Ontario's
Energy Vision Blackout

McGuinty power plan a recipe for toxic emissions, radioactive nuclear wastes, smog and climate change

AN OCAA ENERGY REPORT | www.cleanairalliance.org

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JULY 21, 2006

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Acknowledgments

This report was written by Jack Gibbons. Editing and design by Green Living Communications.

Thanks to Julie Green, Pollution Probe; Keith Stewart, World Wildlife Fund; and Mark Winfield, Pembina Institute, for reviewing a draft of this report and providing us with very helpful comments. However, the reviewers bear no responsibility for any remaining errors or for the report's conclusions and recommendations.

Thanks to the Laidlaw Foundation, the EJLB Foundation and the Toronto Atmospheric Fund for their financial support.

Laidlaw Foundation

TORONTO Atmospheric Fund

The Ontario Clean Air Alliance is a coalition of health, environmental, and consumer organizations, faith communities, municipalities, utilities, unions, corporations and individuals working for cleaner air through a coal phase-out and the shift to a renewable electricity future. Our partner organizations represent more than six million Ontarians.

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Cover photos: Darlington Nuclear Station, Ontario Power Generation; Lambton Generating Station, Henry Kock / OCAA

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1. Introduction

Coal phase-out indefinitely shelved

On June 13, 2006, Premier Dalton McGuinty broke his promise to phase-out all of Ontario's dirty coal-fired power plants by 2009, despite the fact that these major polluters kill 668 people per year in Ontario.[1]

Ontario's Nanticoke Generating Station is the largest coal-fired power plant in North America and the largest air polluter in Canada. The Lambton coal-fired power plant, near Sarnia, is Ontario's #2 air polluter. In 2005 Ontario's coal-fired power plants produced as much air pollution as 5.6 million cars. According to a Government of Ontario report, the province's health and environmental costs associated with these coal plants exceeds $3.3 billion per year.[2]

The phase-out of Ontario's coal plants would have provided the province with 50-80% of the total greenhouse gas emission reductions Ontario needs to achieve compliance with its Kyoto Protocol target in 2010.[3] As a result of Premier McGuinty's broken promise, Ontario will not be able to achieve compliance with the Kyoto Protocol in 2010.

Ontario has also made it clear that it will no longer support the 2010 mercury reduction targets set out in the proposed Canada Wide Standard for Mercury (a standard that has taken eight years to develop).[4] Ontario's dirty coal plants are the largest single source of airborne mercury emissions in the province and the only industrial sector in Ontario that has actually increased mercury emissions over the past 15 years. Methyl mercury is a neurotoxin, considered toxic under the Canadian Environmental Protection Act, a possible carcinogen, and is associated with developmental damage in children. Mercury can cross the placental and blood-brain barrier and can cause pre-natal harm.[5]

When Ernie Eves was Premier, the Government of Ontario was committed to phasing out all of Ontario's dirty coal-fired power plants by 2015. As of June 13, 2006 the Government of Ontario no longer has a date for phasing-out our dirty coal-fired power plants and has put the task of choosing a date in the hands of an agency, the Ontario Power Authority, that has demonstrated a distinct lack of interest in a successful coal phase-out.[6]

Increased demand instead of aggressive electricity productivity growth

At the same time as he essentially stopped the coal phase-out in its tracks, Premier McGuinty directed the Ontario Power Authority (OPA) to develop an Integrated Power System Plan (IPSP) for Ontario that will see our peak electricity demand *grow* by 10% by 2025 — this, despite the fact that Ontario's electricity consumption per capita is already 60% higher than New York State's.[7] If Ontario achieved New York State's level of electricity productivity by 2025, our total electricity consumption would fall by 27%, notwithstanding a 25% increase in our population and a 75% increase in our GDP.[8] Even simply narrowing the gap with New York would largely close the much-vaunted "supply gap" the government wants to fill with unreliable, high-cost nuclear power.

Nuclear ramps up

On June 13th, Dalton McGuinty directed the OPA to increase our nuclear generation capacity by 23% by 2025 despite the fact that the cost of a new nuclear power plant is at least 39-70% more than that of a new high-efficiency natural gas-fired power plant[9] and that Ontario has no long-term plan to deal with the thousands of tonnes of radioactive waste generated by these plants or to decommission the plants themselves.

No independent scrutiny

Finally, Premier McGuinty exempted his decision to increase Ontario's nuclear generation capacity by almost one-quarter from Ontario's *Environmental Assessment Act*.[10] As a consequence, Premier McGuinty has prohibited an independent review of whether Ontario's electricity needs could be met at a lower cost by a combination of energy efficiency, new renewables and natural gas-fired combined heat and power plants.

2. A plan based on dangerous and costly myths

The McGuinty power plan is based on a number of myths that will lead to thousands of unnecessary deaths, an increasingly unstable climate, smog and toxins blanketing our province, and thousands of additional tonnes of radioactive nuclear waste for which Ontario has no long-term safe storage plan.

Myth 1: Nuclear power is necessary to phase-out coal and keep the lights on

Ontario has a two distinct electricity supply gaps that must be addressed. The first is short-term and the second is long-term.

The Short-Term Electricity Supply Gap

Currently, Ontario has sufficient domestic electricity supplies to meet all of its electricity needs except on very hot summer days. On these exceptionally hot days, Ontario has to import up to 3,000 megawatts (MW) of dirty coal-fired electricity to keep the lights on.

There are three options that can be pursued to avoid the need for dirty coal-fired electricity imports on hot summer days within the next few years. Any combination of these options could be used to close the short-term gap.

1. **Pay residential, commercial and industrial consumers to shift some of their electricity consumption from peak to off-peak periods on hot summer days.** While Ontario set a new peak demand record of 26,160 MW on July 13, 2005, the province's annual electricity demand in 2005 exceeded 23,544 MW for only 2.58% of the year. That is, Ontario's top 2,616 MW (26,160 MW – 23,544 MW) or 10% of electricity demand occurred for only 2.58% of the year.[11] As a result, it would be relatively easy to reduce the last 10% of our peak day demands by simply paying consumers to shift some of their consumption from peak to off-peak periods.[12]
2. **Promote energy efficiency and fuel switching.** By promoting the purchase of high-efficiency electrical appliances and equipment, Ontario can reduce its peak-day electricity demand. For example, a new EnergyStar air conditioner uses approximately 50% less electricity than a conventional ten-year-old air conditioner. Ontario can also reduce its peak-day electricity needs by encouraging consumers to switch from electricity to solar, geothermal or natural gas for water heating and other uses. A hybrid solar/electric water heater or a geothermal heat pump can reduce a consumer's electricity consumption for hot water by approximately 60%. A natural gas water heater will reduce the consumer's electricity consumption for hot water by 100%.
3. **Build new natural gas-fired power plants to meet our peak-day needs.** A simple-cycle power plant can be built in one year.[13] Natural gas-fired combined-cycle and combined heat and power plants can be built in two to three years. On the other hand, it would take at least 10 to 12 years to build a new nuclear power plant. Therefore nuclear power cannot solve our short-term electricity supply gap.

The Long-Term Electricity Supply Gap

Ontario's existing electricity capacity is shown in Table 1. Ontario's coal capacity needs to be phased-out by 2009 and virtually all of our existing nuclear capacity will come to the end of its life over the next 20 years. Therefore, by 2025, Ontario must replace approximately 17,831 MW of coal and nuclear capacity.

Table 1: Ontario's existing installed generation resources[14]

Fuel Type	Total Capacity (MW)
Nuclear	11,397
Coal	6,434
Oil/Gas	5,103
Hydro-Electric	7,768
Miscellaneous	68
Total	30,770

Ontario can replace all of its coal and nuclear capacity over the next 20 years through a combination of energy conservation and efficiency, new renewables and natural gas-fired combined heat and power plants. These measures can more than adequately meet both Ontario's base load and peak power demand needs, while creating a system that is much more responsive and efficient than large centralized coal and nuclear generation.

1. **Energy conservation and efficiency.** As noted above, if Ontario achieved New York State's level of electricity productivity by 2025, our total electricity consumption would fall by 27%, notwithstanding a 25% increase in our population and a 75% increase in our GDP. As Ontario works to close the productivity gap with our major economic competitors, increasing the efficiency of our electricity use will be critical. Exploiting the largely untapped efficiency resources in Ontario can deliver energy cheaper and faster than just about any other approach. Efficiency programs in California, for example, cost as little as 1-3 cents per kWh of power reduction.[15] But unlike jurisdictions like California, Ontario has captured only a minute fraction of even the "low hanging" lowest-cost efficiency improvements.
2. **New renewables.** The Government of Ontario has directed the Ontario Power Authority to increase the province's renewable capacity by 7,845 MW by 2025.[16] Intelligent deployment of renewable power resources in smart networks will allow the huge range of renewable power sources (wind, hydro, solar, biomass, geothermal, etc.) to work together to meet both base load and peak power demand. And unlike today's large centralized coal and nuclear generators, any lack of availability of a single source during any single period will be far less critical to the system than the sudden shutdown of a nuclear plant or coal station. It is equivalent to the difference between the internet and a mainframe computer — a single computer off in a large network causes minor inconvenience; a mainframe out of commission in a centralized system causes total system failure. Again, these clean renewable resources can be brought online quickly and are well suited to a high-efficiency distributed system.
3. **Combined heat and power.** Virtually every urban home, commercial and institutional building and factory in Ontario uses natural gas to provide just one service — heating. However, it is much more efficient to use natural gas to simultaneously produce two services, namely heat and power (electricity). A natural gas combined heat and power plant can have an overall energy efficiency of 80-90% versus the 30% energy efficiency of a nuclear reactor.[17] According to a report prepared for Ontario's Ministry of Energy, Ontario's total combined heat and power potential in 2020 will be 16,514 MW.[18] Ontario has many industries — including steel and forestry — that have processes very well suited to combined heat and power, making this technology ideal for improving industrial efficiency and competitiveness, while also making it a perfect fit for meeting the province's base load power needs quickly and cost-effectively.

Myth #2: Nuclear power is the lowest cost option to meet our electricity needs

The Ontario Power Authority (OPA) Supply Mix Advice Report includes an analysis of the costs of obtaining additional electricity supplies from: i) a new CANDU 6 nuclear reactor; and ii) a new natural gas-fired combined-cycle power plant.

The OPA's analysis of the economics of a new CANDU 6 nuclear reactor versus a new natural gas-fired power plant is based on the following four key assumptions:

- The capital cost of a new CANDU 6 nuclear reactor would be $2,845 per kilowatt (kw);
- A new CANDU 6 nuclear reactor would be able to operate at an 85% annual capacity utilization rate for 30 years;
- The natural gas-fired electricity would be produced by a combined-cycle power plant; and
- The annual cost of natural gas over the next 20 years will be $8 per million BTU (2005 Cdn $).[19]

All of the OPA's key assumptions are heavily biased in favour of nuclear power:

Table 2: Cost Comparison: CANDU 6 vs. Natural Gas-Fired Combined-Cycle

	CANDU 6	Natural Gas-Fired Combined-Cycle
Real Pre-Tax Rate of Return on Capital = 5%*	5.2 cents/kWh	6.3 cents/kWh
Real Pre-Tax Rate of Return on Capital = 8.5%	6.8 cents/kWh	6.7 cents/kWh
Real Pre-Tax Rate of Return on Capital = 11%	7.9 cents/kWh	7.0 cents/kWh

*assuming the power plant is 100% debt financed.

- The assumed capital cost for a new CANDU 6 nuclear reactor ($2,845/kW) is 30% less than the actual capital cost ($4,058/kw) of the last nuclear power plant, the Darlington Nuclear Station, built in Ontario.[20]
- During the last 25 years, the average capacity utilization rate of Ontario's fleet of nuclear reactors has never equaled or exceeded 85%. Rather its annual capacity utilization rates declined from 80% between 1980-83 to 51% in 2003. In 2005 the average capacity utilization rate of Ontario's fleet of nuclear reactors was 65%.[21]
- The OPA's analysis of the economics of nuclear versus natural gas-fired generation was based on the cost of a natural gas-fired *combined-cycle* power plant despite the fact that natural gas-fired *combined heat and power* plants are a much more efficient option to produce electricity. Specifically, *combined heat and power* plants can achieve energy efficiencies of 80-90% versus the 60% energy efficiency of a *combined-cycle* power plant. As a result, a combined heat and power plant's natural gas consumption and costs can be 30% less than those of a combined-cycle power plant.[22]
- The OPA's analysis assumes that the real (i.e., net of inflation) cost of natural gas will average $8 per million BTU (2005 Cdn $) between now and 2025, despite the fact that *all* of the nine independent natural gas price forecasts summarized in the Canadian Energy Research Institute report commissioned by the OPA predict that the annual average gas prices will be less than $8 per million BTU during this time period.[23]

The OPA used these assumptions to calculate the cost per kilowatt-hour (kWh) of nuclear and natural gas-fired electricity under three different scenarios with respect to the required rate of return on capital for a power plant. (The required rate of return on capital depends on a project's risk. The greater the risk, the greater its required rate of return. In other words, investors will only put up capital for high-risk projects if there is an equivalent potential for generous financial returns. Needless to say, building a nuclear power plant is a high-risk project.)

The results of the OPA's analysis are shown in Table 2.

As Table 2 reveals, given the OPA's assumptions, a natural gas combined-cycle power plant is the lowest cost option under 2 of its 3 scenarios. Nuclear power is the least-cost option *if and only if* one assumes that a power company could 100% debt finance a multi-billion nuclear power plant. This is simply not realistic.

On October 17, 2005, CIBC World Markets Inc. provided Ontario's Deputy Minister of Energy with its estimate of Bruce Power's required rate of return on capital for its Bruce restart and refurbishment project (Bruce Power is Canada's only investor-owned nuclear power company). According to CIBC World Markets, Bruce Power's actual cost of capital is 30-70% higher than the highest required rate of return on capital (a *real pre-tax* rate of return of 11%) used by the OPA in its analysis (see Table 2). Specifically, according to CIBC World Markets, Bruce Power's *nominal after-tax* required rate of return on capital is 10.6 to 13.8%.[24]

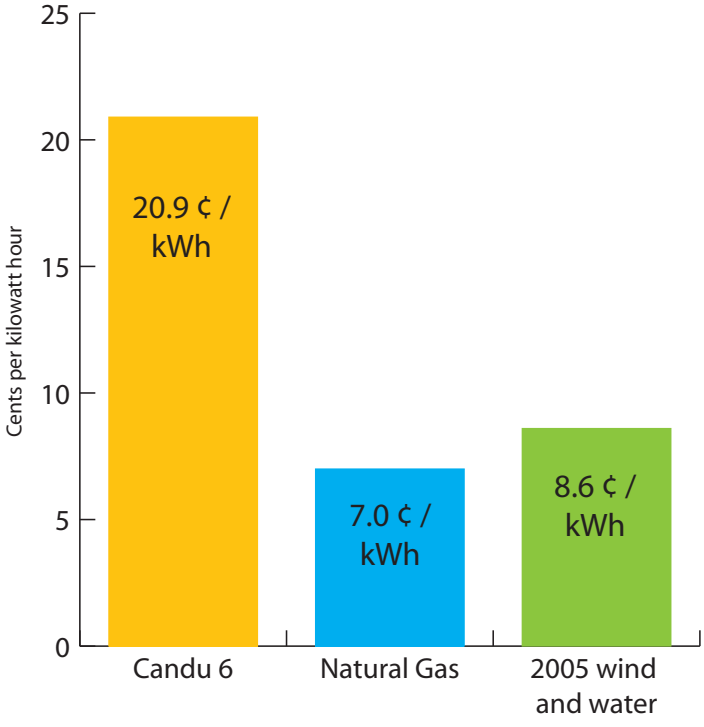
We asked the OPA to recalculate its costs using CIBC World Markets' required rate of return on capital estimates together with all of the OPA's original assumptions. **The result raises the cost of CANDU 6 nuclear electricity to 9.7 to 11.9 cents**

per kWh. That is, the cost of nuclear power (9.7 to 11.9 cents per kWh) is *at least* 39-70% more expensive than natural gas-fired power (combined cycle).[25]

If we further assume that:

- the capital cost of a new nuclear power plant will equal the actual capital cost of the Darlington Nuclear Station ($4,058/kW);
- the new nuclear power plant will have an average annual capacity utilization rate of 65% (the actual average capacity utilization rate of Ontario's fleet of nuclear reactors in 2005); and
- the required nominal after-tax rate of return on capital for a new nuclear power plant is 13.8% as per CIBC World Markets' analysis; then the cost of a new CANDU 6 nuclear power plant is 20.9 cents per kWh[26] — a cost almost three-times greater than that of a new combined cycle natural gas-fired power plant (7 cents per kWh) and almost 2.5 times the cost of renewable power (8.6 cents per kWh) from the eight wind farms and one water power project contracted by the OPA in 2005.[27]

Fig. 1: Cost comparison based on actual nuclear cost and performance factors



Applying real numbers to the OPA's hypothetical analysis makes it clear that nuclear power is, by far, one of the highest-cost options for meeting Ontario's incremental electricity needs. It also demonstrates how pouring billions of public dollars into nuclear power is likely to pull significant financial resources away from more viable options, including efficiency and conservation initiatives and renewable power development.

Myth #3: Natural gas supplies are too limited and its prices are too volatile

According to the Ontario Power Authority (OPA), Canada has 77 years of natural gas supplies at the 2002 level of production.[28]

If all of Ontario's coal and nuclear power plants were replaced by natural gas-fired combined heat and power plants, North American natural gas consumption would rise by 1.75%. On the other hand, if Ontario's coal and nuclear capacity is phased-out using a combination of one-third energy conservation, one-third renewables and one-third natural gas combined heat and power, North American natural gas consumption would rise by only 6/10ths of 1%.[29]

While spot natural gas commodity costs are very volatile, the OPA can reduce this price volatility by entering into five-year natural gas supply contracts for Ontario's electricity generators. By developing a rolling portfolio of five-year natural gas supply contracts, the OPA can minimize natural gas price volatility risk.

According to a Canadian Energy Research Institute (CERI) report commissioned by the OPA, while an upward trend in natural gas prices "from 1997 is expected to last for a decade to 2007… prices are expected to fall in 2008 as the new set of LNG [liquefied natural gas] terminals in North America come on-line. After 2010, demands and supplies in North America are expected to stay in balance and prices are expected to increase at a moderate rate of 1.5%."[30]

The Ontario Clean Air Alliance's (OCAA) long-term goal is to move Ontario towards a 100%

renewable electricity system for our grandchildren. We believe that this goal can be achieved by investing in energy efficiency to increase our electricity productivity and reduce our demand for electricity and by developing our renewable power potential. For example, according to the OPA, Ontario's incremental hydro-electric and wind power potential exceeds 6,000 MW and 600,000 MW respectively.[31] According to the BIOCAP Canada Foundation, Ontario has the potential to develop 7,400 MW of biomass power.[32]

In addition, Ontario has the potential to import significant quantities of wind and hydro-electric power from Manitoba, Quebec and Labrador. In the long-term, solar photovoltaics have the potential to provide Ontario with very significant electricity supplies at a reasonable cost. Nevertheless, currently Ontario obtains only approximately 25% of its electricity from renewable sources. As a result, the OCAA supports the use of natural gas combined heat and power plants as a transition option to move Ontario from coal and nuclear electricity generation to a 100% renewable electricity system.

As outlined in the previous section, the OPA's assertion that gas is too costly to use in baseload power generation falls flat when the true costs of nuclear power generation are considered. The gap between nuclear and gas widens further when the baseload demand is met through highly efficient combined heat and power systems rather than combined-cycle generators, the only scenario used by the OPA in its highly skewed cost comparisons. And, of course, gas fired generation can fill the transition gap between today and a 100% renewable future without leaving a legacy of tonnes of radioactive waste and highly radioactive plants.

Myth #4: Nuclear power is a cost-effective option to reduce greenhouse gas emissions

Table 3 shows the Ontario Power Authority's estimates of the life-cycle greenhouse gas emission rates per megawatt-hour (MWh) of electricity for: a) a coal-fired power plant with state-of-the art end-of-pipe sulphur dioxide, nitrogen oxides and particulate matter emission control technologies; b) a natural gas-fired combined cycle power plant; c) a wind turbine; and d) a CANDU 6 nuclear reactor.

Table 3: Greenhouse Gas Emission Rates[52]

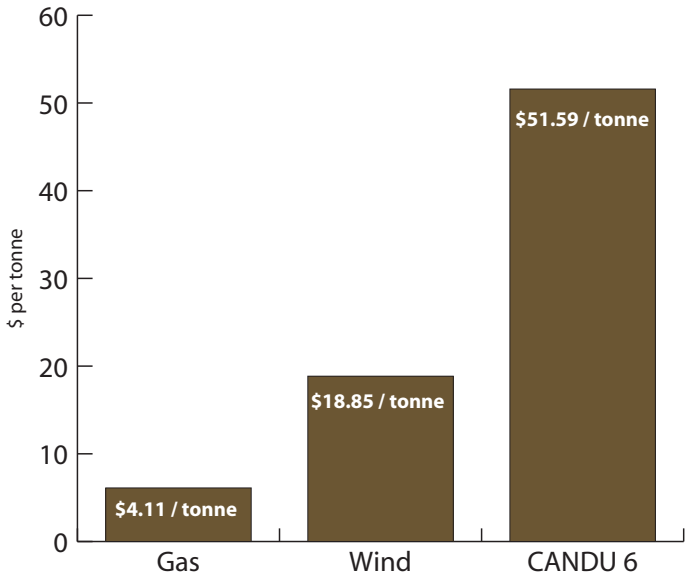
Generation type	Greenhouse Gas Emission Rate (Kg per MWh)
Pulverized Coal Combustion Power Plant	1,020
Natural Gas Combined-Cycle Power Plant	290
Wind Turbine	12
CANDU 6 Reactor	12

According to Table 3, the greenhouse gas emission rates of a natural gas combined-cycle power plant, a wind-turbine and a CANDU 6 nuclear reactor are 72%, 99% and 99% lower respectively than that of a coal-fired power plant.

Nevertheless, as Figure 2 reveals, as a result of its high financial costs, nuclear power is not a cost-effective option to reduce greenhouse gas emissions.

Figure 2 compares the costs of obtaining a tonne of greenhouse gas emission reductions by building a) a natural gas combined-cycle power plant; b) a wind-turbine; and c) a CANDU 6 nuclear reactor instead of a so-called "clean coal" plant with state-of-the-art sulphur dioxide, nitrogen oxides and particulate matter emission control technologies.

Fig. 2: Cost of Displacing a Coal Plant's Greenhouse Gas Emissions by Alternative Electricity Supply Options[53]



Myth #5: Cost-effective options exist to reduce the emissions from coal plants

Premier McGuinty has asked the Ontario Power Authority "to recommend options for cost-effective measures to reduce air emissions from coal-fired generation."[33]

Current so-called "clean coal" technology consists of end-of-pipe scrubbers and filters capable of only partially addressing a subset of the pollutants released by coal plants. Current technology, such as selective catalytic reduction, desulphurization, precipitators and filters, will have no impact whatsoever on the millions of tonnes of climate-change causing greenhouse gas emissions released annually by Ontario's coal plants. It would also cost more than $3 billion to retrofit all the units at Ontario's four remaining coal plants with these end-of-pipe technologies. The result would be a reduction in the total emissions of the coal plants of only one half of 1%.[34]

Some "clean coal" advocates are banking on coal gasification to address coal plant greenhouse gas emissions. Coal gasification would permit the capture and storage of greenhouse gas emissions from coal plants by, for example, injecting captured greenhouse gas emissions into old oil and gas wells. This technology would require large underground reservoirs, such as those found in the Western Canadian Sedimentary Basin. However, even its own promoters acknowledge that "Gasification is still not mature technology for power plant applications. Significant work remains to be undertaken to make this a competitive technology…" [35] Currently the projected capital costs of a coal gasification plant are three to five times higher than those of a high-efficiency natural gas-fired power plant.[36]

In 2001, Ontario's then Minister of the Environment, Elizabeth Witmer, issued a regulation which directed Ontario Power Generation to phase-out coal-burning at the Lakeview Geneating Station by April 30, 2005. According to the Witmer regulation, if the Lakeview site is used to generate electricity post-April 30, 2005, the emissions rates from its power plant must meet or be lower than the emissions rate of a natural gas-fired power plant.[37]

The Government of Ontario should subject all proposals for so-called "clean coal" to the *Witmer Standard*. That is, they should only be considered if their greenhouse gas, nitrogen oxides, sulphur dioxide and mercury emission rates are all equal to or lower than those of a natural gas-fired power plant. Current so-called "clean coal" technology simply cannot meet this standard.

3. An Alternative Vision

The Ontario Clean Air Alliance believes that Ontario should phase-out its dirty coal-fired power plants by 2009 and retire its existing nuclear reactors when they come to the end of their service lives. Our long-term vision is to create a 100% renewable electricity system for our grandchildren. We believe this alternative vision is far more practical, cost-effective and reliable than the myth-based nuclear-and-coal plan being pursued by the McGuinty Government.

Below are the immediate actions the McGuinty Government should take to put electricity planning in Ontario back on track:

Phasing Out Coal

1. **Direct Ontario Power Generation (OPG) to convert the Thunder Bay Generating Station's boilers from coal to cleaner-burning natural gas.** According to the Independent Electricity System Operator, this action will permit the phase-out of coal burning at the Atikokan and Thunder Bay Generating Stations in 2007.[38]

2. **Direct OPG to phase-out coal-burning at the Lambton Generating Station within 12 months of the in-service dates of the Greenfield Energy Centre (1,005 MW) and the St. Clair Generation Project (570 MW).** Both of these projects are new natural gas combined-cycle power plants located near Sarnia. According to the Independent Electricity System Operator, the planned in-service dates for these two new plants is 2008.[39]

3. **Direct OPG to convert all of Nanticoke's boilers from dirty coal to cleaner-burning natural gas by 2009.** The total capital cost of this conversion, including a new gas pipeline to Nanticoke, would be between $280 and $540 million.[40] After the Nanticoke Generating Station is converted to natural gas, it should be used as an emergency back-up source of power on peak demand days or when a current nuclear reactor unexpectedly goes out of service.[41]

Reducing Demand

1. Demand response programs, which pay consumers to shift some of their demands from peak to off-peak periods, can provide multiple benefits to Ontario, including:

a) Eliminating the need for dirty coal-fired electricity imports from the Ohio Valley on smog-alert days.

b) A dramatic reduction in the spot price of electricity. For example, according to National Economic Research Associates, a 2–5% reduction in demand on peak days could reduce spot prices by 50% or more.[42] As a result, demand response programs will reduce the electricity bills of all of Ontario's consumers and make our industries more competitive.

c) Reduced price volatility as spikes in demand (and therefore price) are moderated by demand response measures.

d) Reduced risk of blackouts and brownouts.

e) Reduced need for new electricity generation and transmission infrastructure.

The Government of Ontario should direct the OPA to implement demand response programs that will reduce Ontario's peak day demand by 10% by 2008; that is, reduce our peak day demand from 26,160 MW to 23,544 MW by 2008.[43]

In particular, the government should ensure that the OPA pays the same rate for demand response measures as for electricity imports on smog-alert days.

2. **The Government of Ontario should direct the Ontario Energy Board to establish the following conservation and demand-management budget targets for Hydro One and Ontario's municipal electric utilities (e.g. Hydro Ottawa): 1% of total revenues (distribution revenues plus electricity commodity costs) by 2007; 2% of total revenues by 2008; and 3% of total revenues by 2009.**

These targets would give utilities the means to capture the enormous efficiency and conservation potential that has largely gone untapped in Ontario. Examples of just some existing or potential future electric utility conservation programs are as follows.

a) Toronto Hydro's residential and small commercial customers can enroll their central air conditioners in the utility's PeakSAVER program which cycles their air conditioners on and off on peak demand days to reduce the need for coal-fired electricity imports. With PeakSAVER the A/C fan continues to run during the control period even though the A/C unit is being shut-off for short periods. As a result, most people do not even notice the difference.

b) Toronto Hydro's 10/10 program, which will provide its customers with a rebate equal to 10% of their total electricity bill if they reduce their consumption by 10% or more between July 15th and September 15th.

c) Waterloo North Hydro's program to install and provide on-bill financing for geothermal heat pumps, which can reduce its customers' electricity needs for space heating, water heating and cooling by more than 60%.

d) Woodstock Hydro's low-interest rate financing program for its commercial, institutional and industrial customers' energy efficiency investments.

e) Ontario's electric utilities could establish rental programs for hybrid solar/electric water heaters. A hybrid solar water heater can reduce a residential consumer's electricity consumption for water heating by 60%.

f) Ontario's electric utilities could also establish natural gas furnace and water heater rental programs to encourage their customers to switch to lower-cost natural gas for these uses. Switching from coal-fired electricity to natural gas for water heating can reduce a consumers' water-heating related greenhouse gas emissions by up to 70%. The water heater rental programs shoud give preference to high-efficiency tankless water heaters.

g Ontario's electric utilities could establish programs to build, operate and finance new natural gas-fired combined heat and power plants on their commercial, institutional and industrial customers' premises.

3. The Government of Ontario could direct the Ontario Energy Board to direct Enbridge Gas Distribution and Union Gas to implement electric to gas fuel switching programs (space heating, water heating, cooking and drying), to reduce Ontario's electrical load by 1,500 MW by 2010.[44] Using natural gas directly for heating applications is a much more efficient use of energy than burning either coal or gas for electricity and then converting the electricity back to heat.

Increasing Supply

1. New renewable electricity projects can meet Ontario's electricity needs at a significantly lower cost than new nuclear power plants. Specifically, in 2005, as a result of a competitive bidding process, Ontario contracted for 975 MW of new renewable power supply at an average cost of 8.6 cents per kWh, which is at least 11-28% lower than the cost of a new nuclear power plant.[45]

On June 13th, the Government of Ontario directed the OPA to increase Ontario's renewable electricity supply by 7,845 MW by 2025. **To meet this target as soon as possible, the Government should direct the OPA to establish competitive bidding processes for at least 1,200 MW of new renewable supplies per year.**

2. Most shopping centres, offices, apartment buildings and factories in Ontario use natural gas to produce just one service, namely heat. It is much more efficient to use natural gas to simultaneously produce two services, namely heat and power (i.e., electricity). Combined heat and power plants (CHP) can have an overall energy efficiency of 80-90% versus the 30% energy efficiencies of our nuclear reactors.[47] According to a report prepared for the Ontario Ministry of Energy, Ontario's total CHP potential in 2020 will be 16,514 MW.[48]

Currently companies and institutions that meet some or all of their electricity requirements from CHP plants are required to pay the province 0.7 cents for each kWh that they self-generate in order to help pay down Ontario's $15 billion stranded nuclear debt. This charge is a significant and perverse market barrier to the development of some of our lowest-cost new electricity supply sources.

The Government of Ontario should immediately exempt all new CHP projects from the 0.7 cents per kWh nuclear debt retirement charge.

The Government of Ontario should also direct the OPA to establish a standard offer price for small-scale (10 MW or less) combined heat and power plants, while also directing it to establish competitive bidding processes to obtain an additional 1,000 MW of CHP supply per year until all of Ontario's electricity supply requirements are met.

Full Cost Pricing

1. The Government of Ontario should direct the OPA to develop a long-term strategy to raise the price of electricity up to its full cost without raising the electricity bills of residential consumers or impairing the competitiveness of Ontario's industries.

Full-cost pricing will provide the right signals to industries and consumers about both the health and environmental costs of electricity generation and the true value of efficiency and conservation measures. The result will be significant improvements in efficiency that can more than offset the bill impacts of higher rates. Meanwhile, higher rates will act as an effective deterrent to wasteful practices.

Environmental Assessment Act

1. The Government of Ontario should subject its proposal to increase the province's nuclear capacity by 23% to a full environmental assessment under Ontario's *Environmental Assessment Act.*

Premier McGuinty has directed the OPA to increase Ontario's nuclear capacity from 11,397 MW to 14,000 MW.[49] In addition, the Premier has exempted his directive from a full environmental review. As a result, neither the Environmental Review Tribunal or the Ontario Energy Board can review whether Ontario's electricity needs could be met at a lower cost by an integrated combination of energy conservation and efficiency, new renewables and combined heat and power.

This is contrary to the public interest for the following reasons.

a. Neither the Government of Ontario or the Ontario Power Authority have provided credible evidence to support their claim that nuclear power is the lowest cost option to keep the lights on.
b. A review by the Ontario Energy Board and the Ontario Environmental Assessment Board of Ontario Hydro's 1990 plan to build 10 new nuclear reactors by 2014 revealed fundamentally flawed demand projections and the ready availability of more cost-effective and lower-impact solutions. As a result, Ontario Hydro withdrew its proposal and none of the proposed nuclear reactors were built. A public review of the McGuinty Government's proposal would lead to a similar result.
c. Energy conservation and efficiency, new renewables and natural gas-fired combined heat and power plants are the preferred options of the vast majority of the people of Ontario to meet our electricity needs.[50]
d. A well-organized review of the Government's power plan should take no more than 18 months, which is not an unreasonable period for "sober second thought" on a $70 billion plan that has not been subjected to any independent scrutiny of its core assertions and assumptions.[51]

4. Conclusion

It is somewhat difficult to explain why the Government of Ontario seems intent on basing its energy planning on myths rather than facts. Is it simply a lack of vision? Bureaucratic inertia? The power of entrenched interests? Or is there a more fundamental problem?

In part, the answer may lie in the paradigm shift needed to take Ontario to a clean, green energy future. Rather than a single centralized solution, this new paradigm demands the coordination and aggressive implementation of a multitude of distributed solutions. It also requires a different way of thinking — shifting our emphasis to finding and supporting the most efficient and lowest-impact ways of meeting end needs (a cold beer, a hot shower) instead of just pumping out kilowatts to feed wasteful, subsidized consumption.

We should not underestimate the challenges of moving to this new model. But, at the same time, we should also not underestimate the high costs of sticking with the status quo — soaring levels of smog, an increasingly unstable climate, a widening productivity gap, deteriorating quality of life, and a legacy of enormous debt and radioactive toxic waste for future generations.

Currently, the government is, in some respects, trying to straddle two diametrically opposed options — attempting to increase the use of renewables and make gains in efficiency while also significantly ramping up the use of nuclear power. We know from experience that this is an unworkable recipe. The need to feed the enormous capital appetite of the nuclear program will crowd out investment spending on other energy sources (and other public sector investments like hospitals and schools, for that matter). Meanwhile, the need to justify — through rising electricity demand — the enormous expenditures on high-cost nuclear generators will undermine any serious efforts to create a conservation culture or to move to real-cost pricing.

The fact that the McGuinty Government has gone to such lengths to avoid independent scrutiny of its energy plan speaks volumes about its faith in the factual basis of its lopsided approach. When it comes to the electricity file in Ontario today, the emperor has no clothes.

Endnotes

1 Ontario Ministry of Energy, *Backgrounder*, "Replacing Coal-Fired Generation In Ontario", (June 13, 2006); and DSS Management Consultants Inc. and RWDI Air Inc., *Cost Benefit Analysis: Replacing Ontario's Coal-Fired Electricity Generation*, Prepared for the Ontario Ministry of Energy, (April 2005), pp. iv.

2 DSS Management Consultants Inc. and RWDI Air Inc., *Cost Benefit Analysis: Replacing Ontario's Coal-Fired Electricity Generation*, Prepared for the Ontario Ministry of Energy, (April 2005), pp. ii.

3 Ontario Clean Air Alliance, *More Than Hot Air: Greenhouse Gas Emissions from Ontario Power Generation's Coal-Fired Power Plants*, (February 2005), p. 11.

4 Robert Benzie, "Mercury pledge broken", *Toronto Star*, (June 19, 2006).

5 Sarah Rang, *Mercury Rising: Mercury Emissions from Ontario Power Generation's Coal-Fired Plants*, (Ontario Clean Air Alliance, 2004).

6 The OPA is now suggesting that the coal plants should remain open indefinitely as a "strategic reserve". OPA, *Ontario's Integrated Power System Plan*, (June 29, 2006), p. 18.

7 The Government of Ontario has directed the OPA to reduce Ontario's peak day demand in 2025 by 6,300 megawatts (MW) from 35,000 MW to 28,700 MW. Ontario's peak demand record of 26,160 MW was set on July 13, 2005. Letter to Jan Carr, CEO, OPA re: Integrated Power System Plan from Dwight Duncan, Minister of Energy (June 13, 2006); Ontario Ministry of Energy, *Backgrounder*, "Ontario's Electricity Supply Mix", (June 13, 2006); Independent Electricity System Operator, *18-Month Outlook: An Assessment of the Reliability of the Ontario Electricity System*, (September 27, 2005), p. iii; and Ontario Clean Air Alliance, *Phasing Out Coal: 15-Month Progress Report*, (January 20, 2005), p. 12.

8 If Ontario achieved New York State's level of electricity productivity by 2025 our total electricity consumption would be 113.1 TWh. In 2005 Ontario's total, weather-corrected, electricity consumption was 154.7 TWh. Ontario Clean Air Alliance, *Meeting Ontario's Electricity Needs*, (January 27, 2006), endnote #9; and Independent Electricity System Operator, *18-Month Outlook: An Assessment of the Reliability of the Ontario Electricity System*, (March 24, 2006), p. v.

9 The Government directed the OPA to increase our nuclear capacity to 14,000 MW; and according to Ontario's Independent Electricity System Operator, our existing installed nuclear capacity is 11,397 MW. See letter to Jan Carr, CEO, OPA re: Integrated Power System Plan from Dwight Duncan, Minister of Energy (June 13, 2006); and Independent Electricity System Operator, *18-Month Outlook: An Assessment of the Reliability of the Ontario Electricity System*, (March 24, 2006), p. 10; and Ontario Clean Air Alliance, *High Cost Energy, The economics of nuclear power,* Air Quality Issues Fact Sheet # 20, (March 31, 2006). In addition, 2,568 MW of Ontario's nuclear capacity has been prematurely shut-down for over eight years.

10 Ontario Regulation 276/06 made under the Environmental Assessment Act, June 12, 2006.

11 Independent Electricity System Operator, *18-Month Outlook: An Assessment of the Reliability of the Ontario Electricity System*, (September 27, 2005), p. iii; and email to Jack Gibbons from Peter Lafoyiannis, Customer Relations and Market Information, Independent Electricity System Operator, (June 21, 2006).

12 A number of North American utilities have already implemented demand response programmes which reduce their customers' peak day demands by 10% or more. Randy Gunn, Summit Blue Consulting, *North American Utility Demand Response Survey Results*, (2006).

13 Ontario Ministry of Energy, *News Release*, "McGuinty Government Increasing Electricity Supply for Western GTA", (April 4, 2006).

14 Independent Electricity System Operator, *18-Month Outlook: An Assessment of the Reliability of the Ontario Electricity System*, (June 23, 2006), p. 8.

15 Cynthia Rogers, Mike Messenger and Sylvia Bender, *Funding and Energy Savings From Investor-Owned Utility Energy Efficiency Programs In California for Program Years 2000 Through 2004,* California Energy Commission Staff Paper, (August 2005), pp. 9, 10 & 11; http://energy.ca.gov/2005publications/CEC-400-2005-042/CEC-4002005-042-REV.PDF.

16 Letter to Jan Carr, CEO, Ontario Power Authority re: Integrated Power System Plan from Dwight Duncan, Minister of Energy, June 13, 2006; Ontario Ministry of Energy, Backgrounder, "Ontario's Electricity Supply Mix", (June 13, 2006).

17 OPA, *Supply Mix Analysis Report*, Volume 2, (December 2005), p. 210; and email to Jack Gibbons from Norm Rubin, Director of Nuclear Research, Energy Probe, August 17, 2005.

18 Hagler Bailly Canada, *Potential for Cogeneration in Ontario: Final Report,* (August 2000), p. 25.

19 OPA, *Supply Mix Analysis Report*, Volume 2, (December 2005), pp. 219 & 238; and email to Jack Gibbons from Amir Shalaby, Vice President, Power System Planning, OPA (January 10, 2006).

20 The Darlington Nuclear Generating Station cost $14.3 billion and it has a capacity of 3,524 MW. Letter from Rosemary Watson, Freedom of Information Coordinator, Ontario Power Generation to Ravi Mark Singh, Ontario Clean Air Alliance, April 27, 2004; and Ontario Power Generation, *Sustainable Development Report 2004*, p. 41.

21 For nuclear capacity factors between 1980 and 1996 see: Government of Ontario, *Direction for Change*, (1997), p. 5. In 2003 Bruce Power and OPG produced 24,500 and 37,700 GWh of nuclear power respectively. Their total nuclear capacity was 13,864 MW. Bruce Power, *News Release*, "Bruce Power partners announce 2003 results", (January 27, 2004) and OPG, *Towards Sustainable Development: 2000 Progress Report*, p. 55 and *Towards Sustainable Development: 2003 Progress Report*, p. 32. In 2005 Bruce Power and OPG produced 32,900 and 45,000 GWh of nuclear power respectively. Bruce Power, *2005 Year in Review*, p. 31; and OPG, *Pickering Nuclear 2005 Performance Report*.

22 Email to Jack Gibbons from Manfred Klein, Senior Program Engineer, Electricity and Industrial Combustion, Environment Canada, (April 7, 2004).

23 OPA, *Supply Mix Analysis Report,* Volume 2, (December 2005), pp. 180, 210-212; and Canadian Energy Research Institute, *Electricity Generation Technologies: Performance and Cost Characteristics*, Prepared for the Ontario Power Authority, (August 2005), p. 92.

24 October 17, 2005 letter to James Gillis, Ontario Deputy Minister of Energy from CIBC World Markets Inc.

25 Email to Amir Shalaby, Vice President, Power System Planning, OPA from Jack Gibbons (March 20, 2006) and email to Jack Gibbons from Mike Agrell, Power System Planning, OPA to Jack Gibbons (March 28, 2006).

26 Email to Amir Shalaby, Vice President, Power System Planning, OPA from Jack Gibbons (March 20, 2006) and email to Jack Gibbons from Mike Agrell, Power System Planning, OPA to Jack Gibbons (March 28, 2006).

27 Ontario Ministry of Energy, *Backgrounder,* "McGuinty Government Announces Nine New Renewable Energ y Projects", (November 21, 2005); and email to Jack Gibbons from Rick Jennings, Assistant Deputy Minister of Energy, (November 21, 2005).

28 Ontario Power Authority, *Supply Mix Advice Report*, Volume 1, (December 2005), p. 80.

29 Ontario Clean Air Alliance, *Increasing Productivity and Moving Towards a Renewable Future: A New Electricity Strategy for Ontario*, (October 2005), p. 37.

30 Canadian Energy Research Institute, *Electricity Generation Technologies: Performance and Cost Characteristics,* Prepared for the Ontario Power Authority, (August 2005), p. 86.

31 Ontario Power Authority, *Supply Mix Advice Report,* Volume 1, (December 2005), pp. 17 -22.

32 Ontario Clean Air Alliance, *Meeting Ontario's Electricity Needs: A Critical Review of the Ontario Power Authority's Supply Mix Advice Report*, (January 2006), p. 4.

33 Ontario Ministry of Energy, *News Release*, "McGuinty Government Delivers A Balanced Plan For Ontario's Electricity Future", (June 13, 2005).

34 Diener Consulting Inc., *The Nanticoke Conversion Study*, (Ontario Clean Air Alliance, 2001), p. 19, Table 2.2 and p. 21, Table 3.1; and Peter Savage and Shirley Savage, *Ontario's Energy Crunch: Why Phasing Out Coal Is An Unwise Strategey,* (Thinking Energy, 2005), page 19.

35 Canadian Clean Power Coalition, *CCPC Phase 1 Executive Summary*, (May 2004), p. 4.

36 *CCPC Phase 1 Executive Summary*, p. 3; and *Nanticoke Conversion Study*, p. 19.

37 Regulation 2001.0236.e, Ontario Regulation made under the Environmental Protection Act: Lakeview Generating Station

38 Independent Electricity System Operator, *The Ontario Reliability Outlook*, (June 2006), p. 6; and Tyler Hamilton, "Union Gas seeks recovery of project costs", *Toronto Star*, June 14, 2006.

39 Independent Electricity System Operator, *The Ontario Reliability Outlook*, (June 2006), p. 8.

40 According to a Government of Ontario report, Nanticoke's boilers can be converted to natural gas at a cost of $20 to $60 per kilowatt. Nanticoke's capacity is 4,000 MW. The cost of a new gas pipeline to Nanticoke would be $200 to $300 million. Ontario Ministry of the Environment, *Coal-Fired Electricity Generation in Ontario,* (March 2001), p. 42.; and DDS Management Consultants Inc. and RWDI Air Inc., *Cost Benefit Analysis: Replacing Ontario's Coal-Fired Electricity Generation,* (April 2005), p. 9. To put this cost in context, it cost OPG $1.25 billion to return its 515 MW Pickering A Unit 4 nuclear reactor to service. See Jake Epp, Peter Barnes & Robin Jeffrey, *Report of the Pickering "A" Review Panel*, (December 2003), pp. 3 & 4.

41 In 2005 Ontario produced 29,713 GWh of coal-fired electricity. According to the Independent Electricity System Operator (IESO) between 2006 and 2009 Ontario will obtain an additional 3,265 MW of natural

gas-fired combined-cycle generation capacity from the following sources: Goreway (860 MW), Portlands (550 MW), Greenfield Energy Centre (1005 MW), Greenfield South Generation Project (280 MW) and St. Clair Generation Project (570 MW). These plants will be able to produce 25,741 GWh per year at a 90% capacity factor. The IESO is also forecasting Bruce A Units 1 and 2 will return to service in 2009 and/or 2010. Assuming that these units operate at a 60% capacity factor, they will produce 7,884 GWh per year. IESO, *The Ontario Reliability Outlook*, (June 2006), p. 8.

42 Michael Rosenzweig et al., "Market Power and Demand Responsiveness: Letting Customers Protect Themselves", *Electricity Journal*, (May 2003).

43 In 2005 Ontario's demand exceeded 23,544 MW for only 2.58%of the year. Email to Jack Gibbons from Peter Lafoyiannis, Customer Relations and Market Information, Independent Electricity System Operator, June 21, 2006. According to Summit Blue Consulting, several North American electric utilities have demand response programmes which can reduce their customers' peak demands by 10% or more. See Randy Gunn, Summit Blue Consulting, "North American Utility Demand Response Survey Results" (2006).

44 Enbridge Gas Distribution, *Written Submission: Enbridge Gas Distribution to the Ontario Power Authority in the matter of the province's energy supply mix,* (August 26, 2005).

45 Ontario Ministry of Energy, *Backgrounder*, "McGuinty Government Announces Nine New Renewable Energy Projects", (November 21, 2006); email to Jack Gibbons from Rick Jennings, Assistant Deputy Minister of Energy, November 21, 2005; and Ontario Clean Air Alliance, *High Cost Energy: The economics of nuclear power*, (March 31, 2006).

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48 Hagler Bailly Canada, *Potential for Cogeneration in Ontario: Final Report*, (August 2000), p. 25.

49 Independent Electricity System Operator, *18-Month Outlook*, (March 24, 2006), p. 10; and letter to Jan Carr, CEO, Ontario Power Authority re: Integrated Power System Plan from Dwight Duncan, Minister of Energy, June 13, 2006.

50 Oraclepoll Research, *Survey Report Prepared for The Ontario Clean Air Alliance*, (February 2006).

51 OPA, *Supply Mix Advice Report*, Volume 1, (December 2005), p. 50.

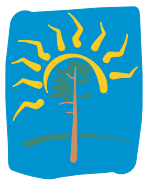
52 Ontario Power Authority, *Supply Mix Analysis Report*, Volume 2, (December 2005), pp. 199, 213, 222 and 226.

53 Displacing a MWh of coal-fired power by a MWh of natural gas-fired power will lead to a 730 kg net reduction in greenhouse gas emissions. As we have previously noted, the cost of natural gas-fired power is $70 per MWh. According to the OPA, the cost of a pulverized coal combustion power plant, assuming an 85% capacity factor and a 11% discount rate, is $67 per MWh. Therefore the incremental cost of obtaining the 730 kg emission reduction is $3 ($70 - $67). Thus the cost of obtaining a 1,000 kg (1 tonne) reduction is $4.11 [($3/730 kg) x 1,000 kg]

Displacing a MWh of coal-fired power by a MWh of wind power will lead to a 1,008 kg net reduction in greenhouse gas emissions. As we have previously noted, the cost of wind power power is approximately $86 per MWh. According to the OPA, the cost of a pulverized coal combustion power plant is $67 per MWh. Therefore the incremental cost of obtaining the 1,008 kg emission reduction is $19 ($86 - $67). Thus the cost of obtaining a 1,000 kg (1 tonne) reduction is $18.85 [($19/1008 kg) x 1,000 kg]

Displacing a MWh of coal-fired power by a MWh of nuclear power will lead to a 1,008 kg net reduction in greenhouse gas emissions. As we have previously noted, the cost of nuclear power power is at least $97 to $119 per MWh. According to the OPA, the cost of a pulverized coal combustion power plant is $67 per MWh. Therefore the incremental cost of obtaining the 1,008 kg emission reduction is at least $30 ($97 - $67) to $52 ($119 - $67). Thus the cost of obtaining a 1,000 kg (1 tonne) reduction is at least $29.76 [($30/1008 kg) x 1,000 kg] to $51.59 [($52/1008 kg) x 1,000 kg].

The OPA's estimate of the cost per MWh of a coal-fired power plant was provided in an email to Jack Gibbons from Amir Shalaby, Vice President, Power System Planning, OPA on July 11, 2006.



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