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Supplementary Information

Renseignements supplémentaires

Presentation from the Sierra Club Canada Foundation

Présentation de la Fondation Sierra Club Canada

In the Matter of the

À l'égard des

Canadian Nuclear Laboratories (CNL)

Laboratoires Nucléaires Canadiens (LNC)

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

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

Commission Public Hearing
Part 2

Audience publique de la Commission
Partie 2

May 30 to June 3, 2022

30 mai au 3 juin 2022

Canada

Sierra Club Canada Foundation

Supplementary submission for the NSDF licensing hearing

May 30, 2022

Gretchen Fitzgerald
National Program Director

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NSDF Project initiated without knowledge of wastes to be disposed of

- CNL skipped the "conceptual and planning" stage for a disposal facility, during which "types and quantities of waste to be emplaced in the disposal facility should be specified and characterized," and "projected waste volumes and activities should be quantified."*
- CNL also skipped the area survey stage.*
- CNL has not complied with the section 3(1)(j) *General Nuclear Safety and Control Regulations* requirement to provide information on the "name, quantity, form, origin and volume" of radioactive and hazardous wastes that would go in the NSDF
- Million-m^3 volume capacity and facility type (landfill) chosen without proper consideration of wastes currently at CRL.

*Source: Appendix 1 of the IAEA's Specific Safety Guide SSG-29, *Near Surface Disposal Facilities for Radioactive Waste*

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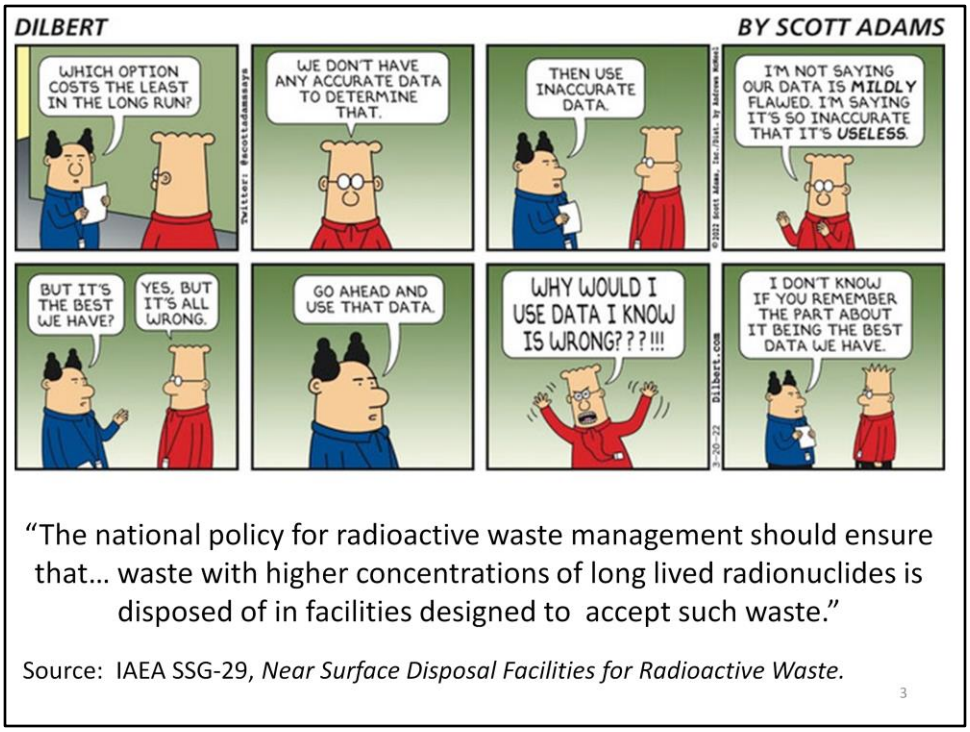
CNSC's Environmental Assessment Report cites IAEA Safety Guide SSG-29 in claiming that "the NSDF site selection process used structured criteria and methodology and is in alignment with the applicable standards."

How is this possible, when Appendix 1 of SSG-29 says the first two stages in siting a disposal facility are a conceptual and planning stage and an area survey stage? Is it not true that CNL skipped both of these stages?

The NSDF Safety Case appears to be based on a made-up inventory that has no apparent relation to actual quantities of federal nuclear waste. SSG-29 says that waste types, quantities and radioactivity must be specified for any nuclear waste facility. CNSC regulations require similar information. Can CNL or CNSC provide this information for the NSDF?



"The national policy for radioactive waste management should ensure that… waste with higher concentrations of long lived radionuclides is disposed of in facilities designed to accept such waste."

Source: IAEA SSG-29, *Near Surface Disposal Facilities for Radioactive Waste.*

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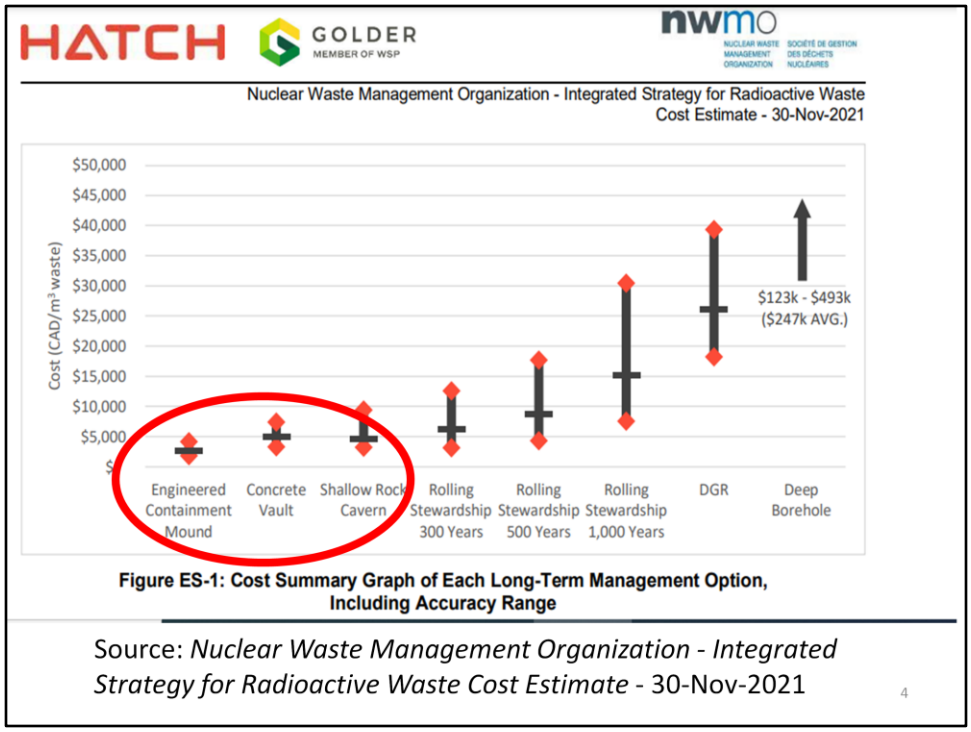
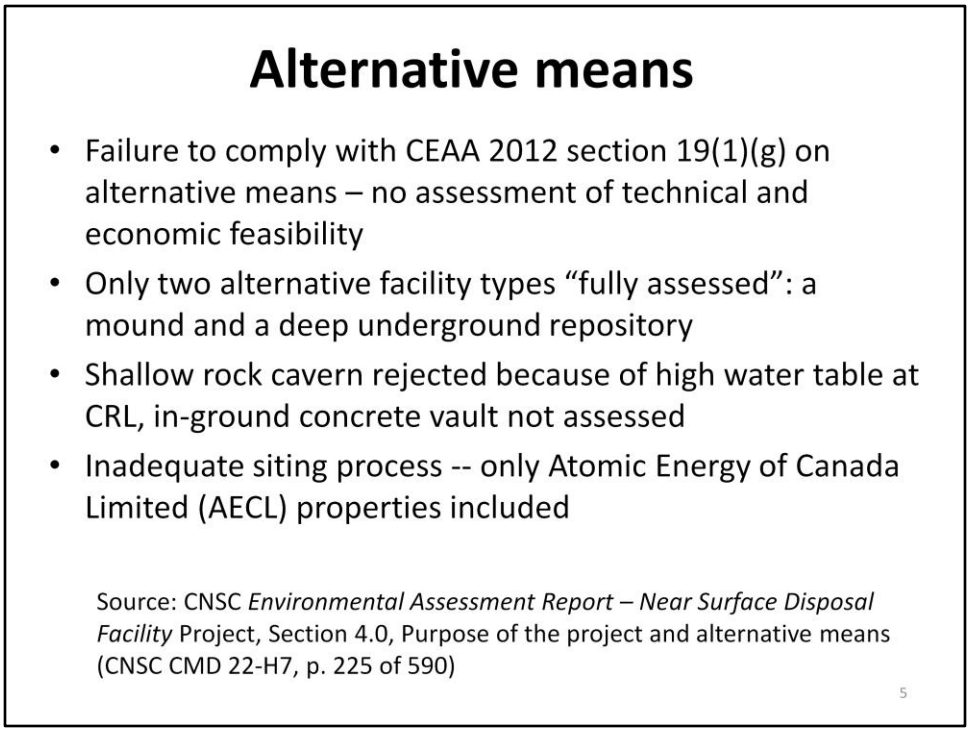
Canadian Nuclear Laboratories lacks data to determine what disposal option for federal waste would cost least in the long run. For the first 40 years at Chalk River Laboratories, low- and intermediate-level wastes were not characterized, labeled, or tracked. Waste was put in unmarked packages or simply dumped in the ground. Can CNL provide credible information on the origins of waste that would go in the NSDF?
Is CNL willing to put uncharacterized waste into the NSDF with only crude estimates of its long-lived radionuclides? Would the CNSC have the capacity to monitor the radionuclides that CNL would put in the NSDF?
CNL has reclassified 95% of what was formerly reported as intermediate-level waste to the IAEA as low-level waste and the much-reduced ILW volume was included in Canada's 7th national report. Can CNL provide information to demonstrate that this was done in a rigorous manner?

The IAEA says national governments should ensure that waste with long-lived radionuclides is disposed of in facilities designed to accept such waste. Should Canada have such a policy and apply it to a facility that would house the Government's own nuclear waste?



This figure, taken from a report done for the Nuclear Waste Management Organization, shows the average cost of waste disposal for an engineered containment mound as $2,500 per cubic meter. A **million** cubic meters would cost $2.5 billion, five times CNL's cost estimate for the NSDF. Is CNL understating the cost of the NSDF and overstating its waste capacity? Has CNL's cost estimate been independently reviewed? Average disposal cost for a concrete vault or shallow rock cavern is around $5000/$m^3$. Would these facilities provide better long-term waste containment and a greater capacity for long-lived wastes than the NSDF?

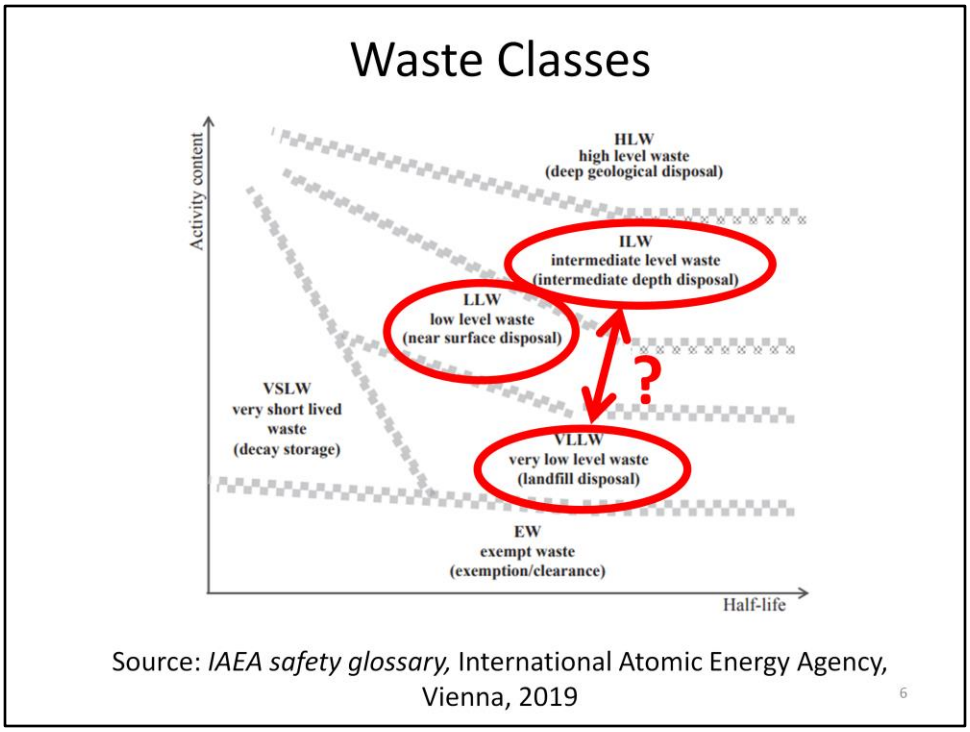
A former Minister of Natural Resources asked the NWMO to develop a long-term management strategy for Canada's low- and intermediate-level radioactive waste. The government should develop this national strategy, not the NWMO. The NWMO assumes all federal low-level waste will go in the NSDF. What fraction of the 75-year accumulation of federal radioactive waste could the NSDF safely contain if CNL were to accurately measure different radionuclides prior to emplacement and adhere to licensed inventory limits for them?



The CNSC is assessing the NSDF under CEAA 2012. This requires consideration of technical and economic feasibility and environmental effects of alternative means. The EA report says that CNL only fully assessed a mound and a deep underground repository. Cost of alternatives was "not factored into CNSC staff's review." Why did CNSC staff not consider economic feasibility of alternative facility types?

How is the Chalk River Laboratories property, with its proximity to the Ottawa River, high groundwater table, uneven terrain, and fractured bedrock, a suitable place for permanent radioactive waste disposal?

Flat, sandy portions of the 30,770-ha Department of National Defence Garrison Petawawa property, adjacent to the Chalk River Laboratories, could accommodate a larger, less expensive, and safer in-ground concrete vault facility. Why weren't potential sites on that property investigated? Why hasn't a regional investigation of crown land with geological formations suitable for a shallow rock cavern facility been conducted?



The IAEA classifies waste based on how radioactive it is (on the y-axis) and how long-lived it is (on the x-axis). Each class is associated with a specific disposal type – landfill, near-surface, intermediate depth, or deep geological.

The IAEA says landfill disposal is only for waste with very limited concentrations of longer lived radionuclides. But 25 of 31 radionuclides in the proposed NSDF inventory have half-lives of more than 1500 years.

Landfills are generally not used for packaged wastes. But waste packages ranging in size up to intermodal shipping containers would make up 13% of the NSDF waste volume.

The NSDF would also include shielded waste packages. The CNSC says waste that requires shielding is intermediate level. Why does the EA report state that only low-level waste would go in the NSDF when CNL plans to put shielded waste in it?

The NSDF would be a landfill

"The NSDF will be a waste disposal facility using an **engineered containment mound** (ECM) that will hold LLW waste [sic] at near-surface level on the CRL site, **similar to a municipal landfill**..."

Source: NSDF *Environmental Impact Statement* 232-509220-REPT-004 Revision 3, Section 1.1, Project Overview (p. 76 of 1661). Canadian Nuclear Laboratories (CNL), May 28, 2021

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CNL says an "engineered containment mound" would be similar to a municipal landfill. The IAEA says some Member States allow no radioactive waste at all to go in landfills.

CNL is stacking these containers of radioactive waste at Area H, with plans to drive them into the NSDF and abandon them. Can CNL provide evidence that their contents have been properly characterized?

Cobalt-60 – a commercial activation product

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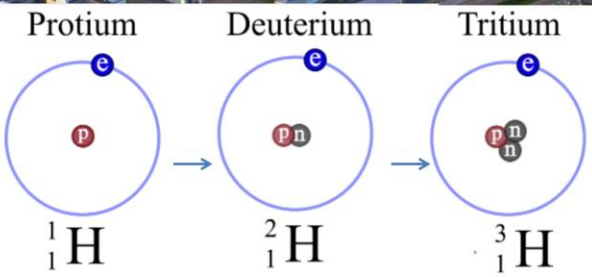
Activation products are made intentionally and sold commercially. Cobalt-59 targets are put in reactors, bombarded with neutrons, and turned into radioactive cobalt-60. Canadian manufacturers Best Theratronics and Nordion put cobalt-60 in devices used to irradiate cancer tumours or sterilize food and medical equipment. Canada exports 95% of the world's high-radioactivity cobalt devices.

Cobalt-60 has a 5.3-year half-life. It decays to radiation levels that are still intense, but not strong enough to quickly kill cancer cells or bacteria in food. Expired cobalt-60 devices, or "disused sources", are sent back to manufacturers who ship them to Chalk River. They become government property.

Disused cobalt-60 sources are dangerous and require lead shielding. CNL seems intent on putting large quantities in the NSDF even though the IAEA considers them intermediate level because of their intense radioactivity. Hundreds of tonnes of lead would also go in the NSDF and contaminate groundwater.

Tritium: another activation product



Tritium is another major activation product in CANDU heavy water reactors. Deuterium is a rare form of hydrogen with both a proton AND a neutron in the nucleus. CANDU reactors make lots of tritium because deuterium atoms in heavy water become radioactive by absorbing a second neutron. Tritium builds up in CANDU reactors and is a radioactive hazard to workers, the public, and the environment.

CANDU reactor heavy water is shipped to the Darlington reactor complex where tritium is removed and converted to a gas. Some is sold to SRB Technologies, a Pembroke company that fills phosphor-coated tubes with tritium gas, seals the tubes, and puts them in glow-in-the-dark exit signs.

Tritium has a 12.3-year half-life. Exit signs get dimmer as tritium decays. They become waste with large quantities of tritium. Truckloads of expired exit signs are shipped back to Pembroke, mostly from the U.S. SRB takes out the tritium-filled tubes, puts them in barrels, and sends them to Chalk River.

CNL provides very little information about what would go in the NSDF, but explicitly mentions disused sources. It appears that nearly all the initial radioactivity in the NSDF would be from commercial waste devices containing cobalt-60 and tritium, many imported from other countries.

What proportion of the initial radioactivity in the NSDF would be composed of cobalt-60 and tritium from disused sources? Can CNL or CNSC provide information on the origins of disused sources that are sent to Chalk River? Can CNL or CNSC verify that all these disused sources were originally manufactured in Canada?

NSDF would create a terrible precedent

- Mounds of waste with:
  - Highly radioactive waste requiring shielding
  - Long-lived radionuclides (ILW)
  - Non-radioactive hazardous substances (arsenic, beryllium, lead, mercury, PCBs, dioxins, etc.)
  - "waste generated by research reactors and from some disused radioactive sources … [that] does not meet the waste acceptance criteria of near surface disposal."*
- Ignoring safety and international standards in a search for low cost "solutions"?

*Source of quote: *Classification of radioactive waste,* General Safety Guide GSG-1, Vienna, International Atomic Energy Agency, 2009.

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At Chalk River In the 1940s and 50s, plutonium and uranium-233 were extracted from irradiated fuel and targets for the U.S. nuclear weapons program. Soils and buildings were contaminated by plutonium and fission products from accidents at fuel reprocessing facilities.

The NSDF would be Canada's first permanent disposal facility for nuclear reactor wastes, including post-fission wastes, neutron activation wastes, disused sources, shielded waste packages, mixed radioactive and hazardous wastes with heavy metals and persistent organic pollutants, and wastes resulting from historic fuel reprocessing activities.

Would the NSDF set a precedent for other mound-type facilities that would contain these waste types? Are there safer options for these waste types that would conform to international standards?

Intermediate-level waste (ILW) in an above-ground mound (a landfill)?

Canadian Nuclear Laboratories, Bruce Power, the Canadian Nuclear Association, Ontario Power Generation, New Brunswick Power and the Nuclear Waste Management Organization (NWMO) all told CNSC in June 2019:

"There are current plans to place ILW in aboveground mounds."

All made submissions to CNSC in support of the NSDF.

Source: Document History of CNSC REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste*

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The IAEA says that ILW is not suitable for **any** form of near surface disposal, and certainly not for landfill disposal. Yet in June 2019, CNL, Bruce Power, Ontario Power Generation, New Brunswick Power and the NWMO all told the CNSC of plans to put ILW in aboveground mounds.

Why did CNL submit that comment to the CNSC nearly two years after announcing that no ILW would be put in the NSDF?

Why are all these companies supporting CNL's plans for the NSDF?

Conclusions

- Putting long-lived waste in a mound would violate international standards and create significant adverse environmental effects.
- Huge uncertainty about NSDF cost estimate.
- Facility type and site must be based on proper waste characterization.
- A thorough study of alternative sites and technologies is needed before decisions are made on permanent radioactive waste disposal.

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Putting long-lived radioactive waste in a mound would violate international standards and create significant adverse environmental effects. There is huge uncertainty about the NSDF cost estimate. Proper waste characterization is essential for choosing the type and site of a disposal facility. A thorough study of alternative sites and technologies is needed before decisions are made on permanent disposal of federal and commercial radioactive waste.