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Oral presentation

Written submission from the Ralliement contre la pollution radioactive

In the Matter of the

Canadian Nuclear Laboratories (CNL)

Application from the CNL to amend its Chalk River Laboratories site licence to authorize the construction of a near surface disposal facility

Commission Public Hearing
Part 2

May and June 2022

Exposé oral

Mémoire du Ralliement contre la pollution radioactive

À l'égard des

Laboratoires Nucléaires Canadiens (LNC)

Demande des LNC visant à modifier le permis du site des Laboratoires de Chalk River pour autoriser la construction d'une installation de gestion des déchets près de la surface

Audience publique de la Commission
Partie 2

Mai et juin 2022

Canada

***Submission from Ralliement contre la pollution radioactive* in the category**
Environmental assessment and environmental protection
for the May 2022 CNSC Hearing for CNL
Licence Amendment to authorize construction of NSDF

8 April 2022

Introduction

The mission of the *Ralliement contre la pollution radioactive* is:

> "To act voluntarily and collectively to promote responsible solutions for the management of radioactive waste to ensure that they pose no risk to the environment and to the health of the population".

The *Ralliement contre la pollution radioactive* still has serious concerns about the NSDF project and would like to make an oral presentation at the public hearing that starts on May 31, 2022.

CNL request a Licence Amendment to CNSC to construct a Near Surface Disposal Facility (NSDF) to house low-level radioactive solid waste at Chalk River Laboratories. This application raises a number of issues that are not adequately taken into account in the *Environmental Assessment report*.

Pollution of our drinking water

The Ottawa River is the drinking water source for millions of people and this is a major concern. Radioactive pollution in water is dangerous, risky and very costly to deal with.

From the beginning of the NSDF project, CNL **never considered the option of a waste disposal site away from bodies of water to reduce the risk of pollution of the Ottawa River**.

CNL decided to minimize the transportation of waste away from Chalk River in choosing the NSDF site but CNL had no problem with transporting waste from all across Canada to Chalk River.

Many of the support documents are incomplete

We consider also that many of the support documents are incomplete or too vague and should be revised to better support the licence application. These include:

- NSDF *Safety Case*
- NSDF Project *Waste Acceptance Criteria*
- NSDF Project *Reference Inventory Report*

Documents for the characterization of the wastes are not included in the licence. The holder of the licence must characterize the radionuclides: there must be a clear reference to REGDOC-2.11.1, Volume 1, to the licensed inventory, and to the *Waste Acceptance Criteria*.

Most of the radioactivity in the NSDF comes from imported wastes

CNL manages commercial lucrative contracts for the storage of radioactive waste from Canadian companies who import these wastes from around the world. For example **Nordion** and **Best Theratronics import cobalt-60 used sources and SRB Technologies imports tritium waste.**

Most of the Co-60 in the NSDF is from imported disused sources:
(81% of all the Co-60 in the NSDF)
Co-60 accounts for 98% of the total radioactivity of the NSDF

This creates a risk of dangerous pollution in the Ottawa River and a risk for the workers and most of it (in terms of radioactivity) is not even Canadian waste!

In the licence application documents, there is no discussion of commercial and industrial waste that will be put in the landfill.

Even worse, there is not a single mention of Co-60 sealed sources in the *Environment Impact Statement* or the *Environmental Assessment Report*. The words “cobalt-60” and “sealed sources” (or their equivalents) never appear on the same page. It does not constitute an open and transparent account of the contents of the proposed facility.

Should we accept that CNL provides waste management services for low level radioactive waste and intermediate level radioactive waste for Canadian companies even if the wastes are from foreign countries? Should Canadians accept a licence for the NSDF and thereby accept the associated risk when most of the radioactivity in the mound will be due to foreign radioactive waste?

History of improper waste characterization at Chalk River Laboratories

Initially the NSDF project was designed for Low Level Waste (LLW) and Intermediate level waste (ILW) but an NSDF is not suitable to isolate ILW from the biosphere according the International Atomic Energy Agency (IAEA). Following protestations from the public, the NSDF project was modified to accept only LLW.

However because a poor characterisation of the waste in the past, it is extremely difficult to sort and classify the radioactive wastes. In the first several decades during which radioactive wastes were generated, collected and stored at Chalk River Laboratories, LLW and ILW were stored together in unmarked packages. Mixing a small amount of ILW with LLW should dictate that waste be classified as ILW.

> But CNL has recently reclassified nearly all (95%) of its stored ILW as LLW, presumably so that it can be put in the NSDF.

Low- radiation-field waste can have levels of long-lived radionuclides that preclude their disposal in a facility like the NSDF. CNL plans to put radioactive waste into the NSDF, apparently without accurately measuring its content of long-lived radionuclides

Adequate characterization is absolutely essential if CNL wishes to proceed with an above ground, landfill-type disposal option (NSDF).

The NSDF reference inventory is not precise enough

https://www.cnl.ca/wp-content/uploads/2021/03/NSDF-Reference-Inventory-Rev-3.pdf

During the initial screening of radionuclides, radionuclides with half-lives less than 5 years and noble gases were removed. In Table A-1, about 200 radionuclides are not in the NSDF reference inventory because their half-life is less than five years. **There is no mention of their individual radioactivity!**

The activities of the remaining radionuclides present in the waste database were then extracted and are found in Table A-2. Only radionuclides in **bold** in that table are included in the reference inventory. Nothing is said about what is done with the other radionuclides.

CNL's partial list of radionuclides destined for the mound indicates that 25 of the 31 radionuclides are long-lived, with half-lives ranging from 1,600 to 14 billion years. This list includes significant quantities of the long-lived "man-made" alpha-emitters plutonium-239 and uranium-233. Because the proposed life of the NSDF is 550 years, these radioactive wastes will not be isolated from the biosphere after the degradation of the membranes.

The waste database has some limited and incomplete characterization data. The CNL waste database does not decay its radioactivity; therefore the in-growth of the daughter product Am-241 from Pu-241 is under reported in the data and Pu-241 is over reported in the data. Table 5 from *NSDF-Reference-Inventory-Rev-3* below shows that many waste packages have limited characterization data and even exceed the NSDF WAC.

Table 5
Packaged Waste Volume screened by NSDF WAC Radiological Categories

	Non-Leachate Controlled Packaged Waste	Leachate Controlled Packaged Waste	Total of Acceptable	Waste Packages that Exceeds NSDF WAC
Waste Database Packaged Waste Baseline Volume (m^3).	8 686	1 227	9 913	1 852
Waste Database Packaged Waste Baseline Volume plus waste in the Waste Database with limited characterization data [a] (m^3).	14 385	1 227	15 612	1 852
Packaged Waste Baseline Volume Extrapolated to NSDF Design (m^3)	122 957	10 490	133 447	n/a
Total Packaged Waste including Stored Liquid Waste Project (m^3)	122 957	10 779	133 737	n/a

Note a: Uncategorized Waste is Waste that was in the Radioactive Waste Database without any recorded radionuclides. Most of this waste only had slight contamination and was assumed it would be characterized as Non-Leachate Controlled Waste Packages.

Over estimation of the local background level radioactivity

The post closure safety assessment modelling is used to refine the radiological inventory. During this iterative process, a decision was made to adjust the concentrations of many long-lived radionuclides to ensure that the total radioactivity in the NSDF decays to near-background levels within a reasonable timeframe.

There is possibly an error in the comparison of radioactivity levels in local uranium ore samples to the radioactivity in the proposed NSDF. CNL overestimated radioactivity in local ore samples by several orders of magnitude.

High-radioactivity waste containers in the dump will exceed radioactivity levels in surrounding rocks for thousands of years. Because of the overestimation error of the local radioactivity, the proposed licenced inventory should be changed. (See the submission from *Concerned Citizens of Renfrew County and Area*).

Co-60 is the main radioactive waste in the NSDF (98.1%)

The NSDF could only safely accommodate a tiny percentage of the federal legacy waste.

In the *Safety assessment report* (the *Safety Case*) *for the NSDF, Revision* 2, p 530, it is written that:

> The inventory of cobalt-60 is 98.1% of the total NSDF radioactivity.

Preoccupied by the high proportion of Co-60 in the NSDF, *Ralliement contre la pollution radioactive* investigated and discovered that most of this Co-60 was **from disused sources imported from the entire World** (81% of all the Co-60 in the NSDF).

The *Ralliement contre la pollution radioactive* had technical meetings about the NSDF with CNL experts in January and February 2021. Among our questions was the non compliance with IAEA *directives GSG-1 [1] and TRS-436 [2]* for cobalt-60 disused sources.

Meggan Vickerd, General Manager of Waste Services at Canadian Nuclear Laboratories ·, gave us the following explanations in these meetings:

> The NSDF reference inventory was assembled and screened through a previous version of the NSDF *WAC*. **That previous version did not include the requirement that consideration of disused sources for disposal in NSDF needed to follow guidance in IAEA TRS-436 [2].** Therefore, when the NSDF reference inventory was assembled, none of the short lived (half live less than 30.1 years) radioactive sources were screened out. CNL has promised that their *Waste Acceptance Criteria* (*WAC*) will be corrected.
>
> The sources in the cobalt inventory are examined and compared with IAEA *GSG-1 [1] and TRS-436 [2]* in the table below.

Co-60 radioactivity in NSDF Licensed Inventory	**Bq**
Total potential radioactivity at placement	9.06E+16 Bq
Potential radioactivity from disused sources at placement	**7.35E+16** Bq
***TRS-436* – Application of Exemption Level for acceptance into NSDF**	**<1.00E+05 Bq**
Total radioactivity of disused sources which meet exemption levels at the time of placement	**4.44E+06 Bq**
Total radioactivity of disused sources which meet exemption levels after 150 years of decay (i.e. crediting operations phase plus 100 years of closure)	**1.67E+14 Bq**
***GSG-1* – Application of weak source classification (low level waste)**	**<1.00E+07 Bq**
Total radioactivity of disused sources which are classified as weak sources at the time of placement	4.12E+08 Bq

> Thus this exercise demonstrates that the licensed inventory for total Co-60 (9.06E+16) will likely never be reached due to the more stringent limits on disused sources in *TRS-436*.
>
> As decay happens during the 50 years of operation and into 100 years after closure, more disused sources will reach classification as a weak source and also exemption levels. CNL's intent is that only disused sources that could be classified as exempt 100 years after closure would be accepted for disposal in NSDF.

So when the TRS-436 exemption level for disused sources is applied, the quantity of cobalt-60 would be lower in the licenced inventory:

> **4.44E+06 Bq of Co-60 should be accepted instead of 7.35E+16 Bq of Co-60 at placement**

Concentration limits

In the EIS report and *Near Surface Disposal Facility Reference Inventory Report 232-508600-rept-003 revision 3*:

> The concentration limit for Co-60 (a short life beta/gamma radionuclide) is **1.00E+04 Bq/g** for a short life beta/gamma radionuclide for **Bulk Waste** and **Non leachate controlled packages**.

But there **is no established radioactivity concentration limit** for **leachate controlled waste packages in the NSDF *WAC*** – that is in agreement with the IAEA guidelines. References: *[1] IAEA General Safety Guide – 1, Classification of Radioactive Waste. [2] IAEA Technical Reports Series No. 436, Disposal Options for Disused Radioactive Sources*.

This means that if the radioactivity per unit mass of a source of Co-60 is too high, it can be still placed in a leachate controlled waste package! There is no limit for the radioactivity per unit mass of beta-or gamma-emitting radionuclides having a short half-life (less than 30 years) that would be placed in containers, called "leachate controlled waste packages". The only requirement is that shielding must be sufficient so that workers are not exposed to a contact dose greater than 0.5 mSv/h, or else the packages must be handled by mechanical means (*WAC*, Table 7).

The NSDF should not contain intermediate level waste (waste that needs to be shielded). However, section 3.3.3 of the *WAC, Shielded Waste Packages,* indicates that there would be wastes in the NSDF that need shielded containers to **protect the workers**. <u>This is in fact a contradiction because if these wastes were really low level waste, they would not have to be shielded</u>.

In the *Near Surface Disposal Facility Reference Inventory Report Version 3* (2020/04/01), there is no limit for Co-60 and Pu-241.

Table D-1
Average Emplaced Packaged Waste Activity compared with WAC Limit

	Alpha	Long Lived Beta/Gamma	Co-60 & Pu-241	Cs-137 & Sr-90	H-3
Average Activity	4.66E+00	4.08E+01	1.32E+06	1.49E+02	1.16E+04
Limit	400	10 000	-	10 000	10 000 000
Percent of Limit	1.2%	0.4%	n/a	1.5%	0.1%

Packages with sources of Co-60 that qualify for disposal in the NSDF will likely be placed in the bottom portion of the disposal cells to minimize worker doses. Disused sources would be placed in the NSDF during the entire 50 years of operation; therefore each of the ten cells has a possibility of containing disused sources. Since the most highly radioactive packages (beta/gamma emitters) would be placed near the bottom of the mound, maybe there is a risk that this more penetrating radiation would damage the lower membrane.

A Revised version of the *WAC* is needed for the hearing

We assume that all waste to be disposed at the NSDF will be required to meet the *Waste Acceptance Criteria* established to assure compliance with operational and long-term safety requirements. The radiological and non radiological inventory disposed of in the NSDF will be controlled through the NSDF *WAC*. Any waste accepted using the *Infrequently Performed Operations process* will be reported to the CNSC in CRL's Annual Compliance Report.

We believe that the *Infrequently Performed Operations process* is not safe or explicit enough and that the *Waste Acceptance Criteria* should be more precise.

In the *WAC*, the reference inventory should be changed and the new version should specify the requirement that disused sources for disposal in NSDF need to follow the guidance in IAEA *TRS-436 [2]* and *GSG-1*. Such a change to the *WAC* has been accepted during our discussions with CNL but it has not been made yet and we are in the licencing process! It is unacceptable for CNSC to give a licence when the Waste Acceptance Criteria are not finalised.

A revised version of the *WAC* was not made available for the NSDF licence hearing starting February 22, 2022. However, **CNL has promised that their *Waste Acceptance Criteria* (*WAC*) will be corrected.**

In the *Consolidated Commitment Lists* for the Near Surface Disposal Facility, page 80, the commitment P-167 was made to the *Ralliement contre la pollution radioactive*:

> Prior to accepting any disused sources into the NSDF, CNL will update Section 5.7 of the *NSDF Waste Acceptance Criteria (WAC)* to clarify specific aspects of the IAEA guidelines which will apply in the acceptance of disused sources in NSDF. CNL will notify *Ralliement Contre la Pollution Radioactive* of the changes once the updated *WAC* has been accepted by the Canadian Nuclear Safety Commission.

CNL has not yet changed the criteria for the cobalt-60 disused source in the *WAC*. The actual *WAC* allows radioactive sources, with a half-life of less than 30 years, to be considered for near surface disposal without special requirements. This *WAC* does not comply with IAEA guidelines.

This is the language in the current version of the *WAC* that should be changed:

> A.5.7 DISUSED SOURCES. As per IAEA guidelines [20] and [21], disused sources (including disused sealed sources) are a waste stream that requires special management because they contain highly concentrated amounts of a single radionuclide. Specifically, the guidance limits that only radioactive sources of a half-life of less than 30 years should be considered for near surface disposal without special requirements. The NSDF requires that sources are subject to all of the *WAC* requirements, including radionuclide concentration limits and external exposure rates. As well, sources shall be segregated from other waste streams; thus ensuring that the activity of sealed sources is not diluted by waste that is less radioactive. The NSDF requirements on sealed sources complies with IAEA guidelines [49].

In the IAEA *General Safety Guide GSG-1*:

> III–20. A particular type of waste is disused sealed radioactive sources. Sealed sources are characterized by the concentrated nature of their radioactive contents and are widely used in medical or industrial applications. They may still be hazardous at the end of their useful lives and will require appropriate management, as they contain large and highly concentrated amounts of a single radionuclide and in many cases may not meet the waste acceptance criteria for near surface disposal facilities even when the source radionuclide is not particularly long lived. Radioactive sources unsuitable for near surface disposal require emplacement at greater depths and therefore fall within the ILW class or, in some cases, even the HLW class.

Lead pollution

356 tonnes of radioactively contaminated lead could be in the NSDF waste without considering the added lead used as shielding in the packaging. The radioactive lead that cannot be reused will come mainly from the shielding recovered during the demolition of buildings and facilities.

Lead shielding of the waste packages was not included in this forecast. **We would like to have a confirmation that no lead will be used for shielding.** The potential lead pollution should be considered seriously because the quantity of lead measured in surface water is already higher than allowed by Quebec standards and Ontario water quality objectives.

Suspend the licence process because governmental reviews of radioactive waste management are underway

Several studies and projects to review radioactive waste management in Canada are underway. These projects would have repercussions on the management of wastes at Chalk River. We recommend to CNSC to suspend the licence process and to wait for:

- the report of the Environment Committee of the House of Commons to be published,
- the investigation by the Auditor General of Canada to be completed,
- the new radioactive waste management policy to be drawn up by NRCan,
- the radioactive waste management strategy to be completed by NRCan.

Whenever a licence is granted for a project, nothing can be readily changed afterwards, even if the project is not so satisfactory for the population or for the environment, if the new policy impose more constraints, or if the new strategy is changed.

For all these reasons we think that the NSDF project should be improved to ensure the protection of the population and the environment. There should be also a reasonable approach to manage more of the Government of Canada's radioactive wastes. It is obvious that the NSDF cannot come close to accommodating the disposal requirements of the federal legacy waste at Chalk River.

Thank you for your attention.

Ginette Charbonneau and Gilles Provost, spokespersons for the *Ralliement contre la pollution radioactive*

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