Canada's Nuclear Regulator

Responses to Questions Raised From Peer Review of Canada's Sixth National Report for the *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*

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Responses to Questions Raised From Peer Review of Canada's Sixth National Report for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

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This document can be viewed on the CNSC website at nuclearsafety.gc.ca. To request a copy of the document in English or French, please contact:

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Responses to Questions Raised from the Peer Review of Canada's Sixth National Report for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

This document supplements the sixth *Canadian National Report for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*. In support of the Sixth Review Meeting, Canada received 86 questions from 17 Contracting Parties. The answers provided in this document demonstrate how Canada has implemented its obligations under the Joint Convention.

This document is produced by the Canadian Nuclear Safety Commission on behalf of Canada. Contributions to the document were made by CNSC staff and representatives from Natural Resources Canada, the Nuclear Waste Management Organization, Atomic Energy of Canada Limited, Ontario Power Generation, New Brunswick Power, Orano Canada, Cameco Corporation, Nordion and Hydro-Québec.

As part of the peer-review process, Canada was required to review the reports that are part of the same country group, specifically Georgia, Ghana, Lithuania, Morocco, the Netherlands, the Republic of Korea and Uruguay. Canada reviewed 18 additional national reports and provided questions or comments to the following Contracting Parties: Argentina, Australia, China, Finland, France, Germany, Italy, Japan, Kazakhstan, Portugal, Romania, the Russian Federation, Spain, Switzerland, Sweden, United Arab Emirates, the United Kingdom and the United States of America.

Contributions to peer review of the 25 national reports were made by CNSC staff and representatives from Natural Resources Canada, the Nuclear Waste Management Organization, Nordion, Atomic Energy of Canada Limited, Orano Canada, Cameco Corporation, Ontario Power Generation and Hydro-Québec.

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
1.	China	Planned Activities	K.5.3.3, P128	It is mentioned that: "Between 2014 and 2016, the NWMO's engineering and design program made significant strides toward its goal of safely containing and isolating Canada's spent fuel…building the first containers designed specifically for the spent CANDU fuel". Q1. What kind of spent CANDU fuel are the first containers designed for? Q2. What are the objective and function of the first containers?	Q1: The containers have capacity for 48 standard CANDU fuel bundles, such as the 37-element bundles used in OPG stations and CANDU 600 stations at Gentilly and Point Lepreau. With a change in the insert geometry, they can accommodate other CANDU fuel bundles. Q2: The first containers are intended to demonstrate and optimize the fabrication process. Also some of these were subjected to tests to verify the design failure limit. Currently, NWMO is planning on a small-run serial production to further test the fabrication technology, and to support above-ground emplacement trials.
2.	China	11	H.3.4, P95	"In some cases, the waste is incinerated or allowed to decay to insignificant radioactivity levels and then discharged into the municipal sewer system or municipal garbage system." Q1. What types of waste are incinerated or allowed to decay to insignificant radioactivity levels in those cases? Q2.The waste are discharged into the municipal sewer system or municipal garbage system, whether the waste needs to satisfy the Derived release limits(F.6.2) and bring into regulatory control by CNSC?	At OPG both liquid and solid waste that is less than 0.6 mSv/ hr is incinerated. All low level waste (< 10 mSv/hr) is allowed to decay to insignificant levels. At OPG's Western Waste Management Facility, workers sort through stored waste that has not been processed to identify items that have decayed to a level that can be free released into public waste or recycling facilities, provided that the waste is below the clearance limits found in CNSC's *Nuclear Substance and Radiation Devices Regulations* (NSRDR). Q2. The amount of radionuclides a CNSC licensee may release to a municipal sewer system or to a municipal landfill is limited through licence conditions. In the licence or licence conditions handbook, the CNSC has limits for radionuclides with relatively long half-lives (in the order of days) that are released to the sewer or to the landfill. These release limits are based on radionuclide specific clearance levels and can be generic or site-specific. Radionuclide specific generic clearance levels are based on highly conservative models from IAEA TECDOC-1000 (published in 1998), limiting exposure to a member of the public

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					to less than 0.01 mSv/year (compared to public dose limit of 1 mSv/year). Site-specific disposal limits are derived for situations where the assumptions associated with the generic clearance values are not considered to be adequately conservative for the facility.
3.	China	11	H.3.2, P92	Canadian licensees follow various forms of waste minimization, depending on site and operational specifics. But in H.3.2 Electricity generation waste, Electricity generation waste consists of varying types of low-and intermediate-level activity radioactive waste such as: light bulbs, cable, retube materials, paper, wood. Q.1 Why are such wastes that do not directly contact the radioactive material recognized as radioactive waste? Q2 Is there some clearance practice of such waste considering RW minimization? If so, please provide more information.	Q1. NPPs have a zoning system in their facilities that ensures all materials regardless of whether or not items have been in direct contact with contamination must be surveyed prior to exiting the facility. Once an item can be confirmed clean then it can be released. Q2. Industry implements a process for items that are expected to be free of contamination based on where they were used. If an item is expected to be uncontaminated, it is placed in a designated container for expedited clearance.
4.	China	11	H.3.6, P96	It is mentioned in section H.3.6 of page 96 that liquid waste from research reactors is cleaned up through a water purification system that includes filtration and ion exchange. Q1. What is the discharge limits of the	Authorized discharge limits are controlled by the Facility Authorization, as per the nuclear site license. At Chalk River Laboratories, the aqueous liquid waste from the National Research Universal reactor is treated along with aqueous wastes from other site sources in the Waste Treatment Centre. The final effluent discharged to the Ottawa river is monitored at the

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				treated liquid?	process outfall and compared against three different limits (from lowest to highest): • The administrative level is an internal limit and is based on a statistical review of historical performance. If this level is exceeded, an internal investigation is conducted. • The action level is set at 5 times the administrative level, and is reviewed by the Canadian Nuclear Safety Commission. Any exceedance of this limit must be reported to the CNSC. An investigation is required if this level is exceeded and appropriate corrective actions are required. • The release limit is the regulatory limit, specified in the site licence and is based on ensuring that the dose to the most exposed member of the public is below 0.3 mSv. The discharge limits for the Waste Treatment Centre are documented in the Facility Safety Analyses documentation and range between: - Tritium 3.7 - 7.4 x 10e6 Bq/L or 100 - 200 µCi/L - Gross Alpha Activity 100 Bq/L - Gross Beta/Gamma Activity 0.37 - 1.05 x 10e5 Bq/L depending on the discharge route.
5.	China	Article 11	H.4, P96-97	Q1. Please introduce the rad-waste minimization technological innovation except of the management innovation indicated in H4 in Canadian national report.	Waste minimization practices include the use of technology and innovation primarily focused on volume-reduction processes, such as incineration, compaction, metal recycling, sorting, segmentation, and decontamination for free-release. Such technologies and innovations (e.g. metal melting) combined with overall waste management procedures have enabled further volume reduction of legacy waste and more efficient minimization of ongoing waste generation.

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6.	China	Article 32.1.4	B.5, P14	Q1. Please introduce the public participation mechanisms and the compensation mechanisms for developing the radioactive waste storage facilities and disposal facilities.	The CNSC conducts as much of its business as possible in an open and transparent manner. This includes holding public hearings in communities most affected by the matter at hand. All public hearings are broadcast live on the Internet and archived on the CNSC website. Transcripts of public hearings and meetings are available online. The CNSC also offers funding through its Participant Funding Program to give the public, Aboriginal groups and other stakeholders the opportunity to participate in its regulatory process. In addition, staff members regularly engage in ongoing public dialogue about the CNSC's regulatory role. CNSC experts regularly visit communities across Canada, where they make presentations, hold open houses, hear opinions and answer questions from people who may be concerned about nuclear facilities in their communities. <u>Public participation mechanisms for the APM project</u> include a comprehensive set of activities. The main objectives are to build awareness and understanding of the project; build and sustain community support; identify potential repository sites that are socially acceptable and explore the potential for partnerships in siting areas. Specific activities include: Community Liaison Committees set up by communities to facilitate community learning and work with the NWMO on an ongoing basis; establishment of NWMO community offices in siting communities; hiring of local staff which work out of community offices; briefings of interested individuals and groups throughout siting areas; participation in area events to provide information and answer questions. The siting process also includes activities which are designed to be completed collaboratively, including: planning and implementation of field studies; development

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					of a community profile and exploration of community vision to understand social considerations; shared visioning of the project; and, exploration of parameters of partnership. Funding for communities in the process: Communities involved in the siting process are eligible to receive funding to cover the costs they incur to participate in the siting process. These funding programs are published on the NWMO website. By principle, communities do not receive financial incentives to participate in the siting process. Beginning in 2018, small community well-being investments are being made in communities where borehole drilling is being planned and who are involved in exploring partnership. Acknowledgement funding for communities removed from the site selection process: At the end of Phase 1 Preliminary Assessment studies, all communities involved in the process, whether they were being screened out at that point or were continuing, received community well-being funds of $400,000 to acknowledge their leadership in advancing Canada's plan. Communities removed from the siting process through subsequent NWMO narrowing down decisions have similarly had their leadership acknowledged through community well-being funds provided upon their exit.

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7.	China	Article 32.2.2	VII.A.1.c) (2), P175	Wet storage technology and dry storage technology were described in Annex 4. It narrated the structure, water treatment and heat transfer of spent fuel storage pools as well as the structure and heat of dry storage. Q1. What monitoring means are equipped in these two kinds of storage facilities? Q2. What improvements have been made after Fukushima nuclear accident? Q3. What measures have been taken in the reactivity control, heat transport or safety monitoring measurements for the high density containers?	Q1. For dry storage facilities designed for CANDU fuel, while no airborne releases are expected to occur under normal operating conditions, there is some potential for airborne contaminants during vacuum drying. Each Dry Storage Building has a HEPA filtration system and a stack monitor which samples for particulate. The wet bays have stack monitors for Tritium and Particulate. As discussed in Canada's report to the seventh review meeting of the Convention on Nuclear Safety (available at http://nuclearsafety.gc.ca/eng/reactors/power-plants/convention-on-nuclearsafety/index.cfm#sec2), the CNSC has completed the implementation of its integrated action plan in response to the lessons learned from the Fukushima accident. As per the CNSC Fukushima Action Plan, licensees were requested to complete an analysis of the structural integrity of the spent fuel pool (SFP) at temperatures in excess of the design temperature limit. If structural failure could not be precluded, they were to then demonstrate what additional mitigation (e.g., high capacity makeup or sprays) would be provided. In addition, licensees were requested to complete an analysis of the structural integrity of the spent fuel pool (SFP) at temperatures in excess of the design temperature limit. If structural failure could not be precluded, they were to then demonstrate what additional mitigation (e.g., high capacity makeup or sprays) would be provided. In addition, licensees were requested to evaluate the consequences in the event of a loss of shielding and the potential for hydrogen generation in the SFP area. The CNSC has found the structural integrity analyses of SFPs at Canadian nuclear power plants acceptable.

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					The analyses predicted some leakage at elevated temperatures; however, this is well within the makeup capability that has been implemented and thus assuring fuel cooling is maintained (spent fuel covered) during an accident. As a result of the analyses, NPPs implemented accessible pool makeup water connections and better monitoring instrumentation. For example, OPG assessed the response of the IFBs in beyond design basis scenarios, and concluded that no additional changes were required and that IFB makeup via Emergency Mitigation Equipment (EME) pumps would be sufficient to maintain IFB safety. OPG has procured portable water level monitoring equipment for the Pickering and Darlington stations that, post event, will be placed in the IFBs for remote level and temperature monitoring. According to analysis performed as part of beyond design basis accident assessments, the failure temperature for IFBs at Pickering occurs when the temperature in the pool reaches or exceeds 40C. For Darlington due to the steel liner in the IFB this value is 100C. The Pickering and Darlington IFBs do not reach their critical failure temperatures until 24.3 and 72 hours respectively (post total loss of IFB cooling assuming a 100% heat load in the IFB). This provides enough time to deploy EME pumps and begin a make-up flow to the IFB before the critical pool temperature is reached. A review of used fuel dry storage processes was also completed and it was determined that the existing dry storage container and storage process were sufficiently robust and that no changes were required. Q3: Reactivity control is not an issue for CANDU fuel either in the wet bay or in dry storage. 7 to 10 year old fuel is transferred and stored in

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					the Dry Storage facilities. Canada's used fuel dry storage containers and facilities are for irradiated natural uranium fuel. Analyses and assessments have yielded adequate subcriticality margin, and have demonstrated that there is no criticality of used CANDU fuel even in storage containers filled with light water. Therefore no special measures are required for reactivity control. The used fuel dry storage container used by OPG's is designed to dissipate the decay heat from the used fuel by natural convection. An aging management program has been developed to ensure the design service life of the Dry Storage Containers will be achieved. Each of the storage buildings has a passive ventilation system consisting of wall-mounted horizontal louvers and roof-mounted turbine ventilators. Gamma radiation surveys are performed at appropriate points covering the entire sequence of the used fuel dry storage container handling and storage operations. Contamination surveys are conducted prior to the transfer of the loaded dry storage containers to each storage facility, and when each container is received at the facility. Gamma radiation and contamination surveys are periodically conducted within each storage facility. For storage facilities outside the nuclear generating station protected area, thermo-luminescent dosimeter monitors are mounted at several locations along the perimeter to monitor for compliance with the regulatory guideline for ambient radiation fields in areas accessible for non-Nuclear Energy Worker personnel.

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					The canisters located at Point Lepreau are similar to that currently in use at Douglas Point and Chalk River and based on the design used at the Whiteshell Laboratories. Containment of fission products in the fuel sheath is achieved using three successive barriers: the fuel sheath, the sea-welded basket and the seal-welded canister steel liner. The bundles placed in the canisters will have cooled for at least 6 years and each bundle will have approximately the same decay heat output. The decay heat generated within the baskets will be symmetric around the basket centre line. No net heat will be transferred to adjacent baskets.
8.	China	Article 32.2.4	Annex 4.5.2, P181, Para 6; Annex 5.1.2,	Q1 How to treat and condition tritiated or containing C-14 waste (including spent resin containing C-14) produced from PHWR in CANDA? Q2 And how to reduce the tritium and C-14 discharge during addressed radioactive waste treatment, conditioning and storage?	Q1. At the NPP, there is no process for treating or conditioning of waste containing tritium or C-14. Tritium is off-gassed through a filtration system to levels that meets waste storage acceptance criteria. Once this criteria is met, the waste is shipped to the waste storage facilities. Q2. As per Q1 tritium and C-14 is not treated or conditioned. However, tritium and C-14 is filtered through "active" ventilation and liquid discharged systems. These systems are monitored on a continuous basis.
9.	China	Article 32.2.4	Annex.4.4, P180	It is mentioned that: "Research programs have assessed the behaviour of spent fuel when stored in dry and moist air conditions and in a helium environment. The programs have concluded that CANDU fuel bundles, whether intact or with defects, can be	Q1: The practice is NOT to store any defective fuel in the Dry Storage facilities. Q2: All CANSTORs are within their current design life of 50 years. This service life is achieved through ongoing monitoring programs and regular inspection and maintenance of the structures or containers. There are requirements for Hydro-Québec (HQ) and New Brunswick Power to have an aging management program in place. There are no

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				stored in dry storage conditions for up to 100 years or more without losing integrity". Q (1) Was there some practice on the CANDU fuel bundles with defects ever stored in dry storage conditions? What are the differences of preconditions when storing intact and defective fuel bundles in the dry storage conditions? Q (2) Based on the conclusions, are there any plans for extending the designed life of CANSTOR dry storage modules? Q (3) What about the designed life of spent fuel dry storage facility and the assessment means of extending its designed life?	current plans to extend the design life of the CANSTOR dry storage modules as a final disposal is planned through the NWMO Adaptive Phase Management (APM) project. Q3: The design life of OPG's used fuel storage facilities are maintained through a program of planned monitoring, maintenance, component replacement and testing, as required. The design life of OPG's used fuel dry storage containers is assured and assessed via an aging management program. Both strategies will ensure that performance and condition data will be available for decisions on potential life extension. Safety Assessments are performed at re-licencing and are submitted to the CNSC for review.
10.	China	Article 32.2.5	Annex 5, P190	It is mentioned that the storage structures include above-ground low-level radioactive waste storage building, refurbishment waste storage buildings and so on. Q1. Please introduce what types of radioactive wastes are stored in different storage buildings?	OPG has 3 types of above ground storage structures – Low level Storage Buildings contain waste that is < 10 mSv/hr excluding reactor components. Retube Waste Storage Buildings (RWSB) which contains reactor components such as end fittings and pressure tubes arising from Refurbishment activities. Steam Generator Storage buildings that contain only waste steam generators arising from refurbishment activities.

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11.	Euratom	Article 11	H4,96	The section H.4 of the national report refers to free release standards waste clearance facilities. Q1. What is the basis for clearance practices in Canada? Q2 Is it authorised, are there different pathways (conditional/unconditional clearance) and how are the clearance levels determined. Q3 Is the approach coherent with IAEA RS-G-1.7?	The CNSC's *Nuclear Substances and Radiation Devices Regulations* (NSRDR) define two clearance levels that may be applied to materials, including radioactive waste: unconditional and conditional. Unconditional clearance means the unrestricted release of materials from regulatory control (i.e., there are no restrictions regarding the disposition of the material). The unconditional clearance levels in the NSRDR are applied when the quantity of material involved is greater than 1 tonne per year per nuclear facility. The unconditional clearance levels in the NSRDR align with IAEA RS-G-1.7, *Application of the Concepts of Exclusion, Exemption and Clearance*. Conditional clearance applies to specified types of materials and disposition routes. As such, conditional clearance levels are developed by CNSC licensees and submitted to the CNSC for review and approval. The conditional clearance levels are therefore specific to each submission for specified types of materials and disposition paths. In support of such requests, licensees submit a pathways analysis to prospectively assess doses to workers and the public from cleared materials. The dose criteria on which conditional clearance levels are based are the same as the unconditional clearance levels, namely an annual effective dose of 10 µSv due to realistic scenarios and parameters and an annual effective dose of 1 mSv due to low probability events (referred to in IAEA RS-G-1.7, *Application of the Concepts of Exclusion, Exemption and Clearance*). In addition to the clearance levels discussed above, exemption quantities are defined in the NSRDR that may also be used to clear radioactive waste if the inventory of material involved is less than or equal to 1 tonne per year per nuclear facility. The exemption

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					quantities in the NSRDR align with the established exemption levels in Schedule I of the IAEA's GSR Part 3, *Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards*. In addition; a CSA Group standard, N292.5-11 (R2016) - *Guideline for the exemption or clearance from regulatory control of materials that contain, or potentially contain, nuclear substances,* has been developed to provide guidance on approaches to the clearance of materials consistent with Canadian and international recommendations.
12.	Euratom	Article 32	5,191 Annex 5.1.2	Q1. Are there some provisions taken to limit the releases of tritium during the waste treatment, conditioning and storage process? Q2. What is the action level (in Bq/L) for tritium in groundwater?	Q1: Tritium management provisions are involved throughout the transportation, receipt, processing, and storage of low- and intermediate-level waste. As per the Waste Acceptance Criteria, Waste Generators shall select appropriate packaging for controlling any tritium hazards, and any wastes with elevated levels of tritium require prior approval for acceptance. Records of the tritium concentration for each container are documented prior to shipment and verified prior to unloading the transportation package. There are tritium monitors located through the processing facility and storage buildings to manage tritium levels with site operations. Q2. There isn't an environmental action level for tritium in groundwater. Environmental action levels are applied to emissions or releases from a facility. There is an action level for waterborne tritium releases from the Western Waste Management Facility and it is 6.2E+13 Bq/month. CSA Standard N288.8-17 *Establishing and Implementing Action Levels for Releases to the Environment from Nuclear Facilities* defines how to establish an environmental action level. From the standard, action

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					levels are defined for releases at the final discharge point within an effluent monitoring program.
13.	Finland	Article 18	Section E page 44	Canada has established a harmonized or joint review approach with other federal, provincial or territorial departments in such areas as health, environment, transport and labour. Q1. If possible, please provide some feedback from this kind of joint regulatory process, concerning especially chemical toxicity and NORM-waste; Q2.What were the challenges? Q3. Any good practices? Q4.Have any overarching common issues been identified that could be presented at the review meeting?	Q1. In Canada, NORM (TENORM) and waste associated with uranium mines and mills is considered radioactive waste and is regulated by the CNSC as part of the nuclear fuel cycle. Naturally occurring radioactive material (NORM) is regulated by the provincial and territorial governments, each having its own specific regulations on the handling and disposal of the material. The Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials have been developed by the Federal Provincial Territorial Radiation Protection Committee to harmonize standards throughout the country. Q2. In Canada environmental protection is a joint provincial and federal responsibility. In its simplest form the federal government tends to establish over-arching policy and national level regulations with limited facility specific licensing or permitting. Licensing and permitting is usually managed at the provincial level. However, under the federal *Nuclear Safety and Control Act*, the Canadian Nuclear Safety Commission has direct regulatory authority over the nuclear fuel cycle including facility specific licensing. In addition, the CNSC also has regulatory authority over hazardous substances associated with licensed activities, not just nuclear substances. Thus there is the potential for regulatory overlap that has to be managed in a manner respecting individual regulatory mandates of the different jurisdictions while still ensuring clarity and efficiency for the licensees. Q3. Best practices focuses on harmonization of requirements wherever feasible with the CNSC reserving the right to enforce stricter and/or additional requirements where it is demonstrated as necessary. Licensees are encouraged to incorporate all of their requirements within a single facility specific environmental protection

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					program, which once identified in the CNSC licence (Licence Condition Handbook) becomes enforceable under the NSCA. Such an approach requires establishing and maintaining strong working relationship and communications with those sharing jurisdiction. It has been found that this is best managed by establishing formal Memorandums of Understanding (MOU) or administrative agreements between the CNSC and various federal and provincial agencies. These are publicly posted on the CNSC web site. Participation in joint regulatory review teams and in national committees such as the Federal-Provincial-Territorial-Radiation Protection Committee (FPTRP) have also been found to be important to communications and consistency in regulatory approaches. Other relevant federal and provincial agencies are also encouraged to participate in public Commission hearings to demonstrate the depth and breadth of the complete range of regulatory oversight. Q4. Importance of communication among the range of regulatory agencies through a formal mechanism (e.g., MOU) to ensure maintenance of communication and joint actions over the long-term.
14.	Finland	Article 18	Section E.4.3	Canada has an impressive public participation and hearing process. Q1 How has this process increased the commitment and participation of different stakeholders? Q2 Has this process had an influence on the public acceptance on radioactive waste disposal projects and waste management?	Q1 As described in Canada's Sixth National Report, all the Commission's proceedings are open to the public. By offering several different ways to participate and or observe, all Commission public proceedings are available in a format and at a time most convenient to different stakeholders. Participation may be in-person, by teleconference or by video-conference if presenting orally to the Commission, or by simply filing a written submission to be reviewed by the Commission members and discussed at the public proceeding. External stakeholders may observe in person, via webcast (live or archived) or by choosing to read the free transcript of the proceedings posted to the CNSC website.

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					In addition to physical or virtual access, the Commission's public proceedings offer simultaneous interpretation in both of Canada's official languages. When holding public proceedings in Canada's northern Indigenous communities, options may also be provided for simultaneous interpretation in a local language. The Commission is committed to fulfilling the requirement of the NSCA that reads, " All proceedings before the Commission shall be dealt with as informally and expeditiously as the circumstances and considerations of fairness permit" (s.20(3)). The Commission will always be mindful of both changing technology and social media tools that might impact public participation as well as individual requests from stakeholders for accommodation. In recent years, the participation of Indigenous peoples in Canada in the CNSC hearing process has increased significantly. Decisions by the Supreme Court of Canada, and commitments and legislative initiatives of the Government of Canada, regarding the rights of Indigenous peoples, as set out in section 35 of the Constitution Act, 1982, require the careful consideration of potential impacts to rights from CNSC regulated facilities and activities. Accordingly, Indigenous peoples, communities and organizations are increasingly likely to participate in the process and provide information on potential or existing impacts to their rights. The CNSC's Participant Funding Program (PFP) has further supported Indigenous peoples' participation in the process by supporting community meetings to better understand community issues and concerns, in addition to meetings with CNSC staff to discuss environmental, health, safety, security and technical issues and concerns. Recently, the CNSC has begun to support Indigenous traditional knowledge and land use studies to help communities better understand impacts to traditional land uses from CNSC regulated

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					projects and activities. Q2. The CNSC does not have formal measures for quantifying public acceptance or any changes to it. The public participation processes in place focus on being open, transparent, informal and flexible. Through timely access to all documentation for each individual Commission matter by download on the CNSC website, the public has both the complete written record before the proceeding together with the oral and written records created during those proceedings. By ensuring such public access to the record, the Commission has done everything in its power to offer all of the available evidence and science needed to reach a balanced, informed view on the application or other matter being considered. Given that many stakeholders have strongly held views on a particular nuclear project or nuclear energy in general, the goal of the process does not focus on changing public acceptance as much as knowing that the process has facilitated the broad dissemination of all available information on a particular subject, and facilitated the public's participation in the process.
15.	Finland	Article 4	Section G.16, page 90	In June 2007, the Government of Canada selected the NWMO-recommended Adaptive Phased Management (APM) approach for the long-term management of Canada's spent fuel. Q1. Please elaborate more how APM approach is planned to be implemented in the future and is there already any feedback from this kind of process?	APM includes a technical method and a management system. The management system, in particular, reflects strongly the social expectations of how the NWMO will advance to implementing the repository. It includes aspects such as phased decision-making, ongoing involvement of people in the process, the ability to adapt to changing circumstances and new knowledge, and the requirement to site the facilities in a willing host. These kinds of requirements continue to be important in sustaining participation of communities, and others, in the implementation process. Refinements have been made to implementation timeframes, to approaches to working with communities and to support programs in response to learning from working with communities, which has

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					helped to keep the program strong and resilient. Refinements to technical approaches have similarly been implemented in response to learning, which has had the effect of both contributing to public confidence on the safety of the plan while achieving cost efficiencies. The NWMO publishes annually an update on the plan, titled *Implementing Adaptive Phased Management*. Each update provides a summary of progress from the year before, as well as a set of strategic objectives for the upcoming five-year period. Before final publication, NWMO releases the plan in draft form for public review. Once the review period is complete, NWMO revises the implementation plan to reflect comments received. As the work has become more focused, so too has the planning document. The next five years are focused towards identifying one preferred site for the project, while ensuring the safety of people and the environment over the long term. Activities are underway in eight areas of the implementation plan, as described in Sec. K.5.3 (Implementing the long-term management plan, 2014–17) of Canada's National Report. Since the issue of Canada's Report, a new draft update of NWMO plan was published for public review; the plan is currently being updated to reflect the comments. The draft is available on the NWMO website at nwmo.ca/implementationplan
16.	France	Article 22	Section B-8 p18, Section F3-4 p61	On page 18, the Canadian report indicates that to address the long-term management of spent fuel, the three major waste owners – OPG, Hydro-Québec and NB Power – established the NWMO in 2002 under the Nuclear Fuel Waste Act. On page 61, it is indicated that following the Government of	The NWMO is a not-for profit corporation established in 2002 by Canada's nuclear electricity producers in accordance with the *Nuclear Fuel Waste* Act (NFWA). The founding members of the NWMO are Ontario Power Generation, New Brunswick Power Corporation, and Hydro-Québec. These organizations, along with Atomic Energy of Canada Limited (AECL), are mandated to fund NWMO. NWMO has its own Board of Directors nominated by the founding

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				Canada's selection of the Adaptive Phased Management (APM) approach for the long-term management of Canada's spent fuel in 2007, the NWMO began its evolution from a small, study-based group to a sustainable corporation with full responsibility for implementing the plan. Work was undertaken to enhance the organization's long term viability and improve its capacity to recruit and retain personnel. On January 2009, the NWMO became its own employer, with the necessary supporting infrastructure including finance, legal services and human resources. Staffing levels increased from 27 at the end of 2007 to 137 by the end of 2016. Q1. Could Canada specify the status of NWMO (private or public company, relations with the waste producers, financing...)?	members. In addition, the NWMO has an Advisory Council with broad membership that was a requirement of the NFWA. The Advisory Council reports every three years to the federal Minister of Natural Resources. NWMO is funded during the current site selection phase directly by its members and AECL according to a funding formula reflecting the amount of spent fuel waste each owns. In the longer term, after a construction licence has been received, the NWMO would be funded from segregated funds that are presently being put aside by these companies as directed by the NFWA.
17.	France	Article 4	Section G.5 p 79	Fuel used for the production of medical isotopes is not included in the report because, once spent, it is reprocessed for extraction of medical isotopes. Q1. Could Canada specify which material and waste are produced further to the	As mentioned in section G.5 of Canada's National Report, medical isotope production fuel is outside the scope of the Joint Convention. At the Chalk River Laboratories (CRL), HEU targets were irradiated and reprocessed to extract Mo-99 (this practice stopped in 2016 because of the shutdown of Mo-99 production at CRL). The waste produced from this process, which is mainly HEU in nitric acid, is stored in the

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				reprocessing and, if any, how they are managed?	Fissile Solution Tank (FISST) and repatriated to the USA.
18.	France	Article 6	Section K p 114	The report mentions public involvement, in particular concerning site-selection for the long term management of spent fuel and environmental impact assessment of deep geological repository for L&ILW. In that respect, on page 114, it is indicated that: - in June 2007, the Government of Canada selected the NWMO-recommended Adaptive Phased Management (APM) approach for the long-term management of Canada's spent fuel. As of July 2017, 7 of the original 22 interested communities were participating in the site-selection process; - in January 2012, the Canadian Environmental Assessment Agency (CEA Agency) and the CNSC established a joint review panel (JRP) to review OPG's environmental impact statement in support of its application for a licence to prepare site for and construct a deep geological repository for its L&ILW. The JRP held public hearings in 2013 and 2014.	APM The APM project requires a willing host in order to be implemented. The project will only proceed with the involvement of the initially interested community which initiated the siting process in their area, First Nation and Métis communities, and surrounding communities in the area working together to implement the project. The steps of the siting process are intended to encourage learning and reflection by the interested community, and progressively the people in the surrounding area, to support this objective. This includes: involvement in planning of technical studies in the area and reviewing findings together with the NWMO; exploring what the project would mean to the area if it were implemented there and how the project might be aligned to achieve community and area objectives; shared visioning of the project; and ultimately the development of the terms and conditions on which the project could proceed including project configuration, needed partnerships, and investments. OPG DGR In 2001, the Municipality of Kincardine approached OPG to jointly look at developing options for a long-term disposal facility for low and intermediate level waste at the Bruce nuclear site. An Independent Assessment Study was created identifying technically feasible options, including a DGR (additional details on the study are available in section K.7.1 on pg 138). In 2004, the Municipality of Kincardine - by resolution - endorsed moving forward with the DGR because of its higher safety margins. Also, in 2004, OPG signed a hosting agreement with the Municipality of Kincardine. An amending agreement was

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				Q1. Could Canada provide details on the perspective in terms of local communities involvement in the further elaboration/implementation of the spent fuel management solution and the OPG's Deep Geologic Repository project?	negotiated in 2017/2018 and ratified by Kincardine council in February 2018. OPG continues to provide regular and frequent updates to the host community council, surrounding municipality councils, and indigenous communities on progress of the DGR Project and on the interim management of the waste.
19.	France	Article 32	Sections B7 p 17 and K7 p 137	On page 137, the report indicates that OPG (which owns many of the CANDU reactors) and AECL are responsible for about 96 percent of the annual accumulated volume of non-historic L&ILW and have initiatives underway to develop and implement long-term solutions. 2 CANDU reactors are owned by NB Power and Hydro-Québec. Q1. Could Canada detail the prospects for the long term management of the L&ILW generated by the two CANDU reactors owned by NB Power and Hydro-Québec?	Currently, all L&ILW is safely stored on-site at each of the two facilities. In accordance with CNSC regulatory guide G-219, *Decommissioning Planning for Licensed Activities*, licensees are required to keep decommissioning plans up to date throughout the lifecycle of a licensed activity. The decommissioning plan documents the preferred decommissioning strategy along with objectives at the end of decommissioning. The plan defines areas to be decommissioned, the general structure and sequence of the principal decommissioning work envisioned, and includes proposed strategies for managing all waste. The licensee's financial guarantee must cover all decommissioning costs, including the projected cost of the waste management option proposed. In the case of both NB Power and Hydro-Québec, the decommissioning plans state that, at this time, the licensees are planning to dispose of the L&ILW in an off-site licensed disposal facility. Both utilities are pursuing discussions with industry partners to understand options for disposal of L&ILW, including participation in the current CANDU Owners Group Decommissioning/Waste Management Peer Group and Decommissioning/Waste Management Strategic R&D Working Group, which were recently established.

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
20.	France	Article 32	Section B10 p 19	Canada's report indicates, on page 20, that historically, tailings were used as backfill in underground mines, deposited directly into lake basins or placed in low areas on the ground surface and confined by either permeable or water-retaining dams. Surface tailings were left bare, covered with soil or flooded; some bare or covered tailings may have been vegetated. In response to evolving regulatory requirements, the containment structures for surface tailings have become much more rigorously engineered for long-term storage and stability. Contaminated industrial wastes are typically recycled, deposited in underground mine workings or landfilled at the site-specific tailings management facility (TMF). The management of Uranium tailings and waste rock is a long-term storage. Q1. Could Canada provide information on how long-term impacts are assessed (including radon exposure) and if the assessment accounts for the possibility of re-use of the site over the long-term resulting from memory loss?	Potential long-term impacts are assessed as part of environmental assessment process, including radon exposure, for a proposed development. Typically, potential long-term impacts are assessed through numerical models that extend many years past the anticipated operating period for the proposed development. The assessments include assumption for the long-term use of the site, which may include restrictions on development within areas such as reclaimed tailings facilities and/or waste rock piles. The assumptions for the long-term use and any potential restrictions on use or development are the basis for the final decommissioning and reclamation strategy for the site. Upon completion of decommissioning and reclamation by the owner of the development, to the satisfaction of the provincial and federal governments, the responsibility for long-term management of the site falls to the provincial and/or federal government. The government uses specific mechanisms such as ongoing licensing, or programs for institutional control to ensure that the use of the site does aligns with the long-term assumptions used within the assessment.

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
21.	France	Article 20	Section E.6 P 48	The report indicates, on page 50, that licensees are required to submit operating reports to the CNSC according to licence conditions. The frequency of these submissions generally ranges from quarterly to annually. The analysis of safety significant events is another component in the safety performance evaluation of a facility. The objective of these analyses is not for the CNSC staff to duplicate reviews done by licensees but to ensure licensees have adequate processes in place to take corrective actions when needed and integrate lessons learned from past events into day-to-day operations. The significant events are mentioned in the operating reports issued quarterly to annually. Q1. Could Canada specify whether the licensees have the obligation to report all significant events to the CNSC upon detection, before issuing the operating report? Q2. In that case, what is the procedure for the licensee to inform CNSC and what are the actions taken by CNSC once the event is known?	Q1. CNSC licensees have the obligation to report significant events to the CNSC as soon as possible after they become aware of an event as outlined in: Section 29 of the *General Nuclear Safety and Control Regulations* specifies reporting requirements several situations such as an attempted breach of security or an unauthorized release of radioactive material into the environment. Subsection 29(2) requires that "Every licensee who becomes aware of a situation referred to in subsection (1) shall file a full report of the situation with the Commission within 21 days after becoming aware of it, unless some other period is specified in the licence…" Section 16 of the *Radiation Protection Regulations* states that "When a licensee becomes aware that a dose of radiation received by and committed to a person or an organ or tissue may have exceeded an applicable dose limit […] shall (a) immediately notify the person and the Commission of the dose;" […] (e) within 21 days after becoming aware that the dose limit has been exceeded, report to the Commission the results of the investigation or on the progress that has been made in conducting the investigation." As an example, REGDOC-3.1.1 *Reporting Requirements for Nuclear Power Plants* and REGDOC-3.1.2 *Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and*

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					Mills are intended for inclusions in licences as part of the conditions and safety and control measures in a licence. These regulatory documents set out reporting requirements for CNSC licenced facilities including requirements for reportable events or situations. Q2. After determining if a situation, event or dangerous occurrence is reportable, the licensee shall immediately notify, or file a preliminary report to, the Commission. If the event or incident triggers actions under emergency response programs, even if it is a false alarm; an event such as a spill, a release or an injury that could trigger stakeholder interest; an event that falls under the requirements of subsection 29(1) of the *General Nuclear Safety and Control Regulations* directly through the CNSC duty officer. Once CNSC staff are notified of the event, it is assessed to determine if the event needs to be reported to the Commission. If after a review and assessment of the event CNSC staff deem it necessary an Event Initial Report (EIR) is prepared and presented to the Commission. Additionally, all reportable events at a facility are reported to the commission through the regulatory oversight reports on an annual basis.
22.	Germany	Article 14	pp. 143/144, Section K7.2.2	Canadian Nuclear Laboratories (CNL) wants to build a Near Surface Disposal Facility (NSDF) at Chalk River Laboratories (CRL). This ground-level facility would be built for permanent and safe disposal of LLW and other suitable waste. This are e.g. wastes from Atomic Energy of Canada Limited (AECL,	Q1) The areal footprint of the proposed Near Surface Disposal Facility is 16 hectares (approximately 40 acres) with a completed capacity of 1 million cubic meters of low-level waste. The entire facility including support infrastructure, buildings, roads and the waste water treatment plant is approximately 37 hectares (approximately 90 acres). Q2) The operational start is currently planned for late 2021, pending the completion of the Environmental Assessment and necessary

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				now CNL) operations and from Canadian hospitals and universities in temporary storage facilities at CRL. These temporary facilities have design lifetimes that range from 25 to 50 years. The intent of the proposed NSDF is to provide a safe and permanent disposal solution for this waste. Q1. How large (volume/areal footprint) will this planned facility be? Q2.What is the expected time of operation? Q3. What will be the intended end-state after closure?	licencing from the CNSC. The operational life of the facilities is planned for 50 years. Q3) Once a final cover is installed and the waste water treatment plant is no longer required for operations, it will undergo demolition and decommissioning. A monitoring period followed by institutional controls is planned for 300-400 years. CNL indicated that the end state objectives for the footprint of the auxiliary facilities – after any remediation required – will be available for industrial re-use.
23.	Germany	Article 4	p. 80, Section G.6	The report says: "The engineered structures, canisters, Modular Air-Cooled Storage (MACSTOR) and Ontario Power Generation (OPG) dry storage containers were originally designed for a 50-year lifetime. The actual life of the structures could be much longer. These structures are vigorously monitored; in the event of a structural failure, the spent fuel can be retrieved and transferred to a new structure." Q1. Is the lifetime "extension" of the containers with more than 50-years age	MACSTOR The construction of Hydro-Quebec's oldest MACSTORs started in 1995; the transfer of HQ's spent fuel to the final disposal site is scheduled in 2050, which is 55 years after construction. Hydro-Quebec has an aging management program for its waste management facility, which includes the MACSTOR and performs quarterly inspections of all the waste management facility. DCS There are currently no Dry Storage Containers that have been life extended beyond 50 years. Our oldest containers were filled in approximately 1992 and therefore have reached approximately 50% of

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				solely done by the monitoring and in case of failure transfer of the fuel to a new container? Q2. Are there, in parallel, calculations or material testing (e.g. with test containers of similar age)?	their expected life. Q2. CNL concrete canisters, MACSTOR modules and OPG dry storage containers (DSCs) are designed to safely store spent fuel for at least 50 years. This service life is achieved through ongoing monitoring programs and regular inspection and maintenance of the structures or containers. The CNSC requires that OPG, HQ, NB Power and CNL have in place an aging management program. A process for managing aging effects on concrete structures, such as MACSTOR modules, is being developed by Hydro-Québec. MACSTORs (the first of which came into service in 1995), OPG's DSCs and CNL's concrete canisters, are subject to periodic inspections to ensure their structural integrity, thereby providing for the protection of the public, workers and the environment. Although the design life was 50 years, it is recognized that some containers may have a shorter or longer operating life. Currently, there are no indications of premature aging of the CNL concrete canister, MACSTOR or OPG dry storage containers.
24.	Germany	Article 28	pp. 112/113, Section J.4.5	Safety of radioactive sealed sources: "According to regulations, sealed sources that are lost or found must be reported to the CNSC. Licensees that go bankrupt must also report this to the CNSC." Q1. Are the costs for securing, handling, perhaps disposal of sources from bankrupt licensees covered by the	Funds for securing, handling and disposal of sources from current and future Nuclear Substance and Radiation Device licensees who go bankrupt may come from the CNSC's budget or may come from the financial guarantee FG) insurance program. The determination as to the source of funding is made on a case-by-case basis by the CNSC. A licensee is responsible for final disposal or transfer to another licensee. The FG insurance program is a source of funding of last resort for disposal If it is from a bankruptcy of a current licensee then the insurance program could be used to cover the disposal however it is at the discretion of the CNSC if they wish to make a claim on the

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				insurance program referred to in J.4.6, or is there a separate funding?	insurance or use operational funds to cover the disposal. In the case of found devices that can't be attributed back to a licensee or former licensee then the cost to cover the final disposal would most likely be from the CNSC;s budget To date there has been no claim on the insurance program for bankrupt licensee.
25.	Ghana	Planned Activities	K,145	Q1. Kindly update us on the completion of the first cell and plans for emplacement of waste of Waste Management Facility (WMF) at Port Hope? Q2. How is Port Granby Project handling the LLW transported from Lake Ontario shoreline prior to completion of the cover system in 2021?	Q1. The first cell began accepting on-site waste in December 2017, when the first truckloads of contaminated soil that has been stored on the site for decades were placed in the engineered aboveground mound. The start of waste movement in the Municipality of Port Hope is anticipated to begin in April 2018. The first areas to be remediated are the temporary storage sites on the Centre Pier, Pine Street Extension and sewage treatment plant. Q2. Historic low-level radioactive waste is being excavated in a planned sequence at the legacy waste management facility on the Lake Ontario shoreline and safely transported to the engineered aboveground mound located approximately 700 metres to the north. Trucks carrying waste are tightly covered, scanned and weighed before exiting the legacy site along a dedicated haul route and through an underpass so that no waste trucks travel on public roads. To date, approximately 500,000 metric tonnes of the waste has been placed in the engineered aboveground mound for long-term storage – this represents more than 50% of the waste to be placed in the facility. All waste water generated by project activities is sent for treatment at the dedicated waste water treatment plant before it is discharged to Lake Ontario

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
26.	Ghana	Planned Activities	K,146	Q1. what will constitute activities in long-term monitoring and maintenance phase which will follow emplacement of wastes and closure of new WMFs?	CNL: The Long-Term Waste Management Facilities in Port Hope and Port Granby will be monitored and maintained throughout their service life, estimated to be hundreds of years. Environmental and performance monitoring programs will include monitoring of groundwater, surface water quality, leachate from within the engineered mound, functioning of the mound's baseliner and cover system. Regular inspections, routine maintenance, and repairs would be performed throughout the life-cycle of the facilities.
27.	Ghana	Planned Activities	K, 147	Q1. what does Canada refer to as guaranteed shutdown state and Deferred Decommissioning Strategy Approach?	Guaranteed shutdown state refers to placing the reactor facility in a safe shutdown state. The Deferred Decommissioning Strategy Approach is a decommissioning strategy where the facility is placed in a period of storage-with-surveillance (usually several decades) followed by decontamination and dismantlement
28.	Hungary	Article 32.1.4	Sec. D.3 P. 25-30 & Annex 5 P. 189-2	The national report mentions the VLLWs only in Section B.6, where the Canadian RW classification system is presented. The other parts of the report (e.g. the radioactive waste inventory in Section D.3 and the presentation of the RWM facilities in Annex 5) do not feature any VLLW-specific information. Q1 What are the practical advantages for RWM in Canada of having a VLLW category? Q2 Are there any (or will there be any)	Q1. VLLW is treated as a sub-category of LLW. As outlined in CSA Group standard N292.0-14 General principles for the management of radioactive waste and irradiated fuel, VLLW has low hazard potential but is above the criteria for exemption. VLLW includes large volume bulk material such as low-activity soil, rubble and some uranium wastes. It does not need a high degree of containment and near-surface repositories are generally suitable. Q2: Canada does not have any current plans for the development of VLLW disposal facilities. Q3: The CNSC uses a performance based approach to regulating under which the proponent proposes their approach to waste management, supported by a safety case. The CNSC will then assess the proposal

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				RWM facilities exclusively for the management of VLLWs? Q3 If so, are there any specific requirements in the Canadian legislative and regulatory framework for the siting, design, licensing, operation, closure, monitoring, regulatory oversight, etc. of these facilities and the related activities?	against existing regulatory requirements to ensure the health, safety and security of the public and the protection of the environment. CNSC Regulatory Guide G-320 provides guidance to licensees for assessing the potential long-term impact that radioactive waste storage and disposal methods may have on the environment and on the health and safety of people. This document addresses: long-term care and maintenance considerations; setting post-decommissioning objectives; establishing assessment criteria; assessment strategies and level of detail; selecting time frames and defining assessment scenarios; identifying receptors and critical groups; and interpretation of assessment results. This document addresses the assessment of long-term safety to support licence applications, and includes discussion of assessment methodologies, structures, and approaches.
29.	Hungary	Article 32.1.5	Section B.6.3 Pages 14-16	As it is explained in the referred section, the VLLW category is a subcategory of the LLW category in Canada. Q1. What is the regulatory or practical approach for distinguishing between VLLWs and other types of LLWs? Q2. Is there a commonly used numerical upper limit for any of the VLLW parameters (e.g. half-lives and activity concentration of radionuclides)?	Q1. And Q2. As outlined in Canadian Standard Association (CSA) N292.0-14 General principles for the management of radioactive waste and irradiated fuel, VLLW has low hazard potential but is above the criteria for exemption. VLLW includes large volume bulk material such as low-activity soil, rubble and some uranium wastes. It does not need a high degree of containment and near-surface repositories are generally suitable. In Canada, licensees are responsible for safely managing their own wastes. They must demonstrate to the CNSC how they propose to fulfill this obligation. CSA standard N-292.0-14, which defines the Canadian waste classification system, did not provide definitive numerical boundaries, as it was developed to provide licensees with a degree of flexibility — according to their operational and organizational needs — in developing waste management plans. Annex A provides numerical orientation with respect to waste

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					classification.
30.	Hungary	Article 19.2.1	Section F.6.1, Page 64	Section F.6.1 (Page 64) of the national report only features information on the effective dose limits for the nuclear energy workers, the pregnant nuclear energy workers and the public. There is no information regarding the dose limits for the 16-18-year-old trainees in the nuclear field, the nuclear energy workers who are breast-feeding and on the equivalent dose limits for the specific body parts. As for the other question: according to the referred section of the national report, the effective dose limit for the pregnant nuclear energy workers in Canada is higher than the limit for the public, while IAEA's GSR Part 3 recommends the following in Req. 28, Sec. 3.114.: "The employer of a female worker, who has been notified of her suspected pregnancy or that she is breast-feeding, shall adapt the working conditions in respect of occupational exposure so as to ensure that the embryo or fetus or the breastfed infant is afforded the same broad level of protection as is required for members of	In accordance with Canada's *Nuclear Safety and Control Act* (NSCA), any person that is required, in the course of their business or occupation in connection with a nuclear substance or nuclear facility, to perform duties where there is a reasonable probability that the person may receive a dose greater than the prescribed limit for the general public (which is 1 mSv per calendar year) is considered a Nuclear Energy Worker (NEW). Canada's *Radiation Protection Regulations* also set out effective and equivalent dose limits for NEWs. The *Canada Labour Standards Regulations* (C.R.C., c. 986) does not allow the employment of persons under the age of 17 years in work activities which would require NEW status, as defined in the NSCA. Canada's *Radiation Protection Regulations* currently do not outline requirements related to breast-feeding female workers and protection of breast-fed infants. However, the CNSC is currently proposing to add new requirements to the Regulations regarding breast-feeding NEWs. The first is to introduce a requirement for a female NEW to inform the CNSC licensee, in writing, if she is breast-feeding. The second requirement is for a CNSC licensee to adapt the working conditions in respect of exposure to that NEW, during both routine operations and emergencies, to ensure the breast-fed infant is afforded the protection required for a member of the public. In other words, the CNSC licensee would need to make accommodations to ensure a NEW that is breast-feeding would not receive an intake of a radioactive substance that would result in a dose to her breast-fed infant in excess of 1 mSv in a calendar year. Canada's *Radiation Protection Regulations* also requires a female NEW who becomes aware that she is pregnant to immediately inform the

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				the public." Question: Q1. Did Canada implement IAEA's detailed recommendations (as per Schedule III. of the GSR Part 3) on the effective and equivalent dose limits for the nuclear energy workers, the 16-18-year-old trainees, the public, and on the protection of the breastfed infants? Q2. How is it confirmed that the effective dose received by an embryo/fetus won't exceed the dose limit set for the members of the public (1 mSv/y) if the mother receives a 4 mSv effective dose during her pregnancy?	CNSC licensee in writing. Once informed, the licensee is required to make any accommodation that will not cause undue financial hardship or business inconvenience, in order to ensure that the effective dose limit for a pregnant NEW (4 mSv for the balance of the pregnancy, once the pregnancy is declared) is not exceeded. Licensees are legally required to ensure that doses are also kept ALARA (as low as reasonably achievable). For pregnant NEWs, the effective dose limit is somewhat less restrictive than that recommended in the IAEA's GSR Part 3, *Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards*. This less-restrictive limit was adopted following a risk analysis and a series of public consultative meetings. A separate explanatory note, INFO-0700, *Dose Limits for Pregnant Workers* on this subject is available from the CNSC.
31.	Japan	Article 32	Page 14	The classification of radioactive waste is described in B.6 (page 14-16), and the Management practice for low and intermediate level radioactive waste is described in B.9 (page 18-19). But there is no difference of management practice for low level radioactive waste and the management practice for intermediate level radioactive waste. Q1. Please elaborate criteria to select	Canada's Radioactive Waste Policy Framework states that, following the "polluter pays" principle, waste owners are responsible for funding, organization, management and operation of disposal facilities and other facilities for their waste. Waste owners will decide on their management practices based on a number of factors including safety, international best practices, feasibility, and cost. Under the Policy Framework, the federal government ensures that radioactive waste disposal is carried out in a safe, environmentally sound, comprehensive, cost-effective, and integrated manner. The CNSC uses a performance based approach to regulating under which

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				the management practice such as surface backfill, surface engineered disposal facility, deep geological repository.	the proponent proposes their approach to waste management, supported by a safety case. The CNSC will then assess the proposal against existing regulatory requirements to ensure the health, safety and security of the public and the protection of the environment.
32.	Japan	Article 32	Page 15	The report states "For example, a contact dose rate of two millisieverts per hour (mSv/h) has been used in some cases to distinguish between LLW and ILW" at page 15 Section B.6 (article 32) Q2. Is there dose rate criteria for the distinguish between HLW and ILW.	High level waste is defined based on the material itself, being the discharged fuel from nuclear power generation or wastes that generate significant heat, rather than through a dose rate criteria as with low- and intermediate-level waste. As outlined in Annex B of CSA N292.0 *General principles for the management of radioactive waste and irradiated fuel:* "High-level radioactive waste (HLW) is used (i.e., irradiated) nuclear fuel that has been declared as radioactive waste and/or is waste that generates significant heat (typically more than 2kW/m3) via radioactive decay. HLW typically has levels of activity concentration in the range of 10^4 to 10^6 TBq/m3." "Intermediate-level radioactive waste (ILW) typically exhibits levels of penetrating radiation sufficient to require shielding during handling and interim storage. A precise boundary between LLW and intermediate level waste (ILW) cannot be provided, as limits on the acceptable level of activity concentration will differ between individual radionuclides or groups of radionuclides. For orientation purposes only, a contact dose rate of 2 mSv/h and thermal power below 2 kW/m3 can be used in some cases to distinguish between low- and intermediate-level radioactive waste class."
33.	Japan	Article 32	Page 25	Q1. Please provide the total storage capacities of interim storage facility for each inventories described in the Table	Please refer to inventories of interim storage which are presented at the end of this table.

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				D.1.Table D.2, Table D.3, Table D.4 and Table D.5.	
34.	Lithuania	Article 6	general	Q1. Could you please provide short overview of established reporting criteria and reporting procedures regarding incidents occurred at spent fuel storage facilities as well as in the radioactive waste management facilities?	Q1. CNSC licensees have the obligation to report significant events to the CNSC as outlined in: Section 29 of the *General Nuclear Safety and Control Regulations* specifies reporting requirements several situations such as an attempted breach of security or an unauthorized release of radioactive material into the environment. REGDOC-3.1.1 *Reporting Requirements for Nuclear Power Plants* and REGDOC-3.1.2 *Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills* are intended for inclusions in licences as part of the conditions and safety and control measures in a licence. These regulatory documents set out reporting requirements for CNSC licenced facilities including requirements for reportable events or situations. Licensees must also submit an annual compliance monitoring report. REGDOC-3.1.1 and REGDOC 3.1.2 outline requirements and timelines for licensees reporting to the CNSC. After determining if a situation, event or dangerous occurrence is reportable, the licensee shall immediately notify, or file a preliminary report to, the Commission. If the event or incident triggers actions under emergency response programs, even if it is a false alarm; an event such as a spill, a release or an injury that could trigger stakeholder interest; an event that falls under the requirements of subsection 29(1) of the *General Nuclear Safety and Control Regulations* directly through the CNSC duty officer. Once CNSC staff are notified of the event, it is assessed to determine if the event needs to be reported to the Commission. If after a review

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					and assessment of the event deems it necessary an Event Initial Report (EIR) is prepared and presented to the Commission, depending on the nature and severity of the event, may be followed up with additional reporting, further compliance activities, or regulatory actions taken by the CNSC as required. Additionally, all reportable events at a facility are reported to the commission through the regulatory oversight reports on an annual basis.
35.	Lithuania	Article 10	general	It is obvious, that Canada is taking a lot of efforts and made a good progress towards implementing a project of disposal of spent fuel. Q1. What are or can be the main challenges to implement such a disposal facility? Q2. What are plans in terms of the date (year) of future construction and operation of spent fuel disposal facility?	**Q1**: APM and the site selection process requires a willing host for the repository. An extended period of time is required for people in an area to learn about the project and develop confidence in its safety. Beyond safety, successful implementation of the project will ultimately require the building of sustainable partnerships involving the initially interested community, First Nation and Métis communities in the siting area, and surrounding communities. Partnerships will need to be anchored in a compelling demonstration of willingness by the communities, as well as a demonstration that the implementation of the project will enhance the well-being of the communities in the siting area. **Q2:** For financial planning purposes, 2032 is assumed as the date for start of construction, and 2043 as the start of operations of the APM DGR. Actual timelines will be driven a variety of factors, including the time it takes to identify a suitable site with an informed and willing host, the time required to assess technical safety, and time required to obtain regulatory approvals.

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
36.	Lithuania	Article 24	F6, Page 64	Since only effective dose limits are indicated in the report, Q1. could you please provide information whether the limit for equivalent dose to the lens of the eye is used in the sector of radioactive waste management. This limit was recently reduced from 150 mSv/y to 20 mSv/y, therefore the limit for effective dose may become not sufficient to ensure that limit for the eye lens is not exceeded even in case of higher energy more or less homogeneously distributed radiation, which is usually the case when dealing with radioactive waste.	Canada's *Radiation Protection Regulations*, including the effective and equivalent dose limits prescribed in these Regulations, apply to CNSC licensees operating radioactive waste management facilities. The CNSC is proposing amendments to Canada's *Radiation Protection Regulations* in order to align with the recommendations of the International Commission on Radiological Protection (ICRP) for the equivalent dose limit for the lens of an eye for occupational exposures. Currently, the equivalent dose limit for a nuclear energy worker (NEW) is 150 mSv in a one-year dosimetry period. The CNSC is proposing to amend the equivalent dose limit to 50 mSv in a one-year dosimetry period, and to add a new equivalent dose limit for the lens of an eye for a nuclear energy worker of 100 mSv in a five-year dosimetry period
37.	Lithuania	Article 28	J.4.2	It is mentioned in the report that The Sealed Source Tracking System (SSTS) and the National Sealed Source Registry (NSSR) allows licensees to report the movements of radioactive sealed sources throughout their complete lifecycle and to keep all the records about the sealed sources used or being in storage in Canada. Q1. But how are you tracking the movements and the use of unsealed sources?	Open (or unsealed) sources are not tracked. Users of open sources must be licensed for their use by the CNSC. A licensee can only use open sources that are listed in their licence and can only possess up to the maximum quantity authorized by their licence. As a requirement, licensees must submit an annual compliance report (ACR). Inventory of all unsealed sources are reported in the ACR. Currently the ACR does not ask how much material is acquired, used or transferred/disposed of. However this information must be maintained by the licensee as per CNSC's *Nuclear Substance and Radiation Devices Regulations* (NSRDR).

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				Q2. Have you any data base or national registry for registration unsealed sources?	
38.	Morocco	Article 20	Annex 3	The regulatory body CNSC has extensive tasks to ensure safety and security in nuclear field. Q1. How many people are employed by CNSC? Q2. What are the main qualifications requested?	Q1. Total Population as of March 31, 2017 was 922 employees, with 791 of those employees being indeterminate and 131 being term employees. Q2. The main qualifications sought are: University degree in science, engineering or other related field, the CNSC key behavioural competencies (KBC) for all staff regardless of level and/or the Public Service Key Leadership Competencies (KLC) for the executive cadre, experience and/or knowledge in a specific area, such as epidemiology, emergency preparedness management, etc.
39.	Morocco	Article 24	operational radiation protection, p 86	Among the activities of CNSC are the evaluation of radiation protection, environmental programmes and other programmes. Q1. Are these evaluations periodic? Q2. If yes, what are the intervals of the periodic evaluations for the different kind of facilities including radioactive waste management?	Q1. And Q2. The CNSC regulates the nuclear industry in Canada through a comprehensive program of licensing, certification, compliance verification and enforcement. For each licensee, CNSC staff evaluate safety performance through inspections, assessments, reviews and evaluations of licensee programs and processes. CNSC staff establish compliance plans, applying a risk-informed strategy for regulatory oversight of each licensee's activities. The compliance plans are adjusted on an ongoing basis in response to events, modifications, changes in licensee performance and lessons learned. CNSC staff determine the type and level of review and inspection in a manner that is commensurate with the risk posed by the regulated activities. CNSC staff assess the level of risk associated with each facility across all 14 Safety and Control Areas (explained in Section E.6.3 of the National Report).

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					The level of risk is reflected in CNSC staff's baseline compliance plan for each facility; this plan includes the number and scope of inspections at the facility, document reviews and, as required monitoring and testing activities by CNSC staff. Areas such as worker radiation dose control and effluent and emission monitoring, are subject to more frequent and in-depth verification by CNSC staff. Therefore, in summary the intervals of evaluations for these programs is dependant on the compliance plan and commensurate to the risk of the regulated activities at the facility.
40.	Morocco	Article 20	E.43.4, p 63	The fact that the CNSC can finance some participants to attend hearing or meeting can influence the decision of the participants. Q1. Why does not the government of Canada find another way to finance the participation?	Providing funding support to participants through the CNSC's Participant Funding Program (PFP) to participate in Commission hearings or meetings does not influence the nature of the public intervention at hearings or meetings. The CNSC is very transparent and provides detailed guidance and criteria on who can apply for funding and what activities can be funded. Eligible recipients include members of the public, not-for-profit organizations, and Indigenous peoples and organizations. Eligible expenses include professional fees, travel and incidentals, honoraria for Indigenous chiefs, elders and knowledge holders, and administrative costs. Eligible activities include the review of documentation and reports, travel to and participation in community meetings and Commission proceedings, and legal advice. This financial support can help provide the capacity or expertise to review material that would not otherwise be possible. In most cases, the funding is used to support interventions at hearings or meetings that are opposed to or critical of the decision being requested. The funding awarded is based on recommendations of an independent and external funding review committee (FRC), which reviews all applications received. All funding awarded and the names of the recipients are posted on the CNSC's website, under the relevant "PFP

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					Decision Report."
41.	Morocco	Article 28	section J.4.6, p 129	Q1. Does the financial guarantee programme for user of sealed sources and radiation devices include the final disposal?	The financial guarantee program for sealed sources (insurance scheme) is not intended to cover the final disposal of sources by the licensee. The licensee (user) of sources is responsible for all costs associated with their use, including their final transfer for disposal. The insurance based financial guarantee program would be used only if the licensee has demonstrated that they do not have the financial means to safely terminate licensed activities, in effect bankruptcy.
42.	Morocco	Article 28	J.4.3, p 127	Canada is a country that exports many Category 1 and 2 sources. Q1. Does the Canadian government have a program to accept sources from countries where safety and security of these sources are lacking?	While Canadian producers of Category 1 and 2 sealed radioactive sources can repatriate disused sources via end-of-life management clauses in their supply contracts, the government of Canada itself does not have a program in place to repatriate disused Canadian-origin sources that are not covered by the aforementioned clauses. Global Affairs Canada's Weapons Threat Reduction Program (WTRP) provides assistance to requesting countries to help manage disused and orphan Category 1 and 2 sources, some of which may be of Canadian origin. End-of-life management options include secure in-country disposal, repatriation to the country of origin (where possible), and secure transfers to third-countries for recycling. Canada's WTRP is also working with the IAEA to demonstrate a borehole disposal concept for disused sealed radioactive sources that would provide a safe, secure and economical long-term solution for countries with small quantities of such sources.
43.	Morocco	General	Section A, page 9	You mention in paragraph "A.4 Canadian philosophy and approach to safety p 9" that the regulatory regime is flexible	CNSC's nuclear regulatory regime is flexible and balances prescriptive and performance-based requirements. By utilizing this approach, CNSC seeks to ensure a regulatory environment exists that encourages

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				about how licensees comply with regulatory requirements. The licensee must demonstrate how the design meets all applicable performance standards and will continue to do so throughout its design life. Q1 And Canada promotes mostly its own technology like Candu reactors. Why Canada cannot opt for prescriptive approach since the technology used is known?	innovation within the nuclear industry without compromising the high standards necessary for safety.
44.	Morocco	Article 20	Section E, page 46	You mention in paragraph "Information and public participation p 46 " that the NSCA requires that a public hearing be held before a major licensing decision is made or whenever it is in the public interest to do so. Q1. Does CNSC involve in public hearing or public hearing which is governed by another specific regulations? Q2. What is the role exactly of CNSC in the public hearing process?	The CNSC Commission is an independent administrative tribunal that makes informed, independent, fair and transparent decisions on the licensing of major nuclear-related activities or facilities. It also establishes legally binding regulations, and sets regulatory policy on matters related to the protection of health, safety, security and the environment and to the implementation of international obligations respecting the peaceful use of nuclear energy. The Commission operates at arm's length from government; therefore its decisions are reviewable only by the Federal Court of Canada. The Commission has up to seven appointed permanent members (generally referred to as Commission members) whose decisions are supported by more than 800 CNSC employees. All Commission members are independent of political, governmental, special interest group or industry influences. To promote openness and transparency, the Commission conducts the majority of its business in public hearings and meetings. Hearings and meetings are referred to collectively as proceedings. Typically,

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					Commission proceedings take place either in Ottawa or in a facility host community in order to further encourage in-person public participation and accessibility. The public has several options available for participation at Commission proceedings. The public is always welcome to attend in person to observe a public proceeding. Alternatively, in order to observe, these public proceedings can be viewed as live webcasts on the CNSC website. Highlights of the proceedings can also be followed live on the CNSC Twitter page. Webcasts are archived on the CNSC site for at least three months, and transcripts are available for approximately two years after the proceeding. In order to more actively participate, the public can look to the notices of proceeding that are published well in advance of the public hearing or meeting and include a description of the public participation options available. The public can participate in Commission proceedings through written and/or oral submissions as outlined in the notices. Participation in a public proceeding is called an intervention, whether done by written submission only or by both a written submission and an oral presentation. The documents filed in relation to matters to be addressed at public Commission proceedings are available to the public on the CNSC website in advance of the proceeding. A request to intervene does not automatically grant intervenor status. Pursuant to rule 19 of the Canadian Nuclear Safety Commission Rules of Procedure, the request to intervene needs to be accepted by the Commission. Also pursuant to rule 19, if the Commission does accept the intervention, it will do so "in the manner and to the extent that the Commission considers will enable it to determine the matter before it in a fair, informal and expeditious manner". For example, an

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					intervenor may request to present information orally, but the Commission will determine the form of intervention – in writing only, or both in writing and orally – that would best assist in its consideration of the matter, and in ensuring an efficient and fair process. Interventions may be made in either of Canada's official languages. Oral interventions are generally made in person at the proceeding. The Commission also accommodates intervenors by arranging an oral presentation by teleconference or videoconference. Oral presentations are not possible without a written submission. Written submissions are submitted in advance of the public proceeding by the date specified in the notice. Intervenors making an oral presentation are encouraged to summarize the key points of their written submission. The length of each oral presentation is usually limited to 10 minutes, followed by an opportunity for the Commission members to ask questions. Commission members read written submissions beforehand, and the question period helps to ensure that they have a clear and comprehensive understanding of the matters raised. There is no time limit for the question period. Finally, some public hearings that deal with subjects that are administrative in nature are not held in a public forum. A public notice is posted for each of these hearings and specifies whether written submissions from the public will be accepted. A panel of the Commission then reviews all of the written submissions, determines if it has sufficient information to make a decision and releases a detailed written decision with reasons that is posted on the CNSC website.
45.	Morocco	Article 20	Section E, page 49	You mention in paragraph "Compliance verification " that CNSC staff assess	**Fully satisfactory (FS)** Safety and control measures implemented by the licensee are highly effective. In addition, compliance with regulatory requirements is fully

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				licensee programs and their implementations according to the following four ratings: FS Fully satisfactory SA Satisfactory BE Below expectations UA Unacceptable Q1. Could you clarify these criteria?	satisfactory, and compliance within the safety and control area (SCA) or specific area exceeds requirements and CNSC expectations. Overall, compliance is stable or improving, and any problems or issues that arise are promptly addressed. **Satisfactory (SA)** Safety and control measures implemented by the licensee are sufficiently effective. In addition, compliance with regulatory requirements is satisfactory. Compliance within the SCA meets requirements and CNSC expectations. Any deviation is minor and any issues are considered to pose a low risk to the achievement of regulatory objectives and CNSC expectations. Appropriate improvements are planned. **Below expectations (BE)** Safety and control measures implemented by the licensee are marginally ineffective. In addition, compliance with regulatory requirements falls below expectations. Compliance within the SCA deviates from requirements or CNSC expectations to the extent that there is a moderate risk of ultimate failure to comply. Improvements are required to address identified weaknesses. The licensee is taking appropriate corrective action. **Unacceptable (UA)** Safety and control measures implemented by the licensee are significantly ineffective. In addition, compliance with regulatory requirements is unacceptable and is seriously compromised. Compliance within the SCA is significantly below requirements or CNSC expectations, or there is evidence of overall non-compliance. Without corrective action, there is a high probability that the deficiencies will lead to unreasonable risk. Issues are not being addressed effectively,

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					no appropriate corrective measures have been taken and no alternative plan of action has been provided. Immediate action is required.
46.	Morocco	Article 20	Section E, page 51	You mention in paragraph "Compliance enforcement" that the CNSC uses a gradual approach to enforcement, commensurate with the risk or regulatory significance of the violation. The enforcement tools available to the CNSC are: Discussion verbal or written notice warning increased regulatory scrutiny AMPs issuance of an order licensing action (e.g., amendment or suspension of part of a licence) revocation of personal certification prosecution revocation or suspension of a licence Q1. Could you give criteria for each enforcement measures listed above?	The CNSC uses a graduated approach to enforcement to encourage and compel compliance and deter future non-compliances. When a non-compliance (or a continued non-compliance) has been identified, CNSC staff assess the significance of the non-compliance, and determine the appropriate enforcement action, based on the CNSC's graduated approach to enforcement. Each enforcement action is a discrete and independent response to non-compliance and multiple enforcement actions may be applied to a single non-compliance (e.g. an order and an AMP). For more information on compliance and enforcement actions please see link here: http://nuclearsafety.gc.ca/eng/acts-and-regulations/compliance-verification-and-enforcement/index.cfm

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
47.	Republic of Korea	Article 26	F.8, p.75	PDP should be reviewed by CNSC and updated every 5 years. Q1. Except regular update, is there any other occasions causing PDP update for another reason (such as operation experience, technical advancement, or request by Commission)? Q2. If so, what are the reasons, backgrounds, and the results of CNSC's review?	Q1. As outlined in Section 6.3.2 of Canada Standard Association (CSA) Standard N294-09 Decommissioning of facilities containing nuclear substances, the PDP should be updated and reviewed to reflect (a) changes in site conditions; (b) changes to the proposed decommissioning objectives or strategy; (c) changes to ownership or management structure; (d) advances in decommissioning technology; (e) significant modifications to the facility; (f) updated cost and funding information; (g) revised regulatory requirements; and (h) revised records requirements. Q2. The decommissioning plan is developed and updated progressively (every 5 years at a minimum) over the life cycle of the facility to reflect the appropriate level of detail required for the respective licensed activities. For siting, construction and operation phases, the decommissioning plan is required to outline the decommissioning strategy in sufficient detail to provide the basis for an estimation of the cost of decommissioning and hence the establishment of a financial guarantee. The results of the review of the decommissioning plan and associate cost estimate are used as one of the inputs into assessing the acceptability of the proposed financial guarantee.
48.	Republic of	Article 26	F.8, p.75	Related to regulatory control release of	Q1 and Q2. CSA standard N294, *Decommissioning of Facilities Containing Nuclear Substances* Annex C provides guidance to licensees

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
	Korea			building and site, Q1. When the licensee is planning to carry out radiation survey and site investigation, at which point CNSC is involved and which activities are carried out by CNSC (i.e. historical site assessment, survey design, selection of radionuclides, etc.)? Q2. Is there any process on making a decision for radiation survey and site investigation between CNSC and licensee (i.e. historical site assessment, survey design, selection of radionuclides, etc.)? Q3. How can CNSC carry out the verification of site investigation result submitted by decommissioning licensee? Is there the guideline or regulation for the verification?	on radiation surveys and site investigation through the process of decommissioning. Annex C provides guidance on the stages of the systematic planning process for surveys such as: (a) identify the purpose and objectives of the survey; (b) identify and review any available information; (c) define the boundaries of the survey; (d) identify potential sampling and analytical techniques; (e) specify the performance and acceptance criteria; and (f) develop the survey plan. CNSC does not carry out the radiation survey or site investigation rather licensees will submit their surveys and CNSC will verify its compliance with regulatory requirements and standards. CNSC inspectors may also take confirmatory readings to verify the data submitted by the licensee. Q3. As stated in CSA standard N294, *Decommissioning of Facilities Containing Nuclear Substances,* when preparing for decommissioning, licensee are required to develop a final decommissioning plan, where regulatory approvals are required. Once decommissioning is completed, verification and acknowledgement by the CNSC that decommissioning is complete and the end-state objectives have been achieved is required. Finally, according to *Nuclear Safety and Control Regulations* Section 4, an application for a licence to abandon is submitted to the CNSC and a regulatory licence to abandon issued following approval.
49.	Republic of Korea	Planned Activities	K.5.3.7, 132	K.5.3.7 describes the design configuration and conceptual design on	Q1**:** There are two existing transportation packages licensed for use in Canada that could be used to transport spent fuel to the repository. These are the Used Fuel Transportation Package (UFTP), and the Dry

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				PHWR spent fuel transportation cask. Q1. What is the difference between the existing cask and new one? Q2. Is there any additional requirement demanded by regulatory body other than design requirements concerning the safety analysis on transportation casks? If yes, what are they?	Storage Container Transportation Package (DSC-TP). They are designed to handle the most common forms in which spent fuel is presently stored at Canadian power stations. In addition to these packages, in 2015, the NWMO began reviewing design concepts for transporting Atomic Energy of Canada Limited (AECL) spent fuel storage baskets, which are used for interim storage of the spent nuclear fuel produced by AECL, New Brunswick Power Corporation and Hydro-Québec. These storage baskets also hold standard CANDU fuel, but in a different geometry. A different transport package is being considered to accommodate these storage baskets so as to minimize handling of the spent fuel. Q2. No, for transport purposes, there are no additional requirements apart from those required under the CNSC *Packaging and Transport of Nuclear Substances Regulations 2015* and IAEA *Regulations for the Safe Transport of Radioactive Material 2012 Edition* (SSR-6).
50.	Republic of Korea	Planned Activities	K.5.3.7, 132	Fig.6 shows the three different types of packages for spent fuel transportation. It is said that among them, the dry storage container transportation package and spent fuel transportation package are currently licenced, and the basket transportation package is under the development. Q1. What is the reason that each package requires separate licence authorization?	The CNSC issues certificate for the design of transport packages in accordance with the IAEA *Regulations for the Safe Transport of Radioactive Material, 2012 Edition* (SSR-6). Since the three package designs are different, three separate certificates would be required.

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
51.	Republic of Korea	Article 24	F.6	F.6 describes the radiation protection for operating facility. Q1. In general, sampling and analysis should be implemented before the gaseous radioactive effluents are discharged to environment. Please explain the sampling method, sampling time (duration), analysis frequency, and radionuclides to be analyzed, for particulates, noble gas, iodine, C-14 and H-3 in the gaseous effluents. Q2. Sampling and analysis should be implemented before the liquid radioactive effluents are discharged to environment. Please explain the sampling method, sampling time (duration) and analysis frequency for difficult-to- measure radionuclides such as C-14, Ni, Fe, Sr-89, Sr-90 in the liquid effluents.	The CNSC requires all licensees with significant interactions with the environment to have an effluent monitoring program in accordance with the Canadian Standards Association (CSA) standard N288.5-11, *Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills*. According to N288.5-11, sampling and analytical procedures must be validated and documented. Samples that are used for compliance purposes must be analyzed at accredited laboratories or laboratories with documented comprehensive Quality Assurance and Quality Control programs. <u>Q1</u> For air releases, if the emissions are expected to vary significantly, the emissions should be measured continuously using continuous emissions monitoring or continuous collection of stack samples for laboratory analysis. If the emissions are expected to be constant, stack sampling should be performed annually, biennially, or following a change to the facility. In some situations, emissions are estimated using site-specific emission factors or mass balance calculations. For these situations, the emissions should be evaluated and recalculated annually or following a change to the facility. For sampling of gaseous effluent, measures must be taken to minimize losses of the gas in the sampling train. Also, the sampling system must be assessed for leaks to minimize errors in the measured sample flow rate. Both the effluent and sample flow rates have to be determined to ensure that the emission estimates are accurate. Samples can be collected using particulate filters, solid sorbents, impingers, canister samplers, or condensate collectors. These samples can be analyzed for noble gas, iodine, C-14 and tritium using gross alpha/beta counting,

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					gamma spectrometry (HPGe), or ionization chamber. Samples can also be analyzed for particulates using gravimetric analysis or particle counter (optical scattering). Q2 For liquid releases, a representative sample must be taken prior to discharge and analyzed. Samples should be taken either by dipping a sample container into the effluent stream using an appropriate retrieval device or by drawing a sample from a sample line inserted into the effluent stream by opening a valve or using an automated sampler. Tritium, radioiodines, and C-14 can be analyzed using liquid scintillation counting. Gross alpha/beta can be analyzed using gross alpha/beta counting. Gross gamma can be analyzed using gamma spectrometry. N288.5-11 recommends weekly grab or composite sampling for waterborne continuous effluents with fairly stable chemistries. For homogeneous batch effluents, one grab sample per batch is adequate. Otherwise, a composite sample is taken, which consists of three grab samples: one near the start, one in the middle, and one at the end of the discharge period.
52.	Republic of Korea	Article 9	G.4.2, p.79	According to G.4.2, once the SLOWPOKE-2 core is removed and the spent fuel is sent either to CRL for storage or returned to the United States. Q1. Is there any real plan in order to return the spent fuel to the U.S, or Is	Some cores have already been sent to the US under the Global Threat Reduction Initiative. The current plan is to return the remaining cores to the USA; however there are currently no agreements to that effect.

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				there a related agreement between Canada and U.S.A?	
53.	Republic of Korea	Article 8	G.6, p.80	According to G.6, MACSTOR was originally designed for a 50-year lifetime and licences issued by the CNSC are generally valid for a five- to 10-year period. At the time of licence renewal, CNSC examines the operational performance and future plans to determine whether it can continue to operate safely for another licensing term – again, typically for a five- to 10-year period. Q1. Is there no limit this licensing renewal procedures of the nuclear safety act as long as MACSTOR dose not deteriorate until a long-term management facility becomes available?	Hydro-Quebec has an aging management program for its waste management facility, which includes the MACSTOR and performs quarterly inspections of all the waste management facility. There are requirements for OPG, HQ, NB Power and CNL to have in place an aging management program. For more information please refer to Canada's response for question 23. As discussed in section G.6, of Canada's National Report at the time of the licence renewal, the CNSC examines the operational performance (i.e. maintenance of MACSTOR and aging management program) and future plans of the dry storage facility (i.e. time needed to move irradiated fuel) to determine whether it can continue to operate safely for another licencing term – typically for a 5 to 10 year period. The facility can be relicensed as long as it continues to be safe to do so.
54.	Republic of Korea	Article 8	G.8.4.1, p.82	According to the G.8.4.1, criticality safety requirements must address both normal and abnormal conditions in compliance with CNSC regulatory document RD-327. It has not been seen to evaluate the criticality for spent fuel because CANDU reactor uses the natural uranium as a	Relevant requirements for a spent fuel facility can be found in the *Nuclear Liability and Compensation Act*, in a number of Canadian Standards (namely, CSA N292 series standards) and in an updated version of CNSC regulatory document RD-327, the draft of which was released for public comments in 2017 as REGDOC 2.4.3. According to these requirements, nuclear criticality safety must be evaluated at all spent fuel facilities with the exception of a facility for short- or interim-term (dry or wet) storage of natural or depleted uranium irradiated in a thermal nuclear reactor, if no other fissionable materials nor significant quantities of graphite, heavy water, beryllium, or other

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				fuel. Nevertheless, Q1. does the criticality for spent fuel facility must be evaluated in compliance with CNSC regulatory document RD-327 ?	moderators more effective than light water are allowed in the licensed site.
55.	Republic of Korea	Article 8	G.8.4.3, p.83	Q1. Is there any case that the intended aircraft crashes are evaluated to the spent fuel storage facility? Q2. Is there any regulatory criteria for the intended aircraft crashes?	These design basis accidents for aircraft crashes are addressed in the Safety Analysis Report (SAR). The SAR is submitted to the CNSC for compliance verification and is a requirement under the licence. For example, for OPG's WMF, an aircraft crash is a postulated malfunction/accident during Dry Storage Container Processing. It has been assessed as an incredible event with a frequency of occurrence <10-7 events per year. The Safety Report is submitted to the regulator as a licensing document.
56.	Republic of Korea	Article 24	F.6.4, P.66	The licensee is required to use CNSC-licensed dosimetry service if the annual dose of radiation worker is likely to exceed 5 mSv. Then, Q1. are there any requirements of personal surveillance for employees who are exposed by dose more than 1 mSv and less than 5 mSv?	Canada's *Radiation Protection Regulations* requires all CNSC licensees to ascertain and record doses to any person who performs duties associated with licensed activities or who is present at the site of licensed activities. Where effective doses to Nuclear Energy Workers (NEWs) are not expected to exceed 5 mSv per one-year dosimetry period, licensees must still ascertain doses to workers, but are not required to use CNSC- licensed dosimetry services. In such cases, licensees may choose to use licensed dosimetry services or to determine doses using other acceptable techniques based on the level of risk. When the CNSC considers an application (for a facility or activity) that proposes to measure doses by means other than a licensed dosimetry service, the CNSC evaluates the applicant's suggested measurement method in consideration of the relative potential risk, the appropriateness of the

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					technique, and the measures to ensure quality results.
57.	Republic of Korea	Article 24	F.6.2, P.65	Section F.6.2 describes the derived release limits of liquid and gaseous radioactive materials released during normal operation of a nuclear facility. Q1. Are there any regulations regarding the periodic review of the derived release limit? Q2. What are the sampling and analysis periods for each species to confirm the derived release limits are met? Q3. Please explain whether there is a plan to apply the derived release limit for gaseous tritium.	Q1. As per their licence conditions handbook, licensees review their derived release limits once every five years. The revised derived release limit document is submitted to CNSC staff for review and approval. Licensees use the CSA standard N288.1-14 *Guidelines for calculating derived release limits for radioactive materials in airborne and liquid effluents for normal operation of nuclear facilities* to calculate their derived release limits. This standard is updated every five years and licensees are required to update their derived release limits using the latest version of the standard. Q2. The sampling and analyses periods for each species varies depending on the effluent quality. Licensees follow CSA Standard N288.5-11 *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills* while developing their effluent monitoring program. Monitoring of airborne emissions should be continuous if emissions are expected to vary significantly. Otherwise stack sampling should be performed annually, biennially, or following a change to the facility. For liquid effluent monitoring, weekly grab or composite sampling is recommended for waterborne continuous effluents with fairly stable chemistries. The sampling frequency may be reduced to monthly or quarterly if it is shown that the monthly average concentrations over a year is well below the authorized monthly mean concentration. For batch effluent releases, if the effluent is homogeneous, one grab sample is taken per batch. Otherwise, a composite sample is required. As an example, at Darlington and at Pickering, the airborne effluent is

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					sampled and monitored continuously and samples are analyzed weekly at a minimum for tritium oxide, elemental tritium (at Darlington only), carbon-14, noble gases, radioiodines, and particulates. At the Darlington Active Liquid Waste (ALW) system and at the Pickering Radioactive Liquid Waste Management System (RLWMS), a representative sample is taken prior to the batch discharge. The pre-discharge sample is analyzed for tritium and gross beta or gross alpha. A composite of pre-discharge samples of pump-outs during the month is analyzed for carbon-14 and radionuclide specific beta or radionuclide specific gamma. If the results show that carbon-14 is higher than 0.005% of the monthly DRL or has a significant increasing trend, pre-discharge screening of carbon-14 is implemented until the carbon-14 emissions are below 0.005% of the monthly DRL and no trend is observed. Gross alpha emissions are estimated and reported. Q3. Licensees with gaseous tritium releases are required to have a derived release limit for gaseous tritium to ensure that a member of the public does not receive a dose of 1 mSv in a year. This value is stated in the licence or in the licence conditions handbook.
58.	Republic of Korea	Article 28	J. p.111	As an exporting country of sealed sources, Canada has stated that it has a policy of accepting disused sealed sources returned from importing countries. In these cases, importing countries will need to have a validated and approved delivery package to facilitate the safe return of the sealed sources. As an exporting country of	No such national policy exists in Canada. Any packages used for shipment in Canada must meet the requirements under the *Packaging and Transport of Nuclear Substance Regulations, 2015.*

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				sealed sources, suppliers need to maintain design approval for the transport package until the sealed sources are discarded. Q1. Is there a national system or policy to support such practice in Canada?	
59.	Republic of Korea	Article 28	J. p110	For the National Sealed Source Registry; Q1. For sealed sources that have been exported to overseas, do you keep the registry record in case of their return? Q2. In case that the sealed sources exported to overseas are returned, do you verify if they are correspondent with the previous registry?	Q1: Yes, records of exported sources are kept in the system. Q2: Yes, the return of a source that was previously exported would be linked to the original record based on the serial number, activity and reference date of the source.
60.	Netherlands	Article 32	Art 32(1), p 15	Deep geological formation is a preferred option for long term management. Q1. What are the other options for disposal Canada is considering?	From 2002 to 2005, the NWMO studied approaches for long-term management of Canada's spent fuel. Other options considered in the study included deep geological disposal in the Canadian Shield, storage at nuclear reactor sites, and centralized above- or below-ground storage. A variety of other options, such as disposal within subduction zones, were also considered over the course of the study. The APM approach, selected by the Government of Canada as Canada's plan, and implemented by NWMO, has used nuclear fuel ultimately contained and isolated in a deep geological repository with provision for continuous monitoring and an extended period of retrievability. This technical method is accompanied by a management system which includes requiring the repository be sited in a willing host, continuous learning, and a phased and adaptive decision-making process.

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					NWMO's current APM implementation plan does not consider other options for long term management of spent fuel.
61.	Netherlands	Article 3	Art 3, p 22 & Art 11-17, H.4	Canada states it does not find it necessary to reprocess fuel. Q1. How does this relate to minimization of waste as stated in B4 (see also note 3 by table D3)? Q2. Has there been a life cycle study made to make a balanced choice between reprocessing or not? Q3. "Minimize production of radioactive waste by preventing materials from becoming radioactive"? How is minimization of radioactive waste implemented?	Canada, like most countries with nuclear power reactors, uses a once-through fuel cycle. It is important to note that in any possible future reprocessing or advanced fuel cycle/fast reactor scenario, there will be quantities of heat generating and long-lived radioactive waste that will require a deep geological repository (DGR) for safe, long-term management. This conclusion has been reached by every major study that has looked at the impact of advanced fuel cycles (e.g. fast neutron reactors). Current reprocessing technologies are extremely expensive, especially for un-enriched CANDU fuel, and do not provide any material benefit to radioactive waste management (i.e., it does not eliminate the need for a deep geological repository). The economic incentive for reprocessing spent fuel from Light Water Reactors (LWR) is far greater than for reprocessing spent CANDU fuel because of the very low fissile content of CANDU spent fuel compared to that of LWR spent fuel. In addition, reprocessing CANDU fuel would result in numerous new high volume, chemically complex waste streams, including highly acidic liquid wastes, that are often more difficult to manage than the original used fuel. A study conducted by Canadian Nuclear Laboratories and commissioned by the Ontario Ministry of Energy (MoE) in April 2016 identified a number of technical challenges and alluded to other social and public perception challenges that must be overcome in order to experience the minor benefits related to used nuclear fuel reprocessing and recycling. This report is available publicly and can be

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					found here. The Canadian program for the long-term management of spent fuel (nuclear fuel waste), called Adaptive Phased Management (APM), was adopted by the Government of Canada in 2007. The DGR planned by the Nuclear Waste Management Organization (NWMO) as part of the APM provides for retrieval of used fuel for a period of time if need be. This allows for the potential for reprocessing and recycling used fuel should it ever become economically and technically viable in the future and a decision to do so is taken by future generations. At the same time, APM meets the priority of Canadians to provide for a long-term solution for the used fuel currently stored in Canada. Q3. Industry implements a process for items that are expected to be free of contamination based on where they were used. If an item is expected to be uncontaminated, it is placed in a designated container for expedited clearance.
62.	Netherlands	Article 18	Art 18-20, p 41	Canada states it has established non-proliferation import and export regulations. Q1. Do these regulations concern spent fuel too?	Yes, source material (e.g., uranium) and special fissionable material (e.g., plutonium) contained within spent fuel are regulated for import and export under the Nuclear Non-proliferation Import and Export Control Regulations (NNIECR).
63.	Netherlands	Article 18	Art 18-20, E.6.2 & E.6.3	The report states that the frequency of planned meetings (concerning compliance promotion) varies by licensee, facility and risk level. Q1. Does risk level take into account	Q1. CNSC staff determine the type and level of review and inspection in a manner that is commensurate with the risk posed by the regulated activities. CNSC staff assess the level of risk associated with each facility across all 14 Safety and Control Areas (explained in Section E.6.3 of the National Report). Safety culture is a specific area that is assessed by CNSC under the

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				safety culture on the site? Q2. Does compliance verification include site visits? Q3. What does a site visit look like and how often does it take place?	Management System safety and control area. Q2. And Q3. CNSC staff conduct inspections at licenced facilities for compliance verification. For each licensee, CNSC staff evaluate safety performance through inspections, assessments, reviews and evaluations of licensee programs and processes. The level of risk is reflected in CNSC staff's baseline compliance plan for each facility; this plan includes the number and scope of inspections at the facility, document reviews and, as required monitoring and testing activities by CNSC staff. Areas such as worker radiation dose control and effluent and emission monitoring, are subject to more frequent and in-depth verification by CNSC staff. CNSC staff reassess and revise compliance plans on an on-going basis to take into consideration unusual occurrences, licensee's performance and lessons learned.
64.	Netherlands	General	Annex 3, 3.4.2	The description of the CNSC tasks is extensive and clear. Q1. How many people are employed in total at CNSC and how are they divided per branch?	The CNSC total population as of March 31, 2017 was 922 employees, with 791 of those employees being indeterminate and 131 being term employees. When looking at the population breakdown by branch, the two largest branches, which are the Technical Support Branch (TSB) and the Regulatory Operations Branch (ROB), represent 63% of the total CNSC population, with TSB at 293 employees and ROB at 285 employees. The third largest branch is the Corporate Services Branch (CSB) with 219 employees followed by the Regulatory Affairs Branch (RAB) with 90 employees. Lastly, the Small Offices, which includes Secretariat, Legal Services, and the President's Office, have a combined total of 35 employees.

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
65.	Romania	Article 11	H.3.2 Electricity generation waste	Q1. Which are the types of contaminated chemical substances produced from NPP's maintenance activities and Q2. how are these waste pretreated/treated for interim storage?	Q1. The types of contaminated chemical waste that are produced are solvents, oils and lubricants. Q2. These are not pre-treated or treated for interim storage. OPG has the ability to incinerate these chemicals at the Western Waste Management Facility. Where liquid wastes can not be incinerated, they can be mixed with approved solidification agents for storage as solid waste.
66.	Romania	Article 11	H.3.2 Electricity generation waste	Q1.Which are the anticipated waste types and quantities to be produced during Darlington NPP refurbishment activities?	The anticipated waste types arising from the Darlington Refurbishment include routine Low Level Waste, Moderator and Heat Transport Resin and Filters and Reactor Components such as End Fittings, Pressure Tubes and Calandria Tubes. The total expected volumes of all waste arising from a single unit Darlington Refurbishment is approximately 19,000 m3.
67.	Romania	Article 11	H.3.2 Electricity generation waste	Q1. Which types of storage structures are planned to be built on Darlington NPP site for waste from refurbishment activities?	The only new storage structure being built on the Darlington site for Refurbishment waste is a Retube Waste Storage Building that will accept Reactor Components such as End Fittings, Pressure Tubes and Calandria Tubes. All other waste will be shipped to the Western Waste Management Facility for storage.
68.	Romania	Article 11	5.1.2 Western Waste Management Facility	Q1. What types of storage structures are planned to be built on the site of Western Waste Management Facility to accommodate waste coming from Darlington NPP refurbishment activities?	At the Western Waste Management Facility, new Low Level Storage Buildings will be built to accommodate the increased waste volumes arising from the Darlington Refurbishment project.

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
69.	Russian Federation	General	K.5.3.3 p. 129	The Report says that between 2014 and 2016, the NWMO's engineering and design program made significant strides toward its goal of safely containing and isolating the spent fuel and a provides a figure of a new layout of deep geological repository representing "a multi-year design of an engineered-barrier system (which earned the NWMO's technical program the Canadian Nuclear Society's 2015 Innovative Achievement Award) specifically designed for the spent CANDU fuel". As we can see, the new disposal concept involves spent fuel containers placed into a bentonite buffer boxes stacked (two high) in a horizontal placement room. Q1. Could you, please, indicated what are the key advantages of the disposal concept proposed for the spent CANDU fuel compared to the previously proposed concepts presented in the Fifth National Report?	Previously, the NWMO had based its conceptual design on the extensive container and emplacement design and testing work completed by other national waste management organizations. Starting in 2014, as part of developing a more detailed design concept for proof testing, we reviewed the state-of-science in containers and emplacement technology, and in addition took into consideration the unique aspects of spent CANDU fuel, notably its smaller size. The revised design retains the core features of steel containers, copper corrosion barrier, and clay buffer important to long-term safety. The key advantages of the present disposal concept compared to the previous concept for spent CANDU fuel are: - Copper coating rather than copper shell, which means that the copper layer is not load bearing. This simplifies a number of requirements on the copper, including allowing the thickness to be dictated by corrosion needs not mechanical and fabrication needs. - Welded lid seal, rather than bolted seal, for greater strength and long-term containment. - Hemispherical end cap, rather than flat, for greater load tolerance. - Use of standard steel components and fabrication of containers within Canadian industry, because of the smaller dimensions. - Ease of fabrication of multiple full-scale prototypes for demonstration because of the smaller dimensions. Also the full-scale prototypes can be tested, including to failure. - Use of prefabricated buffer box to contain the container, because of the smaller dimension and package weight. This allows more of the emplacement assembly to be completed at surface. - Buffer box stacking within an emplacement room, to simplify

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					activities in an underground and nuclear environment.
70.	Russian Federation	Article 3	C.4, p. 22	Q1. How the safe management of radioactive waste containing naturally occurring nuclear substances and not falling under the scope of NSCA is regulated?	In Canada, waste generated from uranium mines and mills is considered radioactive waste and is regulated as such. Naturally occurring radioactive material (NORM) is regulated by the provincial and territorial governments, each having its own specific regulations on the handling and disposal of the material. The *Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials* have been developed by the Federal Provincial Territorial Radiation Protection Committee to harmonize standards throughout the country and ensure appropriate control over NORM. The guidelines may be consulted through Health Canada's website at www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/norm-mrn/index-eng.php NORM-contaminated waste should not go to a regular landfill if it exceeds release limits published in the *Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials*. It should be disposed of at a facility authorized to accept contaminated materials. In Canada, there are three provincially licensed facilities available specifically for NORM disposal. The reviewer is invited to consult additional information regarding NORM by visiting the CNSC's website at: nuclearsafety.gc.ca/eng/resources/fact-sheets/naturally-occurring-radioactive-material.cfm
71.	Russian Federation	Article 32	B.9	Q1. What kind of criteria are being evaluated (risks, costs, etc.) to choose	The criteria to be considered by CNL when determining the preferred and most feasible option, whether to retrieve the waste and dispose of

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				the preferred and most feasible option regarding legacy RW disposal – whether to retrieve the waste and to dispose it of in a centralized repository or to perform necessary activities to enable its in situ disposal?	it in a centralized repository or perform necessary activities to enable its in situ disposal, will include: short and long term risk to the public, the environment, and workers, as well as cost and the planned next use of the site. Environmental remediation planning and execution for legacy waste sites will follow the eight-step process outlined in CSA N294-09, *Decommissioning of Facilities Containing Nuclear Substances*.
72.	Sweden	Article 28	Page 110; Section J.4.2	The report describes how radioactive sealed sources after use may be returned to the manufacturer, sent to a licensed radioactive waste management facility, or transferred to a person licensed by the CNSC to possess such materials, such but does not describe how their long-term management after such transfers are made. Q1. How are such sources (including orphan sources recovered by CSNC) encompassed by disposal plans, once they have been declared as radioactive waste?	Currently, Canada's sealed source manufacturers ship their disused sealed sources to Chalk River Laboratories at the end of their useful lives. A portion of the fees charged by Canadian Nuclear Laboratories (CNL) in order to accept this low-volume intermediate- and high-level waste is set aside by CNL in order to cover the costs of long-term management so that a liability is not incurred by Canada. Domestically, on occasion, the CNSC retrieves orphaned sources from bankrupt businesses and shuttered institutional properties (hospitals, schools). The long-term management costs of these orphaned sources are paid for through a licensee funded program administered by the CNSC. Orphaned sources are packaged at source and transported to the Chalk River site for storage until a suitable processing and disposal route is available. CNL may charge a fee to waste generators for the receipt, storage and disposition of orphan sources.
73.	Sweden	Article 19	Page 42	Q1. How does the recent establishment of the Impact Assessment Agency of Canada affect plans for licensing the long-term management of spent nuclear fuel and ongoing work in relation to OPG's Deep Geological Repository	A bill (Bill C-69) to establish the *Impact Assessment Act* (IAA) and revise the *Canadian Environmental Assessment Act 2012* (CEAA 2012) is in the early review stages and if approved, is not expected to receive Royal Assent before the summer of 2019. Bill C-69 includes a transition clause which states that any EA of a

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				Project?	project commenced under CEAA 2012 will continue as an EA under CEAA 2012, unless the proponent opts to terminate the current EA process and commence an IA under the IAA. An EA process under CEAA 2012 for the OPG Deep Geological Repository (DGR) Project was carried out by a Joint Review Panel. The current status of the OPG DGR Project is that the Minister of Environment and Climate Change Canada is awaiting further information requested of OPG, prior to making the EA decision. If a licence application is submitted in the future, the Adaptive Phased Management approach for the long-term management of Canada's used nuclear fuel will have to meet all applicable federal regulatory requirements, including the EA legislation of the day.
74.	Sweden	Article 19	Page 43	It is stated that CNSC may proceed with a licensing decision only after a positive decision is made on the environmental assessment for a planned project or activity. Q1. How do CSNC's expectations regarding evidential material (e.g. safety analysis reports) in support of an environmental impact assessment differ from those in relation to a subsequent site preparation and construction licence under NCSA?	The applicant chooses whether to complete an EA under CEAA 2012 via an integrated approach with the CNSC licensing process, or a sequential approach. Under an integrated approach, the EA is conducted at the same time as the review of the information in the applicant's licence application, enabling CNSC staff to present their recommendations for the EA and the licence application to the Commission at the same Commission proceeding. Under a sequential approach, the EA is conducted first, with a subsequent review of the licence application. This approach may be more appropriate when, for example, an applicant uses the EA to assess the feasibility of a project. For a licence to prepare a site and construct the facility (LPSC), the applicant is required to provide information on the repository design, the preliminary safety assessments demonstrating the ability of the repository design to meet requirements for its safe construction, operation, and closure, including performance under accident conditions. Much of this information is also common to that expected

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					in support of the EA for the project. The factors that are required to be assessed in an EA under CEAA 2012, for the entire lifecycle of a project, include consideration of environmental effects cause by accidents and malfunctions, alternative means of carrying out the project, mitigation measures and follow-up program requirements, and changes to the project caused by the environment (e.g., climate change, seismicity). For the licence application, the applicant must also demonstrate that all activities related to the site preparation and construction meet regulatory requirements for all applicable Safety and Control Areas (SCA). It is important to note that the EA covers the whole lifecycle of the DGR Project, while the licence application covers only site preparation and construction phases. The LPSC will not permit the possession of nuclear substances, pursuant to subsection 26(a) of the NSCA. Before nuclear wastes can be emplaced, OPG will require a CNSC licence that authorizes operation and that would be evaluated by the Commission under a separate, subsequent licence application process. Nonetheless, evaluation of the licensing application for issuance of the LPSC does consider the remaining repository lifecycle to ensure the overall risk to health, safety and the environment would be low.
75.	Sweden	Article 18	Page 47	The Participant Funding Program (PFP) is identified as one of the administrative measures used by CNSC to support implementation of its hearings process. Q1. What is the source of funds for the PFP in relation to long-term waste	The source of funds for the CNSC's Participant Funding Program (PFP) is a parliamentary appropriation which is then cost-recovered from CNSC licensees operating nuclear power plants, uranium mines and mills, processing and research facilities and radioactive waste management facilities. Each licensee is required to pay a share of the total amount spent by the PFP each year, which may vary from year to year. Participant funding is offered in relation to licence applications

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				management? Q2. Does it come from fees collected from industry, waste management funds or annual appropriation from Parliament?	submitted to the Commission for major nuclear facilities, for example, for Commission Hearings on licence renewals and new projects. Participant funding is also offered to assist in the review and preparation of interventions on Regulatory Oversight Reports on the various sectors of Canada's nuclear industry, which are presented to the Commission during Commission Meetings. The CNSC does not offer participant funding for initiatives at the exploratory or pre-project application stage, such as identifying willing and informed communities to host long-term waste management facilities. Participant funding would be offered for hearings related to licence applications for the long-term management of radioactive waste in a deep geological repository.
76.	Sweden	Article 26	Page 75, 141	To what extent does the application of "sound waste management and environmental principles" in achieving agreed end states from decommissioning and cleanup activities (particularly for former research and development facilities, where the potential for residual ground contamination may be more challenging to address) represent the result of engagement with parties other than the CNSC? Q1. This is understood to have been a major question in relation to the PHAI, but how far is such a model applicable to other sites a) such as CRL, b) mines	Q1. A) CNL engages with the public, local stakeholders and Indigenous groups on an ongoing basis. This includes engagement of local municipal councils, publications distributed to the surrounding communities, hosting an Environmental Stewardship Council (group with local stakeholders and Indigenous communities) on a quarterly basis, site tours, public services announcements, etc. As part of its proposed waste disposal projects specifically, CNL hosted multiple open houses and information session at which the public and stakeholders had an opportunity to provide input. B) An assessment of potential long-term impacts on the public and the environment is completed as part of the overall environmental assessment process for a proposed develop. A fundamental assumption of the assessment is the end state condition of the site and its assumed long-term usage. The public is provided an opportunity to comment on this assessment (including all assumptions) as part of the overall environmental assessment process.

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				and mill tailings facilities?	Further, at the time of final decommissioning, the assumptions for end state and long-term usage are reviewed. At this time, the public is once again provided the opportunity to comment on the assumed end state and long-term usage of the site.
77.	Sweden	Article 6	Page 80, 124	Q1. What type of criteria will be used by licensees and regulators in making choices between investment in continued and augmented on-site storage (with periodic licence renewal) and the development of a shallow centralised interim storage facility at the site of a future geological disposal facility (as part of the APM approach for spent fuel)? Q2. Does the NWMO see any possibility that centralised underground interim storage might lead to greater risks associated with programme delay?	**Q1:** A shallow centralized interim storage was identified as an optional part of the APM approach. However NWMO has no plans to construct such a facility. There is sufficient capacity at the licenced interim storage sites to hold the spent fuel until the APM DGR is operational. The proponent is responsible for selecting an option for waste management, CNSC will assess the option proposed from a safety perspective. **Q2:** The NWMO is not planning on constructing centralized underground interim storage.
78.	Sweden	Article 14	Page 98, 142	The report notes that an integrated waste strategy approach has been developed for the management of AECL's legacy wastes. Q1. Is it possible to give examples of how such an integrated approach has led to specific strategic decisions and/or improvements relating to waste treatment, processing, packaging and	The Integrated Waste Strategy (IWS) has allowed for specific analysis of legacy waste information, which led to strategic decisions including, for example, whether or not CNL requires separate VLLW and LLW disposal facilities. In this particular example, the comprehensive information in the ISW allowed CNL to conclude that while it may be possible to separate VLLW and LLW, the effort, dose and cost consequences would not be justified in relation to disposal of all suitable LLW in a common LLW disposal facility. In addition, CNL's IWS has enabled a prioritized set of actions that have guided work to address a wide range of waste capability gaps including

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				storage?	characterization, storage and disposal.
79.	USA	Article 13	Section K.2.2.1 pg. 119	Canada has proposed construction of a one million cubic meter near-surface disposal facility for low-level wastes and other suitable waste streams. Q1. Please elaborate on the status of funding to construct this facility. Q2. Additionally, please discuss to what extent this disposal facility can accommodate current and projected low-level waste volumes requiring disposal.	The proposed Near Surface Disposal Facility (NSDF) is meant to receive low-level waste owned by AECL, as well as waste from small volumes producers such as hospitals and universities. It should also be noted that two other near surface facilities have been built to receive approximately 1.7 million cubic meters historic low-level radioactive waste which is under the responsibility of AECL as part of the Port Hope Area Initiative. Q1. The current estimated life cycle cost for the near surface disposal facility is $600M CAD. While activities to construct and operate the facility are being carried out by Canadian Nuclear Laboratories, funding is provided by Atomic Energy of Canada Limited as the government organization which owns the waste and the site. AECL receives funding through Parliamentary Appropriations on an annual basis. Q2. CNL maintains a waste forecast which includes all foreseeable waste that will be generated as a result of CNL activities. The current dates cover until the estimated end of operation of the Near Surface Disposal Facility (NSDF), namely 2070. For the purposes of identifying waste projections beyond the expected life of the NSDF, waste volumes have been estimated to an assumed end of operations date of the Chalk River Laboratories site in 2100. While it is unknown if the laboratory will be operational beyond this date, 2100 was used as a working assumption.
80.	USA	Article 22	Section F.3 pg. 59-	Comment 1. The U.S. commends Canada for its recruitment and retention initiatives to develop sufficient human	Canada thanks the USA for the commendation.

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			60	resources to ensure long-term sustainability of the workforce.	
81.	USA	Article 28	Section J.4.3 pg. 112	Q1. Please describe how Cobalt-60 is safely managed once it reaches the end of its working life. For example, is most of it managed in country, repatriated, or returned to the manufacturer? Q2. Is this addressed under the bilateral arrangements?	Q1: Industrial Cobalt-60 sources used in commercial irradiators are returned to the manufacturer at the end of their working life. Q2: The return of radioactive sources to the supplier is a contractual arrangement between the end-user and supplier, and is not specifically addressed under regulatory bilateral arrangements.
82.	USA	Article 6	Section K.5.3.2 pg. 127	Q1. Please elaborate further on how the 21 communities were entered into the repository site selection process and how that number has been reduced to 7 communities still participating in the selection process. Q2.In addition, please provide updates on the selection process since report submission.	Q1: The site selection process was developed through a two year public dialogue process. The collaboratively developed process includes objectives, guiding principles and steps and was initiated in 2010. The first step of this process involved publishing the description of the siting process on the NWMO website and sharing it at municipal and Indigenous conferences. The NWMO did not reach out to individual communities, but instead waited to receive requests from communities to become involved in the process, focused on learning about the project and the siting process. Key points in the process include: communities take the first step; communities must express interest through some formal mechanism such as council resolution; community is indicating interest in learning more, not necessarily in hosting a repository; and communities can leave at any time in this stage of the process. By 2012, 22 communities indicated an interest and entered into the process. As part of the learning process studies of the area geology

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					and environment were initiated. Studies of the potential to foster well-being through the implementation of the project in an area were also initiated. NWMO has been evaluating the areas around each of these communities in terms of technical and social factors that would be necessary for identification of a site. These studies have become progressively more detailed. As a result of these studies, and through an iterative process of narrowing down, the NWMO had identified 7 communities and areas with strong potential to meet the technical and social requirements for the project. The other 14 communities and areas were removed progressively over the intervening years from 2012 to today, based on varying degrees of technical and social uncertainties specific to each of the communities and areas. Each review phase in the process has documented the review of each community and area in that phase of the process, and the rationale for continuing or not with that area. These are published documents presented to the community and available on the NWMO website. **Q2:** Since the Canada National Report was submitted in 2017, the NWMO has further reduced the number of communities and areas to study. There are presently 5 communities, along with surrounding communities, under consideration.
83.	USA	Article 20	Section E.3.3 pg. 40	The report mentions the implementation of administrative monetary penalties for regulatory	The CNSC has issued 33 Administrative Monetary Penalties (AMPs) since the program came into force in 2013. As AMPs remains a relatively new enforcement tool to the CNSC, there

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
				violations. Q1. Please provide roughly how many monetary penalties have been assessed since 2013, and describe if there is any measure of the effectiveness of penalties in increasing regulatory compliance.	is no data available to measure long term effectiveness of this program. Short term data shows that none of the 33 persons who received an AMP have re-offended and we continue to monitor licensee compliance. Anecdotal feedback from our inspectors indicates a strong deterrence factor. Licensees appear to be very mindful of the new CNSC AMP program and are taking additional measures to ensure they remain compliant with regulatory requirements in order to avoid an AMP.
84.	United Kingdom	Article 18	p.49 - 51 Sections E6 & E7	Sections E6 and E7 provides a brief overview of the compliance promotion, verification, inspections and enforcement activities undertaken by CNSC. Q1. Please provide details of CNSC's approach to openness and transparency of the output from the activities listed within this section. Specifically how is such information shared with members of the public to explain its regulatory activities?	The Commission conducts as much of its business as possible in an open and transparent manner. This includes holding public hearings in communities most affected by the matter at hand. All public hearings are broadcast live on the Internet and archived on the CNSC website. Transcripts of public hearings and meetings are available online. Pursuant to rule 19 of the Canadian Nuclear Safety Commission Rules of Procedure, requests to intervene are reviewed by the Commission. Interventions should be specific to the matter being discussed at the public proceeding and all submissions are made available to the public. However, to ensure confidentiality of personal information, such as an address or telephone number, the Commission asks that this information be submitted on a separate page. Oral interventions are generally made in person at the proceeding. The Commission also accommodates intervenors who cannot attend by arranging an oral presentation by teleconference or videoconference. Oral presentations are not possible without a written submission. Written interventions are submitted in advance of the public proceeding by the deadline specified in the notice. Intervenors making

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					an oral presentation are encouraged to summarize the key points of their written submission. The length of each oral presentation is usually limited to 10 minutes, followed by an opportunity for the Commission members to ask questions. Commission members read written submissions beforehand, and the question period helps to ensure that they have a clear and comprehensive understanding of the matters raised. There is no time limit for the question period. In addition, staff members regularly engage in ongoing public dialogue about the CNSC's regulatory role. Through its website and social media channels, the CNSC provides information to the public about how it regulates the use of nuclear energy and materials to protect health, safety, security and the environment. On an ongoing basis, it informs the public about the development, production, possession, transport and use of nuclear substances. Each year, the CNSC publishes regulatory oversight reports, which offer information on the performance of Canadian nuclear licensees. These reports evaluate licensees based on their safety procedures and adherence to regulatory policy. Key issues and emerging changes in regulation are also highlighted in these reports. CNSC experts regularly visit communities across Canada, where they make presentations, hold open houses, hear opinions and answer questions from people who may be concerned about nuclear facilities in their communities. The CNSC also offers funding through its Participant Funding Program to give the public, Aboriginal groups and other stakeholders the opportunity to participate in its regulatory process. The CNSC also requires licensees of major nuclear facilities to develop and implement public information programs, to make sure they keep their public informed about their nuclear activities and any potential

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					related impact on public health and the environment.
85.	United Kingdom	Article 18	p.52 - 53 Section E8	Section E8 recognises the challenges and risks in maintaining highly skilled and engaged workforce within CNSC. A brief description of the efforts that CNSC have taken to maintain adequate and competent human resources including recruitment of graduates and outlines of training programmes is provided. Q1. Please provide further details on how CNSC is securing experience in terms of recruitment of personnel with correct behavioural competencies and experience of nuclear operations and decommissioning. Q2. Please provide more information on the resource challenges within CNSC and provide examples of how regulatory knowledge has been captured and transferred between staff.	The CNSC is committed to renewing the organization and has made considerable efforts over the past four years to recruit new graduates for our critical areas. The renewal assessment includes an initial screening and confirmation of education, a judgement test and a behavioural interview to ensure candidates are proficient in the CNSC key behaviours. Q1. The CNSC strives to ensure quality of hire by assessing both behavioural and technical competencies. Candidates are sourced using a variety of avenues including LinkedIn, targeted job boards and communities of practice. All candidates are selected for further assessment based on the education, skills, knowledge and technical competencies of the position. a) A behavioural based interview using the CNSC Key Behaviours (KBC) and/or the Key Leadership Competencies (KLC) is conducted to assess candidates. To be considered for employment with the CNSC, candidates are expected to demonstrate the 4 KBC's (and/or the 6 leadership competencies depending on the level). b) Knowledge and experience of nuclear operations and decommissioning includes the breadth (scope of knowledge) and depth (thoroughness of knowledge) required to perform the work. These are defined by job and level in work descriptions, are specifically sourced externally as required and assessed with written tests, scenario questions and in the behavioural interview prior to hire. Q2. a) Retirements continue to pose a real risk to the organization. As of March 31, 2017, 36% of the executive cadre will be eligible to retire in the next three years. Retirement of senior staff in the organization is also a challenge for the organization, with 33% being eligible to retire

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					in the next three years. As the organization continues to build from within to ensure a strong pipeline is in place to address the retirement risk, CNSC is cognisant that 15% of the internal pipeline (professional-level) will be eligible to retire within the next three years. b) In addition to the CNSC knowledge management best practices catalogue, the organization also has two development programs focused on the development and transfer of regulatory knowledge. The first, the Inspector Training Qualification Program, uses a variety of formal and on-the-job training activities to provide inspectors-in-training with the knowledge and skills to do their jobs. The on-the-job training component pairs them with a coach – a seasoned inspector whose job it is to transfer job-critical knowledge. The second program, the Regulatory Operations Training Program, extends beyond the inspector community, using a variety of tools to promote a consistent approach to regulatory activities for all those involved in regulatory work.
86.	United Kingdom	Article 28	p.108 - 113 Section J.4	The section details the strategy and processes for management of disused sealed sources under the regulatory control of CNSC within Canada. Q1. Please provide more detail on how Canada manages, controls and disposes of sources not under proper regulatory control i.e. orphan sources.	Domestically, on occasion, the CNSC retrieves orphaned sources from bankrupt businesses and shuttered institutional properties (hospitals, schools). The long-term management costs of these orphaned sources are paid for through a licensee funded program administered by the CNSC. When a source outside regulatory control is discovered, the individual who finds the source is required to notify the CNSC. The CNSC has internal procedures that are used to determine the next steps. Depending on the nature of the source that is found, different paths may be taken. Generally, the CNSC will try to determine the last previous owner of the source or device. Licensees are required to

Q. No.	Posed by Contracting Party	Article	NR pg. Reference	Question	Answer
					submit their inventory of sealed sources and radiation devices to the CNSC each year. They are also required to keep on file records of transfers and disposal of sealed sources and radiation devices. The CNSC uses this information to attempt to find the last owner of the source. If an owner can be found, they are responsible for retrieving the source, and/or arranging for its disposal. If it is a historical artefact (e.g. radium dials), the CNSC will direct the person who found it to contact Canadian Nuclear Laboratories and the Historic Artefact Recovery Program (HARP). HARP will arrange for a contractor to assess the item and arrange for shipment to a long-term storage facility. Costs for this type of recovery are covered by the Government of Canada. If the item found is not a historical artefact, the disposal of the item is the responsibility of the person who found it. On a case-by-case basis, the CNSC determines if it will take possession of the item and arrange for its disposal.

Question 33.

Table D.1 Fuel in Wet Storage

Site	Interim Storage Capacity (bundles)	Interim Storage Capacity (tonnes)
Bruce Power Nuclear Generating Stations	775,000	15,500
Darlington Nuclear Generating Station (NGS)	400,512	7,686
Gentilly-2 NGS	50,160	1,204
Pickering Nuclear Generating Stations	469,152	9,322
Point Lepreau NGS	Reception Bay - 6,737 bundles Storage Bay - 43,897 bundles	Reception Bay - 128.34 tonnes Storage Bay - 836.24 tonnes

	Total - 50,634 bundles	Total - 964.58 tonnes[1]
McMaster Nuclear Research Reactor	N/A	N/A
Chalk River Laboratories (CRL) - NRU	1023 bundles	18.5 tonnes

[1] The fuel bundles used by NB Power have an approximate volume of 0.004 m^3 and an associated uranium mass of approximately 19.05 kg per spent bundle.

Table D.2 Fuel in Dry Storage

Site	Interim Storage Capacity (bundles)	Interim Storage Capacity (tonnes)
CRL Waste Management Area (WMA) G	5,832	Not available due to variance of fuels.
CRL WMA B	3,529	Not available due to variance of fuels.
Darlington Waste Management Facility (WMF)	368,640	7,074
Douglas Point WMF	22,842	316
Gentilly-1 WMF	58	0.75[2]
Gentilly-2 WMF	132,000	3,168
Pickering WMF	383,616	7,622
Point Lepreau WMF	260 canisters 140,400 bundles	2,674.62[1]
Western WMF (located at Bruce site)	731,520	13,916
Whiteshell Laboratories	N/A – being decommissioned	N/A – being decommissioned

[1] The fuel bundles used by NB Power have an approximate volume of 0.004 m^3 and an associated uranium mass of approximately 19.05 kg per spent bundle.
[2] Assuming 0.013 T/bundle

Table D.3 Non-fuel Waste

Radioactive waste management or nuclear fuel cycle facility	LLW Interim Storage Capacity (m^3)	ILW Interim Storage Capacity (m^3)
Western WMF	15,000	3,000
Radioactive Waste Operations Site 1	N/A – No longer receiving waste	N/A – No longer receiving waste
Gentilly-2	3,923	938
Point Lepreau	4581.19[1]	
CRL	129,430	17,209

Whiteshell Laboratories	N/A – being decommissioned	N/A – being decommissioned
Douglas Point WMF	N/A	N/A
Gentilly-1 WMF	888[2]	58
Port Hope Conversion Facility	10,000	N/A
Blind River Refinery	9,000	N/A
Port Hope Fuel Manufacturing	400	N/A
BWXT Fuel Manufacturing Peterborough	15	N/A
BWXT Fuel Manufacturing Toronto	120	N/A
Best Theratronics Manufacturing Facility Kanata	N/A	N/A
Nordion Manufacturing Facility Kanata	N/A	N/A
Bruce Power (Sources)	N/A	N/A

[1] Due to storage practices and infrastructure where no segregation between waste LLRW and ILRW is made, the total storage volume capacities are reported as a single entry

[2] Including 280 m3 of waste that has previously been transferred to another facility. This facility is in the process of being decommissioned cannot accept waste from other sources.

Table D.4 Historic Waste

*Interim storage capacities not required as new waste will not be added to the inventory.