Nuclear Waste Governance and the Transportation of Radioactive Wastes

Northwatch Submission to the
Standing Committee on the Environment and Sustainable Development

March 2022

On Thursday, February 3, 2022, the Standing Committee on the Environment and Sustainable Development determined to undertake a study of Nuclear Waste Governance in Canada.

There are several subject areas which are central to the discussion of nuclear waste governance in Canada, including the transportation of radioactive wastes. This brief is made by Northwatch in support of Standing Committee and their study of nuclear waste governance as it related to the transportation of radioactive wastes. The brief includes a number of topical discussions each of which are supported by recommendations. Those recommendations include:

RECOMMENDATION: Under the principle the precautionary principle, shipments of radioactive waste will be subject to risk assessments that encompass the range of risks and hazards associated with each shipment

RECOMMENDATION: Under the principle of openness and transparency Canada's radioactive waste policies should direct that the public and Indigenous peopled will have sufficient access to risk assessment and its information basis and methods to be assured that a robust approach was taken

RECOMMENDATION: Under the principle of **community right to know** Canada's radioactive waste policies should ensure that those along the transportation route will be given adequate notice and opportunity to comment on transportation plans

RECOMMENDATION: Under the principle of **oversight and accountability** Canada's radioactive waste policies should include enable public and peer review of radioactive waste transportation packages as part of the certification process.
RECOMMENDATION: Under the principles of **community right to know** and **peace, order and good government** Canada's radioactive waste policies should ensure that First Responders are fully informed and supported in advance of responding to radiological emergencies.

RECOMMENDATION: Under the principles of **oversight and accountability**
Canada's radioactive waste policies enable a comprehensive system of checks and balances in the conduct of any shipments of radioactive waste.

RECOMMENDATION: Under the principles of the **Precautionary principle** and **Protection of human health and the environment** Canada's radioactive waste policies should incorporate the Proximity Principle[1] [2] directing that wastes should be managed as close to the point of generation as possible.

[1] ttps://www.researchgate.net/publication/316189473_The_Proximity_Principle_and_the_Movement_of_Waste
[2] https://www.gov.scot/publications/scotlands-higher-activity-radioactive-waste-policy-2011/pages/2/

Assessment and Communication of Transportation Risk

Nuclear materials, including radioactive wastes, are currently being transported in Canada on a regular and ongoing basis, The public is often told this – by nuclear proponents or the nuclear regulator – as a seeming substitute for providing objective and factual information about ongoing or proposed shipments of radioactive wastes and related risks.

The planned transportation of radioactive wastes from the closed nuclear site at Pinawa Manitoba to the Chalk River Nuclear Laboratories site in Ontario offers one example. Northwatch reviewed and commented on the application by Canadian Nuclear Laboratories to extend their licence for the Whiteshell Laboratory in 2019 and found that the application and supporting material raised a number of issues related to the transportation of radioactive waste. A select number of those issues are summarized here.

As set out in their application[3], the transportation of radioactive wastes forms a very large part of CNLs proposed activities during the next licence period, including approximately 1500 shipments of LLW from WL. At the time of the licence review, CNL was anticipating that the inventory of ILW would be shipped from WL in either Type A containers or a Type B cask, depending on the nature and radioactivity level of the waste. An estimated 500 shipments of ILW were expected, and CNL's plans for the shipment of the HLW from WL were that 2 fuel baskets will be accommodated within the certified shipping flask, resulting in a total of 46 shipments of HLW. Additionally, the remediation of the Standpipes may generate additional FM or HLW totaling a volume equal to approximately 2-4 baskets. This will require an additional 1-4 shipments of HLW. CNL also speculated that during the next licensing period, there may be a need to transport intermediate level liquid waste (ILLW) not processed on-site and/or the residual solid waste from on-site ILLW processing, as well as an estimated 500 m3 of hazardous and mixed wastes, to be shipped off-site to licensed waste receivers for treatment and/or disposition.

The information provided by CNL in their application, Commission Member Documents, and various supporting documents that were available to public interveners was inadequate.

For example, there were references to an Integrated Waste Transportation Strategy but that document was not made available to Northwatch. Northwatch requested a copy of the Waste Management Program, an associated document, and were denied by CNL arguing that "the release of which would compromise the operational and commercial interest of Canadian Nuclear Laboratories."[4]
Based on Northwatch's review of the available documents, we make the following observations with respect to the proposed transportation of radioactive wastes:

- There appeared to have been no risk assessment undertaken with respect to the transportation of radioactive wastes
- The documents assumed that the transportation of radioactive materials is straightforward and does not deserve a high degree of focused attention.

[3] Attachment D "Plans for the Proposed Ten Year Period of the Renewed Licence", CNL Application dated 15 November 2018, page 43
[4] See Section 5 of this submission for additional discussion

- The documents did not provide specifics regarding routes, unique local conditions, response preparation, or coordination with local communities.
- The documents provided inadequate descriptions of the waste types, volumes and characteristics, and of the transportation packaging and overall transportation systems
- The documents provided only very generalized estimates of the shipment numbers and types and no timetable or seasonal estimates of the shipments
- The documents did not provide specific descriptions of the radiological hazards associated with each waste type, the basis for container selection, the shielding the selected container will provide, or the estimated dose – including to transportation workers and bystanders – of the wastes as packaged for transportation
- There was no discussion of the uncertainties associated with the thousands of shipments of radioactive wastes envisioned by CNL, including uncertainties associated with failures in packaging, or with road conditions, weather, driver error, vehicle failure or *en route* delays
- There was no comparison of the transportation impacts (including and particularly dose for workers, drivers and bystanders) of transporting the waste within the next decade as compared to transportation at a later time; this absence is particularly notable with respect to intermediate and high level wastes, and when considering the differences in time of transfer between the approved decommissioning plan approach of deferred decommissonining (2002) and CNL's "strategic vision" of accelerated decommissioning (2018)

In the CNSC staff CMD, the transportation of radioactive wastes is characterized as a "routine" activity:

> *The transportation of nuclear substances has been a frequent and routine activity at the WL site during the current licence period. In 2018 alone, 303 radioactive transport packages were safely sent offsite [43]. This included the transportation of 1,333.8 m³ of low-level waste and 7.9 m³ intermediate-level waste to CRL.*[5]

As noted in a report[6] by Dr. Fred Dilger commissioned by Northwatch in 2017

> *"It is important to recognize that millions of shipments of radioactive materials are shipped around the world. These shipments are made in robust containers that prevent release of the materials. <u>It is equally important to recognize that each shipping program, each shipment is unique.</u> The record of successful shipment is only possible due to extensive, sustained effort. Only constant vigilance enables radioactive materials shipments to be successful and there is no guarantee for future performance."*

In their brief address of transportation concerns, CNSC generically describes regulatory controls that contribute to transportation safety, but neither CNSC or CNL provided this information in a detailed and organized fashion specific to the thousands of shipments CNL envisions undertaking during the next licence period:

> *Package designs are combined with additional regulatory controls, including labelling, placarding, quality assurance and maintenance records, allowing*

[5] CMD 19-H4 page 52

[6] CEAR Reference , "Review of Ontario Power Generation's "Additional Information" in Support of their Proposed Deep Geologic Repository for Low & Intermediate Level Nuclear Wastes, Appendix 2, "Review of Ontario Power Generation's Report: Cost and Risk Estimate for Packaging and Transporting Waste to Alternate Locations" by Dr. Fred Dilger, as posted at https://registrydocumentsprd.blob.core.windows.net/commentsblob/project-17520/comment-2525/118324E.pdf

nuclear substances to be carried safely in all modes of transport such as road, rail, air and sea transportation. This philosophy is universally accepted for transport and has guided the development of the International Atomic Energy Agency (IAEA) and Canadian Nuclear Safety Commission (CNSC) regulations on the packaging and transport of nuclear substances. All nuclear substances are transported in packages that are selected based on the nature, form and quantity or activity of the nuclear substance. There are general design requirements that apply to all package types to ensure that they can be handled safely and easily, secured properly and are able to withstand routine conditions of transport.[7]

While the CNL documents provided a very general assignment of waste types to package type, we were unable to locate in the available documents an actual inventory of the wastes per package or container type or an explanation as to the suitability of the container or the selection criteria, other than in very broad terms.

At minimum, we would have expected CNL to provide at least a generic transportation specific risk assessment which included upper and lower boundaries of radiological impact, under both normal and upset conditions.

Notable in their absence from the CNL documents were the following areas of assessment:

- We found no discussion of the potential releases from a severe accident, a failed container, or a transportation vehicle that is stopped for an extended time (for example, due to road closures as a result of weather, forest fires, highway accident, road construction, etc.)
- We found no indication that CNL had assessed the effect to a Maximally Exposed Individual under normal or upset conditions
- We found no indication that a risk assessment had been undertaken, and in particular there was no indication that CNL had undertaken a risk assessment specific to the various waste shipments they propose to undertake, including the specific wastes, specific containers, specific routes, and estimated travel conditions

Such a risk assessment is essential to the responsible consideration of a radioactive waste transportation. We would expect such an assessment to be undertaken, and to address the following questions:

- What are the specific radiological characteristics of all of the waste forms proposed for transportation?
- What will be the effects along the routes?
- What are the potential routes, including potential congestion points?
- What are the estimated routine doses and occupational doses?
- What are the consequences of the worst foreseeable accident?
- Given current heavy truck accident rates, how many CNL shipments will be in accidents?
- Who is affected by the shipments?
- What will it cost to recover from a severe accident or sabotage?
- What unique local conditions effect risk?

CNL reports that it has maintained in its annual compliance/safety reports to CNSC, has complied with all relevant CNSC, Transport Canada, and IAEA regulations and standards and has worked closely with WL and CNSC in handling, packaging, and shipping special types of nuclear waste is not in dispute.

[7] CMD 19-H4 page 60-61

What is in dispute is whether:

- CNL has undertaken – and CNSC has required – adequate examination of risks associated with the transportation of radioactive wastes
- There has been adequate disclosure of the basis for CNL's transportation program, including selection of containers, routes, carriers, etc.
- There has been adequate notice to potentially affected communities – including First Nations – along the transportation route

RECOMMENDATION: Under the principle the precautionary principle, shipments of radioactive waste will be subject to risk assessments that encompass the range of risks and hazards associated with each shipment

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Radioactive Waste Transportation Packages

We noted with interest CNL's stated intentions to use the Nuclear Waste Management Organization's (NWMO) Used Fuel Transportation Package (UFTP) for the transport of wastes from Pinawa to Chalk River:

> *The fuel baskets will be retrieved from the canisters (see Figure 3-3) and transferred to the Used Fuel Transportation Package (UFTP) (see Figure 3-4 and Figure 3-5), for transport to and storage at CRL. The UFTP is a CNSC-certified Type B(U) Transportation Package, leased by CNL from its owner, the Nuclear Waste Management Organization (NWMO), for transporting CNL fuels, including the WL fuel materials. The UFTP is undergoing a comprehensive licensing process for CNL-specific fuels and configurations. Concrete canisters to contain the WL spent fuel baskets are being constructed at CRL. CNL will remain in communication with CNSC staff at all stages of this process, and regulatory oversight by CNSC staff will remain in effect*.[8]

As described in CNL's CMD, nuclear fuel currently on site at Whiteshell – which CNL intends to transport using the NWMO's UFTP, includes both intact, irradiated fuel bundles and sealed storage cans of defective fuel and fuel fragments.[9]

The NWMO's Used Fuel Transportation package was developed by the NWMO as a reference transportation package and used by the NWMO for such purposes as conducting "generic"

[8] CMD 19-H4.1 Page 21

[9] CMD 19-H4.1 Page 20

assessments of radiation dose for use in report being produced as part of their "Adaptive Phased Management" program.[10]

The UFTP was first certified in the 1980's as a contribution by Ontario Power Generation (then Ontario Hydro) to Atomic Energy of Canada Limited Geological Disposal Concept. In 2013, the UFTP was recertified by the Canadian Nuclear Safety Commission staff, without public review.

When the CNSC issues a certificate for the package design, the certificate specifies procedures for the manufacture, operation and maintenance of the transportation package. It also defines the authorized contents that may be carried in the package. The certificate is valid for five years. [11] As set out in the certificate issued by the CNSC in 2013, the UTFP is designed for intact fuel bundles.[12] The UTFP was recertified in 2018.

This intended use of the NWMO's UTFP by CNL raises two questions immediately:

1. Given that the UFTP has been certified for intact fuel bundles and the CNL high level radioactive wastes which they have indicated they intend to ship to Chalk River includes fuel waste which is defective and /or is fuel fragments, what is the basis for selecting this UTFP?
2. CNL states that the "UFTP is undergoing a comprehensive licensing process for CNL-specific fuels and configurations': what is the nature of that comprehensive licencing process, and what oversight is being provided by the Commission and what are the opportunities for review by the interested and potentially impacted public, First Nations, and en route communities?

Northwatch would note that this appears to be another instance of mission creep on the part of the NWMO, although in the absence of full disclosure of related information, it is difficult to ascertain the degree or implications of this.

On a somewhat more humorous note, we appreciated CNL's selection of a photo of NWMO's mock-up of their Used Transportation Fuel Package, perhaps as in indication of their degree of being "road ready".[13] The selected photo is of a transportation exhibit[14] used for promotional purposes by the NWMO when visiting municipalities who have encouraged the NWMO to study areas in their vicinity as potential burial sites for all of Canada's high level nuclear fuel waste.

More recently, the NWMO had disclosed that it intends to use a different packaging for the transport of high level waste from AECL (CNL) sites to their intended deep geological repository, and describes this "basket container" as still being in the "concept" stage.[15]

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[10] NWMO TR-2014-17 December 2014, Generic Transportation Worker Dose Assessment

[11] Safe and Secure Transportation of Canada's Used Nuclear Fuel MAY 2015 NWMO, page 14

[12] Canadian Nuclear Safety Commission (CNSC). 2013. Certificate for Transport Package Design. CDN/2052/B(U)-96 (Rev. 7). CNSC File 30-H1-118-0. July 29, 2013.

[13] CMD 19-H4.1 Page 23, "Figure 3-5: Used Fuel Transportation Package for the removal of CCSF fuel to CRL"

[14] See, for example, https://www.nwmo.ca/en/More-information/News-and-Activities/2017/10/06/15/25/Transportation-Exhibit-Attracts-Hornepayne-Students or https://www.nwmo.ca/en/More-information/News-and-Activities/2016/10/04/12/54/Used-Fuel-Transportation-Package-on-Display-at-Lucknow-Fall-Fair or https://clcinfo.ca/hornepayne/files/2013/06/Jackfish-Journal-NWMO-Transportation-Exhibit-at-FONOM-Conference-May2013.pdf

[15] NWMO Deep geological Repository Transportation System Conceptual Design Report, APM-REP-O0440-0209-R001, September 2021

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First Responders and Radiological Emergencies

With the support of the Ontario Law Foundation, Northwatch conducted an investigation during 2017 and 2018 of the information needs of small municipalities, volunteer fire fighters and First Responders around emergency response / right to know issues in the case of accidents and unintended releases related to the transportation of hazardous goods more generally and with respect to the transportation of radioactive materials and response to accidents and accidental releases in particular.
The following observations are a summary of responses from front line responders:

- The range of experiences and outlooks varies greatly among firefighters, both within a particular service, but even more so between the professional forces and the volunteer forces; further differences are in evidence between volunteer fire services in organized municipalities versus unorganized townships (with Local Service Boards)
- Volunteer forces generally appear to rely more on in-house training and passing expertise from senior more experienced members to younger members, while municipal forces appeared to rely more on formal training; that taken into account, respondents from both types of forces described some members as being more specialized, including in the area of responding to situations involving hazardous materials
- Particularly for volunteer forces, time constraints were noted as the key challenge in expanding training; force members regularly do three hours a week of training and equipment maintenance, outside of response to fire calls
- First responders consistently identified the Emergency Reference Guide 2018 as their primary information source for identifying hazards and developing appropriate responses
- There is a specific training module related to transportation, and most on the force would have Level 1 of this training which addresses how to read the truck placard and response accordingly; in situations where hazards are unknown, likely approach for volunteer forces would be to secure the site and invoke the Mutual Aid Agreement to bring in support from a larger community with more specialized expertise, or from professional hazmat team
- Respondents indicated that there is no training provided specific to radiological events, with the exception of several pages in the Emergency Reference Guide

The Office of the Fire Marshall and Emergency Management Ontario were consistent both across agencies and internally in terms of the chain of command in emergency response and training and information transfer. Both agencies were also consistent in being largely silent on the training and tools being provided to fire fighters to respond to transportation accidents involving hazardous materials, and even more so with respect to radiological events.

Available trainings and training materials were also consistent with this, generally providing minimal attention to these risk areas. In particular, these gaps were evident in the Incident Management and the Basic Emergency Management trainings. While several references were

made during interviews to the 2018 Emergency Response Guidebook[16] as the go-to resource when responding to a hazardous materials event, the 400 page guide is largely a listing of materials with relatively general instructions in how to respond in a fire situation.

Eleven pages deal with six different groupings of radioactive materials, ranging from low level to high level (in terms or radioactivity) and including wastes, fissile material, and uranium hexafluoride. Disconcertingly, each of the six sections begins with the statement "Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases."

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Transportation Safety Issues

Despite the CNSC staff's characterization of the shipment of radioactive wastes as "routine" and taking into account CNL's assertion that their program of radioactive waste shipments from Whiteshell to Chalk Rivers is already underway and has been conducted without incident, there are several areas of concern related to this transportation program.

The first, of course, is the lack of a thorough examination of risks associated with this program, as has been discussed above, and the lack of appropriate notification measures and potentially the absence of emergency response capabilities, as is discussed below. In addition, two areas of specific concern are vehicle safety and maintenance and the occurrence rate of transportation accidents.

During the environmental assessment hearings of Ontario Power Generation's proposed Deep Geological Repository for Low and Intermediate Level Radioactive wastes, the Ontario Ministry of Transportation presented information about routine safety inspections of vehicles transporting Class 7 Dangerous Goods (Radioactive Material), and the disturbing statistics from three years of inspection data. The data showed that 25% of the vehicles inspected were placed out-of-service and / or enforcement action was taken against the operator of the vehicle for various reasons, including:

- Hours Of Service exceeded
- Brake or signal lights inoperative
- Missing Placards
- False Log
- Load Security
- Exceeding Weight, height and/or length limits
- Faulty Speed Limiter
- Faulty Brakes
- Inadequate Vehicle Maintenance

[16] "Emergency Reference Guide 2018", as found at https://www.tc.gc.ca/media/documents/tdg-eng/EnglishERGPDF.pdf

- Inoperative Turn Signal
- Flat Tires
- Vehicle Registration /Insurance

More recently, the Ontario Provincial Police have released statistics on the involvement of transport trucks in highway traffic accidents. Reportedly, during the first half of 2018 the OPP has investigated more than 3,600 transport truck-related collisions, which represent 11 per cent of the total number of collisions **(**34,461**)** and in the course of those investigations the OPP has laid more than 1,615 speeding charges, 354 distracted driving charges and **963** defective equipment-related charges against transport truck drivers.[17]

Statistics for the entire year of 2018 are equally sobering. OPP statistics show that among the thousands of crashes in 2018 involving transport trucks, almost half – 40 per cent – involved a truck that was either following too closely or had made an improper lane change. The OPP said it responded to 7,674 transport truck collisions last year. These crashes claimed 63 lives and caused 1,142 injuries. Close to 80 per cent of last year's transport truck-related collisions were multi-vehicle crashes, making this a significant road safety issue, OPP said.[18] Northeastern Ontario is reported as seeing the largest increase, with an 800% increase in fatalities and 3,600 transportation accidents involving transport trucks (approximately half of the provincial total. Accidents were largely attributed to driver distraction and faulty equipment.[19]

With the data available, Northwatch was not able to determine the frequency of vehicles transporting Class 7 Dangerous Goods (Radioactive Material) being represented in the 2018 statistics of accidents involving transport trucks, but there is presumably a correction between the MOT statistics from 2013 which showed a 25% incidence of faulty maintenance and the OPP observations in 2018 that accidents were largely attributed to driver distraction and faulty equipment.

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[17] OPP FATAL TRANSPORT TRUCK COLLISIONS UP 38 PER CENT, 2018-7-12, www.opp.ca/index.php?lng=en&id=115&entryid=5b4887f9af4f935dc5554413
[18] Transport truck crashes claimed 63 lives in 2018, OPP says, https://www.northernontariobusiness.com/industry-news/transportation/transport-truck-crashes-claimed-63-lives-in-2018-opp-says-1504688
[19] https://northernontario.ctvnews.ca/video?clipId=1438878
[20] ttps://www.researchgate.net/publication/316189473_The_Proximity_Principle_and_the_Movement_of_Waste
[21] https://www.gov.scot/publications/scotlands-higher-activity-radioactive-waste-policy-2011/pages/2/