



**RNAO Submission to the Joint
Review Panel**

**Darlington New Nuclear Power
Plant Project**

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Introduction

Thank you for the opportunity to make a submission to the Joint Review Panel on the proposal by Ontario Power Generation (OPG) for site preparation, construction, operation, decommissioning and abandonment of up to four new nuclear reactors at the existing Darlington Nuclear site on the north shore of Lake Ontario. The Registered Nurses' Association of Ontario (RNAO) is the professional organization representing registered nurses in Ontario. It is the strong, credible voice leading the nursing profession to influence and promote healthy public policy. Like many Ontarians, registered nurses have become increasingly concerned about the staggering health, environmental and economic costs of nuclear power, particularly as safer and more affordable alternatives become available. It is on these areas that the RNAO will focus its submission.

As Peter Lyons, former Commissioner of the United States Nuclear Regulatory Commission stated recently, nuclear industry plans to build new nuclear plants depend directly on continued public assurance of safe and secure operations of existing nuclear facilities.¹ This is true in Canada as it is in the US and elsewhere in the world where similar plans are being evaluated. It is the strongly held view of the RNAO that the proponent has failed to meet the onus of proving current plans are completely safe. Consequently, in the absence of the requisite public assurance, the OPG proposal for a massive expansion of four new nuclear reactors is premature.

Justification and Need for Project

OPG's proposal would generate up to 4,800 megawatts of electricity at the Darlington nuclear site in Clarington, not far from heavily populated areas of Oshawa, Durham region and Toronto. This is more than double the additional nuclear capacity that even the government of Ontario projects as necessary or justifiable. In fact, the Ontario government has no plans – short term or long term – to build four new nuclear reactors. Ontario's Long-Term Energy Plan from 2010 to 2030 projects the need to refurbish 10,000 MW of existing nuclear capacity over the next ten to 15 years, none of which requires new nuclear construction. To achieve the province's objective of nuclear power playing an ongoing central role in Ontario's energy mix, responsible for 50 per cent of the energy supply, a total nuclear capacity of 12,000 MW is projected.² It is only the difference between this total (12,000 MW) and the capacity currently available from refurbishment (10,000 MW) that is required from new nuclear at Darlington. Using the government's own figures then, only 2,000 MW³ would need to be produced by new construction, a far cry from the 4,800 MW in the proposal now before the Joint Review Panel.

Construction of new nuclear facilities involves a significant lead time and this fact is recognized by Ontario's Long-Term Energy Plan. Nevertheless, the government does not claim a need for 4,800 MW capacity over the long-term planning period. What justifies the inflated proposal? Expediency is no answer to a project as inherently risky, expensive and controversial as a nuclear

power plant. Scientific knowledge that may purportedly support certain conclusions in 2011 will operate in a totally different context in 2030 and beyond as technological advances with respect to cheaper, safer and more effective energy sources are likely to leap far ahead of today's imagining. There is no adequate justification for the request for four new nuclear reactors. OPG is asking the public to buy a "pig in a poke" as nobody knows what the state of science will be in 20 years.

Ontario initiated a two-phase competitive bidding process in March 2008 to select a vendor to build two new nuclear units at the Darlington site. While bids were received from three potential vendors, Atomic Energy of Canada Limited (AECL) emerged as the only compliant bidder in the process. However, AECL's bid was higher than what the province was willing to pay. During negotiations between AECL and the provincial government, the federal government indicated its desire to sell AECL. Due to the consequent uncertainty over AECL's future and the province's procurement process, Ontario suspended the request for proposals process in June 2009.

While the Ontario government hopes that its federal counterpart will restructure AECL in a way that would favour a deal between Ontario and AECL, there is no reason to believe this will occur in the foreseeable future.⁴ Not only is the province's need for 4,800 MW of new nuclear-generated power unproven and highly questionable, but there currently is no vendor and no concomitant nuclear technology in the proposal now before the Panel. In effect, OPG is asking the Panel and the public to give it a blank cheque for a project whose cost will be in the tens of billions of dollars. RNAO believes the people of Canada deserve better than this. Former U.S. Nuclear Regulatory Commissioner Peter Lyons is very clear in admonishing the nuclear industry to ensure that all new applications for nuclear reactors are "fully complete and of high quality", essential to ensure regulatory predictability.⁵ Send OPG back to the drawing board until some of the essential pieces to the puzzle are ready to be made public.

Application of the Precautionary Principle

Given the seriousness of consequences of environmental pollution, it is important to take a precautionary approach to protecting human health and the environment. A commonly accepted statement of the precautionary principle is: "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof. The process of applying the precautionary principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action."⁶

Vakil et al cite a long list of hazardous products that were once considered safe, such as cigarettes, DDT, thalidomide and various food additives, and suggest that the precautionary principle should dictate that radiation be added to the list until such time as a safe dose of radiation exposure can be demonstrated.⁷

There is, in fact, an argument to be made that a greater burden should apply to policy decisions concerning an application for new nuclear reactors. Dingwall et al suggest that where nuclear

radiation safety is concerned, public perception and attitudes have an important influence over the safety of radiation at the *political* level. Not only must the people be safe, but they must also *feel* safe. As they advise: “The need to engage the public about radiation and its safety in a non-condescending manner is essential. People do not change their perception of radiation by being told they are wrong; the change in perception can only take place by having educational conversations regarding radiation and its safety.”⁸ No action must be considered a viable and, in the case of nuclear radiation, a preferred option until public safety is assured both in fact and in perception.

Harm to Health and Environment

While the government counts nuclear power as being part of the more than 80 per cent of power generation resulting from emissions-free sources in 2009⁹, this is misleading. During “production” of electricity, nuclear power may not emit pollutants as defined by Environment Canada.¹⁰ But nuclear energy certainly produces more than its share of climate change-causing greenhouse gas emissions during nuclear power plant construction, uranium mining and refining, transportation and fuel fabrication.

Most alarming, a recent study points out that there is no safe level of radiation exposure – any amount of exposure to ionizing radiation is too much and is harmful.¹¹ Further, the health risks associated with radiation arise at all stages of the nuclear fuel chain, from uranium mining and refining, to the fission process in nuclear reactors and radioactive releases into the air and water, to the legacy of radioactive waste that we leave for our grandchildren and future generations.¹²

In the over 50 years of nuclear power generation in Ontario, a permanent solution has yet to be found for the disposal of nuclear waste. At the Pickering nuclear power station alone, 20,000 tonnes of highly radioactive waste has already been produced and is being stored at site, with no foreseeable solution.¹³

Talk of new nuclear generating stations being built in Ontario has stirred a great deal of interest in uranium prospecting and mining, providing itself reasons to be concerned about the impact of this proposal on environmental and human health. Uranium mining has been called “potentially the most contaminating stage of nuclear power generation”¹⁴ thanks to the large amounts of radioactive dust and tailings and radon gas that is produced.

Studies have linked human-produced radiation with cancers, genetic damage, birth defects, mental retardation due to in utero exposure, immune system dysfunction and diabetes.¹⁵ There is the fear of the large-scale accident or meltdown that has made Three Mile Island and Chernobyl part of the common lexicon. But the real danger of radiation may well prove to be the chronic low-level exposures the effects of which are poorly understood, particularly in children.¹⁶ If for no other reason, this cries out for application of the precautionary principle. As Vakil et al conclude: “Providing the least radioactivity in the environment, water and food seem the most prudent advice”.¹⁷

While there are relatively few Canadian studies on the deleterious effects of low levels of radiation on health, there is evidence linking increased prevalence of leukemia in children and living near nuclear facilities. Higher rates of congenital abnormalities have also been documented. A 2008 German study (KiKK study) showed a statistically significant relationship between risk of leukemia and living within ten kilometres of a nuclear plant with consistent results across all 16 nuclear power plants in Germany.¹⁸

While not definitive evidence linking nuclear reactors and harm to human health because of small sample sizes, three studies conducted by the Atomic Energy Control Board (AECB) in Ontario provide reason for concern. Two of the studies in 1989 and 1991 examined childhood leukemia within a 25 km radius of nuclear facilities in Ontario, including the Chalk River research centre, the Port Hope uranium processing plant, Elliot Lake uranium mining and Pickering and Bruce electricity generation. The third study looked at childhood leukemia and paternal radiation exposure. In the initial studies, more cases of childhood leukemia were consistently found at each location except Chalk River, though the overall numbers were small. Though the authors conclude that the findings justify further investigation, a larger case-control study has not yet been done in Canada.¹⁹ Proponents of nuclear power should not take heart from the inconclusive findings of these Ontario-based studies. Rather, they point to the clear need to apply the precautionary principle. Further study of the health effects of nuclear facilities in close proximity to heavily populated areas must be conducted before decisions are taken to expose those areas further to risk of nuclear radiation.

Peter Lyons, former Commissioner of the U.S. Nuclear Regulatory Commission recognizes that “no aspect of nuclear technologies causes greater public apprehension than the health effects of radiation”. He recognizes that while the scientific basis for the most precautionary approach – the use of the linear no-threshold (LNT) or any other no-threshold model – may be lacking, it arguably remains the most appropriate model for the current time. Under the LNT model, cancer risk at low doses can be extrapolated from the risk observed at higher doses. This assumes that risk per dose is constant and there is no safe threshold.²⁰ While some believe that risk is negligible at low doses and that cells can learn to adapt to and benefit from radiation,²¹ it is prudent to apply the LNT model until we have better knowledge and data establishes the safety of low doses of radiation.²²

Ontario now has safe and clean alternatives to the unacceptable health risks of nuclear power. It is time to invoke the precautionary principle and phase out Ontario’s dependence on nuclear power.

Tritium is a toxic material

Canada’s CANDU (Canada Deuterium Uranium) nuclear reactors use heavy water (deuterium oxide) as a coolant to avoid the buildup of excessive heat. Deuterium easily converts to tritium by absorbing a neutron. Therefore, Canadian reactors produce much greater amounts of tritium than reactors that use light water.²³

There is concern among health professionals about the level of protection that Ontario’s drinking water quality standards provide against tritium, a radioactive isotope of hydrogen with a half-life of

12.3 years.²⁴ This persistent toxic substance moves quickly through the environment once it is released, and is not readily removed from drinking water, so reducing or stopping releases is the most practical way to control tritium exposure. The Canadian Nuclear Safety Commission recognizes tritium as a risk to human health when it is ingested in drinking water or food, or when it is inhaled or absorbed through the skin.²⁵ Like other radionuclides, tritium emits ionizing radiation when in the body, and this radiation has been shown to be a teratogen, mutagen and carcinogen.²⁶ Vakil et al point to reported intentional releases of tritium from the Chalk River nuclear facility where tritium levels in the Ottawa River did not exceed allegedly “safe” limits. Even small amounts of a carcinogenic, mutagenic and teratogenic substance such as tritium could still be concluded to represent an unacceptable risk when released into the water supply.²⁷ The isotope tritium occurs naturally, but it is also known to have been released into the environment in large quantities by Ontario’s nuclear reactors. Depending upon the comparator, heavy water reactors have been estimated to release from over 20 times to over 100 times as much tritium per unit of energy produced (compared to pressurized water reactors and boiling water reactors respectively).²⁸ By one estimate, in the first half of this decade, major Canadian nuclear facilities were releasing amounts of tritium equaling about ten per cent of natural production of tritium in the Northern hemisphere.²⁹ The majority of the releases come from Ontario reactors, and the impact will be greatest near nuclear facilities.

A 1991 study looked at birth defects within 25 km of the Pickering nuclear station from 1971 to 1988 and compared them with airborne and waterborne tritium discharges over that period. While the study found a statistically significant increase in Down syndrome babies born near Pickering and a correlation with tritium discharges, the latter relationship fell short of being statistically significant.³⁰ Nevertheless, the higher rates of Down syndrome are eerily reminiscent of similar findings with Chernobyl survivors³¹ and suggest that more study is needed before massively increasing tritium-releasing CANDU reactors at Darlington.

The full impact on human health of a substance like tritium is complex and not fully understood: there are multiple health endpoints (and not just cancer mortality); the exposed population is diverse, with many who are vulnerable due to compromised immune systems or due to their stage of development (such as young children and pregnant women); the interaction of chemicals and radioactive nuclides alters health effects; the mechanisms of health impacts are complex; and, multiple forms of tritium enter the body (elemental tritium, tritiated water, and organically bound tritium

It is essential that there be rigorous studies of the health impacts of tritium exposure immediately.

Economically Unsustainable

There are other reasons not to dramatically increase nuclear power in Ontario. Nuclear power is prohibitively expensive. While the government itself is budgeting \$33 billion for its nuclear plans, which alone would elbow out other more cost-efficient and environmentally sound investments, the track record of nuclear projects is not impressive. Every nuclear project in Ontario has gone considerably over-budget, on average about 2.5 times.³² This means the actual

bill for the government's nuclear plans could total up to \$83 billion.³³ Ontarians concerned about their rising hydro bills are still paying for the huge cost overruns from reactors built decades ago. Compare nuclear plants, where there is no protection for consumers, with renewable energy where Ontario's feed-in tariff guarantees that only the cost of electricity generated is passed along to Ontarians and the cost of overruns and unforeseen liabilities is borne by the developer.³⁴

As the government manages through a fragile economic recovery, it is understandable that the prospect of losing jobs in the nuclear industry would deter pulling the plug on nuclear power. In fact, replacing aging nuclear power plants with green energy means additional, well-paying jobs. *Renewable is Doable: Ontario's Green Energy Plan 2.0* provides details of a diverse green jobs portfolio totalling an additional 27,000 jobs over ten years to produce the equivalent of the aging Pickering A and B nuclear power plants.³⁵ That compares favourably with the 25,000 jobs that the Canadian Manufacturers and Exporters projects will be created from refurbishing and operating the Bruce and Darlington reactors.³⁶

Add this to the uncertainties around the ownership of AECL, where there is a lack of credible buyers,³⁷ and the fact that designs for reactors being considered by the government are untested,³⁸ and the economic rationale for moving beyond nuclear power to cleaner energy sources becomes overwhelming.

There is a note of hope in the government's long-term energy plan that the door is not closed to phasing out the Pickering generators ahead of schedule. Continued operation of the Pickering nuclear units will be monitored closely, with a decision expected in 2012 on extending their lives or, alternatively, converting the Nanticoke and Lambton coal plants to natural gas to ensure system reliability.³⁹ If government is looking seriously at the future of Pickering, it makes no sense to be investing added billions to building new reactors at Darlington. RNAO strongly suggests that every alternative to the nuclear plants must be explored at the earliest opportunity before making new ill-advised investments in new nuclear power.

Safer and More Cost-Effective Alternatives

Renewable is Doable: Ontario's Green Energy Plan 2.0, a detailed study released in August 2010, concludes that we have the opportunity to replace Ontario's aging nuclear plants not with new nuclear stations, but with the range of green energy options that are increasingly available to us.⁴⁰ With demand having fallen each of the last four years (part of which undoubtedly has been due to the recession), coal being phased out by 2014, renewable energy sources producing more than originally expected, and the natural gas capacity that ensures the lights stay on during the transition already in place, now is the time to develop a 21st century clean and safe energy plan, not one that is rooted in the practices of the past century.⁴¹ It is this visionary, yet achievable, approach that the RNAO strongly recommends. In fact, failure to move in this direction would make Ontario an outlier jurisdiction. As the United Nations reported in 2008, for the first time global investment in clean, renewable energy exceeded new nuclear, coal and natural gas combined, a trend that was even more pronounced in 2009.⁴²

Wind, in particular, when properly sited, has huge potential to deliver clean, plentiful and relatively affordable power; it is estimated that wind will meet at least 20 per cent of Canada's power needs by 2025, up from the current one per cent.⁴³ Aggressive targets must be adopted for conservation and energy efficiency. Combined heat and power, in addition to renewable solar, geothermal, tidal and bio energy, must be priorities in planning, regulation, procurement and operation.⁴⁴

There is tremendous potential to create new jobs by expanding clean, green sources of energy such as wind, water, solar, biomass and biogas as well as investing in conservation. In fact, implementation of the *Green Energy and Green Economy Act, 2009* is credited by some for attracting more than \$16 billion in private sector investment to Ontario and creating more than 50,000 clean energy jobs over three years.⁴⁵

Conclusion

As health care professionals who practice in all sectors, nurses are profoundly concerned by the proposal to spend billions of dollars in a massive expansion of Ontario's nuclear energy capacity in the absence of convincing evidence that viable, cost-effective and safer alternatives do not exist. There is no demonstrated need for the scale of the Darlington expansion in the province's long-term energy plan. There are no definitive studies showing there is no risk of harm to human health posed by low levels of radiation, including the releases of tritium that are endemic to CANDU reactors. Application of the precautionary principle, and good common sense, compels the conclusion that OPG's proposed construction of four new nuclear reactors at Darlington must be rejected.

RNAO Recommendation:

- Deny Ontario Power Generation's application to build four new nuclear reactors at Darlington on the basis that the need for 4,800 MW in additional nuclear energy has not been justified, details of the vendor and technology are unavailable or not made transparent, the potential risk to human health and the environment is too great and the economic cost is unsustainable.
- Invest in more cost-effective and safe alternatives such as conservation, energy efficiency and renewable energy sources

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³ Ibid, 24.

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- ¹² Ibid, 5.
- ¹³ T. Weis, S. Stensil and K. Stewart. (2010), *Renewable is Doable: Ontario’s Green Energy Plan 2.0*. Pembina Institute and Greenpeace Canada. Retrieved January 9, 2011 from <http://pubs.pembina.org/reports/ontario-green-energy-report-august-web.pdf>.
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- ¹⁶ Ibid, 4.
- ¹⁷ Ibid, 15.
- ¹⁸ Ibid, 26-27.
- ¹⁹ Ibid, 27-28.
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