Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

CMD 26-H100.8

Date: 2026-06-17

Written Submission from the Radiation Safety Institute of Canada

Mémoire de l’ Institut de radioprotection du Canada

In the matter of the

À l’égard des

Canadian Nuclear Laboratories

Laboratoires Nucléaires Canadiens

Application to amend the licence and licensing basis for the Gentilly-1 Waste Facility

Demande concernant la modification de leur permis et du fondement d’autorisation pour l’installation de gestion des déchets de Gentilly-1

Hearing in writing based on written submissions

Audience par écrit fondée sur des mémoires

July 2026

Juillet 2026

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Canada

Radiation Safety Institute of Canada
Institut de radioprotection du Canada

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Review of Canadian Nuclear Laboratories Application to Amend its CNSC Licence for its Operations at the Gentilly-1 site

for

Canadian Nuclear Safety Commission

(Reference: Form number: *PFP 2025 G1-01*)

by

Radiation Safety Institute of Canada

Report Date: 17 June 2026

Submitted to:

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1 Introduction

1.1 About the Radiation Safety Institute of Canada

Founded in 1980, the Radiation Safety Institute of Canada (RSIC) is an independent, national organization dedicated to promoting and advancing radiation safety in the workplace, in the environment, and in the community. Our commitment to the principle of "good science in plain language"® underpins everything we do. The Radiation Safety Institute of Canada is incorporated under federal statute as a not-for-profit corporation and is also a registered charity (number: 106861511RR001).

The Radiation Safety Institute of Canada offers a broad range of educational, technical, and scientific services to businesses, government organizations, health care providers, communities, and individuals across Canada and around the world. The Institute is known for the high quality and scientific integrity of its work, and the practical and helpful assistance of its staff. The Institute's independent information service receives hundreds of calls and e-mails every year, for information and assistance on workplace radiation questions.

1.2 Project

The *Radiation Safety Institute of Canada* (Institute) applied for and is to receive funding through CNSC's Participant Funding Program (PFP). This funding is intended to assist in the review of Canadian Nuclear Laboratories' (CNL's) application to amend its "***Waste Facility Decommissioning Licence, Gentilly-1 Waste Facility, WFDL-W4-331.00/2034*** *to proceed with execution of decommissioning involving the removal of all buildings and structures from the Gentilly-1 Waste Facility (G1WF) site*". The Institute agreed to review CNL's application and associated documents, including CNSC and CNL Commission Member Documents and provide comments on RSIC's areas of interest.

This document summarizes the findings and recommendations for the Commission.

1.3 Background:

CNL provides information to the public about its Gentilly- Waste Facility related work at the following website:

Gentilly-1 Decommissioning Project - Canadian Nuclear Laboratories

Gentilly-1 (G1WF) is a decommissioned 250 MWe prototype CANDU boiling water reactor located at Bécancour, Québec, on the south bank of the St. Lawrence River. It has been in storage with surveillance since 1986. The proposed amendment would authorize Phase 3, which involves active decommissioning and demolition of all AECL-owned structures, including the reactor building (calandria, bioshield, dome, and containment), portions of the service

building, the turbine building, and the spent fuel canister area. The projected timeline for the work is 2026 to 2035.

2 Review of Documentation Related to Licence Application

The Institute downloaded the following files from the related CNSC website (Download hearing documents) on 3 May 2026:

Published on May 5, 2026
- CNSC Staff's Review – CNL's Request for Confidentiality in relation to the Application - CMD 26-H100 (PDF, 5 pages, 363 KB)

Published on April 23, 2026
- Revised Application from Canadian Nuclear Laboratories Ltd. regarding the request to amend the Licence and the Licensing Basis for Gentilly -1 Waste Facility (PDF, 24 pages, 922 KB)
- Canadian Nuclear Laboratories Ltd. – Reference - Gentilly-1 Waste Facility Decommissioning Public Communications Supplementary Report (2023 January-2026 February) (PDF, 43 pages, 1.57 MB)
- Canadian Nuclear Laboratories Ltd. – Reference - Gentilly-1 Waste Facility Decommissioning Indigenous Communications Supplementary Report (2023 January-2026 February) (PDF, 49 pages, 3.32 MB)
- Canadian Nuclear Laboratories Ltd. – Reference - Gentilly-1 Waste Facility Licence Amendment Application Environmental Protection Measures for Decommissioning and Demolition) (PDF, 246 pages, 21.4 MB)
- Canadian Nuclear Laboratories Ltd. – Reference - Gentilly-1 Waste Facility Detailed Decommissioning Plan Volume 1 Program Overview (PDF, 164 pages, 5.14 MB)
- Canadian Nuclear Laboratories Ltd. – Reference - Gentilly-1 Waste Facility Detailed Decommissioning Plan Volume 1 Program Overview – Addendum (PDF, 31 pages, 386 KB)
- Canadian Nuclear Laboratories Ltd. – Reference - Environmental Risk Assessment for Gentilly-1 Waste Facility (PDF, 97 pages, 5.30 MB)

Published on April 20, 2026
- CMD 26-H100 – Submission from CNSC Staff – Canadian Nuclear Laboratories Ltd. Request to Amend the Licence and the Licensing Basis for Gentilly -1 Waste Facility (PDF, 220 pages, 6.16 MB)

Published on April 14, 2026
- CMD 26-H100.2 - Submission from the Concerned Citizens of Renfrew County and Area (PDF, 5 pages, 389 KB)

Published on May 13, 2025
- CMD 26-H100 - Notice of Hearing in Writing and Participant Funding – Canadian Nuclear Laboratories Ltd. Request to Amend the Licence and the Licensing Basis for Gentilly-1 Waste Facility (PDF, 3 pages, 100 KB)

Published on May 1, 2025
- Canadian Nuclear Laboratories - Request to Amend the Licence and the Licensing Basis for Gentilly-1 Waste Facility (PDF, 25 pages, 549 KB)

2.1 Risks to Workers

This is the category of most significant credible risk identified across the documents.

Radiological exposure is the primary concern. The reactor building contains the calandria and bioshield, which are the most heavily contaminated structures on the site. Workers involved in Planning Envelope B (the reactor building clear-out, approximately 2027–2034) will operate in

radiologically hazardous environments. CNL commits to implementing ALARA (As Low as Reasonably Achievable) principles, individual dose control points, radiation work assessments, and engineering controls. CNSC staff confirm that the maximum annual individual dose during the surveillance period (2019–2024) was only 0.36 mSv (i.e., well below regulatory limits). However, this is under the much less active "storage-with-surveillance" conditions. Demolition and dismantlement will significantly increase the potential for radiological exposure.

The detailed decommissioning safety analyses that will govern worker doses in Phase 3 have not yet been completed. CNL is only committing to produce these in forthcoming Detailed Decommissioning Plans (DDPs) for Planning Envelopes A and B, which will be reviewed by CNSC staff before work commences. This is a staged approach, and CNSC staff acknowledge that DDP acceptance is a precondition for commencing work. However, it means that at the time of licence issuance, the full dose estimates and associated worker protection measures for the most radiologically significant work (the reactor building) have not been independently reviewed.

Conventional occupational health and safety risks during active demolition (e.g., crane operations, structural collapse potential, confined space work, heavy equipment, asbestos and other hazardous building materials) are inherent to any large-scale industrial demolition. CNL references its Occupational Safety and Health Functional Support Area and the National Building Code/Fire Code, but CNSC staff indicate this SCA is "not impacted" by the application, meaning no enhanced programs are deemed necessary. While conventional occupational health and safety is not the primary focus of the RSIC, it does intersect with radiation protection and if not managed properly can result in elevated doses. Given the unprecedented scale and radiological complexity of the reactor building demolition, it is not clear to this reviewer that CNSC staff's assessment is correct.

Intermediate-level waste (ILW) handling poses specific risks. CNL estimates approximately 260 m^3 of concrete ILW and 371 metric tons of ILW from mechanical/electrical components, rebar, and structural steel will be generated. Workers managing, packaging, and transferring this material are exposed to radiation during the work and are likely to receive a measurable dose. The absence of a permanent ILW disposal facility in Canada is an additional complicating factor, as waste must be transported to interim storage at Chalk River Laboratories.

2.2 Risks to the Public

CNSC staff and CNL both conclude there is no predicted significant effect on public health, and the CNSC's Independent Environmental Monitoring Program (IEMP) confirms that nuclear

substance levels around the site are below all applicable guidelines. The public dose contribution from G1WF is described as negligible. This is reassuring.

However, risks to the public during decommissioning would include:

Airborne radioactive dust and particulates: During demolition, particularly during the demolition of the reactor building, contaminated dust may be created. CNL proposes mitigation through wetting techniques, containment, HEPA filtration, limiting activities during high winds, and radiological/non-radiological dust monitoring. These are standard and credible controls, but their effectiveness depends heavily on implementation quality and environmental conditions. The site is adjacent to the St. Lawrence River in a region with variable weather conditions.

Transport risks: Significant quantities of low-level and intermediate-level radioactive waste will be transported by road from Bécancour to Chalk River, approximately 500 km. CNL asserts compliance with Transport of Dangerous Goods Regulations and the Packaging and Transport of Nuclear Substances Regulations. This is an ongoing and authorized activity, but the volumes generated by Phase 3 will substantially exceed what has historically moved from the site, resulting in elevated risk from transport activities.

Groundwater: CNSC staff note that no groundwater protection or monitoring program is currently required because there are no planned effluents with adverse groundwater potential. However, they also note that a re-evaluation will be needed before the site's existing sump system is decommissioned. If the sump system that currently collects potentially contaminated liquid is removed before groundwater monitoring is in place, there is a pathway for undetected contamination. The proximity to the St. Lawrence River makes this a matter deserving close attention.

Noise and non-radiological impacts: These potential impacts on the surrounding community are acknowledged, with CNL committing to mitigation (major activities in daytime only, muffled equipment, keeping the loudest activities inside the building envelope). These are standard and proportionate.

2.3 Risks to the Environment

The overall regulatory assessment, which is supported by the environmental risk assessment, the federal lands assessment under the Impact Assessment Act, and expert input from Environment and Climate Change Canada, Health Canada, and Fisheries and Oceans, concludes

that significant adverse environmental effects are “not likely”. This conclusion is well-supported for baseline conditions but warrants some caveats:

Proximity to the St. Lawrence River: The positioning of the facility near the St. Lawrence River poses the most significant environmental sensitivity. The river is a major aquifer and an active fishery, and is also a source of drinking water downstream. CNL proposes no direct releases to surface water, and liquid effluent from sumps is routed through Hydro-Québec's G2 effluent system before release, providing a secondary compliance filter. This means G1WF's effluent compliance depends in part on a third party's infrastructure.

Ecological receptors: The Environmental Effects Review concludes no significant effects on air quality, wildlife, or species at risk. Mitigation for wildlife (noise and disturbance management) is reasonable given the industrial character of the site. However, as demolition progresses to the reactor building (i.e., the most contaminated structure) the risk of releases during extreme events (heavy rain, high winds during active demolition) increases.

Asbestos and legacy hazardous materials: CNL's approach is to remove and properly dispose of hazardous materials before beginning demolition. The application references hazardous waste removal as a precondition to active decommissioning, which is sound practice. Nonetheless, a legacy industrial site of this age will contain materials whose full inventory is rarely perfectly characterized in advance.

Contaminated soils and foundations: All underground structures and foundations are to be removed to a minimum depth of one metre below grade. Any contaminated underground structures and soil are to be decontaminated to ALARA levels consistent with industrial reuse criteria. The exact remediation criteria have not yet been defined. These will be negotiated between CNL, AECL, and Hydro-Québec, the future site owner. This is a significant open item: if those criteria are set at a level appropriate only for heavy industrial reuse, long-term residual contamination could persist in soils and potentially affect groundwater.

ERA currency: The current Environmental Risk Assessment covers the period of 2019–2024 (storage-with-surveillance conditions) and will not be updated until 2029. The predictive ERA component for Phase 3 is contained in a separate Environmental Protection Measures document. While CNSC staff accepted this approach, it means the primary ERA tool will not capture Phase 3 conditions in a fully integrated way until well after demolition is underway.

2.4 Systemic and Process-Level Risks

Staged safety analysis: The most consequential decommissioning safety analyses (Planning Envelope B, reactor building) will be reviewed only after the licence amendment is granted. While CNSC staff have committed to DDP acceptance as a precondition for work in each envelope, this leaves open questions about radiological characterization, dose estimates, and specific engineering controls. The licence amendment is broad in scope; actual execution controls are deferred.

Indigenous and public interest concerns: Several First Nations have raised concerns, particularly around the transfer of radioactive waste to Chalk River Laboratories (a separate but related issue). CNSC staff conclude consultation obligations have been met, but some nations have expressed reservations about both the process and the substance of waste transfer decisions.

Financial guarantee structure: CNL requests that the 2015 Ministerial letter from the Minister of Natural Resources serve as a permanent financial guarantee for the entire 15-year licence period, without periodic reaffirmation. CNSC staff accepted this approach. While AECL is a Crown corporation backed by the Government of Canada, relying on a 2015 letter as an enduring guarantee for what is projected to be a costly and potentially complex multi-decade decommissioning program carries some financial risk, particularly if cost overruns materialize, as is common in nuclear decommissioning internationally.

Schedule optimism: CNL projects completion of decommissioning by 2035, accelerating a timeline previously projected to extend to 2053. International experience with comparable projects suggests nuclear decommissioning frequently encounters schedule and cost overruns. As an example, the Port Hope Area Initiative, a project to clean up historical radioactive contamination, was initially projected to take 5 years for removing the contaminated material and placing it into a long-term engineered storage facility. However, the project is significantly behind schedule and over budget, with an extra 9 years of work currently forecasted before the project will be completed. The 15-year licence term is designed to provide buffer, but the optimism of the base schedule warrants acknowledgment.

3 Summary Assessment

The overall risk profile of this project is consistent with what CNSC staff and the regulatory framework characterize: a managed, low-to-moderate risk decommissioning project with well-established regulatory controls. The most significant risks appear to be (1) worker radiological

dose during reactor building dismantlement, (2) transport of significant volumes of radioactive waste over a 9-year period, and (3) potential for contaminated soil or groundwater if remediation criteria are set too permissively. These can be mitigated through rigorous implementation of the programs described.

The key regulatory vulnerability is the deferral of detailed safety analyses for the most hazardous work scope (reactor building) to post-licence amendment DDPs. CNSC staff have designed the oversight structure to address this through DDP acceptance requirements, but it means the Commission is being asked to approve a broad authorization before the most granular safety case is complete. This is not uncommon in nuclear decommissioning licensing, but it places a significant burden on ongoing regulatory oversight to function as intended.