



advocates for the environment

SIERRA LEGAL

By Courier and Fax

18 December 2006

Ms Sheridan Scott
Commissioner of Competition
Competition Bureau
50 Victoria Street
Hull, Quebec
K1A 0C9

30 St. Patrick Street
Suite 900
Toronto, ON
Canada M5T 3A3

Re: Canadian Nuclear Association Representations to the Public Concerning the Cleanliness, Reliability and Affordability of Nuclear Power Generation

Dear Commissioner:

Phone:
416.368.7533
Fax:
416.363.2746
E-mail:
sldfon@sierralegal.org
Website:
www.sierralegal.org

Please find enclosed application for an inquiry, filed pursuant to Section 9 of the *Competition Act*, regarding claims published and distributed by the Canadian Nuclear Association. The claims have been circulated in print media, television, radio and on the Canadian Nuclear Association's website at <<http://www.cna.ca>>.

The application is filed on behalf of seven (7) residents of Canada, including representatives of the Canadian Association of Physicians for the Environment, Families Against Radiation Exposure, Inter-Church Uranium Committee Educational Cooperative, Ontario Sustainable Energy Association, The Pembina Institute, Sky Generation, and WWF-Canada.

Statutory declarations of the applicants are attached to the application. The materials sent by courier also include the following supporting materials:

1. The Pembina Institute, *Nuclear Power in Canada: An Examination of Risks, Impacts and Sustainability* (December 2006)

2. A compact disk containing the relevant CNA television advertisements
3. A compact disk containing electronic copies of further background materials

We look forward to confirmation of your initiation of an inquiry into this matter.

Please keep me informed as to the progress of your inquiry and please forward all communications on this matter to my attention.

Yours truly,

SIERRA LEGAL

per:

SIERRA
LEGAL

Hugh Wilkins
Staff Lawyer

Enclosure

Application for Inquiry

Filed pursuant to Section 9 of the *Competition Act* against the Canadian Nuclear Association

Submitted by representatives of the Canadian Association of Physicians for the Environment, Families Against Radiation Exposure, Inter-Church Uranium Committee Educational Cooperative, Ontario Sustainable Energy Association, The Pembina Institute, Sky Generation, and WWF-Canada

**RE: CANADIAN NUCLEAR ASSOCIATION REPRESENTATIONS TO THE PUBLIC
CONCERNING THE CLEANLINESS, RELIABILITY AND AFFORDABILITY OF NUCLEAR
POWER GENERATION**

EXECUTIVE SUMMARY

This application for an inquiry under Section 9 of the *Competition Act* concerns claims published and distributed by the Canadian Nuclear Association (CNA). The claims have been published in print media, television and radio advertisements and on the CNA's website at <<http://www.cna.ca>>. We believe the total expenditures on the campaign by the CNA to exceed \$1.6million in 2005 alone.¹ The campaign is ongoing.

The CNA campaign is centered on a series of statements that nuclear power is:

- “clean”
- “reliable” and
- “affordable”

In addition, the advertisements state that nuclear power generation “does not create greenhouse gases”, “keeps the air clean” and is subject to “stable” fuel prices.

None of these representations is true. Individually and as a whole, the claims provide a misleading impression to the public of the environmental impacts associated with nuclear power and nuclear power’s economic risks and costs. As such, the claims have a detrimental impact on the competitive positions of other, non-nuclear, energy suppliers.

The Canadian Nuclear Association represents its members, which are businesses that participate in the for-profit planning, building and operation of nuclear power generating facilities. As the enclosed materials, including a report entitled *Nuclear Power in Canada: An Examination of Risks, Impacts and Sustainability*, prepared by the Pembina Institute, make apparent, the use of nuclear energy for electricity generation results in the generation of radioactive and hazardous wastes which will require care over extremely long-time periods, effluents which have been found to be “toxic” by Environment Canada

¹ Nielsen Media Research, *Annual Expenditure Summary (2001-2005)*.

and Health Canada for the purposes of the *Canadian Environmental Protection Act*, and the release of a wide range of radioactive, hazardous and conventional air pollutants, as well as greenhouse gases, into the atmosphere. In addition, nuclear generating facilities in Canada have a history of operational difficulties and nuclear facility construction and refurbishment projects in Canada have been subject to significant cost over-runs. With respect to the claim of “stable” fuel costs, the Pembina report notes that world uranium prices have increased by a factor of more than six since 2001.

While not directly relevant to the legal elements of this application, these false and misleading representations have significantly damaged the competitive position of various non-nuclear energy suppliers. These include those focusing on low-impact renewable energy sources, such as wind power generation, solar electricity generation, and small-scale hydroelectric power. An increased role for nuclear power in Canada will reduce the market opportunities for developers of these technologies.

The applicants are individuals representing non-governmental organizations with expertise in energy and environmental policy, organizations representing communities whose environment has been adversely affected by the activities of the nuclear industry, and economic interests whose competitive position has been damaged by the CNA's advertising campaign.

By way of introduction, the Canadian Nuclear Association's statements on its website generally illustrates the false and misleading misrepresentations. The CNA's website states:

Nuclear energy is clean. It's North America's largest source of emission-free energy, which means it emits no pollutants into the air. This keeps the air clean, prevents acid rain, preserves the earth's climate and avoids ground-level ozone formation. And nuclear waste is managed in a safe, environmentally responsible way.

Based on our review of the representations made by the CNA on its website and in the print, radio, television and other media, it is clear that these representations are not based on fact.

THE APPLICATION

Introduction

The following statement of evidence will disclose that the Canadian Nuclear Association (CNA) has engaged in reviewable conduct for the purposes of promoting a business interest by making false and misleading presentation to the public in a material respect. The claims were distributed by the CNA in the form of print media, television and radio advertisements, and on its website at <<http://www.cna.ca>>.

The Applicants believe that Canadian Nuclear Association contravened the *Competition Act* by making representations to the public that are false or misleading in a material respect regarding the risks and adverse effects of nuclear power generation. These claims can be generally characterized as encompassing false or misleading representations relating to the reliability and affordability of nuclear power generation and the environmental and health-related impacts that it causes. Each of these representations has adversely affected the competitive positions of suppliers of energy from non-nuclear sources, including those supplying wind, solar and hydro electricity in Ontario. Each of these representations has thus hindered the abilities of small and medium-sized enterprises to have equitable opportunities to participate in the Canadian economy, and, should the Ontario Government choose to rely on nuclear power in the province's power mix, has prevented consumers from having competitive energy product choices.²

This application is organized into four parts: Applicants; Representations; Analysis; and Conclusions.

I. THE APPLICANTS

Applicant 1 – Gideon Forman, Executive Director - Canadian Association of Physicians for the Environment

The Canadian Association of Physicians for the Environment (CAPE) was established in 1994 to raise awareness of health issues related to environmental degradation. CAPE represents physicians from across Canada involved in education and advocacy work. CAPE frequently advises the federal government and municipalities on issues of environmental health. In June 2006, CAPE won a prestigious Canadian Environment Award (Gold) from Canadian Geographic Magazine and the Government of Canada for its work.

Applicant 2 – John Miller, President - Families Against Radiation Exposure

John Miller is President of Families Against Radiation Exposure (FARE), a citizen's group based in Port Hope, Ontario with 1,500 members. Last year, it led community opposition to plans to blend enriched uranium at a nuclear fuel conversion facility in Port Hope, resulting in the company withdrawing those plans. FARE won a Canadian Environmental Award (Silver) earlier this year, and continues to pursue its goal of eliminating radioactive pollution in the community.

Applicant 3 – Michael Poellet, President - Inter-Church Uranium Committee Educational Cooperative

The Inter-Church Uranium Committee Educational Cooperative (ICUCEC) is a non-profit organization based in Saskatchewan that provides educational materials, workshops, conferences, and other services to schools and to the general public regarding nuclear energy issues. ICUCEC volunteers also work to increase public awareness of

² See Section 1.1 of the *Competition Act*.

issues surrounding nuclear development through briefs to panels and regulators and through the promotion of the use of renewable energy.

Applicant 4 – Deborah Doncaster, Executive Director - Ontario Sustainable Energy Association

The Ontario Sustainable Energy Association (OSEA) is an umbrella organization formed to implement community sustainable energy projects across Ontario. OSEA was established in May 1999 with a mission to “facilitate the transition to a sustainable energy economy in Ontario through the development and support of community-based sustainable energy initiatives.” Its supporting members represent a broad range of interests, including municipalities, farmers, NGOs, and the private sector.

Applicant 5 – Mark S. Winfield, Ph.D., Director, Environmental Governance – The Pembina Institute

The Pembina Institute is an independent, not-for-profit policy research and education organization specializing in the fields of sustainable energy, community sustainability, climate change and corporate environmental management. Founded in 1985 in Drayton Valley, Alberta, the Institute now has offices in Calgary, Edmonton, Vancouver, Ottawa and Toronto.

Applicant 6 – Glen Estill, President - Sky Generation

Glen Estill is the President and Founder of Sky Generation, a wind development company that started in 2000. The company has a 5.1 MW wind farm that produces electricity for sale in the Ontario electricity market, and has near-term ambitions to quadruple its installed capacity. Mr. Estill is past president of the national wind industry advocacy group - the Canadian Wind Energy Association (CANWea) - and remains involved with CANWea, the Renewable Energy Task Team, and other industry committees.

Applicant 7 – Pamela Davis, Vice-President Marketing and Donor Relations - WWF-Canada

WWF-Canada is part of a global not-for-profit conservation organization focussed on solutions to the challenges associated with endangered species, toxic pollution, climate change, oceans and coasts, fresh water and forests. Established in 1967, WWF-Canada has offices located in the NWT, Vancouver, Prince Rupert, Toronto and Halifax.

These seven Canadian residents are referred to hereafter as the “Applicants.” Statutory declarations completed by each of the Applicants are found at Tab 1.

II. THE REPRESENTATIONS: THE NATURE OF THE CONTRAVENTION

Nuclear Power Generation is "Clean"

The Canadian Nuclear Association has disseminated advertisements and continues to disseminate advertisements that are misleading stating that nuclear power generation is "clean". The relevant text of these advertisements is set out below.

Television Advertisements:

- *This year, Ontario will decide on its future energy mix. The reality is the equivalent of 80% of our current power capacity will soon need replacing. Nuclear will continue to play a leading role in the mix. Nuclear is clean, reliable, and doesn't create greenhouse gases.*
- *This year, Ontario will decide on its future energy mix. The reality is the equivalent of 80% of our current power capacity will soon need replacing. Conservation, renewables and hydro can help. But nuclear will continue to play a leading role. Nuclear is clean and reliable*
- *If you're like most Canadians, you're unclear about nuclear power. Well let's clear things up. For one thing it's clean, so you can breathe easier.*
- *Best of all, nuclear keeps the air clean. So, we can breathe easier.*

Website Statements:

- *Nuclear energy is clean. It's North America's largest source of emission-free energy, which means it emits no pollutants into the air. This keeps the air clean, prevents acid rain, preserves the earth's climate and avoids ground-level ozone formation. And nuclear waste is managed in a safe, environmentally responsible way.*

Nuclear Power Generation is "Reliable"

The CNA has disseminated advertisements and continues to disseminate advertisements that are misleading stating that nuclear power generation is "reliable". The relevant text of these advertisements is set out below.

Television Advertisements:

- *Nuclear is clean, reliable, and doesn't create greenhouse gases.*
- *Nuclear is clean and reliable.*

- *Still unclear about nuclear? Well, bet you didn't realize it already makes up half Ontario's energy mix. And has been with us for over 40 years. Nuclear energy is reliable and affordable, which should please everyone.*
- *If you're like most Canadians, you're unclear about nuclear power. Well let's clear things up. [...] And nuclear energy is reliable.*

Website Statements:

- *Canadian nuclear energy provides dependable electricity that you can count on, any time, all the time. Its Canadian designed and built plants are reliable thanks to more than four decades of experience with the technology. The high level of training and expertise of the staff who operate them, and the fact that nuclear's fuel - uranium – is mined, milled and fabricated right here in Canada, makes Canadian nuclear power extremely reliable.*

Nuclear Power Generation is "Affordable"

The CNA has disseminated advertisements and continues to disseminate advertisements that are misleading stating that nuclear power generation is "affordable". The relevant text of these advertisements is set out below.

Television Advertisements:

- *Nuclear energy is reliable and affordable, which should please everyone.*
- *If you're like most Canadians, you're unclear about nuclear power. Well let's clear things up. [...] It's also affordable, which should please everyone. And nuclear energy is reliable.*

Website Statements:

- *Nuclear energy is an economical energy source. Well-maintained plants mean efficient performance. Plus, stable fuel prices make nuclear power the cost-effective alternative.*

Nuclear Power Generation "Doesn't Create Greenhouse Gases"

The CNA has disseminated advertisements and continues to disseminate advertisements that are misleading stating that nuclear power generation "does not create greenhouse gases". The relevant text of these advertisements is set out below.

- *Nuclear is clean, reliable, and doesn't create greenhouse gases.*

"Nuclear Keeps the Air Clean"

The CNA has disseminated advertisements and continues to disseminate advertisements that are misleading stating that nuclear power generation "keeps the air clean". The relevant text of these advertisements is set out below.

- *Still unclear about nuclear? Well, bet you didn't realize it already makes up half Ontario's energy mix. And has been with us for over 40 years. Nuclear energy is reliable and affordable, which should please everyone. Best of all, nuclear keeps the air clean. So, we can breathe easier.*

Nuclear is subject to "stable fuel prices"

The CNA has disseminated advertisements and continues to disseminate advertisements that are misleading stating that nuclear power generation is subject to "stable fuel prices". The relevant text of these advertisements is set out below.

Website Statements:

- *Nuclear energy is an economical energy source. Well-maintained plants mean efficient performance. Plus, stable fuel prices make nuclear power the cost-effective alternative.*

Each of these advertisements is available online at <<http://www.cna.ca>>.

Texts of the CNA Television Messages

Television Message No. 1

This year, Ontario will decide on its future energy mix. The reality is the equivalent of 80% of our current power capacity will soon need replacing. Nuclear will continue to play a leading role in the mix. Nuclear is clean, reliable, and doesn't create greenhouse gases. It's been with us over 40 years, already supplies 51% of our electricity, and must gear up now to help power the years ahead.

A message from the Canadian Nuclear Association. More power to you.

Television Message No. 2

This year, Ontario will decide on its future energy mix. The reality is the equivalent of 80% of our current power capacity will soon need replacing. Conservation, renewables and hydro can help. But nuclear will continue to play a leading role. Nuclear is clean and reliable. It's been with us over 40 years, already supplies 51% of our electricity, and must gear up now to help power the years ahead.

A message from the Canadian Nuclear Association. More power to you.

Television Message No. 3

Still unclear about nuclear? Well, bet you didn't realize it already makes up half Ontario's energy mix. And has been with us for over 40 years. Nuclear energy is reliable and affordable, which should please everyone. Best of all, nuclear keeps the air clean. So, we can breathe easier.

To learn more visit cna.ca and get clear about nuclear.

A message from the Canadian Nuclear Association. More power to you.

Television Message No. 4

If you're like most Canadians, you're unclear about nuclear power. Well let's clear things up. For one thing it's clean, so you can breathe easier. It's also affordable, which should please everyone. And nuclear energy is reliable. As long as our energy needs keep increasing, nuclear will keep playing an important part in our total energy mix.

To learn more visit cna.ca and get clear about nuclear energy.

A message from the Canadian Nuclear Association. More power to you.

III. ANALYSIS

The Applicants submit that each of the foregoing representations is materially false or misleading. The Applicants believe that the ads materially mislead the public by conveying a false impression regarding the risks and adverse effects of nuclear power generation. The following analysis of the claims made by the CNA is based on the findings of the Pembina Institute's December 2006 report, *Nuclear Power in Canada: An Examination of Risks, Impacts and Sustainability*, and other sources. A copy of the Pembina Institute report is enclosed as supporting documentation to this application.

In examining the environmental and health risks and impacts of electricity sources, it is important to consider that the most significant risks and impacts may occur at locations other than the point of electricity generation. For this reason, the Pembina Institute's study examined environmental and health impacts at all stages of the nuclear energy production process, including uranium mining and milling, uranium refining, conversion and fuel production, power plant operation and waste fuel management. This approach is consistent with the Institute's overall practice in examining the risks and impacts associated with different energy sources. It is important to note that the CNA's claims with respect to nuclear power are absolute in nature, and not relative to other potential energy sources.

"Clean"

Nuclear power, like other non-renewable energy sources, has severe environmental impacts. Each stage of the nuclear energy production process generates large amounts of uniquely difficult-to-manage wastes that are radioactive and otherwise extremely hazardous that will require perpetual care, effectively imposing costs and risks arising from current energy consumption on to future generations. The process also has severe impacts on surface water and groundwater water quality through a range of radioactive and hazardous pollutants, and results in releases to the atmosphere of a wide range of criteria, radioactive and hazardous pollutants and greenhouse gases (GHGs).

By comparison, low-impact energy sources, such as wind power, are associated with the generation of virtually no hazardous waste streams, releases of pollutants to surface and ground waters or to the atmosphere other than those related to the manufacturing and transportation of generating equipment.

The key impacts of nuclear power in Canada identified in the Pembina Institute study include the following:

Waste Generation

Major waste streams arise at each stage of the nuclear power production process. The key waste streams include the following:

Uranium mining and milling

- An estimated 575,000 tonnes of tailings per year, of which 90–100,000 tonnes can be attributed to uranium production for domestic energy purposes.³ Uranium mill tailings are acidic or potentially acid generating, and contain a range of long-lived radionuclides,⁴ heavy metals⁵ and other hazardous contaminants.⁶
- Waste rock production may be as high as 18 million tonnes per year, of which 2.9 million tonnes can be attributed to mining for domestic energy production purposes.⁷ Waste rock from uranium mining operations may also contain radionuclides, heavy metals and be acid generating.
- It is estimated that there are more than 213 million tonnes of uranium mine tailings in facilities in Canada.⁸ The safety and environmental hazards associated with waste rock and tailings from uranium mining operations are such that they require perpetual care.⁹

Refining and conversion operations

- International Atomic Energy Agency (IAEA) studies¹⁰ suggest that nearly 1,000 tonnes of solid wastes and 9,000 m³ of liquid wastes are produced per year as a result of uranium refining, conversion and fuel production for domestic energy generation purposes in Canada.¹¹ Information on the precise character and fate of these wastes is not publicly available.

Power plant operation

- Approximately 85,000 waste fuel bundles are generated by Canadian nuclear reactors each year. Waste nuclear fuel is an extremely hazardous material, being highly radioactive, and also containing chemically toxic elements, such as heavy

³ Based on processing of 587,000 tonnes of uranium ore and 18 kg uranium per tonne of ore, and 16 per cent of production for domestic fuel consumption. See Natural Resources Canada, “Canada’s Uranium Industry 2004”, accessed at <<http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=454&oid=967>>.

⁴ Environment Canada, *Priority Substances List Assessment Report. Releases of Radionuclides from Nuclear Facilities (Impact on Non-human Biota)* (Ottawa: Government of Canada, May 2003).

⁵ “Heavy metals” include such elements as mercury, lead, arsenic, nickel and cadmium, which have been classified as toxic substances for the purposes of the *Canadian Environmental Protection Act, 1999*.

⁶ WISE Uranium Project, “Uranium Mill Tailings Deposits”, accessed at <<http://www.wise-uranium.org/uwai.html#TAILCHAR>>.

⁷ Based on estimates in S. Frost, “Waste Management in the Uranium Mining Industry” in *The Uranium Institute: Twenty Third Annual International Symposium 1998*, accessed at <<http://www.world-nuclear.org/sym/1998/frost.htm>> and production figures provided in Natural Resources Canada, “Canada’s Uranium Industry 2004.”

⁸ Low Level Radioactive Waste Management Office, *Inventory of Radioactive Waste in Canada 2004* (Ottawa: Natural Resources Canada, 2004).

⁹ Auditor General of Canada, “Federal Radioactive Waste Management,” *1995 Report to the House of Commons*, paragraph 3.129.

¹⁰ IAEA. *Minimization of Waste from Uranium Purification, Enrichment and Fuel Fabrication*. IAEA-TECDOC-1115 (Vienna: IAEA, 1999), accessed at <http://www-pub.iaea.org/MTCD/publications/PDF/te_1115_prn.pdf>.

¹¹ Based in domestic requirement of 1650 tonnes of uranium. See Natural Resources Canada, “Canada’s Uranium Industry 2004.”

metals. As of 2003, 1.7 million bundles were in storage at reactor sites.¹² The Nuclear Waste Management Organization, established under federal legislation in 2002, estimates that these wastes will have to be secured for approximately one million years for safety, environmental and security reasons.¹³

- Approximately 6,000 cubic metres of lower level radioactive wastes are generated each year in Ontario as a result of power plant operations, maintenance, and refurbishment.¹⁴ A wide range of radiological and hazardous pollutants has been released to the atmosphere as a result of the incineration of these wastes at the Bruce Western Waste Management facility. A new incinerator installed at the facility in 2003 has reduced emissions of hazardous, but not radiological, pollutants.¹⁵
- Power plant maintenance and refurbishment also results in the generation of substantial amounts of additional hazardous wastes, including heavy metals and asbestos.¹⁶
- Very large amounts of low-, intermediate- and high-level radioactive wastes will be produced as a result of the eventual decommissioning of refining, conversion and fabrication facilities and power plants.¹⁷

Water Quality Impacts

Severe contamination of surface water and groundwater with radionuclides, heavy metals and other pollutants has arisen from uranium mine tailing management facilities and mine and mill operations. Reported discharges to surface waters from uranium mines and mills in Canada in 2003 included over 1,500 kg of uranium, 860 kg of molybdenum, 70 kg of arsenic, 185 kg of nickel, 40 kg of selenium, and 10 tonnes of ammonia.¹⁸

Concentrations of major ions (potassium, magnesium, bicarbonate, chloride, calcium, sodium and sulphate) ranging from 10 to 200 times the levels of un-impacted groundwater have been found in areas near uranium mine tailings management facilities.¹⁹ Effluent from uranium mines and mills was found by Health Canada and Environment Canada to be ‘toxic’ for the purposes of the *Canadian Environmental*

¹² NWMO, “Fact Sheet: Nuclear Fuel Waste in Canada”, accessed at <http://www.nwmo.ca/adx/asp/adxGetMedia.asp?DocID=177,20,1,Documents&MediaID=406&Filename=Fact_Sheet_2_Waste.pdf>.

¹³ NWMO, *Asking the Right Questions? The Future Management of Canada’s Used Nuclear Fuel*, (Toronto: NWMO, 2003).

¹⁴ M. Garamszeghy (Ontario Power Generation, Nuclear Waste Management Division), “Low and Intermediate Level Waste Generated by Ontario Nuclear Power Plants, 1999–2003,” personal communication (2005).

¹⁵ Ontario Power Generation, Response to Access to Information Request 060019 (August 28, 2006).

¹⁶ Environment Canada National Pollutant Release Inventory Data, obtained through on-line searchers, accessed at <http://www.ec.gc.ca/pdb/query-comm/community_portal_e.cfm>.

¹⁷ See generally, Canadian Nuclear Safety Commission, “Regulatory Guide G-219: Decommissioning Planning for Licensed Activities.”

¹⁸ Based on Data from Cameco Corporation, 2004 Annual Operations Reports, McArthur River, Rabbit Lake and Key Lake mines.

¹⁹ Canadian Nuclear Safety Commission (2003) *Comprehensive study report: Cluff Lake Decommissioning Project*, accessed at <http://www.ceaa-acee.gc.ca/010/0003/0019/report_e.htm>.

Protection Act in 2004.²⁰ This makes the nuclear sector one of only three industrial sectors whose discharges have been found to be ‘toxic’ for the purposes of CEPA (the other two are pulp mills using bleaching processes, and textile mills using wet processing).²¹

Routine and accidental releases of radionuclides to surface waters occur in the course of power plant operations, with tritium oxide and carbon-14 being the key radioactive pollutants of concern.²² Groundwater contamination with tritium has also occurred at the Pickering generating facility in Ontario.²³

Ontario’s nuclear power plants are the leading source of discharges of hydrazine, an extremely hazardous pollutant,²⁴ to surface waters in Canada.²⁵ Nuclear generating facilities have also been sources of discharges of metals (copper, zinc, and chromium) and ammonia to surface waters.²⁶ Minor discharges of ammonia, nitrates and phosphorous to surface waters occur from refining and conversion facilities, along with discharges of approximately 4 kg of uranium per year.²⁷

Atmospheric releases of pollutants associated with nuclear power production are discussed below in relation to the claims that nuclear power “doesn’t create greenhouse gases” and “keeps the air clean.”

“Reliable”

Ontario’s CANDU nuclear generating stations have been plagued by poor performance. The performance of nuclear generating stations is best described by capacity factors, or actual electricity production expressed as a percentage of what the generating station could have produced had it operated at full capacity for the entire period (i.e. if there had been no maintenance outages). Table 1 lists the capacity factors of Ontario’s nuclear generating stations between 1990 and 2004.

²⁰ Environment Canada, *Priority Substances List Assessment Report. Releases of Radionuclides from Nuclear Facilities (Impact on Non-human Biota)* (Ottawa: Government of Canada, May 2003).

²¹ Department of Justice, *Canadian Environmental Protection Act, 1999*, Schedule 1.

²² CNSC, *Radioactive Release Data from Nuclear Generating Stations 1994–2003, INFO-0210 (Revision 12)* (Ottawa: CNSC, January 2005), accessed at <http://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/I0210r12_e.pdf>.

²³ Sierra Club of Canada, “Take Action: Say No to Nuclear Power in Ontario” (April 20, 2006), accessed at <<http://sierraclub.ca/national/getinvolved/item.shtml?x=925>>.

²⁴ For toxicity information on hydrazine see <<http://www.scorecard.org/chemical-profiles/>>.

²⁵ Environment Canada National Pollutant Release Inventory Data, obtained through on-line searches, accessed <http://www.ec.gc.ca/pdb/query-comm/community_portal_e.cfm>.

²⁶ Review Team, *Evaluation of Emission from Ontario Hydro Admiralty Brass Condensers to the Great Lakes* (Toronto: Ontario Hydro Nuclear, June 1997).

²⁷ Environment Canada National Pollutant Release Inventory Data, obtained through on-line searches, accessed at <http://www.ec.gc.ca/pdb/query-comm/community_portal_e.cfm> and facility compliance reports.

Table 1: Average Capacity Factors at Nuclear Generating Stations, 1990–2003^{28,29,30,31}

	Pickering A	Pickering B	Bruce A	Bruce B	Darlington
1990	39.6	77.7	48.2	81.1	n/a
1991	55.9	89.7	64	88	n/a
1992	61.3	74.1	55.9	78.3	n/a
1993	80.3	81.6	34.3	67.2	81.7
1994	71.7	84.6	48.7	80.4	86.9
1995	41.7	83.4	52.9	77.2	90.1
1996	36.3	50.1	58.9	82.6	84.4
1997	72.5	59.1	39.3	78.5	61.5
1998	0	72.7	85.6	70.2	85.4
1999	0	77	0	75	83.3
2000	0	56.9	0	80.3	86.8
2001	0	73.2	0	80.3	85.6
2002	0	80.9	0	75	90.2
2003	70.3 ³²	67.8	n/a	85	81.7
Average	37.8	73.4	37.5	78.5	83.4

Note: ‘n/a’ indicates that the measurement is not applicable.

Between 1990 and 1996, Ontario’s nuclear generating stations experienced particularly poor performance. The Pickering A station had an average capacity factor of 55 percent during this time and the Bruce A station had an average capacity factor of 52 percent. Capacity factors for Bruce B and Pickering B were 77 percent and 79 percent, respectively. The expected capacity factor for the Ontario CANDU reactor fleet was in the range of 86 per cent.³³

“Affordable”

As shown in Table 2, the actual construction costs of all five of Ontario’s nuclear generating stations significantly exceeded their original estimated costs.

²⁸ Nucleonic Week, “Gross Generation by Reactor Type and Vendor” (February 12, 2004).

²⁹ OPG, 2004. *2004 Performance Report for Pickering Nuclear*, accessed at <http://www.opg.com/ops/reportcards/Pick04_YE.pdf>.

³⁰ OPG, 2004. *2004 Performance Report for Darlington Nuclear*, accessed at <http://www.opg.com/ops/reportcards/Darl04_YE.pdf>.

³¹ Bruce Power, 2002. *Annual Review*, accessed at <http://www.brucepower.com/bpcms_web/uc/GetDocument.aspx?docid=947>.

³² The given capacity factor is for Reactor 4, the only functional reactor in 2003.

³³ A projected capacity factor of 86 per cent underlay the 1997 Ontario Hydro Nuclear Asset Optimization Plan, cited in Ernst and Young, *Ontario Hydro Nuclear Asset Optimization Plan Assessment of Financial Estimates* (Toronto: September 7, 1997), pg.11.

Table 2: Cost Overruns for Ontario Nuclear Generating Stations^{34,35,36,37,38, 39}

Nuclear Generating Station	Estimated Capital Cost (\$billions)	Actual Capital Cost (\$billions)	Per Cent Overrun
Pickering A	0.508 (1965\$)	0.716 (1971\$)	40
Pickering B	1.585 (1974\$)	3.846 (1986\$)	140
Bruce A	0.930 (1969\$)	1.8 (\$ of the year)	90
Bruce B	3.929 (1976\$)	5.994 (\$ of the year)	50
Darlington	3.950 (1978\$) 7.4 (1993\$) projected from estimate in 1981	14.4 (1993\$)	270

All of the Ontario nuclear facility refurbishment projects have also been subject to major cost overruns.

Table 3: Performance Record and Restart Costs for Pickering A and Bruce A^{40, 41,42,43,44}

Reactor	Date of Closure for Maintenance	Date of Restart	Estimated Restart Cost (\$billions)	Actual Cost of Restart (\$billions)
Pickering 1	1997	2005	0.213 million ⁴⁵	1.016 ⁴⁶
Pickering 2	1997	Uneconomical		
Pickering 3	1997	Uneconomical		
Pickering 4	1996	2003	0.458 (1999 estimate)	1.25

³⁴ Ontario Hydro, *Demand Supply Plan Hearing Interrogatory No 9.7.62* (February 1991, p.1), cited in M. Winfield, et al, *Power for the Future: Towards a Sustainable Electricity System for Ontario*.

³⁵ Ontario Hydro, *A Journalist's Guide to Nuclear Power* (1998), cited in M. Winfield et al., *Power for the Future: Towards a Sustainable Electricity System for Ontario*.

³⁶ Ontario Hydro, *Demand Supply Plan Hearing Interrogatory No 9.7.62* (February 1991, attachment 1), cited in M. Winfield et al., *Power for the Future: Towards a Sustainable Electricity System for Ontario*.

³⁷ Ontario Hydro, *Demand Supply Plan Hearing Interrogatory No 9.7.62* (February 1991, Attachment 2, p. 2-1), cited in M. Winfield et al., *Power for the Future: Towards a Sustainable Electricity System for Ontario*.

³⁸ OPG, 2005. "Ontario Power Generation Not Proceeding with the Refurbishment of Pickering Units 2 and 3" (Media Release), accessed at <http://www.opg.com/info/news/NewsAug12_05-NRUnit2and3.asp>.

³⁹ OPG Review Committee, *Transforming Ontario's Power Generation Company* (March 2004, p. 50), cited in M. Winfield et al, *Power for the Future: Towards a Sustainable Electricity System for Ontario*.

⁴⁰ Pickering Review Panel, *Report of the Pickering 'A' Review Panel* (December 2003), accessed at <http://cna.ca/english/Studies/Pickering_Review_%2004/pickering_report_dec2003_en.pdf>.

⁴¹ OPG, "Ontario Power Generation Not Proceeding with the Refurbishment of Pickering Units 2 and 3."

⁴² J. Spears, "Nuclear power key to future: Bruce chief," *The Toronto Star* (January 30, 2004), cited in M. Winfield et al, *Power for the Future: Towards a Sustainable Electricity System for Ontario*.

⁴³ Ontario Ministry of Energy, 2005. *Media Release* "Government and Bruce Power Reach Agreement to Restart Nuclear Units."

⁴⁴ OPG, 2005. "OPG Moving Ahead with Pickering A Unit 1 Return to Service", accessed at <http://www.opg.com/info/news/NewsJuly07_04.asp>.

⁴⁵ Ontario Clean Air Alliance, *Increasing Productivity and Moving Towards a Renewable Future: A New Electricity Strategy for Ontario* (October 2005), p. 15; and OPG, "Ontario Power Generation Reports 2005 Third Quarter Financial Results," *News from Ontario Power Generation* (November 11, 2005).

⁴⁶ Including costs of feeder inspection and replacement (\$20 million), not included in original scope. OPG, 2005. "Ontario Power Generation Reports 2005 Third Quarter Financial Results", accessed at <http://www.opg.com/ir/reports/Q3_05all.pdf>.

Bruce 1	1997	Pending	4.25	
Bruce 2	1995	Pending		
Bruce 3	1998	2003	0.34 (2001\$)	0.72
Bruce 4	1998	2003		

The refurbishment of Pickering Units 2 and 3 has been abandoned by Ontario Power Generation (OPG) as “uneconomical.”⁴⁷ Under an agreement signed with the Government of Ontario in October 2005, Bruce Power will invest \$4.25 billion to restart Units 1 and 2, refurbish Unit 3 when it reaches the end of its operational life and replace the steam generators in Unit 4. In exchange, the Government of Ontario provided price guarantees for power generated from the Bruce A units, agreed to cover Bruce Power’s fuel costs and agreed to share up to 75 per cent of the cost overruns associated with the refurbishment project.⁴⁸ Financial guarantees of this nature have not been required by other electricity suppliers.⁴⁹

When Ontario’s electricity sector was restructured in 1999, Ontario Hydro had \$30.5 billion of debt and \$7.6 billion of other liabilities.⁵⁰ To keep OPG solvent, \$19.433 billion of Ontario Hydro’s accumulated debt or unfunded liabilities associated with electricity generation facilities were transferred to the Ontario Electricity Financial Corporation (OEFC) as “stranded debt” or “unfunded liabilities.” Of this amount, \$15.147 billion was nuclear related.⁵¹

One of the grounds on which the CNA bases its claim of “affordability” is the “stability” of its fuel price. In reality, the price of uranium has increased since the beginning of 2001 by a factor of more than six, from \$US15.98 per kg U₃O₈ to \$US104.72 per kg in July 2006,⁵² as shown in the following figure.

⁴⁷ OPG, “Ontario Power Generation not proceeding with the refurbishment of Pickering A Units 2 and 3.”

⁴⁸ Ontario Ministry of Energy, “Agreement Strengthens reliability of supply and brings on enough new power for one million homes,” News Release (October 2005).

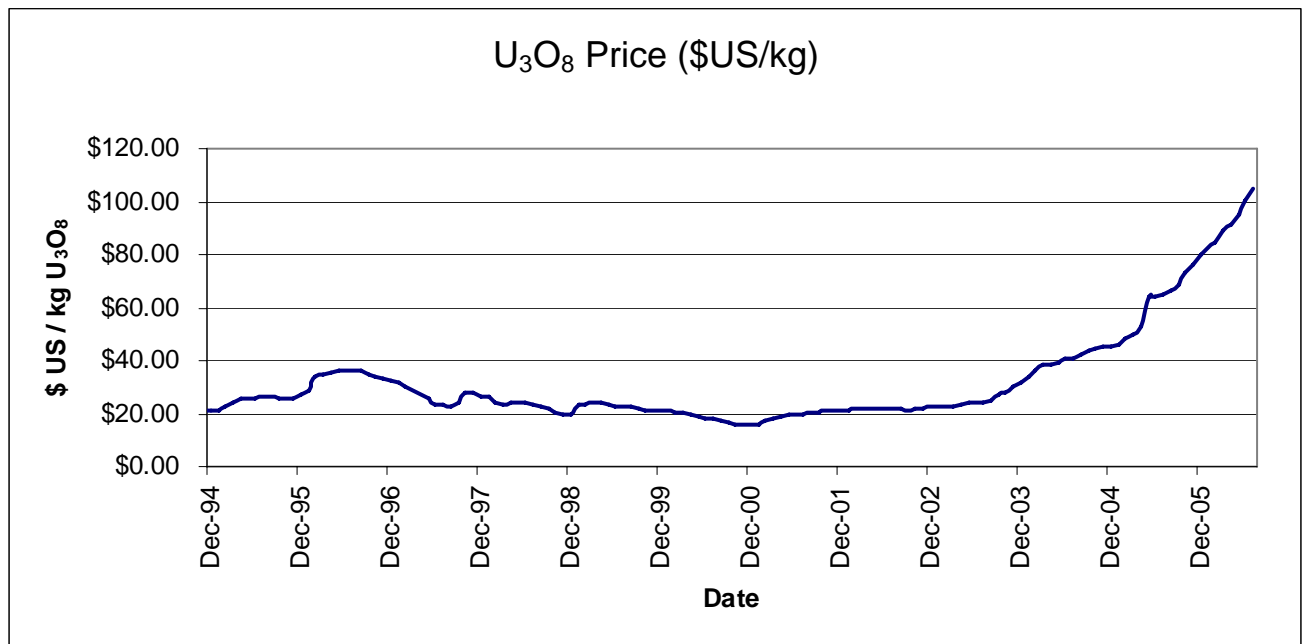
⁴⁹ Ontario Clean Air Alliance, *Factsheet – The Bruce Power Deal: A Comparative Analysis*, accessed at <<http://www.cleanair.web.ca/resource/brucepowerfs3.pdf>>.

⁵⁰ Ontario Electricity Financial Corporation, 1999. “Debt Management”, accessed at <<http://www.oefc.on.ca/debtmanage.html>>.

⁵¹ Ontario Electricity Finance Corporation, *Annual Report, April 1, 1999 to March 31, 2000*, p. 21. The remainder of the debt was related to power purchase contracts.

⁵² The Ux Consulting Company, LLC, accessed at <<http://www.uxc.com>>.

Graph 1: Price of Uranium (\$US/kg U₃O₈)⁵³



Globally, uranium forecasts to 2008 indicate a shortage as demand outstrips supply, leading to continuing price increases.⁵⁴

In addition, nuclear power has been the beneficiary of extensive direct and indirect subsidies by Canadian governments. It has been estimated that direct federal subsidies to Atomic Energy of Canada since the company's creation in 1952 amount to between \$17.5⁵⁵ and \$20.9 billion, with an opportunity cost in the range of \$195 billion.⁵⁶ Indirect subsidies, such as the accident liability protection provided through the federal *Nuclear Liability Act* and the absorption by governments of "stranded" nuclear related debts of electricity utilities, further artificially reduce the costs of nuclear power.⁵⁷

These direct and indirect subsidies make direct comparisons of the full economic and societal costs of electricity generated through nuclear energy relative to other energy sources, that are not subject to similar levels of direct and indirect subsidization, difficult. It has been estimated that privately financing a new reactor in Ontario, including realistic

⁵³ Based on data from the Ux Consulting Company, LLC, accessed at <<http://www.uxc.com>>.

⁵⁴ Morgan Stanley Equity Research, 2005. "Metals and Mining: Global Insights", accessed at <<http://www.alberta-star.com/morganstanley.pdf>>.

⁵⁵ David H. Martin, *Canadian Nuclear Subsidies: Fifty Years of Futile Funding* (Ottawa: Campaign for Nuclear Phase-Out, 2002).

⁵⁶ Energy Probe analysis reported in E. Reguly, "Can Ottawa sell off AECL without selling out taxpayer?" *The Globe and Mail* (November 18, 2006).

⁵⁷ On liability issues see N.W. Taylor, and M. Spivak, *Canada's Nuclear Reactors: How Much Safety is Enough? Interim Report* (The Standing Senate Committee on Energy, the Environment and Natural Resources, June 2001), accessed at <<http://www.parl.gc.ca/37/1/parlbus/commbus/senate/com-E/pdf-e/interim-enrg-e.pdf>>.

expectations of return on capital, would result in an electricity cost per kilowatt-hour of 20.9 cents - three times that of a new combined cycle natural gas fired plant (7 cents), and almost 2.5 times the cost of renewable power (8.6 cents).⁵⁸

“Doesn’t create greenhouse gases”

At each stage of the nuclear energy cycle, greenhouse gases (principally carbon dioxide) are generated and emitted. Emissions occur during the construction of the power plant, operation of equipment in the uranium mining process, the milling of uranium ore, mill tailings management activities, and refining and conversion operations. Greenhouse gas emissions also result from the transportation of uranium between milling, refining and conversion facilities and transportation required in the management of waste nuclear fuel and other radioactive wastes.

The Pembina Institute study conservatively estimates that total greenhouse gas emissions in Canada associated with uranium mining, milling, refining, conversion and fuel fabrication are between 240,000 and 366,000 tonnes of CO₂ per year. Total emissions associated with the sector, including the emissions associated with power plant construction, are in the range of 468,000 and 594,000 tonnes of CO₂ per year. Total annual greenhouse gas emissions associated with domestic power production are estimated at between 267,000 and 289,000 tonnes of CO₂ per year. Details of the basis of these estimates are contained in the study.⁵⁹ Other estimates suggest releases of greenhouse gases associated with nuclear power generation in Canada in the range of 840,000 tonnes per year.⁶⁰

“Nuclear keeps the air clean”

In addition to release of greenhouse gases, releases of criteria (i.e. sulphur dioxide, nitrogen oxides, particulate matter and volatile organic compounds), radioactive and hazardous air pollutants occur throughout the nuclear energy production process.

⁵⁸ Ontario Clean Air Alliance, “High Cost Energy: The Economics of Nuclear Power,” *Air Quality Issues Fact Sheet #20* (March 2006).

⁵⁹ The major sources of information on greenhouse gas emissions related to nuclear power production employed in the study include J. Andseta, M. J. Thompson, J. P. Jarrell, and D. R. Pendergast, *CANDU Reactors and Greenhouse Gas Emissions* (Banff, Alberta: Pacific Basin Nuclear Conference, 1998); Greenhouse gas emissions from truck transport are based on 2,757 g CO₂eq/L, from Environment Canada, *Canada’s Greenhouse Gas Inventory: 1990–2002* (Ottawa: Environment Canada, Greenhouse Gas Division, 2004); 233 g CO₂ emissions/km, from Natural Resources Canada, *Energy Use Data Handbook, 1990 and 1995 to 2001* (Ottawa: Natural Resources Canada, 2003); Construction related emissions from Senes Consultants Ltd., *Methods to Assess the Impacts on the Natural Environment of Generation Options* (Richmond Hill: Prepared for the Ontario Power Authority, September 2005), pp.8-12.

⁶⁰ Based on estimate of emissions of 12kg CO₂ equivalent per MWh of electricity and total 2003 nuclear power generation of 70,000,000 MWh. See Ontario Power Authority, *Supply Mix Analysis Report Volume 2* (Toronto: Ontario Power Authority, 2005), Table 2.7.40.

*Radionuclides*⁶¹

A radionuclide is an atom with an unstable nucleus. Radionuclides may occur naturally, but can also be artificially produced.

Four types of radiation are given off by radionuclides: alpha, beta and neutron particles and gamma rays. They are all hazardous, but they differ in their power of penetration. While radioactive elements can give off two or more types of radiation, they generally give off only one.

Alpha particles are positively charged particles. They are the weakest form of ionizing radiation, and can be stopped by a sheet of paper, layer of skin or a few millimetres of air. However, if swallowed or inhaled, alpha particles can be extremely toxic.

Beta particles are fast-moving electrons. They can penetrate paper or skin, and can travel through a few centimetres of human tissue, but can be stopped by a few millimetres of metal.

Neutron particles are highly penetrating particles released by nuclear fission reactions. They can be stopped by thick shields of concrete or water.

Gamma rays are rays of energy somewhat similar to light rays, although they cannot be seen by the naked eye. Gamma rays can penetrate flesh, bone, and metal. It takes one metre of concrete or three metres of water to stop gamma rays.

Radiation loses energy as it passes through matter. The energy is transferred to and excites the atoms of materials it contacts, disturbing the way the material's electrons are arranged or causing the addition or loss of electrons (referred to as "ionizing radiations"). This may cause chemical changes that are harmful to living cells. Even small amounts of radiation can affect the chemistry of healthy cells, causing them to grow in an uncontrolled manner, producing a cancer. Alternatively their genetic structure may be altered, resulting in mutations in future generations. There is strong evidence that radiation has harsher effects on fetuses and young children than on adults.

The hazard to life and health depends on the length of exposure time, the amount of energy emitted by the radiation, and its ability to penetrate body tissues. Short-term exposure to very high levels of radiation can cause burns and even death. The most penetrating form of radiation - gamma radiation - is most hazardous externally. Alpha and beta radiation can do less harm externally, but are extremely dangerous if inhaled or ingested and absorbed into particularly sensitive parts of the body, such as bone marrow.

⁶¹ Summary of health risks associated with radionuclides adapted from N. Lester, "Radiation" in J. Swaigen and D. Estrin (Eds.), *Environment on Trial: A Guidebook to Ontario Environmental Law and Policy* (Toronto: Emond-Montgomery Publishers and Canadian Institute for Environmental Law and Policy, 1993) pp. 672–673; and Nuclear Waste Management Organization (NWMO), *Asking the Right Questions: The Future of Canada's Used Nuclear Fuel* (Toronto: NWMO, 2003), p.28.

The danger also depends on how quickly the radioactive material decays. Radionuclides with short half-lives release more energy in a shorter time than those with longer half-lives, causing more immediate chemical and biological changes. Radionuclides with long half-lives emit energy at a lower rate, but can be of more concern than those with short half-lives as they may persist over extremely long time periods - up to millions of years.

The International Agency for Research on Cancer (IARC) lists a number of radionuclides as carcinogenic to human beings, including isotopes produced in uranium mining and milling, fuel production and nuclear power plant operations.⁶² More broadly, recent research on the effects of even very low levels of ionizing radiation suggests that no level is safe to health.⁶³ The risk of cancer has been found to be greatest for women and children and to be higher for younger children.⁶⁴

Atmospheric releases of a range of radionuclides occur at all stages of nuclear power production. Atmospheric releases of radon gas occur as a result of mining and milling operations and from tailings management facilities.⁶⁵ Windblown dust from mine sites and tailings management facilities contains a range of radionuclides (e.g. uranium, Ra-226, Pb-210, and Po-210).⁶⁶ Atmospheric releases (principally uranium) arise from refining and conversion activities.⁶⁷ Routine and accidental releases of radiation and radionuclides occur from power plant operations, including tritium oxide, carbon-14, noble gases, iodine-131, radioactive particulate and elemental tritium.⁶⁸ The incineration of low and intermediate-level radioactive wastes from nuclear power plant operations and maintenance in Ontario has resulted in further atmospheric releases of radionuclides, particularly tritium.⁶⁹

Hazardous air pollutants

Windblown dust from mine sites and tailings management facilities contains a range of heavy metals. In addition, releases of a number of hazardous air pollutants, including dioxins and furans, hexachlorobenzene, heavy metals (principally lead) ammonia and hydrogen fluoride arise from uranium refining and conversion operations.⁷⁰ Dioxins and

⁶² See <<http://monographs.iarc.fr/ENG/Classification/crthgr01.php>>.

⁶³ See <<http://www.nuclearactive.org/news/070605.html>>.

⁶⁴ Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation, *Health Risks from Exposure to Low Levels of Ionizing Radiation (BEIR VII)* (Washington: The National Academy Press, 2005).

⁶⁵ United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), *Sources and Effects of Ionizing Radiation*, Annex C: Exposures to the Public from Man-made Sources of Radiation (New York: Report to the General Assembly, 2000), accessed at <http://www.unscear.org/unscear/en/publications/2000_2.html>.

⁶⁶ Environment Canada, Priority Substances List Assessment Report. Releases of Radionuclides from Nuclear Facilities (Impact on Non-human Biota), p.8.

⁶⁷ See Cameco Corporation and Zircotec Precision Industries compliance reports.

⁶⁸ CNSC, *Radioactive Release Data from Nuclear Generating Stations 1994–2003, INFO-0210 (Revision 12)* (Ottawa: CNSC, January 2005), accessed at <http://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/I0210r12_e.pdf>.

⁶⁹ Ontario Power Generation, Response to Access to Information Request 060019 (August 28, 2006).

⁷⁰ Environment Canada National Pollutant Release Inventory Data, obtained through on-line searches, accessed at <http://www.ec.gc.ca/pdb/query-comm/community_portal_e.cfm>.

furans, hexachlorobenzene, lead, and ammonia are all classified as “toxic” substances for the purposes of the *Canadian Environmental Protection Act*.⁷¹ Ontario nuclear power plants are the only National Pollution Release Inventory (NPRI) reported source of releases of hydrazine, an extremely hazardous pollutant, to the air in Canada.⁷² A wide range of hazardous air pollutants have been released to the atmosphere as a result of the incineration of low and intermediate-level radioactive wastes at the Bruce Western Waste Management facility.⁷³ Major historical releases (up to 2,000 tonnes per year) of hydrogen sulphide (H₂S) were associated with heavy water production in Canada for CANDU reactors.⁷⁴

Criteria air pollutants

Criteria air pollutants include sulphur dioxides (SO_x), nitrogen oxides (NO_x), particulate matter (PM) and volatile organic compounds (VOCs). SO_x and NO_x are important precursors for acid rain and smog. PM less than 10 µm in diameter is commonly referred to as inhalable or thoracic particles as it can penetrate into the thoracic compartment of the human respiratory tract. Such particles are known to cause human health impacts. In addition, particles 10 µm in diameter and smaller can scatter light and therefore generate atmospheric haze. SO_x, NO_x, respirable PM, and PM containing metals from certain sources are classified as toxic substances for the purposes of the *Canadian Environmental Protection Act*.⁷⁵

Mining and milling operations are major sources of releases of sulphur dioxide (SO₂) (43,000 tonnes per year from the Rabbit Lake Acid plant alone), VOCs (500 tonnes per year) and NO_x (400 tonnes per year).⁷⁶ Additional releases of NO_x, PM, and sulphuric acid arise from refining and conversion activities.⁷⁷ Road transportation of uranium from mill sites in northern Saskatchewan to the Blind River refinery in Ontario, and then on to the Port Hope conversion facilities in Ontario, result in additional emissions, particularly of nitrogen oxides and particulate matter.⁷⁸ Minor releases of criteria air pollutants are associated with the testing of fossil fuel-powered emergency generating equipment at nuclear generating facilities.⁷⁹ Further transportation-related releases of criteria air

⁷¹ *Canadian Environmental Protection Act, 1999*, Schedule 1.

⁷² Environment Canada National Pollutant Release Inventory Data, obtained through on-line searches, accessed at <http://www.ec.gc.ca/pdb/query-comm/community_portal_e.cfm>.

⁷³ Ontario Power Generation, Response to Access to Information Request 060019 (August 28, 2006).

⁷⁴ Joy Parr, 2005. “Smells Like? Sources of Uncertainty in the History of an Environment”, accessed at <<http://publish.uwo.ca/~jpart/ParrEHRevApril05.htm>>.

⁷⁵ *Canadian Environmental Protection Act, 1999*, Schedule 1.

⁷⁶ Cameco Corporation, *Rabbit Lake Mine Annual Report, 2004*, using Air Quality data found in Section 4 on page 4-1 for sulphur dioxide air-stack monitoring. Also see data from Environment Canada National Pollutant Release Inventory Data, obtained through on-line searches, accessed at <http://www.ec.gc.ca/pdb/query-comm/community_portal_e.cfm>.

⁷⁷ Data from Environment Canada National Pollutant Release Inventory Data, obtained through on-line searches, accessed at <http://www.ec.gc.ca/pdb/query-comm/community_portal_e.cfm>.

⁷⁸ Emissions associated with transportation were estimated using United States Environmental Protection Agency emissions factors. US Environmental Protection Agency, “Emission Facts: Average In-Use Emissions from Heavy-Duty Trucks.”

⁷⁹ B. Lionel, (OPG), “Sources of NPRI Releases from OPG’s Nuclear Generation Stations,” personal communication (2005).

pollutants would arise from the long-term management of waste nuclear fuel and other radioactive wastes arising from facility operations, maintenance and decommissioning, particularly if the management strategies for these materials require the movement of wastes from reactor sites to centralized facilities.

Nuclear is subject to “stable fuel prices”

As noted above in the section on affordability, the price of uranium has increased since 2001 by a factor of more than six, from \$US15.98 per kg U₃O₈ to \$US104.72 per kg in July 2006.⁸⁰ This evidence is set out in Graph 1 above. Globally, uranium forecasts to 2008 indicate a shortage as demand outstrips supply, leading to continuing price increases.⁸¹

IV. CONCLUSIONS

In summary, the available evidence shows that nuclear power generation is neither “clean,” “reliable” nor “affordable.” It is also apparent that nuclear power generation creates greenhouse gas emissions and is a contributor to air pollution.

In the face of this, Canadian Nuclear Association’s claims are materially misleading. The Canadian Nuclear Association’s purpose for disseminating misleading information concerning nuclear power generation is clear - to ensure the development and refurbishment of nuclear power generation facilities in Ontario.

Among other things, an expanded role for nuclear power will reduce opportunities for the development of low-impact renewable energy sources. This is not only a product of the reduction of the available market for electricity supplies, but also as a result of competition for transmission resources.⁸²

The Applicants believe that Canadian Nuclear Association enables and is attempting to achieve the foregoing goals by misrepresenting the dangers and adverse effects of nuclear power generation to the Canadian public and as a result is significantly hindering the competitive position of non-nuclear energy suppliers in Canada.

⁸⁰ The Ux Consulting Company, LLC, accessed at <<http://www.uxc.com>>.

⁸¹ Morgan Stanley Equity Research, 2005. “Metals and Mining: Global Insights”, accessed at <<http://www.alberta-star.com/morganstanley.pdf>>.

⁸² See for example, T. Hamilton, “Ontario faces \$1 billion hit on Bruce project,” *The Toronto Star*, (November 10, 2006).