

# **Radioactive Waste Policy: Export and Import of Radioactive Wastes**

## **Northwatch Submission to Natural Resources Canada - 31 May 2021**

In November 2020 Natural Resources Canada announced a review of Canada's radioactive waste policy framework and launched a virtual hub with four discussions papers and a forum for posting comments online. A series of online sessions were held through direct arrangement – there were no engagement sessions announced on the radwastereview.ca web site and Northwatch is not aware of any opportunities for unaffiliated Canadians to be part of such sessions – and comments were invited by email.

The four discussion papers addressed waste minimization, waste storage, waste disposal, and decommissioning. Northwatch has posted summary comments identifying what was missing from each of these papers and responded to the questions posed in each paper through the online forum.

There are several subject areas which are central to the review and improvement of Canada's radioactive waste policy which were not addressed in any of the four discussion papers. This submission is one of a series prepared by Northwatch to provide input into the review and to propose additions to Canada's radioactive waste policy.

This submission is made by Northwatch in support of the following radioactive waste policy recommendations related to the international trafficking in radioactive waste:

**POLICY RECOMMENDATION:** Under the principle of transparency, Canada's radioactive waste policies should ensure that:

- A detailed inventory of radioactive wastes is maintained, including information about volumes, characteristic, management system and location
- A detailed registry should be maintained of waste transfers, including within nuclear sites (such as transfers from Bruce Power to OPG's WWMF), transfers between sites in Canada, and transfers between the U.S. into Canada.
- In combination, the inventory and registry should include information that allows the user to trace waste volumes from point of generation through treatment to long term storage / disposition.
- The inventory and registry should be peer reviewed and publicly accessible

**POLICY RECOMMENDATION:** Under the principle of public safety and security, Canada's radioactive waste policies should prohibit the commercial trafficking of enriched uranium (including highly enriched uranium and HALEU) between Canada and other countries.

**POLICY RECOMMENDATION:** Under the principle of openness and transparency, the Government of Canada should engage the Canadian public and Indigenous peoples in a thorough investigation and consideration of introducing the use of enriched uranium in commercial reactors prior to any licence reviews of reactor designs that require enriched uranium.

**POLICY RECOMMENDATION:** Under the principle of public safety and security, Canada's radioactive waste policies should prohibit the import of high level nuclear waste into Canada.

## Export and Import of Radioactive Wastes

Over the last several years Northwatch has raised concerns with the Canadian Nuclear Safety Commission (CNSC) regarding the commercial trade and cross-border trafficking of radioactive wastes. Instances of this practice and a summary of our concerns are set out below.

Initially, our communications were with CNSC staff<sup>1</sup> in 2017 as we considered an application by Perma-Fix<sup>2</sup> to export radioactive wastes to a list of consignees which included both the CNL at the Chalk River, Whiteshell and Douglas Point sites, but also three Ontario Power Generation nuclear stations and three facilities operated by Cameco, including the Blind River uranium refinery on the North Shore of Lake Huron. It was the inclusion of the Blind River facility in northeastern Ontario – Northwatch's geographic area of interest – within the Perma-Fix application which first drew our attention, and our concerns about the lack of transparency and accountability surrounding the transit and transfers of radioactive wastes; our concerns broadened and deepened as we investigated and considered the issue more generally.

Notice of receipt of the applications were provided in Federal Register, along with the NRC determination that the import amendment application was to be returned without further action,<sup>3</sup> and that, the only regulatory action pending before the NRC is Perma-Fix's application to amend its specific export license (XW012) for the export of low-level radioactive waste to Canada.

The NRC's stated reason for the return of the import application is that "*the material proposed for import does not meet the definition of radioactive waste in 10 CFR 110.2, because Perma-Fix will not be importing any of the material for ultimate disposal in the U.S. As such, the requested import activities are authorized under an NRC general import license pursuant to 10 CFR 110.27*".

The NRC provided public notice of Perma-Fix's request to amend the license to export radioactive waste and of the opportunity for public comment. No corresponding notice was provided by the Canadian Nuclear Safety Commission, despite the origin and the final destination of the nuclear substances being Canada.

Perma-Fix was applying for four amendments to current application, as follows: to change the licensee's point of contact; to change the foreign suppliers name from Atomic Energy of Canada Limited to Canadian Nuclear Laboratories; to remove reference to Waste Classification as defined in 10 CFR 61.55 and reference to Table A2 values of 49 CFR 173.435 from the waste description; and to change the date of expiration from September 30, 2017 to September 30,

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<sup>1</sup> Email Subject: Re: Import of radioactive wastes from Perma-fix's U.S. operations to Cameco's Blind River uranium refinery, received 2017-06-02 1:14 PM

<sup>2</sup> ADAMS Accession Nos. ML17005A377 and ML17005A373, respectively

<sup>3</sup> ADAMS Accession No. ML17082A001

2022. If granted, the application as amended would permit Perma-Fix to export Class A, B, or C radioactive waste up to a volume of 5,500 tons.

The application to extend and amend the license does not name the consignees, but these are listed in the Export License issued to Perma-Fix Northwest, Inc. on October 9, 2013.<sup>4</sup> That licence lists the following as the “ultimate consignee(s) in foreign country(ies)”, i.e. the waste destination(s) in Canada.

1. Atomic Energy of Canada, Limited, Chalk River Laboratories, Plant Road, Chalk River,
2. Atomic Energy of Canada Limited, Douglas Point, 177 Tie Road, Tiverton
3. Atomic Energy of Canada, Limited, White Shell Laboratories, Pinawa, Manitoba
4. Cameco Corporation, Cameco Fuel Manufacturing, 200 Dorset Street East, Port Hope
5. Cameco Corporation, Port Hope Conversion Facility, 1 Eldorado Place, Port Hope
6. Cameco Corporation, Blind River Refinery, 328 Eldorado Road, P.O. Box 1539, Blind River
7. Ontario Power Generation, Pickering Nuclear, 1675 Montgomery Park Road, Pickering
8. Ontario Power Generation, Darlington Nuclear, Holt Road South, Bowmanville
9. Ontario Power Generation, Western Waste Management Facility, 177 Tie Road, Tiverton

In reviewing Perma-Fix’s license application, we made inquiries with CNSC staff in respect of the existence of any permits Perma-fix currently holds which would permit it to export radioactive wastes from the U.S. to Canada (including but not limited to residuals from wastes they may have previously exported from Canada to the U.S. for treatment), and with respect to the licensing period of any such license, and whether Perma-Fix has applied for a license or a license renewal or extension which would allow the import of radioactive wastes from the U.S. to Canada (including but not limited to residuals from wastes they may have previously exported from Canada to the U.S. for treatment). We reviewed the most recent license for the Blind River uranium refinery and the related license condition handbook, given the facility’s location within our region, and we found no provisions in those instruments for the receipt of radioactive wastes from Perma-Fix's U.S. operations. We also noted that Perma-fix's import/export activities were not reported in the CNSC's 2015 Regulatory Oversight Reports on waste management or on uranium processing facilities.

We inquired of CNSC staff as to whether Perma-Fix had a permit to import radioactive wastes from the U.S. to Canada (including but not limited to residuals from wastes they may have previously exported from Canada to the U.S. for treatment), and received the following response:

Perma-fix does not have a licence issued by the CNSC pursuant to the *Nuclear Non-proliferation Import and Export Control Regulations* to import nuclear substances contained in radioactive wastes from the USA to Canada. Perma-fix is a USA-based company and would obtain any such licence from the USA authorities, namely the US Nuclear Regulatory Commission.<sup>5</sup>

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<sup>4</sup> ADAMS Accession No. ML13282A675

<sup>5</sup> Email Subject: Re: Import of radioactive wastes from Perma-fix's U.S. operations to Cameco's Blind River uranium refinery, received 2017-06-02 1:14 PM

We then further inquired, given that – based on the CNSC staff response - it appeared that Perma-fix did not have a license to transfer any residual wastes from the U.S. back to Canada, whether CNSC staff were aware of any arrangements between Perma-Fix and another waste company operating in Canada (such as UniTech) for the transfer of these wastes, i.e. for the "return trip" for any residuals. We further questioned how the CNSC track such arrangements, i.e. arrangements related to the import and export of radioactive wastes. CNSC staff responded:

CNSC staff do not track nor are aware of any arrangements between CNSC licensees who may operate in the US and Perma-fix. Any return of residual processed waste to Canada would need to be done under a CNSC licence.<sup>6</sup>

We appreciated CNSC staff responding in a relatively timely fashion to our inquiries with respect to the Perma-Fix application to the NRC, but our overall experience was that we were greatly frustrated by our inability to develop a clear understanding of the relationship between (1) the Perma-Fix application as posted by the NRC for public comment and (2) the activities of the nine Canadian consignees listed in the Perma-Fix application.

The degree to which a lack of common terminology on these matters between the CNSC and ourselves was a factor is something we did not come to a conclusion on. What we have concluded is that there is a very troubling lack of transparency on the Canadian side of the border with respect to imports and exports of nuclear materials between Canada and the U.S.

On June 15, 2017 the Canadian Nuclear Safety Commission (CNSC) issued a notice<sup>7</sup> that it would hold a hearing on an unspecified date in June 2017 to consider an application from Ontario Power Generation Inc. (OPG) to amend the nuclear power reactor operating licences for the Darlington Nuclear Generating Station (NGS) located in the Municipality of Clarington, Ontario and the Pickering NGS located in the City of Pickering, Ontario.

According to the notice the proposed amendments would add to the Pickering and Darlington nuclear power reactor operating licences activities that are currently authorized under a nuclear substance and radiation device licence, the activities being the import and export nuclear substances in contaminated laundry, packaging, shielding or equipment. OPG has also requested additional licensed activities, which would allow contaminated laundry from the Western Waste Management Facility to be combined with Pickering laundry before it is shipped to the United States. The notice indicated that the Commission had determined that a public hearing was not necessary to consider this application. The notice further stated that "the requested changes are administrative in nature and do not raise matters related to the protection of health, safety, security or the environment that would warrant being considered in a public hearing". Written submissions from OPG and CNSC staff would be considered, but not from the public.

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<sup>6</sup> Email Subject: Re: Import of radioactive wastes from Perma-fix's U.S. operations to Cameco's Blind River uranium refinery, received 15 Jun 2017 14:44 PM

<sup>7</sup> Ref. 2017-H-109

A revised notice was published on July 4, 2017 indicated that the hearing would not be held until (an unspecified date) in August 2017 and that written submissions would be accepted from the public until August 3<sup>rd</sup>. The hearing remained private, with the date excluded from the revised notice but a closed session with Reference 2017-H-109 posted in the on-line CNSC calendar (as of 3 August 2017) as being August 18<sup>th</sup> (with a note “Documents are not yet available”) and August 25<sup>th</sup> (with a link to the revised notice).<sup>8</sup>

In preparing our comments we reviewed the two CNSC staff CMDs and OPG’s CMD, and the associated attachments and references. Our comments included the following:

- The CNSC staff generated documents variously describe the nuclear substances as being “The nuclear substances consist primarily of contaminated laundry from the Pickering and Darlington NGS and the Western Waste Management Facility that is shipped to the United States to be laundered and returned to OPG”<sup>9</sup> and as “nuclear substances occurring as contaminants in laundry, packaging, shielding or equipment”<sup>10</sup> but does not reconcile these two quite different descriptions
- The CNSC CMD states that “the compliance verification criteria in the Licence Conditions Handbooks (LCH) will list the allowed nuclear substances and quantity limits for import and export” but this information is not included in the CMDs or attachments
- The CNSC CMD asserts that “an Environmental Assessment (EA) under the Nuclear Safety and Control Act is not required given the administrative nature of the proposed licence amendment. No new activities are proposed”; Northwatch disagrees with this assertion by CNSC staff on two grounds: a) there has never been an environmental assessment of the import and export of nuclear substances and b) the caching at the Pickering NGS of nuclear substances from the Western Waste Management Facility *en route* to export is a new activity
- The CNSC provides no basis for several of their statements with respect to tritium, including a) their assertion that the quantities of tritium will be “low”, b) their estimate of the quantities of tritium not exceeding a maximum of 10 GBq, and c) their statement that the estimated amount presents a negligible risk
- CNSC staff have failed to consult with Indigenous peoples, arguing that “the duty to consult Aboriginal groups applies when the Crown contemplates actions that may adversely affect established or potential Aboriginal and treaty rights”; CNSC staff have wrongly concluded that “the activity is administrative in nature”, and have wrongly failed to consult with Indigenous peoples directly to determine whether these activities may adversely affect their rights and interests
- CNSC staff recommends that the Commission grant OPG their three wishes: to amend the Darlington PROL to include import and export of nuclear substances; to amend the current Pickering NGS PROL to include import and export of nuclear substances; and to amend the current Pickering NGS PROL allow Pickering NGS to possess, transfer, package, manage, store and export nuclear substances from the Western Waste Management Facility; Northwatch disagrees with the CNSC staff recommendations for reasons set out below

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<sup>8</sup> [http://nuclearsafety.gc.ca/eng/the-commission/hearings/documents\\_browse/index.cfm?yr=2017](http://nuclearsafety.gc.ca/eng/the-commission/hearings/documents_browse/index.cfm?yr=2017)

<sup>9</sup> CMD Section 1.1

<sup>10</sup> CMD Section 1.2

- We note that at no point does CNSC staff provide any rationale for moving the import and export activity from the Licence 12861-15-19.0 to the PROLs
- We note that at no point does OPG provide any rationale for moving the import and export activity from the NSRD licence to the PROLs, nor does OPG state that this will eliminate the generic Licence 12861-15-19.0 (it more narrowly states that it will “eliminate the generic Licence 12861-15-19.0 for this activity”)
- We find the timing of this request by OPG to transfer authorizations for import and export of nuclear substances from the NSRD to the PROLs curious, given that the generic Licence 12861-15-19.0 was issued in January 2017 for a period of February 1, 2017 to January 31, 2019<sup>11</sup>
- Section IV of Licence 12861-15-19.0, issued in January 2017, states that the authorization is for “temporary possession - no use” but this limitation of “temporary possession” seems incongruous for several reasons, including the following:
  - our more general understanding of the intent, that being the intent to export to the U.S. for treatment items contaminated with “nuclear substances”, i.e. “contaminants in laundry, packaging, shielding or equipment” and then to and then import (return) to Canada the residual nuclear materials after treatment in the U.S.;
  - the facts as communicated to us by the Nuclear Regulatory Commission in the context of an application by Perma-Fix to renew a license for the export (to Canada) of nuclear substances to a list of consignees which included Ontario Power Generation’s Darlington NGS, Pickering NGS, and Western Waste Management Facility, i.e. that after contaminated items are exported from Canada to the U.S. for treatment, the residual nuclear substances are returned to Canada (imported to Canada) for long term management;
  - after residuals are returned to Canada, their possession by Ontario Power Generation would be permanent, or at least very long term
  - there is no information provided or description made available of the radiological nature of the “contaminants in laundry, packaging, shielding or equipment” which are purported to comprise or contain the nuclear substances which are the object of the export / import functions of the authorization proposed for transfer from Licence 12861-15-19.0 to the PROLs
  - in the absence of any description of the radiological nature of the “contaminants in laundry, packaging, shielding or equipment” which are purported to comprise or contain the nuclear substances which are the object of the export / import functions of the authorization proposed for transfer from Licence 12861-15-19.0 to the PROLs, no reviewer – or the Commission itself – can ascertain how those nuclear substances relate or compare to the limits and restrictions in Licence 12861-15-19.0 or any limits or restrictions which might be transferred or embedded in the Licence Condition Handbook should this proposal be approved

As noted above, we had previously inquired of CNSC staff as to whether Perma-Fix had a permit to import radioactive wastes from the U.S. to Canada and whether CNSC staff were aware of any arrangements between Perma-Fix and another waste company operating in Canada (such as UniTech) for the transfer of these wastes, i.e. for the "return trip" for any residuals and were told there was no licence in place and CNSC did not track these shipments. Further to information

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<sup>11</sup> Nuclear Substance and Radiation Device Licence No. 12861-15-19.0, 17 January 2017

that became available during the review of HR we consider it likely that Licence 12861-15-19.0 provides the authorization – the degree to which the license is legally valid – for three of the consignees listed in the Perma-Fix application to the NRC to receive the radioactive wastes being exported to Canada by Perma-Fix.

It is a matter of great frustration that this information was not more readily available at the time we were considering the Perma-Fix application to the NRC. It is of additional frustration that when or if this concern expressed by Northwatch is discussed at the private hearing on the application to add authorization for the export/import of nuclear materials to the operating licenses for the Darlington and Pickering NGSSs, Northwatch and the public more generally will have no knowledge of that discussion or even if the discussion took place.

We requested that the Commission take immediate steps to disclose the full inventory of authorizations for the import/export of radioactive wastes, and prepare a discussion paper outlining recent and current practices and arrangements with respect to the import and export of nuclear materials, with an emphasis on materials that may be classified as radioactive or nuclear wastes. The Commission took neither such action.

In reviewing Canadian Nuclear Laboratories' (CNL) application to amend its nuclear research and test establishment licence for the Chalk River Laboratories site<sup>12</sup> Northwatch identified a concern that - in contrast to the CNL messaging at that time that the CNL "vision" document<sup>13</sup> was one of site revitalization and remediation, addressing legacy wastes and liabilities, and modernizing operations at the CNL property - CNL's activities and operations would continue to accumulate radioactive wastes on the Chalk River property, including through the acceptance of waste of U.S. origin.

Given the absence of information about on and off-site transfers of radioactive wastes in the documents provided by CNL to support their application for renewal of its Nuclear Research and Test Establishment Operating Licence for the Chalk River Laboratories, Northwatch considered what other sources may provide the missing information, in all or part.

The U.S. Nuclear Regulatory Commission (NRC) operates an online information registry known as ADAMS - the Agency-wide Documents Access and Management System. ADAMS is the official recordkeeping system, through which the U.S. NRC provides access to "libraries" or collections of publicly available documents, including the Publicly Available Records System (PARS) Library which contains more than 730,000 full-text documents that the NRC has released since November 1, 1999, and the Public Legacy Library, which contains more than 2 million bibliographic citations (some with abstracts and full text) for earlier documents with the majority dating back to 1980. Several hundred new documents are added to ADAMS each day.

In an effort to gather information about off-site transfers of radioactive wastes that may be originating or routing through the U.S. but have the Chalk River Laboratories as their destination, Northwatch conducted a number of different searches of the ADAMS on-line

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<sup>12</sup> Ref. 2018-H-01

<sup>13</sup> Online: [http://www.cnl.ca/site/media/Parent/Long\\_Term\\_Strategy\\_2017April18.pdf](http://www.cnl.ca/site/media/Parent/Long_Term_Strategy_2017April18.pdf)

registry, using different search parameters. Over 1,000 documents were viewed on-line, and 238 documents were downloaded for more detailed review, based on their match to the search parameters that intersected documents related to export and documents that contained the words “Chalk River”.

Of the 238 documents that were reviewed in detail, all but 10 were from the mid-1990s or newer and those earlier documents had been added recently, presumably because of their relevance to current topics of regulatory or permitting interest. The majority of the documents related to the export of waste from the U.S. to Canada were dated 2007 or newer.

The largest group of documents related to the shipments of Highly Enriched Uranium (HEU), and included a variety of subjects, including export permits, but also expressions of concerns from agencies, government, non-governmental organizations and members of the public about the continued use of HEU in the production of medical isotopes, about what seemed to be perceived as a serious lack of progress on the part of Nordion and AECL to make a shift to isotope production using LEU (and so reduce the proliferation concerns), and – in later years – about the shipments of liquid HEU from Chalk River to Savannah River as part of the repatriation program.

The second largest group of documents related to the export of radioactive wastes from the U.S. to Canada. These 42 documents represent a range of shipments over a number of years, with many of the export licenses covering multiple materials over a number of years, but with some of the documents overlapping, i.e. in some cases there were multiple records in the ADAMS relating to a single export license.

The following are examples of the wastes described as being destined for final disposition at Chalk River, as described in various licenses available through NRC’s ADAMS registry:

- Export to Canada of 100,000 pounds of scrap zirconium tubing contaminated by 15.8 kilograms of uranium enriched to a maximum of 5 percent; transfer by Mississauga Metals and Alloys, Inc. with the residual radioactive wastes sent to Chalk River “burial site” for disposition
- Export to Canada of bulk tritium gas being returned to the original supplier (Ontario Power Generation Inc.) with consignee identified as AECL Chalk River for “long term storage” on behalf of OPG
- 5,000 kilograms of stainless steel contaminated with low enriched uranium, via PermaFix/Diversified Scientific Services, Inc. (DSSI)
- 630 kilograms of non-conforming waste containing approximately tritium and other fission product radionuclides
- Heavy water inadvertently shipped by Ontario Power Generation to DSSI; transferred via Mississauga Metals & Alloys Inc., from PermaFix/Diversified Scientific Services Inc, (DSSI) (Kingston, Tennessee) and Framatome ANP, Inc. (Richland, WA)
- Nonconforming Class A Radioactive Mixed, not exceeding 378,000 kilograms Class A Radioactive Mixed Waste, containing a total of 1,200 curies of tritium and C-14, mixed

fission product radionuclides, and other contaminants, consisting of oil, solvents, scintillation fluids, grease, paint chips, paint sludge, spent bead resins, powder resins, activated carbon and other materials.

- 420.0 kilograms in two drums containing 5.4 curies tritium and other mixed fission product radionuclides (estimated quantity of non-conforming Class A Radioactive Mixed Waste that may be found in a total of 378,000 kg of such waste that DSSI Is authorized by NRC license 1W012 to import from Canada), "DSSI to determine actual quantity of non-conforming waste which cannot be processed at Its Boiler Industrial Furnace and must be returned after examining the material"; 1W012/02 amended to increase the total tritium, C-14, mixed fission product radionuclides and other contaminants.
- From Areva in VA, 3.0 kilograms U235 contained in 60.0 kgs uranium, 60.0 kgs 5.00% 3.0 kgs, carrier is Mississauga Metals
- Enriched to 5.0 w/o maximum, in 150,000.0 kgs zirconium tubing, 25,000.0 kgs of molybdenum metal pieces, and 5,000 kgs stainless steel; For decontamination and recovery, of metals. Waste to be disposed at Chalk River.
- Imported to date are included under the specified ceilings. The licensee is authorized to import up to 378,000 kilograms of materials including oil, solvents, scintillation fluids, grease, paint chips, paint sludge, spent bead resins, powder resins, and activated carbon contaminated with Class A Radioactive Mixed Waste consisting of tritium, C-14, and other mixed fission product radionuclides, the combined total activity level of which shall not exceed 2,000 curies. For transportation purposes, the contaminated materials will be either Low Specific Activity (LSA) radioactive materials or exempt quantities
- Name of Applicant: AREVA Class A radioactive License to be amended to extend expiration date; class A waste in the form of contaminated metals, Metals to be decontaminated and remains to be disposed of at AECL Chalk River facility; Application No.: XW007/02 Docket No.: 11005292. Licenses originally issued to Framatome ANP, Inc.)
- Class A radioactive waste in the form of contaminated metals, Metals to be decontaminated and remains to be disposed of at AECL Chalk River facility;
- 420.0 kilograms in two drums containing 5.4 curies of tritium and other mixed fission product radionuclides (estimated quantity of non-conforming Class A Radioactive Mixed Waste that may be found in a total of 378,000.0 kilograms of such waste that DSSI is authorized by NRC license IW012 to import from Canada).
- Class A radioactive waste consisting of up to 5,500 tons of material contaminated with various radionuclides in varying combinations. The material includes: metals, wood, paper, concrete, cloth, rubber, plastic, liquids, and animal carcasses and animal-human waste from research and medical facilities. Given that there will be numerous shipments, the total combined activity levels for all of the radioactive contaminants on the materials imported under this license will not at any time exceed the licensee's domestic possession limits.
- Class A-radioactive waste consisting of material contaminated with various radionuclides in varying combinations imported from Canada from Atomic Energy of Canada Limited or Zircatec Precision Industries, Inc. with residuals to be returned to Atomic Energy of Canada Limited or Zircatec for disposition

- Forty-eight (48) DOT Empty containers to be shipped to AECL Chalk River (Canada). The containers consist of one nominal 8'x8'x20' cargo container weighing approximately 5500 kgs (12,000 pounds); thirty (30) B-25 boxes (nominal 4'X4'X8' weighing approximately 325 kgs or 720 pounds; and seventeen (17) roll-off Approx 0.119 kgs of source containers (nominal 6'X8'X21' weighing 2500kgs or 5500 pounds). Material Incidental radioactive material is present as contamination on the interior surfaces of the containers. The contamination is < 0.002 grams of SNM (Pu) predominantly byproduct material, with traces of source and special nuclear material. All radioactive material is in the form of solid metal oxides.
- Hospital in Texas to NRC re disposal of the Cesium from the Gammacell 1000; Best Theratronics advised waste would be stored on-site by Best Theratronics in Kanata "for several years before being routed to the AECL Chalk River Waste Management facility for long term storage and eventual disposal"
- Several licenses named several points of Origin: (1. Atomic Energy of Canada Limited (AECL), Chalk River Laboratories, Plant Road, Chalk River, Ontario, Canada K0J 1 JO 2. Atomic Energy of Canada, Limited, Whiteshell Laboratories, Pinawa, Manitoba, Canada ROE 1 LO 3. Cameco Corporation, Cameco Fuel Manufacturing, 200 Dorset Street East, Port Hope, Ontario, Canada L 1A 3V4 4. Cameco Corporation, Port Hope Conversion Facility, 1 Eldorado Place, Port Hope, Ontario, Canada L 1A 3A1 5. Cameco Corporation, Blind River Refinery, 328 Eldorado Road, P.O. Box 1539, Blind River, Ontario, Canada POR 1BO) with generic indication that residuals would be return to same list of consignees; appears to permit waste from any of the nine sources to be returned to any of the nine as consignees, as follows:
- "Class A radioactive waste consisting of material contaminated with various radionuclides in varying combinations imported from Canada under NRC Import License IW022 (and subsequent amendments). This includes waste which may need to be returned to the Canadian generators (Cameco Corporation and Atomic Energy of Canada, Limited) for disposition. Such waste could include material that could not be recycled for beneficial reuse, or does not conform to specification, and/or has been processed for volume reduction and is directly attributable to processing the material imported under IW022 (and subsequent amendments). The quantity of radioactive waste authorized for export shall be consistent with and not exceed that imported under IW022 (and subsequent amendments)"

The above examples are not a complete set of summaries from export (to Canada) licenses accessed via ADAMS, but were selected to provide a sample of the range of waste types and conditions. Further, it is not Northwatch's expectation that this search yielded a complete set of export licenses that might include wastes destined for the Chalk River Laboratories.

Three general observations follow from Northwatch's review of the export permits for the transfer of radioactive wastes from the U.S. to Canada:

1. In what we would estimate to be the majority of cases the radioactive wastes being exported from the U.S. to Canada are residuals of radiologically contaminated materials that have been sent from Canada to the U.S. for some form of "treatment" or "processing;"

2. It is our current understanding that the return of the residual wastes is a regulatory requirement in the U.S., i.e. for an import permit to be issued there must be a corollary export permit for the residual wastes; and
3. There appears to be no requirement that the residual radioactive wastes are returned to the same entity as generated the radiologically contaminated wastes that were sent to the U.S. for treatment, e.g. there appears to be no barrier to OPG's wastes being returned to Chalk River, or Cameco's wastes being returned to Chalk River.

Following from the observations set out above, there is no identifiable system in place for the tracking of radioactive wastes and their transfer across borders, or their transformation from private interests into public liabilities. While we hold an expectation that the CNSC has a tracking system in place, there is no evidence that this is the case. While this is detrimental to the public interest in general, it is particularly so in instances where the public has a concern about increasing radiological burdens in a particular area or location, such as the Chalk River Laboratories properties.

During their review of the application<sup>14</sup> by Bruce Power for a license for a ten year period that would encompass the refurbishment of three or more reactors on-site, Northwatch identified several concerns related to the on-site and off-site transfers or radioactive wastes, including related to the purpose of these transfers, potential adverse related effects, and the lack of transparency related to these transfers.

In gathering information about off-site transfers of radioactive wastes with respect to Bruce Power operations, Northwatch made extensive use of the U.S. Nuclear Regulatory Commission (NRC) operates an online information registry known as ADAMS - the Agency-wide Documents Access and Management System. ADAMS is the official recordkeeping system, through which the U.S. NRC provides access to "libraries" or collections of publicly available documents.<sup>15</sup>

A very limited review of documents posted on the ADAMS registry indicated that Northwatch's concern about cross-border traffic of radioactive wastes may relate directly to Bruce Power's intention to refurbish up to six reactors at the Bruce Nuclear Generation station. As outlined later in this section, Bruce Power provides very little information about wastes that will be generated during refurbishment / Major Component Replacement activities or how those wastes will be managed. However, documents available through the ADAMS registry strongly indicate that during previous refurbishment campaigns Bruce Power's waste management approach included exporting large volumes of refurbishment wastes across an international border for "processing" in the United States. For example, several items of correspondence from Energy Solutions to the U.S. Nuclear Regulatory Commission describe how Energy solutions is providing up to fifty radiologically contaminated cargo containers to Bruce Power, and that these containers will then be loaded with wastes related to reactor refurbishment and then shipped to EnergySolutions' Oak

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<sup>14</sup> Northwatch submission to the Canadian Nuclear Safety Commission on the application by Bruce Power Inc. (Bruce Power) to renew, for a period of ten years, its power reactor operating licence (PROL) for the Bruce Nuclear Generating Stations (NGS) A and B located in Kincardine, Ontario

<sup>15</sup> See online: <https://www.nrc.gov/reading-rm/adams.html>

Ridge, TN processing facility.<sup>16</sup> It is interesting to note that there is more information provided in the ADAMS registry about the radiological contamination of the seacan container that Bruce Power has provided in its entire suite of application and supporting documents about the refurbishment wastes that will be generated through their proposed Major Component Replacement campaign.

As noted previously, Bruce Power provided little information in their application about wastes that will be generated by their operations, or how they will be managed. Of the limited information that is provided, there are several indications that Bruce Power intends to transfer wastes off-site, although there is no information provided about the destination or management conditions or standards. Examples include:

- Bruce Power is reportedly “exploring” the possibility of “reducing spent resin volumes by a factor of five” and that “spent resin may be processed by an external vendor” but no information is provided on the reduction process, or the external location, or even if these two explorations are linked<sup>17</sup>
- Bruce Power reports that they ship “300 – 500 packages of radioactive materials on public roads” but does not indicate what of these shipments are waste shipments versus products such as Cobalt-60<sup>18</sup>

**POLICY RECOMMENDATION:** Under the principle of transparency, Canada’s radioactive waste policies should ensure that:

- A detailed inventory of radioactive wastes is maintained, including information about volumes, characteristic, management system and location
- A detailed registry should be maintained of waste transfers, including within nuclear sites (such as transfers from Bruce Power to OPG’s WWMF), transfers between sites in Canada, and transfers between the U.S. into Canada.
- In combination, the inventory and registry should include information that allows the user to trace waste volumes from point of generation through treatment to long term storage / disposition.
- The inventory and registry should be peer reviewed and publicly accessible

## Import / Export of Enriched Uranium

As described above, during the review of the last application for the Chalk River Laboratories, Northwatch conducted a number of different searches of the ADAMS on-line registry, using different search parameters.

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<sup>16</sup> For example, See <https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML082670340>

<sup>17</sup> Performance Review for Bruce A and B, Section 11.2.3

<sup>18</sup> Performance Review for Bruce A and B, Section 14.2.2

Of the 238 documents that were reviewed in detail, all but 10 were from the mid-1990s or newer and those earlier documents had been added recently, presumably because of their relevance to current topics of regulatory or permitting interest. The majority of the documents related to the export of waste from the U.S. to Canada were dated 2007 or newer.

The largest group of documents related to the shipments of Highly Enriched Uranium (HEU), and included a variety of subjects, including export permits, but also expressions of concerns from agencies, government, non-governmental organizations and members of the public about the continued use of HEU in the production of medical isotopes, about what seemed to be perceived as a serious lack of progress on the part of Nordion and AECL to make a shift to isotope production using LEU (and so reduce the proliferation concerns), and – in later years - about the shipments of liquid HEU from Chalk River to Savannah River as part of the repatriation program.

Recently, a number of vendors have emerged promoting a nuclear technology referred to as “small modular reactors”. Many or most are still at concept-level document, and it is not clear how many – if any – will proceed to an operation stage. However, it should be noted that the majority of the concept designs would utilize enriched uranium as fuel. While all fall below the 20% line of enrichment, several only slightly. And while technically not classified as highly enriched uranium, high-assay low-enriched uranium (HALEU) brings with it a host of security and safety concerns, including the criticality safety aspects of increasing enrichment to nearly 20%, enhanced transportation arrangements, and increased material control and accounting and physical security.<sup>19</sup> For example, it is expected that different transportation packaging would be required for HALEU advanced nuclear reactor fuel, with a significantly higher payload of fissile material per package.<sup>20</sup>

VENDOR	SITE	SITE OWNER	REACTOR TYPE/COOLANT	DESIGN ACRO	MW	Enrichment Level (%) <sup>1</sup>	Fuel
ARC Nuclear Canada Inc.	Point Lepreau	NB Power	Liquid Sodium	ARC-100	100	13	13.1% Enriched uranium
GE-Hitachi Nuclear Energy	Darlington	OPG	Boiling water reactor	BWRX-300e	300	<4.95	3.4 to 4.95% enriched uranium
Moltex Energy	Point Lepreau	NB Power	Stable Salt Reactor	SSR-W	300	Reactor Grade Plutonium	Reactor grade plutonium
NuScale Power, LLC	-	-	Pressurized water reactor	NuScale	60	<4.95	<4.95% enriched uranium
StarCore Nuclear	Chalk River / Pinawa	AECL	High-temperature gas	StarCore	10	15	15% enriched uranium

<sup>19</sup> <https://www.nrc.gov/docs/ML1810/ML18103A250.pdf>

<sup>20</sup> <https://www.tandfonline.com/doi/abs/10.1080/00295639.2020.1802161>

<u>Terrestrial Energy Inc.</u>	Darlington / Chalk River	OPG / AECL	Integral Molten Salt Reactor	IMSR	200	<5.0	<5% enriched uranium
<u>Ultra Safe Nuclear Corporation</u>	Chalk River	OPG	High-temperature gas	MMR-5 and 10	5-10	19.75	19.75% enriched uranium
<u>X Energy, LLC</u>	Darlington	OPG	High-temperature gas	Xe-100	80	15.5	15.5 % enriched uranium

**POLICY RECOMMENDATION:** Under the principle of public safety and security, Canada's radioactive waste policies should prohibit the commercial trafficking of enriched uranium (including highly enriched uranium and HALEU) between Canada and other countries.

**POLICY RECOMMENDATION:** Under the principle of openness and transparency, the Government of Canada should engage the Canadian public and Indigenous peoples in a thorough investigation and consideration of introducing the use of enriched uranium in commercial reactors prior to any licence reviews of reactor designs that require enriched uranium.

## Import of High-Level Waste for “Disposal”

Witnesses appearing before both Parliamentary and Senate Committees considering Bill C-27, An Act respecting the long-term management of nuclear fuel waste argued that there should be a specific provision added to prohibit the importing of high level nuclear fuel waste for placement in a deep geological repository in Canada. The Liberal government of the day, under the leadership of the Hon. Jean Chretien, rejected this amendment, and the Nuclear Fuel Waste Act came into force in February 2002.

In 2003 the Nuclear Waste Management released a background paper titled “7-4 Legal and Administrative Provisions for Radioactive Waste Management Within the North American Free Trade Agreement (NAFTA)” which set out the uncertainties with respect to the availability of a Canadian DGR for foreign waste.<sup>21</sup>

The paper summarized that radioactive waste is treated as a good under NAFTA law, and is thus covered under Chapter three (National Treatment and Market Access for Goods), meaning that U.S. residents and corporations were to have the same access as Canadians. It also clarified that under NAFTA import and export bans are prohibited under articles 309 and 603(1), which basically incorporate GATT law on import and export restrictions. It also noted, however, that

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<sup>21</sup> [https://www.nwmo.ca/en/~/media/Site/Files/PDFs/2015/11/04/17/31/683\\_7-4LegalandAdministrativeProvisionsforRadioactiveWasteManagementwithintheNorthAmericanFreeTradeAgreementNAFTA.ashx](https://www.nwmo.ca/en/~/media/Site/Files/PDFs/2015/11/04/17/31/683_7-4LegalandAdministrativeProvisionsforRadioactiveWasteManagementwithintheNorthAmericanFreeTradeAgreementNAFTA.ashx)

there both general exceptions (Article 2101) and the national security exceptions (Articles 2102 and 607) available under NAFTA.

In tension with the NAFTA provisions (of 2003) the *Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management*, to which Canada and the US are parties asserts that any state has the right to ban import of spent fuel and nuclear waste, and that it is preferable to manage such material in the country where it was produced.

Fast forward to 2021 and the revelations that since at least 2019 former Prime Minister Jean Chretien had been advocating in favour of storing other countries' nuclear waste in Canada and offering his services to help move such a project forward.<sup>22</sup>

Currently, the Nuclear Waste Management Organization, created and composed of the nuclear waste generations as directed by the Nuclear Fuel Waste Act - is in its 18<sup>th</sup> year of operation and is now in Step 3 of a 9 step process to select and secure a site for a deep geological repository for high level nuclear fuel waste. The NWMO is currently investigating two areas, one in northwestern Ontario and one in southwestern Ontario, in a very contentious and increasingly confrontational exercise the NWMO has named "Adaptive Phased Management".

**POLICY RECOMMENDATION:** Under the principle of public safety and security, Canada's radioactive waste policies should prohibit the import of high level nuclear waste into Canada.

Prepared by Northwatch for submission to Natural Resources Canada as part of the Radioactive Waste Policy Review, May 2021

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<sup>22</sup> <https://www.cbc.ca/news/canada/montreal/chretien-nuclear-waste-project-1.5971996>