



Oral presentation

Submission from the Canadian Nuclear Society

In the Matter of the

Canadian Nuclear Laboratories

Application for the renewal of the Nuclear
Research and Test Establishment Operating
Licence for the Chalk River Laboratories

Commission Public Hearing

January 23-25, 2018

Exposé oral

Mémoire de la Société nucléaire canadienne

À l'égard des

Les Laboratoires Nucléaires Canadiens

Demande de renouvellement du permis
d'exploitation d'établissement de recherche
et d'essais nucléaires pour les Laboratoires
de Chalk River

Audience publique de la Commission

23-25 janvier 2018

**Intervention by the Canadian Nuclear Society (CNS)
Before the Canadian Nuclear Safety Commission (CNSC)**

**Application by Canadian Nuclear Laboratories (CNL)
To renew to April 1, 2018 the operating licence for the Chalk River
Laboratories
(Ref 2018-H-01)**

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Introduction

The Canadian Nuclear Society (CNS) views with great interest the renewal of the operating licence for the Chalk River Laboratories under review today during Day 2 of the hearings by the Canadian Nuclear Safety Commission (CNSC). In this short paper, the CNS will present some perspective on the importance of the Chalk River Laboratories and its central role in nuclear research and development in Canada and in the province of Ontario.

The specific focus of this intervention by the CNS is the renewal of the Chalk River site and the construction of the Near Surface Disposal Facility (NSDF); the CNS will provide specific comments regarding the licensing of the latter when it is subject to review by the Commission.

The licensing of a nuclear facility is not an abstract activity. To operate, all regulated nuclear facilities in Canada must meet the safety performance requirements of the CNSC. However, all regulated nuclear facilities in Canada exist for important educational, commercial, research, or energy supply reasons. This means that licensing decisions have direct research, technical and commercial consequences. It is the purpose of this paper to provide the views of the CNS on the importance of these licensing decisions.

The CNS is Canada's learned society for nuclear science, engineering and associated technology. We are a not-for-profit organization representing more than 1,000 professionals, scientists and other researchers, engineers and other nuclear professionals engaged in various aspects within Canada's nuclear industry. We do not represent any company or other organization within the industry. The CNS believes that the views of Canada's nuclear professionals, as embodied by its learned society, may provide useful assistance to the CNSC in its deliberations.

Nuclear Technology in Canada

Nuclear technology plays an important role in Canada, and it has done so for more than 70 years. Canada was the second nation to demonstrate controlled fission with the startup of the ZEEP reactor at Chalk River Laboratories on September 5, 1945. It was one of the first nations to build a demonstration nuclear power reactor, the NPD reactor at Rolphton, Ontario. With the eight nuclear reactors at Bruce, Canada has the world's largest operating nuclear generating facility.

As a Tier-1 nuclear nation, Canada is one of the very few nations of the world in which all of the following activities take place:

- Design of nuclear reactor technology
- Construction and operation of nuclear power plants
- Uranium mining, fuel fabrication and production
- Medical and industrial isotope production
- Decommissioning, environmental remediation and both high- and low-level, long term waste management
- Full scope nuclear laboratory services and R&D
- Post-secondary nuclear education up to and including doctorate level.

Canada is the second largest producer of commercial uranium in the world, with annual production averaging approximately 10,000 tonnes of uranium consistently over the past 40 years. With the exception of uranium enrichment, it has all of the facilities and technology to provide the full spectrum of uranium supply, both to meet Canada's needs and to supply uranium for nuclear power in other nations as well.

The success of Canada's nuclear reactor technology has been shown by its extensive, safe, and economic operation in Canada. It has also been acquired by a number of other nations as well, including South Korea, Romania, Argentina, and China. In all of these countries, CANDU technology has been shown to be both reliable and economic, providing large quantities of electricity to meet these nations' energy needs. Canada's CANDU technology was also adopted by India and Pakistan, and in the case of India, their heavy water reactor technology is to this day the mainstay of that country's commercial power program.

Canadian Nuclear Research and Development

There are many centres of nuclear research and development across Canada. However, Chalk River Laboratories, operated by Canadian Nuclear Laboratories is the centerpiece of Canada's nuclear research infrastructure. And it has been so since the 1940s, emerging out of various wartime projects such as the Montreal Laboratories. For more than 70 years, Chalk River has been the centre of nuclear development based on its research reactors ZEEP, NRX and NRU. It has been the focus of National Research Council (NRC) nuclear research programs. All this infrastructure has attracted over the decades thousands of experts and their research from across Canada and around the world.

This research has produced many different nuclear related technologies including:

- Canada's CANDU power reactor technology;
- the world's first commercial small modular reactor, the SLOWPOKE;
- medical research and applied technologies using radioisotopes;
- innovation in the development and use of neutron spectroscopy for the study of the internal structure of solid materials;

To this day, Chalk River remains one of the world's largest and most active sites for nuclear research and development.

In 2015, the Government of Canada made the decision that Chalk River Laboratories (CRL) should be retained in public sector ownership but operated by a private management team, the so-called GOCO (government owned, company operated) model. The federal government provided the new management team with its direction as to what was to be achieved with the new organization. In providing funding for CNL, the government stated that its intentions were that the site would be renovated and expanded to new nuclear research and development activities while retaining its capacity to sustain established technology; implicit in that direction was that CNL should decommission and demolish facilities that have no further use.

It should be noted here that CNL's responsibilities are not limited to the Chalk River site but extend to all of the holdings of Atomic Energy of Canada Limited, including Whiteshell Laboratories in Manitoba and now shut down facilities across Canada such as Gentilly 1 in Quebec, and the CANDU prototypes Douglas Point and NPD-2 in Rolphton.

Accordingly, CNL prepared a plan for managing all these facilities tabling the first in 2016. What concerns us today is the large-scale plan for the redevelopment and renewal of Chalk River Laboratories.

Renewal at Chalk River

Since its inception in the late 1940s, the Chalk River site has grown incrementally over the years. This incremental growth took place as the mandate for nuclear research and development grew to the point where over 100 buildings were located at CRL. In addition, CRL was required to accept radioactive waste material from a variety of government and medical sources over the decades.

To comply with the federal Government's requirements, as noted above, CNL prepared its plan for renewal of the site. Instead over a hundred separate buildings and structures, CNL would instead establish a research campus with many fewer and larger buildings better suited to modern research, development and security requirements. CNL, in formulating its plans, both expected and planned for the disposal of the large quantity of low level radioactive waste that would be created by this renovation of Chalk River. This low-level waste would include both new waste material from the demolition of old structures as well as part of the historic waste located for years on the site. The federal government agreed to, and funds the plan tabled by CNL.

It is the observation of the CNS that CRL is indeed in dire need of renovation, and the CNS credits the federal government for acknowledging this and for making available the funding that would be required. The CNS would further observe that research purposes for activities like nuclear are best suited in large

facilities where security of material and protection of workers and the public can be both more effective and more efficient.

The CNS therefore agrees that the federal government acted responsibly in deciding that CRL needed renovation to continue to be effective as a research centre. The CNS also agrees that the management plan developed by CNL to meet the government's objectives was and is sound. The CNS notes that the plan has already begun to take effect with the opening of the new Harriet Brooks Laboratory.

New Technology Development

Two important developments have surfaced for Canadian nuclear science and technology development over the past year. Both of these concern the development of new nuclear power generation technology.

The first is that the CNSC has received seven applications for review of new small modular reactor (SMR) designs. They have approached the CNSC for preliminary approval to confirm that their proposed technology generally meets CNSC expectations for reactor safety performance. All of these designs involve reactor configurations that have not come before any Canadian regulatory body before and involve new nuclear science and engineering.

The CNS observes that one such application has received confirmation by the CNSC that it does indeed conform to such expectations.

The CNS also notes that some of these applications have come from companies outside Canada.

The second development is that during 2017 CNL issued a request for expressions of interest (RFEOI) to those interested in working with CNL for new SMR development. During this fall, CNL indicated that more than 70 such expressions of interest had been made. These included a number of companies interested in exploring the potential of new prototype construction at the Chalk River site.

Again, it should be observed that many of these expressions of interest that CNL has received have come from outside Canada. There are two conclusions here:

1. Interest in new SMR technology is taking place on a global basis;
2. Canada is seen as a preferred location for development of such technology.

There are strong reasons why Canada is being perceived as a preferred location for new technology development:

1. Canada has a strong nuclear regulatory system that is robust and efficient. CNSC requirements are robust and reliable. Its performance-based regulation places the burden of establishing a nuclear technology safety case upon a proponent. This is particularly important for new nuclear technology different from those previously reviewed and accepted by a regulator.
2. Canada has a large, well-established industrial infrastructure capable of meeting the varying requirements for new prototype design and construction. This is a condition not possible in many of the nations around the world which have an interest in new reactor technology.
3. With CNL and the Chalk River site, Canada has a nuclear research and development establishment that has a long-established capability in innovative nuclear technology. At Chalk River, Canada has the capability for new nuclear development up to and including the construction and operation of new nuclear prototype projects.

The CNS notes that this drive for new nuclear technology in the form of small modular reactors is well supported by CNL's long term project to renovate the Chalk River site. Both new technology development and site renovation are long term projects. To succeed, they need long term consistency in the approach taken by the regulatory body.

A 10-year extension of the operating licence for CNL and the Chalk River site is entirely consistent with this need for long term regulatory predictability. For these reasons, the CNS fully supports CNL's request for a 10-year extension of its operating licence

Conclusions

1. The CNS agrees with the government of Canada that CRL needs significant renovation if Canada's nuclear research and development is to continue in its world-leading capability. It further agrees that CNL's plan for site renovation is consistent with and supportive of the development of new nuclear reactor technologies, including SMRs for both Canadian and global energy needs.
2. The CNS agrees that the regulatory regime of the CNSC and the capabilities of CNL provide an ideal basis for the development of new nuclear technologies, including SMR technology, in Canada. This is particularly the case when considering the long history of successful new technology development at Chalk River in a wide range of nuclear technology applications.
3. The CNS supports strongly the development of new small modular reactor technology in Canada.
4. The CNS therefore supports CNL's request for an operating licence from the CNSC for a 10-year duration.