IAEA-NS-IRRS-2019/05
ORIGINAL: English

INTEGRATED REGULATORY REVIEW SERVICE (IRRS)

TO

CANADA

Ottawa, Canada

3 to 13 September 2019

DEPARTMENT OF NUCLEAR SAFETY AND SECURITY

Integrated
Regulatory
Review Service

IAEA IRRS

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Integrated Regulatory Review Service

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REPORT OF THE

INTEGRATED REGULATORY REVIEW SERVICE (IRRS) MISSION

TO

CANADA

Mission dates:	*3 to 13 September 2019*
Organizations involved:	*Canadian Nuclear Safety Commission (CNSC), Natural Resources Canada (NRCan) and Health Canada (HC)*
Location:	*Ottawa, CANADA*
Regulated facilities, activities and exposure situations in the scope of the IRRS mission:	*Regulated facilities, activities and exposure situations in the scope of the IRRS mission: Nuclear Power Plants, Fuel Cycle Facilities, Research Reactors, Waste Management Facilities, Decommissioning Activities, Radiation Sources (Radioactive Sources and Particle Accelerators) Applications, Transport of Radioactive Material, Planned and Existing Occupational and Public Exposure Situations.*
Organized by:	*International Atomic Energy Agency (IAEA)*

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The number of recommendations, suggestions and good practices is in no way a measure of the status of the national infrastructure for nuclear and radiation safety. Comparisons of such numbers between IRRS reports from different countries should not be attempted.

CONTENTS

EXECUTIVE SUMMARY

At the request of the Government of Canada, an international team of senior nuclear and radiation safety experts met with representatives of the Government of Canada from 3 to 13 September 2019 to conduct an Integrated Regulatory Review Service (IRRS) mission.

Participating authorities included the Canadian Nuclear Safety Commission (CNSC), Natural Resources Canada (NRCan) and Health Canada (HC).

The mission took place in Ottawa, Canada. The purpose of the IRRS mission was to perform a peer review of Canada's regulatory framework for nuclear and radiation safety against IAEA safety standards as the international benchmark for safety. The mission was also used to exchange information and experience between the IRRS team members and the Canadian counterparts in the areas covered by the IRRS.

The IRRS team consisted of 20 senior regulatory experts from 17 IAEA Member States and four IAEA staff members.

The IRRS team carried out the review in the following areas: responsibilities and functions of the government, the global safety regime, responsibilities and functions of the regulatory body, the management system of the regulatory body, the activities of the regulatory body including authorization, review and assessment, inspection and enforcement, regulations and guides. The review also included the optional module 11 on nuclear safety and security interface. Facilities, activities and exposure situations within the scope of the mission included all those regulated at the federal level by CNSC: nuclear power plants, fuel cycle facilities, research reactors, waste management facilities, decommissioning activities, transport of radioactive material, radiation sources applications (radioactive sources and particle accelerators), planned and existing occupational and public exposure situations.

Facilities and activities with particle accelerators below 1MV, medical exposure, and specific areas of the existing exposure situations, regulated at provincial or territorial level were out of the scope of the mission. In addition, and as agreed with the Canadian counterparts responsible for the Emergency Preparedness Review (EPREV) and those responsible for the Integrated Regulatory Review Service (IRRS), Module 10 (EPR) of the IRRS was included in the Canada EPREV and excluded from the scope of Canada IRRS mission.

The IRRS mission included discussion of two policy issues: "Readiness for innovation from the regulator's perspective"; and "Opportunities to strengthen the CNSC's regulatory safety oversight culture".

The IRRS team conducted interviews and discussions with the staff of CNSC and representatives of HC and NRCan. Members of the team also observed regulatory inspection activities at operating power and research reactors, conversion facility, radioactive waste management facilities, decommissioning activities, research centres, a University hospital, a nuclear processing facility, a radioactive sources producer with transportation activities also, an industrial radiography facility and an industrial irradiator, in Ontario and Quebec. The visits also included discussions with the authorized parties – licensees' personnel and management.

In preparation for the IRRS mission, Canada conducted a self-assessment and prepared a preliminary action plan to address areas that were identified for improvement. The results of the self-assessment and supporting documentation were provided to the team as advance reference material for the mission. Throughout the mission, the IRRS team was extended full cooperation in the regulatory, technical, and policy issues by all parties in a very open and transparent manner.

The IRRS team acknowledged the outstanding efforts of the participating authorities to engage in this extensive international peer review. The participation by the above organisations enabled the team to develop a broad understanding of the regulatory framework resulting in recommendations and suggestions that should benefit nuclear and radiation safety for all in Canada.

Canada has a comprehensive and robust regulatory framework for nuclear and radiation safety covering current facilities and activities. The CNSC strives to continuously upgrade its regulatory framework to address new challenges and upcoming technologies,

The IRRS team identified the following good practices:

- The CNSC, in partnership with other organisations, has established a comprehensive programme for dealing with historic radium devices in the public domain

- The CNSC has a comprehensive system for collecting, analysing and sharing regulatory experience feedback.
- The CNSC is very committed to ensuring a high level of transparency and openness with the public, stakeholders and interested parties about its regulatory activities and decisions.
- The CNSC proactively developed extensive guidance and processes to assist potential applicants determine the content of the small modular reactor application for authorization.
- The CNSC performs peer reviews for certification of transport packages to minimize the risk associated with the certification of higher risk designs.
- HC has undertaken effective programme for raising awareness of radon through strategic and targeted messaging to the public.

The most significant challenges to Canada relate to the enhancement of the national policy and strategy for the radioactive waste management and the alignment of radiation protection requirements with IAEA safety standard GSR Part 3.

The IRRS team made recommendations and suggestions that indicate where improvements are necessary or desirable to continue enhancing the effectiveness of regulatory functions in line with IAEA safety standards. The IRRS team recognized that some of its findings also endorsed the actions identified by Canada as a result of its self-assessment.

The IRRS team also identified some other areas for improvement including:

- The CNSC should:
    - Establish public exposure dose constraints for all Class I type facilities.
    - Align transportation regulatory documents with IAEA SSR-6.

The IRRS team findings are summarized in Appendix IV.

An IAEA press release was issued at the end of the IRRS Mission.

I. INTRODUCTION

At the request of the Government of Canada, an international team of senior safety experts met representatives of the Canadian Nuclear Safety Commission (CNSC), during the period from 3 to 13 September 2019 to conduct an Integrated Regulatory Review Service (IRRS) mission.

The purpose of this IRRS peer review mission was to review the Canadian regulatory framework for nuclear and radiation safety. The review mission was formally requested by the Government of Canada in September 2018. A preparatory meeting was conducted from 17 to 18 December 2018 at the CNSC Headquarters in Ottawa to discuss the purpose, objectives and detailed preparations for the review in connection with the regulated facilities and activities in Canada and their related safety aspects and to agree the scope of the IRRS mission.

The IRRS review team consisted of 20 senior regulatory experts from 17 IAEA Member States and four IAEA staff members. The IRRS team carried out the review in the following areas: responsibilities and functions of the government, the global safety regime, responsibilities and functions of the regulatory body, the management system of the regulatory body, the activities of the regulatory body including authorization, review and assessment, inspection and enforcement, regulations and guides. The review also included the optional module 11 on nuclear safety and security interface. In addition, and as agreed with the Canadian counterparts responsible for the EPREV and the IRRS, Module 10 (EPR) of this IRRS was included in the EPREV and not in the IRRS. Facilities, activities and exposure situations within the scope of the mission included all those regulated at the federal level by CNSC: nuclear power plants, fuel cycle facilities, research reactors, waste management facilities, decommissioning activities, transport of radioactive material, radiation sources applications (radioactive sources and particle accelerators), planned and existing occupational and public exposure situations. Facilities and activities with X ray devices below 1MV, medical exposure, and specific areas of the existing exposure situations, regulated at provincial or territorial level were out of the scope of the mission.

In addition, two policy issues were discussed: (1) Readiness for innovation from the regulator's perspective; and (2) Opportunities to strengthen the CNSC's Regulatory Safety Oversight Culture.

The CNSC conducted a self-assessment in preparation for the mission and presented a preliminary action plan. The results of the self-assessment and supporting documentation were provided to the IRRS review team as advance reference material for the mission. During the mission, the IRRS review team performed a systematic review of all topics within the agreed scope of the review, through review of the advance reference material, conducting interviews with management and staff from CNSC and by direct observation of regulatory inspections at Bruce Power Nuclear Generating Station in Tiverton/Ontario, Western Waste Management Facility in Tiverton/Ontario, Port Hope Conversion Facility in Port Hope/Ontario, Chalk River Laboratories in Chalk River/Ontario, Nordion in Ottawa/Ontario, Nordion in Laval/Quebec, McGill University Health Centre in Montreal/Quebec, and Mistras in Laval/Quebec.

The IRRS team also held meetings with Mr Shawn Tupper - Associate Deputy Minister of Natural Resources, Mr Jay Khosla - Assistant Deputy Minister of Natural Resources, Mr Jim Delaney - Director, Uranium and Radioactive Waste, Ms Aleksandra Hretczak - Special Advisor to the Associate Deputy Minister of NRCan as well as representatives of HC. On September 9 a teleconference was held with CNSC President and Chief Executive Officer Ms Rumina Velshi.

Throughout the mission, the IRRS team received excellent support and cooperation from all of the Canadian counterparts.

II. OBJECTIVE AND SCOPE

The purpose of this IRRS mission was to review the nuclear and radiation safety regulatory framework in Canada against the relevant IAEA Safety Standards, to report on regulatory effectiveness and to exchange information and experience in the areas covered by the IRRS. The agreed scope of this IRRS peer review included all facilities and activities and exposure situations regulated at the federal level by CNSC: nuclear power plants, fuel cycle facilities, research reactors, waste management facilities, decommissioning activities, transport of radioactive materials, radiation sources applications (radioactive sources, and particle accelerators), planned and existing occupational and public exposure situations. Facilities and activities with X ray devices below 1MV, medical exposure, and specific areas of the existing exposure situations (regulation of radon in workplaces – except for CNSC licensees and federal workplaces – regulation of NORM not arising from the nuclear fuel cycle, and the implementation of provisions for protection of people from exposures due to radon in homes and public buildings, radioactivity in drinking water and building materials), regulated at provincial or territorial level were out of the scope of the mission. In addition, and as agreed with the Canadian counterparts responsible for the EPREV and the IRRS, Module 10 (EPR) of this IRRS was included in the EPREV and not in the IRRS. Module 10 includes: regulations for onsite EPR (NPP), assessment and inspection of operator compliance with these regulations and resources devoted by the regulator, the CNSC, to fulfilling its duties as a response organization.

It is expected that this IRRS mission will facilitate regulatory improvements in Canada and other Member States, utilising the knowledge gained and experiences shared between Canada and the IRRS reviewers, and the evaluation of the Canadian regulatory framework for nuclear safety, including areas of good practices and good performance.

The key objectives of this mission were to enhance the national legal, governmental and regulatory framework for nuclear and radiation safety, and national arrangements for emergency preparedness and response through:

a) providing an opportunity for continuous improvement of the national regulatory body through an integrated process of self-assessment and review;

b) providing the host country (Government and Regulatory authorities) with a review of regulatory technical and policy issues;

c) providing the host country (Government and regulatory authorities) with an objective evaluation of its regulatory infrastructure with respect to IAEA Safety Standards;

d) promoting the sharing of experience and exchange of lessons learned among senior regulators;

e) providing key staff in the host country with an opportunity to discuss regulatory practices with IRRS Review Team members who have experience of other regulatory practices in the same field;

f) providing the host country with recommendations and suggestions for improvement;

g) providing other states with information regarding good practices identified in the course of the review;

h) providing reviewers from Member States and IAEA staff with opportunities to observe different approaches to regulatory oversight and to broaden knowledge in their own field (mutual learning process);

i) contributing to the harmonization of regulatory approaches among states;

j) promoting the application of IAEA Safety Requirements; and

k) providing feedback on the use and application IAEA Safety Standards.

III. BASIS FOR THE REVIEW

I. PREPARATORY WORK AND IAEA REVIEW TEAM

At the request of the Government of Canada, a preparatory meeting for the Integrated Regulatory Review Service (IRRS) was conducted from 17 to 18 December 2018. The preparatory meeting was carried out by the appointed Team Leader, Ms Marta Ziakova, Deputy Team Leader, Mr Mika Markkanen, and the IRRS IAEA team representatives, Mr Tim Kobetz, Team Coordinator, Mr Gerard Bruno, IAEA Review Area Facilitator and the Canadian Counterparts.

The IRRS mission preparatory team had discussions regarding regulatory programmes and policy issues with the senior management of CNSC represented by Mr Ramzi Jammal, Executive Vice-President and Chief Regulatory Operations Officer of the CNSC, other senior management and staff. It was agreed that the regulatory framework with respect to the following facilities, activities and exposure situations would be reviewed during the IRRS mission in terms of compliance with the applicable IAEA safety requirements and compatibility with the respective safety guides: nuclear power plants, research reactors, fuel cycle facilities, radiation sources (with the exception of X ray devices below 1MV), radioactive waste management facilities, decommissioning, occupational exposure, existing and public exposure (with the exception of some specific areas).

Presentations were made by the national counterparts on the national context, the current status of regulatory infrastructure in Canada and the self-assessment results.
IAEA staff presented the IRRS principles, process and methodology. This was followed by a discussion on the work plan for the implementation of the IRRS mission to Canada in September 2019.
The proposed composition of the IRRS Review team was discussed and tentatively confirmed. Logistics including meeting and work places, counterparts and Liaison Officer identification, proposed site visits, lodging and transportation arrangements were also addressed.

The Canada Liaison Officers for the IRRS mission was confirmed as Ms Nana-Owusua Kwamena, CNSC.

Canada provided IAEA with the advance reference material (ARM) for the review on 5 July 2019. In preparation for the IRRS mission, the IAEA review team members reviewed the advance reference material and provided their initial impressions to the IAEA Team Coordinator prior to the commencement of the IRRS mission.

II. REFERENCES FOR THE REVIEW

The relevant IAEA Safety Standards and the Code of Conduct on the Safety of Research Reactors were used as the basis for the review. The complete list of IAEA publications used as the references for this mission is provided in Appendix VI.

III. CONDUCT OF THE REVIEW

The initial IRRS Review team meeting took place on Monday, 2 September 2019 in Ottawa, Canada, directed by the IRRS Team Leader and the IRRS IAEA Team Coordinator. Discussions encompassed the general overview, the scope and specific issues of the mission, clarified the basis for the review and the background, context and objectives of the IRRS programme. The understanding of the methodology for review was reinforced. The agenda for the mission was presented to the review team. As required by the IRRS Guidelines, the reviewers presented their initial impressions of the ARM and highlighted potentially significant issues to be addressed during the mission.

The host Liaison Officer was present at the initial IRRS Review team meeting, in accordance with the IRRS Guidelines, and presented logistical arrangements planned for the mission.

The IRRS entrance meeting was held on Tuesday, 3 September 2019, with the participation of Mr Ramzi Jammal, Executive Vice President, Chief Regulatory Operations Officer, Mr Hugh Robertson, Director General, Directorate of Regulatory Improvement and Major Projects Management, Ms Marie-Pierre Grondin, Director, Internal Quality Management Division and Ms Nana-Owusua Kwamena, Senior Project Officer and Liaison Officer. Representatives of NRCan and HC attended the meeting. Ms Marie-Pierre Grondin gave an overview of the Canadian regulatory framework and Ms Nana-Owusua Kwamena presented the results of Canadian self assessment.

During the IRRS mission, a review was conducted for all review areas within the agreed scope with the objective of providing Canada with recommendations and suggestions for improvement and where appropriate, identifying good practices. The review was conducted through meetings, interviews and discussions, visits to facilities and direct observations regarding the national legal, governmental and regulatory framework for safety.

The IRRS review team performed its review according to the mission programme given in Appendix II.

The IRRS exit meeting was held on Friday, 13 September 2019. The opening remarks at the exit meeting were presented by CNSC President Rumina Velshi via videoconference. Juan Carlos Lentijo, Deputy Director General, Department of Nuclear Safety and Security, IAEA intevened also via teleconerence. IRRS Team Leader Marta Ziakova, presented the results of the mission. Response to the mission results were given by Ramzi Jammal, Executive Vice President, Chief Regulatory Operations Officer. The closing remarks were given by David Senior, Section Head, Regulatory Activities Section, IAEA.

An IAEA press release was issued.

1. RESPONSIBILITIES AND FUNCTIONS OF THE GOVERNMENT

1.1. NATIONAL POLICY AND STRATEGY FOR SAFETY

Under Canada's constitution, responsibility for nuclear energy falls within the jurisdiction of the federal government. Its role encompasses research and development (R&D), as well as the regulation of all nuclear materials, facilities and activities and particle accelerators in Canada. The Government of Canada places high priority on health, safety, national security and the environment in relation to nuclear activities in Canada along with the implementation of Canada's international commitments on the peaceful use of nuclear energy.

The government of Canada sets the policy for safety and its implementation is delegated to the CNSC through the Nuclear Safety and Control Act (NSCA). Canada's nuclear policy framework includes the following general elements: a nuclear non-proliferation policy, transparent and independent regulation, a radioactive waste policy framework, a uranium ownership and control policy, support for nuclear science and technology, and cooperation with provincial governments and municipal jurisdictions.

Canada participates in international arrangements (including international agreements, working groups, committees, peer reviews as well as bilateral and multilateral cooperation) to enhance safety globally and fulfil its respective international obligations.

Canada's non-proliferation policy stipulates that Canadian-supplied nuclear material, equipment and technology can only be transferred to countries which have concluded a bilateral Nuclear Cooperation Agreement (NCA) with Canada. Global Affairs Canada is responsible for the negotiation of NCAs. Canada currently has NCAs with 30 countries. The CNSC contributes to NCA negotiations by providing technical advice. The CNSC is further identified in all NCAs as the competent authority for implementing provisions of the NCA. To this end, the CNSC concludes separate Administrative Arrangements (AA) with its bilateral counterpart, an authority granted to it pursuant to section 21(1)(a) of the NSCA.

The NSCA is the prime legislation addressing the IAEA SF-1. The long-term commitment to safety is addressed in section 3 of the NSCA which has the primary purpose for the limitation of risk arising from nuclear energy and nuclear applications. The NSCA does not explicitly address all SF-1 Safety Principles. Subsection 44(1) of the NSCA specifies the areas in which CNSC is authorised to make regulations. Nor do these authorizations include explicit authorization to make regulations on some of the SF-1 safety principles not addressed in the NSCA including the principle of justification. The safety fundamentals are established on various levels in the regulatory framework (acts and requirements set in regulations, licences and REGDOCs).

The IRRS team was informed that licensing under s. 24(4) of the NSCA involves an assessment of risks and determination of the risks that are acceptable. The CNSC sees this determination as an exercise of justification.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The national policy and strategy for safety does not explicitly mention SF-1 Principle 4: Justification of facilities and activities*	
(1)	**BASIS: GSR Part 1, Requirement 1, states that** *"The government shall establish a national policy and strategy for safety, …to achieve the fundamental safety objective and to apply the fundamental safety principles established in the Safety Fundamentals."*
(2)	**BASIS: GSR Part 1 Requirement 1, para. 2.3 states that** *"In the national policy and strategy, account shall be taken of the following:* *(a) The fundamental safety objective and the fundamental safety principles established in the Fundamental Safety Principles [1]; …"*
S1	**Suggestion: The Government should consider explicitly addressing SF-1, Principle 4 (Justification) in its legal framework.**

Before authorizing an activity or the operation of a facility, the Commission is required to exercise its judgment and use its expertise to determine whether an applicant satisfies the requirements under the NSCA. The Commission is guided in its decision-making by its mandate, as provided for in the NSCA. The mandate of the Commission is, in part, to regulate the development, production and use of nuclear energy in order to prevent unreasonable risk, to the environment and to the health and safety of persons, associated with that development, production, possession or use.

Section 4 of the *Radiation Protection Regulations* (RPR) requires licensees to implement and maintain radiation protection programs that ensure radiation exposures and doses to persons (public and occupational) are ALARA, taking into account social and economic factors.

HC is responsible for promoting and protecting persons' health with respect to the risks posed by exposure to natural and man-made sources of ionizing radiation in living, working and recreational environments. HC is also Canada's national centre of excellence for monitoring of radiation in the environment and internal dosimetry. HC also conducts research on exposure trends and health outcomes of occupational and public exposures to environmental radiation, issues guidance for managing environmental exposures, and leads Canada's National Radon Programme. HC also operates Canada's National Dose Registry.

1.2. ESTABLISHMENT OF A FRAMEWORK FOR SAFETY

Works and undertakings for the production, use and application of nuclear energy and the related research are considered as works for the general advantage of Canada and therefore subject to federal legislative control.

The CNSC regulates the conduct of activities related to the use, production and distribution of nuclear energy and substances as defined under the NSCA. This includes the facilities and activities related to uranium mines and mills; uranium fuel fabrication and processing; NPPs; nuclear substance processing; prescribed industrial and medical applications; nuclear research and educational activities; transportation of nuclear substances; nuclear security and safeguards; import and export activities; and waste management and decommissioning.

The Commission's legal framework includes legally enforceable instruments such as acts, regulations, licences and orders, as well as regulatory documents which generally include two kinds of information: requirements and guidance. When included in the licensing basis, requirements are mandatory and must be met by any licensees wishing to obtain (or retain) a licence. Guidance provides direction to licensees and applicants on how to meet requirements. Regulatory documents inform applicants of the Commission's regulatory expectations. The regulations under the NSCA are legally binding and generally non prescriptive. They are made by the CNSC and are subject to the government of Canada regulation making process.

Under the RPR, the CNSC sets dose limits that are within protective health limits and establishes requirements to prevent unreasonable risk to the health and safety of persons. Persons include workers and members of the public. The RPR also require every licensee to implement a radiation protection program that keeps the amount of exposure and effective dose and equivalent dose as low as reasonably achievable (ALARA).

1.3. ESTABLISHMENT OF A REGULATORY BODY AND ITS INDEPENDENCE

The NSCA has established the CNSC, its objects, and the framework under which it can effectively and independently meet those objects. The CNSC is the primary authority in Canada to regulate the development, production and use of nuclear energy, and the production, possession and use of nuclear substances, prescribed equipment in order to prevent unreasonable risk. The CNSC is comprised of the Commission and the CNSC staff.

The Commission is a quasi-judicial tribunal. The CNSC has the legal status of a departmental corporation. The Commissioners of the CNSC are, according to section 10 of the NSCA, appointed by the Governor in Council (representative of the Queen in Canada acting on advice of the Cabinet). The CNSC reports to the Parliament of Canada through the Minister of NRCan. The NRCan acts as the administrative channel for the Commission to the Parliament.

The Commission's objects are to "prevent unreasonable risk" to the health and safety of persons, the environment and national security. It is with this purpose that the Commission establishes the regulations and requirements to be

imposed on the regulated community, through its regulations and its REGDOCs which explain the basis on which its regulatory actions will be based.

There are provisions under the NSCA that empower the CNSC to perform its regulatory functions, including authorization, review and assessment, inspection, enforcement and the establishment or adoptions of regulations and guides.

The Commission's decisions are reviewable only by the Federal Court of Canada. The CNSC's decisions are not subject to review by the Minister or other parts of the executive of government. Neither the Minister nor the Governor in Council has a role in CNSC's decision making or the power of appeal. Legal and governmental mechanisms are in place to ensure that no other responsibilities are assigned to the CNSC which might jeopardize, or conflict with, its responsibility for regulating safety. The Commissions mandate is limited to safety aspects of nuclear and radiation activities. Developmental aspects of nuclear energy or political or economic objectives are not part of CNSC's mandate.

1.4. RESPONSIBILITY FOR SAFETY AND COMPLIANCE WITH REGULATIONS

Paragraph 24(4)(b) of the NSCA requires that the regulator cannot issue or transfer a licence unless it is satisfied that the licence applicant will adequately provide for the health and safety of persons, protection of the environment, national security and compliance by Canada with its international obligations.

The CNSC outlined to the IRRS team that Parliament's statement of the licensee's primary responsibility for safety is spelled out in paragraph 24(4)(b) of the NSCA, as the regulator cannot issue a licence unless it is satisfied that the licence applicant will adequately provide for the health and safety of persons, protection of the environment, national security and compliance by Canada with its international obligations. The CNSC believes this provision clearly indicates primary responsibility rests with licensees. This responsibility is then translated into the detailed obligations on licensees, as outlined in subsection 12(1) of the General Nuclear Safety and Control Regulations.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The legal framework does not expressly assign the prime responsibility for safety to the person or organization responsible for a facility or an activity.*	
(1)	**BASIS: GSR Part 1, Requirement 5 states that** "*The government shall expressly assign the prime responsibility for safety to the person or organization responsible for a facility or an activity, … "*
S2	**Suggestion: The Government should consider expressly assigning, in its legal framework, the prime responsibility for safety to the person or organization responsible for a facility or an activity.**

In addition, neither the NSCA nor the regulations provide for a stipulation that compliance with regulations and requirements established or adopted by the regulatory body does not relieve the person or organization responsible for a facility or an activity of its prime responsibility for safety.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The legal framework does not stipulate that compliance with regulations and requirements, established or adopted by the regulatory body, does not relieve the person or organization responsible for a facility or an activity of its prime responsibility for safety.*	
(1)	**BASIS: GSR Part 1, Requirement 6 states that** *"The government shall stipulate that compliance with regulations and requirements established or adopted by the regulatory body does not relieve the person or organization responsible for a facility or an activity of its prime responsibility for safety."*

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
S3	**Suggestion: The Government should consider enhancing the legal framework to explicitly stipulate that compliance with regulations and requirements established or adopted by the regulatory body does not relieve the person or organization responsible for a facility or an activity of its prime responsibility for safety.**

1.5. COORDINATION OF AUTHORITIES WITH RESPONSIBILITIES FOR SAFETY WITHIN THE REGULATORY FRAMEWORK

The CNSC cooperates closely with other federal and provincial/territorial departments and agencies. Paragraph 21(1)(a) of the NSCA empowers the CNSC to enter into arrangements with any regulatory agency or department of a federal or provincial/territorial government or any international agency. These arrangements include memoranda of understanding (MOU) and Administrative Arrangements (AA). While these arrangements are not legally binding, they nonetheless outline the intentions of participants and guide staff on the scope and topics of mutual interest, or in the case of the AAs, implement the NCAs. The CNSC has domestic arrangements with several federal departments such as Transport Canada, HC and Environment and Climate Change Canada. The CNSC also has domestic arrangements with provincial authorities such as the Ontario Ministry of Labour and the Ontario Office of the Fire Marshal and Emergency Management.

The provinces and territories can, under their own mandates, establish radiation protection regulations and dose limits. The IRRS team noted that there are differences in the dose limits and radon reference levels established at federal level and in the different provinces and territories. The Federal-Provincial-Territorial Radiation Protection Committee is an intergovernmental committee established to support federal, provincial and territorial radiation protection agencies in their respective mandates. The representation on the committee includes CNSC, HC, provinces and the territories. The objective of the committee is to advance the development and harmonization of practices and standards for radiation protection.

The IRRS team identified there is a need for improved coordination regarding occupational exposure control between the CNSC and the provincial/territorial regulatory bodies as to ensure harmonised protection of all workers. The IRRS team encourages the Government of Canada to invite an extended follow-up mission to include medical exposures, all radiation sources and all existing exposure situations.

1.6. SYSTEM FOR PROTECTIVE ACTIONS TO REDUCE EXISTING OR UNREGULATED RADIATION RISKS

The responsibility for implementing a system to reduce risks from exposure to ionizing radiation is shared among the different levels of government (federal, provincial/territorial, and municipal).

The HC works closely with stakeholders to identify situations where guidance for exposure management is required and to develop and promote harmonized, justified, and optimized recommendations. Examples of these situations include naturally occurring radioactive material (NORM) from industrial practices, radioactivity in drinking water, and radon.

The CNSC has a procedure in place for dealing with recovered sources. Within CNSC, the Directorate of Nuclear Substances Regulation (DNSR) is responsible for the regulatory oversight of nuclear substances including radioactive sources. The DNSR Response Procedure for Found Nuclear Substances provides staff guidance on what to do when an "orphan source" has been discovered. It covers all steps from discovery to safe transfer and disposal. As the competent authority, all orphan sources would be reported to CNSC for action.

There are no regulatory requirements for monitoring to detect orphan sources. Many scrap metal recyclers and landfills have installed portal monitors to ensure that nuclear substances do not enter the waste/recycling stream. The CNSC has published a poster and a brochure on Alarm Response Guidelines for Radiation Portal Monitoring Systems that are geared towards waste management and scrap metal facilities. These provide assistance in dealing with found nuclear substances as detected by a portal monitor. The Canada Border Services Agency (CBSA) has portal monitors

installed at marine ports of entry for the purposes of monitoring for nuclear substances. The US border patrol has installed portal monitors at the United States/Canada border.

The CNSC, in partnership with other national organisations, has established a programme for historic radium luminous devices that exist in the public domain. This programme includes multiple elements. These include a risk assessment which identified which types of historic radium luminous devices pose a potential hazard and the potential exposures that could be incurred. Based on the results of the risk assessment, the CNSC identified under which circumstances the radium luminous devices can be exempted from licensing and which activities need to be licensed. This regulatory approach has been partnered with an extensive, targeted public and industry outreach programme which provides assistance in identifying devices containing radium luminous compounds, as well as providing general information on radiation safety awareness and best practices. There is also a free advisory and disposal programme operated by Canadian Nuclear Laboratories for the management of historic radioactive artefacts found on public and private properties across Canada, which supports the safe disposal of radium luminous devices where required. The IRRS team concluded that this combination of different elements in the programme for dealing with historic radium luminous devices represents an exemplary approach to dealing with this legacy issue.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The CNSC, in partnership with other organisations, has established a comprehensive programme for radium luminous devices, including a graded approach to their regulation, public outreach and a programme to support safe disposal.*	
(1)	**BASIS: GSR Part 1 Requirement 9 states that** *"The government shall establish an effective system for protective actions to reduce undue radiation risks associated with unregulated sources (of natural or artificial origin) and contamination from past activities or events, consistent with the principles of justification and optimization."*
GP1	**Good Practice: The CNSC has developed a targeted, multi-faceted programme for dealing with historic radium luminous devices in the public domain.**

1.7. PROVISIONS FOR THE DECOMMISSIONING OF FACILITIES AND THE MANAGEMENT OF RADIOACTIVE WASTE AND OF SPENT FUEL

Waste Management

In Canada, radioactive waste is defined as any material (liquid, gas or solid) that contains a radioactive nuclear substance, as defined in section 2 of the NSCA, and that the owner has declared to be waste. At present, radioactive waste in Canada is generated from: uranium mining, milling, refining and conversion; nuclear fuel fabrication; nuclear power and research reactor operations; nuclear research; radioisotope manufacture and use as well decommissioning of former nuclear facilities.

The NRCan is the lead government department responsible for developing and implementing the federal nuclear energy policy. In 1996, the Government of Canada established a Radioactive Waste Policy Framework to ensure that radioactive waste is managed in a responsible and cost-effective manner. The framework prescribes a set of principles governing the institutional and financial arrangements for disposal of radioactive waste by waste producers and owners and recognises that arrangements may be different for nuclear fuel waste, low-level radioactive waste and uranium mine and mill tailings. In accordance with the framework:

- The federal government will ensure that radioactive waste disposal is carried out in a safe, environmentally sound, comprehensive, cost-effective and integrated manner.
- The federal government has the responsibility to develop policy, to regulate, and to oversee producers and owners to ensure that they comply with legal requirements and meet their funding and operational responsibilities in accordance with approved waste disposal plans.

- The waste producers and owners are responsible, in accordance with the principle of "polluter pays", for the funding, organization, management and operation of disposal and other facilities required for their wastes.

In accordance with the Canadian Standard Association (CSA) Standard N292 0-14 and REGDOCs, four main classes of radioactive waste are recognised: high level radioactive waste; intermediate level radioactive waste; low level radioactive waste and uranium mine and mill tailings.

In 2002, the Canadian Government promulgated the *Nuclear Fuel Waste Act* (NFWA), making the owners of used fuel responsible for the development of long-term waste management approaches. The legislation required nuclear energy corporations to establish a waste management organization as a separate legal entity to manage the full range of long-term used fuel management activities. It also required the organization to prepare and submit a study to the Government of Canada on proposed approaches for the long-term management of the used fuel.

In accordance with the NFWA, the Nuclear Waste Management Organization (NWMO) was established in 2002 by Canada's nuclear electricity producers. The NWMO assumed responsibility for designing and implementing Canada's plan for the "safe, long-term management of used nuclear fuel through deep geological repositories (DGR), among other solutions".

In addition to the governments Radioactive Waste Policy Framework, the CNSC has developed a regulatory document REGDOC 2.11, which details the framework for radioactive waste management and decommissioning in Canada, describes the philosophy underlying CNSC's approach to regulating the management of radioactive waste and the decommissioning of facilities, and explains the principles taken into account in CNSC's regulatory decisions. The IRRS team found no evidence, beyond the above principles, contained in the policy framework or REGDOCs of a governmental policy or strategy related to radioactive waste management. The national policy on management of radioactive waste, should include decommissioning aspects, including the choice of possible decommissioning strategies or combinations of options.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The Canadian Radioactive Waste Management Policy Framework presents the overall principles for radioactive waste management. However, this does not encompass all the needed policy elements nor a detailed strategy or corresponding arrangements that provide a strategy for radioactive waste management in Canada.*	
(1)	**BASIS: GSR Part 5 Requirement 2: National policy and strategy on radioactive waste management states that "***To ensure the effective management and control of radioactive waste, the government shall ensure that a national policy and a strategy for radioactive waste management are established. The policy and strategy shall be appropriate for the nature and the amount of the radioactive waste in the State, shall indicate the regulatory control required, and shall consider relevant societal factors. The policy and strategy shall be compatible with the fundamental safety principles [2] and with international instruments, conventions and codes that have been ratified by the State. The national policy and strategy shall form the basis for decision making with respect to the management of radioactive waste.***"**
(2)	**BASIS: GSR Part 5 paragraph 3.6. states that** *"The national strategy for radioactive waste management has to outline arrangements for ensuring the implementation of the national policy. It has to provide for the coordination of responsibilities. It has to be compatible with other related strategies such as strategies for nuclear safety and for radiation protection."*
R1	**Recommendation: The Government should enhance the existing policy and establish the associated strategy to give effect to the principles stated in the Canadian Radioactive Waste Management Policy Framework.**

The CNSC requires all applicants and licensees to provide a financial guarantee in a form that is acceptable to the Commission. The Commission has made use of its authority to require financial guarantees in order to ensure funds are available for decommissioning and for safe radioactive waste management.

Decommissioning

In Canada, decommissioning refers to those actions taken, in the interest of health, safety, security and protection of the environment, to retire a licensed activity or facility permanently from service and render it to a predetermined end state condition.

Decommissioning is recognised as a distinct stage in the lifecycle of a facility and formal decommissioning plans are required to be submitted to the regulatory authority in support of the authorisation for decommissioning. The requirement to submit decommissioning plans is stipulated in the Class I Nuclear Facilities Regulations (CINFR) and Class II Nuclear Facilities Regulations (CIINFR).

Based on current plans submitted to the CNSC, NPPs will be decommissioned in three major phases: (1) Phase 1: shutdown and stabilization. Phase 1 includes the permanent reactor shutdown and the achievement of a safe sustainable shutdown state. The purpose of Phase 1 is to isolate and stabilize the remaining reactor components for a long-term storage period to allow time for radioactivity levels to decay. The effect will be that radiation doses to workers and the volume of radioactive waste generated by final decommissioning will be reduced. This phase is expected to produce several hundred cubic metres of low and intermediate-level radioactive waste. (2) Phase 2: storage with surveillance. During this phase, the activities are much reduced and focused on surveillance, inspection, servicing and maintenance to confirm that the structures, systems and components needed to maintain safe storage are functioning as required. This phase may last several decades during which a very small amount of waste is generated. Further, the CNSC requires programmes to ensure safety of the site and the radioactive material thereon. (3) Phase 3: dismantling. During this phase the facility is carefully dismantled, all resulting waste is disposed of appropriately and site restoration activities are performed to achieve the end state objectives for the installation.

1.8. COMPETENCE FOR SAFETY

The CNSC provides ongoing training for its staff to ensure they are competent and qualified for the work they perform in the regulation of safety. This is described in more detail in sub-sections 3.3, 4.4 and 7.1.

For authorized parties, the GNSCR stipulates that every licensee shall ensure the presence of a sufficient number of qualified workers to carry on the licensed activity safely and in accordance with the NSCA, the regulations made under the NSCA and the licence. It also stipulates under paragraph 12(1)(b) that every licensee shall train their workers to carry on the licensed activity in accordance with the NSCA, the regulations made under the NSCA and the licence.

REGDOC-2.2.2 provides guidance for licensees regarding the development and implementation of a training system. A training system provides the basis for the analysis, design, development, implementation, evaluation, documentation and management of training for workers at nuclear facilities. It provides a method for meeting the training needs of workers and ensuring that the right people receive the right training at the right time. With a training system as defined in this regulatory document, it can be demonstrated that all required knowledge, skills and safety-related attributes have been attained, through the process of performance-based assessment and program evaluation.

1.9. PROVISION OF TECHNICAL SERVICES

The Canadian technical services work at a high level of competence and regulatory supervision. The CNSC regulates the operation of dosimetry services as a licensable activity under the NSCA. Section 3 of the GNSCR, sections 18 and 19 of the RPR and Regulatory Standard S-106 provide the licence application, technical and quality assurance requirements to operate a dosimetry service.

HC's Human Monitoring Laboratory (HML) performs whole-body counting, lung counting, thyroid counting, and urine bioassay analysis. HML also has portable instrumentation for performing whole-body counting and urine

bioassay analysis in the case of an emergency. HC also operates an external photon dosimetry service and radon monitoring laboratory.

The major nuclear facilities maintain technical services related to internal and external dosimetry, calibration as well as effluent and environmental monitoring.

CNSC's Independent Environmental Monitoring Program (IEMP) was established to support the CNSC's independent verification that the public and the environment around nuclear facilities are protected. Results of monitoring are compared against guidelines and screening levels and are posted online to the CNSC's web page. The IEMP does not relieve licensees of their responsibility to implement and maintain their own environmental monitoring program. In addition, HC runs several programs to monitor the environment around nuclear facilities.

The CNSC's laboratory provides calibrated instruments for CNSC compliance verification activities as well as expert services in radiation instrumentation training, acquisition and calibration. The CNSC calibration laboratory is accredited under ISO/IEC 17025.

Amendments to the RPR are currently ongoing and among the proposed amendments is the inclusion of a new section related to the provision and use of radiation detection and measurement instruments by all CNSC licensees. This proposed amendment will require all radiation detection and measurement equipment to be appropriately selected for the radiation types, levels and radiation energies encountered, and their capability to preform accurately and reliably in operating field conditions during routine work and emergencies. The proposed amendment will also require radiation instrumentation to be tested routinely to verify proper functioning. REGDOC-2.7.1, which is under development includes guidance for the selection, testing and calibration of radiation instrumentation.

All licensed dosimetry services are obliged to regularly provide information to the National Dose Registry (NDR). The NDR maintains records for approximately 160 000 active occupationally exposed workers (OEWs). The NDR does not generally keep records of OEWs who are non-Canadian residents.

1.10. SUMMARY

Canada is a country with a long-standing nuclear safety and radiation protection legal system. The NSCA and associated regulations provide the basis of a flexible nuclear regulatory regime that affords adequate authority and power to the CNSC to discharge its responsibilities, while providing the flexibility to determine regulations that are pertinent to its activities. The CNSC is effectively independent. The style of legislative practice is specific to Canada and may create difficulties to find exact wording when searching where and by what provision individual requirements of the IAEA Safety Standards are addressed.

One good practice was identified related to the programme for dealing with historic radium dials in the public domain.

The following areas for improvement were identified:

- Explicitly addressing the principle of justification in the legal framework;
- Assignment of the prime responsibility for safety to the person or organization responsible for a facility or an activity;
- Enhancing the legal framework to explicitly stipulate that compliance with regulations and requirements does not relieve the person or organization responsible for a facility or an activity of its prime responsibility for safety;
- Enhancement of the national radioactive waste management policy.

2. THE GLOBAL SAFETY REGIME

2.1. INTERNATIONAL OBLIGATIONS AND ARRANGEMENTS FOR INTERNATIONAL COOPERATION

The CNSC is mandated to implement Canada's international obligations on the peaceful use of nuclear energy and technologies. To achieve this objective, the CNSC works bilaterally and multilaterally with foreign partners around the world. The CNSC participates in international arrangements (including international agreements, working groups, committees, peer reviews as well as bilateral and multilateral cooperation) to enhance safety globally and fulfil its respective international obligations.

Canada has signed a number of key international treaties and conventions that establish common obligations and mechanisms to enhance safety. Many of the treaties and conventions that CNSC is responsible for implementing fully or partially are multilateral treaties administered by the IAEA. These include the:

- Convention on Nuclear Safety
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention)
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
- Convention on Early Notification of a Nuclear Accident or Radiological Emergency
- Convention on the Physical Protection of Nuclear Material
- Treaty on the Non-Proliferation of Nuclear Weapons
- International Convention for the Suppression of Acts of Nuclear Terrorism.

Canada has expressed political support to the Code of Conduct on the Safety and Security of Sources and its associated guidance.

The CNSC participates actively in all relevant international meetings on these treaties and conventions.

The CNSC has also been authorized by the Government to implement Canada's agreement with IAEA. These include nuclear safeguards verifications including the Agreement between the Government of Canada and IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons and the Protocol Additional to the Agreement between Canada and IAEA for the Applications of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons.

The way how the IAEA Safety Standards are implemented in the regulatory framework is explained in module 9. Canada actively participates in all of the IAEA Safety Standards Committees to assist in the development of standards. HC participates in the Emergency Preparedness and Response Standards Committee. The CNSC participates in the other Safety Standards Committees. The CNSC has developed formalized processes to enhance coordination of the review of draft IAEA safety standards, which include enhanced consultations with members of the public, Indigenous groups and other stakeholders.

The CNSC participates in many IAEA's peer review missions as a key mechanism for strengthening regulatory effectiveness, both domestically and abroad. The CNSC previously hosted an IRRS mission to Canada in 2009 with a follow-up mission in 2011. In 2015, Canada hosted an IPPAS mission to review national nuclear security practices. Two Operational Safety Review Team (OSART) Missions were conducted in Canada in 2015 and 2016 (NPPs Bruce and Pickering). Canada hosted an EPREV mission in June 2019. In addition, between 2014 and 2018, CNSC staff members led or participated in 27 IRRS missions and 11 IPPAS missions in other countries.

2.2. SHARING OF OPERATING EXPERIENCE AND REGULATORY EXPERIENCE

The CNSC has many arrangements for analysing, identifying and disseminating domestic and international lessons learned from operating and regulatory experience. These range from bilateral international agreements with other regulatory bodies to multilateral international agreements through organizations such as IAEA and the Organization for Economic Cooperation and Development's Nuclear Energy Agency (OECD/NEA).

The CNSC has established the Operating Experience (OPEX) Clearinghouse program to systematically review domestic and international events, and to leverage the integrated expertise of CNSC staff, ensuring that relevant events are followed up in a timely manner. The OPEX Clearinghouse draws information from several sources to cover both domestic and international events. These sources include the Central Event Report Tracking System (CERTS) developed to gather events on Canadian NPP's, the IAEA-OECD Incident Reporting System (IRS) and the NEA Working Group on OPEX. CNSC shares all relevant events with IRS.

In the field of NPPs, CNSC inspectors consult the OPEX in CERTS when planning strategies for their inspections in order to identify specific issues. Similarly, CNSC assessments often incorporate the OPEX recorded in CERTS. As part of the inspection baseline, CNSC inspectors also check the licensee's station condition records or event reports, along with system health reports, to ensure that licensees have reviewed related OPEX and identified the relevant extent of conditions for their facilities.

The CNSC uses regulatory experience feedback through a lessons-learned approach (regulatory oversight and support) that is well ingrained across its organization. CNSC has a very comprehensive system for collecting, analysing and sharing regulatory experience feedback. CNSC has several policies and practices that foster the use of regulatory experience for the continuous improvement of the regulatory framework, such as the CNSC Strategic Planning Framework and the Regulatory Framework Steering Committee (RFSC). CNSC uses many sources for regulatory and operating experience feedback which enable CNSC to implement the necessary improvements. These sources include inspection reports, audits, evaluations, self-assessments, external peer reviews and conferences, MOUs with fellow international regulators, Regulatory Framework Consultations, etc.

The CNSC does not only learn from nuclear regulators, but also from non-nuclear ones. When there is an incident at a nonnuclear installation, CNSC performs its own assessment of the incident to draw lessons learned from it. CNSC also works together with the relevant authorities to assess whether CNSC has the same deficiencies. In a few cases CNSC performed joint inspections with the relevant authority. CNSC participates in the Community of Federal Regulators (CFR) in recognition of the opportunities to learn from other Canadian regulators as well as share information and lessons learned. CNSC leads the CFR efforts in relation to the development and consistent implementation of Administrative Monetary Penalties as it applies to the Canadian enforcement landscape. The CNSC also collaborates with foreign authorities regarding incidents which could interest CNSC. CNSC has a MOU with US NRC to share regulatory experience e.g. on package design approval.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The CNSC has a very comprehensive system for collecting, analysing and sharing regulatory experience feedback. The regulatory experience feedback is disseminated similarly as operating experience feedback. The CNSC shares its experience on the management of regulatory experience feedback actively with other domestic and international organisations.*	
(1)	**BASIS: GSR Part 1 Requirement 15 states that** *"The regulatory body shall make arrangements for analysis to be carried out to identify lessons to be learned from operating experience and regulatory experience, including experience in other States, and for the dissemination of the lessons learned and for their use by authorized parties, the regulatory body and other relevant authorities.*
GP2	**Good Practice: The CNSC has a comprehensive system for collecting, analysing and sharing regulatory experience feedback.**

2.3. SUMMARY

On behalf of the Government of Canada, CNSC is involved in international agreements, working groups, committees, peer reviews as well as bilateral and multilateral cooperation in order to enhance safety globally and fulfil its respective international obligations. The CNSC has many arrangements for analysing, identifying and disseminating lessons learned from operating and regulatory domestic and international experience feedback.

One good practice was identified in that the CNSC has a very comprehensive system for collecting, analysing and sharing regulatory experience feedback.

3. RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY

3.1. ORGANIZATIONAL STRUCTURE OF THE REGULATORY BODY AND ALLOCATION OF RESOURCES

The mandate of the CNSC is to regulate the use of nuclear energy and materials to protect health, safety, security and the environment; to implement Canada's international commitments on the peaceful use of nuclear energy; to regulate the production, possession, use and transport of nuclear substances, to disseminate scientific, technical and regulatory information to the public. The CNSC was established in 2000 under the NSCA to replace the former Atomic Energy Control Board (AECB), and reports to Parliament through the Minister of Natural Resources on the Commission's activities under the Act.

The CNSC's organizational structure consists of two components: the Commission, and the CNSC, which refers to the corporate body and the staff in general. The Commission is an independent administrative tribunal and court of record. The CNSC's Commission has up to seven appointed members. As per section 10 of the NSCA, the Commission members are appointed by the Governor in the Council of Canada for terms not exceeding five years and may be re-appointed. The Governor in Council is the Governor General acting on the advice of Cabinet. The appointed members are mandated to be independent of all influences, including political, governmental, special interest or private sector. The CNSC President serves as a full-time Commission member. The other members serve, in practice, on a part-time basis. The key roles of the Commission are to: (1) establish regulatory policy on matters relating to health, safety, security and the environment, (2) make legally binding regulations (3) make independent decisions on the licensing of nuclear-related activities in Canada.

The CNSC staff support the Commission by: (1) developing proposals for regulatory development and recommending regulatory policies, (2) carrying out licensing, certification, compliance inspections and enforcement actions, and (3) coordinating the CNSC's international undertakings, (4) developing the CNSC-wide programs in support of regulatory effectiveness, (5) maintaining relations with stakeholders and (6) providing administrative support to the organization. The CNSC staff review applications according to regulatory requirements, make recommendations to the Commission, and enforce compliance with the NSCA, other relevant Acts, regulations, and any licence conditions imposed by the Commission.

The CNSC is organised in six branches, and an independent Office of Audit, Evaluation and Ethics. The six divisions are the Regulatory Operations Branch (ROB), the Technical Services Branch (TSB), the Corporate Services Branch, the Regulatory Affairs Branch, the Commission's Secretariat and the Legal Services. The organizational structure of the CNSC is depicted in Annex VII.

The ROB is structured around the diverse range of nuclear facilities and activities in Canada and their characteristic risk profiles. This branch is responsible for the licensing, certification and regulation of NPPs, new major projects, uranium mines and mills, uranium fuel fabricating and processing facilities, waste management facilities, nuclear substances processing and transport and industrial and medical applications. The Regulatory Affairs Branch supports the licensing and compliance core business of the CNSC. This branch is responsible for facilitating and developing the CNSC's regulatory policy and framework, communications and stakeholder engagement, strategic planning, and international relations. The Corporate Services Branch is structured and staffed to provide services that are essential to maintaining the effectiveness and efficiency of the CNSC's core business operations. This branch is responsible for policies, programs and support related to the management of CNSC's finances and administration, human resources, information technology and information management. The Commission Secretariat supports the Commission by planning its business, publishing notices and decisions for Commission proceedings and offering technical and administrative support to the President and other members. The Secretariat is also the official registrar of Commission documentation. CNSC also employs its own Legal Services, which provide legal advice to the CNSC's regulatory activities.

The CNSC uses an internal Technical and Scientific Support Organization (TSO) modelled on IAEA TECDOC 1835 where the majority of the scientific support is provided by the Technical Support Branch (TSB). This branch oversees much of the detailed technical analyses in direct support of ROB. The TSB provides specialized expertise in the areas of nuclear science and engineering, safety analysis, safety management, human factors, personnel training and certification, environmental and radiation protection, security, nuclear emergency management, safeguards and

nuclear non-proliferation. The IRRS team noted that the TSB is working uniquely for the CNSC and is not doing technical work for any of the licensees.

The IRRS team observed that there is an independent Office of Audit and Ethics which performs an internal audit function and provides an independent and objective assessment on the CNSC's performance in delivering its regulatory mandate. Additionally, a Departmental Audit Committee is in place to reinforce the independence of internal audits and ensure that the CNSC president has independent and objective advice, as well as guidance and assurance on the adequacy of the CNSC's control and accountability processes.

The IRRS team observed that the organizational structure of the CNSC allows it to effectively and efficiently discharge its responsibilities and perform its functions in a manner commensurate with the radiation risks associated with nuclear facilities and licensed activities in Canada.

3.2. EFFECTIVE INDEPENDENCE IN THE PERFORMANCE OF REGULATORY FUNCTIONS

The responsibility and authority for the regulation of nuclear facilities and nuclear-related activities in Canada is assigned to the CNSC by Parliament under the NSCA. The CNSC is the sole authority in Canada to regulate the development, production and use of nuclear energy, and the production, possession and use of nuclear substances, prescribed equipment in order to prevent unreasonable risk to Canadians and the environment.

The CNSC's operations are funded from two sources in order to discharge its mandate – parliamentary appropriation and fees paid by applicants, licensees and other special project sponsors in accordance with the CNSC's Cost Recovery Fees Regulations. The Commission has the statutory authority to prescribe and charge fees for the services, products and information that it provides under the NSCA, and the fees may not exceed the costs to the CNSC of its regulatory activities (as described in subsections 44 (1), (2) and (3), paragraph 21(1)(g) of the NSCA). The NSCA, CNSC Cost Recovery Fee Regulations and Revenue Spending Authority provide an approach to the financing of the CNSC's regulatory activities by charging licensees all costs associated to the regulatory regime, which are allocated directly to the CNSC. The parliamentary appropriation funds CNSC activities related to: (1) applicants and licensees that are fee-exempt (e.g., hospitals, universities, other governmental institutions), (2) international obligations including safeguards and non-proliferation activities in support of the non-proliferation of nuclear weapons, (3) outreach and stakeholder relations, (4) public responsibilities such as emergency preparedness (5) ongoing oversight of the NSCA and the associated regulations.

Regarding the decision-making process, the IRRS team noted that the Commissions holds Public hearings and meetings for decisions and other considerations. These hearings and meetings follow CNSC's Rules of Procedure and CNSC's By-laws. The CNSC is accountable to the public and to Parliament through an annual report that is submitted to Parliament, through the Minister of Natural Resources. The IRRS team noted that the Commission's decisions are not subject to review by the Minister or other parts of the executive or government. Neither the Minister nor the Governor in Council has a role in CNSC's decision making or the power of appeal. The Commission's decisions are reviewable only by the Federal Court of Canada. Per section 19 of the NSCA, the Governor in Council is authorized to issue directives to the Commission on broad policy matters related to the mandate of the CNSC. However, the IRRS team noted that any policy directives given to the CNSC must be of a general nature and cannot inhibit the Commission's decision-making authority in specific cases. In addition, all directives must be published in the Canada Gazette and placed before each House of Parliament.

The IRRS team noted that due to the CNSC's independent governance structure, it is ensured that the CNSC remains independent from outside influence, including government departments and agencies, licensees, other Commission members and CNSC staff, in the conduct of its activities. The IRRS team noted that Members of the Commission must avoid conflict of interest. Subsection 11(1) of the NSCA prohibits members of the Commission from having business interests and engaging in activities, direct or indirect that are inconsistent with the duties of the Commission. The IRRS team noted that a member of the Commission who becomes aware of a conflict of interest must either terminate the conflict or resign from the Commission as per subsection 11(2) of the NSCA. The IRRS team observed that there are conflict of interest guidelines, which provide assurances that there is distance between the Commission and stakeholders. The IRRS team noted that the CNSC has a Values and Ethics Code in place, which applies to all staff and serves to strengthen and support governance and ethical leadership. This Code identifies the values and

expected behaviours that guide CNSC employees in performing their duties and responsibilities to ethical standards including maintaining an independent regulatory relationship with licensees and members of the public.

The IRRS team observed that the CNSC is an independent agency of the Government of Canada and operates in a transparent manner. Its operations are open to public scrutiny. The Commission's mandate, set out in its enabling legislation, does not include regulating to meet political or economic objectives. Commission members have a fixed-term appointment during good behaviour, and cannot be removed except for misconduct.

The IRRS team noted that there are also other federal departments with roles and responsibilities in the regulatory decision-making process. The CNSC has MOUs with these departments covering coordination and cooperation and to ensure that there are no gaps or overlap of responsibilities that could result in conflicting requirements for licensees or applicants. With regard to the authority to intervene, the IRRS team noted that the CNSC has the authority and will take whatever actions are necessary to compel the licensee to restore an adequate level of safety, for situations deemed to be serious and considered to pose an imminent radiological hazard to workers, the public or the environment.

As per section 66 of the NSCA, CNSC staff, the members of the Commission and every person acting on behalf of or under the direction of the Commission must take an oath or affirmation of fidelity and secrecy. The Commission and the CNSC staff are required to abide by the Values and Ethics Code for the Public Sector and the CNSC Values and Ethics Code. As per the Code, CNSC staff are responsible for avoiding real, potential or apparent conflicts of interest between their private interests and work-related duties and are to resolve such issues in favour of public interest. Additionally, under the CNSC Conflict of Interest and Post-employment Policy and the CNSC Directive on Reporting and Managing Financial Conflicts of Interest, employees must on an annual basis review and declare assets, liabilities, gifts and benefits as well as outside activities that may place them in a real, apparent or potential conflict of interest. All staff including those recruited from licensees are required to abide by the conditions of employment of the CNSC. Section 5.5 of the CNSC's Conflict of Interest Policy states "New and regular employees who were employed by licensees and contractors are required to inform their supervisor of their employment history. Depending on the context, they may be asked to disqualify themselves from participating for a period of time in any matter associated with these entities".

3.3. STAFFING AND COMPETENCE OF THE REGULATORY BODY

Pursuant to section 16 of the NSCA, the Commission has the authority to appoint and employ the professional, scientific, technical and other staff the Commission considers necessary to carry out its responsibilities under the Act and set their terms and conditions of employment. The IRRS team observed that the CNSC's status as a separate agency under the *Financial Administration Act* provides the Commission with the flexibility to respond to changes in the labour force to ensure it has the people it needs to carry out its work. The IRRS team noted that the number of staff and financial resources dedicated to each of the sector-specific regulatory divisions is determined based on the extent, nature and complexity of the various nuclear facilities and activities being regulated. The IRRS team observed that the relative size of the various organizational units in the core operations and the resource allocation is shaped by the review of strategic and operational plans including a risk-informed assessment of regulatory oversight requirements.

The Commission has the ability to employ the staff required to meet its mandate and fix their remuneration pursuant to subsection 16(1) of the NSCA. As well, subsection 17(1) of the NSCA enables the Commission to enter into paid service contracts with persons having knowledge of any matter relating to the work of the Commission for the purposes of advising and assisting the Commission in carrying out its mandate.

The Strategic Planning Framework (SPF) defines the CNSC's goals for the coming years and outlines key priorities and initiatives to enable the CNSC to achieve these goals. The IRRS team noted that it is one of the CNSC's strategic priorities to build a competent and agile organization that enables the delivery of its mandate. The CNSC has established a competency framework to ensure that the CNSC continues to select, build and maintain a competent and flexible workforce. Key Behavioural Competencies have been articulated and are expected of all employees, regardless of job or level and work in concert with the Government of Canada's Key Leadership Competencies which are expected of all supervisors and executives. The positions at the CNSC are described in Work Descriptions, which

set out the duties and activities of the positions and the required competencies related to education, abilities, skills and knowledge needed to carry out those duties and activities.

The IRRS team was informed that the work description and behavioural/leadership competencies form the basis of recruitment and staff development for all positions at the CNSC. The CNSC's Staffing Policy was developed to ensure the CNSC exploits its ability to attract, develop and retain talent.

On an ongoing basis, all managers at CNSC are required to assess and provide feedback to recognize, develop or adjust the performance of all staff who report to them. Managers are required to complete a performance evaluation on a bi-annual basis and ensure that Individual Learning Plans (ILPs) are developed and maintained to ensure that employees are successful in carrying out their current responsibilities and to support career development.

All CNSC managers have a Performance Management Contract (PMC) that outlines their commitments stemming from the CNSC's Strategic Planning Framework. Twice a year, the Executive Committee reviews management performance against the commitments in the PMC including how managers are demonstrating the key leadership competencies.

The CNSC initiated a number of actions centred on building capacity and capability through the design of the organization, the recruitment and renewal of the workforce, learning and leadership development programs and employee engagement and retention activities. The CNSC has identified hiring young professionals as an integral part of CNSC's efforts to address challenges due to the departure of qualified staff. The IRRS team was informed that since 2015, the CNSC has undertaken a significant recruitment campaign to attract and hire more than 80 recent science and engineering graduates – approximately 8-10% of the CNSC's total workforce. All new graduates were expected to rotate to another area of the organization or participate in a cross-divisional project to further develop their knowledge and understanding of the nuclear industry. Training plans were established, and destination positions identified to ensure that the new graduates were able to participate in a selection process to secure continuous employment.

Further, the CNSC may recruit experienced staff from industry or the private sector on an as-needed basis to avoid gaps in technical competency. The IRRS team observed that the CNSC's has established an Alumni Program, which enabled the CNSC to retain/transfer the knowledge and technical expertise that CNSC employees have developed over the years, by hiring back senior retired staff on a contract bases to retain the services of retirees who may possess certain specialized skills, technical knowledge or important corporate memory. The program provides the opportunity for alumni to pass on this knowledge through mentoring or coaching of other employees. The IRRS team also noted that the CNSC's has introduced a Mobility Directive, which allows the CNSC to meet changing operational needs, by providing senior management with a staffing mechanism to reassign staff to ensure the CNSC has the people with the required skills when and where needed. In addition, the CNSC has a Career Partnership Initiative which encourages staff to gain diversified work experience across the organization.

The CNSC is regularly evaluating its capability to regulate for safety now and in the future. The CNSC has an ongoing initiative, called the Capability for Nuclear Safety, to ensure that the CNSC successfully maintains the necessary capabilities to effectively and efficiently regulate nuclear safety. The CNSC has made various efforts in building a competent and agile organization. Through the Workforce of the Future initiative, CNSC identified the need to clarify roles and responsibilities and improve work assignments at all staff levels. To support role clarity, the Human Resources Directorate developed job family charts. A job family shows differences between similar types of work at each level. Each chart sets out the main duties and responsibilities at each level in one document. Technical competencies required for each position are outlined in work descriptions, which set out the duties and activities of each position and the required competencies related to education, abilities, skills and knowledge needed to carry out those activities. In addition, the CNSC uses workforce planning to shape and structure the workforce to ensure there is sufficient capability and capacity to deliver on its organizational objectives now and in the future.

The IRRS team was also informed that a strategic review of the CNSC's programmes will take place at the CNSC over the next two years. A team of directors general from branches across the organization has been put together to do this work. This team reports directly to the Executive Committee. A key part of this strategic review will be asking employees and managers for ideas on where the CNSC can make changes, improve some aspects of its work or find ways to work even more effectively.

The CNSC has various ongoing activities regarding knowledge management and training. Through the Knowledge Management (KM) Initiative, the CNSC has a 3-year knowledge management plan and has launched a Knowledge Management Policy. The CNSC also has an in-house Effective Knowledge Transfer course which is directed towards those CNSC staff who will soon be retiring and are expected to transfer their knowledge, as well as those junior and mid-career staff to whom the knowledge is being transferred. Moreover, the CNSC also has a learning and Development Program, aimed at developing and maintaining the competencies of staff. The program includes basic mandatory and recommended training. In addition, staff training is documented. The IRRS team noted that CNSC's web-based Learning Management System provides information on learning opportunities, allows staff and their management to keep track of training taken, provides information on related learning opportunities and is a convenient way to register for those activities. Finally, the CNSC also has specific learning programs by job types.

For more information on the management of resources and training of CNSC staff, refer to sub-chapter 4.4.

The IRRS team recognized and highlighted that the CNSC has analysed its needs for current and future qualified staff in a comprehensive and detailed manner. The CNSC's human resources plan covers not only recruitment aspects but also in an extensive and forward looking way initiatives for the rotation of staff and an excellent strategy to compensate for the departure of qualified staff. The CNSC has also established a progressive process to develop and maintain the necessary competence and skills of its staff, through a comprehensive KM Initiative.

Nevertheless, challenges in maintaining staff complement with regards to inspection of nuclear substances and radiation devices were identified by the IRRS team, as described in Section 7.6. Further, there are many anticipated changes to industry in the coming years that may impact CNSC's work including increased waste and decommissioning activities, the introduction of small modular reactor applications, as well as the end of commercial operation in 2024 of the Pickering Nuclear Generating Stations. These changes will affect all staff at CNSC. The CNSC therefore needs to address these changes in the further updating of its human resources plan.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *In view of the changing regulatory and technological environment, the CNSC needs to further adapt and update its human resources plan.*	
(1)	**BASIS: GSR Part 1 Requirement 18 and para 4.11 state that** *"The regulatory body shall employ a sufficient number of qualified and competent staff, commensurate with the nature and the number of facilities and activities to be regulated, to perform its functions and to discharge its responsibilities.* *4.11: "The regulatory body has to have appropriately qualified and competent staff. A human resources plan shall be developed that states the number of staff necessary and the essential knowledge, skills and abilities for them to perform all the necessary regulatory functions."*
S4	**Suggestion:** The CNSC should consider continuing to focus on its human resource management plan to ensure that CNSC continues to have access to a sufficient number of qualified and competent staff to regulate existing facilities and activities as well as new and emerging technologies in accordance with the nature of facilities.

3.4. LIAISON WITH ADVISORY BODIES AND SUPPORT ORGANIZATIONS

In the areas where the CNSC does not have the expertise required to inform a regulatory decision, it does have the statutory authority to enter into contracts with external parties, section 17 of the NSCA or arrangements with other governmental or international bodies or agencies pursuant to Paragraph 21(1)(a) of the NSCA. These arrangements may be made with the private sector, academic institutions, and governmental/non- governmental organizations. At the domestic level, these arrangements include administrative arrangements, letters of agreement, letters of understanding, memoranda of agreement, and memoranda of understanding (MOU). These arrangements provide a framework for bilateral and provincial cooperation, assurances regarding information exchanged as well as clarity

regarding regulatory responsibilities. The process to procure contracts must follow the CNSC's Contracting Policy as well as the Government of Canada's procurement regulations and processes as referred to in the Treasury Board of Canada's Contracting Policy. The IRRS team noted that the CNSC leverages on the expertise of other federal departments and agencies to fulfil its mandate.

In addition, the CNSC maintains a Research and Support Program, which is designed to provide CNSC staff with access to external independent advice, expertise and information. The CNSC's Research and Support Program supports the CNSC's regulatory mandate by funding research associated with nuclear power plant (NPP) safety, uranium processing waste, the handling of spent fuel and management of radioactive waste. Atomic Energy Canada Limited (AECL) is responsible for the management and oversight of the Federal Nuclear Science and Technology Work Plan. The Federal Nuclear Science and Technology Work Plan serves the collective interests of 13 federal departments and agencies (including the CNSC) in the areas of health, nuclear safety and security, energy and the environment. The program funds agreements for research with the private sector, academic institutions, and governmental/non-governmental organizations, in Canada and internationally. Research projects cover most aspects of the Canadian nuclear industry that is regulated by the CNSC including NPPs, waste management facilities, nuclear research facilities, etc. The CNSC uses the outcomes of these research activities to help the CNSC address new or emerging safety issues, gain third-party perspectives on nuclear science and share scientific knowledge with the nuclear industry and the public at large. This research supports the CNSC's mandate to disseminate regulatory information to the public about the activities of the Commission and the industry that it regulates.

The National Standards System (NSS) is Canada's network of people and organizations involved in the development, promotion and implementation of standards. The Standards Council of Canada's (SCC) oversees the National Standards System, accredits standardization organizations, verifying that they have the resources, structures and expertise to deliver trustworthy services and approves the National Standards of Canada. The CSA develops standards in various areas. It has a vast nuclear standards program, and its standards are widely used in the Canadian nuclear industry. CSA standards mostly reference international standards, like the IAEA's, the American Society of Mechanical Engineers (ASME) and the Institute of Electrical and Electronics Engineers (IEEE), amongst others. The CNSC and CSA work together to ensure alignment of CSA's nuclear standards program and the CNSC's regulatory framework. The CNSC references CSA standards in its regulatory documents. Specifically, CSA standards are reflected in the SCA Framework.

3.5. LIAISON BETWEEN THE REGULATORY BODY AND AUTHORIZED PARTIES

The CNSC has established formal and informal mechanisms for communication with licensees and applicants on safety related issues, as well as on its regulatory decisions. The Commission can engage with the applicants/licensees, CNSC staff and members of the public on a wide range of issues. At Commission hearings, the Commission hears information pertaining to the making of licensing decisions. Commission meetings are used to brief the Commission about significant developments that affect the nuclear regulatory process, or to request administrative decisions. The CNSC Rules of Procedure and the CNSC By-laws govern the Commission hearing and meeting processes. The CNSC has permanent location of staff on site at major facilities (all operating NPP sites and Chalk River Laboratories). The location of these site offices facilitates regular, face-to-face interaction between the CNSC and its licensees. The CNSC has four regional offices located across the country.

For NPPs, waste management, decommissioning and processing facilities, communication protocols are established by the CNSC to allow for the dialogue and discussion between experts of the CNSC and the licensee/applicant. Communication between staff and the licensee is channelled through an identified Single Point of Contact (SPOC) approach. The SPOC is responsible for ensuring the communication protocol is followed. The directors of CNSC licensing divisions are also responsible for implementing and maintaining the established protocol. The purpose of formal communication is to document in an acceptable and agreed upon written or electronic format, any official regulatory requirements or positions that the CNSC is imposing on licensees, and equally, to document the licensee's official response to such requirements. This communication can take place face to face, by telephone, or through any other electronic or paper medium. The basis of this communication is normally to clarify technical points that may relate to administrative, licensing or compliance issues. No regulatory positions or licensee commitments are communicated in this manner. In general, communication with licensees related to the use of nuclear substances and

prescribed equipment occurs through CNSC licensing staff. Other CNSC licensing staff or inspectors may communicate directly with the licensee, as needed. E-mail is often used as an informal means to provide guidance on how to meet CNSC's regulatory expectations and positions to licensees. CNSC also engages in outreach with licensees through various other mechanisms.

3.6. STABILITY AND CONSISTENCY OF REGULATORY CONTROL

The CNSC channels its decision making through its management system. The CNSC's management system consists of a framework of policies, structures, people, programs, processes, practices, technologies, etc., that are put into place to ensure that the CNSC fulfils all tasks required to achieve its mandate. Personnel, equipment and organizational culture, as well as the documented policies and processes, are all elements of the CNSC's organization and are integrated into the management system. The CNSC staff uses a safety and control area (SCA) framework in order to evaluate each licensee's safety performance. The SCA framework provides a common set of safety and control terms to ensure consistent reviews, assessments, recommendations and reporting to the Commission, including 14 SCAs covering all technical areas of regulatory oversight and is used throughout the core processes as defined in CNSC's management system, covering three functional areas: management, facility and equipment, and core control and processes.

When making risk-informed decisions or recommendations pertaining to licensing, certification, compliance and the development of regulatory requirements and guidance, CNSC staff follow CNSC's Policy on the Use of Risk-Informed Approach for Regulatory Oversight of Nuclear Activities and Facilities. The Policy on Science in a Regulatory Environment provides governance and a framework to ensure that scientific and ethical standards are applied in providing scientific advice for use in regulatory decisions and supporting scientific integrity in a regulatory environment. The CNSC conducts inspections as one element of a compliance program. Inspections are conducted to verify licensee compliance with regulatory requirements and carried out as described in the CNSC Conduct of Inspection process document.

The CNSC conducts review and assessments of matters related to licensing, certification and compliance activities. The CNSC's Conduct of Technical Assessments fits within the CNSC's management system core processes. The review topics for technical assessments align with specific areas within the CNSC's SCA framework. Compliance verification criteria are used when carrying out the technical assessment for compliance verification purposes. If necessary, the CNSC's Select and Apply Enforcement Tools (SAET) provide guidelines on the selection of appropriate enforcement actions that the CNSC can take in the event of deviation from, or non-compliance with the NSCA and its associated regulations and licence conditions.

The CNSC develops and makes public Commission Member Documents (CMD). CMDs range considerably in content, complexity and scope based on the level of risk associated with the proposed licensed activity. The CMDs outline CNSC staff's conclusions and recommendations, supported by the findings of inspections, desktop reviews and other compliance verification activities. The Commission makes its regulatory decision in consideration of this information.

3.7. SAFETY RELATED RECORDS

The CNSC has made provisions for establishing, maintaining and retrieving records including registers and inventories. The IRRS team noted that the CNSC implements the license conditions compelling the licensee to maintain records relating to the safety of existing or proposed facilities and activities.

Additionally, the CNSC keeps records relating to the safety of facilities and activities in e-Access, CNSC's electronic documents and records management system (EDRMS), and the CNSC's Records Office for paper records. The CNSC's Information Management Division administers the Records Office and EDRMS, providing records storage and retrieval services for all staff members. Processes are in place to properly evaluate the security requirements related to each record and ensure proper storage. The periodic evaluations of systems, processes, and training are made to improve the CNSC's ability to find, retrieve, and secure all business documents appropriately.

The CNSC uses the Regulatory Information Bank (RIB) which is a comprehensive online tool that houses information about actions taken in response to licensing and compliance activities in one repository, allowing staff to quickly retrieve and view actions and record trends. RIB is used by CNSC staff in the operational services and gives staff the ability to track, monitor and report on licensee commitments.

The Licensing Operations User Integrated System (LOUIS) is used to manage licensee information pertaining to licensing and compliance information for radiation sources. LOUIS contains information regarding how much material licensees are allowed to possess, as well as links to most of the relevant documents from the CNSC's EDRMS (i.e., e-Access) related to each licensee.

With regard to the records of doses from occupational exposure, the Section 19 of the RPR requires every CNSC-licensed dosimetry service to periodically update the National Dosimetry Register (NDR), at a frequency specified in the licence and in a form compatible with the NDR, information with respect to each nuclear energy worker for whom it has measured a dose of radiation. The NDR is operated by HC and sharing of the information is covered by the CNSC/HC MOU.

In 2006, the CNSC implemented the National Sealed Source Registry (NSSR) and the Sealed Source Tracking System (SSTS), which is a secure web-based information management program. This is used to populate the NSSR, and allows licensees to report source transactions using an on-line portal. The NSSR enables the CNSC to build an accurate and secure inventory of high-risk sealed sources in Canada. The information is as current as the reporting time frames required by the licence. The NSSR was designed to hold information about the radioactive sources in every category, for all licensees. The SSTS, in contrast, is targeted at high-risk sealed sources (although some licensees are required to track sources below Category 2), as a system designed to enable the reporting of receipts and transfers, imports and exports within strict time limits. Each import, export, receipt and transfer is termed a "transaction" for SSTS purposes. The SSTS follows every high-risk radioactive source throughout its complete life cycle in Canada. The SSTS was built on the CNSC's regulatory information database used for nuclear substances and radiation devices. The SSTS and NSSR are components of the CNSC's overall nuclear substances and radiation devices licensing and compliance database. Building the SSTS and NSSR in this manner enables sources and devices to be associated with specific licensees at particular addresses. The SSTS is the tool used to populate the NSSR, and it allows the CNSC to have an accurate inventory of high-risk sealed sources (Category 1 and 2). Each transaction in the SSTS is coupled in that each transfer has a corresponding receipt, and each transaction represents a separate report to the CNSC. Licensees report their full inventories to the CNSC on an annual basis through their Annual Compliance Reports (ACRs). A database of medium and low risk sealed sources is maintained outside of the NSSR using the information provided in the ACRs.

With regard to records of reported events, including non-routine releases of radioactive material to the environment, the CNSC uses CERTS. The CNSC also uses the Event Information and Tracking System (EITS) to log and report unplanned events concerning nuclear substances, nuclear materials and radiation devices. Unplanned events include incidents regarding (but not limited to) the loss, theft, recovery, transport, storage, disposal, unauthorized use/possession/transaction, spills, malfunction or damage of nuclear devices, and waste and scrap material alarms. The system allows for recording of event details, tracking of these events, detailed searching, and the creation of reports. On a quarterly basis, a summary of events related to the use of nuclear substances, radiation devices and prescribed equipment is prepared and shared with the EITS distribution list. CNSC staff report significant events to the Commission. The CNSC's management system document Event Initial Reporting (EIR) provides an overview of the process for assessing and reporting significant events as a formal record of early notification to the Commission Members. Additionally, events are listed in the Regulatory Oversight Reports (RORs) prepared for the Commission.

Requirements related to records for the shutdown and decommissioning (or closure) of facilities are described in Sections 14-15 of the *Class 1 Nuclear Facilities Regulations*, as well as in CSA Standard N294.

The licensees are required to submit an annual compliance monitoring report for inventories of radioactive waste. Furthermore, the licensees are required to include the following information regarding radioactive waste management: identification and characterization of the waste streams generated by the operation of the facility and inventories of each of the following, including type, volume, total activity level and/or concentration. Every three years, NRCan collects, compiles and analyses radioactive waste inventory data in Canada. The updated data is published in the triennial inventory of radioactive waste in Canada, which provides an overview of the production,

accumulation and future projections of radioactive waste in Canada based on Canada's four waste categories (i.e., high-level, intermediate-level, low-level and uranium mine and mill waste).

3.8. COMMUNICATION AND CONSULTATION WITH INTERESTED PARTIES

The IRRS team noted that the CNSC interacts with a variety of stakeholders on a regular basis. The CNSC aims to be a trusted and timely source for safety and science-based nuclear regulatory information for Canadians. The objective is to inform stakeholders using plain language information, and engage with audiences in order to encourage participation in regulatory activities. The CNSC's target audiences are those who are or have the potential to be impacted by the CNSC's decision-making, those who have demonstrated a general interest in the CNSC's activities, and those who actively participate in the regulatory process. The CNSC engages with indigenous groups/peoples; the public including host communities, youth, general public; federal, provincial or municipal levels of governments; academic communities; non-governmental organizations: national, local and environment-specific; licensees and applicants; media and international stakeholders. The CNSC's strategy behind any interaction with stakeholders is to earn trust and confidence by maintaining a high level of transparency and engagement throughout the regulatory process.

The CNSC's external website is the main source of information to the public. It contains a wide range of material and media. The CNSC is also active on multiple social media platforms. In addition, the CNSC conducts outreach and engagement sessions in communities that are impacted by nuclear facilities or licensed activities. CNSC staff interact directly with members of the community by participating in public community meetings, or municipal government meetings. The CNSC staff participate in regular bilateral meetings with government counterparts to become aware of any new initiatives and to inform them of items of regulatory interest. In addition, regular interactions with members of the media are conducted to inform them of CNSC's regulatory activities, and correct any misinformation that may have been previously reported.

The Commission hearings are open to the public and are also webcast live on the CNSC's external website. Past webcasts of Commission hearings are posted on the CNSC's website. The Commission publishes a detailed Record of Decision, to explain the regulatory basis for its licensing decisions. The Commission provides extensive reasons for its decisions. When the Commission has reached its decision, the Record of Decision is prepared, sent to all participants in the hearing, with information regarding the decision announced to the Commission's website and on social media platforms through a news release. The Records of Decision are also posted on the CNSC's external website.

The public hearings give involved parties, Indigenous groups, members of the public and other stakeholders, an opportunity to be heard before the Commission. Notices for Commission proceedings are posted on the CNSC's website. Members of the public, Indigenous groups and other stakeholders who have an interest or expertise in the matter being considered, or who have information that may be useful to the Commission in coming to a decision can formally participate as intervenors in public hearings. Interventions may be made in either of Canada's official languages, via either a written submission or a written submission accompanied by an oral presentation during the hearing. The Commission also accommodates participation in its proceedings by teleconference or videoconference. The IRRS team was told that even non-Canadian organisations and interested parties are allowed to be heard in the CNSC's regulatory decision-making.

There are meetings to brief the Commission about significant developments that affect the nuclear regulatory process or to request other decisions. These meetings are open to the public. The Commission holds hearings on licensing decisions in the communities that will be most affected by the decision at hand, when possible. The CNSC staff also report to the Commission in public meetings at predetermined frequencies (e.g. annually, biannually) on the facilities' operation and safety performance of regulated activities. The CNSC publishes Regulatory Oversight Reports (RORs) annually which offer information on the safety performance of CNSC licensees. The RORs are used by the CNSC to presents staff's evaluation of licensee compliance, performance, key issues and any emerging changes in regulation.

The IRRS team recognizes that the CNSC fosters openness and transparency in its regulatory process for which it has in particular launched a Participant Funding Programme (PFP), which gives the public, indigenous groups and other stakeholders the opportunity to request funding from the CNSC to participate in its regulatory process. The

participants present their positions at Commission hearings. The CNSC's PFP Guide describes the programme and is available on the CNSC's website. The awarding of participant funding is done by a Board independent of the licensing and technical support branch of the regulator. The participant funding demonstrates a clear commitment to transparency.

With regards to the liaison with interested parties within the vicinity of authorized facilities, the licensees and licence applicants are required to develop and implement a public information program that includes a disclosure protocol. REGDOC-3.2.1, Public Information and Disclosure, clarifies the regulatory requirements of the public information program. The target audience of the public information program must be clearly defined. It includes the general population of the local community and other communities impacted by the licensee's nuclear facility and related activities. REGDOC-3.2.2, Aboriginal Engagement, sets out the requirements and guidance for licensees on Indigenous engagement. It also provides procedural direction for licensees in support of the whole-of-government approach to Indigenous consultation implemented by the CNSC in cooperation with federal departments and agencies.

The CNSC implements an IEMP to verify that the public and environment around CNSC-regulated nuclear facilities are not adversely affected by releases to the environment. The IEMP complements CNSC's ongoing environmental protection compliance verification activities. However, it does not relieve licensees of their responsibilities and they are required to carry out their own approved monitoring programs. The IEMP is a mechanism for providing independent environmental monitoring information to the public and Indigenous communities about nuclear facilities and activities in Canada. IEMP results are posted on the CNSC's external website.

The REGDOC-3.2.1, Public Information and Disclosure, defines the CNSC's requirements for public information and disclosure protocols for licensees and applicants. It is applied to uranium mines and mills, Class I and some Class II facilities. The document provides guidance on how to develop and implement the requirements for public information programs and disclosure protocols. The primary goal of the public information program is to ensure information related to the health, safety and security of persons and the environment, along with other issues associated with the lifecycle of the nuclear facilities, is effectively communicated to the public. The CNSC expects a licensee's public information program and disclosure protocol to be commensurate with the level of risk of the facility and the level of public interest in the licensed activities along with the risks to public health and safety and the environment perceived to be associated with the facility and activities.

The licensees are required to inform the public about possible radiation risks associated with their facilities and activities through a public information program that is guided by REGDOC-3.2.1, Public Information and Disclosure. Licensees are also required to submit and publish event reports and notifications for situations or events of high safety significance and that may require short-term action by the CNSC as per their licensing basis. The CNSC uses event initial reports to ensure that the Commission is aware of any events that may require its decision-making capacity.

The IRRS team noted that the CNSC's transparent and open communication about regulatory decision making and the provision of opportunities for the involvement of interested parties contributes to informing interested parties about how the CNSC is discharging its duties and its safety related activities. CNSC also conducts outreach activities to educate the public, licensees and other stakeholders about particular issues or topics. Examples are the publication of the CNSCS's enforcement actions on its website or the openness to the public of Commission meetings.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The IRRS team noted that the CNSC is very committed to ensuring a high level of transparency and openness.*	
(1)	**BASIS: GSG No-6, para. 2.4, 2.5 and 2.6 state that** *2.4: "The concepts of transparency and openness should underlie the regulatory body's strategy for communication and consultation with interested parties, so that trust in its independence, competence, integrity and impartiality can be established.* *2.5.: The regulatory body should be committed to ensuring a high level of transparency and openness. To this end, the regulatory body should communicate proactively, and initiate dialogue, with the public, and should demonstrate a willingness to listen and respond to a broad variety of concerns.*

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
	The regulatory body should also enable genuine participation of the public in the regulatory decision-making processes. *2.6.: When necessary, the regulatory body should ensure that interested parties are involved at the earliest opportunity; in certain situations, such involvement should be ensured even before formal regulatory activities have been launched, for example in review and assessment activities relating to radioactive waste."*
GP3	**Good Practice: The CNSC is very committed to ensuring a high level of transparency and openness, through an established, systematic, accountable and comprehensive set of activities that ensure transparency, openness, involvement, dialogue and accountability with the public, stakeholders and interested parties about its regulatory activities and decisions.**

3.9. SUMMARY

The CNSC performs its functions in a manner that does not compromise its independence and meets the relevant IAEA safety requirements.

One good practice was identified regarding the CNSC's strong commitment to transparency and openness.

One area of improvement was identified regarding adapting and updating the CNSC human resources plan.

POLICY DISCUSSION ON THE READINESS AND CAPACITY OF THE REGULATOR TO RESPOND TO INNOVATION

The pace of technological change in the nuclear industry is accelerating. As a result, the status quo is in an almost perpetual state of transformation and evolution. Resources must be sufficient for the regulatory body to effectively oversee current industry activities; however, this limits the capacity of the regulator to ensure readiness ahead of new applications.

The purpose of this policy discussion was to exchange international best practices and lessons learned from expert participants on how they respond to innovation in the conduct of regulated activities. Experts from the Czech Republic, France, Hungary, The Netherlands, Slovakia and the United States participated and provided views.

Most of the discussion focused on the challenges associated with implanting small modular reactor (SMR) technology. For example, most of the experts acknowledged that changes would be required their regulatory framework to enhance current, or develop new, regulatory requirements. This could be costly. In addition, the timeframe required to develop new requirements most likely will not support the industry's desire to move forward quickly in the development and construction of SMRs. The question also arises regarding the funding for enhancing the regulatory framework for SMRs. Should the financing come from private or public funds? The last challenge discussed regarding SMRs was that one of the advantages of the technology is that the emergency preparedness zones (EPZ) could be reduced and which would offer financial savings to the project. However, reducing the EPZ would also erode stakeholder confidence. Potentially modifying or reducing emergency preparedness zones may reduce public confidence

The experts acknowledged that converting from analogue control systems to digital instrument and control (I&C) systems introduced numerous challenges. For example, the introduction of cyber security vulnerabilities associated with digital I&C systems including challenges in the prevention and detection of cyber-attacks. It was noted that strict rules need to be implemented to ensure that the safety related computers are isolated from the rest of the plant computers and external networks. Another challenge was identified in recruiting and training inspectors to specialize in cyber security issues.

The topic of commercial dedication of components was also discussed. As NPPs age, equipment and component vendors no longer supply one-for-one replacement parts. This results in licensees relying on commercial (non-

nuclear) vendors for replacement parts. This problem has been particularly evident in obtaining replacement parts for emergency diesel generators. The CNSC and experts discussed the challenges with regulating the commercial dedication of components for nuclear applications.

4. MANAGEMENT SYSTEM OF THE REGULATORY BODY

4.1. RESPONSIBILITY AND LEADERSHIP FOR SAFETY

The senior management of CNSC demonstrates leadership for safety and commitment to safety through the established mission, vision and core values. The CNSC Vision, Mission and Values as well as CNSC Mandate are published on the CNSC website. The CNSC values are also identified in the Management System Manual (MSM), "Our Navigator Manual."

The CNSC commits to ethical standards as outlined in both the CNSC Values and Ethics Code and the Values and Ethics Code for the Public Sector. The CNSC is committed to the values of: respect, integrity, service, excellence, responsibility, safety.

The CNSC Values and Ethics Code identify expected supporting behaviours and principles that staff should apply in all day-to-day decisions and actions. Safety is an overriding priority and CNSC staff are expected to support and demonstrate a strong regulatory safety culture (RSC). The President's and executive management's commitment to safety and the continuous improvement of the management system are expressed in the MSM.

The CNSC has also developed policies, including but not limited to: conflict of interests and post-employment; documentation management; open door policy; staffing; enterprise risk management; science in a regulatory environment; use of a risk informed approach for regulatory oversight of nuclear activities and facilities; regulatory safety culture.

Policies are approved by the respective management committees or authorized authority. Before approval the policies are discussed through: managers' fora; divisional meetings; Operations Management Committee meetings; Management Committee meetings.

Policies are approved by the Management Committee, chaired by the President of the CNSC. Communication plans are developed for approved policies to ensure they are appropriately communicated to all CNSC staff. Communication is conducted through a variety of channels such as all-staff emails, intranet messages, display monitors and direct communication with staff through means such as divisional meetings.

4.2. RESPONSIBILITY FOR INTEGRATION OF SAFETY INTO THE MANAGEMENT SYSTEM

The President of the CNSC is accountable for the overall effective integration of all elements in the management system. The Executive Vice-President (EVP) and the Chief Regulatory Operations Officer (CROO) is responsible for leading the development, promotion, implementation, and improvement of the management system. The Internal Quality Management Division (IQMD) is assigned with the responsibility to coordinate all maintenance, review and improvement activities associated with the management system. The IQMD reports to the CNSC's Management Committee on all management system matters.

The IRRS team observed that individual elements of CNSC's safety policy are included in various documents including Regulatory Fundamentals, the CNSC Values and Ethics Code, the Values and Ethics Code for the Public Sector, the CNSC Mandate and sections of the MSM (Mission, Vision, Values, President's and Executives' Commitments). However, the IRRS team noted that CNSC has not gathered the elements of a safety policy in one document.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *CNSC addresses individual elements of its safety policy in different documents such as in the Management System Manual, the CNSC Values and Ethics Code, the Values and Ethics Code for the Public Sector and Regulatory Fundamentals. However, the CNSC has not developed a single document where all elements of safety policy are gathered and approved by the senior management.*	
(1)	**BASIS: GSR Part 2, Requirement 3, para 4.2 states that** *"Senior management shall be responsible for establishing safety policy"*

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
(2)	**BASIS: GSG-12 para 3.1 states that** *"Senior management, managers and leaders at all levels of the regulatory body should demonstrate, by their own behaviour, consistent adherence to the values of the regulatory body. This should typically include the following:* - *- Establishing and communicating a clear vision for safety, which is elaborated through a safety policy, strategy, plans and objectives, whereby safety is paramount;"*
S5	**Suggestion: CNSC should consider consolidating all elements of its safety policy into a single document.**

Senior management has established goals, strategies, plans and objectives in such a manner that safety is not compromised.

The CNSC has developed the following plans:

- Strategic Planning Framework expresses strategic goals and objectives across eight target areas. They focus on continuous improvement of safety, security and organizational excellence.
- Departmental Plan outlines the CNSC's commitments, spending estimates and performance expectations for the upcoming three-year period. It also describes CNSC's organizational priorities, key activities to be undertaken and resources required to meet its mandate. This plan is submitted to Parliament on a yearly basis and is publicly available.
- Operational Annual Plans (regulatory activities plan) allow management to prioritize work through a consolidated operations plan.

Further, the CNSC develops a three-year communication plan, revised every year, related to interaction with interested parties. Additionally, on the basis of the Governmental Directive on the Management of Communication, the CNSC prepares Communication plans for specific activities. Additional information on the interaction with the interested parties are included in chapter 3.8.

4.3. THE MANAGEMENT SYSTEM

The CNSC's management system is documented. Documentation of management system policies, processes, instructions and tools is completed by assigning the priority to where the lack of documentation or inconsistency in the execution of activities may possibly cause risk to safety.

The management system documentation is available to all staff on the intranet through the CNSC Navigator Portal. The documents are systematically organized in three-tier hierarchical groups, namely: MSM and Policies; Programme and Process documents; Procedures, Work Instructions, Forms, Checklists, Instructions, and Templates.

The CNSC is continuously improving its management system through the use of its Harmonized Plan (HP) Programme which encompasses all change agenda initiatives across the CNSC. The CNSC developed the document Overview of How the Harmonized Plan Programme Works. The document includes the description of the change management process and includes a template HP Scoping Document which captures all elements of the change management process. HP provides a graded approach to managing improvement initiatives and implementing approved changes. HP facilitates prioritizing and executing strategic improvements in the area of policy, processes and procedures.

The CNSC has developed the MSM which explains how the organizational components of the CNSC fit together and describes in general the essential elements and interactions of how the CNSC works. The IRRS team noted that some elements of the CNSC management system are not fully addressed in the MSM such as: fostering a culture for safety; measurement assessment and improvement of the management system; measurement, assessment and improvement of leadership for safety and safety culture. CNSC is encouraged to strengthen the above elements in the MSM.

The CNSC has a variety of channels available to staff to raise issues or concerns when conflicts arise in the decision-making process which are addressed in the following documents: the Open-Door Policy; the Non-Concurrence Process; the Differences of Professional Opinions Process; and the Informal Conflict Management System.

Changes, including organizational changes are managed through the HP. Prior to implementation of changes, the proposed changes are evaluated to ensure, among other aspects, that safety is not compromised. CNSC has also created a new position within its organisation structure with responsibilities for change management.

The CNSC's management system is developed and applied using a graded approach in line with GSR Part 2 requirements.

4.4. MANAGEMENT OF RESOURCES

Senior management is responsible for ensuring that the competencies and resources needed for the CNSC to undertake its functions are available. The IRRS team was informed that the CNSC performs several activities to continuously evaluate its capability to regulate safety.

In order to have its own technical and scientific resources and collaboration with external technical support, the CNSC has made a considerable effort in building a competent and agile organization.

To support this initiative, the Human Resources Directorate developed job family charts which show differences between similar types of work at each level. Each chart sets out the main duties and responsibilities at each level in one document. Additionally, Technical competencies required for each position are outlined in work descriptions, which set out the duties and activities of each position and the required competencies related to education, abilities, skills and knowledge needed to carry out those activities.

The CNSC uses Workforce Planning to shape and structure the workforce to ensure there is sufficient and sustainable capability and capacity to deliver on its organizational objectives now and in the future. Each employee also creates an Individual Learning Plan (ILP) to help support their competency development. Employees are encouraged to include a broad range of learning activities in their ILPs, such as on-the-job learning, formal coursework and self-study. Formal course work is not limited to CNSC in-house training.

The CNSC has developed Key Behavioural Competencies expected of all employees, regardless of job or level. These behavioural competencies form the basis of recruitment and development of staff. These competencies align with the Key Leadership Competencies required of all managers.

CNSC has developed a Learning and Development Programme to help develop and maintain competencies of staff. The program includes basic, mandatory and recommended training.

Additional information on the competences and resources necessary to carry out activities safely are captured in sub-chapter 3.3.

4.5. MANAGEMENT OF PROCESSES AND ACTIVITIES

The CNSC's integrated management system was developed using a process-based approach. Processes with related sub-processes and templates are documented in the management system documentation and they are available to the staff on the CNSC intranet through the Navigator Portal. The CNSC has documented all core processes necessary to deliver its mandate.

Process owners are selected based on their knowledge of the assigned process and how it interacts with other processes. The process owner is responsible for developing, implementing and continuously improving the process.

According to the Navigator Portal processes are divided into the following groups: Leadership and Management; Processes which cover CNSC Programs, such as the Nuclear Fuel Program and underlying processes (e.g. Compliance); Regulatory Affairs and Communications; and Internal Services.

The IRRS team observed that through the recent update of the MSM a new process map was developed. It was noted that the CNSC is in the process of aligning the Navigator Portal with the new process map.

The sequencing of a process is specified when processes are being developed. Interfaces between documented processes are identified in process diagrams to ensure effectiveness and efficiency. Interactions between interfacing processes are indicated.

The IRRS team was informed that CNSC has developed performance indicators for measuring the effectiveness of the processes of the CNSC Programmes. The CNSC is encouraged to continue with the documentation of all processes and related performance indicators taking into consideration a graded approach.

4.6. CULTURE FOR SAFETY

CNSC recognizes the importance of safety culture and has taken action to foster and support a culture for safety. In 2012, the CNSC established a Regulatory Safety Culture (RSC) working group to create a structured approach to cultivating a healthy RSC throughout the organization. From 2016 to 2018 a self-assessment of RSC was conducted which resulted in five recommendations being identified. Self-assessment results are documented in the report, which was communicated to the CNSC staff. Additionally, in 2018 a Safety Culture Action Plan was established to address the recommendations.

One of the recommendations from the self-assessment was to develop a Regulatory Safety Culture Policy. This policy was issued in August 2019. The Regulatory Safety Culture Policy outlines traits such as leadership for safety, continuous learning and improvement, personal accountability, questioning attitude, safe environment for raising concerns, communication and collaboration. The CNSC is committed to fostering a strong safety culture which is frequently reinforced and communicated by CNSC's senior management to all staff via emails, town hall meetings, and committee meetings. Senior management also makes presentations to outside stakeholders. The CNSC engages its staff in improvement initiatives which provides staff opportunities to question and improve existing processes and activities. For example, regulatory safety culture town hall events are hosted quarterly, and all staff are invited to attend and participate. The town hall sessions are open-format meetings used to identify opportunities for improvement and encourage internal collaboration to achieve improvements by engaging in dialogue in all areas of CNSC work. The CNSC also has a management forum once per month where all CNSC managers come together for an hour to share experiences and transfer knowledge related to CNSC initiatives and projects. Additionally, the CNSC offers presentations to all CNSC staff on a wide variety of leadership development topics including the leadership characteristics necessary for a healthy RSC.

The Navigator Portal will, on completion, provide all CNSC staff with a single consolidated repository of current and approved CNSC management system documentation. The Navigator Portal contains a section called "Foster Regulatory Safety Culture."

The CNSC has committed to a Country Specific Safety Culture Forum (CSSCF) for Canada in 2020. The CSSCF is co-organized with the NEA. The forum will be tailored to the specific needs and interests of Canada and will examine how nuclear safety culture is affected by the national cultural context.

All the above-mentioned activities demonstrate that the CNSC has established provisions under the management system for strengthening safety culture and applied methods for fostering a strong safety culture. This demonstrates the CNSC's management commitment to the fostering, strengthening, and continuous improvement of the culture for safety.

4.7. MEASUREMENT, ASSESSMENT AND IMPROVEMENT

The CNSC regularly performs measurements, assessments, and improvements of the management system.

Internal audits are performed by the Office of Audit and Ethics, which provides an independent and objective assessment on the CNSC's performance of its regulatory mandate as well as provide advice to the Departmental Audit Committee on related improvement initiatives. The CNSC regularly performs independent assessment of its management system. When additional technical support is needed, the Office engages external experts. Audits are performed on the basis of the three-year Risk-Based Audit Plan performed by the Office of Audit and Ethics. Each year the Office updates the Audit Plan. When there is room for improvement, internal auditors make recommendations for enhancing processes, policies and procedures and identifying the highest priorities for inclusion

in the three-year Risk-Based Audit Plan. Reports on CNSC audits are public and published on the CNSC website. The efforts towards transparency can be considered as a good practice as indicated in sub-chapter 3.8.

Another method to assess and improve the management system is management review. Mechanisms and approaches to assess and improve the management system are highlighted in CNSC's process document "How to Conduct Management Review of CNSC Management System". Management system reviews are conducted by the Management Committee twice a year. All foreseen improvements and changes of the management system are managed through the HP. In the framework of management review, the outcomes of the following are considered: internal assessments, and evaluations; environmental scans and strategic framework planning; IAEA peer reviews (e.g., IRRS, EPREV, IPPAS); audits conducted by the office of the auditor general and 3rd-party/consultant reviews; staff surveys (taking the pulse, employee engagement, public service employee survey, etc.); stakeholder feedback; Government of Canada strategic reviews; parliamentary standing committee participation; benchmarking exercises; self-assessments.

The IRRS team was informed that the following issues are discussed during the management system reviews:

- Lessons from experience gained and from events that have occurred, both within the organization and outside the organization, and lessons from identifying the causes of events;
- Technical advances and results of research and development;
- Good practices.

Self-assessments of management system are performed through different channels, i.e.: approved and implemented processes are subject to regular self-assessments to ensure their continued effectiveness; and management system reviews.

Comprehensive assessments of the management system all elements as per IAEA standard is planned and executed as deemed necessary.

The self-assessment of culture for safety is described in sub-chapter 4.6. CNSC regularly performs independent assessments of regulatory safety culture through Taking the Pulse (survey of specific element of safety culture), Employee Engagement, Public Service Employee Survey (once a year). The IRRS team was informed that in the framework of internal audits, the independent assessment of safety culture is not conducted.

4.8. SUMMARY

The CNSC management system is well established, documented and implemented based on a process approach which integrates all functions and activities.

The CNSC has conducted a comprehensive self-assessment on culture for safety. On the basis of the self-assessment results, proposed actions were applied for fostering and continuously improving the regulatory culture for safety. The HP for improvement initiatives is used by CNSC as its primary vehicle for improvement.

One area for improvement of CNSC management system was identified to consolidate all elements of CNSC safety policy into a single document.

POLICY DISCUSSION ON STRENGTHENING THE CNSC'S REGULATORY SAFETY CULTURE

The importance of fostering a culture for safety within a regulatory body (RB) has been recognized by CNSC as an integral element of effective regulatory oversight. As such, an assessment of CNSC regulatory culture for safety was conducted, using international best practice. The methodology followed was based on relevant NEA and IAEA publications. The assessment findings revealed the CNSC strengths and also identified areas for improvement. These led to five recommendations to further strengthen the CNSC's culture for safety, which have already been introduced in the management action plan.

CNSC seeks to learn from international best practice and lessons learned from participants on their experiences in assessing, promoting, embracing and maintaining the culture for safety of RB. Participants from Czech Republic,

Finland, France, Ireland, The Netherlands, Slovakia, Slovenia and Switzerland, contributed to the discussion and shared their experience.

The topics for and outcomes of discussions are summarized below. Some indicative, but not exhaustive, examples are also given.

Most countries welcome the term "Culture for Safety" compared to "Safety Culture". They also noted that the culture for safety is a part of their overall organisational culture. Several countries confirmed that they are facing the same challenges as CNSC.

Regarding the practices to strengthen and maintain the RB's culture for safety, the importance of defining clear core values and of enhancing communication and training were stressed. Most participants reported that when they ask the licensees about their programmes for culture for safety, the licensees usually return the question, indicating the need for the RBs to be a role model for culture for safety. Some indicative examples presented are:

- France's ASN has introduced 4 core values: competence, independence, rigour, transparency. The concepts of Safety and Authority (from the name of ASN) are also implicit values. ASN delivers an oversight policy message at a very high level.
- Ireland's EPA senior management worked on the area of values-based leadership, using the approach of adopting 'small', very specific behaviours to help move towards the desired cultural attributes. This facilitated the holding of managers accountable for living the values and has started making a discernible difference in behaviours.
- The Netherlands ANVS, a newly re-structured RB consisted of staff coming from several government departments, faced the challenge of bringing the respective cultures together. ANVS relies on training, coaching and communication. A game has been designed with questions for the staff on culture for safety. Newer staff developed the questions and it has worked very well as a tool for discussion of the issue.

Regarding the methods to assess the progress achieved, all countries reported that they perform surveys and request the evaluation of their programmes on promoting, maintaining and improving a culture for safety at various levels. Evaluations are also performed under accreditation programmes.

At the internal level some indicative examples are:

- Switzerland's ENSI has initiated a study on how to elaborate a methodology for assessing the progress achieved. Questionnaires addressed to all staff levels were analysed and revealed critical issues related to human resources, the interaction of the RB with the licensees and the way to lead the organisation.
- Slovenia's SNSA has processes in place for the evaluation of employees, the evaluation of licensees, the evaluation of the RB's work by the licensees. Meetings with the directors are organised frequently.

Most RBs request to be evaluated by the licensees. Some indicative examples are:

- Slovakia's UJD asked to be evaluated by licensees and communities in the proximity of NPPs.
- Finland's STUK performed a national survey of interested parties. The availability of TSOs was revealed as a critical issue.

Finally, regarding human resources management, participants reported that particular attention is paid to the candidates' soft skills when selecting new personnel. Probation periods from 3 to 12 months are applied upon recruitment. Some RBs use recently retired staff to train the newcomers.

5. AUTHORIZATION

5.1. GENERIC ISSUES

The NSCA prohibits all activities associated with the development, production, and use of nuclear energy, the production, possession, transport and use of nuclear substances and radiation devices, and equipment and information prescribed in the GNSCR, except in accordance with a licence (see section 26 of the NSCA), unless expressly exempted from a licence requirement in regulations. The Commission makes decisions on risk-significant facilities and activities and may delegate decisions on some lower risk facilities or activities to select CNSC staff members called designated officers (DOs). The DO may refer the application back to the Commission. Under certain conditions, other regulatory authorities will participate in the licensing process or to provide expertise at an authorization hearing.

The licensing process for Class I facilities and uranium mines and mills consists of the submission of a licence application, a review and assessment of the application by CNSC staff, a public hearing and a decision by the Commission. These facilities are authorized throughout the life-cycle stages of for site preparation, construction, operation, decommissioning and abandonment. The CNSC considers all the information related to the stage under review as well as verifying that any outstanding issues from the previous stage have been resolved. For licence renewals, the CNSC staff conduct a comprehensive assessment of the licensee performance history, current programs and planned future activities, focusing on areas based on performance history, facility type, and associated risks.

On matters related to the application, the Commission communicates with the applicant and CNSC staff only through the Commission Secretariat or at formal proceedings. The Commission does not have a permanent advisory board but engages experts as necessary. The Commission holds a public hearing when it makes any licensing decision for a nuclear facility or activity and encourages participation from the public and Indigenous communities. Participation can be via written submissions and/or oral presentations. After the Commission makes a licensing decision, they publish a detailed explanation of its basis in a record of decision.

CNSC's authorization process uses a graded approach. For example, CNSC uses a more expedient process for lower risk facilities and activities. This process consists of the submission of an application, a review and assessment of the application by CNSC staff, and a decision by a DO. This approach is used for licenses required for Class II nuclear facilities, nuclear substances and radiation devices and prescribed equipment, import or export, and transport. It is also used for certifications of prescribed equipment, packaging, and certification for persons carrying out duties that have a direct impact on the safe operation of a facility, the health and safety of workers, the public or the environment.

An appeal may be made to the Commission by any person directly affected by a decision made by a DO and an application for re-determination may be made to the Commission by any person or entity affected by a decision made by the Commission. The Commission's decisions are reviewable only by the Federal Court of Canada.

Requirements for the content of license applications are specified in general regulations (such as the GNSCR) as supplemented by more specific regulations (such as CINFR). In addition, CNSC has issued phase, facility, and equipment specific licence application guides for some facilities and activities (and plans to issue others) to identify what information should be contained in the license application. This guidance was developed using a graded approach where a greater level of detail may be required for the more risk-significant facilities.

All licensees are required to conduct their activities in accordance with the licensing basis, which is defined as a set of requirements and documents for a regulated activity comprising the following:

- The regulatory requirements set out in the applicable laws and regulations
- The conditions and safety and control measures described in the licence, and the documents directly referenced in that licence
- The safety and control measures described in the licence application and the documents needed to support that licence application

As a companion piece to the licence in support complex facilities, CNSC issues a licence conditions handbook (LCH). The general purpose of the LCH is to provide additional detail on the regulatory requirements and other relevant parts of the licensing basis for each license condition. The LCH, which should be read in conjunction with the licence, provides compliance verification criteria that the licensee must follow to comply with licence conditions, describes

any delegation of authority from the Commission, and specifies the applicable versions of documents referenced in the licence and a list of documents used as guidance.

Modifications that may affect the licensing basis, including changes to the documents listed in LCH, require written notification to the CNSC. Based on safety significance and the graded approach, CNSC establishes three categories of change: notification at time of implementation, notification prior to implementation and changes which require formal approval.

The IRRS team noted that the authorization activities associated with the CNSC Integrated Action Plan in response to the lessons learned from the TEPCO Fukushima Daiichi accident have been incorporated in the regulations, regulatory requirements and relevant licences.

5.2. AUTHORIZATION OF NUCLEAR POWER PLANTS

NPPs in Canada are designated as Class IA nuclear facilities and subject to authorization throughout their lifetime. Licenses are required for site preparation, construction, operation, decommissioning, and abandonment. The licensing process for NPPs always includes an environmental protection review under the NSCA. The content of the license application is stipulated in the regulations and the CNSC also provides license application guides to set out information and guidance for the different licensing phases. These license application guides address CNSC's 14 SCAs (management systems, human performance, operating performance, safety analysis, design, fitness for service, radiation protection, conventional health and safety, environmental protection, emergency management, fire protection, waste management, security, safeguards, and packaging and transport) and identify where to find additional CNSC guidance specific to each SCA. The IRRS team noted that CNSC guidance become part of the licensing basis when referenced directly or indirectly, such as through licensee-referenced documents.

An NPP licence includes a description of the licensing basis which sets the boundary conditions for the activities being licensed. The IRRS team observed that a license to operate includes license conditions requiring the licensees to give written notice of changes to the facilities or their operation, and to implement and maintain programs to address all 14 SCAs.

The CNSC staff develop a LCH for each licence using internal templates. The LCH identifies and clarifies the relevant parts of the licensing basis for each license condition to help ensure that the license maintains facility operation in accordance with its licensing basis. While the CNSC documents referenced in the LCH are generally publicly available, the licensee documents are not as they may contain proprietary or prescribed information. For each license condition, the LCH contains a set of compliance verification criteria including licensee documents that require written notification of change and revision numbers of other publications in the licensing basis. Licensee documents that require notification of change are further classified as those that require notification prior to the change, and those that require notification when the change is implemented. When the CNSC receives notification of changes on documents that require prior notification, they carefully review the change to ensure that the NPP can operate safely and within the design parameters described in the licensing basis, including the safety analysis. If this is not the case, the change will be denied and the licensee will be required to submit an application for an amendment, which will be reviewed by the Commission.

The IRRS team observed that an NPP license to operate includes a license condition on reporting requirements for events of safety significance and routinely scheduled reports. One of the requirements of this document is that the deterministic and probabilistic safety analyses and the site environmental risk assessment be updated within five years (or when requested by CNSC).

Applications for license amendments and renewals generally follow the same licensing process as a license to operate except that existing information may be incorporated by reference. For renewals, NPPs are required to conduct periodic safety reviews and the CNSC assesses the results as part of the renewal application. The output of a periodic safety review is an integrated implementation plan and the IRRS team noted that this plan becomes part of the licensing basis of the renewal license. The duration of licenses is typically 5-10 years.

The training of personnel associated with the operation of NPPs is the responsibility of the licensee. CNSC provides guidance on the design, development, implementation, evaluation and management of training and certification

programs and certifies NPP operators and Senior Health Physicists, based on a recommendation of the licensee and verification of compliance by CNSC.

The regulatory documents for reactors are generally written to apply to all water-cooled reactor designs. Recognizing that innovations in technology are producing small modular reactor designs (both water-cooled and non-water cooled) with low potential consequences and self-regulating passive systems, the CNSC proactively published supplemental guidance for small modular reactor proponents. This guidance offers pre-application opportunities, including a vendor design review that helps the vendors understand the regulatory requirements, and, for potential applicants, a CNSC process to determine an appropriate application assessment strategy for the proposed activity that involves the construction and operation of a specific design. In this process, the CNSC works with a potential applicant to provide clarification on preparing a licence application to include risk-informed assessments of the SCAs and the use of alternative approaches in the development of the licensing application, and in addressing the regulations and criteria in regulatory documents. These initiatives help to ensure that the application contains the appropriate level of detail and that the staff is prepared to perform their assessment in a risk-informed manner specific to that design.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Small Modular Reactors may have a significantly different demonstration of safety than existing reactors. CNSC provides guidance on pre-application opportunities to ensure vendors understand the regulatory requirements and to provide them with an appropriate application assessment strategy that includes a risk-informed assessment of the SCAs and the use of alternative approaches in the development of the licensing application.*	
(1)	**BASIS: GSR Part 1 Requirement 24, para. 4.34 states that** *"The regulatory body shall issue guidance on the format and content of the documents to be submitted by the applicant in support of an application for an authorization".*
GP4	**Good Practice: CNSC proactively developed extensive guidance and processes to assist potential applicants determine the content of the SMR application.**

The IRRS team noted that the CNSC has established a robust licensing process for NPP facilities that are consistent with the IAEA safety standards.

5.3. AUTHORIZATION OF RESEARCH REACTORS

The research reactors in Canada are Class IA nuclear facilities and are subject to licensing by the CNSC throughout the lifecycle of the facility, from siting through construction and operation to decommissioning and abandonment.

Legal requirements on submittals for licenses are described in CINFR. These legally binding regulations require the applicant to submit to the CNSC a suite/set of documents demonstrating the safety and adequacy of the facility design containing information on safety analysis, quality assurance, and descriptions of system structures and component in research reactor.

The authorization process described in REGDOC-3.5.1 applies in graded manner to research reactors. The REGDOC 1.1.5 (in conjunction with other REGDOCs) provides additional considerations and guidance on information to be provided to the CNSC in support of an application for a licence for a small reactor facility including research reactor. The licensing process for research reactors includes a public Commission hearing in accordance with the CNSC's Rules of Procedure that may allow for interventions from interested parties, and a Commission decision.

The CNSC licences for current research reactors contain standardized licence conditions for the 14 SCA as well as licence conditions for other areas of regulatory interest, such as a financial guarantee. The accompanying LCHs provide the compliance verification criteria that the licensee must follow to demonstrate compliance with licence conditions, operational limits and applicable versions of documents referenced in the licence.

The IRRS team found that the licensing system for research reactor is well established, comprehensive and consistent.

5.4. AUTHORIZATION OF FUEL CYCLE FACILITIES

There are five uranium mines and mills in Canada and five uranium processing facilities, which includes conversion, refining and three fuel fabrication sites. Fuel cycle facilities are subject to the CINFR or UMMR and other relevant regulations.

According to CINFR, Class IB facilities also include the following fuel cycle facilities: plants for the processing, reprocessing or separation of an isotope of uranium, thorium or plutonium; plants for the manufacture of a product from uranium, thorium or plutonium; facilities for the disposal of a nuclear substance generated at another nuclear facility. There are currently no operational radioactive waste disposal facilities licensed in Canada.

CINFR and UMMR contain requirements for the information provided within licence application for site preparation, facility construction, operation, decommissioning and abandonment. The CNSC staff evaluates the licensees' compliance to the regulatory requirements and CNSC expectations and reports the results to the Commission.

In accordance with the CINFR, the Commission or DO certify persons employed in nuclear facilities with the exception of Class IB facilities. The IRRS team was informed, that this exception was made taking into account the risk-informed approach. It was noted that the risk ranking of fuel cycle facilities is conducted using qualitative techniques with established and documented criteria. For example, in accordance to the Directorate of Nuclear Fuel Cycle Facilities Regulation risk-ranking, the Port Hope Conversion Facility was ranked as a facility with high risk. Consequently, the CNSC required the implementation of a formal internal qualification program for Uranium Hexafluoride Operators at the Port Hope Conversion Facility.

The CNSC assessed that the risks/hazards at fuel cycle facilities do not require personnel certification. Licensees are required through licence conditions to implement a qualification process including human performance management and training programs. Competence of fuel cycle facility staff is being verified by CNSC through event reviews, licensee compliance reports and inspections.

Operating Fuel cycle facilities in Canada are usually considered to be of lower risk than nuclear power plants, though they still present hazards associated with criticality, radioactivity and chemical toxicity of nuclear materials handled.

The IRRS team encourages the CNSC to continue to assess personnel certification in view of the potential nuclear developments (e.g. SMR fuel cycle, radioactive waste disposal, etc) taking into account the risk ranking of existing facilities.

5.5. AUTHORIZATION OF RADIOACTIVE WASTE MANAGEMENT FACILITIES

The CNSC authorizes a diverse range of facilities and activities for management of radioactive waste. The three major waste streams are waste from historic activities, waste from operations (including spent fuel) and waste from decommissioning activities.

All radioactive waste management facilities (comprising predisposal facilities) are authorized as Class 1B nuclear facilities and are subject to the provision of the NSCA and the associated regulations, their licence and supporting LCH, as well as REGDOCs and standards (e.g., CSA), when included in the licensing basis. In instances where the waste management facilities are on the site of other nuclear installation the combined facilities may be regulated under a single licence for the whole site. When the total inventory of radioactive waste or total annual throughput of radioactive waste is less than 10^{15} Bq the operations are authorized in accordance with subsection 26(b) of the NSCA.

The CNSC staff develop a LCH for each licence using internal templates. The LCH identifies and clarifies the relevant parts of the licensing basis for each license condition to help ensure that the license maintains facility operation in accordance with its licensing basis. For each license condition, the LCH contains a set of compliance verification criteria including licensee documents that require written notification of change and revision numbers of other publications in the licensing basis. Licensee documents that require notification of change are further classified as those that require notification prior to the change, and those that require notification when the change is implemented. When the CNSC receives notification of changes on documents that require prior notification, they

carefully review the change to ensure that the WMF can operate safely and within the design parameters described in the licensing basis, including the safety analysis. If this is not the case, the change will be denied and the licensee will be required to submit an application for an amendment, which will be reviewed by the Commission.

At present there are no operational radioactive waste disposal facilities in Canada. However, the CNSC is currently reviewing licence applications related to –

i. Near Surface disposal facility for low and intermediate level waste at the Chalk River Laboratories (CRL) site

ii. In situ confinement of shutdown NPD reactor at Rolphton and the and Whiteshell WR-1 reactor in Pinawa, Manitoba

The Canadian Environmental Assessment Agency (CEA Agency) and the CNSC established a joint review panel (JRP) in January 2012 to review Ontario Power Generation's (OPG) environmental impact statement in support of its application for a site preparation and construction licence for a DGR for its low and intermediate level waste. The JRP held public hearings in 2013 and 2014. In 2015, the JRP issued its EA report, which included recommendations, to the federal minister of Environment and Climate Change (ECC) for review and decision under the *Canadian Environmental Assessment Act, 2012*. The JRP concluded that OPG's DGR project is not likely to cause significant adverse environmental effects, provided the mitigation measures proposed by OPG and recommended by the JRP, as well as the commitments made by OPG during the review are implemented. Subject to the Minister of ECC's decision, under the NSCA, the JRP would decide whether to issue a licence to OPG to prepare a site and construct the DGR facility.

The CNSC is also engaging in pre-licensing discussions with the Canadian Nuclear Waste Management Organization (NWMO) related to the proposed DGR for spent nuclear fuel. The CNSC is also seeking inputs from the public and Indigenous people on this matter.

Additionally, the Port Hope Area Initiative is a federal environmental clean-up programme that involves the development of two long-term waste management projects in the Port Hope area of south-eastern Ontario. They are both near surface disposal projects consisting of engineered containment mounds for historic waste. Completion of both facilities is expected by 2023. There will be ongoing environmental monitoring at the site into the foreseeable future. The IRRS team noted that the licensing process for waste management is generally consistent with the requirements of the IAEA safety standards; however, the strategy of in situ confinement for reactors is not in full compliance with IAEA safety standards GSR Part 6 and SSG-47. The IRRS team encourages Canada to request an international peer review of the proposed strategy related to in situ confinement of legacy reactors.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The CNSC is currently considering two licence applications related to in situ confinement of legacy reactor facilities. This strategy of in-situ confinement is not consistent with SSG-47.*	
(1)	**BASIS: SSG-47 para 5.17states that** *"Entombment, in which all or part of the facility is encased in a structurally long-lived material, should not be considered an acceptable strategy for planned decommissioning. It might be considered as a last option for managing facilities that have been damaged in an accident, if other options are not possible owing to high exposures of workers or technical difficulties".*
S6	**Suggestion: CNSC should consider revising its current and planned requirements in the area of decommissioning to align with the IAEA guidance that entombment is not considered an acceptable strategy for planned decommissioning of existing NPPs and future nuclear facilities.**

5.6. AUTHORIZATION OF RADIATION SOURCES FACILITIES AND ACTIVITIES

According to its mandate CNSC authorizes radiation sources facilities and activities bearing a nuclear substance or operating particle accelerators. In particular, CNSC authorizes, through licensing, the manufacturing of nuclear

substances and radiation devices, industrial radiography, diagnostic nuclear medicine procedures and therapeutic nuclear medicine, radiotherapy facilities, x-ray fluorescence metal detection, the various uses of fixed and portable radiation devices, etc. The CNSC also licenses the import and export of controlled nuclear substances, equipment, information and nuclear-related dual-use items.

Radiation devices that contain more than the exemption quantity of a nuclear substance must be designed and manufactured to strict safety specifications and require certification.

The CNSC authorizes facilities and activities with nuclear substances and radiation devices in accordance to pre-established criteria based on safety requirements.

A high-level generic justification is provided in the regulatory framework through a broad list of radiation sources and practices to be licensed by the CNSC. However, the CNSC does not implement a systematic process to ensure the prior justification for all types of practices with radiation sources.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *There is no systematic evaluation of justification for the various practices involving radiation sources in the licensing process.*	
(1)	**BASIS: GSR Part 3 Requirement 1, para. 2.8 states that** "*For planned exposure situations, each party with responsibilities for protection and safety shall ensure, when relevant requirements apply to that party, that no practice is undertaken unless it is justified".*
(2)	**BASIS: GSR Part 3 Requirement 10 states that** *"The government or the regulatory body shall ensure that only justified practices are authorized".*
S7	**Suggestion: CNSC should consider establishing a procedure to ensure the systematic implementation of justification in the authorisation of all practices involving radiation sources.**

REGDOC-1.6.1 differentiates the licensing requirements for low, medium and high risk uses of nuclear substances and radiation devices in accordance with a graded approach. Based on a graded approach, depending on the risk of the activity, the depth of information required to be submitted by the applicants to the CNSC may vary and is aligned with the IAEA risk categorization for sealed sources. The CNSC does not implement notification alone for its regulatory control.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The CNSC implements only licensing in the regulatory control of nuclear substances and radiation devices. Notification is not included in the regulatory system as an option.*	
(1)	**BASIS: GSR Part 3 Requirement 3, para. 2.30 states that "***The regulatory body shall establish a regulatory system for protection and safety that includes; (a) Notification and authorization".*
(2)	**BASIS: GSR Part 3 Requirement 7, para. 3.7 states that** *"Any person or organization intending to carry out any of the actions specified in para. 3.5 shall submit a notification to the regulatory body of such an intention. Notification alone is sufficient provided that the exposures expected to be associated with the practice or action are unlikely to exceed a small fraction, as specified by the regulatory body, of the relevant limits, and that the likelihood and magnitude of potential exposures and any other potential detrimental consequences are negligible. Notification is required for consumer products only with respect to manufacture, maintenance, import, export, provision, distribution and, in some cases, disposal".*
(3)	**BASIS: GSR Part 3 Requirement 6 states that** *"The application of the requirements of these Standards in planned exposure situations shall be commensurate with the characteristics of the*

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
	practice or the source within a practice, and with the likelihood and magnitude of exposures".
S8	Suggestion: The CNSC should consider including notification alone as an option for the regulatory control of nuclear substances and radiation devices in accordance with a graded approach.

5.7. AUTHORIZATION OF DECOMMISSIONING ACTIVITIES

In accordance with the provisions of the NSCA, decommissioning is a distinct stage in the life cycle of a nuclear facility or activity. A decommissioning licence is required prior to the commencement of decommissioning activities. Further in accordance with the provisions of subsection 24(5) of the NSCA, the CNSC includes in all licenses a condition requesting the licensee to provide a financial guarantee in a form that is acceptable to the Commission. The Commission has made use of its authority to require financial guarantees in order to ensure funds are available in the event of decommissioning and for safe radioactive waste management.

Preliminary decommissioning plans are required (in the CINFR, CIINFR and UMMR) at the time of initial application and said plans for Class I facilities and UMM are required to be updated and resubmitted to the CNSC every five years to ensure that it is still within the bounding conditions of the original EA.

A detailed decommissioning plan, and supporting safety assessment, is required as a prerequisite for approval of decommissioning activities to commence. Decommissioning encompasses a wide variety of activities to retire a licensed facility or site permanently from service and render it to a predetermined end-state. There are seven sites undergoing decommissioning activities within Canada.

In view of the lack of disposal facilities in Canada the licensees have also sometimes adopted a phased approach to decommissioning. The decommissioning phases are described in Section 1.7. In many cases a deferred decommissioning strategy has been proposed by the licensees. In such cases the licensee submits a storage with surveillance plan to the CNSC. This plan must be supported by an assessment that confirms the safety of the facility from the time of permanent shutdown to the time of the start of decommissioning.

At the end of decommissioning the site may be subject to free release, restricted release from CNSC licensing or continued licensing by the CNSC.

5.8. AUTHORIZATION OF TRANSPORT

CNSC internal process and procedural documents ensure consistency in licensing and certification activities. CNSC requires a licence for certain transport activities, as established in section 6 of the *Packaging and Transport of Nuclear Substances Regulations*, 2015 (PTNSR 2015), and a certificate for certain packages as established in section 10 of these regulations. In each case, the PTNSR 2015 specify the contents of the document to be submitted by the applicant to support an application for license to transport nuclear substances and for the certificate of design. These regulations are based on SSR-6 and include an ambulatory incorporation by reference to the IAEA Requirements to maintain alignment with the international regulations. The PTNSR 2015, apply to the transport of nuclear substances for all modes of transport other than the transport by post. As described in Canada Post's "Non-mailable Matter Guide", transport by post of nuclear substances is prohibited.

The PTNSR 2015 do not use the term "special arrangement", as reported in SSR-6 to indicate a shipment of nuclear substances that cannot meet the requirements of the regulations for which a license is anyway requested although this type of shipment is covered under section 6 of PTNSR 2015. Certificate of approval of shipment under special arrangement shall be identified by the code "X" according with SSR-6. In keeping with this requirement, transport licenses for transport of nuclear substances that cannot meet the requirement of the PTNSR 2015 are issued by CNSC with the code "X" according with Appendix A of the work instruction "Process Transport Licence Application".

Trained and competent staff are available at CNSC for issuing licenses and authorizations requested by the PTNSR 2015 for the transport of nuclear substances. When an application to transport is received, CNSC staff assess the

application and a decision is made by a Designated Officer (DO) with respect to the issuance of the license. Public participation in the decision making relating to license process is not foreseen for transport of nuclear substances and certifications of designs according with the licensing and certification process established by CNSC for lower risk facility and activities. A DO may refer the review of the application to the Commission for decision. The refusal by a DO to issue a license and the requirement for an opportunity to be heard regarding a license refusal is covered under section 39 of the NSCA.

The CNSC has published the regulatory document, RD-364, Joint Canada-United States Guide for Approval of Type B(U) and Fissile Material Transportation Packages. This is a guidance document to assist applicants in preparing their application to demonstrate that a given package can meet the regulations. When an application to certify a package is received, CNSC staff assess the application and a decision is made by a DO with respect to issuance of the certificate. Additional information on how RD-364 aligns with IAEA safety standards is discussed in Section 9.8 of this report.

The IRRS team noted that Canada has a robust regulatory framework for the packaging and transport of nuclear substances supported by specific packaging and transport regulations as well as regulatory documents.

5.9. AUTHORIZATION ISSUES FOR OCCUPATIONAL EXPOSURE

For occupational exposure the authorization process implemented by CNSC is consistent with what is included in the generic sub-chapter, 5.1.

Section 4 of the RPR requires licensees to implement a radiation protection program and, as part of that program, keep the amount of exposure to radon progeny and the effective dose and equivalent dose received by and committed to persons ALARA.

The CNSC dosimetry service licences authorize the operation of a dosimetry service that meets the regulatory requirements prescribed in the RPR, and in the CNSC Regulatory Standard S-106.

5.10. AUTHORIZATION ISSUES FOR MEDICAL EXPOSURE

Out of scope

5.11. AUTHORIZATION ISSUES FOR PUBLIC EXPOSURE

Under the NSCA one of the regulatory objectives of CNSC is to prevent unreasonable risk to the environment and to the health and safety of people from the development, production and use of nuclear energy and the production, possession and use of nuclear substances and prescribed equipment. Section 10 of the GNSCR contains an exemption for naturally occurring nuclear substances other than those that are or have been associated with the development, production or use of nuclear energy.

CNSC staff review each licence application to determine if there is the potential for an impact on the environment (such as planned releases of radioactive or hazardous substances to the environment). The findings of these reviews are documented in an Environmental Protection Review report (previously referred to as an EA under the NSCA) for major facilities such as Class I facilities, uranium mines and mills or other facilities with known project-environment interactions. Certain major projects are also subject to the *Impact Assessment Act* (IAA-2019; or the former *Canadian Environmental Assessment Act*-2012) based on the *Physical Activities Regulations* which set the type of projects subject to IAA.

The applicant or licensee is required to assess the environmental impact (including public exposures) for the entire project life-cycle as part of the licensing process. These assessments of the impact include a radiological impact assessment under normal operations as well as abnormal conditions. Both NSCA and IAA (replacing CEAA, 2012) require prospective radiological risk assessment for both humans (public) and the environment (non-human biota). The RPR also provide specific regulatory requirements including dose limits for the public which are in line with GSR Part 3.

The requirements for authorisation for Class I facilities and uranium mines and mills include preparation of an Environmental Risk Assessment (ERA), including a human health risk assessment, demonstration of ALARA and the application of Best Available Technologies Economically Achievable (BATEA) within facility design and associated pollution prevention equipment and procedures, measures for control of releases to the environment, baseline studies prior to operation, development of an effluent monitoring programme, an environmental monitoring programme, groundwater protection and monitoring, and an environmental management system that meets the recognised standard ISO 14001. These requirements are applied to other facilities utilizing a graded approach based on the CNSC review of the application and the potential for releases and their interaction with the environment.

The REGDOC- 2.9.1 outlines the CNSC's regulatory expectations in this area, as well as other applicable guides and standards. The CNSC's approach to authorising releases to the environment includes limits and controls on the amount and characteristics of release are put in place. These include establishing derived releases limits (DRL) and actions levels which are identified within the licence or LCH. The DRLs are, depending on the facility, calculated based on effective dose criteria ranging from 1 mSv per year to 0.05 mSv per year as specified by the CNSC. Action levels are levels of releases, based on a fraction of the DRL, exceedances of which are required to be reported to the CNSC. Action levels are used to allow early identification of any potential deviation from normal performance of the control measures. Appropriate use of them should keep doses to the public well within the annual dose limit.

A comparable authorisation system also applies to approval of remediation plans for contaminated sites. For a site undergoing remediation, the licensee is required to submit the remediation plan to CNSC staff for review and approval; this often includes a long-term assessment of impacts on the environment and the public based on a scenario of expected evolution of a site or facility.

Some nuclear facilities with very low releases are deemed not to require a DRL. Instead their licences incorporate conditions for releases which are either adopted directly from IAEA-TECDOC-1000 or are calculated using the same principles and methodology.

The IRRS team noted that dose constraints are not explicitly established for all Class I facilities. The focus is on optimization through the application of ALARA and BATEA especially in facility design. However, inconsistencies are evident in the derivation of DRLs, with some facilities required to calculate their DRLs from a specified dose constraint while others have DRLs based on the public dose limit (i.e., nuclear power plants).

All facilities are required to comply with the dose limits for public exposure established in the RPR and these dose limits are in line with the GSR Part 3. The IRRS team noted that, with the exception of the lack of consistent application of the concept of dose constraints, as a further tool to drive optimisation for some Class I facilities, the authorisation requirements are in line with the IAEA requirements.

The IRRS team noted that the CNSC has recognised that there are different approaches used to the regulation of the control and authorization of releases for different types of facilities and is currently drafting a new Environmental Protection REGDOC with the working title REGDOC-2.9.2 "Environmental Protection – Controlling Releases to the Environment". This REGDOC aims to further clarify certain elements of the control measures around environmental and public protection, including the process for authorization of limits for discharges.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: The CNSC imposes dose limits for public exposure for all facility types and also requires BATEA to be demonstrated as part of a licence application. However, *dose constraints have not been established for all Class I facilities and the DRLs for NPPs are based on 1mSv/y.*	
(1)	**BASIS: GSR Part 3 Requirement 29, Para. 3.120 states that** *"The government or the regulatory body shall establish or approve constraints on dose and constraints on risk to be used in the optimization of protection and safety for members of the public."*
(2)	**BASIS: GSR Part 3 Requirement 29, para. 123(b) states that "***The regulatory body shall establish or approve operational limits and conditions relating to public exposure, including authorized limits for discharges. These operational limits and conditions:*

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
	Shall correspond to doses below the dose limits with account taken of the results of optimization of protection and safety;"
R2	**Recommendation: The CNSC should establish or approve dose constraints for all Class I type facilities.**
S9	**Suggestion: The CNSC should consider consistently implementing the concept of dose constraints for all facilities and standardising regulatory practice for derived release limits (DRLs).**

The Nuclear Substances and Radiation Devices Regulations (NSRDR) provides exemptions from licence requirements for activities in relation to certain consumer products that contain very small quantities of radioactive nuclear substances. Providers of consumer products are required to ensure that consumer products are not made available to the public unless their use by members of the public has been justified, and either their use has been exempted or their provision to the public has been authorized. The HC has issued a policy statement for enforcement on low level radiation in consumer products stating that it does not accept the risk related to radioactivity in consumer products where there is no benefit or rationale for its presence.

Existing exposure situations, such as radon in work places that are not regulated by the CNSC or are non-federal workplaces, and NORM not arising from the nuclear-fuel cycle are under the jurisdiction of the provinces and territories and so are beyond the scope of the IRRS mission.

5.12. SUMMARY

The CNSC has a well-structured and comprehensive authorization process that generally meets the expectations of the relevant IAEA safety standards.

A good practice was identified regarding CNSC's guidance on pre-application opportunities for vendors of small modular reactors.

The following areas for improvement were identified:

- Justification in the licensing process of radiation sources;
- Provisions for notification or registration of nuclear substances and radiation devices;
- Establishment and consistent application of dose constraints for all Class I facilities;
- Revision of requirements for decommissioning.

6. REVIEW AND ASSESSMENT

6.1. GENERIC ISSUES

6.1.1. MANAGEMENT OF REVIEW AND ASSESSMENT

CNSC reviews all submissions using existing legislation, codes and expertise available in Canada and internationally to ensure regulatory requirements are met. The review and assessment supports licensing, compliance with requirements, regulatory decision making and the development of regulatory positions.

The CNSC performs review and assessment based on the best available science (such as technical knowledge and analytical methods), taking OPEX into consideration, to determine whether submitted documents and supporting evidence have a sound technical basis. Review and assessment addresses the completeness, comprehensiveness and the validity of the rationale and technical justification provided in submissions, and are also used to verify licensee compliance with regulatory requirements.

Management system procedures support regulatory review and assessment for nuclear power plants, research reactors, fuel cycle facilities, transport, waste management, use of sources and other activities. They provide clearly specified information on how to effectively and consistently prepare for conducting an assessment; complete sufficiency checks of the information provided according to applicable criteria; peer review; integrate assessment results, and how to provide technical conclusions and recommendations to support the regulatory recommendations. In addition, a work instruction "How to Prepare for Conducting a Technical Assessment" provides directions on how to prepare for conducting a review. All reviews are subject to internal peer evaluation prior to finalization.

Facility specific matrices are used to ensure that all applicable codes and standards are used to evaluate licence applications. These matrices also ensure that the concerns of federal, provincial and territorial agencies are considered in the regulatory process and are reflected, as appropriate, in the licence.

A risk-informed approach has been used for planning and conducting review and assessment to ensure the regulatory effort is commensurate with the potential severity and nature of the risk. Using a graded approach, the depth of the requirements and documentation to support the licence application can vary, depending on the particular characteristics of a nuclear facility or licensed activity. The past performance of the licensee or the potential risk of planned safety improvement or activities are taken into account during the review and assessment.

6.1.2. ORGANIZATION AND TECHNICAL RESOURCES FOR REVIEW AND ASSESSMENT

Review and assessment are performed by various specialists of the CNSC according to the information and type of application submitted. Specialists perform detailed review and assessment of specific technical areas such as; radiation protection, emergency management, human factors, security, engineering design, geotechnical, fuel, and physics.

Review and assessment takes into account a risk-informed regulatory framework to ensure they cover specific goals at specified frequencies during the life cycle of the facility and activity to achieve the consistency of inspections, reviews and other regulatory activities.

The CNSC has minimized its dependence on external experts by developing and maintaining a large, highly qualified and multi-disciplinary staff of experts. Where the CNSC does not have the expertise required to inform a regulatory decision, it may have contracts with external parties. While the CNSC may seek and receive advice and recommendations from external sources, ultimately the CNSC is accountable for ensuring that licensees are discharging their responsibilities safely.

6.1.3. BASES FOR REVIEW AND ASSESSMENT

Regulations specify the information an applicant must submit to the CNSC and guidance assists the applicant to demonstrate that the submission meets the regulations. The licensing basis contain the relevant set of requirements and criteria for review and assessment.

Throughout the life cycle of a licensed facility, specific review and assessment criteria from relevant documents may be referenced in operating licences and LCHs, thereby making the requirements enforceable. This includes both national and international standards, which provide criteria against which licensees are assessed; as well as regulatory documents which outline requirements and also acceptable methods of meeting regulatory requirements. Regulatory documents serve as requirements and guidance to both licensees and CNSC staff. The regulatory framework is made available on the CNSC's website in an open and transparent manner.

6.1.4. PERFORMANCE OF REVIEW AND ASSESSMENT

CNSC conducts review and assessment in support of licensing and certification decisions as well as compliance verification. CNSC conducts compliance verification to assess licensee documents, such as quarterly technical reports, annual compliance reports and documentation related to design, safety analysis, programs and procedures, to ensure that the operations remain within the licensing conditions.

CNSC's approach to review and assessment of licence applications and ongoing compliance includes establishment of assessment teams. These teams bring together staff from the regulatory operations, technical support and other subject matter experts, as appropriate. The teams are involved in review of licence applications and compliance activities. Regular meetings are held for the team members to remain up to date on the relevant developments at the facility.

The facility inspectors' access to specialist areas as needed and keeps the specialist areas up to date on key developments between the periodic assessments.

CNSC uses RIB which stores information on actions taken in response to licensing and compliance activities in one database, allowing staff to quickly retrieve and view actions and perform a trend analysis.

CNSC prepares and publishes RORs which provide information on the safety performance of CNSC licensees. The RORs are used by the CNSC to present staff's evaluation of licensee compliance, performance, key issues and any emerging changes in regulation.

CNSC is also involved in several international fora and groups dealing with the development and review of safety cases such as IAEA international projects and the DGR Regulators forum, which foster the sharing of information on safety and contributes to overall knowledge improvement.

6.2. REVIEW AND ASSESSMENT FOR NUCLEAR POWER PLANTS

For nuclear power plants the review and assessment process implemented by CNSC is consistent with what is included in sub-chapter 6.1.

6.3. REVIEW AND ASSESSMENT FOR RESEARCH REACTORS

For research reactors the review and assessment process implemented by CNSC is consistent with what is included in sub-chapter 6.1.

6.4. REVIEW AND ASSESSMENT FOR FUEL CYCLE FACILITIES

For fuel cycle facilities the review and assessment process implemented by CNSC is consistent with what is included in sub-chapter 6.1.

6.5. REVIEW AND ASSESSMENT FOR WASTE MANAGEMENT FACILITIES

For waste management facilities the review and assessment process implemented by CNSC is consistent with what is included in sub-chapter 6.1.

6.6. REVIEW AND ASSESSMENT FOR RADIATION SOURCES FACILITIES AND ACTIVITIES

For radiation sources facilities and activities the review and assessment process implemented by CNSC is consistent with what is included in sub-chapter 6.1.

6.7. REVIEW AND ASSESSMENT FOR DECOMMISSIONING ACTIVITIES

For waste management facilities the review and assessment process implemented by CNSC is consistent with what is included in sub-chapter 6.1.

6.8. REVIEW AND ASSESSMENT FOR TRANSPORT

CNSC is responsible for the review and assessment of applications for package certification, for the issue of transport licences and for evaluation of compliance through audits and inspections.

A review of the management system of the applicant is part of the approval process of the package and can be reviewed as part of the reissuance of the certificate of approval. The CNSC Certification Engineers follow internal documents "Technical Assessment of Transport Certificate Applications" when assessing certificate applications and "Case Management: Process Transport Licence Application" when assessing the licence applications. CNSC issued the regulatory document, RD-364, Joint Canada-United States Guide for Approval of Type B(U) and Fissile Material Transportation Packages which provides guidance to the applicant as well as to the CNSC for conducting the review and assessment. This process also includes independent internal peer review which is not common practice in transport licensing and the certification of packages in IAEA Member States.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The CNSC internal process "Peer Review of Radiation Devices, Class II Prescribed Equipment and Transport Certificate Applications" documents the process required for peer review of a technical assessment for certification performed by a Certification Engineer.*	
(1)	**BASIS: TS-G-1.5 para. 2.10 states that** *"The competent authority should be able to independently assess and verify the technical and test data submitted by an applicant. Such independent assessment may cover nuclear criticality control, heat transfer, radiation protection, structural analysis and risk studies, and all related measures of the management system of the applicant.*
GP5	**Good Practice: The peer reviews adopted for certification of packages minimize the risk associated with the certification of higher risk designs and increases reliability and consistency of certificates issued by CNSC. They also improve communication and knowledge sharing among Certification Engineers.**

Multilateral approval of packages of foreign countries are performed either by independent certification or validation of the approval certificate issued by the competent authority in the country of origin. In both cases CNSC follow the same certification process for multilateral approval. The assessment of the Safety Analysis Report for certification consists of a technical evaluation of the report and of independent analysis performed on some of the requirements for the package such as the prevention of criticality in case of certification of fissile packages.

6.9. REVIEW AND ASSESSMENT FOR OCCUPATIONAL EXPOSURE

For occupational exposure the review and assessment process implemented by CNSC is consistent with what is included in sub-chapter 6.1.

CNSC staff assess licensees' applications to ensure that they meet the all requirements of the RPR. The radiation protection program, required by section 4 of the RPR, also forms part of the licensing basis for the nuclear facility or regulated activity

When the CNSC receives an application for a dosimetry service licence, CNSC staff assess the application to determine if the proposed activities meet applicable requirements and CNSC S-106 revision 1. A licence will only be issued if the CNSC is satisfied that the proposed dosimetry service program meets the regulatory requirements and S-106 revision 1. Dosimetry service licences are generally issued for ten-year terms.

6.10. REVIEW AND ASSESSMENT FOR MEDICAL EXPOSURE

Out of scope.

6.11. REVIEW AND ASSESSMENT FOR PUBLIC EXPOSURE

For public exposures the relevant licensing and compliance documentation reviewed by CNSC staff includes those related to safety analyses, physical design, waste management, and the radiation protection and environmental protection programmes. The review and assessment of licence application follow the process described in sub-chapter 6.1.

On an ongoing basis, CNSC staff review effluent data submitted by licensees and evaluate the information for compliance against the release limits. Reviews include the discharge and environmental monitoring programmes to confirm compliance with authorised discharge limits, action level requirements and confirmation of the predicted environmental transport and doses.

An EA report is prepared by CNSC staff for initial and subsequent licence applications. As part of this process, the review and assessment considers, as relevant, data from the CNSC's IEMP, CNSC staff's compliance verification activities, annual environmental monitoring reports, previous EAs and follow-up programmes, decommissioning plans and Indigenous and public input. The EA report includes CNSC staff's recommendation on the adequacy of the applicant or licensee's environmental protection measures.

Following initial authorisation, the licensee is required to periodically review and revise the Environmental Risk Assessment (plus associated public dose modelling) on a minimum 5-year cycle using the accumulated site knowledge derived from operational experience, monitoring, special investigations, incorporation of advances in scientific knowledge and, where available, Indigenous traditional knowledge. The IRRS team considered that use of the "living" ERA provides a strong method for assessing if the original environmental impact predictions are exceeded or may be exceeded in the future, helping to support the control of public exposures.

Licensees are required to report on their environmental protection measures (e.g. action levels, discharge and receiving environment monitoring) on either a quarterly or annual basis. CNSC evaluates the results in these reports, trends discharges and receiving environment monitoring data and verifies compliance with respect to program implementation and any specific licence limits such as authorized discharge limits and action levels. On an annual basis, licensees are required to report on public dose by submitting the associated monitoring and modelling data for CNSC review as part of their annual environmental report. The CNSC utilizes the results of their IEMP in combination with the results of the licensees' environmental protection measures for their on-going determination of the adequacy of the programs with respect to the protection of the public and the environment.

Existing exposure situations:

Public protection from indoor radon arising from NORM not associated with the nuclear fuel cycle is led by HC but the responsibility to recognise radon testing and mitigation as a priority rests with other levels of government and with private individuals.

The responsibility for developing a national program for radon was delegated to HC through a Memorandum to Cabinet and Treasury Board Submission. In 2008, HC established the National Radon Program (NRP). The NRP includes the review and assessment of public exposure to radon, the Canadian National Radon Proficiency Program and outreach activities to the public and to stakeholders to encourage inclusion of radon protection measures in practices, policies, codes and regulations. The information provided as part of the NRP includes materials such as brochures, factsheets, guides and infographics to educate the public and key stakeholders (including medical

professionals, provincial and territorial governments, construction and real estate professionals) about the risks from exposure to indoor radon and the increased health risks due to smoking.

HC works with a wide range of public authorities including provinces, territories and municipalities across the country, academic institutions, not-for-profit organisations, professional bodies, certification bodies, and others to deliver the NRP. This outreach includes establishing the 'Take Action on Radon Network' to implement the programme. While this has proven very effective to date, the IRRS team noted the fact that responsibility for promoting the control of radon exposure rests predominantly with HC and that this is limiting the roll-out of the programme. The establishment of a formal steering group or committee including stakeholders from all levels of government would assist in putting and keeping protection from radon on the relevant government agendas. This is the key factor given that responsibility for the testing and/or mitigation of radon in Canada is multijurisdictional.

The NRP has used a range of innovative solutions to raise awareness, educate key groups and promote measurement, mitigation and prevention of radon. These include the 3 Point Home Safety Checklist Campaign, which encourages families to use smoke detectors, carbon monoxide detectors and radon tests, which involved the recruitment of radon leaders and champions in the childcare and the SmartMoves Program in conjunction with Canada Post whereby those who change address automatically receive information on radon at a time when they are primed to make home improvements. This programme reaches more than 700,000 homeowners per year.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Under the National Radon Program, HC has established a strategic communication programme to deliver targeted information on radon to the public and relevant professionals.*	
(1)	**BASIS: GSR Part 3 Requirement 50, Para 5.19 (b) states that** *"Relevant information on exposure due to radon and the associated health risks, including the increased risks relating to smoking, is provided to the public and other interested parties"*
GP6	**Good Practice: HC has undertaken a strategic differentiation of messages on radon in order to effectively target sub-groups of the public. This represents an innovative and effective programme for raising awareness of radon and the necessary actions to mitigate it, targeting a point of time when people are more likely to be receptive to the message.**

HC has completed several large-scale radon surveys in Canada in residential homes and federal workplaces to collect information on the levels of indoor radon. Surveys have also been completed on thoron levels in dwellings and on the contribution of radon emanation from building materials to indoor radon levels. However, the potential impact of gamma-emitting radionuclides in building materials on indoor dose rates has not been evaluated.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *No survey has been undertaken to assess potential public exposure indoors from gamma-emitting radionuclides in building materials.*	
(1)	**BASIS: SSG-32, para. 4.14 states that** *"The national authority should use the data generated in surveys of the levels of radionuclides of natural origin in building materials to identify those radionuclides that may make a significant contribution to exposure to gamma radiation indoors. Where there are only limited data available on levels of radionuclides in building materials, the national authority should make arrangements for a survey to be carried out, and/or it should require manufacturers of building materials and suppliers of imported building materials to provide it with such data."*
S10	**Suggestion: HC should consider undertaking a survey of radionuclide levels in building materials or indoor gamma dose rates arising from building materials to determine if they make a significant contribution to public exposure.**

6.12. SUMMARY

The CNSC meets the expectations of the IAEA safety standards for review and assessment. The CNSC conducts comprehensive and systematic review and assessment to support licensing, certification and compliance verification as a part of regulatory oversight programme.

The following good practices were identified:

- The peer review of the assessment results of certification of transport package design;
- HC has developed an innovative public communication approach on radon.

One area of improvement was identified for assessing public exposure from building materials.

7. INSPECTION

7.1. GENERIC ISSUES

CNSC has established a systematic approach to conducting inspections that is consistent with the recommendations in the IAEA safety standards. Specifically, CNSC has produced a process document "Conducting an Inspection", last revision dated April 2019, which details the process to be followed when conducting activities related to independent inspections at all nuclear and radiation facilities and activities. The IRRS team noted that all Directorates have established work instructions, which align with the CNSC general process, "Conducting an Inspection".

Within the instruction, the roles and responsibilities of inspectors, and details of the different phases of conducting an inspection are described.

The purpose of CNSC inspections as stated in the CNSC's general (corporate) process document is to ensure that:

- the licensee's activities, facilities, equipment and work performance meet regulatory requirements;
- licensing basis documents are adhered to;
- workers possess the necessary competence for the effective performance of their functions;
- deficiencies and deviations are identified by the licensee and are corrected or justified without undue delay;
- any lessons learned are identified by the licensee and communicated to stakeholders; and
- the licensee is managing safety in a proper manner.

The powers of the CNSC inspectors are defined in sections 30 to 33 of the NSCA and include access rights to facilities where nuclear substances and radiation devices are used. Moreover, inspectors have the power to issue orders under section 35 of the NSCA.

The CNSC inspection programme appropriately specifies the types of regulatory inspections and stipulates the frequency of inspections and the areas and programs to be inspected, in accordance with a graded approach and the risk ranking of the authorized/regulated activity. The CNSC also makes use of external agencies in a few specialized areas (e.g., pressure boundary, fire protection inspections).

Process document "Conducting an Inspection" describes the types of inspections that the CNSC performs, which include Type I and Type II inspections, field inspections, and reactive inspections. Type I inspections are performed to verify licensee compliance with their programs, processes or practices. Type II inspections are performed to verify the results of the licensee processes and not the processes themselves. Reactive inspections and field inspections can be triggered from desktop reviews, technical assessments, reported safety concerns, events or the occurrence of unplanned regulated activities. Field inspections may be baseline or reactive and typically focuses on a particular physical area of a facility, and/or one or several specific areas (SpAs) within the SCA framework.

Inspections may be performed announced or unannounced. When the likelihood that the inspection outcome will be affected by advance notification is low, an announced inspection is conducted. In the likelihood that the inspection outcome will be affected by advance notification is high, an unannounced inspection is conducted. The IRRS team noted that the majority of inspections conducted are announced inspections.

CNSC management encourages the practice of sharing inspection resources through inspector exchanges to achieve a level of cross training domestically and internationally which can broaden experience and provide inspectors with different perspectives from working with other inspectors. These inspector exchanges help preserve objectivity and independence for CNSC inspectors as they gain diverse perspectives of inspection techniques and licensee engagement. Although this practice is at times exercised, and inspectors interviewed acknowledged the benefits, inspector exchanges are not consistently performed due to emerging constraints and competing priorities.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES
Observation: *The IRRS team observed the practice of sharing operating experience and lessons learned amongst inspectors through multiple means, including exchanges. However, constraints and other priorities may prevent inspectors from performing exchanges at the frequency needed to take full advantage of the benefits achieved from*

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
the practice.	
(1)	**BASIS: GSR Part 1 Requirement 29, para. 4.50 states, in part, that,** *"The regulatory body shall develop and implement a programme of inspection of facilities and activities, to confirm compliance with regulatory requirements …"*
(2)	**BASIS: GSG-13, Para 3.231 (d) states that** *"Operating experience and lessons learned from operating the facility or conducting the activity, and from similar facilities and activities in the State and in other States, as well as results of research and development".*
S11	**Suggestion: CNSC should consider formalizing the practice of inspector exchanges between licensee locations for inspection assistance to ensure the operating experience and lessons learned from assisting other CNSC staff perform inspections at different licensee locations are maximized.**

All inspections require a documented inspection report. The lead inspector is responsible for the preparation and issuing of the final inspection report. The inspection report is issued to the licensee and may be available to stakeholders and the public upon request. A list of completed inspections are provided to the public in the ROR.

Findings that require licensee action are tracked through formal action items and are recorded in the CNSC's RIB. Progress on inspections planned as part of the annual compliance verification plan is reported on a quarterly basis at regulatory and technical management meetings.

The CNSC recognizes the importance of having well-trained staff who possess good technical and communication skills prior to assigning them to conduct inspections at nuclear facilities. A systematic approach to inspector training and qualification (i.e., certification) is used to establish the CNSC's Inspector Training Qualification Program (ITQP). Once an inspector is deemed qualified, they are issued a Certificate of Inspector under the NCSA. Formal qualification cards are issued to each inspector that complete the training program to enable CNSC inspection staff to readily present the level of certification obtained. CNSC inspectors are required to undertake a formal training programme which typically ranges from 12-18 months. Under the NSCA, CNSC inspectors are afforded unimpeded access to licensed facilities and activities. The inspector certification is subject to a periodic review and recertification.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *CNSC does not have a comprehensive formal process to regularly review on site inspectors to ensure they remain independent and objective. Inspector observation elements, such as direct management observations, used as methods to review inspector objectivity and independence should be formalised.*	
(1)	**BASIS: GSG-12, Para 6.10, states that** *"Staff assignments should be regularly reviewed to ensure that regulatory independence and objectivity are maintained in dealings with authorized parties."*
S12	**Suggestion: CNSC should consider its process to formalise all elements used to ensure a comprehensive, regular review of the objectivity and independence of the on site inspectors.**

7.2. INSPECTION OF NUCLEAR POWER PLANTS

The strategic process used by the CNSC to establish a risk-informed compliance plan for NPPs is contained in the PRPP Compliance Verification Strategy process document. This process is used to develop compliance verification plans that outline inspection activities performed by inspectors to verify that licensees are compliant with regulatory requirements.

The annual compliance verification plan provides for a graded approach, based on both deterministic criteria and site-specific risk insights gained from detailed PSAs, and inputs from the five-year PRPP Baseline Compliance Verification Plan. The annual compliance verification plan is also informed by licensee-specific performance data, plant specific design, and new or existing projects (initiatives such as refurbishment outages) at the NPP.

To evaluate licensee performance, inspectors execute various types of inspections at NPPs. Inspections at NPPs are led by qualified on site inspectors with the support of specialists and project officers as needed. As previously described in section 7.1, Type I, Type II, and field inspections are performed by the CNSC. A fundamental element of all CNSC inspections is a review of a licensee's ability to self-identify and correct their own performance problems. In addition, reactive inspections are performed in response to incidents that occur at nuclear power plants based on risk-based criteria. These inspections are typically announced by advanced notification to the licensee, however, the on site inspectors conduct several unannounced inspections throughout the annual inspection period. All inspections are implemented using specific procedures and field inspection guides including standard checklists that have been developed for the inspections performed at NPPs in collaboration with CNSC specialist staff. CNSC regulations require that licensees provide agency inspectors full, unfettered access to their facilities, meetings, procedures, documents and staff at any time or upon request.

The CNSC inspections can also include a review of nuclear component suppliers (vendors), but only in conjunction with a licensee's own inspections of these entities. The CNSC inspectors assess the adequacy of licensee quality assurance programs with respect to procurement of safety-related components.

Consultants are rarely used during the conduct of inspections as CNSC has maintained adequate numbers of sufficiently trained inspectors supported by specialists from the CNSC's TSB for each technical discipline to successfully implement the annual compliance verification plan. As of the date of this mission, there are approximately 29 qualified inspectors and 5 inspectors-in-training located at CNSC's headquarters and at the four NPP site offices.

The CNSC staff follow the "Conducting an Inspection" process, described in section 7.1, and the applicable inspection procedure, which follow a format that could include an opening meeting, field and document verifications, discussions with licensee staff, preliminary findings, an exit meeting, and a final report to the licensee.

During a site visit to the Bruce Nuclear Generating Station (NGS) A and B, the IRRS team observed the activities of a on site inspector, with assistance from a specialist, perform a field inspection for the SCA of Field for Service in the SpA of Maintenance - Work Execution. The on site inspector and specialist were observed to engage the plant staff in challenging dialogue, perform thorough field "walk-downs," review work documents and other relevant maintenance records, and validate the licensee's overall ability to execute the maintenance process in a safe and compliant manner. Interviews with the on site inspection staff assigned to the facility confirmed that these individuals maintained day-to-day oversight of safety-related activities at the plant. Further, the relationship between the licensee and the on site inspectors appeared to be open, communicative and cooperative. The communication paths have been shown to be effective at resolving issues.

After completion of the annual compliance verification plan, inspectors and managers conduct a comprehensive review of all the inspection findings and performance indicators to assess the integrated safety performance of each NPP. The performance ratings for the NPPs are documented annually in the NPP ROR presented to the Commission and published on the CNSC's external website.

7.3. INSPECTION OF RESEARCH REACTORS

The CNSC staff within the CNSC's Directorate of Nuclear Cycle and Facilities Regulation (DNCFR) are responsible for the conduct of inspections at research reactors. A risk informed process is applied to research reactor facilities, which determines the minimum frequency of compliance activities and inspections, which then feeds into the baseline compliance plan. The risk ranking is carried out in consultation with CNSC specialist groups. This graded approach is driven primarily by assessment of the risk associated with the activities at facility. The frequency of inspections is matched to the risk rating and performance history of the licenced facility.

The DNCFR baseline plan for inspections cover a rolling10-year period and is updated every year. On the basis of the 10 year plan, CNSC prepares annual compliance plan to properly allocate resources and inspection efforts and to reflect specific needs for the following year.

Typically, a team of 1-2 inspectors conduct an inspection in research reactor, which has been noticed by the IRRS team during observation of inspection at the CNL facility in Chalk River Laboratories. The inspection team was supplemented with inspectors-in-training, specialists and project officers who actively participate in conducting the inspection. CNSC inspections at research reactors cover all 14 SCAs over an inspection planning cycle.

The IRRS team observed that the inspection at CNL facility in Chalk River Laboratories was carried out in accordance with the DNCFR inspections instruction. Templates were used for documents that are required to be completed throughout the inspection process including: inspection plan; inspection notification letter; inspection documentation tracking sheet; inspection agenda; compliance matrix; inspection meeting attendance records; inspection facts and findings report; and inspection close-out form. Other required document templates such as inspection report peer review; inspection report notification letter; and final compliance inspection report were available to inspectors.

Inspection evidence is typically collected using the following inspection methods: monitor and observe; review procedures, records and other documents; conduct interviews or discussions with personnel; and conduct sampling, testing and measurements. The IRRS team observed that, during the inspection at ZED-2 research reactor, the inspectors performed general plant walk down, records review, licensee staff interviews and radiation measurements. They did not perform the specific inspection of plant operations, maintenance or surveillance activities. As such no direct monitoring or observation inspection methods had been used with that specific inspection nor were they planned. The IRRS team verified inspection reports from other research reactors and noticed that specific SCAs were monitored and observed by CNSC inspectors. The IRRS team encourages CNSC to more frequently use all available methods during inspections of research reactors.

The IRRS team noted that CNSC inspectors follow-up on issues identified during inspection in a timely manner.

7.4. INSPECTION OF FUEL CYCLE FACILITIES

When a licence is issued, CNSC staff develops a licensee specific 10-years inspection plan, which includes 14 SCAs to be inspected with the frequency identified for every relevant area. On the basis of the 10 year plan, CNSC prepares annual compliance plan to properly allocate resources and inspection efforts and to reflect specific needs for the following year. There are no on site inspectors at fuel cycle facilities, thus inspections are conducted by inspectors from CNSC headquarters. The inspection team often includes specialists for the inspected areas. The number and specializations of participants in an inspection is determined by the scope of the inspection.

During DNCFR inspections, CNSC staff conduct document reviews, interviews, walk downs, and observation of activities. Typically, 1-3 people conduct a 1-3 days inspection. Inspection findings are documented in the preliminary inspection report (to be signed by the lead inspector and licensee), and then in the final inspection report, within 60 working days. The mentioned time framework is used to receive additional evidence from licensee, make the relevant assessment of inspection findings, and finalize inspection report.

The IRRS team observed a CNSC inspection conducted at the Port Hope Conversion Facility operated by Cameco Corporation. During this inspection, the IRRS team did not notice any non-compliances with the relevant IAEA requirements for inspections of fuel cycle facilities. It was also noted, that no unannounced inspections were conducted by CNSC for Port Hope Conversion facilities since 2012, as well as for other fuel cycle facilities at least since 2017 to date (except for radioactive waste management facilities).

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *No unannounced inspections have been conducted for uranium fuel fabrication, refining and conversion facilities since 2017.*	
(1)	**BASIS: GSR part 1 Rev.1 para. 4.50 state that:** "*The regulatory body shall develop and implement a programme of inspection of facilities and activities, to confirm compliance with regulatory*

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
	requirements and with any conditions specified in the authorization. In this programme, it shall specify the types of regulatory inspection (including scheduled inspections and unannounced inspections), and shall stipulate the frequency of inspections and the areas and programmes to be inspected, in accordance with a graded approach".
S13	**Suggestion: The CNSC should consider performing unannounced inspections for uranium fuel fabrication, refining and conversion facilities.**

7.5. INSPECTION OF WASTE MANAGEMENT FACILITIES

For waste management facilities the inspection process implemented by CNSC is consistent with what is included in sub-chapter 7.1.

The inspections are performed by the designated inspectors with the assistance of experts specialized in various SCAs. The majority of performed inspections are announced to the licensee.

A 10-year plan for inspections is used as the baseline for performing inspections. During that period each of the 14 SCAs will be covered for each facility. Some of the SCAs are inspected more frequently than others, such as radiation protection. The frequency of inspections is also risk based, since the facilities are arranged in high, medium and low risk facilities. On the basis of the 10-year plan, CNSC staff prepare an annual compliance plan to properly allocate resources and inspection efforts and to reflect specific needs for the following year. Events and activities going on at the waste management facility and decommissioning activity will also trigger inspection, which will be built into the annual plan. The 10-year plan fixes the number of general and focused inspections per year. Additional inspections can be added, mainly if an event has occurred that justifies the initiation of a reactive inspection.

The IRRS team observed inspections for waste management at CNL facility in Chalk River Laboratories and at Western Waste Management Facility in Tiverton, as well as for decommissioning activities at the CNL facility in Chalk River. The IRRS team was provided with inspection documentation prepared for the planning and execution phases of conducting an inspection, such as the inspection plans and the compliance matrices. The team observed that the compliance matrix used for the inspections are prepared by the inspection team inspector prior to inspections and that the inspections were carried out in accordance with the DNCFR process on how to conduct and inspection.

The IRRS team encourages the CNSC to compile and establish a database of existing compliance criteria in the area of waste management and decommissioning activities in order to support inspectors' compilation of individual inspection compliance matrices.

7.6. INSPECTION OF RADIATION SOURCES FACILITIES AND ACTIVITIES

CNSC carries out inspections of radiation sources facilities and activities to verify compliance of the licensees with the regulatory requirements and the terms and conditions specified in the authorization.

Most inspections are announced, but some unannounced inspections are also performed, particularly for field uses of exposure devices. Additionally, reactive inspections are performed routinely and are triggered from an event, regulatory performance review of the licensee or a reported safety concern.

The CNSC develops and implements a rolling 12 months inspection programme taking due account of risk ranking for Accelerators and Class II Facilities Division (ACFD) or a 15 months programme for the Operations Inspection Division (OID). However, the IRRS team observed that the targeted frequencies are not always respected due to a CNSC's staff shortage. Currently, the OID is staffed with 12 certified inspectors and 4 in-training inspectors to control the 2300 active nuclear substances and radiation devices licences. This issue has been addressed in Suggestion S4 in chapter 3.

Operational meetings are held periodically in ACFD and OID during which the results of previous inspections are discussed. These meetings are used to discuss a wide variety of topics such as non-compliances found during the

inspection, any unusual or novel situations encountered during the inspection, any procedural difficulties encountered during the inspection, recommendations for best practices and lessons learned, and consistency in regulatory interpretation.

The IRRS team observed three inspections which were conducted at: an industrial radiography facility at Mistras Services, St-Lambert, Qc; a nuclear medicine department at the Mc Gill University Health Center, Montreal, Qc; an irradiator facility at Nordion (Canada) Inc., Gamma Centre of Excellence, Laval, Qc.

The inspections included review of documents and records, facility walkdowns, observations and interviews, testing and measurements. The inspections were conducted in accordance with a predefined plan and the related procedures developed by the CNSC, reviewing the areas of workers' dose monitoring results, sources inventory, equipment maintenance, and security access control.

During the closing meeting, the preliminary inspection findings were clearly explained to the licensees' representatives as well as the corrective actions expected by the CNSC and the follow up process. The licensee was requested to sign the preliminary inspection report. The lead inspector was responsible for the preparation and issuing of the final inspection report and for the follow up of the expected corrective actions. The inspections were performed in a very professional manner and in a very good climate.

The inspected licensees suggested that a possibility for improvement was for the CNSC inspectors to dedicate more time to inspecting the physical location of the licensed activity and less time on document control. Licensees also commented that they would appreciate feedback from the CNSC on periodic reports sent to the about CNSC such as the annual compliance report.

7.7. INSPECTION OF DECOMMISSIONING ACTIVITIES

Since inspections of decommissioning activities are conducted by the CNSC's DNCFR and WDD, the inspections for both waste management facilities and decommissioning activities are described in sub-chapter 7.5.

7.8. INSPECTION OF TRANSPORT

The responsibility to verify compliance with the safe transport of nuclear substances is shared by CNSC and TC (federal inspectors) as well as provincial and territorial inspectors. CNSC regulates and inspects all the facilities and activities under the NSCA while TC develops and enforces safety regulations and standards to manage safety risks for all mode of transport of all dangerous goods under the TDG Act.

A MOU between the CNSC and TC, in place for many years, renewed in June this year, to consult and cooperate on activities of regulatory nature including inspections, investigations, collection and exchange of information, training, monitoring and compliance verification. Provincial-territorial inspectors inspect carriers of dangerous goods, including Class 7, radioactive material. They ensure compliance with PTNSR 2015 and TDG Regulations through various means including roadside inspections.

CNSC performs inspections of transport activities of facilities based on operational activities or in the scope of general inspections. Consignor, consignee and carrier of nuclear substances are inspected following a risk-informed approach against all the requirements set in the PTNSR 2015 and TDG that applied to all modes of transport. The plan of inspections for transport activities is part of the general inspection plans of CNSC. About 100 for-hire carriers are known to transport nuclear substances, but only a few are classified as "high-risk" according to the number of packages transported and the nuclear substances transported.

Approximately 10 carrier inspections are performed per year based on the risk-performance attributed to the carriers. Most of the inspections are planned and announced for routine compliance verification activities. The CNSC has two Transport Officers with responsibilities focused on the packaging and transportation of nuclear substances. All the other CNSC inspectors receive training on the TDG regulations and PTNSR 2015. The CNSC Transport Officers follow a work instruction focused on carriers, those in possession of transport licence and manufacturers of packages certified by the CNSC.

Customs operations involving inspections by the CBSA are performed according to the PTNSR 2015 subsections 40(1) and (2). The CBSA instructions included in their Standard Operating Procedures state that if a portal sets off an alarm or the package is a declared import of radioactive material, CBSA personnel will not open a container or package to check it until they have consulted with the CNSC.

Compliance verification is conducted by CNSC inspectors based on several checklists. Inspections of consignor, carrier or consignee of nuclear substances, other than one who only handles or transports excepted packages, include the verification of keeping a record documenting their radiation protection program in accordance with PTNSR 2015 subsection 31(2).

The IRRS team observed an inspection conducted by a CNSC team, in the SCA of Packaging and Transport at Nordion (Canada) Inc.'s Ottawa facility. The inspection regarding the preparation for the shipment of a package containing special form sources of Cobalt-60 was conducted by the lead inspector with the support of the Transport Officer. The inspection included an entrance meeting followed by a detailed and well performed inspection including independent measurement of the surface radiation level and the Transport Index of the package by CNSC. A preliminary report was prepared by the team lead inspector and signed by the licensee's representative.

7.9. INSPECTION OF OCCUPATIONAL EXPOSURE

For occupational exposure, the inspection process implemented by CNSC is consistent with what is included in sub-chapter 7.1.

To verify compliance with licence conditions and regulations, CNSC staff perform compliance activities to verify licensees' compliance with the RPR and radiation protection program requirements. CNSC staff review documentation and operational reports submitted by licensees and evaluate the implementation of licensees' radiation protection programs. CNSC staff also conduct on-site inspections focused on radiation protection to verify compliance with regulatory requirements.

The IRRS team observed two CNSC inspections that included occupational radiation protection aspects at an industrial radiography facility at Mistras Services, St-Lambert, Qc and at a nuclear medicine department at the Mc Gill University Health Center, Montreal, Qc.The CNSC inspectors identified a number of preliminary findings related to ORP. The IRRS team noted that at Mistras, in addition to the "gamma bunker", 4 "x-ray bunkers" were in operation. The IRRS team was informed that the 4 x-ray bunkers are outside the scope of the CNSC mandate. X-rays devices below 1 MV are not regulated by the CNSC and are under provincial/territorial jurisdiction.

The CNSC regularly monitors dosimetry service licensees to verify that they are complying with the requirements of the RPR and their licences. CNSC staff evaluate compliance by licensees through, as examples, on-site inspections, reviews of annual compliance reports submitted by licensees, and reviews of performance tests and independent tests.

7.10. INSPECTION OF MEDICAL EXPOSURE

Out of scope

7.11. INSPECTION OF PUBLIC EXPOSURE

The CNSC's inspection programme includes inspections that look at a licensee's effluent and emissions control programme and/or associated monitoring activities. These are undertaken as part of a wider inspection of a facility. Specialists participate in environmental inspections of Class I facilities and activities, while for other lower risk facilities, verification of environmental and public exposure issues are carried out by the general inspectors.

Those specialists who participate in inspections are required by CNSC to meet the relevant training requirements for inspectors. They typically participate in a few inspections each year. The objectives of these environmental inspections are to confirm that releases to the environment and doses to the public are controlled, that the appropriate monitoring programmes and action levels are in place and that appropriate actions are taken during exceedances.

In advance of the inspection, the specialist reviews relevant documents including training records, equipment records, written procedures and discharge data. The on site inspection includes observation of procedures and a visual check of the site including effluent control equipment. Where the facility has a laboratory, the inspection includes checking QA/QC data, observing procedures and reviewing results from proficiency tests.

The IRRS team reviewed the inspection guides and compliance matrices developed by CNSC to support and guide inspectors in undertaking inspections of effluent control and monitoring and found them to be provide a useful aide for inspections, both for the desktop review and the field inspection. The IRRS team noted that they provide appropriate documentation of the approach to be taken to the inspection, including setting out the relevant regulatory requirements, expected outputs and inspection activities to verify the relevant requirements are being met.

The IRRS team noted that the CNSC has established robust arrangements for inspections of environmental aspects, including public exposure, which are consistent with the IAEA safety standards.

7.12. SUMMARY

The CNSC has established a systematic approach to conducting inspections that is consistent with the requirements in the IAEA safety standards. Where there is overlap in regulatory oversight with other regulatory bodies, the CNSC coordinates its verification activities to optimize efficiency. The CNSC also makes use of external agencies in a few specialized areas (e.g., pressure boundary, fire protection inspections). A graded approach is used in a risk ranking process to inform the minimum frequency of compliance activities for each nuclear facility.

The following areas for improvement were identified:

- Formalization of the practice of encouraging CNSC inspectors to periodically visit other licensee locations to share operating experience and lessons learned;
- The current process to ensure on site inspectors' objectivity and independence could be enhanced by including other diverse elements to achieve a more comprehensive, regular review;
- Performing unannounced inspections of uranium fuel fabrication, refining and conversion facilities.

8. ENFORCEMENT

8.1. ENFORCEMENT POLICY AND PROCESS

The CNSC may take a series of enforcement actions in response to non-compliance by authorized parties with regulatory requirements. Offenses and indictable offenses are clearly and precisely defined in the NSCA (sections 48, 49 and 50).

Diverse enforcement actions could be taken, such as: oral warnings; written warnings; orders; withdrawal of an authorization; administrative monetary penalties (AMP); increased regulatory scrutiny; investigation and prosecution.

Financial penalties are defined in AMP Regulations which describe the categories of violations and determine the amount of financial penalties.

The NSCA provides CNSC staff with enforcement powers.

The CNSC has established and implemented an enforcement policy according to a graded approach. This enforcement policy is expressed in a CNSC document which states that enforcement actions must be commensurate with safety significance. It also gives CNSC staff guidance on how to use the enforcement tools available while performing their activities.

8.2. ENFORCEMENT IMPLEMENTATIONS

The IRRS team was informed that CNSC considers that its enforcement activities are not delivered to punish but rather to encourage compliance. The IRRS team has had the opportunity to confirm that this message is clearly understood and applied by CNSC staff through interviews and during on site observations.

The selection and execution of enforcement actions by CNSC staff are risk informed. Enforcement starts with oral warnings to the licensee. If a non-compliance is corrected by the licensee as soon as detected during an inspection, the issue is nevertheless noted in the report. Warning letters issued by CNSC management is a common and strong way to enforce the licensee to correct non-compliance. Orders are issued in case of immediate threats of health, safety or security.

The IRRS team noticed that AMPs are imposed by CNSC in response to a violation of a regulatory requirement. The AMP process is entirely managed by CNSC. There is no need to send the notice of violation to Court.

The CNSC posts regulatory enforcement actions on its website. The efforts towards transparency are considered a good practice as addressed in the field of communication mentioned in sub-chapter 3.8. The content is removed from the website two years after the date of issue.

The enforcement actions include orders, regulatory actions and AMPs. During the last two years, 53 enforcement actions have been imposed.

8.3. SUMMARY

The CNSC has established and implemented a well-balanced enforcement process by using a wide range of enforcement activities.

The fact that CSNC may deliver financial penalties with autonomy is a tool to enforce licensees to comply with their obligations.

The CNSC communicates on its enforcement process by publishing the list of enforcement actions on its website. This information delivered to the public reinforces CNSC’s efforts towards transparency and is considered a good practice.

9. REGULATIONS AND GUIDES

9.1. GENERIC ISSUES

The CNSC has a regulatory framework consisting of applicable legislation, regulations, licenses and regulatory documents (REGDOCs) which are made available for all stakeholders on the CNSC's external website. The regulatory framework provides instruments that outline the CNSC's regulatory requirements as well as the guidance, to meet the regulatory requirements. Regulatory document REGDOC-3.5.3 covers the regulatory fundamentals CNSC organization and high-level safety fundamentals. However, CNSC regulations do not comprehensively cover all IAEA Fundamental Safety Requirements i.e. application of defence in depth, which is recognized in REGDOCs. In Canada, a REGDOC will become a legally binding requirement after the finalization of the authorization process as the specific REGDOC is included in each individual license and in the licensing basis.

Regulatory management objectives are set out in the Federal Government's *Cabinet Directive on Regulation* (CDR). Development of regulatory framework is one of the core processes of CNSC's Managements system. Development of regulations, REGDOCs and CNSC participation in CSA standards development are well described in the Integrated Management System documentation. Regulatory framework development is managed under the guidance of the CNSC Regulatory Framework Steering Committee and Management Committee. CNSC regularly reviews its regulatory framework and conducts regulatory policy analysis to decide the need to develop or revise regulations and REGDOCs, and sets out a specific regulatory framework plan, outlining which regulations and REGDOCs are going to be revised and developed. CNSC has adequate resources for development of regulatory framework.

The IRRS team noted that the upper level process Document "Overview of Conduct Regulatory Policy Analysis" acknowledges the need to have consideration to international lessons learned and standards. However, the Framework Development Work Instruction Documents do not include a systematic coherent process to check the regulatory framework requirements nor do they directly reflect the hierarchy set in IAEA safety standards documents. The current CNSC process for consideration of IAEA safety standards in the regulatory framework could be more explicitly documented in the process documents.

Regulations cover areas of regulatory oversight activities and are supported with REGDOCs and CSA standards. The CSA standards may be adopted in whole or in part by the CNSC or the CNSC may decide to develop its own requirements and guidance for any particular topic. Regulations and REGDOCs address specific authorization areas with supported requirements for safety review and assessment. Requirements for Periodic Safety Review, Operating Experience Feedback and Severe Accident Management are presented in the framework requirements. Also, regulations and REGDOCs include discussions to address all planned and existing exposure situations. Regulatory functions of inspection and enforcement have been covered in the regulatory framework. However, the IRRS team noted that some CNSC REGDOCs are draft versions, and there is also a need to consider a review to minimize the overlapping requirements. The IRRS team observed that CNSC is updating REGDOC-2.11.1 Volume I and REGDOC-2.11-1 Volume III. Further, some older guides will be replaced with REGDOCs that are in draft versions for the moment; REGDOC 2.11.2 and REGDOC 3.3.1. Finalising the REGDOCs is included in the CNSC Regulatory Framework Plan.

The CNSC regulatory framework is periodically updated. CNSC creates and publishes the "Regulatory Stock Review Plan", which is a public list and description of planned reviews of regulations made under the NSCA that the CNSC plans to review over the next 10 years. It is intended to give Canadians, including businesses, Indigenous peoples, and trading partners, greater opportunity to inform the reviews of regulations and future plans. The IRRS team noted that the publication of the "Regulatory Stock Review Plan" contributes to transparency.

The CNSC uses a predominantly non-prescriptive approach in the application of its regulatory framework such that, the applicant can present an alternative approach in its application, which would result in the same, or greater level of safety, to that stated in the REGDOCs. The primary consideration is to ensure the outcome does not pose an unreasonable risk to the health, safety and security and the environment. CNSC carries out an assessment, that the regulatory requirements and fundamental safety functions have been met. CNSC also ensures that defence-in-depth is maintained, and safety margins are appropriate to address specific hazards over the facility's lifecycle.

The IRRS team noted that the CNSC applies a graded approach to licensing and compliance activities that is designed to be commensurate with the relative risk to health, safety, security, the environment and the implementation of the

international obligations to which Canada has agreed. The graded approach is described in REGDOC-3.5.3. The approach is driven primarily by an assessment of the risk associated with the activities being regulated and the performance history of the licensee. The IRRS noted that the CNSC adheres to the following principles, when applying the risk-informed approach: (1) the meeting of regulatory requirements, (2) the maintenance of sufficient safety margins, (3) the maintenance of defence in depth.

CNSC consults with interested parties in the development of the regulations and REGDOCs. CNSC also recognizes that Indigenous people have rights and interest with regard to the nuclear sector and CNSC seeks opportunities for engagement to ensure these rights and interest are respected. CNSC uses many modern communication channels for promotion of regulations and guides (e.g. through various social media platforms and emailing lists).

The IRRS team noted that the current RPR are not fully consistent with GSR Part 3 and that the proposed revision to the RPR and associated REGDOCs while closer, will still not be fully consistent with GSR Part 3, see also sub-chapter 9.9.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The current radiation protection regulations and requirements are not in accordance with GSR Part 3 with respect to optimization of radiation protection through dose constraints, dose limits and retention of dose records by licensees.*	
(1)	**BASIS: GSR Part 3 Requirement 11, para. 3.25 states that "***For occupational exposure and public exposure, registrants and licensees shall ensure, as appropriate, that relevant constraints are used in the optimization of protection and safety for any particular source within a practice."*
(2)	**BASIS: GSR Part 3 Requirement 12, para. 3.28 states that** *"Registrants and licensees shall ensure that the exposures of individuals due to the practices for which the registrants and licensees are authorized are restricted, so that neither the effective dose nor the equivalent dose to tissues or organs exceeds any relevant dose limit specified in Schedule III."*
(3)	**BASIS: GSR Part 3 Requirement 25, para. 3.104 states that** *"Records of occupational exposure for each worker shall be maintained during and after the worker's working life, at least until the former worker attains or would have attained the age of 75 years, and for not less than 30 years after cessation of the work in which the worker was subject to occupational exposure."*
R3	**Recommendation: CNSC should ensure that the radiation protection requirements are consistent with the requirements of GSR Part 3.**

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: CNSC has no *systematic approach to conduct a gap analysis between the new IAEA requirements and the regulatory framework. By identifying the possible gaps, the regulations and guides would be updated.*	
(1)	**BASIS: GSR Part 1 Requirement 33 states that** *"Regulations and guides shall be reviewed and revised as necessary to keep them up to date, with due consideration taken of relevant international safety standards and technical standards and of relevant experience gained."*
S14	**Suggestion: CNSC should consider implementing a systematic gap analysis between the IAEA requirements and the regulatory framework and updating the regulatory framework as necessary.**

9.2. REGULATIONS AND GUIDES FOR NUCLEAR POWER PLANTS

In Canada, the CINFR apply to nuclear facilities including nuclear reactors. For design of NPPs, there is a specific regulatory document, REGDOC-2.5.2 which establishes requirements and guidance for the design of new NPPs. The document includes a set of comprehensive design requirements and guidance that are risk-informed and align with accepted international codes and practices.

The fundamental IAEA requirement of "Defence In Depth" (DID) application in NPPs is presented in CNSC regulatory framework REGDOC level documents, which are not a directly binding regulation. Also, the fundamental safety functions in accordance with SSR 2/1 requirement 4 and failure tolerance requirements, are presented in REGDOC-2.5.2 Requirements for presenting the plant design basis, design extension, design limits and postulated initiating events are set forth in REGDOCs 2.4.1 and 2.4.2, REGDOC requirements become binding if the requirement to apply the DID is included in the license condition handbook as a part of NPP authorization.

REGDOC and SCA documentation cover SSR-2/1 for safe NPP design, and SSR 2/2 for NPP commissioning and operation. The REGDOCs include guidance and requirements for fundamental safety functions, plant states, design basis, design extension, design limits, postulated initiating events as well as reliability and failure tolerance requirements. REGDOCs for operational safety include guidance and requirements for operational limits and conditions, personnel qualification and training, monitoring of safety performance, accident management including severe accident management, operating procedures, modification, maintenance, testing, surveillance, inspection, monitoring, and control of activities performed by vendors, contractors and suppliers.

9.3. REGULATIONS AND GUIDES FOR RESEARCH REACTORS

In Canada basic requirements for research reactors are established in GNSCR and CINFR, which apply also to other nuclear facilities.

In addition to the regulations, there are guides and regulatory documents that also apply for research reactor facilities. These regulatory documents cover the entire lifecycle of research reactors according to the IAEA requirements. The authorization process described in CNSC REGDOC-3.5.1 applies to the licensing of research reactors. The CNSC published a specific regulatory guide connected with small reactors, which may include research reactors. REGDOC-1.1.5, (in conjunction with other REGDOCs) sets out requirements and guidance for submitting an application to the CNSC for the small reactor facility in Canada. The REGDOC makes reference to requirements and guidance for a licence to prepare a site, and application guides for a licence to construct, and a licence to operate. REGDOC-1.1.5 also identifies considerations that the CNSC takes into account when assessing the adequacy of submissions. This document will be used by CNSC staff to assess licence applications for proposed small reactors, which also include advanced reactors.

The IRRS team noted that the regulations and guides relevant to research reactors provide a comprehensive set of requirements and guides for licensing and oversight of research reactors in Canada.

9.4. REGULATIONS AND GUIDES FOR FUEL CYCLE FACILITIES

CINFR and UMMR apply for fuel cycle facilities in Canada. These regulatory framework documents contain requirements for licensing documentation to be provided within an application. There are several REGDOCs which contain requirements and guidance for fuel cycle facilities.

To set out other specific requirements, CNSC uses the CSA standards, if applicable for certain areas. Relevant CSA standards referred to in a license handbook as documents are containing the compliance verification criteria. There are no REGDOCs covering requirements to the following specific safety issues for fuel cycle facilities: site evaluation, design and safety assessment; construction and commissioning programs, operational limits and conditions, maintenance, periodic testing and aging management, periodic safety reviews.

The IRRS team observed that the current suite of REGDOCs does not fully address the requirements of SSR-4. According the CNSC Action Plan REGDOC 2.4.4 is under development with a targeted completion date of 2020.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *CNSC regulatory framework does not entirely specify safety requirements and associated criteria for fuel cycle facilities. However, CNSC Regulatory Framework Plan and Action Plan includes development of the regulatory document regarding safety analysis for Class IB facilities, which intends to establish relevant requirements and criteria for fuel cycle facilities.*	
(1)	**BASIS: GSR Part 1 Requirement 32 states that:** "*The regulatory body shall establish or adopt regulations and guides to specify the principles, requirements and associated criteria for safety upon which its regulatory judgements, decisions and actions are based".*
S15	**Suggestion: CNSC should consider the requirements of SSR-4 and relevant IAEA guidance when specifying safety requirements and criteria for fuel cycle facilities.**

9.5. REGULATIONS AND GUIDES FOR WASTE MANAGEMENT FACILITIES

The CNSC's regulatory approach for radioactive waste and decommissioning is developed from the NSCA, and articulated in regulations, licences, LCHs and regulatory documents as described in 9.1.

There are a number of legislations that apply to radioactive waste management facilities, waste nuclear substances and waste management activities depending on their type and scale. Regulations and REGDOCs are supplemented by the CSA standards. There are six CSA standards to supplement the waste management area. Current regulatory documents specific to waste management include REGDOC 2.11 and 2.11.1 Volume II, 2.11.1 Volume III (version 1).

REGDOC-2.11.1, Volume I, is currently in development and aims to clarify the CNSC requirements for applications for licenses related to waste management facilities. Further, REGDOC 2.11.1, Volume III is also in development.

The IRRS team observed that there is an ongoing review of REGDOCs in the area of waste management. The IRRS team noted that finalized versions of REGDOCs should be in line with the IAEA safety standards when the draft versions are finalized, since the updates address identified gaps between the regulations and the CSA standards. A relevant Suggestion 14 is in sub-chapter 9.1.

9.6. REGULATIONS AND GUIDES FOR RADIATION SOURCES FACILITIES AND ACTIVITIES

The CNSC has developed a series of REGDOCs to assist licensees to comply with the regulation requirements and the terms and conditions in licenses for nuclear substances and radiation devices uses.

The REGDOCs 1.4.1 and 1.6.2 are under development and are expected to be finalized soon. The issuing of REGDOC 1.6.2. will document the required qualification for the RSO designated for activities with nuclear substances and radiation devices.

The IRRS team was informed that the REGDOCs G-121, G-91 and G-313 issued in 2000, 2003 and 2006 respectively will be replaced by new REGDOCs with updated content. A relevant Suggestion 14 is in sub-chapter 9.1.

9.7. REGULATIONS AND GUIDES FOR DECOMMISSIONING ACTIVITIES

The CNSC's regulatory approach for decommissioning activities stems from the NSCA and articulated in regulations, licences, LCHs and regulatory documents as described in 9.1.

There are a number of legislations that apply to decommissioning, depending on the type and scale of the facility or activity. Regulations and REGDOCs are supplemented by the CSA standard, and for decommissioning, one CSA standard is applicable. This standard stipulates that the REGDOCs for waste management cover waste from decommissioning activities as well.

The CNSC is developing REGDOC 2.11.2 which will update G-219. The REGDOC contains requirements and guidance that address the GSR Part 6 requirements. The REGDOC is in development and listed in the CNSC's Regulatory Framework Plan, and CNSC's intention is to continue to develop the REGDOC. Further, the CNSC is developing REGDOC 3.3.1, which will update G-206. Relevant Suggestions S6 and S14 are in sub-chapters 5.5. and 9.1, respectively.

9.8. REGULATIONS AND GUIDES FOR TRANSPORT

The transport of nuclear substances in Canada is regulated by PTNSR 2015 and TDG that apply to all modes of transport. The CNSC has developed REGDOCs 2.14.1 and RD-364 to assist the applicant in the use of PTNSR 2015, and REGDOC-2.14.1, Volume II, for the design of a radiation protection program for the transport nuclear substances.

The Joint Canada-United States Guide, RD-364, is consistent with a superseded edition of the IAEA TS-R-1 and should be revised to refer to PTNSR 2015 that incorporates the IAEA SSR-6. The duration of the RD-364 revision process could be affected due to the involvement of the USNRC. Nevertheless, the document represents a useful tool, and provides comprehensive and very detailed guidance on administrative and other technical aspects to be considered in the joint approval of the package design. It contributes to the harmonization in documentation, assessment procedures, as well as assessment criteria.

The PTNSR 2015 in paragraph 24 requires the implementation of a management system for transport of radioactive material as specified in paragraph 106 of the IAEA Regulations SSR-6. Guidance on management systems for transport or the adoption by an explicit reference to the IAEA TS-G-1.4 should be considered.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The* Joint Canada-United States *RD-364 refers to IAEA TS-R-1, while the PTNSR 2015 incorporate the IAEA SSR-6. This could cause uncertainty during the preparation of the Safety Analysis Report for the certification of Type B(U) or fissile package by the applicant.*	
(1)	**BASIS: IAEA GSR Part 1 Requirement 33 states that** *"Regulations and guides shall be reviewed and revised as necessary to keep them up to date, with due consideration of relevant international safety standards and technical standards and of relevant experience gained".*
R4	**Recommendation: The CNSC should revise its guidance for package design certification applications to align it with IAEA SSR-6.**

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The IAEA Regulations SSR-6 establish that a management system based on international, national or other standards acceptable to the competent authority shall be established and implemented for all the activities associated to the transport of radioactive material. The CNSC has not explicitly established or adopted guidance regarding management system for transport.*	
(1)	**BASIS: GSR Part 1 Requirement 32 states that** *"The regulatory body shall establish or adopt regulations and guide to specify the principle, requirements and associated criteria for safety upon which its regulatory judgement, decisions and actions are based"*
S16	**Suggestion: The CNSC should consider establishing or adopting guidance aligned with IAEA TS-G-1.4.**

9.9. REGULATIONS AND GUIDES FOR OCCUPATIONAL EXPOSURE

The RPR is the principal document relevant to occupational radiation protection. The RPR is based on the IAEA International Basic Safety Standards 115. As stated in the action plan, the RPR and associated REGDOCs and guidance are being updated in accordance with IAEA GSR Part 3, see recommendation R3 in sub-chapter 9.1.

The proposed update, expected to be published in the first half of 2020, will bring the RPR more in line with GSR Part 3. The new RPR however does not foresee a reduction in the dose limit to the pregnant nuclear energy worker (NEW) from 4 mSv to 1 mSv nor the establishment of dose limits for apprentices or students of 16 to 18 years of age (GSR Part 3 requirement 28 and schedule III.2) nor the establishment of restricted areas defined as supervised areas (GSR Part 3 Requirement 24). The period of record keeping by licensees is not consistent with GSR Part 3. Recommendation R3 in sub-chapter 9.1. addresses the application of a systematic gap analysis.

The RPR establishes that licensed dosimetry is required when annual effective doses above 5 mSv are foreseen. Between 1 mSv/y and 5 mSv/y regulatory guidance states that workers doses may be estimated or measured through workplace monitoring, although individual monitoring is the preferred method. The IAEA GSG 7 suggests that individual monitoring should be conducted when the prospective annual effective dose to the worker is above 1 mSv/y. The IRRS team encourages the CNSC to revise the draft REGDOC 2.7.2 Volume I to take this into consideration.

For workplaces that are regulated by the CNSC where the activities may give rise to radon and its progeny, licensees are required to ascertain the magnitude of this exposure. The effective dose and equivalent dose (section 5 of RPR) from radon and its progeny are then considered part of the total dose to nuclear energy workers. Radon in federal workplaces is regulated under the Canada Labour Code and the Canada Occupational Health and Safety Regulations. The current reference level for radon in federal workplaces (800 Bq/m3) is currently being revised to align with the reference level established by HC (200 Bq/m3). Provinces and territories have jurisdiction for occupational radon exposure in work places that are not regulated by the CNSC or are non-federal work-places and these are outside the scope of this mission.

9.10. REGULATIONS AND GUIDES FOR MEDICAL EXPOSURE

Out of scope

9.11. REGULATIONS AND GUIDES FOR PUBLIC EXPOSURE

The CNSC has developed a series of REGDOCs, as well as adopting relevant CSA standards to assist licensees comply with the regulatory requirement to protect the public and the environment against exposure, including complying with the dose limits for a member of the public established in the RPR.

These were reviewed by the IRRS team and found to represent a comprehensive set of documents to support licensees in meeting the objective of the control of doses to the public, and to be in line with GSR Part 3.

For existing exposure situations at licensed sites, the licensee is required to establish criteria for remedial actions and submit that information to the CNSC and/or other relevant authority. The appropriate federal or provincial/territorial regulator would review and establish criteria for remedial actions. The coordination of reference levels is done through federal/provincial/territorial committees and so is beyond the scope of this mission.

There are no federal regulations related to public exposure to radon in dwellings or public buildings, however, HC has recommended a radon action level of 200 Bq/m^3 under the NRP consistent with GSR Part 3.

HC has developed guidance to promote harmonised application of protection at the Provincial and Territory levels. These include guidelines on management of NORM from industrial practices, radioactivity in drinking water, and radon. The IRRS team reviewed the guidance and found it to be consistent with GSR Part 3.

The responsibility for implementing measures to reduce risks from exposure to radiation in construction materials and drinking water is shared among the different levels of government. A reference level has been established for drinking water (0.1 mSv/y), this is in line with WHO guidelines and GSR Part 3. The need for reference levels in other commodities in routine situations have not been identified.

9.12. SUMMARY

The CNSC's regulatory framework is mature and provides instruments that clearly outline the regulatory requirements as well as the REGDOCs to meet the regulatory requirements. CNSC is updating and developing its regulatory framework by implementing a long-term plan, Regulatory Stock Review Plan, to create and maintain regulations

5 areas for improvement were identified:

- Alignment of the RPR with GSR Part 3;
- Implement a systematic gap analysis between the IAEA requirements and the regulatory framework and updating the regulatory framework as necessary;
- Consider the requirements of SSR4 and relevant IAEA guidance when specifying safety requirements and criteria for fuel cycle facilities;
- Alignment of transport requirements with SSR 6;
- Development of guidance aligned with IAEA TS-G-1.4.

10. EMERGENCY PREPAREDNESS AND RESPONSE REGULATORY ASPECTS

On 3 to 13 June 2019, at the requested of the Government of Canada, an Emergency Preparedness Review (EPREV) mission was undertaken. EPREV missions are designed to provide a peer review of emergency preparedness and response (EPR) arrangements in a country, based on the IAEA Safety Standards. The mission focused on preparedness for emergencies originating from events at Emergency Preparedness Category I (EPC I) facilities, as defined in IAEA GSR Part 7 which includes emergencies taking place at NPPs, irrespective of their initiating events.

As agreed with the Canadian counterparts responsible for the EPREV and those responsible for the IRRS scheduled for September 2019, Module 10 (EPR) of the IRRS was included in the Canada EPREV mission and thus excluded from the Canada IRRS mission.

11. INTERFACE WITH NUCLEAR SECURITY

11.1. LEGAL BASIS

The CNSC is a "3S" nuclear regulator, and it is the federal nuclear regulator responsible for nuclear safety, security and safeguards. Canada has a legal framework for maintaining nuclear security. The CNSC has regulations and regulatory documents which give licensees requirements and guidance on how to meet regulatory expectations to ensure nuclear facilities are designed and the configuration of such facilities ensure the optimization of nuclear security and safeguards. The CNSC is responsible for enforcing the Nuclear Security Regulations (NSR), which were enabled under the NSCA. The NSR provides the regulatory requirements that licensees or applicants must meet regarding nuclear security. For Safeguards and nuclear material accountancy, REGDOC 2.13.1 sets out the requirements and guidance for safeguards programs for licensees who possess nuclear material, operate a uranium or thorium mine or carry-out specified types of nuclear fuel-cycle related activities. The Nuclear Non-Proliferation Import and Export Control Regulations enables the CNSC to exercise control over nuclear material as it moves across Canada's border.

The CNSC has developed several regulatory documents that contain harmonized security and safety requirements and the interfaces between the two. Furthermore, CSA N286-12 requires licensees to integrate measures for safety and security. The CNSC requires designers of a NPP to consider security, safety and safeguards measures, therefore, REGDOC-2.5.2 states that safety and security measures may not compromise one another. The IRRS team encourages the CNSC to ensure consistent application of this requirement for all nuclear facilities.

Canada is a contracting party to a number of international treaties that establish common obligations and mechanisms to ensure safety and security. The CNSC is responsible for implementing Canada's obligations under these treaties.

11.2. REGULATORY OVERSIGHT ACTIVITIES

Licensees must comply with the NSCA, the NSR, licence conditions, LCH and REGDOCs or CSA standards in their licensing basis. They are required to have in place emergency preparedness and response plans, nuclear security programs and infrastructure commensurate with the national threat assessment, design basis threat and the level of risk of the facility or activity. These are reviewed as part of the licensing process and their implementation is reviewed through ongoing compliance inspections and audits.

Security inspections are conducted in accordance with CNSC approved processes. The CNSC's Nuclear Security Division (NSD) conducts inspections in collaboration with safety divisions to ensure that safety and security requirements are addressed cohesively. CNSC licensing and inspection staff are trained to assess and verify safety and security requirements based on the use and risk significance of the nuclear material or facility. For nuclear facilities, a security inspector will collaborate with the safety inspector or on site safety inspector. As part of the security inspector training, CNSC inspectors receive training get familiarize with the site, nuclear facility and its operational activities. Similarly, the safety inspector assigned as the point of contact for nuclear security receives training on nuclear security, on a need-to-know basis, and how to conduct security rounds inspections. The security inspection and the inspection report are done jointly. For nuclear substances, radiation devices or Class II prescribed equipment, safety inspectors receive training in security so that they can conduct the security inspections. The responsibilities for oversight and enforcement are defined in a joint protocol between CNSC's ROB and TSB.

Further, under the Vendor Design Review process for Small Modular Reactors, the NSD and safety divisions work together in design assessments, licensing and the development of REGDOCs to ensure that safety and security requirements are integrated. CNSC is in the process of developing further REGDOCs and has indicated the intention to further entrench the interfaces between safety and security in all future REGDOCs.

The Directorate of Nuclear Substance Regulation (DNSR) and the Directorate of Security and Safeguards have implemented a formal protocol and a work instruction document to address their mutual cooperation. For licensees of nuclear substances, radiation devices or Class II prescribed equipment, the responsibilities for oversight and enforcement are clearly defined in a joint protocol that has been approved at the Director General level of the CNSC's ROB and TSB. Roles and responsibilities between the relevant safety division and the NSD are clearly established and documented. Consultation and coordination of compliance activities including security inspections are discussed at the CNSC's Directorate of Safeguards and Security and DNSR Working Group on Radioactive Source Security

and documented in Working Group minutes. Security Awareness training is delivered to safety inspectors by the NSD. This training is integrated within the mandatory qualification and training for new inspectors for the Operations Inspection Division and Accelerators and Class II Facilities Division within DNSR. DNSR inspectors verify both safety and security regulatory requirements while on-site at specified frequencies. The IRRS team noted that the DNSR performs work for security, which show a very good working relationship. The NSD has also established very good working relationships with the other safety divisions, such as the DNCFR and the Directorate of Power Reactor Regulation, but do not have formal agreements. An internal review has been done in July 2019, which identified the need to incorporate a collaboration framework. The IRRS team encourages that the collaborative framework be established within the management system.

OPEX on safety is shared with security to address potential safety/security issues. Some OPEX may lead to cooperation on projects between safety and security. OPEX from security inspections is shared within the NSD and with the safety divisions, as appropriate.

In Canada there are several organizations with responsibilities for security issues. These organizations and CNSC NSD have a system to receive and share security incidents. These incidents are only shared with safety on a need-to-know basis.

11.3. INTERFACE AMONG AUTHORITIES

The CNSC has established relationships with other organizations having responsibility for security and emergency and maintains MOUs with some organizations. The CNSC maintains MOUs with the Canadian Border Service Agency (CBSA), the Royal Canadian Mounted Police and Transport Canada (TC) for exchanging information and for the provision of technical advice. CNSC also has an MOU with the USNRC to exchange security information on the transport of radioactive materials. The CNSC works closely with nuclear facility operators, law enforcement, intelligence agencies, international organizations and other government departments to assure that nuclear materials, nuclear facilities and other radioactive materials and associated facilities are adequately protected.

The CNSC leads the National Nuclear Forensics Capability (NNFC) which integrates resources, capabilities and expertise from CNSC and across the Government of Canada to support its national nuclear security, safeguards and non-proliferation interests and requirements. Apart from the network of laboratories under the NNFC, the CNSC also has its own laboratory to undertake nuclear forensic capability and regulatory related research. The laboratory maintains and develops forensics capabilities in order to support investigations related to nuclear terrorism and crime.

The CNSC provides information to operators, nuclear substance licensees, local police departments etc. to enhance security awareness. In the case of nuclear substance licensees (e.g. hospitals) this led to a greater awareness of possible security threats and the development of a security plan for the site. Being more transparent and doing outreach has also led to better cooperation with other federal and provincial departments.

11.4. SUMMARY

The CNSC is a “3S” nuclear regulator, it is responsible for nuclear safety, security and safeguards. CNSC’s safety and security staff work closely together to harmonize safety and security requirements and measures. The CNSC has made efforts to integrate safety and security.

IRRS CANADA REVIEW AND COUNTERPARTS TEAM

APPENDIX I - LIST OF PARTICIPANTS

INTERNATIONAL EXPERTS:		
ZIAKOVA Marta	Nuclear Regulatory Authority (UJD)	Marta.Ziakova@ujd.gov.sk
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APPENDIX II - MISSION PROGRAMME

Canada IRRS Mission Schedule

3 – 13 September 2019

First Week

Time	SUN	MON (Holiday)	TUE	WED		THU	FRI		SAT		SUN	
9:00-10:00	Arrival of Team Members	Free time	Entrance Meeting	Interviews	Site Visits	Interviews	Interviews	DTC writes introductory parts	TM write Report TL and DTL review introductory part		**Free day, Social Tour**	Reading, Cross-reading of the Report (as needed)
10:00-11:00									**Draft text to TL**			
11:00-12:00												
12:00-13:00			Lunch with Host	Standing lunch		Standing lunch	Standing lunch		Standing lunch			
13:00-15:00		Initial Team Meeting: • IRRS process • Main objectives • Report writing • Schedule • First observations	Interviews	Interviews	Site Visits	Interviews	Interviews	DTC writes introductory parts	Policy Discussions			
14:00-15:00 15:00-16:00									Secretariat edits the report **Preliminary Draft Report Ready**	Cross-reading by TM		
16:00-17:00						**Written preliminary findings delivered**						
17:00-18:00		In-Group discussions	Daily Team Meeting	Daily Team Meeting		Daily Team Meeting: Discussion of findings	Daily Team Meeting		Daily Team Meeting			
18:00-20:00	Informal dinner	19:00 Team Dinner	Dinner	Dinner		Dinner	Dinner		Dinner			
20:00-24:00			Writing of the report	Writing of the report		Secretariat edits Report TM write Report	Writing of the report		TM Read Draft			

Canada IRRS Mission Schedule

3 – 13 September 2019

Second Week

	MON	TUE	WED		THU		FRI	
9:00-10:00	• Discussing and improving Draft Report • Cross-Reading TL, DTL, TC and DTC read everything	Individual discussions of Rs, Ss and GPs with counterparts / TC, DTC prepares Executive Summary	Host reads Draft		**Written comments by the Host**		**Submission of the Final Draft**	9:00-10:00
10:00-12:00					Discussion of Host comments by the Team		Exit Meeting	10:00-12:00
12:00-13:00	Standing Lunch	Standing lunch	Standing lunch		Standing Lunch		Standing Lunch	12:00-13:00
13:00-14:00	Discussion of the results of Cross-Reading	Team discussion of the changes in observations due to discussions with counterparts	Host reads Draft	Discussion of Executive Summary and TC, DTC prepares exit presentation / TC drafts the Press Release Deliver Executive Summary to Host	Team meeting for finalisation of the Report Discussion of Host comments by the Team	Briefing of the DDG Finalisation of the press release	Departure	13:00-15:00
14:00-15:00								
15:00-17:00	Finalization of the report parts by team members	Team included agreed changes into report						15:00-17:00
17:00-18:00		Cross-Reading, TL, DTL, TC and DTC read everything						17:00-18:00
18:00-20:00	Dinner	Dinner	Dinner		Farewell Dinner			18:00-20:00
20:00-21:00	Secretariat edits the report	Common read through and finalisation of the report by the Team	Host reads Executive Summary		Team meeting for finalisation of the Report			20:00-21:00
21:00-24:00		**Submission of the Draft to the Host**						21:00-24:00

APPENDIX III – IRRS MISSION COUNTERPARTS

	IRRS Experts	Lead Counterpart	Support Staff
1.	**RESPONSIBILITIES AND FUNCTIONS OF THE GOVERNMENT**		
	DRABOVA Dana	VELSHI Rumina JAMMAL Ramzi	BOURGEAU Pierre-Daniel CATTRYSSE Clare McGEE Kelly POOLE Shannon POWER Robert
2.	**GLOBAL NUCLEAR SAFETY REGIME**		
	NES Johanna	JAMMAL Ramzi	CATTRYSSE Clare POIRIER Jean-Claude
3.	**RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY**		
	MUELLER GERMANA Annatina	VELSHI Rumina JAMMAL Ramzi	BOURGEAU Pierre-Daniel BUTLER Robin CATTRYSSE Clare McGEE Kelly POWER Robert WALKER-SISTTIE Rhonda
4.	**MANAGEMENT SYSTEM OF THE REGULATORY BODY**		
	SLOKAN-DUSIC Darja	ROBERTSON Hugh	HOWDEN Christine SENATHIRAJAH Ananda
5.	**AUTHORIZATION**		

	IRRS Experts	Lead Counterpart	Support Staff
	HAYES Michelle	LEBLANC Marc FRAPPIER Gerry	MOSES Colin
5.-9.	**RESEARCH REACTORS**		
	GLOWACKI Andrzej	DUCROS Caroline	BURTON Patrick JENDEN James TANGUAY Pierre
5.-9.	**FUEL CYCLE FACILITIES**		
	BOGDANOVA Tatiana	EATON Sarah JONES Mike	SMITH Graham YOUNG Michael
5.-9.	**RADIOACTIVE WASTE MANAGEMENT FACILITIES AND DECOMMISSIONING**		
	ZAZZI Åsa PATHER Thiagan BRUNO Gerard	GLENN Karine GREENCORN Nancy	CHERIF GACEM Mohamed FORTIER Eric LEGREE Brett OUE Shirley THOMPSON Shona
5.-.9.	**RADIATION SOURCES APPLICATIONS**		
	ECONOMIDES Sotiris LETZELTER Claire	FAILLE Sylvain BROEDERS Mark BOUCHARD André	ALU Daniel BRODA Kasia JOBIN Luc OBUCHI Ross PLANTE Jacinthe POZIHUN Lindsay
5.-9.	**TRANSPORTATION**		

	IRRS Experts	Lead Counterpart	Support Staff
	TRIVELLONI Sandro	OWEN-WHITRED Karen	DAGENAIS François POSADA Lester RAMSAY Jeff YOUNG Michael
5.-9.	**OCCUPATIONAL RADIATION PROTECTION**		
	HUNT John	PURVIS Caroline	DODKIN Christina
5.-9.	**PUBLIC PLANNED AND EXISTING EXPOSURE**		
	MCMAHON Ciara	MCKEE Malcolm	LAM Jeffery THERIAULT Bertrand QUAYLE Deborah (HC)
6.	**REVIEW AND ASSESSMENT**		
	JUHASZ Laszlo	GRONDIN Marie-Pierre NEWLAND Dave	LANGE Karina MILLER Douglass
7.	**INSPECTION**		
	WARNICK Gregory	CAMPBELL Kimberly VIKTOROV Alex	BAIG Arslan BOUCHARD André BURTON Sean CARRIERE Danielle KHOUAJA Hatem POIRIER Jean-Claude
8.	**ENFORCEMENT**		

	IRRS Experts	Lead Counterpart	Support Staff
	ALLAIN Olivier	CAMPBELL Kimberly VIKTOROV Alex	BROEDERS Mark CASTERTON Lee KHOUAJA Hatem POIRIER Jean-Claude TRAN Nhan
9.	**REGULATIONS AND GUIDES**		
	NEVALAINEN Janne	TORRIE Brian FORREST Lynn	GRATTON Wayne
10.	**EMERGENCY PREPAREDNESS AND RESPONSE REGULATORY ASPECTS**		
	KOBETZ Tim	n/a	
11.	**INTERFACE WITH NUCLEAR SECURITY**		
	NES Johanna	TENNANT Richard DUGUAY Raphaël	

APPENDIX IV - RECOMMENDATIONS (R), SUGGESTIONS (S) AND GOOD PRACTICES (GP)

AREA	R: Recommendation S: Suggestion GP: Good Practice	Recommendations, Suggestions or Good Practices
1. RESPONSIBILITIES AND FUNCTIONS OF THE GOVERNMENT	S1	Suggestion: The Government should consider explicitly addressing SF-1, Principle 4 (Justification) in its legal framework.
	S2	Suggestion: The Government should consider expressly assigning, in its legal framework, the prime responsibility for safety to the person or organization responsible for a facility or an activity.
	S3	Suggestion: The Government should consider enhancing the legal framework to explicitly stipulate that compliance with regulations and requirements established or adopted by the regulatory body does not relieve the person or organization responsible for a facility or an activity of its prime responsibility for safety.
	GP1	Good Practice: The CNSC has developed a targeted, multi-faceted programme for dealing with historic radium luminous devices in the public domain.
	R1	Recommendation: The Government should enhance the existing policy and establish the associated strategy to give effect to the principles stated in the Canadian Radioactive Waste Management Policy Framework.
2. THE GLOBAL SAFETY REGIME	GP2	Good Practice: The CNSC has a comprehensive system for collecting, analysing and sharing regulatory experience feedback.
3. RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY	S4	Suggestion: The CNSC should consider continuing to focus on its human resource management plan to ensure that CNSC continues to have access to a sufficient number of qualified and competent staff to regulate existing facilities and activities as well as new and emerging technologies in accordance with the nature of facilities.
	GP3	Good Practice: The CNSC is very committed to ensuring a high level of transparency and openness, through an established, systematic, accountable and comprehensive set of activities that ensure transparency, openness, involvement, dialogue and accountability with the public, stakeholders and interested parties about its regulatory activities and decisions.

4. MANAGEMENT SYSTEM OF THE REGULATORY BODY	**S5**	**Suggestion: CNSC should consider consolidating all elements of its safety policy into a single document.**
5. AUTHORIZATION	**GP4**	**Good Practice: CNSC proactively developed extensive guidance and processes to assist potential applicants determine the content of the SMR application.**
	S6	**Suggestion: CNSC should consider revising its current and planned requirements in the area of decommissioning to align with the IAEA guidance that entombment is not considered an acceptable strategy for planned decommissioning of existing NPPs and future nuclear facilities.**
	S7	**Suggestion: CNSC should consider establishing a procedure to ensure the systematic implementation of justification in the authorisation of all practices involving radiation sources.**
	S8	**Suggestion: The CNSC should consider including notification alone as an option for the regulatory control of nuclear substances and radiation devices in accordance with a graded approach.**
	R2	**Recommendation: The CNSC should establish or approve dose constraints for all Class I type facilities.**
	S9	**Suggestion: The CNSC should consider consistently implementing the concept of dose constraints for all facilities and standardising regulatory practice for derived release limits (DRLs).**
6. REVIEW AND ASSESSMENT	**GP5**	**Good Practice: The peer reviews adopted for certification of packages minimize the risk associated with the certification of higher risk designs and increases reliability and consistency of certificates issued by CNSC. They also improve communication and knowledge sharing among Certification Engineers.**
	GP6	**Good Practice: HC has undertaken a strategic differentiation of messages on radon in order to effectively target sub-groups of the public. This represents an innovative and effective programme for raising awareness of radon and the necessary actions to mitigate it, targeting a point of time when people are more likely to be receptive to the message.**
	S10	**Suggestion: HC should consider undertaking a survey of radionuclide levels in building materials or indoor gamma dose rates arising from building materials to determine if**

		they make a significant contribution to public exposure.
7. INSPECTION	**S11**	**Suggestion: CNSC should consider formalizing the practice of inspector exchanges between licensee locations for inspection assistance to ensure the operating experience and lessons learned from assisting other CNSC staff perform inspections at different licensee locations are maximized.**
	S12	**Suggestion: CNSC should consider its process to formalise all elements used to ensure a comprehensive, regular review of the objectivity and independence of the on site inspectors.**
	S13	**Suggestion: The CNSC should consider performing unannounced inspections for uranium fuel fabrication, refining and conversion facilities.**
8. ENFORCEMENT	**N/A**	
9. REGULATIONS AND GUIDES	**R3**	**Recommendation: CNSC should ensure that the radiation protection requirements are consistent with the requirements of GSR Part 3.**
	S14	**Suggestion: CNSC should consider implementing a systematic gap analysis between the IAEA requirements and the regulatory framework and updating the regulatory framework as necessary.**
	S15	**Suggestion: CNSC should consider the requirements of SSR-4 and relevant IAEA guidance when specifying safety requirements and criteria for fuel cycle facilities.**
	R4	**Recommendation: The CNSC should revise its guidance for package design certification applications to align it with IAEA SSR-6.**
	S16	**Suggestion: The CNSC should consider establishing or adopting guidance aligned with IAEA TS-G-1.4.**

APPENDIX V - REFERENCE MATERIAL PROVIDED BY CNSC

Module	Document Name
Module 1 – Responsibilities and Functions of the Government	NSCA
	Nuclear Energy Act
	Nuclear Fuel Waste Act
	Nuclear Liability and Compensation Act
	Canadian Environmental Assessment Act, 2012
	Constitution Act, 1867 to 1982
	Financial Administration Act
	Food and Drugs Act
	General Nuclear Safety and Control Regulations
	Class I Nuclear Facilities Regulations
	Class II Nuclear Facilities and Prescribed Equipment Regulations
	Nuclear Substances and Radiation Devices Regulations
	Uranium Mines and Mills Regulations
	RPR
	Packaging and Transport of Nuclear Substances Regulations, 2015
	Nuclear Non-Proliferation Import and Export Control Regulations
	Nuclear Security Regulations
	Administrative Monetary Penalties Regulations
	CNSC Cost Recovery Fees Regulations
	CNSC Rules of Procedure
	CNSC By-Laws
	Transportation for Dangerous Goods Regulations
	Cabinet Directive on Regulation
	Canada Occupational Health and Safety Regulations
	Values and Ethics Code for the Public Sector
	Food and Drug Regulations
	List of MoUs
	Memorandum of Understanding between CNSC and Royal Canadian Mounted Police
	Memorandum of Understanding between CNSC and Transport Canada
	Memorandum of Understanding between the CNSC and Environment Canada
	Memorandum of Understanding between the CNSC and Fisheries and Oceans Canada
	Memorandum of Understanding between the CNSC and HC
	Memorandum of Understanding between the CNSC and Ontario Ministry of Labour
	Memorandum of Understanding between the CNSC and The Department of National Defence

	Administrative Agreement between the CNSC and the Government of Saskatchewan
	G-91 Ascertaining and Recording Radiation Doses to Individuals
	G-206 Financial Guarantees for the Decommissioning of Licensed Activities
	G-219 Decommissioning Planning for Licensed Activities
	P-211 Compliance
	REGDOC-1.1.1 Site Evaluation and Site Preparation for New Reactor Facilities
	REGDOC-1.4.1 Licence Application Guide Class II Nuclear Facilities and Prescribed Equipment
	REGDOC-1.6.1 Licence Application Guide: Nuclear Substances and Radiation Devices
	REGDOC-2.2.2 Personnel Training
	REGDOC-2.2.3 Personnel Certification: Exposure Device Operators
	REGDOC-2.2.3 Personnel Certification: Radiation Safety Officers
	REGDOC-2.7.1 Radiation Protection (draft)
	REGDOC-2.7.2 Dosimetry, Volume I: Ascertaining Occupational Dose
	REGDOC-2.9.1 Environmental Principles, Assessments and Protection Measures
	REGDOC-2.11 Framework for Radioactive Waste Management and Decommissioning in Canada
	REGDOC-2.11.1 Waste Management, Volume III: Safety Case for Long-Term Radioactive Waste Management (draft)
	REGDOC-2.11.1 Waste Management, Volume II: Management of Uranium Mine Waste Rock and Mill Tailings
	REGDOC-2.11.1 Waste Management, Volume I: Management of Radioactive Waste (draft)
	REGDOC-3.5.2 Compliance and Enforcement Administrative Monetary Penalties
	REGDOC-3.5.3 Regulatory Fundamentals
	CNSC Conflict of Interest and Post-Employment Policy
	CNSC Directive on Reporting and Managing Financial Conflicts of Interest
	CNSC Knowledge Management Policy
	CNSC Mobility Directive
	CNSC Open Door Policy
	CNSC Staffing Policy
	Policy on Science in a Regulatory Environment
	Policy on the Use of a Risk-Informed Approach for Regulatory Oversight of Nuclear Activities and Facilities
	Safety and Control Area Framework
	CNSC Contracting Policy
	Commission Member Document (CMD) Process
	Conduct Regulatory Policy Analysis
	Develop and Publish Regulations
	Conducting a Technical Assessment

	How to Establish Communication Protocol between CNSC and Licensees or Applicants
	Event Initial Reporting
	Independent Environmental Monitoring Program Process
	Difference of Professional Opinion (DOPO) Process
	Non-Concurrence Process
	Nuclear Power Reactor Operating Licence - Bruce NGS A and B
	Licence Condition Handbook - Bruce NGS A and B
	Class II Nuclear Facility and Prescribed Equipment Licence - Nordion (Canada) Inc
	Nuclear Substance and Radiation Device Licence - McGill University Health Centre
	Nuclear Substance and Radiation Device Licence - Mistras Services Inc
	Canadian National Report for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management - Sixth Report October 2017
	Canadian Guidelines for the Management of NORM
	Guidance on Human Health Detailed Quantitative Risk Assessment
	Guidelines for Canadian Drinking Water - Radiological Parameters
	CNSC Values and Ethics Code
	CNSC Key Behavioural Competencies
	Inspection Training and Qualification Program
	Technical Information Sheet: CNSC Screening Levels for the Independent Environmental Monitoring Program
Module 2 - Global Safety Regime	NSCA
	REGDOC-3.1.1 Reporting Requirements for Nuclear Power Plants
	REGDOC-3.1.2 Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills
	REGDOC-3.2.1 Public Information and Disclosure
	Conduct Regulatory Policy Analysis
	Event Initial Reporting
	Canadian National Report for the Convention on Nuclear Safety - Seventh Report Aug 2016
	CNSC Fukushima Task Force Report
	CNSC Integrated Action Plan on Lessons Learned from the Fukushima Daiichi Nuclear Accident
	Report on Lost or Stolen Sealed Sources and Radiation Devices
	2015 IPPAS Mission to Canada Report
	Canadian National Report for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management - Sixth Report October 2017
	Regulatory Oversight Report for Research Reactors and Class IB Accelerators 2016-2017

	Regulatory Oversight Report for Uranium and Nuclear Substance Processing Facilities in Canada 2017
	Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada 2017
	Regulatory Oversight Report on Nuclear Generating Sites in Canada 2017
	Regulatory Oversight Report on the use of nuclear Substances in Canada 2017
	OPEX Clearinghouse Terms of Reference
	Examine NPP event reports and notifications
Module 3 – Responsibilities and Functions of the Regulatory Body	NSCA
	Nuclear Energy Act
	Access to Information Act
	Canada Business Corporations Act
	Conflict of Interest Act
	Constitution Act, 1867 to 1982
	Financial Administration Act
	Privacy Act
	General Nuclear Safety and Control Regulations
	Class I Nuclear Facilities Regulations
	Class II Nuclear Facilities and Prescribed Equipment Regulations
	Nuclear Substances and Radiation Devices Regulations
	Uranium Mines and Mills Regulations
	RPR
	Administrative Monetary Penalties Regulations
	CNSC Cost Recovery Fees Regulations
	CNSC Rules of Procedure
	CNSC By-Laws
	Cabinet Directive on Regulation
	Values and Ethics Code for the Public Sector
	Memorandum of Understanding between the CNSC and Fisheries and Oceans Canada
	Memorandum of Understanding between the CNSC and HC
	Administrative Agreement between the CNSC and the Government of Saskatchewan
	REGDOC-3.1.1 Reporting Requirements for Nuclear Power Plants
	REGDOC-3.1.2 Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills
	REGDOC-3.1.3 Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices (draft)
	REGDOC-3.2.1 Public Information and Disclosure
	REGDOC-3.2.2 Aboriginal Engagement
	REGDOC-3.5.3 Regulatory Fundamentals
	CNSC Conflict of Interest and Post-Employment Policy

	CNSC Directive on Reporting and Managing Financial Conflicts of Interest
	CNSC Knowledge Management Policy
	CNSC Mobility Directive
	CNSC Open Door Policy
	CNSC Staffing Policy
	Policy on Science in a Regulatory Environment
	Policy on the Use of a Risk-Informed Approach for Regulatory Oversight of Nuclear Activities and Facilities
	Safety and Control Area Framework
	CNSC Contracting Policy
	Commission Member Document (CMD) Process
	Develop and Publish Regulations
	Conducting a Technical Assessment
	How to Establish Communication Protocol between CNSC and Licensees or Applicants
	Independent Environmental Monitoring Program Process
	Difference of Professional Opinion (DOPO) Process
	Organizational Capabilities
	Non-Concurrence Process
	Licence Condition Handbook - Bruce NGS A and B.
	CNSC Regulatory Framework Plan
	Inventory of Radioactive Waste in Canada
	Canadian National Report for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management - Sixth Report October 2017
	Science of Safety CNSC Research Report 2016-2017
	Notice of Commission Meeting December 12-13, 2018
	Agenda of Commission Meeting December 12-13, 2018
	Commission Meeting Minutes December 12-13, 2018
	Participant Funding Program Guide
	Submission from CNSC Staff - Pickering Nuclear Generating Station Licence Renewal
	Detailed Record of Decision - Pickering Nuclear Generating Station Licence Renewal
	Summary Record of Decision - Pickering Nuclear Generating Station Licence Renewal
	Status of the Designated Officer Program - 2016
	Example Work Description Form
	Audit, Ethics, Evaluation and Research Job Family Chart
	Administration of Tribunal/Administrative Assistant and Program Support Job Family Chart
	Communications Job Family Chart
	Compliance Job Family Chart
	Corporate Planning Job Family Chart

	Emergence Preparedness and Response Job Family Chart
	Finance and Procurement/Contracting Job Family Chart
	Human Resources Job Family Chart
	Information Management and Information Technology Job Family Chart
	International Obligations Job Family Chart
	Legal Job Family Chart
	Licensing and Certification Job Family Chart
	Policy Coordination Job Family Chart
	Regulatory Framework Management Job Family Chart
	Regulatory Program Management Job Family Chart
	Review and Assessment Job Family Chart
	Security, Facilities and Administration Job Family Chart
	Inspection Training and Qualification Program
	Communications Plan Template
	Strategic Communications Division presentation to Management Committee 2016
	Strategic Communications Division presentation to Management Committee 2018
	Policy on Communications and Federal Identity
	Strategic Communications Division process on outreach and engagement
	Presentation outlining roles and responsibilities in outreach
	CNSC learning Portal web page
	Knowledge Management Programs, Tools and Practices at the CNSC
Module 4 – Management System of the Regulatory Body	NSCA
	Values and Ethics Code for the Public Sector
	CNSC Management System Manual
	CNSC Document Management Standard
	CNSC Information Management Policy
	CNSC Knowledge Management Policy
	CNSC Open Door Policy
	Enterprise Risk Management Policy
	Policy on Science in a Regulatory Environment
	Policy on the Use of a Risk-Informed Approach for Regulatory Oversight of Nuclear Activities and Facilities
	CNSC Contracting Policy
	Conducting an Inspection
	Conducting a Technical Assessment
	Select and Apply Enforcement Tools
	Difference of Professional Opinion (DOPO) Process
	Non-Concurrence Process
	Management System Document Control Process
	CNSC Workforce Planning Process
	CNSC Departmental Plan 2019-2020

	CNSC Values and Ethics Code
	CNSC Key Behavioural Competencies
	Example Job Family Chart
	Example Work Description Form
	Regulatory Safety Culture Policy
	Regulatory Safety Culture Self-Assessment
	How to rate findings for NPP
	How to make risk informed decision making
	Management System Benchmarking Report
	Audit Plan
	Departmental Results Framework
	Performance Information Profile for Nuclear Fuel Cycle Program
	Front page of the Navigator Portal
	Overview of How the Harmonized Plan Program Works
	Harmonized Plan Scoping Document Template
Module 5 – Authorization	NSCA
	Canadian Environmental Assessment Act, 2012
	General Nuclear Safety and Control Regulations
	Class I Nuclear Facilities Regulations
	Class II Nuclear Facilities and Prescribed Equipment Regulations
	Nuclear Substances and Radiation Devices Regulations
	Uranium Mines and Mills Regulations
	RPR
	Packaging and Transport of Nuclear Substances Regulations, 2015
	Nuclear Non-Proliferation Import and Export Control Regulations
	Nuclear Security Regulations
	CNSC Rules of Procedure
	RD-364 Joint Canada - United States Guide for Approval of Type B(U) and Fissile Material Transportation Packages
	RD/GD-369 Licence Application Guide: Licence to Construct a Nuclear Power Plant
	REGDOC-1.1.1 Site Evaluation and Site Preparation for New Reactor Facilities
	REGDOC-1.1.3 Licence Application Guide: Licence to Operate a Nuclear Power Plant
	REGDOC-1.5.1 Application Guide: Certification of Radiation Devices or Class II Prescribed Equipment
	REGDOC-1.6.1 Licence Application Guide: Nuclear Substances and Radiation Devices
	REGDOC-2.9.1 Environmental Principles, Assessments and Protection Measures
	REGDOC-3.5.1 Licensing Process for Class I Nuclear Facilities and Uranium Mines and Mills
	REGDOC-3.5.3 Regulatory Fundamentals

	Licence Condition Handbook - Bruce NGS A and B
	Module 5 - Attached Figures
Module 6 – Review and Assessment	General Nuclear Safety and Control Regulations
	Class I Nuclear Facilities Regulations
	Class II Nuclear Facilities and Prescribed Equipment Regulations
	Uranium Mines and Mills Regulations
	RPR
	G-129 Keeping Radiation Exposure and Doses ALARA
	GD-52 Design Guide for Nuclear Substance Laboratories and Nuclear Medicine Rooms
	RD-367 Design of Small Reactor Facilities
	REGDOC-2.4.1 Deterministic Safety Analysis
	REGDOC-2.5.2 Design of Reactor Facilities: Nuclear Power Plants
	REGDOC-2.5.4 Design of Uranium Mines and Mills: Ventilation Systems
	REGDOC-2.5.5 Design of Industrial Radiography Installations
	REGDOC-2.5.7 Design, Testing and Performance of Exposure Devices
	REGDOC-3.5.3 Regulatory Fundamentals
	Policy on the Use of a Risk-Informed Approach for Regulatory Oversight of Nuclear Activities and Facilities
	Conducting a Technical Assessment
	Modified Copy of presentation on SCA structure
	Fitness for Service compliance verification program
	CNL TARM for Whiteshell and NPD proposed waste disposal facilities
	Contract for Dr. Price re: Review of Geology for OPG DGR
	Technical Assessment Reference matrix for Operation: Power Reactors
	Bruce B Nuclear Generating Station: CNSC Type II Inspection Report: BRPD-MCR-2019-2098 – MCR Supply Management U6 (Letter)
	CNSC Type II Compliance Inspection Report: MCR Supply Management U6 - Report Number: BRPD-MCR-2019-2098 (Report)
	DNSR Flow Chart
	Respond to Events Reported to DNSR
	Canadian Light Source Incorporated - Commission Member Document
Module 7 – Inspection	NSCA
	REGDOC-3.5.3 Regulatory Fundamentals
	Conducting an Inspection
	CNSC Actions in Response to the Findings of the Fall 2016 Report of the Commissioner of the Environment and Sustainable Development on the inspection of nuclear power plants
	Regulatory Oversight Report for Uranium and Nuclear Substance Processing Facilities in Canada 2017
	Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada 2017
	Regulatory Oversight Report on Nuclear Generating Sites in Canada 2017

	Regulatory Oversight Report on the use of nuclear Substances in Canada 2017
Module 8 - Enforcement	NSCA
	General Nuclear Safety and Control Regulations
	Administrative Monetary Penalties Regulations
	CNSC Rules of Procedure
	Directive to the CNSC Regarding the Health of Canadians
	G-273 Making, Reviewing and Receiving Orders under the NSCA
	P-211 Compliance
	REGDOC-3.5.2 Compliance and Enforcement Administrative Monetary Penalties
	REGDOC-3.5.3 Regulatory Fundamentals
	Select and Apply Enforcement Tools
	Order Issued to Canadian Construction Materials Engineering and Testing Inc.
	Order to Alpha Adroit Engineering Ltd.
	Order to Orbit Engineering Limited
	Order to Trenergy Inc.
	Order to Union Street Geotechnical Ltd.
Module 9 – Regulations and Guides	NSCA
	Nuclear Energy Act
	Nuclear Fuel Waste Act
	Nuclear Liability and Compensation Act
	Canada Labour Code
	Canadian Environmental Assessment Act, 2012
	Constitution Act, 1867 to 1982
	Fisheries Act
	Migratory Birds Convention Act, 1994
	Navigation Protection Act
	Nuclear Terrorism Act
	Radiation Emitting Devices Act
	Species at Risk Act
	Transportation of Dangerous Goods Act, 1992
	General Nuclear Safety and Control Regulations
	Class I Nuclear Facilities Regulations
	Class II Nuclear Facilities and Prescribed Equipment Regulations
	Nuclear Substances and Radiation Devices Regulations
	Uranium Mines and Mills Regulations
	RPR
	Packaging and Transport of Nuclear Substances Regulations, 2015
	Nuclear Non-Proliferation Import and Export Control Regulations
	Nuclear Security Regulations
	Administrative Monetary Penalties Regulations
	CNSC Cost Recovery Fees Regulations

	CNSC Rules of Procedure
	CNSC By-Laws
	Cabinet Directive on Regulation
	REGDOC-3.2.2 Aboriginal Engagement
	Conduct Regulatory Policy Analysis
	Regulatory Stock Review Plan
	CNSC Forward Regulatory Plan 2019–2021
	Regulatory Framework Plan
	Managing the Regulatory Framework Plan
	Regulatory Framework Issue Identification Form
	Results of Regulatory Policy Analysis
	Conduct Regulatory Policy Analysis
	Develop and Publish Regulations
	Develop and Publish Regulations – work instructions
	Develop and Publish Regulatory Documents
	Develop and Publish Regulatory Documents – work instructions
	Conducting an inspection
	Risk-informed approach for CNSC Power Reactor Program
	Licensing – Making a Risk Informed Regulatory Decision
	Nuclear Power Reactor Operating Licence - Bruce NGS A and B
	Licence Condition Handbook - Bruce NGS A and B
	Implementation Strategy Form Template
	Assessment of licensee changes to documents or operations
	CNSC SED – Type II Inspection Guide Instrumentation Calibration
	CNSC DPRR – Type II Inspection Guide Planned Outage
	CNSC Conflict of Interest and Post-Employment Policy
	Value and Ethic – Internal Disclosure
	PRRP Type I (Program) Inspection Procedure
	Initiate an Incident Inspection/Statutory Investigation
Interfaces with Nuclear Security	NSCA
	Nuclear Terrorism Act
	Security Offences Act
	General Nuclear Safety and Control Regulations
	Nuclear Non-Proliferation Import and Export Control Regulations
	Nuclear Security Regulations
	Regulations Designating Physical Activities
	CNSC Rules of Procedure
	Memorandum of Understanding between CNSC and Royal Canadian Mounted Police
	Memorandum of Understanding between the CNSC and The Department of National Defence
	REGDOC-2.1.2 Safety Culture
	REGDOC-2.2.4 Fitness for Duty: Managing Worker Fatigue

	REGDOC-2.5.2 Design of Reactor Facilities: Nuclear Power Plants
	REGDOC-2.10.1 Nuclear Emergency Preparedness and Response, Version 2
	REGDOC-2.12.2 Site Access Security Clearance
	REGDOC-2.12.3 Security of Nuclear Substances Sealed Sources and Category I, II and II Nuclear Material
	REGDOC-2.13.1 Safeguards and Nuclear Material Accountancy
	REGDOC-2.13.2 Import and Export
	REGDOC-3.1.1 Reporting Requirements for Nuclear Power Plants
	REGDOC-3.1.2 Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills
	REGDOC-3.1.3 Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices (draft)
	REGDOC-3.5.3 Regulatory Fundamentals
	Protocol between the Directorate of Nuclear Substance Regulation and the Directorate of Security and Safeguards Regarding security oversight DNSR Licensees
	2015 IPPAS Mission to Canada Report
Nuclear Power Plants	NSCA
	General Nuclear Safety and Control Regulations
	Class I Nuclear Facilities Regulations
	Class II Nuclear Facilities and Prescribed Equipment Regulations
	RPR
	G-219 Decommissioning Planning for Licensed Activities
	G-206 Financial Guarantees for the Decommissioning of Licensed Activities
	G-228 Developing and Using Action Levels
	G-276 Human Factors Engineering Program Plans
	GD-327 Guidance for Nuclear Criticality Safety
	RD/GD-369 Licence Application Guide: Licence to Construct a Nuclear Power Plant
	REGDOC-1.1.1 Site Evaluation and Site Preparation for New Reactor Facilities
	REGDOC-1.1.3 Licence Application Guide: Licence to Operate a Nuclear Power Plant
	REGDOC-2.1.2 Safety Culture
	REGDOC-2.2.2 Personnel Training
	REGDOC-2.3.1 Conduct of Licensed Activities - Construction and Commissioning Programs
	REGDOC-2.3.2 Accident Management
	REGDOC-2.3.3 Periodic Safety Reviews
	REGDOC-2.4.1 Deterministic Safety Analysis
	REGDOC-2.4.2 Probabilistic Safety Assessment for Nuclear Power Plants
	REGDOC-2.5.2 Design of Reactor Facilities: Nuclear Power Plants
	REGDOC-2.6.1 Reliability Programs for Nuclear Power Plants

	REGDOC-2.6.2 Maintenance Programs for Nuclear Power Plants
	REGDOC-2.7.1 Radiation Protection (draft)
	REGDOC-2.7.2 Dosimetry, Volume I: Ascertaining Occupational Dose
	REGDOC-2.10.1 Nuclear Emergency Preparedness and Response, Version 2
	REGDOC-2.11 Framework for Radioactive Waste Management and Decommissioning in Canada
	REGDOC-2.11.1 Waste Management, Volume III: Safety Case for Long-Term Radioactive Waste Management (draft)
	REGDOC-2.11.1 Waste Management, Volume II: Management of Uranium Mine Waste Rock and Mill Tailings
	REGDOC-2.11.1 Waste Management, Volume I: Management of Radioactive Waste (draft)
	REGDOC-3.1.1 Reporting Requirements for Nuclear Power Plants
	REGDOC-3.5.3 Regulatory Fundamentals
	S-106 Technical and Quality Assurance Requirements for Dosimetry Services
	Conducting an Inspection
	Conducting a Technical Assessment
	Select and Apply Enforcement Tools
	Nuclear Power Reactor Operating Licence - Bruce NGS A and B
	Licence Condition Handbook - Bruce NGS A and B
	CNSC Fukushima Task Force Report
	CNSC Integrated Action Plan on Lessons Learned from the Fukushima Daiichi Nuclear Accident
	2015 IPPAS Mission to Canada Report
	Bruce B Nuclear Generating Station: CNSC Type II Inspection Report: BRPD-MCR-2019-2098 – MCR Supply Management U6 (Letter)
	CNSC Type II Compliance Inspection Report: MCR Supply Management U6 - Report Number: BRPD-MCR-2019-2098 (Report)
	BRPD-AB-2019-03635 – Bruce NGS A and B: CNSC Quarterly Field Inspection Summary Report – Q1 2019-20 (Letter)
	CNSC Quarterly Field Inspection Report: Bruce A and B Generating Stations, Q1, Fiscal Year 2019-2020 BRPD-AB-2019-03635 (Report)
	Bruce NGS A and B: Desktop Review Report: BRPD-AB-2018-00859 - Chemistry Personnel Training Program (Letter)
	CNSC Desktop Review Report: Chemistry Personnel Training Program – Report Number BRPD-AB-2018-00859 (Report)
	Bruce A and B Nuclear Generating Stations: CNSC Field Inspection BRPD-A-2019-FIR-4174 - Configuration Management (Letter)
	CNSC Field Inspection Report: Configuration Management – Report Number: BRPD-A-2019-FIR-4174 (Report)
	Applicability of the Standard Licence Conditions to Class I Facilities
	Regulatory Performance Indicators for Point Lepreau Nuclear Station
Research Reactors	NSCA

	Canada Labour Code
	Canadian Environmental Assessment Act, 2012
	Canadian Environmental Protection Act, 1999
	General Nuclear Safety and Control Regulations
	Class I Nuclear Facilities Regulations
	RPR
	Packaging and Transport of Nuclear Substances Regulations, 2015
	Nuclear Non-Proliferation Import and Export Control Regulations
	Nuclear Security Regulations
	Administrative Monetary Penalties Regulations
	CNSC Cost Recovery Fees Regulations
	Regulations Designating Physical Activities
	CNSC By-Laws
	G-129 Keeping Radiation Exposure and Doses ALARA
	G-206 Financial Guarantees for the Decommissioning of Licensed Activities
	G-219 Decommissioning Planning for Licensed Activities
	G-228 Developing and Using Action Levels
	G-276 Human Factors Engineering Program Plans
	G-278 Human Factors Verification and Validation Plans
	P-119 Policy on Human Factors
	RD-308 Deterministic Safety Analysis for Small Reactors Facilities
	RD-336 Accounting and Reporting of Nuclear Material
	RD-367 Design of Small Reactor Facilities
	REGDOC-1.1.1 Site Evaluation and Site Preparation for New Reactor Facilities
	REGDOC-1.1.5 Licence Application Guide: Small Modular Reactor Facilities
	REGDOC-2.1.2 Safety Culture
	REGDOC-2.2.1 Human Factors
	REGDOC-2.2.2 Personnel Training
	REGDOC-2.2.3 Personnel Certification: Exposure Device Operators
	REGDOC-2.2.3 Personnel Certification: Initial Certification Examinations
	REGDOC-2.2.3 Personnel Certification: Radiation Safety Officers
	REGDOC-2.3.1 Conduct of Licensed Activities - Construction and Commissioning Programs
	REGDOC-2.4.1 Deterministic Safety Analysis
	REGDOC-2.6.3 Aging Management
	REGDOC-2.9.1 Environmental Principles, Assessments and Protection Measures
	REGDOC-2.10.1 Nuclear Emergency Preparedness and Response, Version 2
	REGDOC-2.13.1 Safeguards and Nuclear Material Accountancy
	REGDOC-3.1.2 Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills
	REGDOC-3.5.3 Regulatory Fundamentals
	S-106 Technical and Quality Assurance Requirements for Dosimetry Services

	Safety and Control Area Framework
	Conducting a Technical Assessment
	Select and Apply Enforcement Tools
	Non-Power Reactor Operating Licence - McMaster University
	Licence Condition Handbook - McMaster University
	CNSC Fukushima Task Force Report
	Regulatory Oversight Report for Research Reactors and Class IB Accelerators 2016-2017
Fuel Cycle Facilities	NSCA
	Canadian Environmental Assessment Act, 2012
	General Nuclear Safety and Control Regulations
	Class I Nuclear Facilities Regulations
	Class II Nuclear Facilities and Prescribed Equipment Regulations
	RPR
	Packaging and Transport of Nuclear Substances Regulations, 2015
	Nuclear Security Regulations
	G-91 Ascertaining and Recording Radiation Doses to Individuals
	G-121 Radiation Safety in Education, Medical and Research Institutions
	G-129 Keeping Radiation Exposure and Doses ALARA
	G-147 Radiobioassay Protocols for Responding to Abnormal Intakes of Radionuclides
	G-206 Financial Guarantees for the Decommissioning of Licensed Activities
	G-228 Developing and Using Action Levels
	G-276 Human Factors Engineering Program Plans
	G-278 Human Factors Verification and Validation Plans
	G-313 Radiation Safety Training Programs for Workers Involved in Licensed Activities with Nuclear Substances and Radiation Devices and with Class II Nuclear Facilities and Prescribed Equipment
	G-323 Ensuring the Presence of Sufficient Qualified Staff at Class I Nuclear Facilities – Minimum Staff Complement
	GD-150 Designing and Implementing a Bioassay Program
	P-119 Policy on Human Factors
	RD-58 Thyroid Screening for Radioiodine
	RD-336 Accounting and Reporting of Nuclear Material
	REGDOC-1.1.1 Site Evaluation and Site Preparation for New Reactor Facilities
	REGDOC-2.1.2 Safety Culture
	REGDOC-2.2.2 Personnel Training
	REGDOC-2.4.3 Nuclear Criticality Safety
	REGDOC-2.6.3 Aging Management
	REGDOC-2.7.1 Radiation Protection (draft)
	REGDOC-2.7.2 Dosimetry, Volume I: Ascertaining Occupational Dose
	REGDOC-2.7.2 Dosimetry, Volume II-Technical and Management System Requirements for Dosimetry Services

	REGDOC-2.9.1 Environmental Principles, Assessments and Protection Measures
	REGDOC-2.10.1 Nuclear Emergency Preparedness and Response, Version 2
	REGDOC-2.13.1 Safeguards and Nuclear Material Accountancy
	REGDOC-3.1.2 Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills
	REGDOC-3.5.3 Regulatory Fundamentals
	REGDOC-3.6 Glossary of CNSC Terminology
	S-106 Technical and Quality Assurance Requirements for Dosimetry Services
	S-260 Making Changes to Dose-Related Information Filed With the National Dose Registry
	CNSC Management System Manual
	Safety and Control Area Framework
	Conducting an Inspection
	Select and Apply Enforcement Tools
	Managing Licensee Actions within DNCFR
	Nuclear Fuel Facility Operating Licence - Port Hope Conversion Facility
	Licence Condition Handbook - Port Hope Conversion Facility
	2015 IPPAS Mission to Canada Report
	Regulatory Oversight Report for Research Reactors and Class IB Accelerators 2016-2017
	Regulatory Oversight Report for Uranium and Nuclear Substance Processing Facilities in Canada 2017
	Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada 2017
	Regulatory Oversight Report on Nuclear Generating Sites in Canada 2017
	PHCF Compliance Calendar
	Radiation Protection and Super CUP Inspection – Inspection Facts and Findings Report – CAMECO-PHCF-2018-03
	Management System Inspection – Inspection Fact and Findings Report – CAMECO-PHCF-2018-06
	Radiation Protection and Super CUP Inspection – Inspection Report - CAMECO-PHCF-2018-03
	Management System Inspection – Inspection Report – CAMECO-PHCF-2018-06
	Nuclear Fuel Cycle and Research Reactors Program- Assure Compliance
	Technical Assessment Reference Matrix (TARM) for Fuel Fabrication operating Licence
	CAMECO-PHCF-2019-04 Inspection Plan
	CAMECO-PHCF-2019-04 Compliance Matrix
	CAMECO-PHCF-2019-04 Inspection Agenda
	CAMECO-PHCF-2019-04 Letter of Notice
	CAMECO-PHCF-2019-04 Itinerary for Site Visit

	CSA N286.12 - Management system requirements for nuclear facilities
	CSA N292.0 - General principles for the management of radioactive waste and irradiated fuel
	HP Initiative dashboard - IRRS S-8 - Confirming Competence of Operators Dashboard
	DNCFR FACTeam Terms of Reference
Waste and Decommissioning	NSCA
	Canadian Environmental Assessment Act, 2012
	General Nuclear Safety and Control Regulations
	Class I Nuclear Facilities Regulations
	Class II Nuclear Facilities and Prescribed Equipment Regulations
	Nuclear Substances and Radiation Devices Regulations
	Uranium Mines and Mills Regulations
	RPR
	Packaging and Transport of Nuclear Substances Regulations, 2015
	Nuclear Security Regulations
	CNSC Cost Recovery Fees Regulations
	CNSC Rules of Procedure
	G-129 Keeping Radiation Exposure and Doses ALARA
	G-206 Financial Guarantees for the Decommissioning of Licensed Activities
	G-219 Decommissioning Planning for Licensed Activities
	G-228 Developing and Using Action Levels
	RD-336 Accounting and Reporting of Nuclear Material
	RD/GD-369 Licence Application Guide: Licence to Construct a Nuclear Power Plant
	REGDOC-1.1.1 Site Evaluation and Site Preparation for New Reactor Facilities
	REGDOC-1.1.3 Licence Application Guide: Licence to Operate a Nuclear Power Plant
	REGDOC-1.4.1 Licence Application Guide Class II Nuclear Facilities and Prescribed Equipment
	REGDOC-1.6.1 Licence Application Guide: Nuclear Substances and Radiation Devices
	REGDOC-2.1.1 Management System
	REGDOC-2.1.2 Safety Culture
	REGDOC-2.3.2 Accident Management
	REGDOC-2.7.1 Radiation Protection (draft)
	REGDOC-2.9.1 Environmental Principles, Assessments and Protection Measures
	REGDOC-2.10.1 Nuclear Emergency Preparedness and Response, Version 2
	REGDOC-2.11 Framework for Radioactive Waste Management and Decommissioning in Canada
	REGDOC-2.11.1 Waste Management, Volume III: Assessing the Long-Term Safety of Radioactive Waste Management

	REGDOC-2.11.1 Waste Management, Volume III: Safety Case for Long-Term Radioactive Waste Management (draft)
	REGDOC-2.11.1 Waste Management, Volume II: Management of Uranium Mine Waste Rock and Mill Tailings
	REGDOC-2.11.1 Waste Management, Volume I: Management of Radioactive Waste (draft)
	REGDOC-2.13.1 Safeguards and Nuclear Material Accountancy
	REGDOC-3.1.1 Reporting Requirements for Nuclear Power Plants
	REGDOC-3.1.2 Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills
	REGDOC-3.1.3 Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices (draft)
	REGDOC-3.5.1 Licensing Process for Class I Nuclear Facilities and Uranium Mines and Mills
	REGDOC-3.5.3 Regulatory Fundamentals
	REGDOC-3.6 Glossary of CNSC Terminology
	Independent Environmental Monitoring Program Process
	Waste Facility Operating Licence - Western Waste Management Facility
	Licence Condition Handbook - Western Waste Management Facility
	Record of Decision on Deep Geological Repository
	Technical Information Sheet: CNSC Screening Levels for the Independent Environmental Monitoring Program
	Regulation of Decommissioning of Facilities - Question 2.7 Figures
	DNCFR Inspection Process
	CNSC Enforcement Process
	OMG-WWMF-2019-02 Inspection Agenda
	OMG-WWMF-2019-02 Inspection Notification Letter
	OMG-WWMF-2019-02 Inspection Document Tracking Sheet
	OMG-WWMF-2019-02 Inspection Plan
	OMG-WWMF-2019-02 Inspection Compliance Matrix
	OMG-WWMF-2019-02 Inspection Opening Meeting Remarks
	WWMF 10-year Compliance Plan
	IRRS CRL Inspection Observation Itinerary (General at ZED-2; Waste Management at WMA B & H and B100/100A)
	CNL-CRL-2019-03 Inspection Agenda
	CNL-CRL-2019-03 Notice of Inspection Letter
	CNL-CRL-2019-03 Compliance Matrix
	CNL-CRL-2019-03 Preliminary Inspection Facts and Findings Report
	Chalk River Laboratories Licence
	Chalk River Laboratories Licence Condition Handbook
Occupational Radiation Protection	NSCA
	Canada Labour Code

	Privacy Act
	General Nuclear Safety and Control Regulations
	Class I Nuclear Facilities Regulations
	Class II Nuclear Facilities and Prescribed Equipment Regulations
	Nuclear Substances and Radiation Devices Regulations
	RPR
	CNSC Cost Recovery Fees Regulations
	Canada Labour Standards Regulations
	Canada Occupational Health and Safety Regulations
	G-91 Ascertaining and Recording Radiation Doses to Individuals
	G-121 Radiation Safety in Education, Medical and Research Institutions
	G-129 Keeping Radiation Exposure and Doses ALARA
	G-147 Radiobioassay Protocols for Responding to Abnormal Intakes of Radionuclides
	G-228 Developing and Using Action Levels
	G-313 Radiation Safety Training Programs for Workers Involved in Licensed Activities with Nuclear Substances and Radiation Devices and with Class II Nuclear Facilities and Prescribed Equipment
	GD-52 Design Guide for Nuclear Substance Laboratories and Nuclear Medicine Rooms
	GD-150 Designing and Implementing a Bioassay Program
	DIS-13-01 Proposals to Amend the RPR
	What we heard Report for DIS-13-01
	RD-58 Thyroid Screening for Radioiodine
	RD-204 Certification of Persons Working at Nuclear Power Plants
	RD-367 Design of Small Reactor Facilities
	RD/GD-369 Licence Application Guide: Licence to Construct a Nuclear Power Plant
	REGDOC-1.1.3 Licence Application Guide: Licence to Operate a Nuclear Power Plant
	REGDOC-1.4.1 Licence Application Guide Class II Nuclear Facilities and Prescribed Equipment
	REGDOC-1.6.1 Licence Application Guide: Nuclear Substances and Radiation Devices
	REGDOC-2.2.2 Personnel Training
	REGDOC-2.2.4 Fitness for Duty Volume III: Nuclear Security Officer Medical, Physical and Psychological Fitness
	REGDOC-2.2.4 Fitness for Duty, Volume II: Managing Alcohol and Drug Use, version 2
	REGDOC-2.2.4 Fitness for Duty: Managing Worker Fatigue
	REGDOC-2.5.2 Design of Reactor Facilities: Nuclear Power Plants
	REGDOC-2.5.5 Design of Industrial Radiography Installations
	REGDOC-2.7.1 Radiation Protection (draft)
	REGDOC-2.7.2 Dosimetry, Volume I: Ascertaining Occupational Dose

	REGDOC-2.7.2 Dosimetry, Volume II-Technical and Management System Requirements for Dosimetry Services
	S-106 Technical and Quality Assurance Requirements for Dosimetry Services
	S-260 Making Changes to Dose-Related Information Filed With the National Dose Registry
	Technical Note: Proposed Changes to the Equivalent Dose Limit for Lens of the Eye
	DIS-16-02 Radiation Protection and Dosimetry
	Commercial and Business Aviation Advisory Circular No. 0183R - Measures for Managing Exposure to Cosmic Radiation of Employees Working on Board Aircraft
	Regulatory Oversight Report for Research Reactors and Class IB Accelerators 2016-2017
	Regulatory Oversight Report for Uranium and Nuclear Substance Processing Facilities in Canada 2017
	Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada 2017
	Regulatory Oversight Report on Nuclear Generating Sites in Canada 2017
	Regulatory Oversight Report on the use of nuclear Substances in Canada 2017
	Occupational Radiation Exposures in Canada - 2017
	Occupational Radiation Exposures in Canada - 2018
	Memorandum of understanding between CNSC and HC
	National Research Council of Canada - Ionizing radiation standards calibration services
	National Research Council of Canada - CLAS requirements for applications for CLAS certification and SCC accreditation for calibration laboratories
	DNSR licence condition 2578, Extremity Dosimetry – Beta Emitters
	NDR Personal Dose History Summary (PDHS) Request Form
	Federal Provincial Territorial Radiation Protection Committee Three Year Business Plan
	2018 Annual Federal Provincial and Territorial Radiation Protection Committee Meetings
	2018 Annual Federal Provincial and Territorial Radiation Protection Committee Meeting Agenda
	Federal Provincial and Territorial Radiation Protection Committee Teleconference Agenda
Control of Public Exposure	NSCA
	Nuclear Liability and Compensation Act
	Canada Consumer Product Safety Act
	Canadian Environmental Assessment Act, 2012
	Constitution Act, 1867 to 1982
	Food and Drugs Act
	General Nuclear Safety and Control Regulations

	Class I Nuclear Facilities Regulations
	Class II Nuclear Facilities and Prescribed Equipment Regulations
	Nuclear Substances and Radiation Devices Regulations
	Uranium Mines and Mills Regulations
	RPR
	Packaging and Transport of Nuclear Substances Regulations, 2015
	Memorandum of Understanding between the CNSC and HC
	Canada - United States Air Quality Agreement
	Great Lakes Water Quality Agreement
	G-91 Ascertaining and Recording Radiation Doses to Individuals
	G-121 Radiation Safety in Education, Medical and Research Institutions
	G-129 Keeping Radiation Exposure and Doses ALARA
	G-147 Radiobioassay Protocols for Responding to Abnormal Intakes of Radionuclides
	G-206 Financial Guarantees for the Decommissioning of Licensed Activities
	G-219 Decommissioning Planning for Licensed Activities
	G-228 Developing and Using Action Levels
	G-313 Radiation Safety Training Programs for Workers Involved in Licensed Activities with Nuclear Substances and Radiation Devices and with Class II Nuclear Facilities and Prescribed Equipment
	GD-52 Design Guide for Nuclear Substance Laboratories and Nuclear Medicine Rooms
	GD-150 Designing and Implementing a Bioassay Program
	RD-58 Thyroid Screening for Radioiodine
	RD-367 Design of Small Reactor Facilities
	REGDOC-1.5.1 Application Guide: Certification of Radiation Devices or Class II Prescribed Equipment
	REGDOC-2.3.3 Periodic Safety Reviews
	REGDOC-2.4.1 Deterministic Safety Analysis
	REGDOC-2.4.2 Probabilistic Safety Assessment for Nuclear Power Plants
	REGDOC-2.5.2 Design of Reactor Facilities: Nuclear Power Plants
	REGDOC-2.5.4 Design of Uranium Mines and Mills: Ventilation Systems
	REGDOC-2.5.5 Design of Industrial Radiography Installations
	REGDOC-2.5.7 Design, Testing and Performance of Exposure Devices
	REGDOC-2.7.1 Radiation Protection (draft)
	REGDOC-2.7.2 Dosimetry, Volume I: Ascertaining Occupational Dose
	REGDOC-2.7.2 Dosimetry, Volume II-Technical and Management System Requirements for Dosimetry Services
	REGDOC-2.9.1 Environmental Principles, Assessments and Protection Measures
	REGDOC-2.11.1 Waste Management, Volume III: Safety Case for Long-Term Radioactive Waste Management (draft)
	REGDOC-3.1.1 Reporting Requirements for Nuclear Power Plants

	REGDOC-3.1.2 Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills
	REGDOC-3.1.3 Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices (draft)
	REGDOC-3.2.1 Public Information and Disclosure
	REGDOC-3.5.3 Regulatory Fundamentals
	S-106 Technical and Quality Assurance Requirements for Dosimetry Services
	S-260 Making Changes to Dose-Related Information Filed With the National Dose Registry
	Safety and Control Area Framework
	Independent Environmental Monitoring Program Process
	A Homeowner's Guide to Radon
	Canadian Guidelines for the Management of NORM
	Canadian Lung Cancer Relative Risk from Radon Exposure for Short Periods in Childhood Compared to a Lifetime (2013)
	Canadian Population Risk of Radon Induced Lung Cancer: a re-assessment based on the recent cross-Canada radon survey
	Comparative Study of Radon Exposure in Canadian Homes and Uranium Mines
	Guidance on Human Health Detailed Quantitative Risk Assessment
	Guidelines for Canadian Drinking Water - Radiological Parameters
	Guidelines for Canadian Drinking Water Quality Summary Table
	Radon - Another Reason to Quit
	Radon Exhalation from Building Materials for Decorative Use
	Results of Simultaneous Radon and Thoron Measurements in 33 Metropolitan areas of Canada
	Risk Assessment for Radon Exposure in Various Indoor Environments (2019)
	Soil Radon Measurements in the Canadian Cities
	Cross-Canada Survey of Radon Concentrations in Homes
	Technical Information Sheet: CNSC Screening Levels for the Independent Environmental Monitoring Program
	Household Smoke Detector Safety and Disposal
	Safety Requirements for Public Exposure - Figure 1
	Safety Requirements for Public Exposure - Figure 2
	Effluent monitoring type II inspection guide for NPPs
	Effluent Monitoring Field Check
	Uranium Mine environmental protection inspection criteria
	Conduct a Technical Assessment of an Environmental Monitoring Program to Verify Compliance against REGDOC 2.9.1 and CSA N288.4-10
	Conduct a Technical Assessment of an Effluent Monitoring Program to Verify Compliance against REGDOC 2.9.1 and CSA N288.5-11
	Conduct a Technical Assessment of an Environmental Risk Assessment to Verify Compliance against REGDOC 2.9.1 and CSA N288.6-12

	Conduct a Technical Assessment of an Action Level Document to Verify Compliance against CSA N288.8-17
	Nuclear Medicine Safety Poster
	CNSC brochure “Radium Luminous Devices: Tips For Your Safety”
	CNSC webpage “Could your collectible item contain radium?”
	Canadian Nuclear Laboratories Historic Artefact Recovery Program leaflet
	Assessment of the Relevance of the Inclusion of Radionuclides as a Chemical of Mutual Concern under Annex 3 of the Canada-United States Great Lakes Water Quality Agreement
	NDR Input File Specification
	Dose limits under Provincial/Territorial & CNSC jurisdiction – Registered in the NDR
	Report on Occupational Exposures in Canada – 2017
	Report on Occupational Exposures in Canada -- 2018
Radiation Sources	NSCA
	Canadian Environmental Assessment Act, 2012
	Customs Act
	General Nuclear Safety and Control Regulations
	Class I Nuclear Facilities Regulations
	Class II Nuclear Facilities and Prescribed Equipment Regulations
	Nuclear Substances and Radiation Devices Regulations
	Uranium Mines and Mills Regulations
	RPR
	Nuclear Non-Proliferation Import and Export Control Regulations
	G-91 Ascertaining and Recording Radiation Doses to Individuals
	G-121 Radiation Safety in Education, Medical and Research Institutions
	G-129 Keeping Radiation Exposure and Doses ALARA
	G-147 Radiobioassay Protocols for Responding to Abnormal Intakes of Radionuclides
	G-228 Developing and Using Action Levels
	G-313 Radiation Safety Training Programs for Workers Involved in Licensed Activities with Nuclear Substances and Radiation Devices and with Class II Nuclear Facilities and Prescribed Equipment
	GD-52 Design Guide for Nuclear Substance Laboratories and Nuclear Medicine Rooms
	RD-58 Thyroid Screening for Radioiodine
	REGDOC-1.1.3 Licence Application Guide: Licence to Operate a Nuclear Power Plant
	REGDOC-1.4.1 Licence Application Guide Class II Nuclear Facilities and Prescribed Equipment
	REGDOC-1.5.1 Application Guide: Certification of Radiation Devices or Class II Prescribed Equipment
	REGDOC-1.6.1 Licence Application Guide: Nuclear Substances and Radiation Devices

	REGDOC-2.1.2 Safety Culture
	REGDOC-2.5.5 Design of Industrial Radiography Installations
	REGDOC-2.5.7 Design, Testing and Performance of Exposure Devices
	REGDOC-2.7.1 Radiation Protection (draft)
	REGDOC-2.7.2 Dosimetry, Volume I: Ascertaining Occupational Dose
	REGDOC-2.7.2 Dosimetry, Volume II-Technical and Management System Requirements for Dosimetry Services
	REGDOC-2.7.3 Radiation Protection Guidelines for Safe Handling of Decedents
	REGDOC-2.9.1 Environmental Principles, Assessments and Protection Measures
	REGDOC-2.12.3 Security of Nuclear Substances Sealed Sources and Category I, II and II Nuclear Material
	REGDOC-2.13.2 Import and Export
	REGDOC-3.1.1 Reporting Requirements for Nuclear Power Plants
	REGDOC-3.1.2 Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills
	REGDOC-3.1.3 Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices (draft)
	S-106 Technical and Quality Assurance Requirements for Dosimetry Services
	S-260 Making Changes to Dose-Related Information Filed With the National Dose Registry
	Safety and Control Area Framework
	Select and Apply Enforcement Tools
	National Sealed Source Registry and Sealed Source Tracking System 2016 Report
	Alarm Response Guidelines for Radiation Portal Monitoring Systems
Transportation	NSCA
	Transportation of Dangerous Goods Act, 1992
	RPR
	Packaging and Transport of Nuclear Substances Regulations, 2015
	Nuclear Security Regulations
	Transportation for Dangerous Goods Regulations
	Cabinet Directive on Regulation
	Memorandum of Understanding between CNSC and Transport Canada
	RD-364 Joint Canada - United States Guide for Approval of Type B(U) and Fissile Material Transportation Packages
	REGDOC-2.12.3 Security of Nuclear Substances Sealed Sources and Category I, II and II Nuclear Material
	REGDOC-2.14.1 Information Incorporated by Reference in Canada's Packaging and Transport of Nuclear Substances Regulations, 2015

	REGDOC-3.1.3 Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices (draft)
	Develop and Publish Regulations
	Conducting a Technical Assessment
	Select and Apply Enforcement Tools
	CNSC-TC Parallel Review of Respective Regulations Process
	Inspection Training and Qualification Program
	Notice of Public Hearing 2010-H-09 Bruce Power Steam Generators
	Transport Licence Example
	Work Instruction Case Management System – Process Transport Licence Application
	Making Designated Officer Decisions
	Supplementary CMD Annex D Designated Officer Positions and Duties
	Respond to Events Reported to DNSR
	DNSR Flow Chart (INES)
	Study to further Investigation Doses to Transport Workers - Phase 2
	PTNSR 2015 CGII Presentation to the Commission with Speakers Notes
	Canada Post Guide - Non-mailable matter
	CNSC website for transport of liquid highly enriched uranium
	CNSC website Bruce Power Transport of Steam Generator Hearing Documents
	CNSC website for Service Standards for High-Volume Regulatory Authorizations
	HC's Report on Occupational Radiation Exposures in Canada (2017)

APPENDIX VI - IAEA REFERENCE MATERIAL USED FOR THE REVIEW

1.	**IAEA SAFETY STANDARDS SERIES No. SF-1** – Fundamental Safety Principles
2.	**IAEA SAFETY STANDARDS SERIES No. GSR PART 1 (Rev. 1)** – Governmental, Legal and Regulatory Framework for Safety
3.	**IAEA SAFETY STANDARDS SERIES No. GSR PART 2** – Leadership and Management for Safety
4.	**IAEA SAFETY STANDARDS SERIES No. GSR PART 3** – Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards
5.	**IAEA SAFETY STANDARDS SERIES No. GSR PART 4 (Rev. 1)** – Safety Assessment for Facilities and Activities
6.	**IAEA SAFETY STANDARDS SERIES No. GSR PART 6** – Decommissioning of Facilities
7.	**IAEA SAFETY STANDARDS SERIES No. GSR PART 7** – Preparedness and Response for a Nuclear or Radiological Emergency
8.	**IAEA SAFETY STANDARDS SERIES No. SSR-2/1** – Safety of Nuclear Power Plants: Design
9.	**IAEA SAFETY STANDARDS SERIES No. SSR-2/2** – Safety of Nuclear Power Plants: Commissioning and Operation
10.	**IAEA SAFETY STANDARDS SERIES No. SSR-4** – Safety of Nuclear Fuel Cycle Facilities
11.	**IAEA SAFETY STANDARDS SERIES No. SSR-5** – Disposal of Radioactive Waste
12.	**IAEA SAFETY STANDARDS SERIES No. SSR-6** – Regulations for the Safe Transport of Radioactive Material
13.	**IAEA SAFETY STANDARDS SERIES No. TS-R-1** – Regulations for the Safe Transport of Radioactive Material
14.	**IAEA SAFETY STANDARDS SERIES No. GSG-6** – Communication and Consultation with Interested Parties by the Regulatory Body
15.	**IAEA SAFETY STANDARDS SERIES No. GSG-12** – Organization, Management and Staffing of the Regulatory Body for Safety
16.	**IAEA SAFETY STANDARDS SERIES No. GSG-13** – Functions and Processes of the Regulatory Body for Safety
17.	**IAEA SAFETY STANDARDS SERIES No. GS-G-2.1** – Arrangements for Preparedness for a Nuclear or Radiological Emergency
18.	**IAEA SAFETY STANDARDS SERIES No. GS-G-3.1 -** Application of the Management System for Facilities and Activities
19.	**IAEA SAFETY STANDARDS SERIES No. GS-G-3.2 -** The Management System for Technical Services in Radiation Safety
20.	**IAEA SAFETY STANDARDS SERIES No. RS-G-1.3 -** Assessment of Occupational Exposure Due to External Sources of Radiation
21.	**IAEA SAFETY STANDARDS SERIES No. RS-G-1.4 -** Building Competence in Radiation Protection and the Safe Use of Radiation Sources

22. **IAEA SAFETY STANDARDS SERIES No.** SSG-25 **-** Periodic Safety Review for Nuclear Power Plants

23. **IAEA SAFETY STANDARDS SERIES No. SSG-50 –** Operating Experience Feedback for Nuclear Installations

24. **INTERNATIONAL ATOMIC ENERGY AGENCY** - Convention on Early Notification of a Nuclear Accident (1986) and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1987), Legal Series No. 14, Vienna (1987).

25. **INTERNATIONAL ATOMIC ENERGY AGENCY** - Generic Assessment Procedures for Determining Protective Actions during a Reactor Accident, IAEA-TECDOC-955, IAEA, Vienna (1997)

26. **INTERNATIONAL ATOMIC ENERGY AGENCY - ** General Safety Guide SGS-7 Occupational Radiation Protection

27. **INTERNATIONAL ATOMIC ENERGY AGENCY - ** Specific Safety Guide -46 Radiation Protection and Safety in Medical uses of Ionization Radiation

APPENDIX VII – CNSC ORGANIZATIONAL CHART