imports from American coal fired power plants. Imports will come from coal plants with higher emissions than Ontario coal plants.

◊ The Minister of the Environment has filed an objection with the US Environmental Protection Agency for allowing some US coal plants to continue to operate without abatement or modern emissions equipment. According to the Globe & Mail report "Enforcement of this (Clean Air Act) law would lead to a reduction of more than 90% in smog and acid rain causing emissions. The Bush administration wants to replace this tough requirement with a relaxed rule that Ontario estimates would 'at best' lead to a 70% drop in these pollutants, indicating that far bigger reductions would occur simply by enforcing existing rules." Why can't the McGuinty government admit this to the people of Ontario?

6. Transmission and Infrastructure

CONCERN:
Adequate resource supply will not suffice if transmission is incapable of delivering power to required locations. There is an apparent "disconnect" between resources planned and the realities of transportation and distribution. (AMPCO)

♦ The IESO and Hydro One "both provide extensive detail on the problems, the available solutions and the limits on the solutions facing Ontario. The challenges to maintaining a reliable, economic power supply, particularly in southern Ontario, are truly daunting at this time."

♦ The OPA discusses "maintaining good system voltages and avoiding either long circuits or circuit outages on delivery paths that are heavily loaded – critically important to the operation of power systems." It is noted that reliable supply to the Golden Horseshoe is currently threatened by weaknesses in these areas and could become much worse if Nanticoke is retired. The OPA is considering installing "series capacitors", "another technique, not commonly used in North America" which "... seem like the ideal solution, but in practice are very complex to design in a manner that provides a reliable solution to the problem." In spite of this however, the OPA "plans to install them in several major southern Ontario lines to avoid the need to construct new facilities with the attendant long lead times, environmental hearings and costs that would be otherwise needed."

"The risk profile of a supply mix option is not complete unless it includes the risk impact on associated transmission and distribution. ... There is no value in creating diversity and then not being able to use it due to transmission congestion." (Hydro One)

♦ Additional infrastructure and transmission concerns are highlighted in the section on natural gas concerns and issues.

7. Operating Reserve

CONCERN:

Reserve capacity represents standby resources, an excess of peak needs, that can be dispatched quickly, on short notice. This allows for system security. The CAE Alliance is concerned that the OPA has not planned for sufficient resources for average provincial needs, and is therefore deficient in establishing reserve resources. A significant portion of renewable generation cannot be dispatched quickly. "Ontario demand plus the operating reserve that the IESO is required to carry exceeded the available domestic capacity in 593 hours during 2005, a 30% increase over 2004." (IESO) The situation will only worsen with the resources planned by the OPA.

CONSIDER:

♦ "Planning reserve is put in place to allow for the fact that demand is sometimes higher than expected, and that the planned generation resources are not always available to generate when required."

♦ The IESO reminds the OPA that requirements for supply adequacy are met through compliance with relevant planning standards of the North American Electric Reliability Council, and the criteria of the Northeast Power Coordinating Council.
These standards are designed to ensure that each jurisdiction takes proper action and responsibility to provide for their own loads and in so doing, prevent disruptions to neighbouring jurisdictions.

♦ The OPA reports that "The standards are lengthy and too complex for this report but there is one requirement which will have a direct impact on planning the power system. Power system planning is required to result in a planned system having a Loss of Load Probability of one day in 10 years. ... The labour and time required to use this technique (for calculation) are neither justified nor required ... Since an 18% reserve is the approximate reserve ... OPA has decided to use an 18% reserve requirement as a proxy for the required LOLP requirement ... without the extremely time-consuming work required to do the reliability calculations for generation options that are not defined by location at this time." The OPA also notes that "Unfortunately, many power systems in North America have become more highly loaded since the electricity markets opened in the 1990s and the margins are thinner than they were previously."

Table 2.6.2 – Planning Reserve Margins

Year	Required Reserve (%)
2006	16.4
2007	14.6
2008	15.1
2009	14.5
2010	13.8
2011	13.7
2012	13.8
2013	14.2
2014	14.8
2015	15.1
2016	16.0
2017	17.0
2018	18.0
2019	18.0
2020 - 2025	18.0

Source: OPA

♦The above chart shows the planned reserves through to 2025. The reserve rate is lowest in 2011, a critical time for the power system, as we have demonstrated.

♦ The OPA indicates that "In developing the portfolios, this reserve margin was applied to the load forecast after the effects of CDM and other customer side of meter programs were subtracted. This, in effect, assumes that the CDM resource has no associated reserve requirement. Moreover, the effect of CDM is to reduce the overall reserve requirement (because the 18% is applied to a smaller base)." However, the lowest rates are prior to 2014 when smart metering is expected to reach maximum effectiveness.

♦ Factors that are required for use in determining the important calculation noted above, include "generator reliability, annual load shape, generator size, available load reduction measures (... to reduce requirement under shortage conditions), and importable power in emergencies.

♦ When these factors are weighed against the fact that "generation options are not defined by location at this time", that imports are already included as part of the proposed supply mix, and much of the potential new power is unreliable in terms of dispatch and load following capability, it is a frightening prospect. That the OPA was unwilling at this time to devote the time to proper calculation, especially with so many contingencies and variables, is but another indication of the rushed element of "planning".

♦ In determining reserve capacity as charted above, the OPA notes that "A second simplification concerns plant mix. The effect of changes in the generation plant mix on the reserve margin has been ignored. A more rigorous approach would associate larger reserve margins with larger plant size." This would imply that if a larger nuclear facility, for example, included in the mix, a larger reserve should be included as the impacts of loss of a larger facility would have a greater impact on grid stability.

♦ Ontario should be planning for a larger reserve capacity, not relying on imports. This brings down the price of power, because imported peak power is the costliest.

♦ Without sufficient reserve capacity, Ontario could trigger the next big blackout.

8. Other reliability factors

CONCERN:
Reliability and availability of electricity has been determined by stakeholders, public and industrial, as the most important consideration for power system planning. When viewed realistically, it is evident that the OPA Planning Recommendations fall far short in securing a reliable power supply. The following other factors compound the concerns:

CONSIDER:

♦ Reliability of power supply is inherently tied in with resource control. The more uncertainty there is over fuel supply, the less control there is. The IESO advises that "The portfolio should be constructed in a way that recognizes the threat of fuel supply disruption ..."

♦ 95% of our natural gas comes from outside the province. There are real concerns about natural gas supply, including expressed future reliance on LNG. There is nothing in the supply mix to mitigate the risk of natural gas becoming unavailable or uneconomical to use.

♦ The OPA is procuring 6,000 MW of additional natural gas generation, without having a secure plan for delivery in place. "Because not all of the TCPL (TransCanada Pipe Line) capacity is contracted for long-term, it is possible that some of the existing capacity could be made available. It is not possible to predict the quantity available over the period 2007-2009 with any certainty ... (It is) assumed that generators will either acquire existing available capacity or will provide enough notice to allow new capacity to be built." (OEB Natural Gas Electricity Interface Review)
(The hope of LNG from a facility to be built along the St. Lawrence is factored into the best case scenarios for lower facility costs beyond 2010.)

♦ The OPA has entered into contract, on behalf of the electricity users of Ontario, with Greenfield Energy Centre LP, for 1005 MW of power. Calpine Corp., one of two parent companies of the GEC, will develop, construct, and provide all services related to the administration, engineering, and environmental permitting and monitoring during operation. (Ontario Energy Board)

Calpine Corporation recently filed for bankruptcy protection from creditors. As part of the restructuring program, Calpine is seeking to be relieved of U.S. power contract obligations which it deems "unprofitable", regardless of the problems this creates for power consumers. Concerns have been raised regarding Calpine's ability to procure gas

to run facilities, as well as cash to fund plant maintenance. An article posted by the Connecticut Post, February 20, 2006, discusses a power plant project involving Calpine Corp. as builder. A spokesman for Calpine has advised that the project was "under scrutiny. Everything in the Calpine portfolio is under evaluation ... This is a process that will play out over the next several months." A town official indicated, "We have not counted on Calpine building a plant for quite a while."
Clearly there are significant issues here that will impact reliability and security of power in Ontario. Contractual obligations are such that the OPA must consider terminating this agreement, as we believe the contract states.

♦ Following the blackout of August, 2003, it took nuclear plants days to return to full capacity. Coal fired generation has black start capability and was quickly returned to service.

♦ The OPA Report indicates that much of resource planning is contingent on best case scenarios in terms of timing, fuel cost and variables outside the control of the OPA. Prudent planning assesses risks inherent in each available technology and seeks to mitigate these risks. The CAE Alliance is concerned that the OPA is glossing over certain risks that will impact power reliability.

♦ Nanticoke Generating Station, which supplies 4,000 MW of power, "also provides reactive power to support the heavy power flows ... to the GTA." "Under peak load conditions, a minimum of 6 Nanticoke units are currently required to be in service to ensure reliable system operation." (IESO) This situation has yet to be addressed, as location for new power has not yet been fully determined.

Conclusion: The characteristics of the resource mix, as suggested, simply do not make for a reliable supply of power that ensures uninterrupted electricity to customers. Looking at the future scenarios, there is no provision for intermediate generation, too many contingencies and "hoped for" resources that may not materialize. The CAE does not consider this to be planning – this is speculation. This will put a lot of lives, and the economy, at risk – for what good? This is **not** in the public interest.

NATURAL GAS-FIRED POWER TO REPLACE COAL GENERATION

"Without coal power, Ontario becomes massively dependent on gas-fired power" to replace the 30 Twh of coal fired electricity production. (Tom Adams, Energy Probe)

CONCERN:
Ontario's coal fired generating plants provide about 20% of the provincial needs. More than mere production, however, coal provides stability in terms of mitigating costs of other high priced forms of power generation, and load balance in the system. Coal is the dependable workhorse, available year round, and on demand. The CAE Alliance believes that replacing coal with natural gas will impact cost, security and availability of power.

1. Infrastructure Costs

CONCERN:
The Ontario ratepayers will be strapped with huge infrastructure charges in order to accommodate natural gas use for electricity.

CONSIDER:

♦ As part of the Interface Review, the Ontario Energy Board determined that "there will be significant gas infrastructure investment needed in Ontario" as a result of "gas-fired power generation replacing capacity that is being phased out". The OPA estimates $7-10 **billion** will be spent on capital costs for the extensive changes to natural gas infrastructure alone. The bulk of this amount will be paid out prior to 2010.

♦ The IESO indicates that "The phase out of coal-fired generation and the integration of cleaner forms of supply into the Ontario system is a major and complex undertaking ... Extensive changes and the realignment of the transmission infrastructure are also necessary to integrate the new supply..." (The Ontario Reliability Outlook, February, 2006)

♦ "The need for additional gas storage capacity in Southern Ontario close to the new gas-fired generation ... the need for additional upstream gas transmission pipeline and other capacity improvements ... will entail major costs and development times." (OPA Report – Natural Gas Price Context)

2. Major Changes for Minimal Return

CONCERN:
The information provided is either confused, or misleading. The OPA implies that natural gas will be used as a transition fuel source to future reliance on renewable generation. On paper this appears to be the case. In reality, however, Ontario will be dependent on natural gas generation well beyond the 20 year planning period.

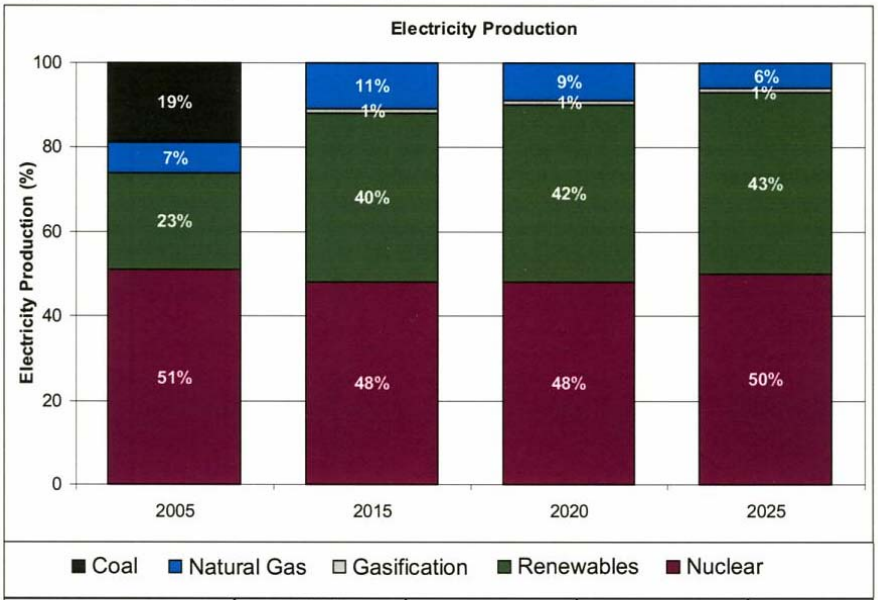
CONSIDER:

♦ Natural gas currently represents 16% of the installed capacity, but generates only 7% of total electricity production. (Part of the designation "natural gas" actually included oil – Lennox Generating Station.) See page 3 for chart.

♦ The OPA intends to increase the amount of installed gas-fired generation from the existing 4,976 MW to 11,000 MW (up to 12,500 MW) from now until 2025. However, over that time period the percentage of electricity production from natural gas is expected rise to 11%, then decrease to 6%. (Natural gas facilities produced 11 Twh of electricity in 2005. The OPA recommends 11 Twh of production from natural gas in 2025.)

♦ The following chart shows inconsistencies and impossibilities of the recommendations.

Figure 1.2.22: Supply Mix Recommendations – Electricity Production



(%)	2005 (Estimate)	2015	2020	2025
Nuclear	51	48	48	50
Renewables	23	40	42	43
Gasification	0	1	1	1
Gas	7	11	9	6
Coal	19	0	0	0

(TWh)	2005 (Estimate)	2015	2020	2025
Nuclear	79	76	81	89
Renewables	36	64	71	77
Gasification	0	2	2	2
Gas	11	17	15	11
Coal	29	0	0	0
Total	155	159	169	179

Source: OPA

♦ If this is a true representation of what is being recommended, it appears that the intent of installing this gas-fired generation is to provide electricity from about 2009, when coal

is removed from service, until 2017 when new nuclear and hydro imports are anticipated to come on line.

♦ According to OPA recommendations, the ratio for installed capacity to electricity production for natural gas over the planning period is as follows:

YEAR	INSTALLED GENERATION CAPACITY	ELECTRICITY PRODUCTION
2005	4,976 MW – 16%	7%
2015	10,500 MW – 31%	11%
2020	11,000 MW – 30%	9%
2025	11,000 MW – 27% *	6%

*The OPA has indicated that up to 12,500 MW of installed capacity may be desired/required.

♦ Ontarians will be burdened with huge infrastructure and high generation costs over a 20 year period to achieve a net increase of only 4% production in the year 2015.

♦ If the information portrayed is accurate, Ontarians will continue to pay, through contracted support payments, for installed capacity that is not required past 2017, or Ontarians will purchase power from the privately owned power plants, while publicly owned assets, ie Lennox Generating Station (2100MW) and Brighton Beach (partly owned by OPG – 580 MW) generate little or no power.

♦ The OPA has/is initiating 20 year contracts with private merchant generators. The present contracts allow for bonus payments if completed within a designated time frame (in order to facilitate the coal closure), and guaranteed "support payments" to ensure profitability and to entice private investment into the provincial electricity market.

♦ Current installed gas-fired generation is underutilized. The OPA should look to increase the production from these facilities rather than contracting for more natural gas power plants. (For comparison - Lennox Generating Station has 2100 MW of installed capacity, Lambton Generating Station has 1975 MW of installed capacity. In 2005 Lennox produced about 1.3 TWh of power; Lambton produced 11 TWh).

3. Replacing Coal Production with Natural Gas Electricity Production

The OPA recommends that natural gas fired generation be used for peaking purposes only, due to the risks associated with price and supply. The Ontario Energy Board, on the other hand, reports that gas plants will be used for significant base load, intermediate and peak generation.

♦ The OPA recommends that natural gas produce 17 Twh of power by 2015; 15 Twh by 2020; and 11Twh by 2025.

♦ Therefore, the addition of 6,000 MW of natural gas by 2010 will only be required to produce an additional 6 Twh of electricity by 2015. (6,500 MW of coal-fired generation produced 30 Twh of electricity in 2005.)

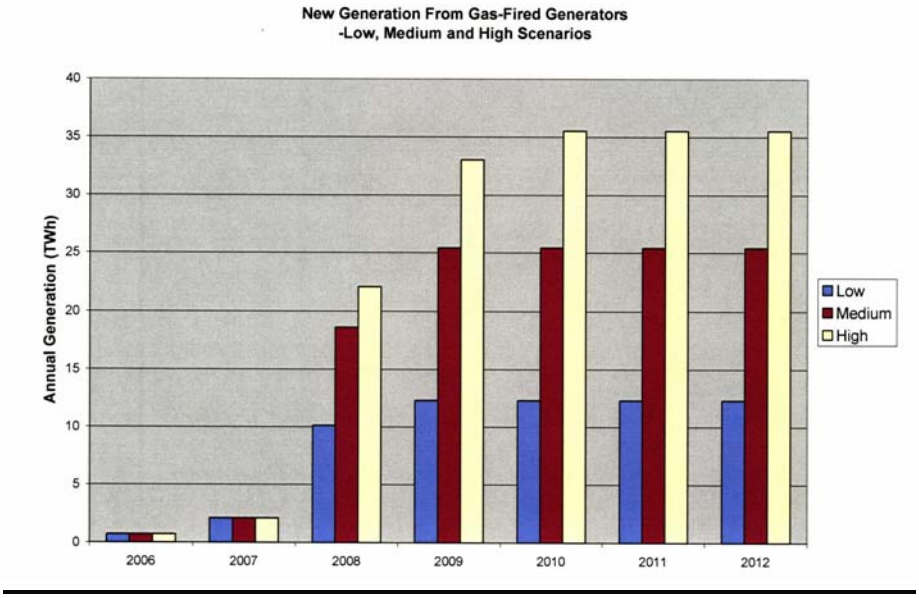
♦ Contrary to the OPA report, the Ontario Energy Board is suggesting the likelihood of 25.4 – 35.5 Twh of electricity production in 2015 for gas installation to replace coal.

♦ Gas (and oil) produced 11 Twh of electricity in 2005.

♦ It is simply impossible to limit natural gas production to 17Twh from 2010 to 2015 as the OPA summary would indicate. There is nothing else in the mix to pick up the 30 Twh of electricity needed when coal is removed. Rather, natural gas will likely be required to produce closer to 40 Twh of electricity, (11 Twh currently + 30 Twh current coal) which will include base, intermediate and peak load.

♦ The following chart was obtained from the Ontario Energy Board 'Natural Gas Electricity Interface Review (NGEIR)". The explanation for the chart notes that, "The medium scenario, which this review used as the base case, includes the gas-fired generating capacity (5025 MW ...) identified in the IESO's coal replacement scenario and an additional 240 MW to meet load growth by the year 2012. It is assumed that all capacity is in service by 2010. ... OEB staff and ERA met with the OPA, IESO, Hydro One and MOE to discuss these assumptions and to confirm that the scenarios were reasonable.... The electricity production ...was estimated using the forecast demand and expected production of nuclear and renewable power. Gas-fired generation output is assumed to 'fill the gap' between the forecast load and generation from other sources."

Figure 4: Electricity Production from New Gas-Fired Generation



♦ This chart indicates possibly more than 35 Twh of production from natural gas from 2010, when all new gas generation is expected to be installed, until 2012 and beyond.

♦ In order to determine infrastructure requirements, the OEB determined the manner in which gas generation would be used (utilization rate). Base load requires more gas and transport per MW of capacity than peaking which requires higher storage deliverability per MW of capacity. The following chart "illustrates the utilization rate ... to match as reasonably as possible the ... announced cogeneration plans, annual coal replacement requirements and capacity requirements. The IESO, OPA and MOE reviewed the scenarios, and the proposed generation mix, for general reasonableness."

♦ It is evident from this chart below, that natural gas **will** be used for significant base and intermediate load, not primarily peak generation, as is advised by the OPA.

Table 1: Assumed Utilization Rates for Gas-Fired Power Generation

MEDIUM SCENARIO	2006	2007	2008	2009	2010	2011	2012
Baseload	85%	65%	65%	65%	65%	65%	65%
Intermediate	45%	45%	45%	45%	45%	45%	45%
Peaking	5%	5%	5%	5%	5%	5%	5%
Average Utilization	85%	62%	56%	55%	55%	55%	55%
Capacity (MW)	90	390	3765	5265	5265	5265	5265
Generation (TWh)	0.7	2.1	18.6	25.4	25.4	25.4	25.4
LOW SCENARIO	2006	2007	2008	2009	2010	2011	2012
Baseload	85%	40%	40%	40%	40%	40%	40%
Intermediate	25%	25%	25%	25%	25%	25%	25%
Peaking	5%	5%	5%	5%	5%	5%	5%
Average Utilization	85%	31%	33%	33%	33%	33%	33%
Capacity (MW)	90	90	3455	4305	4305	4305	4305
Generation (TWh)	0.7	0.2	10.1	12.3	12.3	12.3	12.3
HIGH SCENARIO	2006	2007	2008	2009	2010	2011	2012
Baseload	85%	70%	70%	70%	70%	70%	70%
Intermediate	50%	50%	50%	50%	50%	50%	50%
Peaking	8%	8%	8%	8%	8%	8%	8%
Average Utilization	85%	57%	62%	60%	60%	60%	60%
Capacity (MW)	90	390	4075	6275	6775	6775	6775
Generation (TWh)	0.7	0.4	22.1	33.0	35.5	35.5	35.5

♦ Ms. Cansfield, the Minister of Energy, in a letter to the CAE Alliance, dated December 1, 2005, has advised that "... these gas-fired plants are being built for 'intermediate generation', which means they will not run 24 hours a day, seven days a week, but only during periods of moderately-heavy to peak demand."

♦ Staff available to answer questions during an Invenergy open house for the proposed St. Clair Energy Centre in Lambton County, on February 15, advised the CAE Alliance that their 570 MW natural gas plant was intended for "intermediate generation".

However, The OPA Supply Mix Summary concludes, "Gas-fired generation is not recommended for base-load generation because in that role it presents risks across all three dimensions of cost, environmental impact and financial risk." and "... the volatility of price and uncertainty of supply ... major drawbacks to gas-fired generation for base load."

CONCERN:

The information provided in the OPA summary would lead us to conclude that natural gas is best suited for peak load, is a temporary replacement for coal generation, and will not be used at any time to generate any more than 17 Twh of electricity – really not much more than the 11 Twh of current production. There is clearly confusion and contradiction here, within the OPA report, between the OPA report and the Ontario Energy Board, and between the expectations of the Minister of Energy, the Merchant generators and the OPA.

♦ The purpose of the Ontario Energy Board Natural Gas Electricity Interface Review was to determine "...whether gas-fired power generation, which may replace capacity that is being phased out, puts new types of demands on the natural gas system. The first concern related to volume. ... The second concern was the consumption pattern." (Executive Summary, Ontario Energy Board – Natural Gas Electricity Interface Review)

This report was completed late November, 2005, long after the OPA had struck key contracts with natural gas power suppliers, and after the procurement process had been initiated for the remaining 6,000 MW of gas-fired generation. In other words, the feasibility and impact of this amount of natural gas power generation – whether the current infrastructure could sustain such development - had not been assessed before the net was cast to procure natural gas-fired generation. The CAE concludes that the contracts were awarded prematurely, and are evidence of the panic to shut down coal.

4. Fuel Costs

CONCERN:

The OPA acknowledges the high, volatile cost of natural gas as a fuel source. This will obviously and immediately impact electricity costs. However, there are many economic ramifications of switching to natural gas fired generation, some of which are alluded to in the OPA Report, some of which have not been factored in, or even considered.

(i) OPA Comments Re: Cost of Natural Gas

The OPA recommends more than doubling the amount natural gas-fired generation in the Province, from the current 4,976 MW to as much as 12,500 MW by 2025, in spite of numerous references to cost and supply concerns. These concerns are a reality, as evidenced by the Ontario Energy Board reference to a "generator awarded a CES (Clean Energy Supply) contract" requesting a direct connection to a high-pressure pipeline because of "their limited ability to manage the risks associated with volatile demand and the price of natural gas". (OEB – Natural Gas Electricity Interface Review)

The following comments represent a **sampling** of the information interspersed throughout the OPA Supply Mix Advice and Recommendations Report:

♦ "The price of natural gas has increased four-fold in the past five years and is expected to remain high and volatile. Residential and commercial space heating and industrial processes compete for supply and several nearby jurisdictions also rely heavily on gas, all of which puts its availability at a premium or even at risk."

♦ "OPA has selected the natural gas price forecast produced by Sproule ... for use in the preparation of the supply mix advice that projects that prices will decline from current levels to slightly less than $8/MMBTu by 2010 and remain close to this level until 2025."

♦ "The price of natural gas has increased sharply over the past five years – from $2 to $3 per million BTU to the current $12 to $14, reflecting increasing demand for oil and gas ... Natural gas-fired generation had a cost advantage in the 1990s based mainly on its relatively low capital and fuel costs, but today the fuel price has pushed up operating costs to eliminate that advantage."

♦ "Key uncertainties for supply mix include unpredictability of future natural gas prices and availability..."

♦ "... nuclear generation would provide an excellent alternative to the volatility of price and uncertainty of supply that are major drawbacks to gas-fired generation for base-load."

♦ "The combination of rising natural gas prices and a market for natural gas that is very mature and liquid increases the likelihood that operators of natural gas-fired stations may choose to shut down generation to free up the gas fuel for more profitable resale in the gas markets. Since gas and electricity demand peaks tend to coincide in cold climates, this phenomenon increases both price and supply risks for many systems with a heavy reliance on natural gas."

♦"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."

♦ "Do not use natural gas for base-load generation, since this use results in higher exposure to natural gas price risks."

♦ The high cost of natural gas is expected to remain – it is not a cyclical rise, but structural, due to lasting changes in the supply demand scenario. Additional cost information includes:

♦ Natural gas fuel costs are more than double now what they were in 2003 when the Liberal government determined to close coal fired power plants. Using OPG figures, it

will now cost $85 million **more** to generate a terawatt hour of power using gas-fired generation than it did then.

♦ According to the US Energy Information Administration, the average cost per unit of energy was over 3 times higher for natural gas than coal, over the 2002-2005 period. (Annual Energy Outlook 2204 with Projections to 2025)

♦ CERA Advisory Service has reported that "... replacing Ontario's coal-fired capacity with solely natural gas-fired plants would cost Ontario consumers between $800 million and $1.3 billion annually, depending on gas price assumptions over the life of the plants." (Ontario's Power Problems – Mostly in the Past or More to Come, December, 2004) This represents the fuel cost difference per year.

(ii) Impact of Higher Fuel Costs

CONCERN:
The cost of electricity produced from natural gas will be significantly higher than the coal-fired generation that it would replace.

CONSIDER:

♦ ERA, consultant to The Ontario Energy Board "....assumed that new base load and intermediate gas-fired generation projects would rely on firm upstream supply ... because power obligations in the CES contracts and future power purchase agreements would likely result in generators requiring firm services ... given the substantial increase in gas-fired generation." The result of this would, of course, be high electricity prices. (Note the assumption regarding base and intermediate load generation.)

♦ Fuel costs represent over 50% of the levelised cost of electricity, and 90% of the operating costs for natural gas-fired power generation.

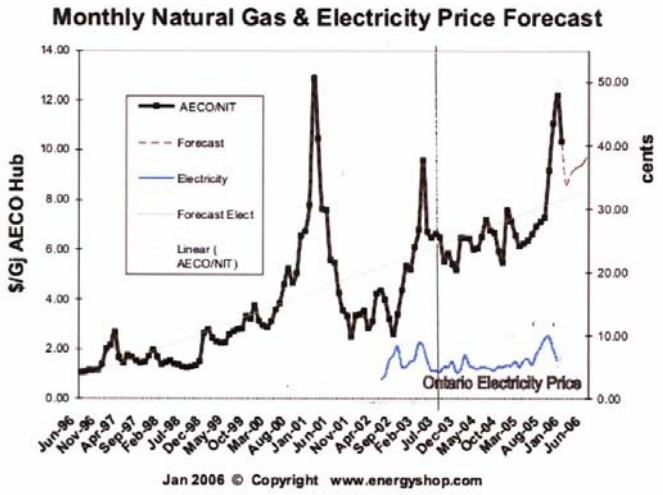
♦ The U.S. government agency, Energy Information Administration indicates that the "projected average prices of natural gas and coal delivered to electricity generators in 2025 are 31 cents and 11 cents per million Btu, respectively ..." The fuel costs of natural gas to replace 30Twh of coal generation will be about triple. (Annual Energy Outlook with Projections to 2030, Early Release, December 2005)

♦ "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)

♦ Navigant Consulting advises, "Higher than forecast natural gas prices have been a primary contributor to higher than forecast electricity prices in the spot market. Preliminary analyses show that for every 10% increase in natural gas prices, Ontario

electricity spot market prices would increase by approximately 6%. It is notable that both the natural gas price and the electricity spot market price have each increased by 32% relative to forecast." (Monthly Variance Explanation April/05 – October/05)

♦ The following chart demonstrates the correlation between the cost of natural gas and the price of electricity.



♦ According to the Electricity Conservation & Supply Task Force, Final Report, "Coal-fired generation is today's lowest cost electricity-generation fuel and has set the market-clearing price 56% of the time in Ontario since market opening. If that segment of the market is removed, it is likely that the market-clearing price will be predominantly set by higher priced natural gas generation. This will have a significant effect on the price Ontarians pay for electricity."

♦ Many U.S. states are now planning new coal plants with available clean air emissions technology. A primary reason stated for the coal choice is the need to mitigate the high cost of natural gas-fired generation.

Conclusion:

According to the OPA Report, 6,000 MW of additional gas generation is currently under procurement. The OPA did not conduct assessments of natural gas cost and supply prior to the Requests for Proposals. Considering the numerous statements throughout the report regarding the risks associated with natural gas, we wonder why the OPA would not now reconsider **any** additional natural gas generation. The switch for the Thunder Bay plant to natural gas should be halted. It is within the power of the OPA to suspend further progress on procurement. No project is yet in the construction phase. Some projects have met with obstacles. Certainly the recent Chapter 11 bankruptcy filing by Calpine Corp. provides grounds for release from the Greenfield Energy Centre project in Lambton County.

(iii) Volume of Gas Required and Resulting Impacts

CONCERN:
The volume of natural gas required to generate required power in Ontario will impact the price of natural gas and of electricity. Consumer bills will include infrastructure cost payments. Industry will leave Ontario. Farming will be greatly impacted. Natural gas supply shortfalls will be accelerated.

♦ "The Ontario Energy Board's Natural Gas Electricity Interface Review (NGEIR) reported that gas-fired generators would become the largest class of gas-consumers in the province if all current (ie not including the Lakeview Generating Station – 1,000 MW closed in April, 2005) coal-fired generation were replaced with natural gas, consuming more gas than all natural gas residential customers in the province combined.

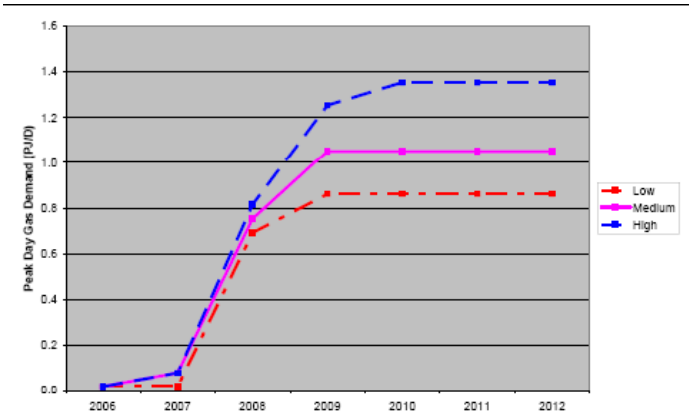
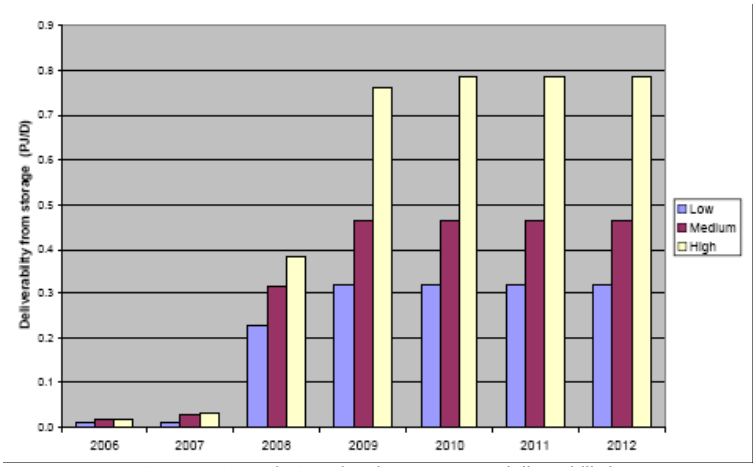


Figure 3.9.29 – Peak Day Requirements for Gas-Fired Generators Sources: OEB (NGEIR)

♦ "... the quantity of natural gas required to replace all the OPG coal-fired plants with gas-fired plants would be about ... 347 Bcf per year. The total primary demand for natural gas in Ontario in recent years have averaged about 986 Bcf/yr." (Dr. J. T. Rogers, Professor, Department of Mechanical and Aerospace Engineering, Carleton University – "Options for Coal-Fired Plants in Ontario, September, 2004) Therefore gas demand will increase by about 35% (more than the volume of residential use) to replace coal generation.

♦ The following chart, extracted from the OPA Supply Mix Report (Natural Gas Price Context) graphically displays the increase in the amount of gas required to fuel the recommended gas generation.

Figure 3.9.28 – Storage Deliverability Demand for New Gas-Fired - Generation*



Sources: OEB (NGEIR); * (assumes 5% deliverability)

♦ The OPA admits that "The growth of natural gas-fired generation demand is not likely to conform to a steady load growth profile and hence there is likely to be additional demands on the delivery systems that have not previously been present."

♦ "...gas demand jumps starting in 2008 and increases through 2009 as new gas-fired generation comes on line. Significant supporting infrastructure will be needed by that time." (OEB – Natural Gas Electricity Interface Review)

♦ Further note, "... a forecast of the price increase of gas above the price otherwise forecast is not possible until the amounts, location and operating pattern of gas-fired generation are known. The effects on gas prices at Dawn, which will likely rise if the gas usage rate increases rapidly, are similarly unknown at this time.
What is clear is that the increased usage will put upward pressure on gas prices and that the delivery costs will increase for the generators and possibly also other natural gas customers."

♦ Gas-fired generators will starve other users of natural gas in order to produce power; likewise, gas storage space, which the OEB deems "uncertain" at this time in terms of demand, except to "assume a significant demand for new storage space ... for new gas-fired generators from a low of 7.1 PJ to a high of about 17.5 PJ." (1 PJ = approx 1 billion cubic feet)

♦ The OEB's 'Natural Gas Electricity Interface Review' deals with issues "arising out of the increasing amounts of gas-fired generation planned for Ontario, partly to deal with increased electricity load ... but largely to deal with new generation required to allow coal-fired generation to be replaced by 2009". Their findings include, "The amounts of additional gas required are significant and new delivery and storage facilities will be required to accommodate the new demand. The number of parameters involved and unique demand characteristics should be offered as a tariff item to gas-fired generators and other qualifying customers."

♦ Industrial consumers have expressed concern that the gas supply, transport and distribution will disrupt gas supply to current users; that they will be forced to incur unnecessary infrastructure costs, in effect subsidize independent power producers; and that interruptible gas customers will suffer increased curtailments, or contract for firm service which increases costs. Storage rates for gas could double. They warn of the potential switch to alternate fuels which may have adverse environmental impacts.

♦ Competition for supply may well occur, particularly on cold winter days – home heating, industrial use, electricity generation. With escalating air conditioning requirements gas will be used to generate electricity in the summer, when it would traditionally be injected into storage for use in the colder winter months. (The OPA is suggesting that "consideration should be given to providing dual fuel capability" for some new gas plants, in winter months. See point 1., "Concerns Relating to the Environmental Process", Page 46)

(iv) Impact on Industry, Business, and the Farming Community

CONCERN:
The OPA acknowledges the impact of electricity costs on economic development. "Many large corporations base their decisions about future expansion of studies of possible alternative locations, on a global basis. It is known that the projected reliability and costs of power supplies in possible areas of expansion are major factors in such decisions." However, the OPA is making decisions that exacerbate, not alleviate these concerns that will impact the future economic growth and development in Ontario.

Although the OPA has indicated that "listening" to stakeholder views was an important element in the supply mix planning, the CAE questions how much weight they placed on the concerns and warnings raised by industry and business. The impact to these sectors will have a ripple effect throughout our economy. Their concerns are justified.

CONSIDER:

♦ "In cases where the gas delivery system, including storage capacity, must be augmented significantly to provide large quantities of gas required by electricity generation, there is concern on the part of other non-generation gas users that the additional infrastructure costs ... market force costs, do not fall on them. This discussion is still active and unresolved and hence the final gas prices at the consumer level, either generator or non-generator, are unresolved."

♦ "... the context of increased reliance on gas-fired generation has made the need to resolve these questions acute." (OEB – Natural Gas Electricity Interface Review)

♦ Industrial gas consumers, relying on interruptible clauses in contracts, are voicing concerns that processes will be impacted with higher instances of interruption of gas supply to them, or that they will be forced to contract for more reliable supply. Either

way, costs increase. The OPA indicates that secure supply and storage for gas generators "... depends on the extent to which the gas requirements of additional supply are interruptible. Interruptible supply does not require guaranteed capacity."

♦ Some large volume energy users have urged the Ontario Energy Board to ensure that new infrastructure investment costs caused or incurred by new electricity generators be fully paid for by these generators. However, "The Board's policy is that when there is a shared benefit to facility expansion, these costs should be allocated to all customers that benefit from the expansion. As a result, the costs of distribution expansions for the benefit of the gas system are borne by all distribution customers." (OEB – Natural Gas Electricity Interface Review) Similar principles apply to costs of gas storage and common pipeline transmission expansion. It will be argued that, as the power supplied is to the benefit of all Ontarians, they all should incur the costs. (A recent Order pertaining to a gas pipeline 2km in length, and metering for the Greenfield Energy Centre, estimated at about $5 million indicated that, "... the economics of the pipeline project become a consideration as the costs will be borne by Union's ratepayers. ... We ... are satisfied that there would not be undue adverse rate impacts on Union's ratepayers in the first year.")

♦ Higher natural gas costs – fuel and passed through infrastructure costs and higher electricity rates – will drive industry from the Province. "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." (The New York Power Authority, October 25, 2005)

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

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

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

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

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

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

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

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

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

"If CES contracts are used for future power generation contracts then very large volumes of gas will be purchased at Dawn ... Dawn Index will be pushed higher but there will be significant price volatility... other purchasers, including industrial consumers may be forced out of that market."

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

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

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

"Recent government policy decisions including the decision to phase out coal-fired generation and RFP contracts will virtually guarantee higher prices for electricity. ...

Ontario must not become an island of higher priced electricity relative to other jurisdictions that are competing for investment."

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

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

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

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

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

The President of the CCPA ... urges provincial policy makers... to revisit energy and electricity policies that have largely eliminated coal as a fuel ... in spite of its low costs. We're looking for strong leadership on energy ... not platitudes, wishful thinking and naiveté while industry leaves for lower-priced markets."

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

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

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

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

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

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

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

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

(v) Drivers of Price – Supply & Demand

CONCERN:

All credible North American energy agencies, government and commercial, are warning of supply issues of natural gas. Demand has outpaced supply. Production is waning. This has a direct impact on the price of this commodity.

♦ The price of natural gas is based on supply and demand issues. "Demand is driven by weather, economic growth and fuel consumption. The supply side is affected by production, drilling rates, storage and available pipeline capacity."

♦ The OPA has chosen to rely on resource supply estimates of the National Energy Board, 2004, which indicates, "... for the ultimate potential of natural gas in Canada, including proved reserves and undiscovered conventional resources (coalbed methane, tight and shale gas), 575 Tcf, which is about 77 years of natural gas at 2002 levels of production."

♦ Total Canada (Tcf – Trillion Cubic Feet) (Canadian Petroleum Producers)

Proved Reserves (Jan 1/03) 59;

Discovered Resources:	151;
Undiscovered Resources:	365
Total Remaining Resources	**575**.

♦ Discovered Resources are "estimated quantities of gas in known drilled reservoirs, which are too remote to be connected to existing pipelines and markets. If pipelines were built, gas volumes would be recoverable under existing technological and economic conditions." Undiscovered Resources are "An estimate, inferred from geological data, of gas volumes thought to be recoverable ... but not yet discovered by drilling." These include "unconventional sources" of gas such as coalbed methane, shale and tight gas. (Natural Resources Canada, Review of 2004)

♦ The estimation of ... gas reserves is not an exact science. There is always uncertainty in making these predictions, ... To express the variance in reserves estimates, the industry has developed reserves classification systems, referred to as "Reserves Definitions". Proved, probable and possible reserves imply low, intermediate, and high degrees of uncertainty, respectively." (Reserves Estimations and Definitions: Standardization and Enforcement J. Glenn Robinson (Sproule Associates Limited)

♦ The information upon which the OPA is making their recommendation is based on 2002 levels of production. However, Canadian production was down 4% in 2003 over 2002, although there was a 54% increase in drilling.

♦ "... by 2020, it is expected that western Canadian conventional natural gas production will be about 3 Tcf, accounting for only 10% of total North American natural gas supply. ... In Canada, total gas wells drilled increased 12%, surpassing the 15,600 well mark for the first time in history. ... exploration is now finding smaller and smaller pools..." (National Energy Board Canadian Natural Gas: Review of 2004 and Outlook to 2020)

♦ "At 60 trillion cubit feet, Canadian reserves... in 2002, giving a reserves/production ratio of 9.3 years. (CERI – World Energy: The Past and Possible Futures)

♦ "... the basis for the numbers is '2002 production' not consumption, which is higher than production now and growing. <u>The key to how many years of supply are available in North America rests heavily on what is done to adjust consumption rates</u>."

♦ This echoes the statement by the National Energy Board, "Tight natural gas supply relative to demand implies ... new electric power generation will come from a variety of sources, including coal, wind, large hydro and possibly nuclear." also, "Developers of ... electric power generators may also be pressured to reconsider their reliance on natural gas." (Natural Gas Markets in Transition – An Energy Market Assessment, August, 2004)

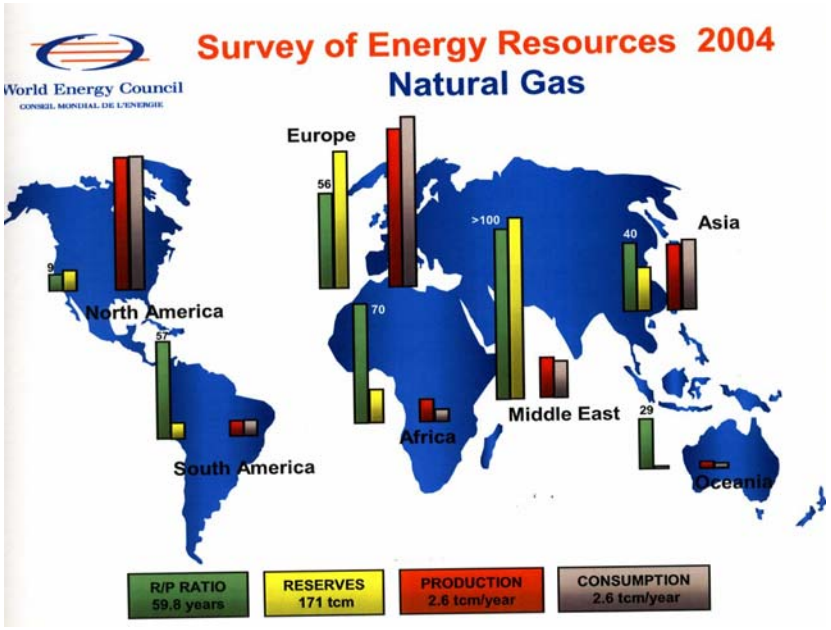
♦ "The environmental efficiency ratings of natural gas power systems are dominated by ... relatively low efficiency ratios for the energy resource depletion indicators, reflecting

the relatively high rate of resource depletion for natural gas..." This is another clear indication that natural gas supplies are a widespread concern. (SENES Consulting, Commissioned by the OPA)

♦ "There are considerable differences among published forecasts of natural gas prices, production, consumption and imports. The differences highlight the uncertainty of future market trends." (CERI Electricity Generation Technologies: Performance and Cost Characteristics)

♦Ontario needs to increase current consumption, just to replace coal-fired production, by an additional 35%. U.S. needs are increasing, while their production is also declining. Although the Dawn Hub pools gas from various sources, we have no guarantee that these resources will be available to us. This is particularly true if we have an unnecessarily cold winter, or a hot humid summer that coincides with similar weather in the areas where natural gas generation would be increased.

♦The following map shows the high consumption pattern in North America, in comparison with production and remaining reserves.



♦ Regarding supply/demand issues and resulting price concerns, note the following comments included in the OPA report:

◊ "Particularly worrisome were the facts that, despite increased drilling activity, production could not be increased, and natural gas demand was growing in Canada."

◊ “Shrinking Canadian production is leading to decreased exports and increased imports... 43% higher in 2003 than 2002 and 650% higher than in 1999.”

◊ “The impact of a rapid adoption of natural gas-fired generation in Ontario for power generation is also becoming a concern for neighbouring jurisdictions.”

◊ “The North American natural gas market is facing a decline in deliverability from existing ... sources ... The US has added over 225 GW of natural gas-fired generation ... much of it is operating at relatively low capacity factors thus understating the potential demand that these electricity resources may place on natural gas supplies ... unanticipated increases in demand from severe weather could result in significant run-ups in the price of natural gas. ...” (Navigant Consulting – commissioned by the OPA)

◊ “Under these market conditions, Liquefied Natural Gas (LNG) is expected to play a critical role in addressing the forecast supply gas. ... future natural gas prices will be significantly influenced by LNG project development and this represents a major long-term gas price risk.” (Navigant Consulting – commissioned by the OPA)

◊ Future LNG supplies to North America are the swing factor for future pricing. Those predicting lower and stable prices for the next 20 years anticipate significant LNG imports. However, “... much of the viable gas production exists in countries that are not politically friendly with the United States.”(“Clogs in the Pipeline”– May 16, 2005 - Navigant Consulting)

◊ “Currently, Canada does not import any LNG. ... A ‘consensus’ view of the Canadian natural gas supply in 2020 forecasts LNG to be 6% of the total Canadian supply.” The U.S. north-east is bargaining for significant amounts of LNG from eastern Canadian provinces when it does become available.

◊ Demand, and therefore competition, for LNG is rising rapidly. This translates into cost increases. Environmental concerns, ie methane and CO_2 release in conversion, makes LNG use worse than coal for greenhouse gas emissions.

◊ The U.S. government Energy Information Administration predicts that 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 – Overview)

♦ The Ontario Energy Board, when conducting the review of the system impacts of natural gas did not include “the economic implications of using gas-fired generators on gas price levels, price volatility, security of supply and long term supply contracts”, nor the impact on “surrounding jurisdictions regarding additional capacity for storage and transmission. ... it was the Board staff’s view that “...Board should not have a central planning function in the gas market.”!

♦ The CAE Alliance booklet entitled, "The Switch to Natural Gas, An Unaffordable Option", available from our website, provides information from a variety of credible sources that warn that we have less than 10 year supply of known reserves to production of natural gas in Canada, and in North America. We have compiled information regarding new and unconventional sources of gas, the concerns with LNG, and the competition for gas supplies. Since this information was compiled, Summer of 2005, the situation has worsened.

Conclusion:
The OPA has used the "ultimate potential" figures to justify using natural gas for electricity – the best case scenario, which includes "undiscovered" and "hoped for" potential reserves. These sources simply are not materializing. Any cursory review of current market news will reveal that North American supply is declining to the point of drilling in socially and environmentally sensitive areas. There is a scramble for LNG contracts. The U.S. built 225,000 MW of gas fired generation in 10 years which is now running at 30% capacity. In spite of all words of caution, the OPA is contracting for up to 20 years of natural gas electricity generation based on uncertain supply.

The CAE Alliance believes that this move shows disdain for industrial gas users and callous disregard for the residents of Ontario, who will pay dearly for this move. Security of power supply hinges on a declining resource that may not be there in 10 years time. It is irresponsible to use such a precious resource, vital for home heating, necessary for industrial feedstock, to generate electricity. Residential heating and industrial processes utilize natural gas at 95% efficiency – electricity generation at 40-60% efficiency. Natural gas is a fossil fuel – an expensive and increasingly scarce resource. As a power source for intermediate and base load generation, it is far too expensive. (70-75% of Ontario homes are heated with natural gas)

In the final analysis, ten years down the road when there is competition for declining gas resources, who will get the supply?

(vi) Rate of Price Change

CONCERN:
Consumers have expressed "An additional concern for price. ... not just the level of prices, but the rate which they change is a concern."

CONSIDER:

♦ Natural gas prices have, in recent years, been described as "volatile". Defined as "changeable", "characterized by rapid change" (Webster), volatility of price is exactly that – rapid fluctuations in cost.

♦ "The price of gas in the long-term is linked to the price of oil and is highly volatile."

♦ "... 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."

♦ Due to rate structure, industrial consumers of power are more vulnerable to fluctuations in electricity prices than are residential consumers.

(Note also the comments under the heading "OPA Comments Re: Natural Gas Costs")

CONCERNS RELATED TO AFFORDABLE POWER

It is the legislated responsibility of the Minister of Energy to "protect the interests of consumers of Ontario with respect to prices". "Protect" is defined as "to shield from injury or destruction; to guard; to save from contingent financial loss". (Webster) Stakeholders have emphasized with the OPA that the economy of the province must be the most important priority – the primary driver of all decisions. However, the OPA Supply Mix Advice and Recommendations does not include a cost evaluation of the supply mix that will for the basis for the power plan for the next 20 years. A capital cost estimation has been provided, with bonus information that "there are significant operating, fuel and maintenance costs" that are yet undetermined. The OPA has not even conducted a cost evaluation of the impact of coal removal and natural gas generation on the price of electricity. Tens of thousands of jobs have been lost in the province over the past few years as a result of high energy costs, yet the OPA plans as though ratepayer pockets are bottomless.

The CAE Alliance has considered, in the sections above, some of the cost concerns arising from installing significant amounts of natural gas fired generation. Additional cost concerns include the following:

1. Capital Cost

CONCERN:

The OPA anticipates spending a staggering $56 billion to $83 billion on capital costs alone. Using a middle-of-the-road figure, the OPA suggests $70 billion to factor annual costs. (We are all aware that the highest cost analysis is often exceeded). The Report concludes that, as "the total of all electricity bills in Ontario is $12 billion per year, the capital expenditure averages $3.5 billion per year over the twenty-year period." That figure alone suggests an approximate 25% to 30% increase in all electricity bills for capital expenditure alone, exclusive of higher operating and fuel costs. A large portion of this capital cost will be expended in the next 5 to 7 years, including the $7-$10 billion natural gas infrastructure costs plus conservation initiation expenses. The Ontario economy simply cannot sustain this degree of energy spending.

Table 1.2.10: A Robust Portfolio for Meeting a Range of Scenarios

Resource	Installed Capacity (MW)	Capital Costs (as spent $Billions)
Conservation	1,800 to 4,300	5 – 11
Renewables	13,900 to 16,100	14 – 22
Natural gas-fired generation	10,200 to 12,500	7 – 10
Nuclear power	12,900 to 15,900	30 – 40

Source: OPA

♦ Costs will be paid by Ontarians, through their energy bills, taxes, or both. (Note, that gst is included on our energy bills.) "Higher electricity prices not only take a bite out of the consumer's budget, but also affect the competitiveness of business." (CERI Report to OPA)

♦ Ontario's power system is currently weighted down by approximately $20 billion in stranded debt.

♦ The OPA estimates a capital cost of $5-11 billion dollars to procure public participation in conservation measures.

♦ A megawatt saved is better than a megawatt generated, but not less expensive to create. Progressive measures, with continual assessment would balance the need to reduce demand, while protecting consumers from any large expenditures, such as smart meters.

♦ Peak demand by sector shows 47% of consumption by commercial enterprise, ie offices, retail stores, etc. If smart meters are implemented, these businesses will be hit with high rate increases, due to hours of operation. Navigant Consulting reports that power reduction from this sector will net 5%, or 140MW from its original peak at pm on a winter day, and roughly 3%, or 120 MW at 1 pm on a summer day. This will cause hardship for businesses unable to conserve or shift load during prime business hours.
Likewise the farming community, with little ability to shift load, will pay much higher costs. This will impact all consumer spending.

♦ Education and incentive should be key to conservation and demand management initiatives. All programs should encourage participation, but not penalize those who cannot manage load shift requirements.

♦ Smart meters will be installed at a cost of $1-2 billion, plus monthly administration fees. Very expensive power!

The CAE Alliance has a separate document dealing with Smart Meters. A copy will be provided with this Response to the OPA.

♦ Renewable resources will incur significant costs. "Transmission and system equipment will need to be upgraded to accommodate the variability of power flows ... These issues must be considered in planning ... especially because of the economics involved, which currently make the price of wind power relatively high."

♦ Developing renewable energy includes payments to generators of production incentives, sales tax abatements, favourable income tax treatment, direct subsidies for capital costs, direct capital incentives. In fact, it is argued that these tax breaks and subsidies provide more revenue for producers than the actual electricity sold into the power grid.

2. Coal Replacement Costs

CONCERN:
There are significant costs to Ontario ratepayers associated with the coal closure, in addition to specific costs related to replacement of coal generation with gas-fired power. These costs have not been included in the OPA Report.

CONSIDER:

♦ "Gas now costs upwards of four times as much as coal per unit of energy." (Library of Parliament – Parliamentary Information and Research Service – "Ontario's Electricity System: Is There Light at the End of the Tunnel?" – September 22, 2005)

♦ Premature retirement of coal-fired power plants, including costs to install emissions control technology on some units. (In the past 12-15 years, over $1 billion of consumers' money has been spent to enhance efficiency, reliability, safety and environmental performance on coal-fired units. Shutting down Lambton Generating Station, with 2 of North America's cleanest units, is a waste of ratepayer's money.)

♦ Decommissioning costs, or costs to place coal-fired plants in a state of available future use have not been considered in the OPA cost evaluation.

♦ The Ministry of Energy refers to "aging units". However, the Ministry of the Environment has reported that the lifespan of existing coal plants can "extended indefinitely" with overhauls and component replacement.

♦ Higher energy costs for schools, hospitals, and other institutions, struggling now to meet budgets, will cause a domino effect of compounded costs to taxpayers.

♦ In order to facilitate the rush to close coal plants, the OPA has promised bonuses (5%) to gas fired power generators for timely construction. This adds to the unnecessary costs to the Ontario consumer.

♦ Navigant Consulting reports that nuclear refurbishment capital costs are assumed to be $1.35 billion per unit based on the cost to refurbish the Bruce units. A cost effective measure is provided by Navigant in the comments that, "For the portfolio where the shut-down of Nanticoke is delayed and anticipated, it is assumed that some units of Nanticoke will be refurbished with scrubbers and selective catalytic reduction technology ("SCR"). Refurbishments are assumed to take one year during which time the capacity of Nanticoke is reduced to reflect the unit(s) that is off-line. Refurbishment capital costs are assumed to be $500 per Kw or $205 million per unit."

3. Public vs. Private, Merchant Generation

The OPA report notes that "The parties providing the new resources will, however, be fully commercial entities, not crown agencies." This move impacts both cost and additional risk to the Ontario ratepayers.

♦The above statement would lead to the conclusion that the inclusion of private power (merchant) generation is as basic a criteria for future electricity planning as is the coal-closure policy.

♦ "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 in 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)

♦ The report "Levelised Unit Electricity Cost Comparison of Alternate Technologies for Baseload Generation in Ontario", prepared by CERI, August, 2004, concludes that publicly financed generation is less costly than is private, merchant generation.

♦ In any commercial, or merchant venture, investors absorb all the risks of developing, financing, owning and operating infrastructure. However, under the CES (Clean Energy

Supply) contract structure natural gas price risks are borne by the OPA. "Given the uncertainties regarding future natural gas prices ... there is likely to be reluctance by ... developers to bear these fuel price risks." (Discussion Paper on Standard Offer Contracts) The bottom line is that consumers ultimately bear the risks associated with natural gas price volatility. Not only is the no advantage for the Ontario public, there is distinct disadvantage.

♦ "We favour a supply mix that uses the maximum of equipment and energy sources from Ontario, creating jobs and opportunity in the home market. We would be concerned if supply decisions generated large cash flows and wealth transfers out of the Ontario economy." (AMPCO)

♦ Any profit from any of the publicly owned generating plants can be used to offset higher costs of other power generation. If these profits are paid to foreign, private companies, the money is channeled out of the system, out of the Province.

♦ We concur with the Society of Energy Professionals, that "The process of privatization also inhibits the development and deployment of newer renewable energy technologies." (Submission to the OPA supply mix process)

♦ Over reliance on natural gas generation, resulting impacts on industrial and manufacturing employment will impact the Ontario credit rating.

(Are the OPA and Ministry of Energy considering the private development of new nuclear generating facilities?)

CONCERNS RELATED TO THE ENVIRONMENTAL ASSESSMENT PROCESS

CONCERN:
The letter from former Minister Duncan directed the OPA, an "independent" body, to prepare a report that "conforms closely" to government policy related to the coal closure issue. The CAE Alliance believes the OPA has skewed and slanted information in favour of natural gas generation and nuclear, and decidedly against coal-fired generation in order to fulfill that directive.

CONSIDER:

1. The OPA report states, "In developing a balanced generation portfolio to minimize fuel supply vulnerability, consideration should be given to providing dual fuel capability at plants which are unable to maintain fuel inventories onsite. In particular, this aspect may be necessary for some new gas-fired plants to ensure operational capability during winter peak periods when gas demand and electricity demand peak simultaneously."

Although Lennox Generating Station currently relies on oil for part of its electricity production, there is no discussion about the environmental impact of oil use, with the exception of SENES' review which rates oil higher than coal for environmental impacts. We understand that the CES contracts between the OPA and private generators allows for a percentage of oil use. This has not been considered, or factored in to the environmental impact analysis.

Also, with natural gas supply a very real concern for industry, it is possible that fuel switching may occur. The environmental impact of this must be charged to the natural gas scenario, which would be the leading cause of fuel switching.

2. The OPA did not bring an unbiased mindset to the determination of environmental criteria. From a review of the processes used to assess potential power sources, the CAE Alliance believes that the data does not present an accurate assessment of all factors.

♦ SENES, the consulting firm commissioned to assess environmental impacts, used a system of "power scorecard" to compare generation sources. This method was utilized to identify and quantify relevant environmental factors, cumulative impacts and sustainability for generation options and supply mix plans. A life-cycle approach - from mining of raw fuel material to operations, and through decommissioning and waste disposal- was used.

♦ Impact rankings were used to determine overall analysis of the effects of each generation type to the environment.

♦ "From the beginning of this process ... it was clear that inclusion of all environmental components identified would make the methodology cumbersome and impossible to evaluate. Further, many of the components involve information that is only available on a site specific basis or is generated specifically during consideration of generation alternatives siting.
Decisions were made to determine which components of the generation life-cycle and the environment were key to the subsequent comparison of different generation options were carried forward." (SENES)

♦ "... relative weightings between the environmental criteria have not been applied, they are all assumed to be equal. The relative importance of one aspect of the environment versus another is largely a measure of societal values and/or politics (e.g., commitment to meet Kyoto)." (SENES)

♦The "Power Scorecard" methodology is somewhat subjective, in that the "rankings of different generation technologies reflect the bias of the authors..." (SENES)
The CAE Alliance has noted some omissions, or exaggerated inclusions, which greatly impact the outcome of the resources impact study.

3. The emissions ranking for natural gas was determined a "2", and for coal a "5". However, SENES indicated that all existing technologies were to be considered in this calculation. Existing clean emissions technology for coal can reduce 95-99% of particulate matter; 90+% of NOx and SO_2; over 95% of acid mists, including 99% of hydrochloric acid and over 97% of the hydroflouric acid. Mercury is removed at 90%, and other metals 95%. (The CAE Alliance would be pleased to provide the OPA with information as to where this technology can be accessed.) Considering that natural gas emits higher quantities of CO and VOCs, precursors to smog, the rating for coal emissions should be on a par with that of natural gas.

4. The Report Assumptions did not consider transmission and distribution requirements associated with generation options. Therefore, the environmental impacts of the significant ($7 - $10 billion) infrastructure changes - gas pipelines, gas storage and transmission lines - associated with the addition of large volumes of natural gas were not factored into the impacts assessment.

5. "Social considerations were not part of the natural environmental evaluation." Therefore, the construction of the Portlands Energy Centre in an area disputed by the Toronto public was not a factor for land use impacts.

The ripple effect of wide scale unemployment that industry is warning of due to increased use of natural gas was not a factor in determining adverse environmental impact.

Visual impacts associated with wind mills were not used to determine land use affects.

6. The Canadian Electricity Association and Natural Resources Canada commissioned a study to develop a method "for benchmarking environmental performance ... in conformance with international life-cycle standards". Although this is a work in progress, a comparison was made of 5 generation types using existing facilities in Canada – wind, coal, hydro, nuclear and natural gas. Findings on the gas plant include, "relatively low efficiency ratios for the energy resource depletion indicators reflecting relatively high rate of resource depletion for natural gas ... low efficiency rating for greenhouse gas...". With respect to coal indicator, "... the study found that newly constructed coal power can efficiently contribute to net reductions in impacts for the existing regional power pool."

7. The SENES report included a number of "general assumptions" to develop this methodology, including, "... any new generation or refurbishment would utilize prevailing best management practices to minimize and/or mitigate ... impacts..." SENES did not consider the carbon credits or trading systems currently being developed in Canada by the National Offsets Trading Team, which is expected to be released soon.

Neither SENES, nor the OPA, have considered that Japan and European countries such as Germany and Denmark co-fire biomass fuels with coal to neutralize the CO_2 emissions.

8. SENES notes that "there was a lack of readily available information for many life-cycle impacts for many generation options". However, SENES included all stages of life-cycle emissions for coal-fired generation.

9. SENES' calculations included "conventional" natural gas production. Unconventional sources, such as coal-bed methane and LNG, have higher environmental impacts and concerns that were not addressed. As both of these sources of natural gas are necessary for future supplies to gas-fired generators, they should have been included. Increased drilling in environmentally sensitive areas, the impact on western farming from the number of wells drilled, and higher greenhouse gas emissions should have been considered.

10. Regarding "Transport", it is noted that "No information was readily available for any generation option or evaluation criteria. Further, much of the impact would be relatively site specific depending on traveling distances. As such, no evaluation was completed for this life-cycle stage." Fugitive emissions of methane are significant, up to 4% line losses in the transport of natural gas. This would more than double the impact of CO_2 emissions. Further, the optimistic assessments of natural gas prices for future use include large quantities of LNG to become available to North American consumers. The process of liquefying, then degasification of natural gas for transport also results in up to 15% loss of methane to the atmosphere.

The World Energy Council, of which Canada is a member (Energy Council of Canada), reports that "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. ... the projected increase in annual emissions of carbon dioxide from coal between 2001 and 2025 of 1.1 billion metric tons of carbon equivalent will be less than the increased amount for either natural gas (1.3 billion tons) or oil (1.5 billion tons)."

"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. During the next critical 20 to 50 years 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." (James Lovelock – address to the Canadian Nuclear Association Annual Seminar, March 10, 2005)

11. The Kyoto Accord indicates that greenhouse gas emissions are attributed to the country in which they originate. Greenhouse gas emissions for coal mining and transport should not be included, as the coal for Ontario power generation comes from the United States. (The SENES calculations use Alberta coal information.) Similarly, natural gas processed in Canada, but exported to the U.S., incurs greenhouse gas emission rates to Canada.

12. Emissions charts included in the SENES report highlight PM_{10} and $PM_{2.5}$ for coal, but only PM_{10} for natural gas. Natural gas produces higher levels of PM2.5 than

"scrubbed" coal. These tinier particles are considered more easily inhaled, and therefore more harmful to the lungs.

13. There was no accounting for the CO emissions from natural gas. Carbon Monoxide is a precursor to smog formation.

14. There was no assessment for emissions associated with chemical use in natural gas cooling water towers. These chemicals are dispersed when water droplets form from cooling tower vapour, affecting both land and water.

15. The calculation used by SENES for water withdrawal for a Natural gas/Oil, Combined Cycle Plant with Cooling tower is 874 litres/MWh, typical water consumption 684 litres/Mwh. However, the figures provided by Calpine Corp. for the proposed Greenfield Energy Centre, a 1005 MW natural gas plant indicate 20,400 litres/minute, or 1,224,000 litres/hour. Comments from Calpine Corp. include, "Water intake from St. Clair River used for cooling purposes only ... 90% of cooling water evaporated; 10% treated and discharged back to river." Therefore, there is significantly more cumulative, consumptive use of water from the Great Lakes River system. Decreasing water levels are a concern for this waterway system.
Ontario's thermal generating stations, on the other hand, use once-through process whereby most of the water is returned to the source. (Typical Water Withdrawal – 190,000 litres/Mwh and Typical Water Consumption 1140 litres/Mwh –SENES.)

Strangely enough, SENES ranked coal-fired generation a "3.5" for water impacts, and natural gas-fired generation a "1.5". SENES reports that, "It must also be recognized that water discharge, with respect to quality, is closely regulated by both Environment Canada and the Ontario Ministry of Natural Resources. As such, any potentially harmful discharges will require permitting that will be site specific. Therefore, no additional multiplier will be added at this stage for water quality impacts." As water temperature for returned use is monitored in the same way, we do not understand the 2 point rating difference. If anything, natural gas would have more negative impact on water resources due to the amount of withdrawal and consumption.

16. SENES used a calculation for "radioactivity" from fuel sources. SENES used a factor of "20 Normalized Collective Effective Dose (person Sv/GW a)" to come up with a rating of "10" for coal. It is interesting to note that the information used to determine the "20", is "...collective dose varies greatly by country; for example UNSCEAR 1993 estimates a normalized collective effective dose of 20 person Sv/GW a for China as a result of older technology and higher radionuclide levels in air". This represents dose per GW annual, whereas collective dose for electricity generation is normally designated as "person SV/MW y", or dose per MW year. Therefore, 20 Sv/GW a could be described as .02 Sv/MW y. As this is represents the dose from "older technology and higher radionuclide levels", we should expect the ratings to be much smaller, more in line with the information provided below. This is an example of "selective" information.

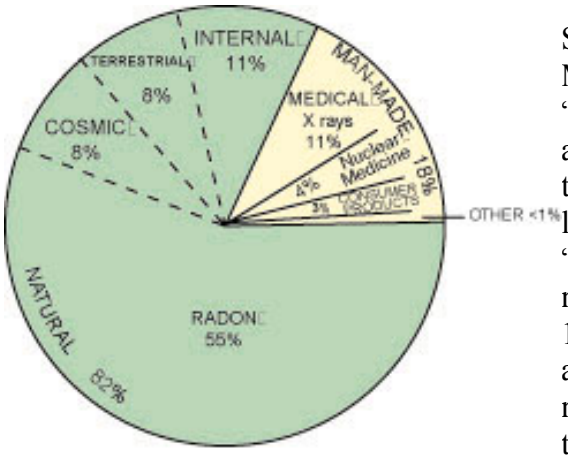


Figure 4. Percentage contribution of various radiation sources to the total average radiation dose to the U.S. population.

Source: United States Geological Survey – Modified April 28, 2003

"On this plot, the average population dose attributed to coal burning is included under the consumer products category and is much less than 1% of the total dose."

"Studies concluded that the maximum radiation does to an individual living with 1km of a modern power plant is equivalent to a minor, perhaps 1 to 5 % increase above the radiation from the natural environment. For the average citizen, the radiation dose from coal burning is considerably less."

"Radiation is a natural part of our everyday lives. Natural background radiation exists from numerous sources—the food we eat, the water we drink, the air we breathe and the soil on which we walk. Americans, on average, receive 360 millirem of radiation exposure each year from their surroundings with no identifiable health risk. Natural sources of radiation account for 82 percent of the radiation to which the public is exposed every year. ... Man-made sources account for the remaining 18 percent, including medical and dental x-rays and nuclear medicine (15 percent) and consumer products, such as televisions, computers and smoke detectors (2-3 percent). The degree of background radiation varies greatly from one location to another—from 100 to 1,000 millirem—due to many natural and man-made factors. People living in high altitudes, such as Denver, receive far more ambient radiation than people living in low-lying coastal cities, like Savannah, Ga.

Residents living near nuclear power plants receive an infinitesimal amount of radiation, especially when compared to naturally occurring sources of radiation. Living within 50 miles of a nuclear power plant increases ones radiation exposure by a mere 0.009 millirem (less than one-thousandth of one percent of radiation exposure from all sources), according to the Environmental Protection Agency. To put this in perspective, one would have to live near a nuclear power plant for 2,222 years to get the same amount of radiation exposure one gets from a single diagnostic medical x-ray (20 millirem). In comparison, the EPA notes that people living within 50 miles of a coal-fired power plant also receive an extremely small radiation dose of 0.03 millirem from the naturally occurring radiation in coal—though it is still more than three times the radiation they would receive from living near a nuclear power plant." (Testimony of Joe F. Colvin President and Chief Executive Officer Nuclear Energy Institute U.S. House of Representatives Science Subcommittee on Energy & Environment Washington, DC, July 18, 2000)

As noted, the impact of radiation for both coal and nuclear is so minimal that inclusion, particularly at the very high rating attributed, is unreasonable.

17. In the ratings for "waste", and impacts on the environment, SENES rated only 2 forms of generation, coal and nuclear. Waste from coal is the fly ash resulting from coal combustion. However, 91% of the total ash from coal firing was diverted from landfill and used constructively in the production of gypsum. Some newer coal technologies, which SENES should have incorporated, (US PowerSpan) provide a liquid ammonium sulfate fertilizer as a valuable by-product.

Nuclear power generation, on the other hand, has spent fuel storage concerns going into future generations, "only a few hundred years, if the used fuel is properly recycled". ("Nuclear Power: Clean, Safe and Needing a Level Playing Field", August, 2003 The National Center for Public Policy Research)

For the nuclear assessment, SENES included "low-level radioactive waste in the form of clothing, mop heads, rags, paper towels and floor sweepings; intermediate level waste such as used reactor components, or resins and filters to keep the reactor water systems clean; used fuel bundles; hazardous Wastes - liquid and solid; and combustion by-products (ash and gypsum)." "The lifespan of a long-term storage facility for radioactive waste is tens-of-thousands of years."

Regarding coal ash land filled, and nuclear fuel rods stored, SENES notes that, "A comparison of the relative potential impacts of a landfill versus a long-term storage facility for radioactive waste is not readily available and quantification of this kind of impact is beyond the scope of this document. As such, it is difficult to assign a modifying value to potential environmental or human health impacts from either type of storage facility and therefore, no modifying factor was developed to evaluate potential differences between environmental or human health impacts."

However, coal fired generation was rated a "10" out of "10" for "waste"; nuclear was rated a "1" out of "10"!

18. The only factor used to determine "sustainability" was that of resource availability. Surprisingly, SENES used out of date information. "Canadian natural gas production almost doubled between 1988 and 1998 ... According to NRCan's Canada Energy Outlook 1996-2020, Canadian gas demand is projected to increase from 79 billion m^3 in 1997 to between 127 and 150 billion m^3 by 2020. ... At maximum estimated 2010 production, there is an expected 70 years of production remaining."

The CAE Alliance has included natural gas resource information earlier in this document. However, in order to address the information above, note that The North American Natural Gas Vision, a summary of joint findings between the U.S., Canadian and Mexican governments notes that "When regulations were amended removing the requirement of holding large volumes of proved reserves, WCSB production was able to increase rapidly. Thus, WCSB production was able to grow quickly in the early 1990s to meet rapid Canadian growth ... by 1996, Canadian production growth began to slow ... and more recently Canadian natural gas production has declined, falling 1% in 2002 and 4 % in 2003 ... despite a much heavier drilling effort." Producers indicate remaining

reserves at December 31, 2004 at 56.5 tcf, a reduction in reserves. Contrary to the 1996-2020 NRC outlook, later NRC reports (Canada, Review of 2004), show a peak in production in 2001, and a steady decline in from that point.

"In estimating the years of production for coal it was noted that while there is 100 years of proven reserves available but an estimate 1000 years of 'immediate interest' reserves exist. Therefore, an estimate of 500 years was used for this project." (SENES)

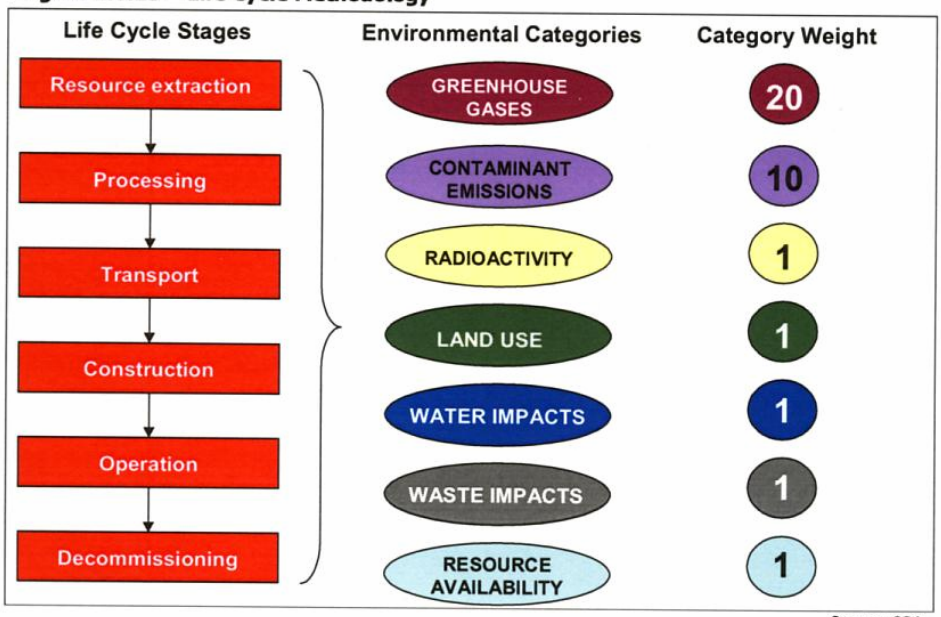
19. The ratings determined by SENES are included below:

Table 2.6.6 – Environmental Scores by Generation Type

		Contaminant Emissions (Weight = 10)	Greenhouse Gases (Weight = 20)	Radioactivity (Weight = 1)	Land Use (Weight = 1)	Water Impacts (Weight = 1)	Waste Impacts (Weight = 1)	Sustainability (Weight = 1)
Nuclear		1	1	6	1	4.5	1	5.3
Hydro								
	run of river	0	1	0	0	0	0	1
	reservoir/ impoundment	0	1	0	4	5.5	0	1
Hydro Import		0	1	0	8.5	5.5	0	2
Coal		5	7	10	1	3.5	10	2
Oil		5	10	1	1	5	3	5
Gasification								
	without CO_2 removal	4	6	10	1	2	0	2
	with 90% CO_2 removal	4	2	10	1	2	0	2
Natural gas								
	single cycle	2	3	0	1	2	0	8
	combined cycle	2	2	0	1	2	0	8
	fuel cell	Life cycle data unavailable						
Wind		1	1	0	4.5	0	0	0
Biomass		2	1	0	1	4	1	1
Photovoltaic		2	1	0	1	0	0	0

However, once the OPA received the ratings for the potential supply mix resources, a second layer of scoring was applied to the first ratings developed by SENES. The OPA determined a multiplier for the ratings according to OPA criteria, then multiplied these findings by the factors, as shown below:

Figure 2.6.23 – Life Cycle Methodology



Source: OPA

♦ The results represent a highly exaggerated profile, giving the OPA exactly what the Minister of Energy required:

Table 2.6.6 – Environmental Scores by Generation Type

		Contaminant Emissions (Weight = 10)	Greenhouse Gases (Weight = 20)	Radioactivity (Weight = 1)	Land Use (Weight = 1)	Water Impacts (Weight = 1)	Waste Impacts (Weight = 1)	Sustainability (Weight = 1)	**Total Impact (Weighted)**
Nuclear		1	1	6	1	4.5	1	5.3	**47.8**
Hydro									
	run of river	0	1	0	0	0	0	1	**21**
	reservoir/ impoundment	0	1	0	4	5.5	0	1	**30.5**
Hydro Import		0	1	0	8.5	5.5	0	2	**36**
Coal		5	7	10	1	3.5	10	2	**216.5**
Oil		5	10	1	1	5	3	5	**265**
Gasification									
	without CO_2 removal	4	6	10	1	2	0	2	**175**
	with 90% CO_2 removal	4	2	10	1	2	0	2	**95**
Natural gas									
	single cycle	2	3	0	1	2	0	8	**91**
	combined cycle	2	2	0	1	2	0	8	**71**
	fuel cell	Life cycle data unavailable							
Wind		1	1	0	4.5	0	0	0	**34.5**
Biomass		2	1	0	1	4	1	1	**47.0**
Photovoltaic		2	1	0	1	0	0	0	**41**

Note: Total Weighted Score is calculated by assigning of weight of 10 to contaminant emissions, a weight of 20 to greenhouse gases, and a weight of 1 to all other categories. Environmental scores for Hydro Import were based on values for the Manitoba purchase analyzed by SENES.

Source: OPA based on SENES data

♦ The CAE Alliance believes that some important aspects were not included, while others had an artificially high rank. Changes, inaccuracies or omissions in any one category will impact the overall rating of a resource and therefore the viability/suitability of inclusion in the supply mix.

CONCERNS RELATED TO THE SUPPLY MIX PROCESS

1. Focusing on the Last Things First

The OPA was given the Ministry directive to aggressively pursue Conservation/Demand Management and new renewable generation. The focus on these resources results in imprudent and premature decisions. The CAE Alliance believes that wise planning would follow the common power system planning approach which advocates the use of "portfolio techniques to analyze the most preferred mix of conventional supply options, then to use this initial plan to determine the economic criteria (such as avoided costs) that are then applied in the determination of the amounts of renewables and CDM that are economic.... This process of adjustment for economic CDM and renewables reflects the belief that CDM and renewable programs are generally limited in their contributions ..."

"The approach OPA has taken for providing "supply mix" advice falls generally within the definition of IRP (Integrated Resource Planning), but with government policy direction respecting certain resources. For this reason, the current Ontario approach can be characterized as "modified IRP", in the sense that policy interventions favouring demand and renewable supply options have been reflected."

2. Constrained Time Frame

As noted, it has been many years since a comprehensive, long term power plan was conducted. In that time generating assets have been removed from service, the population and economy have grown, load patterns have modified to higher summer peak, the break up of Ontario Hydro and steps to deregulation have changed the complexion of power production in the Province.

In spite of this, the current planning procedure "... has been somewhat constrained by the limited time available to perform it ... The Ontario government has set a target of a peak demand reduction of 5 % by 2007, and a coal replacement by 2009. It has also set a goal for 5% of all generating capacity in the province to come from renewable sources by 2007 and 10% by 2010. The Minister explicitly requests that other supply options should be identified only after consideration of CDM and renewables."

"There was short turnaround time available to the OPA to formulate their recommendation." (Navigant)

The rush to implement Ministry directives is jeopardizing independent and prudent power planning. The OPA must develop a plan that will span different governments, not cater to the current political will.

3. Not Listening

The OPA used a number of "principles" to guide the development of their Recommendations and Advice. Top on that list was "Listening: Any plan for Ontario's energy future must reflect the values and concerns of its citizens."

♦The recommendations and advice contained as the final product of the OPA Report negate that statement. Industry and business are warning of dire consequences of a power plan that is unreliable and unaffordable. In addition to the concerns noted earlier in this report, the IESO President and CEO advises, "Ontario businesses, industries and residents are not being provided the level of assurance they expect for a reliable supply of power when there are frequent power warnings, voltage reductions or routine reliance on emergency control actions to meet our power needs." (The Evolving Ontario Energy Market, Notes for Remarks, Ontario Energy Association Conference, Sept. 14, 2005)

♦ The OPA commissioned a study of the public stakeholder for feedback (Decision Partners). Over 90% of research respondents indicated reliability and availability as top priority. "... environmental responsibility was ... rated high or medium by almost all of the interviewees ... but throughout ... interviewees spoke more about availability of electricity and the economic impacts than they did environmental impacts ..."

♦ The public has said that a healthy provincial economy was the ultimate criteria for power planning decisions. However, "Shutting down a quarter of our generating capacity in the middle of a supply crisis in which rising prices and uncertainty about the future have already cost thousands of manufacturing jobs... The Toronto Sun, November 19, 2005. The OPA must work to reverse this trend.

♦ Workshop participants "... noted the positive response to coal in the Mental Models and Web Survey research and said they hoped that they results would be carefully considered by the OPA and the Minister." It was disregarded.

♦ **"**The role of stakeholder input into the process of creating decision criteria is critical; the measurement of stressors is relatively objective but choosing what to measure, what units to use and how to use these in making decisions depends on stakeholders' values." (B.C. Hydro)

4. Methods of Securing Power

♦ In order to secure generation contracts, the OPA is providing subsidies and incentives to the private market. Long term contracts with a guaranteed return of profit, transferring infrastructure costs to ratepayers, and OPA shouldering some of the risks all increase cost to the Ontario consumers.

♦ The OPA is relying on unrealistic expectations - the optimum, not "worst case" assumptions - are being used for future power planning.

♦ The OPA has deliberately excluded Ontario Power Generation from the contract bidding processes.

♦ The OPA has concentrated efforts for securing renewable generation on the private market. This is perhaps expedient, but limits the resources available. OPA should be involved in research and development of newer and existing technologies.

3. Apparent Contradictions

(i) The OPA has sought information and planning assistance from other jurisdictions. However, the OPA has been very selective in the information chosen for use. For example, "The United Kingdom has seen growth in co-firing biomass in coal-fired power plants. Denmark, Germany and Spain are often cited for their installed, and rapidly growing, renewable electricity generation capacities. While these countries have made large capacity additions with new renewables, their systems are also heavily reliant on conventional sources of energy, such as thermal (fossil fuels), large hydroelectric and nuclear resources. These electrical systems are also highly interconnected with their neighbouring transmission grids, providing these systems with the type of resiliency and robustness that would mitigate the interconnection issues typically associated with new renewable generation technologies. Germany is often cited as a model country for its growth in renewable energies. ... Germany's supply mix is dominated by coal and nuclear resources. While Germany is among the world leaders in installed renewable generation capacity, these resources still represent a minute fraction of Germany's total installed generation capacity."

The world's cleanest burning coal plant, in Copenhagen Denmark, has "an over-all emission profile that's better than the gas-fired stations now being built in Ontario." (Energy Probe)

Ontario is the only jurisdiction in the world contemplating the closure of its coal fired plants. Many other countries, including the U.S., are embracing coal generation, with current and promising emissions control technology. A number of U.S. states cite mitigation of high natural gas costs as reason to turn to coal-fired generation. The U.S. government has designated $1.8 billion for clean coal development. Alberta is currently working with the state of Texas to develop a zero emission coal plant scheduled to begin operations in 2012. "Many people have the perception that 'Clean Coal' is an oxy-moron, however, we do have the technology to make this a reality. Coal-fired electricity plants can be retrofitted or built so that they produce low to zero emissions..." (Natural Resources Canada – Clean Coal Technology Road Map)

(ii) The OPA noted that there was a range of stakeholder conceptions about "clean coal technologies", including what is available in our own province. However, the OPA has not conducted any evaluation of the coal-fired power plants within our province. The OPA has looked to many other jurisdictions for information, has used figures and facts from various sources, but has not evaluated the data right here in our own province.

Although the Ministers of Energy may refer to those advocating coal technology as "Neanderthals", and from "fairy tale land", The CAE Alliance had expected a more studied and open approach from the OPA.

(iii) The OPA acknowledges that "Given a relatively small supply margin ... and the relatively large combined risk of the many elements on which supply reliability depends, the replacement of the coal-fired plants needs to be monitored closely ..." " If required, alternatives should be developed to ensure the success of the coal replacement policy..."

The OPA has not built any contingency plans into this very unrealistic Report of Advice and Recommendations. There are really no other options to consider, except keep coal in the mix longer than anticipated. Unfortunately, the OPA is arranging gas-fired replacement for Ontario's cleanest coal fired units, ranked 4th and 9th in North America.

(iv) The OPA considered "Managing Risks" an important part of the process. ("The economic, environmental and reliability risks of potential supply sources must be explicitly recognized, and options combined in ways to mitigate or avoid these risks.")

However, the OPA acknowledges that the pricing of natural gas is the greatest risk factor element. "Forecasting future natural gas prices is very difficult and uncertain, especially given the current tight supply environment in natural gas markets, uncertainty regarding liquefied natural gas (LNG) infrastructure and coalbed methane, and Ontario's plan to replace coal-fired generation."

Also, "The current schedule relies on a number of elements falling into place in the relatively short period ... demand would need to remain essentially flat through intensive conservation efforts... major transmission investments and reconfigurations to bring new generation into the grid would have to be completed."

(v) The OPA has listened to the idealism of some, while negating the realism of those who are the economic drivers in this province. Environmental groups, like the OCAA and Greenpeace, get the ear of decision makers, and impact public perception through lobbying, "public education", market mobilization and regular intervener status at the Ontario Energy Board. Although some of these organizations shun nuclear and coal-fired generation, they promote natural gas, not only for power generation, but encourage "switching to natural gas for space and water heating in residential, commercial and institutional sectors." (Greenpeace – Submission to the OPA)

(vi) The Minister of Energy has repeatedly spoken of "technology" as a path to the future. The OPA writes that "Advice and plans must be forward-looking, open to new possibilities and technologies, and willing to tackle difficult choices." The OPA is selectively following their own advice.

RECOMMENDATIONS

♦ The Select Committee on Alternative Fuels, Final Report, referred to in our Executive Summary advises, "Ensure that the relative cost of different energy sources, fiscal implications, energy security, impact on job creation, export development and the

provincial economy are all considered." That should be the first priority of a power plan that has as its "goal" reliable, affordable, available power.

♦ "Investment by government in research and development should be targeted towards the development of new and renewable fuel sources, energy management and intelligent networks" (SENES), for the long term yield of economic, environmental and social benefits.

♦ The OPA would serve the public needs of reliability and affordability by refurbishing and upgrading existing coal fired power plants with available technology that could bring emissions within 1% those of natural gas. Providing emissions controls and leaving coal plants running would permit sufficient time to develop a proper plan and allow for the impact of conservation and renewable generation to be felt.

♦ A high amount of base load power will be required. Diversity of fuel supply sources is encouraged. Therefore, we suggest constructing advanced coal-fired generation plants, in conjunction with new nuclear facilities to satisfy part of this load, thereby mitigating some of the high cost of nuclear construction. Lead times and the construction period would also be less than that of nuclear.

♦ The OPA should organize a technical conference to supplement the findings of this process in order to obtain the optimum supply mix, as recommended by the IESO.

♦ Prudent power planning for our future now sets the foundation for generations to come. Planning for a secure future when we are in such a fragile state has been overshadowed and hindered by the coal closure mandate and over-emphasis on renewable generation. The OPA should advise the Minister that they must take a step back and re-evaluate all information obtained, without the restraints of existing directives.

CONCLUSION AND SUMMARY

The OPA has declared that it "is committed to the pursuit of environmental sustainability in a fashion that preserves economically sustainability. OPA supports the 1987 Bruntland Commission interpretation of sustainable development as that 'which meets the needs of the present without compromising the ability of future generations to meet their own needs'". We are asking the OPA to honour that commitment with integrity. The OPA has a first duty to the residents and ratepayers of this great Province. Decisions made now, and in the coming months will impact generations to come. Electricity is not a convenience. It is a necessity. Lives and livelihood depend on secure, available, affordable power.

In spite of the amount of time, and money, spent on developing this report, the CAE Alliance regards the recommendations as being fundamentally flawed in terms of load capability and supply reliability. The cost of the proposed electricity restructuring will financially cripple this province.

The CAE Alliance represents the broad concerns of many, in all sectors, in this province. We hope that the OPA will seriously consider the information presented in this Response to the OPA Supply Mix Recommendations and Advice.