Canada's Nuclear Regulator

Responses to Questions Raised from Peer Review of Canada's Seventh National Report for the Convention on Nuclear Safety

Seventh Review Meeting
March 2017

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Canadian Nuclear Safety Commission

Commission canadienne de sûreté nucléaire

Responses to Questions Raised from Peer Review of Canada's Seventh National Report for the Convention on Nuclear Safety

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Canadian Nuclear Safety Commission
280 Slater Street
P.O. Box 1046, Station B
Ottawa, Ontario K1P 5S9
CANADA

Tel.: 613-995-5894 or 1-800-668-5284 (in Canada only)
Facsimile: 613-995-5086
Email: cnsc.information.ccsn@canada.ca
Website: nuclearsafety.gc.ca
Facebook: facebook.com/CanadianNuclearSafetyCommission
YouTube: youtube.com/cnscccsn
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Responses to Questions Raised from Peer Review of Canada's Seventh National Report for the Convention on Nuclear Safety

Seventh Review Meeting

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This document supplements the Canadian National Report for the Seventh Review Meeting of the *Convention on Nuclear Safety*. By offering additional and detailed information in response to 164 specific questions, or comments received from 20 Contracting Parties, the document demonstrates how Canada has implemented its obligations under the *Convention on Nuclear Safety*. This document is produced by the Canadian Nuclear Safety Commission (CNSC) on behalf of Canada. Contributions to the document were made by CNSC staff and representatives from Ontario Power Generation, Bruce Power, NB Power, SNC-Lavalin Nuclear, Health Canada and Natural Resources Canada.

The question numbers given in the serial column (Ser) in the tables below along with the order of the questions aligns with the numbers and order per the International Atomic Energy Agency (IAEA) website.

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General comments					
1	Austria	Vienna Declaration on Nuclear Safety (VDNS)	VDNS Principle 1	How do you define "a new nuclear power plant"? For example, do you consider a nuclear power plant (NPP) to cease being a "new nuclear power plant" once operations begin?	The CNSC does not have a formal definition for a new NPP. However, in general, a new NPP can be defined as a plant with no previous operation. Therefore, in practice, an NPP would cease to be new once its first operating licence is renewed.
2	Austria	VDNS	VDNS Principle 1	How do your national requirements and regulations incorporate appropriate technical criteria and standards to address the objective of preventing accidents in the commissioning and operation of new nuclear power plants? For example: can you describe the basic design objectives and the measures you have in place to ensure the robustness and independence of defence in depth measures? Consider the instance inclusion of implementation of regulatory requirements for: • Robustness of defence in depth and independency of the levels of defence in depth • Design extension conditions (DEC) • Practical elimination of high pressure core melt scenarios	New NPPs in Canada are designed in accordance with the requirements given in CNSC regulatory document REGDOC-2.5.2, *Design of Reactor Facilities: Nuclear Power Plants*, which was published in May 2014 and takes into consideration the lessons learned from the Fukushima Daiichi accident. REGDOC-2.5.2 is based on IAEA Safety Standards Requirements document SSR-2/1, *Safety of Nuclear Power Plants: Design*. Per REGDOC-2.5.2, new NPPs must be designed in accordance with the IAEA's general nuclear safety objective: to protect individuals, society and the environment from harm. This general safety objective is supported by complementary safety objectives in three areas: • radiation protection • technical safety • environmental protection The technical safety objectives are to provide all reasonably practicable measures to prevent accidents in the NPP, and to mitigate the consequences of

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				• Achieving a very low core melt frequency • Protecting digital safety equipment against Common Cause Failure (CCF) • External events analysis	accidents if they do occur. This takes into account all possible accidents considered in the design, including those of very low probability. **Applying the defence-in-depth approach** The primary means of preventing accidents (and mitigating the consequences if they do occur) is the application of the defence-in-depth approach throughout the design and operation of an NPP. This approach requires a series of levels of defence to be in place to prevent accidents from occurring and to ensure appropriate protection in the event that prevention fails. If a failure were to occur, the defence-in-depth approach allows the failure to be detected and then compensated for or corrected. Per REGDOC-2.5.2, the design for a new NPP should provide: • levels of defence in depth that are addressed by individual structures, systems and components (SSCs) • supporting analysis and calculation • evaluation of operating procedures To ensure the different levels of defence are independently effective, any design features that aim to prevent an accident should not belong to the same level of defence as those that aim to mitigate the consequences of the accident. The defence-in-depth approach is reinforced when

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					each level of defence is treated independently and strengthened separately through diverse provisions. For example, the use of dedicated systems to deal with design-extension conditions (DECs) ensures the independence of the fourth level of defence (which aims to ensure radioactive releases caused by severe accidents are kept as low as practicable). The design authority shall identify the set of DECs based on deterministic and probabilistic methods, operational experience, engineering judgment, and the results of research and analysis. These DECs shall be used to further improve the safety of the NPP by enhancing the plant's capabilities to withstand, without significant radiological releases, accidents that are either more severe than design-basis accidents or involve additional failures. **Establishing quantitative safety goals** The technical safety objectives also provide the basis for identifying the safety goals of the new NPP. For practical application, the quantitative safety goals established for NPPs consist of: • core damage frequency • small release frequency • large release frequency Core damage frequency is a measure of the NPP's accident-prevention capabilities against core damage accidents (i.e., an accident resulting from a postulated initiating event followed by the failure of one or more safety systems or safety support systems). Core

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					damage frequency is the sum of frequencies of all event sequences that can lead to significant core degradation and shall be less than 10^{-5} per reactor year. Small and large release frequencies are measures of the NPP's accident-mitigation capabilities. They also represent measures of risk to society and the environment due to the operation of the NPP. These three frequencies are utilized in the probabilistic safety assessment of an NPP (to determine the probabilities of occurrence for severe core damage states) as well as assessments of the risks of major radioactive releases to the environment. **Addressing common-cause failures** Section 7.6 of REGDOC-2.5.2 addresses common-cause failures (CCFs). The principles of separation, diversity and independence are defined in that section and guidance is given to address these issues. The potential for CCFs of items important to safety shall be considered in an NPP's design to determine where to apply the principles of separation, diversity and independence in order to achieve the necessary reliability. Per REGDOC-2.5.2, the following requirements apply to the principles of separation, diversity and independence: ***Separation*** The design shall provide sufficient physical separation between:

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					• redundant divisions of a safety system • redundant divisions of a safety support system • a safety support system and a process system ***Diversity*** Diversity shall be applied to redundant systems or components that perform the same safety function by incorporating different attributes into the systems or components. Such attributes shall include different principles of operation, different physical variables, different conditions of operation, or production by different manufacturers. ***Independence*** Interference between safety systems or between redundant elements of a safety system shall be prevented by means such as electrical isolation, functional independence and independence of information (e.g., data transfer), as appropriate.
3	Austria	VDNS	VDNS Principle 1	How do your national requirements and regulations incorporate appropriate technical criteria and standards to address the objective of mitigating against possible releases of radionuclides causing long-term offsite contamination and avoiding early radioactive releases or radioactive releases large enough to require long-term protective measures and actions? For example: can you describe the measures you have in place to protect	As given in the response to Question 2, new NPPs in Canada are designed in accordance with the requirements given in REGDOC-2.5.2, *Design of Reactor Facilities: Nuclear Power Plants*, which was published in May 2014 and takes into consideration the lessons learned from the Fukushima Daiichi accident. REGDOC-2.5.2 is based on IAEA Safety Standards Series, Specific Safety Requirements SSR-2/1, *Safety of Nuclear Power Plants: Design*. The technical safety objectives considered in the design phase are to provide all reasonably practicable

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				against severe accidents and your accident management arrangements – how do you protect people during accident management? Consider for instance inclusion of implementation of regulatory requirements for: • Engineered systems to protect the containment • Engineered systems to cool the molten core • Severe accident management, protection of staff during the accident • Provision and resilience of Emergency Mitigating Equipment (EME)	measures to prevent accidents in the NPP and to mitigate the consequences if an accident does occur. They must take into account all possible accidents considered in the design, including those of very low probability. Furthermore, the requirements for accident management are provided in CNSC regulatory document REGDOC-2.3.2, *Accident Management*, which was published in October 2014 and then updated in April 2015. The design requirements for engineered systems to protect the containment and cool the core are found in REGDOC-2.5.2. The requirements for severe accident management and protection of staff during an accident are found in REGDOC-2.3.2. All NPP licensees in Canada have implemented severe accident management guidelines. Also, licensees have dedicated systems or emergency mitigating equipment (EME) stored onsite or offsite for the transition phase during which the installed structures, systems and components are incapacitated, and offsite equipment and resources to maintain or restore fuel and containment cooling function indefinitely. For example, REGDOC-2.5.2 states: "The ability of the containment system to withstand loads associated with DECs shall be demonstrated in design documentation, and shall include the following considerations: 1. various heat sources, including residual heat, metal-water reactions, combustion of gases and

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					standing flames 2. pressure control 3. control of combustible gases 4. sources of non-condensable gases 5. control of radioactive material leakage 6. effectiveness of isolation devices 7. functionality and leak tightness of airlocks and containment penetrations 8. effects of the accident on the integrity and functionality of internal structures "The design authority shall demonstrate that complementary design features have been incorporated that will: • prevent a containment melt-through or failure due to the thermal impact of the core debris • facilitate cooling of the core debris • minimize generation of non-condensable gases and radioactive products • preclude unfiltered and uncontrolled release from containment" Also, for DECs with severe core damage, the containment shall maintain its role as a leak-tight barrier for a period that allows sufficient time for the implementation of offsite emergency procedures following the onset of core damage. Containment shall also prevent uncontrolled releases of radioactivity after

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					this period. Particular attention shall be placed on the prevention of potential containment bypass in severe accidents. Additionally, ccontainment leakage in a severe accident should remain below the design leakage rate limit for sufficient time to allow implementation of emergency measures. Beyond this time, containment leakage that would lead to exceeding the small and large release safety goals should be precluded. This may be achieved by the provision of adequate filtered containment venting along with other features.
4	Austria	VDNS	VDNS Principle 2	How do your national requirements and regulatory framework address the application of the principles and objectives of the Vienna Declaration to existing NPPs?	Canada's national requirements and regulations include basic requirements for systematic safety assessments. They also establish a flexible system of licensing that imposes more detailed safety requirements on NPPs. The licence renewal process facilitates the imposition of new requirements on existing NPPs, including requirements to continually re-assess safety and to implement reasonably practicable and achievable safety improvements in a timely manner. NPP operating licences are typically renewed every 5 years – and each renewal introduces new or updated requirements into the revised licence. Any new and updated requirements are codified on an ongoing basis in CNSC regulatory documents and CSA standards, both of which are included in the revised licensing basis for the existing NPPs when their licences are renewed. The implementation of new and revised regulatory documents and standards have resulted in

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					numerous improvements for existing NPPs under all 14 of the CNSC's safety and control areas (including design and safety analysis) as well as other areas such as fitness for service (e.g., aging management). Through licence renewal, the CNSC has imposed specific requirements for deterministic safety analysis and probabilistic safety assessment, including requirements to update them regularly. **Integrated and periodic safety reviews** Licence renewals have also been used to impose requirements for the conduct of integrated safety reviews (ISRs) when NPPs have proposed major refurbishments (which typically occur after approximately 30 years of operation). ISRs are equivalent to periodic safety reviews (PSRs) but are named differently because they are not periodic. The ISRs that have been conducted so far have involved comparisons with the latest applicable regulatory documents and standards. Reasonably practicable safety improvements were required via conditions in the renewed licence that required the completion of an integrated improvement plan (IIP). During the reporting period, CNSC began introducing, also through licence renewals, requirements for PSRs in conjunction with longer licensing periods (i.e., 10 years). PSRs are conducted according to CNSC regulatory document REGDOC-2.3.3, *Periodic Safety Reviews*. The renewed licences will also require the completion of an IIP that results from the PSR. In addition, the *General Nuclear Safety and Control*

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					Regulations (made under Canada's *Nuclear Safety and Control Act*) contain a provision in subsection 12(2) allowing the CNSC to request specific information from existing NPP licensees to help address particular issues. For example, this kind of request helped form the basis for the safety assessments and resulting physical upgrades that were completed to address the lessons learned from the Fukushima Daiichi accident.
5	Austria	VDNS	VDNS Principle 2	Do your national requirements and regulatory framework require the performance of periodic comprehensive and systematic safety assessments of existing NPPs? – if so, against what criteria/benchmarks are these assessments completed and how do you ensure the findings of such assessments are implemented?	As explained in the response to Question 4, the Canadian licensing system sets requirements for the periodic, comprehensive and systematic safety assessments of existing NPPs. The following CNSC regulatory documents establish detailed requirements for those assessments: • REGDOC-2.4.1, *Deterministic Safety Analysis* • REGDOC-2.4.2, *Probabilistic Safety Assessment (PSA) for Nuclear Power Plants* • REGDOC-2.3.3, *Periodic Safety Reviews* REGDOC-2.3.3 aligns with the requirements provided in IAEA Safety Standards Series, Specific Safety Guide SSG-25, *Periodic Safety Review for Nuclear Power Plants*. It requires the review to be conducted against applicable modern national and international codes, standards and practices. Licence conditions also require licensees to execute the IIP resulting from its assessment. Canada is currently implementing PSRs as the operating licences for existing NPPs are renewed. ISRs, which are effectively the same as PSRs (as

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					explained in the response to Question 4), have already been conducted by licensees – and the execution of the resulting IIPs has been confirmed via CNSC inspections and desktop reviews. IIPs that result from PSRs will be ensured in the same way.
6	Austria	VDNS	VDNS Principle 2	Do your national requirements and regulation require reasonably practicable/achievable safety improvements to be implemented in a timely manner – if so, against what risk/engineering objective or limit are these judged and can you give practical examples?	As explained in the responses to Question 4 and Question 5, Canada's requirements and regulations require reasonably practicable and achievable safety improvements to be implemented in a timely manner, primarily through the licence conditions imposed during the renewal of the operating licences for existing NPPs. Specific risk and engineering objectives and limits are provided in the list of modern codes, standards and practices that have formed the basis for ISRs and will form the basis for PSRs. An example is the installation of a containment filtered venting system at Point Lepreau Generating Station. The benefits for such a system were identified as part of the plant's ISR, while the probabilistic safety assessment identified that such a system would help reduce the consequences of severe accidents (identified as reductions in predicted release frequencies). Another example is the set of enhancements completed under the action plan to address the lessons learned from the Fukushima Daiichi accident, which improved overall defence in depth while addressing specific hazards or weaknesses that had not previously been considered and addressed as rigorously (perhaps because of their low likelihood of occurrence). These enhancements were categorized as either short-,

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					medium- or long-term enhancements through a risk-ranking process and then scheduled and completed accordingly. Details about these enhancements can be found in the sixth and seventh Canadian reports.
7	Austria	VDNS	VDNS Principle 3	How do your national requirements and regulations take into account the relevant IAEA Safety Standards throughout the life-time of a NPP?	NPPs in Canada are operated in accordance with the national regulatory framework (including CNSC regulatory documents and consensus CSA standards), which accounts for the siting, design, procurement, construction, commissioning, operation, aging and decommissioning of the NPP. The national regulatory framework is aligned with and informed by the IAEA safety standards, which themselves have been demonstrated to fulfill the principles of the VDNS. For more details on the alignment of Canada's regulatory framework with the IAEA safety standards, refer to annex 7.2(i)(b) of the seventh Canadian report. The regulatory documents and standards are reviewed and updated on a regular basis – for example, to incorporate the lessons learned from the Fukushima Daiichi accident.
8	Austria	VDNS	VDNS General Question	What issues have you faced or expect to face in applying the Vienna Declaration principles and objectives to your existing fleet or new build of NPPs?	There are no impending issues related to the application of Principle 1 of the VDNS, which relates to new build. Canada's requirements for new build have been updated based on the lessons learned from the Fukushima Daiichi accident. Furthermore, as explained in the seventh Canadian report, these requirements are aligned with IAEA safety standards, which themselves fully address the VDNS principles. The active new-build project, as described in the

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					report, is the potential construction of up to four new units at the existing site of the Darlington Nuclear Generating Station. Although a licence to prepare the site has been granted by the CNSC, site preparation will not begin until a reactor vendor is selected. The granting of a licence to construct would be the next major regulatory step – and when that occurs, up-to-date requirements will be applied. Other new-build possibilities in Canada remain at the initial exploratory/discussion stage and there are no impending licensing actions. Regarding Principle 2, the response to Question 4 explains how the implementation of ISRs and now PSRs, as imposed by licence requirements, has introduced comprehensive, systematic safety assessments and IIPs. Canada already has extensive experience in conducting and overseeing ISRs and IIPs. As the execution of a PSR is effectively the same as that of an ISR, it does not pose an unknown challenge. The transition from 5-year to 10-year operating licences will obviously involve less frequent major licensing decisions. This will be balanced by enhanced reporting to the Commission (the decision-making body) to ensure there are sufficient performance assessments, updates and opportunities for the Commission and the NPP licensees to exchange information. This challenge will be addressed by, among other things, enhancements to the annual regulatory oversight report (and associated processes) to the Commission.

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<tr><td></td><td></td><td></td><td></td><td></td><td>Regarding Principle 3, the seventh Canadian report explains how CNSC regulatory documents and CSA standards comprehensively take into account relevant IAEA safety standards. Those safety standards have been confirmed to adequately address the VDNS principles. Furthermore, Canada has in place rigorous processes to ensure that its regulations, regulatory documents and standards continue to reflect IAEA safety standards, where applicable. Therefore, no specific issues are anticipated in continuing to satisfy Principle 3 of the VDNS.</td></tr>
<tr><td>9</td><td>Hungary</td><td>General</td><td>p. 11</td><td>Regarding the new NPP project at the Darlington site, the report states that “An environmental assessment (EA) concluded in May 2010 that the project was not likely to cause significant adverse environmental effects.”

Are there any other adverse environmental effects that are likely to occur? What are they?</td><td>As indicated in the table below, Ontario Power Generation (OPG) has identified the following residual adverse effects to the environment related to the new NPP project at the Darlington site, all of which have been determined to be not significant:

<table><tr><th>Residual adverse effect</th><th>Rationale for determining effect to be minor adverse effect, not significant</th></tr><tr><td>Loss of some aquatic biota (including fish) during the construction of the lake infill and the intake and discharge structures</td><td>• The nearshore environment is a high-energy zone with few documented invertebrate species.
• The most common fish species that may be affected is the round goby, which is an invasive species.
• As the footprint of cooling/service intake and discharge structures is small, the loss of biota is not significant relative to the entire area.
• Extensive similar habitats are found adjacent to the affected</td></tr></table></td></tr>
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						area.
					Impingement and entrainment losses associated with operation of the once-through lakewater cooling option and, to a lesser degree, with the cooling tower option	• The once-through cooling intake has been designed specifically for reducing entrainment and impingement of fish. • The intake incorporates design features based on fish behavioural principles. It is also located offshore at depths that are less productive than inshore locations. • The expected losses will be low relative to Lake Ontario populations.
					Loss of approximately 40 hectares of Lake Ontario nearshore aquatic habitat as a result of lake infilling and construction of cooling water intake and discharge structures	• There is nothing distinctive about the nearshore habitat as a spawning or feeding area that is not shared by adjacent areas east and west of the site. • The nearshore in this area is a high-energy environment. Its ecology is heavily skewed toward the seasonal and intermittent presence of migratory Lake Ontario fish species. • Mitigation measures will be implemented (notably, the Fish Habitat Compensation Plan).
					Loss of approximately 50 hectares of terrestrial habitat on the Darlington site	• Cultural meadows and other terrestrial habitat of the types found at the site are widespread in the environment in southern Ontario as well as in the regional study area (RSA) and local study area (LSA). • Many of those at the site are

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						plant mixtures of low ecological function. • Some habitat will remain available on the Darlington site. • None of the breeding bird habitats being reduced due to effects of the project are unique to the site and they occur commonly in the RSA and LSA.
					Loss of nesting habitat for up to 1,000 bank swallows	• Mitigating options include the long-term protection of important nesting areas, the design and construction of artificial bank swallow colonies, and research into declines in aerial foraging birds. These actions will bring long-term tangible benefits to this species and perhaps others. • The portions of the colony being removed are confined to the site study area (SSA). A larger portion of the associated colony will still remain viable.
					Disruption to wildlife travel along the east-west wildlife corridor during the site preparation and construction phase	• Wildlife using the east-west corridor through the site is already adapted to the road network and high levels of human disturbance that characterize both the LSA and SSA. • The site remains permeable for many of these species and the period of disturbance will be relatively limited. • Replanting will strengthen corridors affected during site

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<tr><td></td><td>preparation and construction.</td></tr>
<tr><td>Reduced use and enjoyment of community and recreational features on the Darlington site during construction</td><td>• Areas on the site will remain available for recreational purposes.
• The reduced use and enjoyment of the site for recreational. purposes will likely be experienced by a small number of users for a limited period
• Recreational areas will be re-established once construction is complete.</td></tr>
<tr><td>Disruption to use and enjoyment of property because of common construction nuisances (e.g., dust, noise, traffic) for some residents living along the truck haul routes</td><td>• Increased traffic, noise and dust effects are not anticipated to be of sufficient magnitude to preclude continued use of private property.
• Effects will be limited to a few properties along the haul route to a soil-disposal area within the LSA.</td></tr>
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</td></tr>
<tr><td>10</td><td>Hungary</td><td>General</td><td>p. 173</td><td>The report states that changes to the operating limits “that may negatively affect safety require appropriate justification by operations support staff and are reviewed by the CNSC.”

What can justify a change that negatively affects safety? (Note: Hungarian regulation and international practice prescribe that the changes shall not decrease nuclear safety.)</td><td>Clarification: The statement “may negatively affect safety” was intended to explain that the licensee’s assessment and CNSC review are intended to confirm IF there is a potential negative impact on some aspect of safety. If there is such a negative impact, the CNSC requires that the proposed change to the licensee’s operating limits be reconsidered or other compensatory measures be undertaken so that the net effect would be no overall decrease in safety.

In Canada, the detailed requirement regarding changes that negatively affect safety for NPPs is contained in</td></tr>
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					the condition in the operating licence that requires the licensee to operate within the licensing basis, which includes the licensee's proposed operating limits and many other safety-related details.
11	India	General	Chapter-1, D.2, p. 9	Several existing CANDU NPPs have undergone major life-extension projects. It is mentioned that "Depending on the circumstances and CNSC approval, a refurbished reactor with replaced 'fuel channels' could operate for approximately 30 or more years." In the post refurbishment phase, does the scope and frequency of in-service-inspections for the retained SSCs remain the same as what was being followed earlier?	The scope and frequency of inspections for retained components will continue to follow the requirements of the governing CSA standards on periodic inspection programs, which are referenced in each station's licence conditions handbook. These standards currently do not include specific changes to the scope and frequency of inspections for retained components for NPPs that have undergone major life-extension projects, such as refurbishment. The scope of an inspection program is based upon an assessment of the impact of a failure of SSCs on the safe operation of the NPP. This assessment considers the design basis of SSCs. As long as there are no changes to the design basis due to life-extension activities, there would be no expected change to the scope of the periodic inspection program. Any changes to the design basis arising from life-extension activities that could affect the assumptions used in the development of the periodic inspection program will result in a review of the program's scope.
12	Japan	General	Appendix F	Canadian Report shows the CNSC's assessment and Rating System for Nuclear Power Plants in Appendix F. Please elaborate how the results of rating of plant will be reflected through inspection or evaluation by CNSC. Does the CNSC give	In the case where a licensee's performance from the rating system is satisfactory, the CNSC continues to conduct a baseline set of compliance verification activities. The purpose is to monitor and maintain confidence in the continued performance of a licensee and to identify problems at an early stage.

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				incentive to licensees with good ratings through frequency or contents of inspections? Please elaborate the relation to the Administrative Monetary Penalties (AMPs) and rating system?	If a licensee's performance from the rating system does not meet expectations, it may be necessary to increase regulatory scrutiny. Reactive compliance verification activities may be used to inspect or monitor the situation. Once the licensee has implemented a corrective action plan (CAP), a systematic and documented compliance verification activity may be warranted to verify the effectiveness of the CAP. Administrative monetary penalties (AMPs) issued to an NPP licensee may result in increased regulatory scrutiny and the event resulting in the AMP will be considered in the annual rating for the licensee.
13	Korea, Republic of	General	Appendix D, p. 188	With reference to the event of suspect material discussed in Appendix D of the Canadian national report, it is stated that vendors and licensees involved with the event will implement a new CSA N299 standard. With respect to the provided information in the appendix in question, Korea would like to inquire the following question: Which vendors and suppliers will be subjected to apply the new CSA N299 standard?	CSA standard N299, *Quality assurance program requirements for the supply of items and services for nuclear power plants*, is a series of four standards developed by the nuclear power industry as an update to the previous CSA Z299, *Quality assurance program* series. CSA standard N299 has now been adopted by all Canadian NPP licensees. CSA N299 is a graded set of standards (N299.1 to N299.4) that NPP licensees use to specify the quality assurance requirements to their suppliers and sub-suppliers. The standards are graded by complexity of design and risk/safety significance. The application of the four standards in this series is as follows: • N299.1 applies to suppliers of custom-designed, high-technology items and services that tend to require complex processes and extensive design

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					effort. • N299.2 applies to suppliers of relatively high-technology items or services that tend to require design activities, design verification and production planning, and have a significant number of complex processes. • N299.3 applies to suppliers of items or services requiring some complex processes. This may include high-volume services or mass-produced items, and may include design changes and associated verification and production activities • N299.4 applies to suppliers of mass-produced items designed to commercial technical standards for simple processes such as machining, assembly, installation, warehousing and distribution CSA N299 is not a standard imposed by the CNSC. It is the licensees' choice as the means of meeting the supply chain requirements in CSA standard N286, *Management system requirements for nuclear facilities*, which is the reference standard for the CNSC's regulatory requirement on management systems.
14	Netherlands	General	General	Could you please explain what you consider to be the most important actions that Canada will take based on the IAEA Fukushima summary report?	The most important actions Canada has taken in response to the IAEA's *The Fukushima Daiichi Accident: Report by the Director General* (DG-IAEA Report) were in the areas of assessing radiological consequences and post-accident recovery (i.e., sections 4 and 5 of the DG-IAEA Report). The reason for this is that the DG-IAEA Report was developed over a longer period – five years post-accident – than the *CNSC Integrated Action Plan on*

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					the Lessons Learned from the from the Fukushima Daiichi Nuclear Accident (CNSC Action Plan), which was developed within the first year following the accident. As a result, the information presented in sections 4 and 5 of the DG-IAEA report was not available at the time of preparing the CNSC Action Plan. The actions taken by CNSC staff have focused on ensuring that appropriate processes are either in place or will be developed to address the lessons learned in these two areas. (For details on Canada's actions related to each lesson, refer to annex 8 of the seventh Canadian report.) An example of this is the consideration of issues in the development of post-accident recovery guidelines, such as guidelines for food and water controls, which will enhance the CNSC regulatory framework/processes and emergency preparedness. This effort is to be carried out collaboratively by a number of Canadian government organizations, including the CNSC, Health Canada and Public Safety Canada.
15	Pakistan	General	General	The National Report of Canada is written in a legible, generally understandable and very well structured manner. Each article of the convention is comprehensively and thoroughly addressed giving the reader a clear picture of nuclear safety in Canada. The review of the report reveals that the principles of Vienna Declaration are already being implemented/followed by Canada. The CNSC fosters openness and	Comment is appreciated. Thank you.

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				transparency in its regulatory processes for which it has also launched a Participant Funding Program, which facilitates the participation of eligible interveners in the decision-making process. The report provides detailed information about the measures taken in response to the challenges identified during the Sixth Review Meeting for Canada. Operation of the Participant Funding Program which gives the public, aboriginal groups and other stakeholders the opportunity to request funding from the CNSC to participate in its regulatory process may be considered a good practice.	
16	United Arab Emirates	General	General	The report is very comprehensive and well presented. Sufficient information reflecting each article is available through the report, with further details explained in the appendices.	Comment is appreciated. Thank you.

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Article 6: Existing nuclear power plants					
17	Argentina	Article 6	pp. 28, 59	Which are the expected steps to complete the decommissioning of Gentilly-2 and the time schedule?	The major activities to be conducted by Hydro-Québec to complete the decommissioning of the Gentilly-2 Nuclear Generating Station, along with their expected completion dates, are as follows: • **2019:** Detailed decommissioning plan for the next phase of decommissioning, safe storage state (SSS) with all spent fuel in dry storage (SSS dry, also called dormancy), to be submitted to the CNSC • **2020:** SSS dry • **2057:** Detailed decommissioning plan for the dismantling of the facilities to be submitted to the CNSC • **2058:** Preparation for dismantling activities • **2059–2064:** Conduct of dismantling activities • **2065–2066:** Conduct of site-restoration activities • **2066:** Application for a licence to abandon the Gentilly-2 site to be submitted to the CNSC The key activities to be completed by the end of 2020 to achieve the SSS dry (dormancy) phase include: • transferring irradiated fuel from the spent fuel pool to CANDU Storage (CANSTOR) dry storage modules; these transfers will be conducted through a series of annual and seasonal campaigns that will be completed by 2020 • transferring the content of the auxiliary fuel pools to

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					the onsite solid radioactive waste management facility (SRWMF); this transfer is expected to be completed by 2020 • draining the spent fuel pool and the auxiliary fuel pools; this is scheduled to take place in late 2020 • transferring the complete inventory of accumulated spent resins to the SRWMF; the initial phases of this operation took place in 2013 and 2014, with the final phase planned for 2017 • draining of the reactor shield cooling system; this is planned for late 2020 • rinsing and draining the heavy water purification towers; this will be carried out by 2020 • reconfiguring buildings or rooms where residual radioactive material can be found; this will be completed gradually between now and 2020 • developing a detailed decommissioning plan (including any remaining surveillance activity) to cover the next phase of the decommissioning, SSS dry; this plan will be submitted to the CNSC in 2019
18	Russian Federation	Article 6	Section D.2	Section D.2 in National Report mentions that there are two procedures provided for units on the end of their design life: "life extension" or "refurbishment". In particular, according to the report, for Pickering 5-8 it was decided that incremental life extension, rather than the options of shutdown or refurbishment, was	As a CANDU reactor approaches the end of its assumed design life, the operator must decide to either: • shut down the reactor • undergo a life-extension project Life-extension projects are undertaken to support the operation of structures, systems and components

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				the best option. Could you please explain what "refurbishment" includes and how it differs from "life extension"?	beyond their assumed design life as well as to refurbish components. There are essentially two types of life-extension projects: • extended operation • refurbishment **Extended-operation projects** For an extended-operation project, the operation of the unit is extended beyond the design life. The project is supported by a condition assessment, assurance of fitness for service and an aging management plan. **Refurbishment projects** If the operator decides it wants to continue to operate units beyond the design life **and** beyond the period supported by an extended-operation project, it must initiate a refurbishment project. Refurbishment may involve the replacement of major components such as pressure tubes and steam generators.
19	Russian Federation	Article 6	Section D.2, pp. 9-10	Section D.2 discusses life-extension projects. Could you please give information about major activities carried out at each operating nuclear unit to justify service life of equipment, perform refurbishment and enhance safety?	Canadian operators collaborate extensively on life-extension analysis and service-life justifications through the CANDU Owners Group (COG) Research and Development Program and COG joint initiatives such as the: • Fuel Channel Life Management Project, which helps ensure that fuel channels meet their targeted service lives through in-service inspections, maintenance and engineering assessments • Pressure Tube End-of Life Hydrogen Equivalent

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					Fracture Toughness Testing and Assessment • Industry Standard Toolset Program • Gaseous Fission Product (GFP) Monitoring System, with a goal of 20-year life extension of GFP system operations • Film Forming Amine (FFA) Project to preserve steam generators and qualify CANDU stations for AREVA's FFA process, which preserves metal in the condensate, feed water and boiler systems against corrosion • Aging Management Peer Group, which shares information, methodologies and approaches for asset management CNSC staff closely monitor the progress on these efforts and perform detailed reviews of licensee plans and strategies supporting continued safe operation of their units. CNSC staff also confirm consistency between licensee assessments of remaining component life and their refurbishment plans. Once a licensee undertakes a life-extension project, the licensee conducts a comprehensive assessment of plant design, condition and operation – known as a periodic safety review (PSR) – and then identifies and addresses all environmental and safety concerns in an integrated implementation plan. Prior to performing the PSR, the licensee prepares a PSR basis document, which clearly defines the full period of the proposed extended operation.

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Article 7: Legislative and regulatory framework					
20	Japan	Article 7	p. 45	License renewal is considered as an opportunity to implement newly introduced regulatory requirements and those requirements which have not been considered at the timing of license renewal would be implemented as a licensee's continuous improvement based on the risk information. License renewal is recognized as a legally binding action. How about licensee's continuous improvement? Is it a legally binding activity? (Through this question we would like to discuss about the method to implement revised regulatory requirements at existing nuclear power plants.)	Operating licences for NPPs are now being issued with requirements to conduct periodic safety reviews (PSRs) and complete the corresponding integrated improvement plans (IIPs). The IIPs typically span work that is conducted throughout the licence period. General requirements for ongoing improvement are set in CSA standard N286-12, *Management system requirements for nuclear facilities*, which requires that: • safety is the paramount consideration guiding decisions and actions • the management system is continually improved These are broad principles that NPP licensees are required to apply when identifying and implementing new, specific requirements beyond those that are considered during licence renewal. The existing licensees have prioritized various improvement initiatives, some of which are implemented between licence renewals. The CNSC has recently established an implementation working group to coordinate its efforts in implementing new CNSC regulatory documents and CSA standards for all licensed facilities, including NPPs. This working group will track which new requirements are implemented as part of licence renewal versus which ones are being (or should be) implemented before the next renewal. In cases where the implementation of new

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					requirements or improvements needs to be expedited, subsection 12(2) of the *General Nuclear Safety and Control Regulations* gives the Commission, or a person authorized by the Commission, the authority to seek information or to direct a licensee to revise or update regulatory requirements at any time, including between licence reviews. This mechanism was used to request the information and analysis from the NPP licensees that helped form the basis for the actions completed in response to the lessons learned from the Fukushima Daiichi accident.
21	Japan	Article 7	p. 40	What are the structures and contents of LCH (License Condition Handbook) (p.40)? Are the design conditions and specifications of the plant described simply but comprehensively enough? How does it assist the review work in reality?	The licence conditions handbook (LCH) provides a relatively large amount of information that is sufficient to guide the compliance activities related to each licence condition. For example, the licence to operate an NPP may contain the following, simple condition: "The licensee shall implement and maintain a fitness for service program." The LCH, under this licence condition, provides: • general background information relevant to fitness for service • a list of the CNSC regulatory documents and CSA standards that contain requirements for fitness for service • specific exceptions or exemptions to requirements in the relevant CNSC regulatory documents and CSA standards • a list of the most important licensee documents that describe the requirements and provisions of the

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					licensee's specific fitness-for-service program • other criteria that will be used to oversee compliance with the licence condition • additional guidance on how the licensee can comply with the licence condition This information typically comprises several pages and may also be organized under sub-topics (e.g., maintenance, periodic inspections, reliability, aging management). There is often enough information provided or referenced to facilitate review work. However, if more information is needed, licensees will provide it to CNSC staff upon request. Regarding detailed design information and plant specifications, these were submitted to the CNSC in the past as part of previous licence applications. The licence to operate issued now requires the licensee to inform the CNSC when changes are made to these and other important details that affect the licensing basis for the NPP. The licensee documents containing design-related information that are referenced in the LCH include the safety analysis report (deterministic analysis, regularly updated) and the probabilistic safety assessments (PSA, regularly updated). The LCH also references the documents that describe the licensee's engineering and design change control mechanisms, which CNSC reviews, monitors and inspects. See the response to Question 49 for additional discussion on this topic.

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22	Japan	Article 7	p. 46	Canada has set the renewal license term at 5 years; please explain the details of the basis/idea for setting the renewal term at 5 years?	Licence renewals for NPPs in Canada are typically complicated projects. The breadth and depth of the assessments carried out by both the applicant and the CNSC, as explained in Canada's CNS reports, can be compared to that required for PSRs. Licence renewals typically initiate the implementation of new requirements (e.g., as provided in new or revised CNSC regulatory documents and CSA standards). Licence renewals also involve significant opportunities for other stakeholders to review the material to be presented to the Commission by both CNSC staff and the applicant/licensee, as well as opportunities to submit their own material and possibly participate in the Commission hearings themselves. These activities require significant time, with preparations for a typical NPP licence renewal starting two years before the expiry of the current licence. A five-year interval between renewals allows the licensee sufficient time to complete any implementation of new requirements that is not yet completed at the time of renewal, while giving all parties sufficient time between renewal activities to address other priorities. It also provides the Commission with sufficiently frequent opportunities to examine in detail the applicant/licensee and its past performance, programs and plans for improvement.
23	United Kingdom	Article 7	Various	Articles 7, 14 The national report states that CNSC regulatory document REGDOC-2.3.3 "Periodic Safety Reviews" (PSR) was	Requirements for integrated safety reviews (ISRs) were first documented in CNSC regulatory document RD-360, *Life Extension of Nuclear Power Plants*. It required an ISR basis document that identifies, among

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				published in 2015 and closed a remaining open recommendation from the 2009 IRRS mission to Canada. This requires PSR for future licence renewals, with the first in 2018. Previously, licensees were required to produce integrated safety reviews (ISR) as part of licence renewal and it is claimed that ISR will be considered to be the equivalent of a first PSR. Hence reactors will not be subject to PSR until 10 years after their last ISR and the first PSRs for some reactors may not be required until the mid-2020s. To demonstrate that the PSR process has been adequately implemented, please provide: • A list of the dates for the first PSR for each operating reactor. • Details of how it has been shown that the gap between a PSR and an ISR is such that the claim of equivalence can be substantiated. • Details of any transitional arrangements, in terms of additional analyses that need to be completed, in advance of the first complete PSR for a site	other things, the set of modern codes, standards and practices to be used during the review, as well as a set of safety factor reports, a global assessment report and an IIP. The methodology was based on IAEA Safety Standards Series Safety Guide NS-G-2.10, *Periodic Safety Review of Nuclear Power Plants*. PSRs also require a PSR basis document that identifies, among other things, the set of modern codes, standards and practices to be used during the review, as well as a set of safety factor reports, a global assessment report and an IIP. The requirements for PSRs are consistent with IAEA document SSG-25, *Periodic Safety Review for Nuclear Power Plants* (which superseded NS-G-2.10). Thus, ISRs and PSRs involve the same processes, which are modelled on the IAEA safety standards. In addition to addressing the IAEA safety factors, the licensees' IIPs also address other CNSC safety and control areas that are beyond the IAEA safety factors (such as waste management, security, safeguards and non-proliferation, and packaging and transport). See table F.2 in the seventh Canadian report for an illustration of how the CNSC safety and control areas correspond to the IAEA safety factors. Given the equivalence of the ISR and PSR processes, there are no major additional analyses required to bridge a gap between an ISR that has been conducted and the next PSR (other than the obvious updates of the existing assessments). In the table given below, the ISRs that have been

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<tr><th>Ser</th><th>Country</th><th>Original reference</th><th>Reference in report</th><th>Questions/comment</th><th>Response</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>conducted are listed as initial PSRs. Predicted dates for PSRs that have not yet been completed are in parentheses.

<table><tr><th rowspan="2">NPP and units</th><th colspan="2">Year PSR completed (or predicted to be completed)</th></tr><tr><th>Initial</th><th>Next</th></tr><tr><td>Pickering Units 1, 4</td><td>2000</td><td>(2018)</td></tr><tr><td>Pickering Units 5–8</td><td>2009</td><td>(2018)</td></tr><tr><td>Bruce A Units 1, 2</td><td>2007</td><td>(2017)</td></tr><tr><td>Bruce A Units 3, 4</td><td>(2017)</td><td></td></tr><tr><td>Bruce B Units 5–8</td><td>(2017)</td><td></td></tr><tr><td>Darlington Units 1–4</td><td>2015</td><td>(2026+)</td></tr><tr><td>Point Lepreau</td><td>2008</td><td>(2022+)</td></tr></table>
There are no transitional arrangements planned. Licensees are required to submit PSR documents and reports per CNSC regulatory document REGDOC-2.3.3, Periodic Safety Reviews, as provided through a licence condition.</td></tr>
<tr><td>24</td><td>United States of</td><td>Article 7</td><td>7.2 (ii) (e) p. 47</td><td>The report states that CNSC has established a licensing strategy for decommissioning NPPs in the context of</td><td>The regulatory experience gained from the shutdown and future decommissioning of Gentilly-2 yielded some lessons that may be valuable to other regulators.</td></tr>
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	America			the license renewal for Gentilly-2. Does CNSC plan to document lessons-learned from this strategy, in such a way it can be used globally by other international partners?	These lessons covered areas such as managing regulatory staffing levels, changes in the compliance verification strategy, changes in the regulatory framework, changes in the overall licensing approach and changes in the regulator/licensee communication regime, among others. Other issues that arose during Gentilly-2's transition from an operating regime to a safe storage state have also been captured. Most of these issues are site-specific and have either already been resolved or are currently under review (e.g., issues relating to the sale or leasing of non-nuclear facilities located on site). Other site-specific factors, such as the shutdown and decommissioning of a single versus multi-unit site, have also yielded lessons for the CNSC. The CNSC does not currently have any plans to document or share these lessons learned with any international partner.
25	Indonesia	Article 7.1	Section A	Please kindly elaborate on pre-licensing review of a vendor's reactor design. Is the review the same as the US NRC's?	Information on the pre-licensing review can be found in CNSC guidance document GD-385, *Pre-licensing Review of a Vendor's Reactor Design.* A pre-licensing review, commonly referred to as a vendor design review, is an optional service that the CNSC provides for the assessment of a vendor's design for a nuclear power plant or small reactor. The primary purpose of this review is to inform the vendor of the overall acceptability of the reactor design. The CNSC enters into a service agreement with the vendor that is based on a fixed scope of work. This review provides the early identification and

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					resolution of potential regulatory or technical issues in the design process, particularly those that could result in significant changes to the design or safety case. The CNSC conducts more detailed reviews of the design and safety case at the time of an application for a licence to construct and an application for a licence to operate. A review considers technical aspects and does not include considerations such as: • design costs • state of completion of the design • scheduling factors relative to the review of a licence application • design changes that could be required as a result of future findings The vendor design review is divided into three phases, each requiring increasingly more detailed technical information: **Phase 1 – Compliance with regulatory requirements:** CNSC staff assess the information submitted in support of the vendor's design and determine if, at a general level, the design intent complies with CNSC design requirements. **Phase 2 – Pre-licensing assessment:** This phase goes into further detail, focusing on identifying potential fundamental barriers to the licensing of the vendor's design for a nuclear power plant or small reactor in Canada.

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					Phase 3 – Pre-construction follow-up: In this phase, the vendor can choose to follow up on one or more focus areas covered in Phase 1 and 2 against CNSC requirements pertaining to a licence to construct. For those areas, the vendor's anticipated goal is to avoid a detailed revisit by the CNSC during the review of the construction licence application. The CNSC pre-licensing review differs from that of the United States Nuclear Regulatory Commission in that it does not certify a design and does not fetter the Commission in a future licensing decision.
26	Indonesia	Article 7.1	Section A	Please further explain the importance of bird migration included in your regulation. Were there any disaster related to the bird migration which impact on nuclear installation?	Approximately 450 species of native birds seasonally migrate to and from Canada, the majority of which are protected under the *Migratory Birds Convention Act, 1994*, and are collectively referred to as "migratory birds". This Act and its complementary regulations ensure the conservation of migratory bird populations by regulating potentially harmful human activities. It is the responsibility of Environment and Climate Change Canada, with whom the CNSC has signed a memorandum of understanding, to develop and implement policies and regulations to ensure the protection of migratory birds and their eggs and nests. Therefore, potential impacts on migratory birds from a proposed (or operating) nuclear facility are assessed by the CNSC with support from Environment and Climate Change Canada. There have never been any incidents or disasters involving migratory birds at Canadian nuclear facilities regulated by the CNSC. As part of the pre-licensing environmental assessments conducted under

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					the *Nuclear Safety and Control Act* (NSCA) and/or the *Canadian Environmental Assessment Act, 2012*, the impacts of a proposed nuclear facility on the environment, including on migratory birds, are assessed. Other potential risks such as (but not limited to) bird strikes with nuclear structures are also considered in such assessments. Mitigation measures, if required, are stipulated in the operating licence or the associated LCH as a condition that the licensee is expected to meet. In addition, the CNSC's compliance and monitoring programs ensure that the licensee is compliant with the conditions for the protection of the environment. The licensee is also required to report any incidents, which are then investigated by the CNSC and other appropriate authorities. Furthermore, environmental performance reports are routinely submitted to the CNSC for a detailed technical review and additional conditions may be implemented if deemed appropriate.
27	Indonesia	Article 7.1	Section A	Please explain the methodology to determine the AMP for individual and persons other than individual $25,000,000 and $100,000,000. Is this value enough to prevent violation of the regulation?	To correct the amounts given in the question statement, per the seventh Canadian report and CNSC regulatory document REGDOC-3.5.2, *Administrative Monetary Penalties, version 2*, the maximum penalties for individuals and persons other than an individual (i.e., a corporation or other institution) are set at $25,000 and $100,000, respectively. REGDOC-3.5.2 provides information about the administrative monetary penalty (AMP) program, including the methodology used to determine the AMP penalty amount.

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					As to whether the maximum penalty amounts are enough to prevent regulatory violations, since the CNSC started issuing AMPs in 2013, no violator has been issued a second AMP after a CNSC follow-up inspection. This indicates that AMPs are effective in deterring future non-compliance with the regulations. All AMPs are also published on the CNSC's public website, providing licensees with additional motivation to prevent future violations. The maximum penalty amounts set in the NSCA are the maximum penalty amounts per violation. If a violation is committed on or continued for more than one day, the CNSC may issue a separate AMP for each day on which the violation is committed or continued (section 65.07 of the NSCA). Furthermore, if the violator re-offends, the penalty amount on a subsequent AMP will increase accordingly based on poor compliance history. There are additional deterrents against non-compliance with the NSCA or regulations: namely, suspension or withdrawal of a licence, and proceedings in criminal court.
28	Russian Federation	Article 7.1	Section 7.1, p. 27; Section 11.1, p. 91	*Nuclear Liability and Compensation Act* comes into force on January 1, 2017; it will increase the amount of compensation available to address civil nuclear damage to $1 billion. Will financial security to the amount stipulated by *Nuclear Liability and Compensation Act* be a mandatory	Financial security in the amount stipulated by the *Nuclear Liability and Compensation Act* (NLCA) will be mandatory once the operator has been issued an operating licence. Specifically, paragraph 27(1) of the NLCA requires that an operator of a nuclear installation maintain financial security in an amount equal to the liability imposed on the operator by paragraph 24(1) of the NLCA or by regulation

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				condition to obtain a site/construction/operation licence?	pursuant to paragraph 24(2)(b) of the NLCA. Nuclear installations and operators of nuclear installations are designated by Government of Canada regulations that come into force only when the CNSC has issued a licence to operate and the licensed facility contains nuclear material (i.e., fissile material or radioactive waste or products originating from that material). Therefore, once the licence is issued and the facility contains nuclear material, the NLCA would apply and the operator would be required to maintain the amount of financial security stipulated by the NLCA.
29	United Arab Emirates	Article 7.1	p. 25	It is noted that Section 9 of the NSCA sets out the CNSC's objects (or mandate) as follows: "to disseminate objective, scientific, technical and regulatory information to the public concerning the activities of the Commission and the effects, on the environment and on the health and safety of persons, of the development, production, possession and use of nuclear substances, prescribed equipment and prescribed information." Kindly elaborate on the methods and tools used for such communication with the public.	The CNSC communicates with the public through many means, including Commission hearings and meetings. It also uses tools such as its website, social media accounts (e.g., Facebook, Twitter, YouTube), webinars, interactive online modules, email updates to subscribers, and attendance at third-party events and conferences to reach its target audiences. CNSC staff members also host information sessions to explain to stakeholders how the nuclear industry is regulated and how to participate in the regulatory process. The CNSC methods of communicating with the public are given in subsection 8.1(f) of the seventh Canadian report.
30	Hungary	Article 7.2	p. 47	With the adoption of the Periodic Safety Reviews, operating licenses that were formerly valid for 5 years will be issued for 10 years in the future.	CNSC staff will continue to assess the safety of NPPs in Canada during the course of a 10-year licensing period for each NPP through the application of the compliance verification program. The activities in this

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				Is there any process planned for the assessment of safety of the licensed power plants at the mid-term of their 10-year license period or at any time between PSRs?	program include surveillance and monitoring by full-time, onsite inspectors, as well as announced and unannounced inspections supported by subject matter experts and desktop reviews by technical specialists. All compliance verification activities are fully documented and record the objective evidence that forms the basis of the compliance results. NPP licensees are notified of the results and expected to address the findings and improve their programs accordingly. The Commission is informed of the results of the compliance verification program as well as the safety performance of each licensee through the publication of the annual *Regulatory Oversight Report for Canadian NPPs*, which is presented by CNSC staff to the Commission and made publicly available on the CNSC's website.
31	Korea, Republic of	Article 7.2	p. 35	With reference to article 7, section 7.2(i)(d), page 35 of the Canadian national report, it is stated that CNSC regulatory documents and CSA standards incorporate the content of IAEA publications as reference in relation with principle 3 of the Vienna Declaration on Nuclear Safety (VDNS). With respect to the provided information in the section in question, Korea would like to inquire the following question: 1) What are the specific safety goals or criteria stipulated in regulatory documents	Per CNSC regulatory documents, REGDOC-2.5.2, *Design of Reactor Facilities: Nuclear Power Plants*, and REGDOC-2.4.2, *Probabilistic Safety Assessment (PSA) for Nuclear Power Plants*, the technical safety objectives provide the basis for identifying the safety goals of the NPP. For practical application, quantitative safety goals are established for NPPs consisting of: • core damage frequency • small release frequency • large release frequency Core damage frequency is a measure of the NPP's

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				and CSA standards for new reactors that are used to confirm that off-site contamination is mitigated and early releases or large releases that require long-term protective measures are avoided?	accident-prevention capabilities against core damage accidents (i.e., an accident resulting from a postulated initiating event followed by the failure of one or more safety systems or safety support systems). Core damage frequency is the sum of frequencies of all event sequences that can lead to significant core degradation and shall be less than 10^{-5} per reactor year. Small and large release frequencies are measures of the NPP's accident-mitigation capabilities. They also represent measures of risk to society and the environment due to the operation of the NPP. The small release frequency safety goal relates to the prevention of short-term evacuation while the large release frequency safety goal relates to the prevention of long-term relocation. These three frequencies are utilized in the PSA of an NPP (to determine the probabilities of occurrence for severe core damage states) as well as assessments of the risks of major radioactive releases to the environment. For CANDU reactors, severe core damage is defined as a condition where there is extensive physical damage to multiple fuel channels, leading to loss-of-core structural integrity. Risks of major radioactive releases would include both small and large release frequencies.
32	United Arab Emirates	Article 7.2	p. 28	It is noted that the most recent update to the CNSC's long-term regulatory framework plan covers the period from 2016 to 2021 and outlines the regulations and regulatory documents the CNSC will be developing or amending during that	The CNSC's five-year regulatory framework plan reflects projects that are required to ensure that the CNSC's requirements continue to be robust and clear and that guidance is available, as required, in an ever-changing context. The plan starts with a strategic view of the modernized and structured regulatory document

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				time. This plan allows for more effective long-term planning of resources and better scheduling of projects within the regulatory framework. Please elaborate more on the process of developing such plan, and if possible illustrate the mechanism used to accommodate new changes and updates.	framework, which has similarities to the structure of the IAEA safety factors and provides a holistic, integrated view of the nuclear regulatory environment. It permits clarity of requirements by permitting cross-referencing of information among documents in the framework and the elimination of unnecessary duplication. The plan considers licensing and compliance experience as well as changes in the nuclear environment, such as planned new builds, new technology such as advanced reactor concepts, refurbishments and life extension, design and process changes at the regulated facilities, evolving national and international standards and practice, and other significant events. The plan also includes the review of each of the CNSC's regulatory instruments at least every five years. The consensus national standards (specifically, the CSA standards) that inform and are referenced in the regulatory framework and LCHs also undergo regular five-year reviews. This ensures that the regulatory framework remains up to date with changes in the regulatory environment. New proposals are assigned a priority rating for importance and urgency. This rating informs the decision made by CNSC management as to whether to approve the addition of the project to the plan and the time frame in which it will be undertaken. An internal CNSC committee of senior management called the Regulatory Framework Steering Committee is responsible for oversight of the CNSC's regulatory

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					framework plan and approval of modifications. The plan is presented to the CNSC Management Committee semi-annually. The plan is available on the CNSC's website and the public may submit comments and suggestions for consideration by CNSC staff.
33	United Arab Emirates	Article 7.2	p. 30	It is noted that the CNSC also continued to modernize its approach to documenting its requirements and expectations, moving to a single document type (referred to as a regulatory document (REGDOC)) that includes both regulatory requirements and guidance in the same document for ease of understanding and cross-referencing. This is a brilliant idea, how did the CNSC come up with such idea, was it a result of a study conducted earlier, or a stakeholders' discussion, or comments from the licensees? Is there a notable improvement in the licensees' performance resulting from this action?	Thank you for the comment on the CNSC's modern approach to regulatory documents. In deciding to combine requirements and guidance into a single document type (REGDOCs), the CNSC took into account feedback from staff, licensees and other stakeholders. Over time, the CNSC found that consolidating the requirements and guidance into one publication provided more clarity for licensees, who have indicated that they are now more aware of and readily consider the information provided in the REGDOCs. The consolidated documents also include information on how the REGDOCs fit into the regulatory framework and the licensing basis; and the application of requirements, guidance, graded approach and safety significance considerations when referenced in the licence or the LCH. As guidance in REGDOCs can include examples of acceptable methods, stakeholders can now provide more timely feedback on guidance in draft documents. Guidance in standards can include best practices for voluntary industry improvement as well as rationales that support interpretations for clarity of implementation. There has been an improved conversation between the

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					CNSC and its licensees about how they can meet the CNSC's expectations. The CNSC does not have any data yet to determine whether there has been a notable improvement in licensees' performance.
34	United Arab Emirates	Article 7.2	p. 33	It is noted that discussion papers are used to solicit early public feedback on CNSC policies or approaches, which the CNSC then analyzes and considers so that it can determine the type and nature of requirements and guidance to issue. The use of discussion papers early in the regulatory process underlines the CNSC's commitment to a transparent consultation process, giving stakeholders an early opportunity to present their positions on regulatory initiatives. Kindly explain the nature and content of these discussion papers.	Discussion papers are generally used in three situations: • when considering amendments to regulations or creating new regulations • when proposing regulatory oversight in a new area • when exercising authority in a manner different from past practice Discussion papers are vehicles for communicating the CNSC's early thinking on proposed approaches to regulatory issues (such as fitness for duty for nuclear workers, safety culture, radiation protection and waste management). They provide opportunities for early stakeholder input on the CNSC's regulatory issues, which is then taken into account when determining the most appropriate regulatory approach to achieve the CNSC's objectives. The use of discussion papers early in the regulatory process underlines the CNSC's commitment to transparent consultation.
35	United Arab Emirates	Article 7.2	p. 47	It is noted that the CNSC has established a licensing strategy for decommissioning NPPs in the context of the license renewal for Gentilly-2. Hydro-Québec submitted a	As an update to the content provided in the seventh Canadian report, in May 2016, the Commission issued a 10-year nuclear power reactor decommissioning licence to Hydro-Quebec that authorizes activities

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				license application in 2015, as its current operating license will expire on June 30, 2016. Kindly elaborate further on this strategy.	related to the decommissioning of the nuclear facility and the operation of the waste management facilities at the Gentilly-2 site. The licence is valid from July 1, 2016 to June 30, 2026. In addition, CNSC staff are to submit annual regulatory oversight reports on the safety performance of the Gentilly-2 facilities and the status of nuclear facility decommissioning activities. Regarding the decommissioning strategy for NPPs in Canada, the strategy established by the CNSC provides the regulatory process to be followed when an NPP transitions from an operational state to a decommissioned state and is prepared to be released from CNSC regulatory control. For the decommissioning phase of an NPP, one of two strategies are typically followed: • immediate decommissioning, which involves the immediate dismantling of the facility (i.e., over a period of 2 to 10 years) • deferred decommissioning, which consists of several phases across 25 to 40 years, including storage with surveillance (a major phase that is not included in the immediate decommissioning strategy) For both strategies, there is the need for a waiting period of 7 to 10 years during which the spent fuel must be stored in the irradiated fuel pools for cooling. After this initial cooling period, the spent fuel can be transferred to CANDU Storage (CANSTOR) dry storage modules that are currently located on the Gentilly-2 site. The deferred decommissioning strategy is currently

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					the only viable option in Canada because there is no permanent spent fuel repository available to accept the spent fuel that is stored in the temporary dry storage modules.
36	United Arab Emirates	Article 7.2	p. 48	It is noted that "Promotion of compliance refers to all activities related to fostering conformity with legal requirements. The goal is to maximize compliance, by strengthening those factors that encourage it and by mitigating those that hinder it. Compliance promotion can take the form of consultation, acknowledgement of good performance, collaboration with other regulatory bodies, and dissemination of information to the regulated community about regulatory requirements/standards and the rationale behind them. Specific compliance promotion activities include, but may not be limited to, training, seminars, workshops and conferences." This process reflects a Good Practice.	Comment is appreciated. Thank you.
37	United Arab Emirates	Article 7.2	p. 49	It is noted that "Important inspection improvements during the reporting period included the modernization of the CNSC laboratory, its information management system, and implementation of mobile inspection kits to enhance CNSC's capability to verify licensee compliance programs." Kindly explain more about mobile	As part of the CNSC's continuous improvement process, the mobile inspection kit makes use of new technologies to better equip CNSC inspectors in performing their compliance verification activities. An electronic application developed for use on tablets, the mobile inspection kit allows CNSC inspectors to easily capture inspection findings and results, generate inspection reports, and transfer inspection data to CNSC databases electronically. This new system

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				inspection kits and their use.	replaces the largely paper-based one that the CNSC had been using for these activities.
38	United Arab Emirates	Article 7.2	p. 50	It is noted that "Type I inspections are used to evaluate licensee programs that address the topics listed in appendix C, and may be conducted after programmatic changes. As Canadian NPP licensees are well-established, Type I inspections are rarely conducted. Type I inspections are planned to a high degree of detail, with acceptance criteria spelled out in advance. The results from Type I inspections are transmitted by letter to licensees." Please indicate how often each NPP receives this type of inspection approximately? Has the CNSC evaluated the frequency of these inspections and if so what are the insights in this regard?	Type I inspections are conducted when necessary to determine whether a licensee program, process or practice complies with regulatory requirements. There is no set frequency for conducting a Type I inspection and each is conducted when needed. As an example of how often they are conducted, during the CNS reporting period (2013, 2014 and 2015) four Type I inspections were conducted at Canadian NPPs. The CNSC conducts both process-based and performance-based compliance verification activities. Process-based compliance verification (i.e., a Type I inspection) evaluates licensee programs against appropriate standards. Performance-based compliance verification evaluates the desired, measurable outputs and outcomes of a program. A high-level assessment of licensee programs is conducted during the licensing or re-licensing process. The purpose is to verify that the basis of the program is well understood by the licensee and the program is based on appropriate standards. In addition to this high-level assessment, an in-depth Type I inspection of licensee programs may be conducted during the licensing period. Compliance verification includes the collection of data such as observations, facts, findings and safety performance indicators. This data is then integrated and analyzed – and if the results indicate a decrease in licensee performance, increased regulatory scrutiny

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					may be required. Criteria that trigger a Type I inspection include: • a new licensing basis program • significant changes to an existing licensing basis program • systemic failures within a licensing basis program • changes to the manner in which a program is implemented or administrated
39	India	Article 7.2.1	Section 7.2 (i) (b), p. 32	It is mentioned that REGDOC-2.5.2, Design of Reactor Facilities: Nuclear Power Plants has been revised to address key lessons learned/ identified in the CNSC Fukushima Task Force recommendations. The revised version also includes the description of plant states by adding design extension conditions for beyond-design-basis accidents to be addressed in design. Towards this, whether CNSC has issued any guidance with respect to safety classifications and design requirements (e.g. redundancy, diversity) of SSCs catering to design extension conditions?	CNSC regulatory document REGDOC-2.5.2, *Design of Reactor Facilities: Nuclear Power Plants*, was published in 2014 and contains requirements and guidance relevant to design-extension conditions. In particular, see section 7.1, "Safety classification of structures, systems and components," and section 7.3.4, "Design extension conditions." In 2016, Canada published CSA standard N290.16-16, *Requirements for beyond design basis accidents*. This standard contains more detailed requirements and guidance for design-extension conditions.
40	India	Article 7.2.1	Section 7.2(i)(b), p. 30	The report states that "The CNSC also continued to modernize its approach to documenting its requirements and expectations, moving to a single document type (referred to as a regulatory document	Comment is appreciated. Thank you.

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				(REGDOC)) that includes both regulatory requirements and guidance in the same document for ease of understanding and cross-referencing. The CNSC is working towards a target date of introducing all new REGDOCs and completing the revisions to current REGDOCs by 2018." The CNSC approach of bringing requirements and guidance in single document will help in better understanding of requirements and the expected approaches to meet these requirements, besides providing convenience.	
41	Russian Federation	Article 7.2.1	Annex 7.2, pp. 227-228	As of now, CNSC is planning to apply a graded approach to NPP licensing and has been developing a dedicated document for licensing small modular reactors (SMRs) with involving stakeholders in discussion of draft documents. Considering that in case of an accident at a SMR plant, maximum liability for damage will be significantly lower than in the event of a similar accident at a larger plant, are you going to develop separate requirements for financial security for SMR operator civil liability for nuclear damage?	Any reduction in the liability limit of a small modular reactor (from the limit set for a NPP) would be established by a Government of Canada regulation and be based on an evaluation of the nature of the reactor and the nuclear material (i.e., the fissile material or radioactive waste or products originating from that material) contained in it. Specifically, paragraph 24(1) of the NLCA sets the liability limit for an operator of a nuclear installation at $1 billion or a higher amount established by regulation pursuant to paragraph 24(2a). However, paragraph 24(2b) of the NLCA gives the authority to the Government of Canada to establish, by regulation, lower liability limits for nuclear installations or classes of nuclear installations, taking into consideration the nature of the installation and its nuclear material. In the case of a small modular reactor, Natural Resources Canada would consult with the CNSC in evaluating

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					the risk and, based on this evaluation, make a recommendation to the government on a liability limit commensurate with the risk. The regulation-making process in Canada provides for public and stakeholder consultation.
42	Russian Federation	Article 7.2.1	p. 30	It is written in section 7.2 (i) (b) "Regulatory framework documents", para "General description of CNSC regulatory documents" that "Typically, the Canadian approach to setting requirements in regulations and regulatory documents is non-prescriptive; that is, the CNSC sets general, objective, performance-based regulatory requirements and NPP licensees develop specific provisions to meet the requirements. Specific requirements can be established where necessary." Could you please clarify how it is verified that the specific provisions taken by the licensee allow for meeting general regulatory requirements? Is the licensee accountable for failure to meet its own requirements? How is it defined that specific requirements shall be established in a particular case (please give an example)?	Verification that a licensee's specific provisions meet general regulatory requirements occurs, initially, as part of the licence renewal process. In advance of the renewal, the CNSC communicates to the licence applicant the requirements for the licence. General requirements are established in the various regulations. Additional requirements for NPPs are provided in the CNSC regulatory documents and CSA standards, which will be included in the licensing basis. CNSC staff assess the applicant's detailed provisions against the relevant regulations, regulatory documents and standards. This assessment forms the basis of the recommendations CNSC staff make to the Commission regarding the decision to grant the licence. For licensees of existing NPPs, some of the assessment against existing requirements would have been conducted for previous licensing actions. During the licence period, the CNSC staff assessment is typically limited to confirming that the licensee is following its own provisions when implementing its programs. However, a comparison of the licensee's provisions against CNSC requirements may also occur – for example, when the licensee implements new requirements or executes a change. The licensee is accountable to meet its own requirements and, as stated above, CNSC staff check

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					this during the licence period. The general accountability is established in the licence itself, with the first licence condition stating that the licensee shall operate in accordance with the licensing basis, which includes the safety and control measures described in its licence application and the documents needed to support the application. While CNSC regulations tend to be general and goal oriented, CNSC regulatory documents and CSA Group standards tend to have both prescriptive and non-prescriptive requirements. Specific requirements are used for specialized technical areas. For example, CNSC regulatory document REGDOC-2.2.2, *Personnel Training*, includes detailed requirements for managing the records of a training system. CNSC regulatory document REGDOC-3.1.1, *Reporting Requirements for Nuclear Power Plants*, outlines licensees' reporting requirements, including specific deadlines at which certain reports must be submitted to the CNSC and details about the contents of those reports. CSA standard N293, *Fire protection for nuclear power plants*, provides detailed requirements for the layout of cable trays to reduce the potential for fires to spread in an NPP.
43	Slovakia	Article 7.2.1	p. 42	How does the licensee (operator) ensure its responsibility for the activities of contractors and sub-contractors whose activities might affect nuclear safety (qualified staff)?	As an example of how a licensee ensures its responsibility for the activities of its contractors and sub-contractors, the process for Ontario Power Generation (OPG) is explained below. OPG's governing document, N-STD-AS-0032, *Oversight of Supplemental Personnel*, provides the oversight principles and requirements to be applied to

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					work packages initiated or executed within OPG by supplemental personnel. OPG has also codified and embedded the processes given in INPO standard AP-930, *Supplemental Personnel Process Description*, into its managed systems. Included within oversight is the independent assessment necessary to ensure a common understanding of the attributes, principles and performance standards for performing work successfully and effectively. It also includes the appropriate due diligence required to ensure that all contractual obligations are met. The INPO standard is intended to provide guiding principles for the determination of supplemental personnel oversight within the wide range of categories for these personnel. Two general classifications of workers are considered by OPG through its governing document: • workers who are integrated into the station's workforce, with supervisory and management requirements handled by OPG staff • transient workers who are involved with managed task work where the contractor assumes the accountability for worker management and supervision The oversight of contractors and sub-contractors is based on a proactive and graded, risk-based approach as specified in OPG's documentation. Furthermore, OPG also assembled a team comprising various leaders (director and manager level) from

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					OPG and contract partners, along with support from the World Association of Nuclear Operators (WANO) and Institute of Nuclear Power Operations (INPO) to create a technical support mission (TSM). The purpose of the TSM was to review the process for the selection, training and oversight of supplemental workers and supervisors. The team focused on getting the organization to agree on a consistent method for contractor oversight, and improve station contract oversight personnel performance. Specifically, the TSM addressed the areas of oversight staff, risk reviews, vendor supervisors and governing documents.
44	Russian Federation	Article 7.2.2	Section D.1	According to section D.1 of the National Report, of the 22 nuclear power reactor units in Canada, 19 are currently producing power. The operation of these reactors is governed by five operating licences. This means that one licence is valid for several units. How are unit-to-unit differences (original design differences, modifications, operating modes, etc.) taken into account? If one of such units (for instance, during life extension) is granted operation licence for less years than another unit, then how is this reflected in licence conditions?	Unit-to-unit differences are typically not reflected in the licences of Canadian NPPs. The operating licences are relatively general and brief (e.g., two or three pages). They contain a very brief description of the site and licensed activity. The licence for a multi-unit NPP would not necessarily mention the number of units. The operating licences also contain short, concise licence conditions. As an example, the operating licences for both single-unit and multi-unit NPPs would include the following licence conditions: • The licensee shall implement and maintain an operations program, which includes a set of operating limits. • The licensee shall implement and maintain a safety analysis program. These conditions apply at all times during the licence period and to all units, regardless of the operating

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					configuration of the NPP. The licences also have a general condition requiring the licensee to operate in accordance with the licensing basis, which includes the licence application and the documents referenced in it. This is the mechanism by which the design, operation and other details about the NPP are captured in the licensing basis. An application for a multi-unit NPP would describe the units, their status and the applicant's proposed plans to operate those units during the licence period being requested. These details become part of the licensing basis when the licence is issued and are captured as necessary in the LCH, which is written and maintained by CNSC staff during the licence period. While specific details about individual units can be described in the LCH as needed, the basic licence requirements would remain the same.
45	Russian Federation	Article 7.2.2	pp. 39-40	It is written in section 7.2 (ii) (a) "Licences and licensing process", para "Content of licences – General" that "CNSC licences for NPPs contain a general requirement to conduct the licensed activities in accordance with the licensing basis. The licensee can improve its provisions, operations or facility design during the licence period as long as the improvements are within the licensing basis and executed according to the licensee's management system. The licensee must obtain the written approval of the Commission if it wants to make a change outside the	When a licensee plans to make a change – whether related to the design, operation or management of the NPP; the measures in place to protect the public, its workers or the environment; the way it communicates with the public; or a change in any other area – it first makes its own determination of whether that change will remain within the licensing basis. Changes often involve improvements to certain provisions and these must be demonstrated to not significantly weaken other provisions. The licensee describes the change (and its impact) when it notifies the CNSC of the change. The CNSC reviews the change to confirm it will be within the

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				licensing basis. These licences also contain a general condition requiring the licensee to notify the CNSC in writing when it changes its safety and control measures. This allows CNSC staff to confirm that operations remain in accordance with the licensing basis." Could you please explain how is it defined whether the measures to improve operations or design remain within the licensing basis if the licence contains general requirements only? It is not clear whether changes in safety and control measures can be made within the licensing basis or these changes always lie outside the licensing basis and demand confirmation of their being included in the licensing basis.	licensing basis. The CNSC may determine that the change is **not** within the licensing basis if it meets any of the following high-level criteria: • reduction in safety margins • breakdown of a barrier • reduction of defence in depth • increase (in certain parameters) beyond accepted limits • increase in overall risk associated with the operation of the facility • decrease in ability to safeguard nuclear materials or comply with Canada's international obligations • reduction in security • impairment of any special safety systems • reduction of the capability to control, cool and contain a reactor • increase in the risk of radioactive releases or spills of hazardous substances • likelihood of injuries to workers or members of the public • introduction of a new hazard • introduction of hazards or risks different in nature or greater in probability or magnitude than those stated in the safety analysis of the nuclear facility

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					• increased uncertainty due to reduced capability (e.g., monitoring, reporting, predictive, operational, responsive, protective, managerial) • reduction in licensee qualifications (e.g., certification, training, staffing, organization) • invalidation of the safety case, analysis or report due to physical changes • non-administrative permanent exemptions • changes that requires an environmental assessment In terms of detailed criteria, although the licence itself is brief and typically contains only general requirements, it does impose the elements of everything in the licensing basis, which is defined to include: (i) requirements in applicable laws and regulations (ii) safety and control measures described in the licence and the documents cited in the licence (iii) safety and control measures described in the licence application and the documents needed to support the application The licence requires the written approval of the Commission for any proposed operation outside the licensing basis. Part (iii) of the licensing basis includes the highly detailed requirements that govern the siting, design and operation of the NPP. The licensee uses these requirements to confirm that a proposed change is within the licensing basis. CNSC staff use them when

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					reviewing the proposed change. The licensees notify the CNSC of many routine changes that can be demonstrated to have no impact on safety and hence are within the licensing basis. There are other changes, however, that may require adjustments or compensatory measures to ensure that the net effect is no reduction in safety. In all cases, CNSC staff review the changes to confirm they are within the licensing basis. The instances where the approval of the Commission itself must be obtained before proceeding are rare.
46	Romania	Article 7.2.3	pp. 49-50	Please provide an estimate of the overall amount of inspection work of CNSC staff, on average, in man-hours per plant site per year, covering both preparation of the inspections and the actual conduct of the inspections.	An estimate of the amount of inspection work conducted by CNSC staff in the compliance verification program is provided by the CNSC each year in the *Regulatory Oversight Report for Canadian Nuclear Power Plants*. The CNSC's inspection activities effort (in person-days) for each NPP site in 2015 are given below: • Bruce A and B: 1,030 • Darlington: 1,079 • Pickering: 1,460 • Gentilly-2: 147 • Point Lepreau: 1,030
47	Poland	Article 7.2.4	Enforce-ment	Which criteria of graduated approach has an impact on the use of enforcement tools (especially written notices-recommendations, action notices and	The CNSC uses a graduated approach to enforcement to encourage and compel compliance and to deter future non-compliances. When a non-compliance (or a continued non-

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				directives)? Please provide examples for using enforcement tools (recommendations, action notices and directives) with reference to graduated approach.	compliance) has been identified, CNSC staff assess the significance of the non-compliance and determine the appropriate enforcement action, based on the CNSC's graduated approach to enforcement. Each enforcement action is a discrete and independent response to non-compliance. If the initial enforcement action does not result in timely compliance, more severe enforcement actions may need to be used. This enforcement approach takes into account such things as: • the risk significance of the non-compliance with respect to health, safety, security, the environment and Canada's international obligations • the circumstances that led to the non-compliance (including acts of willfulness) • the licensee's previous compliance record • operational and legal constraints (e.g., the Directive on the Health of Canadians) • industry specific strategies Enforcement tools, used to encourage and compel compliance, and deter further non-compliances, include: • discussions, meetings or letters • written notices (e.g., recommendations, action notices, directives) • increased regulatory scrutiny • requests from the Commission for information

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					• orders • increased regulatory scrutiny • licensing actions • administrative monetary penalties • prosecution **The graduated approach in action** Examples of how the CNSC applies the graduated enforcement approach are given below. These examples pertain to the results of a hazardous waste management Type II inspection at an NPP. ***Recommendation*** As a result of the inspection, CNSC staff found instances where housekeeping of materials could be improved. CNSC staff recommended that the licensee adequately dispose of obsolete material. ***Action notice*** It was found that the licensee did not have training requirements clearly identified for the generation, handling and disposal of hazardous waste. CNSC staff issued an action notice for the licensee to develop and implement a corrective action plan to ensure that a systematic approach to training is applied to hazardous waste handling training. ***Directive*** During an inspection, multiple procedural gaps were identified in the handling, storage and disposal of hazardous waste. The inspection team became

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					concerned that there was a high potential for the active waste to be inadvertently removed from the site. It was determined that the hazardous waste management program exhibited considerable deficiencies. A directive was issued to the licensee to develop and implement a corrective action plan to fully review the adequacy and adherence to hazardous waste management processes, procedures and documents to ensure that there are no gaps that could lead to active waste inadvertently leaving the site.
48	Russian Federation	Article 7.2.4	Section D.2, pp. 9-10	According to the report, Units 2 and 3 of the Pickering NPP were each placed in a safe storage condition. "Some Unit 2 and 3 systems remain operational, providing common system support to the operation of Units 1 and 4. Units 2 and 3 will be maintained in safe storage states until the entire NPP is shut down for eventual decommissioning." Exactly, what Unit 2 and 3 systems currently remain operational? Are there any hazardous radiological activities associated with maintenance of these systems, and are there any life extension activities for these systems pursued in the framework of the life extension of Pickering units?	1) What Unit 2 and 3 systems currently remain operational? The operational systems on Units 2 and 3 that remain in service can be divided into two groups: those necessary to allow safe access within the units for monitoring purposes, and those that are interconnected with and continue to support the operation of the running units and associated common services. The first group of systems (i.e., those supporting safe access) includes normal and emergency lighting, inactive drainage, ventilation and fire protection. The second group (i.e., those supporting the operation of the running units) includes electrical systems that supply common safety-related systems such as instrument air, class 1 and 2 power, common screen wash pumps, breathing air and negative pressure containment. This second group also supports common non-safety-related systems such as service air. 2) Are there any hazardous radiological activities

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					associated with maintenance of these systems? There are no hazardous radiological activities associated with maintenance of the Unit 2 and 3 systems that continue to be operational. 3) Are there any life-extension activities for these systems pursued in the framework of the life extension of Pickering units? The Unit 2 and 3 systems that support the operation of the running units are addressed within the current life-extension framework.
49	Russian Federation	Article 7.2.4	Chapter II	It is said in Chapter II in the section on regulatory framework and amendments that "as a result of the licence reform project that began in 2008, NPP licences contain relatively general requirements that are common to all NPPs in Canada. … Each NPP site with a licence to operate has an associated licence conditions handbook (LCH). The LCH associates each licence condition with compliance verification criteria (CVC) that are used by CNSC staff to confirm the licensee's compliance with the licence condition. In addition, the LCH provides recommendations and guidance for each licence condition, which include non-mandatory suggestions or advice on how the licensee can comply with the licence condition. During the reporting period, the CNSC began removing references to regulatory documents and	Although the licence conditions are now relatively brief and general (see the examples provided in the response to Question 44), there is a general licence condition that effectively imposes highly detailed requirements upon the licensee. As explained in the response to Question 45, the licence requires the licensee to operate in accordance with the licensing basis, which includes the safety and control measures described in the licence application and the documents needed to support the application. CNSC staff review licence applications to confirm they meet the necessary requirements, which are included in numerous CNSC regulatory documents and CSA standards that are addressed in the application. The interpretation of the licence conditions is addressed in the LCH. As explained in the response to Question 21, the LCH links together, for each condition, the detailed requirements in the CNSC regulatory documents and CSA standards, specific exceptions or exemptions associated with them,

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				industry standards from renewed NPP operating licences, including this information in the LCHs instead." Wouldn't this lead to a situation when licensee will be free to interpret licence conditions at its will? How will general requirements included in the LCH reflect particular regulatory requirements that licensees shall fulfil in order to be compliant with licence conditions, and how will they reflect unit-to-unit differences as well as results of reviews of unit's fulfilment of regulatory requirements? Could you please explain in more detail the benefits of this amendment, and give more details about requirements that can be included in the LCH?	relevant licensee documents, and other information. It explains the specific requirements to the licensee and provides the basis upon which the CNSC conducts its compliance activities. **Applying the requirements across multiple units** As described in the response to Question 42, the requirements outlined in CNSC regulatory documents are typically non-prescriptive. The basic fulfillment of such requirements is not necessarily greatly affected by differences from unit to unit. Many requirements are "programmatic" in nature and licensee programs are typically the same across entire NPPs (i.e., any differences in the units would be reflected only at the day-to-day operational or procedural level). Further, the individual reactors and systems within multi-unit NPPs in Canada tend to be relatively similar and, in many cases, identical or shared. Having said that, some very detailed criteria in the LCH are drawn from the licensing basis and used to verify compliance with the general requirements in the licence. For example, the CSA standard for pressure-retaining components that is cited in the LCH includes detailed requirements for pressure vessel design, registration and inspection, and links to other, more detailed pressure boundary requirements. The level of detail included in the LCH does not usually need to be broken down to a unit-by-unit level. However, some licensee documents that are cited in the LCH (e.g., safety analysis report) do provide unit-by-unit details as needed.

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					Documenting changes in the LCH The development of LCHs has led to several benefits for the Canadian nuclear industry. In the past, NPP operating licences were approximately 20 pages in length and included no direct references to the licensing basis. While the licences included a fair amount of detail, the level of detail was not evenly distributed across all areas. There were also some differences in the licences among the NPPs. Whenever a change was required to one of these details, regardless of safety significance (even if it was an improvement), the change had to be addressed by the Commission through a licence amendment. In the current approach, the licences are brief, general and consistent among the operating NPPs. Each one incorporates (but does not attempt to describe) the licensing basis, which entails the large number of details and requirements that are relevant to an operating NPP. Changes to any of those details do not necessitate a licence change and hence do not need to be reviewed and approved by the Commission. Instead, changes are proposed by licensees and confirmed by CNSC staff. Any changes are documented by CNSC staff in the LCH. Improvement initiatives, such as the implementation of new requirements during a licence period, are captured relatively easily by CNSC staff in the LCH. For any changes that could be outside the licensing basis, the licence has a condition requiring that the change be addressed by the Commission.

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Article 8: Regulatory Body					
50	Germany	Article 8	p. 75, Ch. 8.2 (b)	The CNSC has a formalised process in which risk is considered systematically. What does this formalised process look like and what is its reliability?	The CNSC's risk-informed decision-making (RIDM) process identifies and assesses the risks associated with the inherent hazards related to a given issue. By taking the likelihood and severity of the established risk scenarios into consideration, the outcomes of the RIDM process provide insight for regulatory decision making and may inform the need for additional risk-control measures as applicable. For a more detailed explanation of the CNSC's RIDM methodology, see the sixth Canadian report (p. 78). The RIDM process has been incorporated into the CNSC management system and is aligned with CSA standard Q850, *Risk Management Guideline for Decision-Makers*. It may be used to support any regulatory decision where risk is taken as a factor. The CNSC has applied the RIDM process to several NPP licensing applications requiring regulatory decision. Examples of how this process was applied (specifically, with regard to the battery replacement by Ontario Power Generation and the reinstallation of shutdown system trips by Bruce Power) are provided in appendix H of the sixth Canadian report. The report of the initial IRRS mission in 2009 commented positively on the CNSC's development and use of processes and tools for risk-informed decision making.
51	Japan	Article 8	p. 61	Based on the description, that three audit committee members are selected from	Following a public selection process, the Treasury Board of Canada appoints to the CNSC Audit

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				external organization, what kinds of requirements for the member and procedure are needed?	Committee three members external to the Public Service of Canada whose skills and competencies are aligned with the committee's mandate. The requirements cover the areas of the adequacy of the CNSC's controls, risk management, governance and accountability processes by strengthening risk management, internal controls, resource stewardship, internal auditing and good governance.
52	Japan	Article 8	p. 61	Please explain the details of the national policy of audit.	Internal auditing in the Government of Canada is a professional, independent and objective appraisal function that uses a disciplined, evidence-based approach to assess and improve the effectiveness of risk management, control and governance processes. The internal audit policy sets out the responsibilities for deputy heads of departments as they relate to internal audits, as well as the role and responsibilities of the Comptroller General of Canada as the head of that function government-wide. **Objective** The objective of this policy is to contribute to the improvement of public sector management by ensuring a strong, credible, effective and sustainable internal audit function within departments as well as government-wide. **Expected results** Deputy heads are effectively supported in their role of accounting officer by a strong, credible internal auditing regime that contributes directly to sound risk management, control and governance; and is

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					independent from line management. At the departmental level, deputy heads are provided with independent assurance from internal auditing, along with advice from the Audit Committee, regarding the effectiveness of risk management, control and governance processes. The Comptroller General of Canada is provided with the same assurances at the government-wide level.
53	Japan	Article 8	p. 61	Please explain in detail the procedures of internal audits. Do CNSC staff perform audits of other departments? What kinds of procedures are needed to report the audit result to the committee?	An internal audit consists of four steps: planning, examination, reporting and follow-up. It follows the detailed procedures outlined in the internal audit manual, which consists of reviewing documentation, conducting interviews, making observations, performing walk-through tests and analyzing all the information collected to firm up the audit's objectives, scope, methodology, criteria and lines of inquiry. CNSC auditors do **not** have a mandate to conduct audits outside the CNSC. They are internal to the CNSC only. The auditors prepare finding sheets and discuss their findings with the auditee's management prior to drafting the report that summarizes the results of the audit. The Chief Audit Executive then tables the draft audit report at an Audit Committee meeting for review and recommendation for approval by the President of the CNSC.
54	Japan	Article 8	p. 70	There is a description about scope of the audit at page 70. Please explain the measures to keep the skilled audit staffs	The audit of the CNSC described in this section of the Canadian report was conducted by the Office of the Auditor General (OAG) from a different department of the Government of Canada. Retention of skilled audit

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				that cover such wide audit scope.	staff by the OAG is not looked after by the CNSC. However, the CNSC does provide training to its own auditors to maintain and improve their competencies. When expertise for a specific audit is lacking, the CNSC engages outside consultants to assist in the audit.
55	Japan	Article 8	p. 61	Please explain details (for audit manuals) of the audit process.	The audit process conducted by the CNSC's Office of Audit and Ethics (OAE) consists of four phases: 1. **Engagement planning –** In this phase, the audit team develops an appropriate level of knowledge concerning the auditee, the activities under examination and the related issues. Through this knowledge, the audit team can develop an examination plan that will provide the basis for an orderly, efficient and cost-effective audit. 2. **Examination –** The purpose of this phase is to gather appropriate and sufficient evidence to conclude against the audit's objectives and to support all statements made in the audit report. 3. **Reporting –** The purpose of this phase is to communicate the audit's findings, conclusions and recommendations clearly, precisely, persuasively and effectively. 4. **Follow-up –** Typically held within two years after the audit, this phase helps the OAE and the President of the CNSC determine the extent to which corrective actions have taken place to resolve previously reported issues.
56	Japan	Article 8	p. 75	The internal disclosure program is quite an	The movement to build greater trust in Canada's

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				interesting system. Please explain details of the reason to start the system and the history of the system? In the system, what kinds of areas are covered in the scope? Please explain details of the system procedures.	public sector started with the 1996 publication of *A Strong Foundation: Report of the Task Force on Public Service Values and Ethics*, also known as the Tait Report. Following recommendations made in 2000 by the Auditor General on values and ethics in the federal public service, the Treasury Board of Canada adopted the policy on the *Internal Disclosure of Information Concerning Wrongdoing in the Workplace* in 2001. In 2003–2004, accompanying the Auditor General's release of the Sponsorship Program Report, the reports of both the House of Commons Standing Committee on Government Operations and Estimates and of the Working Group on the Disclosure of Wrongdoing recommended a new, legislated regime for the disclosure of wrongdoing in the public sector. As part of the *Federal Accountability Act* and related action plan, the *Public Servants Disclosure Protection Act* (PSDPA) came into force on April 15, 2007, forming a key element of the values and ethics regime of the Canadian federal public service. **Scope of the PSDPA** The PSDPA encourages employees in the public sector to come forward if they have reason to believe that serious wrongdoing has taken place and provides protections for them against reprisal when they do so. It allows any person to provide the Public Sector Integrity Commissioner with information about possible wrongdoing in the federal public sector. The PSDPA also allows employees to make disclosures to their supervisors or the senior officer designated for

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					their organization and created the Public Sector Disclosure Protection Tribunal to address alleged cases of reprisal. **Internal disclosure procedures** Following an internal disclosure, the OAE screens and reviews the issue, investigates the allegation and makes recommendations to the President of the CNSC. The CNSC's Human Resources Directorate will then execute the President's decisions, as required. If wrongdoing (as defined by the PSDPA) is found, the CNSC provides prompt public access to the investigation results through a posting on its website. In addition, the CNSC reports annually to the Treasury Board Secretariat of Canada on the wrongdoing cases and inquiries it has dealt with each year. For the definition of wrongdoing and reprisal and additional information, see the PSDPA.
57	Japan	Article 8	p. 67	Please explain that CNSC's management system conforms to GSR-Part2? If not, what is lacking compared with GSR-Part2?	While the 2009 IRRS mission and its follow-up mission in 2011 confirmed that the CNSC met the requirements of IAEA document GS-R-3, *The Management System for Facilities and Activities*, the CNSC has not yet conducted a formal comprehensive assessment against IAEA document GSR Part 2, *Leadership and Management for Safety*. However, the CNSC fully aligns with the underlying principles of leadership and management for safety and has adapted the requirements of GSR Part 2. As the CNSC strives for continuous improvement, there will always remain opportunities to further strengthen its management

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					system and how well it aligns with the requirements of GSR Part 2. Sections of GSR Part 2 where the CNSC may currently be "lacking" include: • Section 4.26, "All individuals in the organization shall be trained in the relevant requirements of the management system": CNSC staff are trained on processes and programs within which they work. The CNSC also leverages opportunities as they arise to reach out to staff and management by way of presentations and information sessions about the management system. • Section 6.10, "Senior management shall ensure that an independent assessment of leadership for safety and of safety culture": The CNSC regularly conducts self-assessments through staff surveys, information sessions and all-staff town halls. In 2016, the CNSC held preliminary discussions regarding conducting a comprehensive independent assessment and elected to proceed with a comprehensive self-assessment with the assistance of an external expert for validation of approach and findings.
58	Japan	Article 8	p. 67	Please explain details of activities to foster internal safety culture.	To foster ongoing improvements in its internal safety culture, the CNSC has created a cross-functional working group and senior management oversight team, conducted numerous employee surveys, held town hall sessions open to all staff, provided numerous information sessions, and communicated frequently by way of all-staff communiques and website updates. To better understand safety culture and to define

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					expectations for both licensees and regulatory bodies, the CNSC interacts frequently with its peers and recognized experts, actively participates in international workshops and conferences, and contributes to the development of international standards and guidelines. The CNSC also works to ensure that its new organization-wide improvement initiatives (such as its Key Behavioural Competencies, Workforce of the Future and Strategic Planning Framework initiatives) are fully integrated with its efforts associated with internal safety culture. These efforts to improve the CNSC's safety culture are strengthened by its position on safety culture for licensed facilities and regulated activities, including the forthcoming publishing of a new regulatory document on safety culture. Current efforts are focused on conducting a safety culture self-assessment with the assistance of an external expert to establish a baseline for the current state and for identifying next steps to further improve safety culture at the CNSC.
59	Japan	Article 8	p. 68	Please explain the process and criteria to classify the key processes into core, management and enabling processes.	Key processes are those that are considered to be vital to the success of the CNSC in meeting its mandated responsibilities. The collective set of key processes, as defined in the CNSC *Management System Manual*, are as follows: • Core processes are those operational processes that are associated with the reason why the CNSC exists. These processes are directly related to the CNSC achieving its mandated responsibilities and include

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					Manage the Regulatory Framework, Manage Licensing and Certification, and Assure Compliance. • Management processes are associated with managing the organization. They comprise the following key processes: Direct and Manage the Organization, Manage Communications and Stakeholder Engagement, Evaluate and Improve Performance, and Manage Processes. • Enabling processes support day-to-day program delivery and assist the CNSC in meeting corporate obligations. The profile of internal services provided by the enabling processes matches the Government of Canada's whole-of-government perspective as defined by the Treasury Board Secretariat.
60	Japan	Article 8	p. 69	Related to the description that "establishing levels of regulatory activities that are founded on formal, well-articulated risk-informed approaches," please explain using some examples of how some regulatory activities are reconstructed and how such regulatory activities are improved.	The CNSC's Harmonized Plan of Improvement Initiatives is leveraged as a mechanism to ensure that once a preferred approach or process is defined and approved by management, it becomes the standardized approach or process and is consistently adhered to. The plan's methodology provides the necessary support in preparing for and assuring ongoing sustainable change. Examples of regulatory activities that benefit from improvement and standardization include inspections, authorizations, technical assessments, the selection and application of enforcement tools, the development of regulatory documents, and the preparation of Commission member documents (for reporting to the Commission).

Ser	Country	Original reference	Reference in report	Questions/comment	Response
61	Japan	Article 8	p. 75	Please explain details of the risk-informed decision making methodology. Is this methodology available to public? In addition, is there a plan to revise the methodology so as to be compliant with GSR-part2?	The CNSC's RIDM methodology is described in the response to Question 50. The RIDM process was presented at a public Commission meeting on August 16, 2016 and described in appendix B of the CNSC CMD 16-M34, *Risk-informed Assessment of CANDU Safety Issues*. Two examples of the application of the RIDM process were provided in appendix C of CMD 16-M34. The process was also presented at an IAEA meeting on good practices in heavy water reactor operation. (For more details, see IAEA document TECDOC-1650, *Development of Risk-informed Regulatory Positions on CANDU Safety Issues*.) The CNSC's RIDM process is compliant with IAEA document GSR Part 2 and addresses the following risk areas: • radiological risk to the public during design-basis accidents • severe accident risk • impact on plant safety • health and safety risks to workers and risks to the environment due to radioactive releases and spills of hazardous substances • organizational risks
62	Japan	Article 8	p. 67	Please explain the ITQP (Inspector Training and Qualification Program) in a concrete manner.	The CNSC's Inspector Training and Qualification Program (ITQP) was launched in 2009 to provide CNSC staff in designated inspector positions with the training required to be officially certified as inspectors

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					(i.e., through the issuance of an inspector certificate). The ITQP has three main learning components: core training, service-line-specific training and on-the-job training. The ITQP transitioned from implementation to ongoing maintenance in 2014 when it was deemed to be in a steady-state phase. The ITQP is now under the governance of the Process Owner of Compliance and managed by the Regulatory Operations Coordination Division (ROCD) within the CNSC. In 2015, a guidance document was developed to assist managers and staff involved in the training and qualification of CNSC inspectors. The ongoing maintenance activities of the ITQP include: • implementation of performance measures and continuous improvements • implementation and maintenance of service-line-specific and on-the-job training documentation • maintenance of the inspector datasheet and inspector files • issuance of inspector certificates • tracking the status of core inspector training • collaboration and integration between ROCD and the divisions responsible for training, security and inspection • governance and reporting of ITQP activities The success of the ITQP is the result of strong

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					partnerships and continued efforts to sustain its operating condition.
63	Japan	Article 8	p. 57	Please explain the role of Health Canada for nuclear safety. Please explain the clear difference between the roles of CNSC and Health Canada.	Health Canada is the federal department responsible for helping Canadians maintain and improve their health. Health Canada's role in the area of nuclear safety includes monitoring, advising and reporting on exposure to radiation that occurs both naturally and from man-made sources. The key components of this nuclear safety program are Canada-wide environmental and occupational radiation monitoring programs; radiation health assessment programs; maintenance of the National Dose Registry for occupationally exposed workers, and the National Calibration Reference Centre of licensed dosimetry service providers; contributing to environmental assessments of nuclear activities; and management of inter-organizational plans, procedures and capabilities for a nuclear emergency that requires a coordinated federal response. For emergencies occurring at NPPs with actual or potential offsite radiological releases, three federal organizations have roles in nuclear safety: the CNSC, Health Canada and Public Safety Canada. The descriptions below outline the differences in the roles and of each organization. **The CNSC** The CNSC is the Canadian nuclear regulator and onsite authority. As described in the Nuclear Emergency Response Plan (NERP), the CNSC has a specific and direct role involving its licensees. It

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					monitors the licensees' emergency response. It also provides support to Health Canada, Public Safety Canada and the provincial emergency organizations for situational awareness and risk assessment in response to a nuclear emergency. In addition, it provides support to the whole-of-government response for nuclear emergencies involving non-licensees, such as malevolent acts and emergencies abroad. **Health Canada** Health Canada is the lead department for the Federal Nuclear Emergency Plan (FNEP), which integrates with and forms an annex to the Federal Emergency Response Plan (FERP) led by Public Safety Canada. The role of the FNEP is to coordinate and lead the management of actual or potential offsite radiological consequences, focusing particularly on scientific and technical arrangements and analysis required to address actual or potential offsite radiological consequences and risks. Health Canada also has responsibilities related to radiation protection, including developing guidelines for radiation protection during a nuclear emergency, cross-Canada monitoring networks, laboratories and decision-support systems. **Public Safety Canada** Under the *Emergency Management Act*, the Minister of Public Safety is responsible for coordinating the Government of Canada's overall response to an emergency. The FERP, which is led by Public Safety Canada, is the Government of Canada's all-hazards response plan. The FERP has both national and

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					regional components, providing a framework for the integration of effort on both fronts throughout the federal government.
64	United Kingdom	Article 8	p. 66	The report recognises that the level of uncertainty within the Canadian nuclear industry and anticipated attrition within the organisation required an initiative to build and protect the organizational capabilities needed to deliver on its mandate. However, the report does not provide information on how successful the initiative has been in retaining and recruiting staff and whether current staffing levels are adequate. What is the current status of the adequacy of staffing levels in the Canadian Nuclear Safety Commission as required to fulfil its assigned responsibilities?	The CNSC's overall staffing levels are currently adequate to fulfill its assigned responsibilities as evidenced by the ongoing successful completion of activities in support of its mandate to regulate nuclear activities, fulfill relevant international obligations, and disseminate information. The CNSC has implemented a human resources allocation methodology to determine the level and number of NPP inspectors needed to verify licensee compliance. Given anticipated attrition, the CNSC has significantly increased the rigour of its workforce-planning activities, designing strategies to address anticipated gaps and future capability needs, and establishing human resources management strategies to mitigate risks. Most recently, this has included the recruitment of 74 new graduates into entry-level positions. The CNSC continues to be very successful in the retention of qualified staff, experiencing a voluntary turnover rate of less than 3 percent.
65	United States of America	Article 8	8 (i) (c), p. 67	Proposed Good Performance: The U.S. commends CNSC for developing their Inspector Training and Qualification Program.	Comment is appreciated. Thank you.
66	Ghana	Article 8.1	p. 61	The report stated that the organization of CNSC staff "consist of a President, federally appointed members of the Commission and approximately 829 staff	The distribution of CNSC staff members (full-time equivalents, FTEs) as of March 31, 2016 was as follows:

<table>
<tr><th>Ser</th><th>Country</th><th>Original reference</th><th>Reference in report</th><th>Questions/comment</th><th>Response</th></tr>
<tr><td></td><td></td><td></td><td></td><td>members.”

The report also indicated the expertise and academic background of the staff members but did not state the exact number of staff members for each branch/directorates under the organizational structure of the CNSC.</td><td>
<table>
<tr><th>Organization</th><th>CNSC staff members (FTEs)</th></tr>
<tr><td>Technical Support Branch</td><td>268</td></tr>
<tr><td>Regulatory Operations Branch</td><td>259</td></tr>
<tr><td>Corporate Services Branch</td><td>168</td></tr>
<tr><td>Regulatory Affairs Branch</td><td>81</td></tr>
<tr><td>Other offices shown in figure 8.1(b) of the seventh Canadian report</td><td>32</td></tr>
<tr><td>Total</td><td>808</td></tr>
</table>
It is noted that the number of FTEs provided in the seventh Canadian report (829) does not match the total given above (808) as the report gives the total number of staff members and not the number of FTE staff members. The finalized seventh Canadian report posted on the CNSC website gives the number of FTE staff members as 808 (the President plus 807 staff members).
</td></tr>
<tr><td>67</td><td>Japan</td><td>Article 8.1</td><td>p. 60, line 11 from the</td><td>As stated almost 70% of CNSC’s funding accounts for licensee’s payment (Art 8.1(a), p.60, line11 from the bottom), how</td><td>Fees are calculated and invoiced per the Canadian Nuclear Safety Commission Cost Recovery Fees Regulations (Regulations).</td></tr>
</table>

Ser	Country	Original reference	Reference in report	Questions/comment	Response
			bottom	is the fee decided? If the unit price for each facility is fixed, the budget for the regulatory activities depends on the number of facilities to be paid. Thus, it may lead to promote the number of facilities to be assessed or inspected and this attitude might compromise the regulatory institution's integrity to be independent from the promotion side. How does the Canadian revenue system comply with the regulatory organization's integrity, apart from the promotion?	The Regulations prescribe the charging methodology for Class I nuclear facilities (which include NPPs), uranium mines and mills, and waste nuclear substances activities under "Part 2 – Regulatory Activity Plan Fees"). The estimated fees for each facility are calculated annually based on the estimated full cost of the Regulatory Activity Plan (RAP) prepared by the CNSC. Following year-end, fee adjustments are made by the CNSC by subtracting the estimated annual fee from the actual full cost. The licensees are then notified of the amount of the actual full cost and the amount of the fee adjustment. Under the RAP cost-recovery process, fees are estimated based on the planned regulatory activities to be conducted for each Class I facility. The requirement to adjust fees to reflect actual regulatory effort supports regulatory independence as the regulations related to RAPs do not incentivize the CNSC to allocate regulatory resources to licensees based on their ability or willingness to pay. On the other hand, the Regulations prescribe a distinct charging methodology for Class II nuclear facilities (facilities that include Class II prescribed equipment) and Class II prescribed equipment (which includes irradiators, teletherapy machines, accelerators and brachytherapy remote afterloaders) under "Part 3 – Formula Fees". Under the formula fee charging mechanism, licensees are charged based on the number of devices and locations (not the number of facilities). Fees are calculated and invoiced annually based on the standard regulatory hours related to the inventory of devices maintained by each licensee. As

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					the CNSC has the authority to align the standard hours invoiced with actual regulatory hours, the Regulations related to formula fees do not incentivize CNSC to allocate regulatory resources to licensees based on their ability or willingness to pay. The Regulations do not provide licensees with financial influence or any influence over the CNSC's regulatory priorities or operating plans. As stated in the Canadian report, revenue recovered from fee-paying applicants and licensees accounts for almost 70 percent of the CNSC's funding. CNSC activities that are not recovered through cost-recovery fees are funded through annual appropriations from Parliament. This accounts for the remaining 30 percent of the CNSC's funding. For fluctuations associated with these licensees or activities, the CNSC can request additional funding from the Government of Canada. Fees are charged to all non-exempt licensees based on the methodology set out in the Regulations, which eliminates any discretion in the setting of fees. The number of fee-paying facilities is based solely on the requirement to obtain a licence or certification, under the specific thresholds set out in the *Nuclear Safety and Control Act* (NSCA) and its associated regulations, again eliminating the discretion on who pays fees and what amount is paid. A Cost Recovery Advisory Group composed of CNSC staff and industry members meet periodically to discuss matters related to fees. All funds received are subject to detailed accounting and controls processes, including an annual review of

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					the implementation of the Regulations as part of the independent annual financial audit conducted by the Auditor General of Canada. Consequently, statutory, regulatory and administrative requirements and controls are in place to ensure that the integrity and independence of the CNSC is never compromised by the fact that 70 percent of its revenues are funded regulatory activities that are cost recovered from the industry. As with other government departments collecting revenues, all funds received from CNSC licensees are deposited into the Consolidated Revenue Fund of Canada. The deposits use CNSC coding, which is how they can be tracked as CNSC sources of funds. Additionally, the CNSC has no promotional mandate; this further guarantees the regulator's independence.
68	Korea, Republic of	Article 8.1	p. 58	With reference to article 8.1, page 58 of the Canadian national report, it is stated that "Commission members are chosen on the basis of their credentials and are independent of all political, governmental, special interest group or industry influences." With respect to the provided information in the article in question, Korea would like to inquire the following questions: 1) In the NSCA article 10, it is stated that the commission consists of permanent members and the president is a full-time and the other members may be appointed as full-time or part-time members. How do	**Permanent Commission members' participation** 1) The Commission consists of up to seven permanent members. The only full-time member at this time is the President / Chief Executive Officer of the CNSC. All other permanent members of the Commission are appointed on a part-time basis. Temporary members have also been appointed on a part-time basis. Commission members are required to be available for hearings and meetings, which are conducted approximately 10 times annually for periods of 1 to 3 days each (an average of 20 days per year). In addition, members are expected to provide another 30 to 40 days of preparation per year, conducted from their personal offices outside of the CNSC headquarters.

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				these permanent members participate in the Commission works while maintaining their respective occupations? 2) How is the independence of permanent Commission members ensured when they have affiliations outside the CNSC? In addition, when conducting reviews within a limited time frame, what perspective do these permanent Commission members adopt when carrying out reviews and arriving at decisions?	Commission members are not required to participate in all proceedings should they have other commitments. In addition, members are expected to recuse themselves from any proceedings where they may have or be perceived to have a conflict of interest. Historically, most part-time members have been university professors (with flexible schedules) or have retired from full-time occupations (retired or semi-retired). As such, maintaining their respective occupations has not been an issue to date. **Ensuring Commission members' independence** 2) The independence of all members has always been a key feature of the composition of the Commission. Since the NSCA came into force in 2000, only one Commission member has had previous links with the nuclear industry (occurring years prior to joining the Commission). All the other permanent and temporary members have had no links to the nuclear industry, instead possessing transferable skills and strong credentials in areas such as engineering, physics, mining, geology, conventional or radiological health and safety, medicine, and others, allowing them to fully participate in Commission proceedings without impugning their independence and that of the Commission. As Commission members are subject to the *Conflict of Interest Act* and given that it is paramount that there be no real or perceived conflicts of interest, the Commission will not appoint a member to a particular panel or will ask a member to recuse himself or herself if there is any potential conflict due to affiliations

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					outside the CNSC. Also, section 11 of the NSCA states that members shall not, directly or indirectly, engage in any activity that is inconsistent with the member's duties and, in case of a conflict of interest, the member shall terminate the conflict or resign from the Commission. In cases of uncertainty, the Commission will seek advice from the Office of the Conflict of Interest and Ethics Commissioner, an independent office of Parliament responsible for helping appointed officials prevent and avoid conflicts between their public duties and private interests. **Decisions made by Commission members** As members of a quasi-judicial administrative tribunal, Commission members must make decisions within the limits of the statutory mandate of the Commission. As the Commission does not have an economic or nuclear promotion mandate, the decisions made by its members must be based solely on the protection of the environment and the health and safety of persons. Their decisions must also be based on the scientific evidence set out in the record of proceedings, informed by the written submissions or oral presentations of the applicant and members of the public as well as recommendations from CNSC staff. Commission decisions are comprehensive (30 to 50 pages on average, sometimes longer) and are published on the Commission's website. In all cases, Commission members seek to achieve a consensus when deliberating on a decision. Where no consensus is reached but there is a majority decision, a minority

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					statement will also accompany the decision. If there is a tie, the President (who does not normally have a vote) will call a deciding vote in accordance with section 23 of the NSCA.
69	Korea, Republic of	Article 8.1	p. 68	With reference to section (d) and (e) in article 8.1, page 68 of the Canadian national report, it is stated that "The *Management System Manual* also identifies the CNSC governance structure and describes the role of process owners who are responsible for the development, implementation and maintenance of the key processes. Each key process has a single process owner, appointed by senior CNSC management." With respect to the provided information in the article in question, Korea would like to inquire the following questions: 1) In regard to the design and implementation of the MS process, does the CNSC regard the process owner and manager to be identical? If not, what are the authorities and responsibilities of the process owner? 2) It is also mentioned in the Canadian national report that CNSC staff are actively involved in various activities which can contribute to the strengthening of the CNSC management system. How are these activities extended to the actual improvement of the management system?	**Design and implementation of management system process** Process owners and managers are not necessarily the same individual. Process owners often choose to delegate day-to-day management of the process to a process manager. Process owners are responsible for the development, improvement, implementation and maintenance of the CNSC's core regulatory processes and for supporting its sub-processes. Process owners are also accountable for ensuring the process meets all required performance criteria and planned outcomes, including providing assurance that: • the process is developed, documented and maintained in accordance with approved standards • the process meets the requirements of all applicable acts, regulations, policies and other requirements set by the Government of Canada or CNSC senior management • the appropriate level of training is provided • process effectiveness is maintained and improved where warranted • process performance, following implementation by

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				If any, what are the policies which encourage staff members to become involved in the operation and improvement of the management system?	line management, is monitored and reported • interfaces with other processes are understood and managed • risks to the process performance are identified, controlled and mitigated • affected and interested stakeholders are engaged when considering substantive changes **Strengthening the CNSC management system** In line with IAEA document GSR Part 2, the CNSC takes a broad, comprehensive view toward defining its management system. As such, any and all improvements to how the CNSC functions as Canada's nuclear regulatory body are viewed as improvements to its management system. The CNSC seeks feedback from employees to improve its capacity to identify and correct issues, and to enhance the attributes that affect how it meet its mandate. For example: • Staff are encouraged to develop and apply a questioning attitude, and to hone their analytical and technical skills and competencies. • Formal feedback programs, assessment tools and oversight mechanisms are geared toward corrective action. • The CNSC's Harmonized Plan of Improvement Initiatives, which is the primary means for strategically investing in and strengthening the management system, integrates and aligns all cross-

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					functional improvement initiatives into a single, prioritized plan for action. The CNSC has documented processes in addition to the many accepted practices and expectations whereby staff help improve the CNSC through participation in town hall sessions, staff surveys, cross-functional working groups and Harmonized Plan improvement initiatives. The CNSC's *Policy on Science in a Regulatory Environment* is currently under development to govern and enable all mechanisms for staff to bring forward their concerns and professional opinions related to the application of science in day-to-day regulatory activities and decision making.
70	Netherlands	Article 8.1	Article 8.1	The national report describes an able, well-structured and organised regulatory body, the CNSC. It also describes the funding which is 70% based on regulatory fees. Can you comment on the possible interference with the independent role of the regulatory body?	Through the *Canadian Nuclear Safety Commission Cost Recovery Fees Regulations*, the CNSC can establish fees for major licensees that are directly based on the workload associated with regulatory oversight of that licensee. Through its revenue spending authority, the CNSC can collect these fees and use them to carry out the identified regulatory work. The CNSC therefore controls the resources necessary to carry out the work associated with each licensee and is independent of interference related to the appropriation of those resources. Parliamentary appropriations are used to fund some activities and to cover the CNSC's costs associated with regulating certain types of licensees that are, by regulations, not subject to cost recovery. The regulations state that some licensees, such as hospitals and universities, are exempt from paying fees as these entities exist for the public good. Parliamentary

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					appropriation also funds general work that is not directly related to any specific licensee. This includes activities related to: • international obligations (including safeguards and non-proliferation) • outreach and stakeholder relations • public responsibilities (e.g., emergency preparedness) • oversight of the NSCA and the associated regulatory framework In both of these funding mechanisms, there is no opportunity for specific licensees or their agents to influence decisions directly related to them. Furthermore, the *Canadian Nuclear Safety Commission Cost Recovery Regulations* do not incentivize the CNSC to allocate regulatory resources to licensees based on their ability or willingness to pay, nor do they provide licensees with any influence over the CNSC's priorities or operating plans. The operation of the CNSC also has a number of features that contribute to regulatory independence, namely: • full transparency in decision making by the Commission • formal risk-informed decision-making process used for important decisions by CNSC staff • excellent communications and outreach programs

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					• a values and ethics program with training for staff See also the responses to Question 67 for discussion on cost recovery and the independence of the Commission.
71	Netherlands	Article 8.1	p. 67, sect 8.1c	The national report mentions the "course on effective knowledge transfer" which seems a very good thing. Since many regulatory bodies also face the sometimes challenging task of knowledge transfer, could you expand a bit on the programme?	Knowledge transfer is a two-day CNSC course that focuses on the following objectives: • transferring tacit knowledge from expert to novice or from expert to expert • identifying job-related tacit knowledge and areas of expertise for transfer • identifying methods for transferring knowledge to a group or an individual • managing mentoring time effectively while fulfilling the demands of day-to-day work responsibilities • developing a roadmap for knowledge transfer This course is a formal route to train subject matter experts on how to effectively transfer their knowledge. The CNSC also encourages various informal, on-the job mechanisms for the mentoring and coaching of newer staff.
72	Netherlands	Article 8.1	p 73, sect 8.1f	The Participant Funding Program provides funding to stakeholders and opportunity to request funding to support their participation. The term "eligible stakeholders" is mentioned. What are the criteria on which it is decided a	Eligible applicants for the CNSC's Participant Funding Program (PFP) are individuals, Indigenous groups and not-for-profit organizations who are able to demonstrate one or more of the following criteria: • a direct, local interest in the project the CNSC regulates or will regulate (e.g., living in or owning

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				stakeholder is eligible?	property near the project area) • Indigenous traditional knowledge or community knowledge relevant to the project • potential or established Aboriginal or Treaty rights that may be affected by the project • value-added information relevant to the CNSC's mission and specific to the project (where "value-added information" refers to new, distinctive and relevant information that contributes to a better understanding of the anticipated effects of a project) All funding applications are reviewed by the Funding Review Committee (FRC), an independent body established by the CNSC for each proposed project where funding is made available. The FRC makes funding recommendations to the CNSC based on the eligibility criteria listed above and outlined in the FRC Guidelines. More information about the PFP is available on the CNSC website.
73	Russian Federation	Article 8.1	para 8.1(a), p. 60	What was the size of CNSC funding in 2013-2016? As stated in the report, "Revenue recovered from fee-paying applicants and licensees accounts for almost 70 percent of the CNSC's funding. CNSC activities that are not recovered through cost recovery fees are funded through annual appropriations from Parliament. This accounts for the remaining 30 percent of	The table below summarizes the CNSC's sources of funding during the three fiscal years covered by the reporting period and as published in the *2015–16 Departmental Performance Report*. Over this period, roughly 70 percent of the CNSC's funding was derived from cost recovery from fee-paying licensees and 30 percent was derived from parliamentary appropriations.

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<tr><th>Ser</th><th>Country</th><th>Original reference</th><th>Reference in report</th><th>Questions/comment</th><th>Response</th></tr>
<tr><td></td><td></td><td></td><td></td><td>the CNSC’s funding.”

Doesn’t this split affect regulator independence?</td><td>
<table>
<tr><th></th><th>Revenue ($ millions)</th><th>Parliamentary appropriations ($ millions)</th><th>Total funding ($ millions)</th><th>Percentage funding from revenue</th></tr>
<tr><td>2013–14</td><td>$99.5</td><td>$46.1</td><td>$145.6</td><td>68%</td></tr>
<tr><td>2014–15</td><td>$98.1</td><td>$40.1</td><td>$138.1</td><td>71%</td></tr>
<tr><td>2015–16</td><td>$104.0</td><td>$41.4</td><td>$145.4</td><td>72%</td></tr>
</table>
Parliamentary appropriations are used to fund some activities and to cover the CNSC’s costs associated with regulating certain types of licensees that are, by regulations, not subject to cost recovery. The regulations state that some licensees, such as hospitals and universities, are exempt from paying fees as these entities exist for the public good. In addition, fees are not charged for activities that result from CNSC obligations that do not provide a direct benefit to identifiable licensees. These include activities with respect to Canada’s international obligations (including non-proliferation activities), public responsibilities such as emergency management and public information programs, and updating of the NSCA and its associated regulations as appropriate.

CNSC Cost Recovery Program

In accordance with government legislation, the CNSC has established the CNSC Cost Recovery Program, which provides an equitable and transparent approach to the financing of its regulatory activities.</td></tr>
</table>

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					The CNSC Cost Recovery Program: • allows the recovery of actual costs of regulation from fee-paying licensees (with the cost of regulating the exempt licensees paid from general revenues from the federal government) • encourages and reinforces compliance by allowing the CNSC to appropriately charge licensees based on their good or poor compliance records • promotes transparency by sharing with licensees the CNSC RAP as well as the rates for both formula fees and fixed fees The funding from licensees is calculated and invoiced per the *Canadian Nuclear Safety Commission Cost Recovery Regulations*. **Regulatory independence** Under the CNSC's operational planning framework, the management takes an evidence-based approach to independently determine regulatory priorities and allocate regulatory resources to licensing and compliance activities where required. Regulatory independence therefore is maintained as the *Canadian Nuclear Safety Commission Cost Recovery Regulations* require licensees to pay the CNSC the full cost of the regulatory activities provided by the CNSC. The regulations do not cause the CNSC to allocate regulatory resources to licensees based on their ability or willingness to pay, nor do they provide licensees any influence over the CNSC's priorities or operating plans. In this way, the *Canadian Nuclear Safety Commission Cost Recovery Regulations* ensure

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					regulatory independence despite 70 percent of the CNSC's funding coming from licensing revenue. See also the responses to Questions 68 and 77 for discussion on the independence of the Commission.
74	United Arab Emirates	Article 8.1	p. 68	It is noted that ongoing development and strengthening of the management system has focused on continuing to move the organization from an expert-based system to a more process-based system. Please elaborate further on this point and the results achieved.	In 2008, Talisman International LLC was engaged to review the performance of the CNSC and Atomic Energy of Canada Limited (AECL), identify the underlying causes of the extended National Research Universal outage and make recommendations for improvements in both organizations. A primary conclusion of the review was that the CNSC regulatory program and the AECL regulatory compliance program were "expert-based" and not "process-based," and that the regulatory effectiveness of both organizations could be significantly improved by developing and implementing formal processes. The CNSC has taken this recommendation to become more process-based through its ongoing commitment to continually improve from a systems perspective and to align its management system with recognized safety standards such as IAEA document GS-R-3 and, more recently, GSR Part 2. With respect to results achieved, the CNSC implemented its Harmonized Plan of Improvement Initiatives in part to define, document and implement standardized processes as appropriate. Examples of regulatory activities (which used to be expert-based) that have benefited from improvement and standardization include inspections, authorizations, technical assessments, the selection and application of

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					enforcement tools, the development of regulatory documents, and the preparation of Commission member documents (for reporting to the Commission).

75	United Arab Emirates	Article 8.1	p. 68	It is noted that "At the working level, integral with its annual planning exercise, the CNSC organizes its inspections, reviews and other regulatory activities for NPPs by creating, implementing, monitoring and adjusting regulatory work plans for each NPP. Work plans are reviewed to ensure they cover specific goals, are risk-informed, and are consistent among NPPs."
				
				Please describe the nature and content of these work plans.
					The regulatory work plans provide CNSC management with the results of the annual planning exercise for regulatory activities planned to be conducted during the year. The plans give the planned activities and projects, their goals and status, and the planned effort to conduct the activities. Work plans are prepared annually by CNSC staff for each NPP licensee in Canada. These work plans are implemented at the divisional level within the CNSC.
					
					The contents of the CNSC regulatory work plans are divided according to the following categories, which cover the work of CNSC staff:
					
					• compliance
					  o inspections
					  o desktop reviews
					  o other
					• licensing
					  o licensing
					  o re-licensing
					  o periodic safety reviews
					  o other
					• regulatory framework
					  o standards development

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					○ regulatory research
76	United Arab Emirates	Article 8.1	p. 69	It is noted that "Many of the improvement initiatives needed to address employee suggestions, the findings of peer reviews, and audits and evaluations of the CNSC are addressed through the CNSC's Harmonized Plan for Improvement Initiatives." Kindly elaborate more on the mechanism used for developing such a plan.	In the spirit of continuous improvement, all findings from external and internal audits, evaluations and reviews of the CNSC are acknowledged by management and addressed in management action plans (which include actions, responsible authorities and timelines for completion). All management action plans are tracked through to completion and closure. Some elements of the management action plans are included in the Harmonized Plan for Improvement Initiatives, which integrates and aligns all cross-functional CNSC improvement initiatives into a single, prioritized plan for action. Proposed initiatives are documented by the proponent and then prioritized and selected for resourcing by a senior management oversight team. Documented processes, guidelines and templates facilitate ongoing reporting and decision making. Progress is reported quarterly to executive management. Integration with the CNSC Strategic Planning Framework ensures that management attention and the assignment of resources remain focused on those initiatives deemed to be of strategic value.
77	Russian Federation	Article 8.2	para 8.2, p. 74	Sections 8.2 (a) "Separation of the CNSC and organizations that promote and utilize nuclear energy" and 8.2 (b) "Other mechanisms that facilitate regulatory independence" of the National Report do not mention exact arrangements meant to ensure effective separation of regulator	The CNSC is an effective and independent regulator as well as a quasi-judicial administrative tribunal (the Commission). Its mandate is clear: to regulate the use of nuclear energy and materials to protect the health, safety and security of Canadians and the environment; to implement Canada's international commitments on the peaceful use of nuclear energy; and to disseminate

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				functions (in this case, CNSC) from functions of organisations that promote or use nuclear energy (primarily, NPP operators). In particular, it is not shown how provisions of the IAEA document SF-1 (para 3.11) are met in respect of licensee independence from state authorities responsible for regulatory functions. Could you please explain this in greater detail?	objective scientific, technical and regulatory information to the public. The mandate does not include the promotion of nuclear energy or the consideration of the social acceptability of nuclear projects. The Commission has an effective legal framework in place (as provided by the NSCA) as well as a strong set of practices that ensure it is and continues to be an independent and capable regulator. For example: • The Commission reports to Parliament through – and not to – the Minister of Natural Resources. • As is the case for other administrative tribunals, the Commission maintains an arm's length relationship with federal ministers (so that the appropriate degree of independence is maintained). • The President of the CNSC does not vote at Commission proceedings except to break a tie. • The Commission is independent of outside influence, including from government, industry and non-governmental organizations. • The Commission has clear and sole authority to regulate nuclear facilities and activities, including the ability to establish regulations. The CNSC having no promotional mandate further guarantees that independence. • The Commission's decisions are final and binding. They are subject to review only by the Federal Court and not by the government. Commission decisions are not subject to political influence. No minister can

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					overturn decisions of the Commission, including the Minister of Natural Resources. • When making its decisions, members of the Commission take into account all relevant factors without compromising safety. To change the CNSC's mandate, Parliament would have to formally amend the NSCA. • Commission members are appointed "during good behaviour" and cannot be fired or removed "without cause" by the government. No Commission member has ever had their appointment terminated for cause. In reference to section 3.11 of IAEA document SF-1, *Fundamental Safety Principles*, all NPP licensees are either a commercial company owned by a provincial government, Crown corporations of provinces or a private corporation. No NPP licensees in Canada belong to the federal government. The CNSC is a federal government agency. Therefore, separation exists between the CNSC and the NPP licensees in terms of the organizations to which they are responsible. Considering the above, the Commission certainly meets paragraph 3.11 of IAEA SF-1 given that the CNSC is fully independent from governmental authorities as well as NPP licensees, which are within the branches of provincial governments or are privately owned.

Ser	Country	Original reference	Reference in report	Questions/comment	Response
Article 9: Responsibility of the licence holder					
78	Germany	Article 9	p. 77, Ch. 9 (b)	According to the report, "The licensees' processes also require independent assessments to confirm the effectiveness of the management systems in achieving the expected results." Who exactly carries out such independent assessments for licensees?	In Canada, the CNSC reviews management systems to ensure that they meet regulatory requirements as stated in CSA standard N286-12, *Management system requirements for nuclear facilities*. The World Association of Nuclear Operators (WANO), as part of its peer-review process, independently assesses licensees' management systems to determine strengths or areas for improvement. In addition, licensees' internal audit and assessment organizations review the effectiveness of their company's management systems. These internal groups (which are called "quality assurance" or "audit" by different organizations in Canada) are independent from the line performing the work being reviewed. As an example, Bruce Power has an independent oversight organization that performs both audits and performance-based assessments of the elements of its management system. An evaluation of the nuclear oversight processes is conducted by a peer team from another utility to assure independence. On a periodic basis, an overall assessment of the management system is conducted by top management and includes reviewing the results of the corrective action process (significant events); self-assessments by the line; independent internal audits and assessments; and independent external assessments by the CNSC, WANO, IAEA and other independent bodies.

Ser	Country	Original reference	Reference in report	Questions/comment	Response
Article 10: Priority to safety					
79	Argentina	Article 10	pp. 93-99	Have you developed any quantitative performance indicator in order to assess safety culture in NPPs?	The CNSC has not developed quantitative performance indicators to assess safety culture in NPPs. CNSC staff, however, review the results of the licensees' safety culture self-assessments, which are completed at a minimum of every three years. The CNSC reviews the assessment findings as well as how the findings are used to drive improvement activities. The NPPs have recently established safety culture monitoring panels (in accordance with the Nuclear Energy Institute's document NEI 09-07, Rev 1, *Fostering a Healthy Nuclear Safety Culture*) to monitor safety culture on an ongoing basis. The CNSC has reviewed the initial implementation of these panels. With respect to NPP licensees and performance indicators for safety culture, Ontario Power Generation (OPG), as an example, uses the process given below to assess its nuclear safety culture traits. Each year, OPG completes a self-assessment of the nuclear safety traits that have affected the most significant events across the NPP fleet (as indicated in its Significance Level 2 Root-Cause Evaluation Reports). On a quarterly basis, OPG's Nuclear Safety Culture Monitoring Panel (NSCMP) rates each of the traits by department as a "1" (improvement opportunity), "2" (acceptable) or "3" (strength). This rating is then rolled up as an overall station percentage.

<table>
<tr><th>Ser</th><th>Country</th><th>Original reference</th><th>Reference in report</th><th>Questions/comment</th><th>Response</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>In addition to the station overall percentage, the NSCMP averages the ratings of each of the safety culture traits for the quarter using the same rating scheme as given above.

The results are displayed in a dashboard using the definitions given in the table below:

<table>
<tr><th>Name of metric</th><th>Quarterly overall station percentage</th><th>Quarterly average for each trait</th></tr>
<tr><td>Definition</td><td>Green >= 80%
White > 66%
Yellow <= 66%
Red <= 51%
Blue Data not available</td><td>Green >= 2.3
White > 1.9
Yellow <= 1.9
Blue Data not available</td></tr>
</table>
</td></tr>
<tr><td>80</td><td>Indonesia</td><td>Article 10</td><td>Section A</td><td>Please explain the methodology used for safety culture assessment and the action plan to minimize any gaps.

Please kindly elaborate on safety culture implementation.</td><td>The principal components of the licensees' safety culture assessment methodology are surveys, interviews and focus groups. The methodology may include reviews of documentation or meeting observations, depending on the licensee.

An action plan is established following reflection by the senior leadership team on key issues and themes arising from the safety culture assessment. At Bruce Power, for example, the practice has been to identify three to five company-level actions against which to focus efforts. These actions do not necessarily reflect the items that scored lowest on the assessment; that is, the action plan is not focused on "gap closure."</td></tr>
</table>

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					Instead, the senior leadership team identifies those areas it deems the most significant risk or contributor to achieving positive safety outcomes, and then sponsors initiatives to address the heart of those issues. Senior leadership alignment, sponsorship and sustained focus are key success factors in effective corrective actions related to cultural issues. **Safety culture is implemented through leadership decisions, communication and action.** It is also reinforced across the licensee's management system by ensuring that processes, programs and procedures put safety as the overriding consideration for guiding decisions and actions.
81	Japan	Article 10	p. 87	CNSC staff members evaluate safety culture by management review method. For management review, please explain how often CNSC carry out reviews of licensees in a year? What are the indicators that the CNSC uses for safety culture?	The CNSC expects licensees to develop their own capacity for assessing safety culture. Licensees should conduct safety culture self-assessments every three years or more frequently under special circumstances (e.g., during refurbishment when there is a large contractor population). CNSC staff review the results of the safety culture self-assessments undertaken by NPP licensees. The CNSC reviews how the findings were determined in the assessments as well as how the findings are used to drive improvement activities. NPP licensees have recently established safety culture monitoring panels (in accordance with NEI 09-07, Rev 1) to continuously monitor safety culture. The CNSC reviews the implementation of these panels with the expectation of continual improvement. The CNSC uses qualitative indicators to maintain

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					regulatory oversight for safety culture at NPPs. These include regular promotional visits to licensee sites to discuss safety culture, reviews of the licensee's current activities and documents in support of safety culture, and detailed event reviews and trending. The CNSC is also in the process of developing a new regulatory document, REGDOC-2.1.2, *Safety Culture*, which contains objective-based guidance and criteria for licensees to use in conducting safety culture self-assessments. Once published and implemented, the CNSC will apply this regulatory document using a graded approach to licensees' safety culture activities.
82	Korea, Republic of	Article 10	p. 83	With reference to article 10(b), page 83 of the Canadian national report, Korea would like to inquire the following question: In Korea, safety culture assessments have been periodically implemented based on the safety culture assessments guideline developed by NPP licensees incorporating the assessment methodologies such as survey with questionnaire, interview. What are the methodologies (i.e., survey through questionnaires, interviews, field observation, etc.) used by NPP licensees for assessing nuclear safety culture at nuclear facilities?	Safety culture assessments utilize surveys, interviews and focus groups and, depending on the licensee, may also include reviews of documentation or meeting observations. **Surveys** The survey provides everyone in the organization with a chance to have their say about the state of its safety culture. • It gathers statistically valid data about the range of nuclear safety characteristics in the framework. This data allows comparisons between demographic groups and, more importantly, allows for the insights from the interviews to be compared to the surveys. • It allows for statistical comparisons to be made with past assessments (although the numbers coming from such comparisons cannot be taken as absolute measures of change).

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					• It acquires a large number of written comments from respondents, which are valuable inputs to the reporting. **Interviews** • Interviews gather significantly deeper, personal and structured insights into the organization's safety culture. They surface people's concerns and perceptions and provide examples and stories. • An assessment cannot carry out sufficient interviews to give any reliable data by demographic breakdowns. They also do not easily allow people to express what is most on their mind because the interview follows a pathway laid out by the cultural framework. **Focus groups** • Focus groups are discussions held with a minimal agenda. They therefore provide insights into what is "top of mind" as well as "what people do not say" that the other more structured processes cannot do.
83	Korea, Republic of	Article 10	p. 83	With reference to article 10(b), page 83 of the Canadian national report, It is stated that the foundation of safety culture is further established by promoting a "just culture" that aims to learn as much as possible from events or near misses without removing the possibility of holding persons responsible for their actions. With respect to the provided information in the article in question,	1) The "just culture" approach – which is compatible with the Canadian legal system as well as the enforcement policies of the Canadian regulatory system – is implemented by NPP licensees through the framework set out in INPO document 12-012, *Traits of a Healthy Nuclear Safety Culture*, which sets the expectation that all workers/individuals are personally accountable for nuclear safety. Licensees also implement activities and processes to assure excellence in worker performance and to minimize the

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				Korea would like to inquire the following questions: 1) How is "just culture" encouraged or implemented by licensees? 2) Is "just culture" compatible with the legal system and enforcement policies within the Canadian regulatory system?	likelihood and consequence of errors. Licensees have established corrective action processes to ensure that identified problems are resolved in a manner commensurate with their safety significance. When an event occurs, licensees use a graded approach in their response, with more significant events being subject to activities such as initial fact finding or "rapid learning" by a specialized team, the completion of a root-cause or apparent-cause evaluation, event review boards to understand the issue, and oversight by station review meetings. **Taking human performance into consideration** Where human performance contributed to the event, licensees try to determine whether there were organizational or other weaknesses that contributed to the event. In some cases, an event may have been caused by a worker not following procedure, whether through inattention to detail or distraction or, in more severe cases, willful non-compliance. To address the issues of workers not following procedures, one licensee, Bruce Power, utilizes the culpability model defined in the book *Managing the Risks of Organizational Accidents* by James Reason. This model is embedded in Bruce Power's rapid learning process. Licensees have put in place performance-management processes to appropriately coach or discipline employees, commensurate with the nature and severity of the failure. These rules are known by employees and applied in a consistent and graded manner that

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					includes not only the employee and their supervisor but also engages human resources and union representatives. In most cases, performance management is not intended to be punitive (with the exception of willful non-compliance). Performance management is generally set up to ensure that employees have the appropriate skills and knowledge to prevent reoccurrence of an event. For example, Bruce Power has successfully used staff involved in human performance-related events in training and communications to help others learn from their mistakes. Bruce Power has found that most staff are very willing to participate in these communication forums to help their colleagues avoid making the same mistakes and help ensure their safety.2) The "just culture" approach is compatible with the legal system and the enforcement policies of the Canadian regulatory system.
84	Romania	Article 10	p. 83	Do the licensees have employees' suggestion programs for collecting proposals for safety improvements from all categories of staff? Are the suggestions gathered through the same mechanisms for abnormal condition reports and corrective actions or through different processes?	The licensees use their corrective action program as a means for staff to propose safety improvements.
85	Russian Federation	Article 10	Article 10, para 10(b), p. 84	It is stated that according to a safety culture assessment performed in 2015 at Pickering NPP, one focus area was noted in reducing maintenance backlogs.	Although the maintenance backlogs at Pickering have been reduced over the past number of years, the reduction of backlogs stalled recently due to obsolescence of plant equipment. As more equipment

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				What was the cause of this issue and how has it been (or how is it being) resolved?	becomes obsolete, the timelines for replacing the equipment has expanded due to the need for additional engineering. The licensee, OPG, has initiated an improvement project to improve parts availability and proactively address aging-management issues, including obsolescence and work-management process improvements.
86	United Arab Emirates	Article 10	p. 84	It is noted that "After evaluating the results of the nuclear safety culture self-assessment, Bruce Power decided to concentrate on three main new focus areas to address the findings related to: • management communications to staff • the lack of awareness of the value of the corrective action plan • the employees' concern about equipment reliability" Please elaborate on the operator's response to these findings and any regulatory follow-up.	The action plan from the 2013 Bruce Power safety culture assessment was determined with input from the assessment team and reflections from the senior leadership team on the key issues and themes arising from the assessment. Bruce Power's practice has been to identify a small number of broad, company-level actions against which to focus efforts. Senior leadership alignment, sponsorship and sustained focus have been key success factors in effective corrective actions related to cultural issues. Bruce Power's Visual Management Board established three new focus areas to address the results of the safety culture assessment. The first focus area aimed at strengthening the efforts in the "leadership safety values and actions" safety culture trait (as defined in INPO 12-012) and, specifically, the "field presence" trait. It also created the opportunity to communicate issues associated with the corrective actions and management decisions for operational issues. The second focus area was intended to address perception of weaknesses in the "continuous learning" and "problem identification and resolution" safety

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					culture traits. The third focus area looked to address the perception that the NPP's equipment condition was degrading, despite believing that the NPP was being operated with the design limits. The reasons arising from the assessment centered on management decision making, inefficiencies in work management, the ability to execute planned work, and resource levels. Each of the three focus areas received a senior leadership sponsor assigned by the Chief Nuclear Officer. The nature of each action and the reasons for its selection were widely communicated to workers. The actions were included as corporate focus areas in Bruce Power's business plan and were backed by sufficient resources and organizational alignment to enable effective implementation and sustained change management. A progress report on the status of the high-level actions was submitted to the Corporate Corrective Action Review Board on a quarterly basis to ensure that sufficient progress was being made and, on an ongoing basis, each action became a corporate initiative with a cross-functional team to understand the issues and advance improvements. The information from these submissions were consistently communicated to staff.

Ser	Country	Original reference	Reference in report	Questions/comment	Response
Article 11: Financial and human resources					
87	Hungary	Article 11	Article 11, p. 98	How do the "on-the-job" and "classroom-based" training communities share best practices?	As an example of a practice used by Canadian licensees, Ontario Power Generation (OPG) has training committees in various work groups that cover both classroom and on-the-job training. During committee meetings, the members discuss operating experience and best practices for consideration for the training program. This is done to ensure that lessons learned are transferred from the more experienced staff to newer incoming staff. Committee meetings are held regularly to ensure both continual improvement of the training program and timely capture of operating experience.
88	United Arab Emirates	Article 11	pp. 92-99	Kindly elaborate more on the competency frame work used for developing young professionals working in the CNSC.	All positions within the CNSC have defined competency requirements, which include technical competencies specific to the role, and behavioural competencies common to all positions within the organization. These competencies form the basis for hiring decisions as well as for the development of each employee's individual learning plan, which they are required to update annually. Furthermore, employees have access to information concerning other roles in the organization, which they can use for the development of personal career goals and developmental paths. Through ongoing performance discussions with their manager, employees have an opportunity to discuss developmental needs and refine their personal developmental plans. Additionally, through on-the-job learning, training and assignments, employees are afforded the opportunity to develop their competence and prepare themselves for alternate

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					roles that may become vacant. In addition to being selected based on the key behavioural and technical competencies required for their work, the CNSC has many knowledge-transfer mechanisms to transfer tacit knowledge from in-house experts to new professionals. New professionals within the inspector community are required to go through the CNSC's Inspector Training Qualification Program to ensure their competence in licensing, certification and compliance activities, with other formal and informal mechanisms in place to promote effective knowledge transfer and competency development. For example, the CNSC has implemented a rotation program to broaden exposure of new recruits to as many areas of the organization as possible. Informal opportunities through the Young Professionals Network provide young professionals the chance to network, build relationships and enhance their organizational awareness, in addition to their behavioural and technical competencies.
89	Netherlands	Article 11.1	Article 11.1	How does the regulatory body assess the sufficiency of financial resources of the licensees (of nuclear installations)?	The CNSC does not explicitly assess the financial resources of applicants and licensees. Through its licensing and compliance verification programs, the CNSC is able to ensure that sufficient resources, including the organizational management structure, management system and financial resources, are in place. This represents a case of implicit assessment of the licensee's financial resources for operation and maintenance. In accordance with the *General Nuclear Safety and Control Regulations* (made under Canada's *Nuclear*

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					Safety and Control Act) applicants and licensees must submit with their licence application a description of any proposed financial guarantee related to the activity to be licensed. This is interpreted as being the financial guarantees for waste management/storage and decommissioning the installation. During the licensing process, the CNSC assesses the financial guarantees to determine whether they are sufficient for the proposed licence activity. For decommissioning, guidance for assessing the financial guarantees is provided in CNSC regulatory guide G-206, *Financial Guarantees for the Decommissioning of Licence Activity*. However, the CNSC does not directly assess the financial guarantees for operating the NPP, only for waste management and decommissioning.
90	Russian Federation	Article 11.1	Para 11.1, p. 89	What was the size of funding in 2013-2016 to: • ensure (enhance) nuclear, radiation, fire and industrial safety and amend regulations, in particular, in view of the lessons of Fukushima-Daiichi accident • provide physical protection, accounting for and control of nuclear material • provide NPP decommissioning • provide further development of NPPs • provide management of spent nuclear fuel and radioactive waste How is it evaluated that the allocated	As an example of the size of funding, details for OPG are provided in this response. OPG is required to maintain a financial guarantee for decommissioning costs of the Darlington, Pickering and Bruce nuclear generating stations. This includes management of low- and intermediate-level waste, reactor and waste storage facility decommissioning, and the spent fuel arising from the operation of the NPPs. The financial guarantee is reviewed and revised on a five-year cycle and presented to the CNSC for approval. In October 2012, the financial guarantee presented to the CNSC contained $14.2 billion. In October 2016, OPG commenced the refurbishment of its Darlington NPP, citing a $12.8 billion project estimate.

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				funding is sufficient?	**Long-term care** Canada's *Nuclear Fuel Waste Act* requires a trust fund for the long-term care of used nuclear fuel. Regular contributions to these trust funds are made to meet project implementation costs. Trust fund balances at end of 2015 were $3.7 billion. **Fukushima Daiichi accident** The exact dollar value spent on action items related to the Fukushima Daiichi accident is difficult to extract from the overall implementation plans put in place by licensees following the event. **Financial guarantees** The CNSC does not directly assess the financial guarantees for operating the NPP, only for waste management and decommissioning. With respect to evaluating whether the financial guarantees for decommissioning is sufficient, in Canada, the operating licences for NPPs contain a licence condition that states that the licensee shall maintain a financial guarantee for decommissioning and the financial guarantee shall remain valid and sufficient to meet the decommissioning needs, including the long-term management of spent nuclear fuel and radioactive waste. Further, the financial guarantee for decommissioning the nuclear facility shall be reviewed and revised by the licensee every five years (or when the Commission requires) or following a revision of the preliminary decommissioning plan. CNSC staff evaluate the licensee's financial guarantee submission to ensure that they comply with the criteria outlined in

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					CNSC guidance document G-206, *Financial Guarantees for the Decommissioning of Licensed Activities*.
91	Hungary	Article 11.2	p. 92	REGDOC-2.2.2, *Personnel Training*, is not yet implemented since its publication in August, 2014. What is the (overall) status of the implementation of this regulatory document?	The CNSC has recently taken steps to clarify its expectations for personnel training by formalizing and standardizing the requirements and guidance for licensees' training systems in a new regulatory document, REGDOC-2.2.2, *Personnel Training*, which describes the systematic approach to training (SAT). Although REGDOC-2.2.2 is not yet referenced in all NPP operating licences, all of the licences refer to training systems that are based on SAT. To ensure licensees' full compliance with the requirements of REGDOC-2.2.2, CNSC staff developed an implementation strategy that allows the licensees a transition period to conduct gap analyses and then submit implementation plans for approval by CNSC staff. As a result of this strategy, licensees' implementation timelines vary. The following is the status of REGDOC-2.2.2 implementation at Canadian NPPs: • Darlington and Pickering have REGDOC-2.2.2 referenced in the compliance-verification criteria in their licence conditions handbooks (LCHs). • Point Lepreau will be going through licence renewal in 2017 and the licensees, NB Power, has requested in its licence application that REGDOC-2.2.2 be referenced in the next operating licence for the NPP. • Bruce A and B and Gentilly-2 are currently

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					conducting a gap analysis to ensure that they meet the requirements of REGDOC-2.2.2. At present, the document is part of the "recommendation and guidance" section of their LCHs.
92	Hungary	Article 11.2	p. 93	During the regulatory affairs training program, how are the differences of licensees (e.g. sites, number of reactors, etc.) taken into account?	The regulatory affairs training program content is written at a level that has no impact on differences between licensees' facilities. For example, for a single unit station (such as at Point Lepreau), the station complies with the *Nuclear Safety and Control Act* (NSCA) and its regulations, and has an operating licence and LCH with similar contents to the other NPPs in Canada. Canadian NPP licensees manage regulatory issues in a similar manner and therefore the regulatory affairs training is applicable and beneficial to all licensees.
93	Netherlands	Article 11.2	Section 11.2a, p. 94 and Annex 11.2a, p. 263	The national report mentions the guides RD-204 and G-323. It appears the CNSC provides guidance on the minimum presence of qualified staff at class 1 nuclear facilities. Do these guides provide the actual numbers of staff expected or rules to calculate such numbers, and if so, how did CNSC arrive at such numbers/rules?	The *General Nuclear Safety and Control Regulations* (made under Canada's NSCA) require licensees to "ensure the presence of a sufficient number of qualified workers to carry on the licensed activity safely and in accordance with the Act, the regulations made under the Act and the licence." The CNSC has adopted a non-prescriptive regulatory philosophy under which it lays out expectations for licensees who are then responsible for demonstrating that they meet these expectations. The CNSC does not define the specific numbers or rules for establishing the minimum staff complement for a facility. CNSC regulatory guide G-323, *Ensuring the Presence of Sufficient Qualified Staff at Class I Nuclear Facilities – Minimum Staff Complement*,

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					identifies the factors to be considered in first analyzing and validating the minimum shift complement, as well as expectations for documentation and implementation of the minimum shift complement. Therefore, the minimum shift complement is specific to each facility based on plant design, organizational structure and procedures. There are certain requirements for the number of certified operators who must be present in the nuclear facility, in the main control room and in direct attendance at the control panels of a reactor unit. These requirements are based on the number of reactor units at the facility and are documented in the LCH for each facility. The CNSC has undertaken benchmarking studies related to main control room minimum shift complement and the identification of safety critical work groups. This work formed the basis of G-323, which was published in 2007 and is now due for a review. In preparation for this review, a research project was completed to update the literature review and solicit feedback from stakeholders.
94	Romania	Article 11.2	Annex 11.2 (a), pp. 260-262	The use of the fuel handling simulator (at Bruce Power), the dynamic learning activities (DLAs) used at Bruce Power, Ontario Power Generation and NB Power for all staff, including plant managers, and the use of mock-ups at the refurbishment training facility Darlington Energy Complex are all outstanding good	Comment is appreciated. Thank you.

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				practices.	
95	Romania	Article 11.2	Annex 11.2 (a), pp. 262-263	Is the Unit 0 control room operator licensed or certified by the CNSC? If yes, what are the requirements for the certification or licensing of the Unit 0 control room operator?	The CNSC certifies Unit 0 control room operators. The program and process requirements to support certification are contained in CNSC regulatory document RD-204, *Certification of Persons Working at Nuclear Power Plants Part I*. Requirements specific to Unit 0 control room operators are found in part III, sub-part B of RD-204.
96	Romania	Article 11.2	Annex 11.2 (a), pp. 262-263	What are the main duties (for normal operation and for the response to transients, accidents and emergency situations) and the licensing requirements for the shift manager for multi-unit NPPs?	The main duties for the shift manager for a multi-unit NPP are as follows: **Normal operations:** The shift manager oversees all work groups on shift and ensures: • public safety, environmental protection, worker safety, product quality and manpower development • station system chemistry, airborne and liquid effluent releases, thermal, noise, radiological and chemical emissions are within limits • system and equipment configurations in the control room and in the field are in the proper state • environmental spills are promptly mitigated and reported to the relevant agency • operating license, policies and principles are rigorously observed • minimum shift complement in number and qualification at all times • operating experience is communicated and

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					implemented • deficiencies are identified and prioritized for corrective action • increases in reactor power after upset conditions, resetting of trips (except neutronic) and unit restarts are within limits of authority as defined in station procedures • technical problem solving is coordinated on shift and appropriate resources are available **Emergency response:** The shift manager: • executes emergency response actions as defined in the licensee's nuclear emergency plan and associated procedures • acts as the emergency response manager until relieved by the call-in of the duty emergency response manager and augmentation of the emergency response organization • executes both the senior shift licence duties and the specific responsibilities of the emergency response manager (e.g., offsite interface role, overall site commander and chief of response) until relieved
97	Romania	Article 11.2	p. 94	Please provide more information on the results of the analysis of the roles and functions of staff that would be required beyond minimum shift complement, in common mode events and multi-unit facilities, including for various conditions	The minimum shift complement for multi-unit stations is derived from evaluating resource requirements for all design-basis accidents, which include common mode events that potentially affect the entire station. The minimum shift complement is defined in a licence requirement. To ensure licence compliance, a normal

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				that extend beyond the previously postulated design-basis accidents (e.g., an extended loss of all AC power). What are the preliminary conclusions of the work performed so far? Are additional staff members (and from what categories – e.g. operators, maintainers, technicians, technical support group members, etc.) deployed on site on shifts or are they available on call?	scheduled staff complement is established, which provides adequate margin to the evaluated minimum shift complement. Staffing requirements for beyond-design-basis events are analyzed using best estimate techniques. The normal scheduled staff complement is considered available to support a beyond design-basis response. Resource deployment in non-traditional ways is also considered in beyond design-basis response. Plant modifications have been made to reduce resource requirements for the deployment of beyond design-basis response strategies. Finally, coping strategies are devised to optimize resource management for the response plans.
98	Russian Federation	Article 11.2	Para 11.2, p. 92	Could you please provide information about the number of operational personnel at Canadian NPPs?	The number of nuclear energy workers at NPP sites will vary from year-to-year. For 2015, the distribution of monitored nuclear energy workers (i.e., workers monitored with a personal dosimeter) at each NPP site in Canada is shown in the table below. This table also provides the number of certified persons at each NPP. Certified persons are NPP staff for whom the licensee shall establish and document policies and procedures for training and maintaining the qualification of the persons holding a certification for the applicable position. These positions include: • senior health physicist • reactor operator • Unit 0 operator

<table>
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control room shift supervisor
plant shift supervisor

Nuclear energy workers and certified persons at Canadians NPPs, 2015
<table>
<tr><th>NPP</th><th>Nuclear energy workers</th><th>Certified persons</th></tr>
<tr><td>Darlington</td><td>9,203</td><td>97</td></tr>
<tr><td>Pickering</td><td>7,002</td><td>140</td></tr>
<tr><td>Bruce A and B</td><td>7,853</td><td>182</td></tr>
<tr><td>Point Lepreau</td><td>1,936</td><td>22</td></tr>
<tr><td>Gentilly-2</td><td>1,235</td><td>3</td></tr>
<tr><td>Total</td><td>27,229</td><td>444</td></tr>
</table>
</td></tr>
<tr><td>99</td><td>Slovakia</td><td>Article 11.2</td><td>p. 97</td><td>Knowledge management processes are implemented by NPP licensees in Canada, including:
knowledge repositories that use common documentation
a high-potential development program for emerging leaders and middle managers that accelerate the development of high-potential employees</td><td>The CNSC uses similar knowledge-management practices as implemented by NPP licensees, such as:
Nukipedia, an online repository for information involving nuclear facilities as well as the regulation of the uses of nuclear energy
the Canada School of Public Service’s curriculum for employees aspiring to various leadership roles
succession management efforts that focus on leadership competency building for high-potential</td></tr>
</table>

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				for future leadership roles, etc. Does CNSC use any of the initiatives implemented by NPP licensees? If yes, please describe how, if not please describe why?	employees in the pipeline • an alumni program that takes advantage of the unique knowledge and expertise of many retired CNSC employees, allowing the CNSC to meet short-term needs for talent that supports both knowledge transfer and succession-planning efforts • recruitment of new graduates to renew the organization along with a focus on building internal capability by encouraging employee movement and development of new skills • formal and informal coaching and mentoring activities, offered to staff at all levels • on-the-job training guides for targeted inspector communities, which were launched in December 2016 • a formal training and development program for inspectors, as well as one that the CNSC is currently developing for all employees involved in regulatory work
Article 12: Human factors					
100	Korea, Republic of	Article 12	p. 94	With reference to article 12, page 94 of the Canadian national report, it is stated that OPG conducted the analysis and validation on minimum staff complement (MSC) for the operating NPPs at Pickering and Darlington based on the requirements of CNSC regulatory document, G-323. With respect to the provided information in the	**Minimum shift complement analysis and validation** 1) CNSC regulatory guide G-323, *Ensuring the Presence of Sufficient Qualified Staff at Class I Nuclear Facilities – Minimum Staff Complement*, identifies the need for Class I nuclear facilities licensees to conduct a systematic analysis of the minimum staff complement in terms of qualifications and numbers. The systematic analysis should consider

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				article in question, Korea would like to inquire the following questions: 1) Would it be possible to provide an overview of the requirements on the MSC analysis and validation described in G-323? 2) What are the process and activities related to MSC analysis and validation conducted by OPG? 3) After applying the lessons learned from Fukushima, what are the expected changes of the on-site staffing level in comparison with the existing on-site staffing level for accident management?	the range of the most resource-intensive conditions under all operating states. Licensees are also directed to consider the most resource-intensive initiating events and credible failures in the safety analysis report and probabilistic safety assessment (PSA), as well as operating strategies for response to anticipated operational occurrences, design-basis accidents and emergencies, interactions among personnel, concurrent use of procedures, considerations of tasks in field locations, and the completion and timing requirements of any safety-critical human actions. Once the systematic analysis has been documented, licensees must demonstrate the adequacy of the minimum shift complement to respond to the most resource-intensive scenario by means of an integrated validation exercise. The minimum shift complement considers the work group staffing requirements for normal operations as well as the staffing requirements for response to any anticipated operational occurrence, design-basis accident or emergency. The minimum shift complement includes the consideration of certified personnel and all workers with specialized qualifications such as fuel handling, control and mechanical maintainers, and emergency response personnel. **Minimum shift complement at OPG** 2) The approach employed by Ontario Power Generation (OPG) in the analysis and validation of its minimum shift complement was defined by CNSC

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					regulatory guide G-323. The major steps in the approach employed by OPG were as follows: • defining the assumptions and boundaries of the work • conducting the preliminary analysis work to select the most resource-intensive limiting scenarios (as considered in the safety analysis report and the applicable PSA) for each major work group • selecting the limiting scenarios and analyzing each of these scenarios in detail using the human factors methods, formally documenting the results of each human factors analysis, and making a final determination for each work group of the single most limiting scenario • validating the single most limiting scenario for each major work group through field execution, with simulation as required **Staffing response to the Fukushima Daiichi accident** 3) There are no planned changes to the onsite staffing levels at OPG's nuclear facilities in response to the lessons learned from the Fukushima Daiichi accident. Analysis and integrated validation exercises have demonstrated that the required actions following a beyond-design-basis event (BDBE) could be accomplished by the currently defined staffing levels. It is important to note that extensive work has been undertaken to ensure that required emergency actions can be accomplished by the currently defined staffing

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					levels following a BDBE. Examples of this work include, but are not limited to, the following: • creation of new sets of procedures specifically designed to guide response actions in a BDBE environment • installation of plant modifications to allow BDBE actions to be taken by as few staff members as possible and with as few specialized skills as possible
101	Korea, Republic of	Article 12	p. 101	With reference to article 12, page 101 of the Canadian national report, it is discussed that the CNSC conducted a series of Fukushima-related inspections at NPPs, focusing on human and organizational factors. With respect to the provided information in the article in question, Korea would like to inquire the following question: What was scope of the inspection, along with the methods and relevant guidelines used in the inspection?	The inspections focused on assessing compliance of a sample of engineering design change packages and procedures resulting from Fukushima action items to determine whether they were implemented in accordance with the documented governance. The Fukushima-related verification inspections comprised two main compliance verification activities: design packages review and procedures review. Several methods were used to collect information for these inspections, including document reviews, database reviews, observations of designs resulting from the implementation of Fukushima action items, and discussions with licensees' staff. **Design packages review** The purpose of the design packages review was to verify that licensees were properly taking into account human factors in design for specified processes that resulted from Fukushima action items, and also to verify that licensees had adequately implemented the

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					engineering design verification and validation processes. Another part of the inspection focused on a sample of procedures related to the Fukushima action items ensuring licensees have the capabilities to respond effectively during a severe accident. **Procedures review** The purpose of the procedures review was to verify that the licensees were adequately developing and modifying their procedures as a result of Fukushima action items. This regulatory activity was also used to verify that licensees had adequately implemented the procedure verification and validation processes. The procedure sample was mostly related to emergency mitigating equipment guidelines and severe accident management guidelines. In some inspections, maintenance and emergency procedures also were reviewed.
102	Korea, Republic of	Article 12	p. 100	With reference to article 12, page 100 of the Canadian national report, it is stated that the CNSC issued RECDOC-2.3.2 to describe regulatory requirements on integrated accident management program. Moreover, this document describes requirements for human and organizational performance. With respect to the provided information in the article in question, Korea would like to inquire the following question: Would it be possible to provide an	CNSC regulatory document REGDOC-2.3.2, *Accident Management*, *version 2*, provides the following approach, requirements and guidance regarding human performance issues for the development and implementation of an accident management strategy: • It allows the use of a graded approach, whereby the application of requirements is commensurate with the risk. • Licensees should consider the coordination of accident management and emergency preparedness (e.g., some personnel may have roles both with

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				overview on the human factors approach and activities used to systematically address human performance issues when developing and implementing an accident management strategy?	accident management and emergency preparedness). • It lists a set of requirements that address the information needs of all of the stakeholders involved in accident management. • It provides a set of requirements for developing, verifying and validating procedures and guidelines for accident management (including severe accidents). It also provides requirements to ensure a clear transition between emergency operating procedures and severe accident management guidelines. It also considers the effect of uncertainty in the information available to personnel. The following accident management requirements apply specifically to human and organizational performance: • Ensure that personnel involved in managing an accident have the information, procedures, and human and materiel resources to carry out accident management actions. • Provide training to personnel who are required to respond to accidents at a level commensurate with their respective roles in accident management. • Ensure the habitability of the facilities required to support human performance during the implementation of accident management measures, or provide alternate habitable facilities. **The role of human factors engineering** When NPP licensees develop and implement accident management strategies, human factors engineering

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					(HFE) is considered in every modification that has a human system interface. For example, the modification process for OPG defines what has to be followed for all changes to the nuclear design basis, including modifications to, removal of or abandonment of any of the following: • structures, systems and components (SSCs) • software • engineered tooling designs OPG uses a systematic graded approach to determine the appropriate level of HFE effort and rigour required for a modification. For each modification, the level of effort is determined during the scope definition phase. For the full level of effort, the HFE program plan will consider the 11 elements outlined in U.S. Nuclear Regulatory Commission regulatory document NUREG 0711, *Human Factors Engineering Program Review Model*, and determine the extent to which all elements are required, given the nature of the modification. This applies to SSCs, software and engineered tools used for the full range of operating conditions, including any that may be required for design-basis accidents. Guidance and its associated technical basis are also followed in relation to the design, modification, procurement, maintenance, testing and operation of SSCs recommended for mitigating beyond-design-basis accidents and preventing their progression to severe accidents.

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103	Korea, Republic of	Article 12	p. 103	With reference to article 12, page 103 of the Canadian national report, it is stated that the CNSC issued a draft regulatory document REGDOC-2.2.4 to describe specific regulatory requirements on fitness for duty (FFD). With respect to the provided information in the article in question, Korea would like to inquire the following question: What is the background (or undesired event) behind the issuing of the regulatory document on FFD program?	The CNSC has a proactive approach to regulating and acts continuously to strengthen nuclear safety requirements. CNSC regulatory document REGDOC-2.2.4, *Fitness for Duty*, was not developed in response to a specific event or known problem within the Canadian nuclear industry. The document was developed as part of the CNSC's continual improvement of its regulatory framework. The intent of REGDOC-2.2.4 is to clarify the high-level requirements contained in regulatory document RD-204, *Certification of Persons Working at Nuclear Power Plants*, and to expand the requirements of regulatory document RD-363, *Nuclear Security Officer Medical, Physical and Psychological Fitness*, to other safety-sensitive workers. REGDOC-2.2.4 is also meant to make expectations related to alcohol and drug testing clear, consistent, transparent and enforceable. It is scheduled to be presented to the Commission for approval in March 2017.
104	United Arab Emirates	Article 12	pp. 94 and 106	It is noted that "Work organization and job design relate to the organization and provision of a sufficient number of qualified staff and the organization and allocation of work assigned to staff to ensure that work-related goals are achieved in a safe manner. They include, but may not be limited to, staffing levels and minimum shift complement, which are discussed in more detail in subsection 11.2(a)." Kindly explain how CNSC measures the	CNSC regulatory document G-323 describes the expectations of CNSC staff as they relate to the key factors that must be considered for ensuring the presence of a sufficient number of qualified staff at Class I nuclear facilities. When conducting inspections of NPP licensees in this area, CNSC staff have reviewed analysis methodology documents and reports to ensure that the analysis was completed in a systematic manner and that it considered all of the factors identified in G-323. CNSC staff reviewed validation plans and observed validation of individual procedures and fully

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				adequacy of the available staff number to respond to the most resource-intensive circumstances, including emergencies during times when staff may not typically be available in a planned manner.	integrated validation exercises that demonstrated adequate response to the most resource-intensive events. The documentation of the analysis and final validation report submitted by licensees established the licensing basis for the facilities' minimum shift complement. By working with the licensees through a multi-stage approach, there is greater confidence that the final determination of the minimum shift complement will be adequate to respond to the most resource-intensive conditions, including emergencies. All NPP licenses contain a condition that states that "the licensee shall implement and maintain the minimum shift complement and control room staffing for the nuclear facility." The minimum shift complement must be present at the nuclear facility 24 hours per day, seven days per week. Any violations of the minimum shift complement are reported to the CNSC in quarterly reports. Several of the licensees have an electronic monitoring system that records incoming and outgoing minimum shift complement staff. This type of system allows for real-time monitoring of the availability of a sufficient number of qualified staff.
Article 13: Quality assurance					
105	Korea, Republic of	Article 13	pp. 107-110	With reference to article 13 of the Canadian national report, Korea would like to inquire the following question: In a case where a licensee procures an item	Irrespective of whether the supplier has a management system to the same standard as the licensee, the supplier's management system or quality assurance program would be evaluated by the NPP licensee's vendor quality assurance group to the NPP's specified

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				significant to safety from a supplier with a different management system from that of the licensee, what are the measures taken by the licensee to ensure that the supplier is capable of providing items pivotal to safety?	requirement of that supplier. If it were assessed as meeting these requirements, the supplier would then be included on the Approved Suppliers List for safety-significant items and services. If the supplier was not on the Approved Suppliers List, the item would then have to be procured as commercial grade and subsequently dedicated for safety-related use by either the licensee or a third party.

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106	Korea, Republic of	Article 13	p. 110	With reference to article 13, page 110 of the Canadian national report, Korea would like to inquire the following question regarding CFSI: It is stated that "Canadian NPP licensees were notified by a valve supplier that materials contained in valve assemblies and components may not conform to accepted standards, specifications or technical requirements." What are the requirements NPP licensees must meet to prevent the entry of suspect items?	All NPP licensees are required to comply with the licence conditions set out in their respective licences. The details of these licence conditions are further explained in the licence conditions handbooks (LCHs). The specific licence condition related to the prevention of entry of suspect items into nuclear facilities is the requirement that "the licensee shall implement and maintain a management system," with the corresponding LCH detailing that "this management system shall comply with the requirements set out in CSA standard N286, *Management system requirements for nuclear facilities.*" The pertinent requirements of CSA N286 are as follows: • Potential suppliers shall be assessed on the … ability to provide a technically adequate … product or service; … management system; supply history; and oversight of supplier's supply chain. • Examination of received items shall be performed to establish that … the item received is in keeping with the purchasing documents … the specified packaging and shipping requirements have been maintained during shipping … identification and markings are in accordance with applicable codes, specifications, purchase orders, and drawings. • In addition to the examination, there shall be evidence that the item received was fabricated, tested, and inspected prior to shipment, in accordance with the applicable code, specification,

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					purchase order, or drawings. • Records shall be traceable to the related items. In addition, NPP licensees are required per CNSC regulatory document REGDOC-3.1.1, *Reporting Requirements for Nuclear Power Plants*, *version 2*, to report to the CNSC any discovery of counterfeit, fraudulent or suspect items (CFSIs) during the conduct of licensed activities. Licensed activities are defined by the *Nuclear Safety Control Act* and its regulations.
107	Russian Federation	Article 13	Section 13(b), pp. 109-110	Could you please tell what other measures apart from training supply chain staff are taken by licensees to oversee quality assurance programmes of their sub-suppliers for discovering counterfeit, fraudulent and suspect items?	The consideration of CFSIs is part of the NPP licensees' audit requirements in vendor quality assurance. As such, NPP licensees provide the necessary Electric Power Research Institute (EPRI) training to all supply staff.
108	Slovenia	Article 13	Article 13(a)	The current CSA N286 standard, N286-12, Management system requirements for nuclear facilities, is being cited as the management system requirement for all new licence applications and licence renewals. This standard promotes the integration of management systems and requires that safety be the paramount consideration guiding decisions and actions. It follows and builds on the model provided in the IAEA general safety requirements document GS-R-3, *The Management System for Facilities and Activities*. Question: Please, explain, if you intend to	CSA standard N286 is reviewed and amended on a five-year cycle or as necessary. The successful implementation of the entirety of the standard is senior management's responsibility and accountability. The first principle of the standard states that "safety is the paramount consideration guiding decisions and actions." This principle is also supported in the standard by a requirement related to safety culture. The current version of this standard, CSA N286-12, was published in July 2012. It represented a major change from the previous revision of the standard, CSA N286-05, as it significantly broadened its scope to include all Class I nuclear facilities as well as suppliers contracted to perform lifecycle activities. As it was anticipated that adoption of this standard by

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				amend the current standard with the additional requirements defined in new IAEA standard GSR Part 2, *Leadership and Management for Safety*.	Canada's nuclear power industry would take time, it was decided that no further revisions to CSA standard N286 would be made at this time. All Class I licensees will have adopted N286-12 by the end of 2017. It is anticipated that the next revision of CSA standard N286 (expected by 2022) will include the updated management systems given in IAEA document GSR Part 2, *Leadership and Management for Safety*. The CNSC is drafting a regulatory document on management systems, REGDOC-2.1.1, which will provide useful information to all classes of licensees on this subject. It is anticipated that this draft regulatory document will be published in 2017. It will refer to the requirements in CSA standards and other documents, such as GSR Part 2. It will also include information on the safety expectations for leadership and management.
109	United Arab Emirates	Article 13	p. 110	It is noted that "Licensees performed a root-cause analysis [responding to the issue of suspect materials] and identified the root cause and have taken corrective actions to prevent re-occurrence of a similar event." Please elaborate further on the results of the root cause analysis and what corrective actions were taken.	A summary of the root-cause analysis and corrective actions taken by Ontario Power Generation (OPG) to prevent re-occurrence is provided below. Companies 1, 2 and 4 were the companies involved in supplying the suspect valves. a) A supplementary audit was conducted at Company 1 by OPG and the results were shared with affected Canadian utilities. This audit: i. focused on procurement (selection and control of sub-suppliers) and quality audits (external) ii. validated that the corrective actions implemented by Company 1 are effective

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					iii. validated that Company 1 does not purchase materials from Company 4 iv. confirmed the following enhanced measures taken by Company 1: • added requirement of NCA-3800 to audit checklist of the sub-supplier • evaluated sub-supplier's CFSI program • implemented new procurement procedure to differentiate between safety and non-safety applications • performed positive material identification on receipt of raw materials and components b) A supplementary audit was also conducted at Company 2 by the CANDU Procurement Audit Committee (CANPAC) and the results were shared with affected Canadian utilities. This audit: i. focused on procurement (selection and control of sub-suppliers), quality audits (external) and CFSI ii. validated that the corrective actions implemented by Company 2 are effective iii. confirmed that the enhanced measures taken by Company 2: • removed Company 4 from the approved vendors list (AVL) • validated material certifications supplied with American Society of Mechanical Engineers (ASME)-grade material against the original by communicating directly with the third-party test house

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					• increased frequency of audits on ASME-grade material suppliers • included third-party test houses used for ASME-grade material on the AVL • performed positive material identification on receipt of raw materials and components c) The CANDU Owners Group (COG) and the Organization of CANDU Industries are working together to set up a CANDU Industry Audit Committee (CANIAC) organization that would allow OPG's main suppliers to share audit information on sub-suppliers (second and third tier). CANIAC will enhance the quality of sub-supplier audits by leveraging CANPAC's experience and utilizing well-trained and highly qualified audit resources. d) The newly created CSA standard N299, *Quality assurance program requirements for the supply of items and services for nuclear power plants*, will: i. contain requirements for prevention and detection of CFSI ii. provide a systematic and consistent set of requirements applicable to suppliers for NPPs iii. The implementation of new requirements will be subject to audits by a licensee's tier 1 and tier 2 suppliers
Article 14: Assessment and verification of safety					
110	Germany	Article 14	p. 119, Ch. 14 (i)	According to the report, "Although there are no explicit requirements for safety goals at the existing NPPs, the CNSC does	Canadian utilities establish probabilistic safety assessment (PSA) safety goals that are consistent with the goals established by the IAEA and the U.S.

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			(d)	expect the licensees of operating NPPs to establish safety goals that are aligned with international practices." Please explain, how exactly these expectations are met on the practical level.	Nuclear Regulatory Commission for operating NPPs. These safety goals are also then aligned within Canada by sharing experiences and practices through the CANDU Owners Group, and by documented those experiences and practices in licensees' governance. In addition, Bruce Power, Ontario Power Generation (OPG) and NB Power each post summaries of their PSA methodologies, results and safety goals to their public websites: Bruce Power OPG summaries: • Darlington • Pickering NB Power
111	Japan	Article 14	p. 119	We found that there are different safety goals between new build reactors and existing reactors. Please elaborate on the concept to apply such different safety goals to new build and existing reactors.	The safety goals for existing reactors are established by the licensees in accordance with IAEA report INSAG-12, *Basic Safety Principles for Nuclear Power Plants*. These were included as part of the licensees' licensing basis and were accepted by the CNSC. The CNSC has also established safety goals for new builds in regulatory document REGDOC-2.5.2, *Design of Reactor Facilities: Nuclear Power Plants*. These goals (probabilities of occurrence) are one magnitude lower than those set for existing reactors. This approach is consistent with IAEA INSAG-12, and it is internationally accepted that more stringent safety requirements are to be applied for new builds.
112	Japan	Article 14	p. 124	In 2009, CNSC and industry collaborated to survey CANDU safety issues (CSIs) and	The CNSC has a process for the re-categorization of Category 3 CANDU safety issues (CSIs). The process

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				to rank them into Categories 1 through 3. Some Category 3 CSIs were downgraded to Category 2 during the reporting period. Do you have prescribed procedures, such as regulatory review meetings and discussion with industry, for such decision making? What is a practical measure to maintain independence and transparency as a regulatory body, and to ensure a fair regulation?	includes the following steps: • A licensee provides their submission addressing the risk-control measures (RCMs), including supporting documentation, and states their request for re-categorization. • CNSC staff review the submission and evaluate the re-categorization request based on the RCMs to be taken for the CSI. • After it has been verified that the RCMs have been implemented, the Category 3 CSI is re-categorized to Category 1 or 2 as appropriate. Since 2009, the CNSC has met with licensees on a regular basis to discuss progress on addressing Category 3 CSIs. As described above, licensees have made submissions supporting their requests for re-categorization of the CSIs. The CNSC has reviewed these submissions and rendered decisions regarding each request. An update on the status of Category 3 CSIs was published in December 2016 and will be presented in a meeting of the Commission in March 2017. The public may provide comments on the document published in December 2016.
113	Korea, Republic of	Article 14	p. 120	With reference to article 14, page 120 of the Canadian national report, it is stated that the Canadian nuclear industry is developing a safety goal framework and a pilot application of the whole site PSA methodology. With respect to the provided information in the article in question, Korea would like to inquire the following	1) Work to establish the safety goal hierarchical framework and whole-site safety goals is well underway. A proposed framework has been developed by the Canadian nuclear industry for trial application and improvement. 2) Additional work is ongoing in support of the whole-site PSA methodology, including cataloguing of risk

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				questions: 1) What is the current development status of the safety goal framework? 2) What is the current development status of the whole site PSA methodology?	sources and reactor operating states, development of a methodology for the treatment of non-reactor radioactive sources, assessment of onsite (habitability) and offsite impacts, and assessment of risk-aggregation techniques. A pilot application of the whole-site PSA methodology for Pickering will be completed in 2017.
114	Korea, Republic of	Article 14	pp. 120-121	With reference to article 14(i)(d), pages 120 to 121 of the Canadian national report, it is described that multi-unit PSA is required by REGDOC-2.4.2, and COG is developing a safety goal framework. It is also discussed that the whole-site PSA methodology is expected to be completed by 2017 and is currently undergoing pilot application process. With respect to the provided information in the article in question, Korea would like to inquire the following question: How will the Safety Goal Framework under development be different from the one which implements Single-unit PSA?	The existing safety goal framework currently used by the Canadian nuclear industry considers safety goals on a per-unit, per-hazard basis. The safety goal framework currently under development will consider safety goals in the context of multiple units and multiple hazards. Fundamental to a site-based PSA is that PSAs for multi-unit stations in Canada already explicitly account for multi-unit effects, such as possible cross-links among units that could cause an event occurring in one unit to propagate to other units. They also account for the potential for common mode events – including internal hazards and external hazards – to affect multiple units simultaneously. Therefore, Canadian PSAs for multi-unit stations are in essence multi-unit PSAs, meaning they already provide most of the information needed to address questions about multi-unit and site-based safety for severe accidents. The new framework, therefore, will address how to evaluate and communicate the PSA results in a way that accurately and meaningfully portrays overall site safety.
115	United	Article 14	pp. 127-	Based on the information presented in the	Canadian NPPs have made use of digital

Ser	Country	Original reference	Reference in report	Questions/comment	Response
	Kingdom		128	National report, Section 14 (ii) (b) "Aging Management", and the issuing of regulatory document REGDOC-2.6.3 on Aging Management, it appears that Canada is addressing this issue thoroughly. Within Section 14 (ii) (b) and the associated annex, ageing management programmes are covered, however there is limited information Instrumentation and Control (I&C). Please provide additional information on the following: • The methodology used and ageing mechanisms considered for different types of I&C components e.g. relays, printed circuit boards (PCBs), etc. • What ageing effects of I&C equipment have been identified and the action taken.	instrumentation and control (I&C) technology from its inception in the early 1970s. As a result, a large amount of internal operating experience has been accumulated with respect to aging mechanisms affecting I&C components and equipment within CANDU NPPs. In addition, close attention is paid to external operating experience in the I&C area. Some of the prominent aging mechanisms that NPP licensees manage include: • tin whisker growth on circuit cards leading to short circuits • loss of tension in connectors coupling circuit cards to backplanes • brittleness of I&C cables and de-tensioning of cable connections • unavailability of replacement parts due to withdrawal of vendor support • power supply failures due to aging of electrolytic capacitors • I&C component failure due to being operated outside of specified environmental temperature, humidity or vibration limits • loss of maintainability after multiple removal/re-solder of I&C components • mercury-wetted relay failures • I&C component failures due to prolonged radiation exposure

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					Action taken with respect to aging effects has been both proactive and reactive. Proactive actions include careful design of I&C cabinetry and type-testing of I&C systems/components against specifications prior to installation. A particular aspect is the environmental qualification (EQ) program for safety-related I&C components to ensure that they will perform their credited functions for the required duration under accident conditions resulting in harsh environments. Such EQ components typically have a defined qualification lifetime prior to which replacement must occur. Reactive responses to I&C degradation take many forms depending on return-on-investment alternatives considered. They can include: • replacing the entire system using a rigorous engineering change control (EEC) process • reverse-engineering and re-qualifying component replacements, usually with upgraded designs or technology improvements • utilizing available replacement components and re-qualify using a non-identical component-replacement (NICR) process • designing out the need for the I&C component in cases where this is feasible
116	United Kingdom	Article 14	pp. 127-128	The National Report, section 14 (ii) (b) 'Aging Management', makes reference to obsolescence but does not provide further detail.	To provide details for this response, OPG's obsolescence program will be described below. OPG uses the Proactive Obsolescence Management System (POMS) for proactive identification of

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				Please provide further information on Canada's obsolescence management process for Instrumentation and Control (I&C) equipment throughout the lifecycle of operating reactors.	obsolescence issues. Prioritization for implementation of the obsolescence solutions is established using a numerical value that is calculated based on three major components: • importance to the plant • station demand • stock availability As a result of the prioritization process, the numerical value assigned to each obsolete item is called an obsolescence value ranking (OVR) score. An item with a higher OVR score receives higher priority. EQ-related instrumentation and control components receive the highest score in prioritization for implementation of obsolescence solutions due to their high effect on the three major components for determining their OVR score.
117	United Kingdom	Article 14	p. 127	The report describes that in service experience of material ageing due to various degradation phenomena have led to the development and formalisation of ageing management programmes. The report does not describe the codes and standards utilised in the development of the ageing management programmes. Nor does it discuss and significant findings from the ageing management programmes. Please provide details of the codes and standard utilised in the development of the ageing management programme and key	For pressure-retaining components such as pipework and vessels, Canadian NPPs implement periodic inspection programs utilizing two national standards of Canada: • CSA standard N285.4, *Periodic inspection of CANDU nuclear power plant components* • CSA standard N285.5, *Periodic inspection of CANDU nuclear power plant containment* These standards are complemented with the requirements identified in several associated programs: • component and equipment surveillance

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				findings from the programme, concerned with pressure retaining components, such as pipework and vessels.	• major components (including the reactor) • chemistry • flow-accelerated corrosion • buried piping
118	United States of America	Article 14	14 (i) (d) pp. 120 and 16	The report states that "The licensees are developing a safety goal framework and pilot application of a whole-site PSA methodology." (1) How is the CNSC staying abreast of the licensees' initiative? (2) Once developed, is the intent to have this framework and methodology reviewed/approved by the CNSC and included in regulatory guidance? In other words, are there regulatory check-points for this initiative?	The Canadian industry's methodology for the whole-site PSA and safety goal framework was submitted for CNSC review and acceptance in 2014. CNSC staff reviewed the industry submission and have provided preliminary comments. A pilot application of the whole-site PSA methodology for Pickering will be completed in 2017, and the CNSC is hosting ongoing exchange information meetings with industry to discuss the progress of the project.
119	Argentina	Article 14.1	pp. 4, 27, 43, 131	The report says that "The licensees are developing a safety goal framework and pilot application of a whole-site PSA methodology." Could you please describe the philosophy of this "whole-site PSA methodology"?	The whole-site PSA framework proposes site-wide characterization of NPP risk within a hierarchal framework founded on defence-in-depth principles and proposes site safety goals. It will also discuss risk-aggregation techniques and complementary approaches to risk assessment.
120	Argentina	Article 14.1	p. 119	In the safety goal identified as small release frequency, have you considered the inclusion of tritium release covering sequences without core damage?	The small release frequency (SRF) is defined as the sum frequency of all event sequences that can lead to a release to the environment of more than 10^{15} Bq of iodine-131. The rationale for establishing this safety

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					goal is related to the specific CANDU design, where some accident scenarios may result in limited core damage, leading to small releases that may require emergency measures such as sheltering or short-term evacuation of an area around the plant. The SRF is set identical to the core damage frequency as both events are characterized as a release that would likely trigger evacuation. Iodine-131 is considered the lead radionuclide and the equivalent release magnitude is accounted for with other radionuclides, including tritium. However, tritium releases are not considered in the SRF for sequences without core damage.
121	China	Article 14.1	D2/p. 9	It is mentioned that "Depending on the circumstances and CNSC approval, a refurbished reactor with replaced fuel channels could operate for approximately 30 or more years." Question: What are the focuses in operating license renewal process for these refurbished reactors?	A power reactor operating licence issued for an NPP undergoing a refurbishment project will include regulatory hold points for return to service and continued operation. This makes the licensing renewal process different than for an NPP that does not include a refurbishment project. The licensee shall seek approval of the Commission (or consent of a person authorized by the Commission) prior to the removal of the stated regulatory hold points for the return to service of each unit. The regulatory hold points that mark the completion of the commissioning phases are as follows: 1. prior to fuel load 2. prior to removal of guaranteed shutdown state 3. prior to exceeding one percent full power 4. prior to exceeding 35 percent full power After the completion of the refurbishment project, the

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					process for future operating licence renewals will include the submission of periodic safety reviews (PSRs) prepared in accordance with CNSC regulatory document REGDOC-2.3.3, *Periodic Safety Reviews*. The PSR includes a PSR basis document, safety factors reports, global assessment report and an integrated implementation plan. The PSR is a rigorous safety assessment that the CNSC will review and accept once comments have been satisfactorily dispositioned. The CNSC's review is used to determine: • the extent to which the facility conforms to modern codes, standards and practices • the extent to which the licensing basis remains valid for the next licensing period • the adequacy and effectiveness of the programs and the structures, systems and components in place to ensure plant safety until the next PSR or, where appropriate, until the end of commercial operation • the improvements to be implemented to resolve any gaps identified in the review and timelines for their implementation In accordance with IAEA Specific Safety Guide SSG-25, *Periodic Safety Review for Nuclear Power Plants*, as well as international best practice, 10 years is considered an appropriate interval between PSRs to identify any factors that would limit the NPP's continued safe operation and to determine the extent to

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					which it conforms to applicable modern codes, standards and practices.
122	Hungary	Article 14.1	p. 115	The LBLOCA event was formerly considered as a design-basis accident, but now it is a beyond design-basis accident. What are the reasons for this change?	The full text on page 115 of the seventh Canadian report reads, "an example of a design extension conditions accident resulting in fuel damage but maintaining intact core geometry is a large-break loss of coolant accident (LBLOCA) **coincident with a loss of emergency core cooling** where the moderator serves as an ultimate heat sink. This event was formerly considered as a design-basis accident and its analysis continues to (**typically**) be included as part of safety reports" [**emphasis added**]. The large-break loss of coolant accident + loss of emergency core cooling (LBLOCA + LOECC) accident was considered part of the original design basis. At initial licensing, two accident categories were used: • single process system failures • single process system failures with coincident failure of a protective system The LBLOCA + LOECC accident is an example of the second category, which is often called a "dual failure". In most countries, such an accident would have been considered beyond the design basis. However, in Canada, it formed part of the design basis for the plant. CNSC regulatory document REGDOC-2.4.1, *Deterministic Safety Analysis*, adopted the more common categorization of plant states used in IAEA document SSR-2/1, *Safety of Nuclear Power Plants:*

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					Design. It is the frequency bands of the CNSC's accident categorizations that have changed, not the frequency of the accident. Canada is now in line with the international best practices as documented in IAEA SSR-2/1. REGDOC-2.4.1 defines requirements for deterministic safety analysis. It allows events (or part of events) previously categorized as design-basis accident (DBA) to be re-classified as a beyond-design-basis accident (BDBA) based on their frequency of occurrence. If the probability of an initiating event is less than 10^{-5} per year, a DBA can be re-categorized to a BDBA and a more realistic analysis methodology can be used to assess adequacy safety margins. Based on this principle, a portion of the break scenarios that were previously classified as a DBA can now be analyzed as a BDBA scenario if adequate justification is provided. Therefore, the LBLOCA scenario is not entirely re-classified to BDBA – a portion of it could be re-classified if there is sufficient justification for it.
123	India	Article 14.1	Section 14 (i) (d) pp. 120-121	It is stated "Industry, through COG, is developing a safety goal framework and a pilot application of the whole-site PSA methodology." As the CNSC has specified safety goals for new NPPs and have expectations of safety goals for existing NPPs in alignment with international practices; how do these existing safety goals relate to the safety goal for whole-site?	The safety goals for whole-site PSAs are still in development and discussion within the nuclear power industry. Several options are being evaluated and tested. Their relationship to the existing safety goals will be addressed during the development period.

Ser	Country	Original reference	Reference in report	Questions/comment	Response
124	India	Article 14.1	Annex 14 (i)(c) p. 271	It is mentioned that "During the reporting period, NB Power completed its event identification and classification in accordance with REGDOC-2.4.1 and performed a clause-by-clause and event-specific gap assessment against the requirements of REGDOC-2.4.1. It applied a graded approach for determining the analysis of anticipated operating occurrences (AOOs), which identified that no further AOO analysis was required at that time." As per REGDOC-2.4.1, one of the acceptance criteria is – "radiological doses to members of the public do not exceed the established limits." Dose limits as per REGDOC-2.5.2 for AOOs is given as "0.5 mSv for any AOO." Is this dose limit for AOOs above the normal operation dose limit (i.e., 1 mSv/year) or is the requirement to show that for each AOO analysed, calculated dose should be less than 0.5 mSv?	CNSC regulatory document REGDOC-2.4.1 requires the safety analysis to demonstrate that "radiological doses to members of the public do not exceed the established limits." CNSC regulatory document REGDOC-2.5.2 applies to new NPPs. The dose limits published in it do not apply to existing NPPs unless the document is made part of the licensing basis. For Point Lepreau, the facility is licensed under the single/dual failure criteria. The applicable dose limits are given in the licence conditions handbook. The whole-body dose limit for a member of public from a single failure of a process system is 5 mSv. The requirement, per REGDOC-2.5.2, is to show that for each AOO the analyzed, calculated dose is less than 0.5 mSv.
125	Netherlands	Article 14.1	Article 14.1	In chapter 14 the national report mentions PSA-1, PSA-2 and PSA-3, but it appears that the Canadian NPPs have developed PSAs Level 1 and 2. Is it anticipated to develop PSAs further, including PSA-3?	There are no plans to develop Level 3 PSAs. Utilities may perform limited Level 3-type assessments to support specific risk-informed applications.
126	Romania	Article 14.1	pp. 117-121	Does the CNSC have any plans to require Level 3 PSA for the nuclear power plants?	The CNSC has no plans at this time to introduce requirements for Level 3 PSAs. However, the CNSC

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				Please provide details in the relation to the answer.	is closely monitoring international progress on this topic.
127	Russian Federation	Article 14.1	Article 14, para 14 (i) (a), p. 122	The report mentions that WANO Peer Reviews have been conducted at several plants, and the feedback, insights and learning from the WANO peer-review process are highly valuable. Could you please give examples of the most valuable lessons learnt?	All strengths identified during World Association of Nuclear Operators (WANO) reviews are posted on the WANO website, which is available to WANO members. The facility is not identified on the website but the information is available to all members. At Bruce Power, lessons learned from a WANO peer review in radiation protection led to a wide-ranging radiological improvement initiative that reduced collective radiation exposure by 0.97 person-sieverts (97 person-rem) at Bruce B. This initiative saw radiation protection personnel provide even greater oversight of high-risk radiological work activities, which led to improved dose control and fewer personnel contamination events. Lessons learned also helped dose reduction during fuel channel inspections, improved tritium control, and enhanced sponsorship and oversight by station leadership and the as low as reasonably achievable (ALARA) committee. Point Lepreau can be used as another example, where as a result of a WANO-review finding, control room fuel-handling operator performance improved by using the fuel-handling simulator (the first of its kind for a CANDU 6 reactor). The simulator was used for practicing evolutions and developing procedure aids for executing infrequently performed tasks event-free.
128	Russian Federation	Article 14.1	Article 14, para 14 (i)(c),	As mentioned in Section 14 (i) (c) "Deterministic safety analysis": "General requirements and approach", "an example	The LBLOCA + LOECC accident was considered part of the original design basis. At initial licensing, two accident categories were used:

Ser	Country	Original reference	Reference in report	Questions/comment	Response
			page 116	of a design extension conditions accident resulting in fuel damage but maintaining intact core geometry is a large-break loss of coolant accident (LBLOCA) coincident with a loss of emergency core cooling where the moderator serves as an ultimate heat sink. This event was formerly considered as a design-basis accident and its analysis continues to (typically) be included as part of safety reports." Could you please clarify why this accident has been moved from a design-basis accident to a beyond-design-basis accident category? Wouldn't this move lower the requirements for the safety systems designed to cope with design-basis accidents?	• single process system failures • single process system failures with coincident failure of a protective system The LBLOCA + LOECC accident is an example of the second category, often called a "dual failure." In most countries, such an accident would have been considered beyond the design basis. However, in Canada, it formed part of the design basis for the plant. CNSC regulatory document REGDOC-2.4.1, *Safety of Nuclear Power Plant Design*, adopted the more common categorization of plant states used in IAEA document SSR-2/1. Therefore, it is the frequency bands of the CNSC's accident categorizations that have changed, not the frequency of the accident. Canada is now in line with the international best practices as documented in IAEA SSR-2/1.
129	Russian Federation	Article 14.1	Article 14, para 14 (i) (f), p. 123	1. What are the plans in regard of decommissioning and/or life extension of Pickering 1 and 4? 2. Have any significant safety gaps been revealed in safety-significant systems at CANDU plants in the course of life extension activities?	1) OPG staff at Pickering have been executing work under extended operations to develop greater certainty in the technical and economic feasibility of extending operations. OPG is seeking a 10-year operating licence renewal for Pickering, commencing upon licence renewal in 2018. To support the Pickering licence renewal, OPG is conducting a PSR. Pickering is on track to substantiate the 10-year operating licence that includes activities related to safe storage of fuel subsequent to end of commercial operation. 2) Pickering is currently completing component condition assessments (CCAs) to support the PSR

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					process leading to licence renewal. The information that the CCAs provide will prove fitness for service and will provide evidence of robust programs. Though the CCA work is ongoing, to date no indicators present technical concerns or significant gaps that would preclude the continued safe and reliable operation of Pickering.
130	Russian Federation	Article 14.1	Article 14 (i) (d), p. 117	Section 14 (i) (d) mentions comprehensive and integrated assessments of NPP safety – PSA. Could you please give information about PSA results (quantitative risk assessment).	Bruce Power, OPG and NB Power all post summaries of their PSA methodologies, results and safety goals to their public websites. These include simple aggregation (by addition) of PSA results and can be accessed through the following links: Bruce Power OPG summaries: • Darlington • Pickering NB Power
131	Russian Federation	Article 14.2	Article 14, para 14 (ii)	How is it ensured after construction/upgrading/refurbishment that as-built documentation corresponds to the actual state of the plant systems and components?	Documentation accuracy is ensured since, as part of the NPP licensee's design close-out process, documentation is updated so that it reflects the actual state of plant systems and components.
Article 15: Radiation protection					
132	Argentina	Article 15	p. 134	The report says that "to ensure that the public dose limit is not exceeded, the Canadian Nuclear Safety Commission (CNSC) restricts the amount of radioactive	Derived release limits (DRLs) are calculated using environmental transfer models in accordance with CSA standard N288.1, *Guidelines for calculating derived release limits for radioactive material in*

Ser	Country	Original reference	Reference in report	Questions/comment	Response
				material that licensees may release" using the derived release limits (DRLs). These DRLs "are derived from the public annual dose limit of 1 mSv". Has it been considered a fraction of the dose limit for the calculation of derived release limits (DRLs), as part of the implementation of the ALARA process? Please provide additional information.	*airborne and liquid effluents for normal operation of nuclear facilities*. The dose criterion typically used in the calculation is the public annual dose limit of 1 mSv, as that is a regulatory requirement that all licensees must meet. Licensees can choose to set a dose criterion lower than 1 mSv to ensure that the annual regulatory dose limit to a member of the public is never exceeded. For example, the annual limits for liquid and airborne releases at Chalk River Laboratories are calculated based on a dose constraint of 0.3 mSv to the critical group (member of the public). Currently, all Canadian NPPs calculate DRLs using the dose criterion of the 1 mSv regulatory limit to a member of the public. Releases from the Canadian NPPs are well below the established DRLs. The CNSC reviews the basis for the calculations to determine whether the licensee is making adequate provisions to protect the health and safety of persons and the environment.
133	Argentina	Article 15	p. 134	In practice, what percentage of derived release limits (DRLs) usually corresponds to the action level? Please provide additional information.	There is no set percentage of the DRL that usually corresponds to the action level. Action levels are meant to be facility-specific and take into account facility design and relevant operating experience. Action levels are used to provide assurance that dose and release limits will not be exceeded by providing early indication of a potential loss of control of part of the environmental or radiation protection program. Action levels are also used to ensure that licensees demonstrate adequate control of their facility based on

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					their approved facility design, environmental protection programs and radiation protection programs. Additional information on release limits and action levels can be found on the CNSC website.
134	Korea, Republic of	Article 15	p. 134	With reference to article 15, page 134 of the Canadian national report, Korea would like to raise the following observation and inquire its question based on the observation: Regarding control of radioactive material released into the environment, a number of countries have set dose constraints in their country's law below the public dose limit. In Canada, it seems that DRL is derived from the public dose limit. Apart from the Canadian DRL of 1 mSv, if any, what are the details (values, technical base) of specific DRL individually set by licensees?	Licensees calculate DRLs using multimedia pathways modelling in accordance with CSA standard N288.1. DRLs represent estimates of releases that could result in doses to the public that equal the prescribed public limit for effective dose (1 mSv per year) or other associated equivalent dose limits. A DRL is derived using mathematical equations that describe the transfer of radioactive materials through the environment to humans. It takes into account all exposure pathways, including external exposure from immersion in contaminated air and water, external exposure to contaminated soil and beaches, and internal exposure from inhalation and ingestion of radioactivity. Licensees can set a release limit based on a dose criterion of lower than 1 mSv to ensure that the annual regulatory dose limit to a member of the public is never exceeded. For example, the annual limits for liquid and airborne releases at Chalk River Laboratories are calculated based on a dose constraint of 0.3 mSv to the critical group (member of the public). Currently, all Canadian NPPs calculate DRLs using the dose criterion of the 1 mSv regulatory limit to a member of the public. Releases from the Canadian NPPs are well below the established DRLs.

Ser	Country	Original reference	Reference in report	Questions/comment	Response
135	Russian Federation	Article 15	para 15(a), p. 133	How often do personnel undergo mock-up training (is there annual training schedule, or is training carried out right before an outage)? Is there any difference in the exposure doses at plants conducting mock-up training and those that do not have this practice? What is this difference?	The contractor executing the work will ensure that contract trades workers conducting the retube and feeder replacement (RFR) activities receive the basic "RFR 101" classroom training course as well as relevant series training (such as pressure tube removal training) prior to performing the work. Contract trade workers will also receive up to five mock-up/rehearsal sessions, including full-dress rehearsal. The mock-up/rehearsal training will be conducted with the radiation protection personnel embedded into their assigned shift crews. New technologies will be used to simulate dose rates and dose. This allows workers to become familiar with as low as reasonably achievable (ALARA) hold points and low-dose waiting areas. The technologies will also train the workers on the appropriate responses to dose rate, dose alarms, tritium, airborne particulate monitors and gamma area monitors. During mock-up/rehearsal activities, refurbishment training utilizes the latest technologies for mapping/simulation of radiation doses rates and radiation beams. Other simulator technologies are used in the classroom and laboratories as part of practical evaluations and dynamic learning activities. Operating experience from past high radiation hazard work mock-up/rehearsal training has produced between 10 percent and 25 percent dose reduction by utilizing basic radiation protection fundamentals such as time, distance, shielding, and personnel movement and control.

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					Early plans are developed and implemented for the effective and timely training and qualification of staff, including supplemental personnel. Personnel, including supplemental personnel, must satisfy established training and qualification requirements before being assigned to work independently on refurbishment activities at the Darlington site. Furthermore, vendors must demonstrate and ensure that all workers are qualified and competent to perform assigned work. One of the most important principles of personnel qualification is the traceability of the qualification.
136	Russian Federation	Article 15	para 15(b), p. 133	How are gas aerosol releases accounted for when they are below the lower boundary of instrument measurement range?	The dose calculations include all pathways of radionuclide uptake or external exposure by humans. The dose contribution from each pathway is estimated with the IMPACT 5.4.0 dose-calculating software either using direct measurements in the environment or by modelling the emissions.

Ser	Country	Original reference	Reference in report	Questions/comment	Response
Article 16: Emergency preparedness					
137	Germany	Article 16	p. 140, Ch. 16.1 (a)	According to the report, "The CNSC Action Plan assigned an action to the CNSC to initiate a project to amend the *Class I Nuclear Facilities Regulations* to require submission of applicable provincial and municipal offsite emergency plans, along with evidence to support how the licensees are meeting the requirements of those plans, as part of the licence application. It is anticipated that the amendments to the *Class I Nuclear Facilities Regulations* to address lessons learned from Fukushima will be published in 2017." Will this amendment of the law be applicable only to new nuclear installations or to the existing ones as well?	The proposed amendment to the *Class I Nuclear Facilities Regulations* will apply to both existing and new nuclear installations. Further requirements and guidance have also been published in CNSC regulatory document REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response*, and consensus CSA standard N1600, *General requirements for nuclear emergency management programs*. The CSA standard in particular outlines the consensus agreement and commitment of the broad multi-stakeholder and multi-jurisdictional bodies with emergency management responsibilities in Canada. The new regulatory document and standard apply to existing facilities and have already been implemented by licensees and governments. Full multi-stakeholder and multi-governmental exercises have been held at the NPPs in Canada.
138	Korea, Republic of	Article 16.1	p. 100	With reference to article 16.1, Korea would like to inquire the following question: What is the role of the CNSC during nuclear emergencies?	The CNSC's role is to provide assurance that appropriate actions are taken by licensees and response organizations to limit risk to the health, safety and security of the public and the environment. The CNSC's Nuclear Emergency Response Plan (NERP) describes the strategies and guidelines that the CNSC will follow during a nuclear emergency. The CNSC performs regulatory oversight of licensees' activities as well as independent assessment of the onsite conditions and potential offsite consequences.

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					Under the Federal Emergency Response Plan (FERP) and the Federal Nuclear Emergency Plan (FNEP), the CNSC plays a supporting role in responding to nuclear emergencies. This includes but is not limited to providing technical assistance to support the lead organization. The CNSC also provides support to the whole-of-government response for nuclear emergencies involving non-licensees, such as foreign emergencies and malevolent acts. As described in the NERP, the CNSC has a specific role for its licensees when they are confronted with a nuclear emergency. The CNSC requires licensees to: • identify and assess the safety significance of the emergency • control and mitigate the emergency • notify offsite authorities of an accidental release or the imminence of an accidental release • report information to offsite authorities during and after an accidental release • assist offsite authorities in dealing with the effects of an accidental release • notify the CNSC in accordance with applicable regulations and licence conditions • inform the public about onsite actions and conditions Note: "Offsite authorities" refer to the Province of Ontario and Province of New Brunswick.
139	Korea,	Article 16.1	p. 139	With reference to article 16.1, page 139 of	In Canada, the provinces are the lead authorities for

Ser	Country	Original reference	Reference in report	Questions/comment	Response
	Republic of			the Canadian national report, it is described that Public Safety Canada is the lead authority for Federal Emergency Response Plan and Health Canada is the lead authority for Federal Nuclear Emergency plan. With respect to the provided information in the article in question, Korea would like to inquire the following questions: 1) Which organization would assume the lead authority under accidents followed by natural disasters similar to that of Fukushima? 2) Which organization would assume the lead authority under nuclear emergencies without natural disasters?	offsite releases/consequences resulting from an accident at an NPP. This does not change regardless of what caused the emergency (i.e., a natural disaster versus a non-natural disaster). Should a province require additional assistance with an actual or potential emergency, it can request assistance from the federal government. At the federal level, the Minister of Public Safety is responsible for exercising leadership related to emergency management in Canada, by coordinating emergency management activities among government institutions and in cooperation with the provinces and other entities. The FERP (led by Public Safety Canada) and the FNEP (led by Health Canada) would provide support to the affected province. The FERP is the Government of Canada's "all-hazards" response plan. It has both national and regional components that provide a framework for the integration of effort on both fronts throughout the federal government. Under the FERP, the Minister of Health is responsible for public health and essential human services, and has developed the FNEP as a nuclear-specific annex to the FERP, focusing on scientific and technical arrangements and analysis required to address offsite radiological consequences and risks. The FNEP also has provincial annexes that define interfaces with provincial nuclear plans and outline arrangements for support when pre-defined triggers are met. These arrangements are independent of the cause of the emergency.

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					The CNSC's role is to provide assurance that appropriate actions are taken onsite by the NPP operator and that their responses are timely and appropriate so as to limit the risk to the health, safety and security of the public and the environment. Under the FERP and FNEP, the CNSC also contributes information to support the offsite response.
148	Netherlands	Article 16.1	Annex 16.1b, sect 19 iv, p. 175	Annex 16.1b describes the various emergency preparedness plans available at the corporations operating NPPs in Canada. From the descriptions one gets the impression they may differ somewhat in the definition of nuclear emergency and/or alert levels. Are there plans from the CNSC to harmonise the plans? Does the upcoming REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response, version 2*, provide for this harmonisation?	During the NPP licence application phase or during the re-licensing process, the licensee's emergency response program and plan are reviewed and assessed independently by the CNSC. Emergency plans differ from one NPP operator to another. Licensees have different approaches, methodologies and expectations. For example, locations of NPPs, population demographics and weather patterns may have an impact on how a particular NPP prepares for their response to emergencies. Emergency plans are meant to address specific objectives. These are based on new and existing response methodologies that have been tested and found to work well within their response plans. Currently, there is no intention to update CNSC regulatory document REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response*, *version 2,* to ensure that all NPP licensees follow the same methodology when preparing their emergency programs and response plans.
140	Russian	Article 16.1	para	In section 16.1 (a) "General responsibilities of the licensees, regulatory	In Canada, each province is the lead authority for offsite releases/consequences from NPPs within its

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	Federation		16.1(a)	body and other authorities", para "Response to Fukushima – Emergency preparedness in general" of the National Report it is stated that "The CNSC Action Plan assigned an action to the CNSC to initiate a project to amend the *Class I Nuclear Facilities Regulations* to require submission of applicable provincial and municipal offsite emergency plans, along with evidence to support how the licensees are meeting the requirements of those plans, as part of the licence application." As follows from this text, off-site emergency plans will be included into the license application documentation, and hence, the operating organisation will be charged with the responsibility for their implementation. This may lead to a situation when due attention will not be paid to the on-site emergency plans. Could you please comment on this opinion, and clarify how responsibility for the implementation of provincial and municipal off-site emergency plans will be split between municipal (provincial) authorities and the operating organisation?	region. During the NPP licence application phase or during the re-licensing process, the CNSC will review and assess the onsite emergency programs and plans from the applicant or licensee. It was recently decided, after discussion with the affected parties (including NPP operators), that the CNSC would not amend the *Class I Nuclear Facilities Regulations* to require the submission of applicable provincial and municipal plans. It was determined that the current regulations are adequate and that no text is needed to explicitly require the submission of offsite plans for review. Also, it was felt that, as the province is the lead authority for offsite consequences, the task should remain with the province and its municipal partners. In retrospect, not changing the process will ensure that operators are not overburdened with additional emergency response tasks. This will allow them to focus their efforts on matters inside the site fence and also provide a direct link between operators and offsite authorities at all levels as they will continue to work closely with one another. Per the *Class I Nuclear Facilities Regulations*, during the NPP licence application phase or during the re-licensing process, applicants or NPP licensees are required to provide the proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances.

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141	Russian Federation	Article 16.1	Article 16, para 16.1 (c)	It is stated in para 16.1 (c) "Emergency preparedness expectations for new-build projects" of the National Report that "additional criteria related to emergency preparedness found in these regulatory documents that need to be considered at the design and construction phase include…: • The containment design allows sufficient time for the implementation of offsite emergency procedures." Could you please explain how containment design could allow sufficient time for arranging emergency actions?	Per CNSC regulatory document REGDOC-2.5.2, *Design of Reactor Facilities: Nuclear Power Plants*, the design requirements for containment ensure that leakage in a severe accident remains below the design leakage rate limit for enough time to allow for implementation of emergency measures. Beyond this time, containment leakage that would exceed the small and large release safety goals should be precluded. This may be achieved by supplying adequate filtered containment venting, among other features. Because the requirements on containment design are stringent and specified in REGDOC-2.5.2, the design for a new build plant will ensure that there is sufficient time to implement offsite emergency measures before containment leakage could exceed the small and large release safety goals, which are tied to releases that could trigger short-term evacuation or long-term relocation, respectively.
Article 17: Siting					
142	United Kingdom	Article 17	p. 161	The report states that "Canada and the U.S. have a longstanding practice of cooperation with respect to transboundary impacts through such treaties as the Boundary Waters Treaty of 1909, the Great Lakes Water Quality Agreement of 1978, and the Canada-United States Air Quality Agreement of 1991." Please clarify if these agreements place specific legal obligations on either party relating to the siting of nuclear sites or	These agreements set out principles for addressing transboundary environmental impacts but they do not make specific mention of nuclear sites. The *Canadian Environmental Assessment Act, 2012* and its regulations require transboundary environmental effects to be considered and assessed in the environmental assessment of designated projects, including proposals for new NPPs in Canada. The CNSC requires proponents of new NPPs in Canada to assess the effects of potential severe

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				actual or potential transboundary impacts resulting from normal operations or accident conditions on such sites.	accidents scenarios. CNSC regulatory document RD-346, *Site Evaluation for New Nuclear Power Plants*, states that prior to construction, the proponent confirms with the surrounding municipalities and any affected provinces, territories, foreign states or neighbouring countries that implementation of their respective emergency plans and related protective actions will not be compromised for the lifecycle of the proposed site.
143	United Kingdom	Article 17	p. 161	The report states that the Canadian Nuclear Safety Commission (CNSC) and the U.S Nuclear Regulatory Commission (NRC) have an administrative arrangement for the exchange of technical information and cooperation in nuclear safety matters, including the siting of any designated nuclear facility in either country. Please clarify if this administrative arrangement specifies the information regarded as necessary for each party to be able to evaluate and make their own assessment of the likely safety impact of a (foreign) nuclear facility on their territories?	The administrative arrangement between the CNSC and the U.S. Nuclear Regulatory Commission provides for the exchange of unclassified technical information but does not specify what information is considered necessary in the event that one country assessed the impact on its territory of a foreign nuclear facility. The arrangement does not affect either country's ability to render independent decisions in the siting or construction of an NPP. Rather, the close relationship that has evolved through formal and informal collaborative efforts over the years ensures that both countries' points of view are considered early in the decision-making process by the respective regulatory agency before a final decision is rendered.
144	Russian Federation	Article 17.1	Article 14, para 14 (i), (c)	It is stated in para 14 (i) (c) "Deterministic safety analysis", sub-para "Updating safety analysis requirements, methods and acceptance criteria" of the National Report that "a set of siting criteria for assessing the acceptability of NPPs was developed in	In the *CNSC Integrated Action Plan on the Lessons Learned from the Fukushima Daiichi Nuclear Accident*, the CNSC took action to implement periodic safety review (PSR) in Canada. With the publication of CNSC regulatory document REGDOC-2.3.3, *Periodic Safety Reviews*, this action is now complete.

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				the mid-1960s", and then it is specified that "these criteria continue to be used as part of the licensing basis [i.e. analysis of application justification for license granting\extension] for all Canadian NPPs, except for Darlington." Meanwhile, the Fukushima Daiichi accident has demonstrated the importance of using proper criteria characterising the NPP site for adequate assessment of the external events that may impact normal operation of a nuclear power plant. Could you please clarify whether the use of outdated criteria could lead to the underestimation of external hazards, and hence, to the failure to take into account the lessons learned from the Fukushima accident? Does the Canadian Nuclear Safety Commission take into account in its regulatory activities the provision of the IAEA document SSG-35, *Site Survey and Site Selection for Nuclear Installations*, para 1.5 which states "The siting process, from the beginning, has to be guided by a clearly established set of criteria consistent with the relevant regulatory requirements"?	Previous to this, licensees performed integrated safety reviews (based on PSR) in accordance with CNSC regulatory document RD-360, *Life Extension of Nuclear Power Plants*, as part of refurbishment for life extension. Both regulatory documents require a review against modern standards. A PSR ensures that the important changes since the original licensing are assessed and appropriate changes are made. In Canada, the modern standards include CNSC regulatory document RD-346, *Site Evaluation for New Nuclear Power Plants*. This document pre-dates IAEA Specific Safety Guide SSG-35, *Site Survey and Site Selection for Nuclear Installations*, but does reference the relevant IAEA documents available at the time of publication. RD-346 is currently being updated with relevant information from SSG-35 being considered.

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Article 18: Design and construction					
145	Japan	Article 18	p. 166, line 15	Please let us know the content of the nuclear code of conduct for NPP vendor countries in detail.	The Nuclear Power Plant Exporters' Principles of Conduct includes six principles: • Principle 1: Safety, health and radiological protection • Principle 2: Physical security • Principle 3: Environmental protection and the handling of spent fuel and nuclear waste • Principle 4: Compensation for nuclear damage • Principle 5: Non-proliferation and safeguards • Principle 6: Ethics
146	Japan	Article 18	p. 166	The report says that the purpose of "Principles of Conduct" is to complement national laws and regulations, international laws and norms, and the recommendations of institutions. What are the aspects to be complemented? What has been achieved reflecting activities of the Principles of Conduct?	The world's major suppliers of civilian NPPs agreed to apply a common set of principles in their exporting decisions and practices. These Principles of Conduct provide voluntary guidelines for negotiating export contracts, designing facilities and engaging customer states. They have been adopted to achieve common high standards of practice in the areas of safety, security, non-proliferation, environmental protection, ethics and liability insurance, and to complement corresponding national laws and regulations. The Principles of Conduct reflect recent trends in the management of global challenges, where leading industries recognize that their reputations as socially responsible actors are key to their long-term business success. Other industries with similar codes of conduct include the financial, electronics, manufacturing and

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					extractive sectors. SNC-Lavalin Nuclear offers a good example of the application of the Principles of Conduct, which are reflected in the organization's approach to designing and marketing NPPs and in its own Corporate Code of Ethics and Business Conduct.
147	Korea, Republic of	Article 18	pp. 163-168	Reviewing the Canadian national report, it was found that cyber security was not discussed in "Article 18. Design and Construction", pages 163 to 168. With respect to cyber security, Korea would like to inquire the following questions: In Korea, cyber security has been applied from the beginning of the design and construction level to reinforce the nuclear safety against cyber attack. 1) Are there requirements applicable to cyber security in the design and construction of nuclear facilities? If there are such requirements, how is the review on cyber security performed? 2) What does the regulatory authority demand of NPP licensees in terms of cyber security?	CNSC regulatory document REGDOC-2.5.2, *Design of Reactor Facilities: Nuclear Power Plants*, outlines high-level cyber security requirements and guidance for new licence applications. Cyber security requirements and guidance can be found in the following sections of REGDOC-2.5.2: • 5.2, Design management • 5.7, Design documentation • 7.9.2, Use of computer-based systems or equipment • 7.22.4, Cyber security CNSC staff also use CSA standard N290.7, *Cyber security for nuclear power plants and small reactor facilities*, as a compliance-verification criteria necessary to meet CNSC regulatory requirements and expectations. CNSC staff conduct compliance-assessment activities to determine whether the cyber security aspects of submitted designs meet requirements and expectations. For example, compliance-assessment activities may include desktop reviews of the submitted design packages or visits to the development facility where the instrumentation and control (I&C) systems of the submitted designs

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					are implemented and tested, if necessary. The CNSC requests that licensees provide information on the cyber security aspects of their overall I&C design and the systems important to safety based on REGDOC-2.5.2 and CSA standard N290.7. The level of depth of the required information for cyber security review is dependent on the design phases. The following information is requested, but not limited to: • cyber security program • cyber security defensive architecture • cyber security controls • secure development environment
4	Netherlands	Article 18	pp. 166-167	Strengthening of the application of Defense in Depth (DiD) was an important lesson of Fukushima, also in the regulatory context of supervision. What, in the opinion of Canada could or should be changed/added to the supervision programmes of regulatory authorities to increase the confidence in the application of DiD at NPPs?	The safety improvements implemented following the Fukushima Daiichi accident to enhance the defence-in-depth concept of operating NPPs in Canada, including the objectives of each level and the corresponding means essential for achieving the objectives, were mostly focused on defence in depth Levels 4 and 5 for beyond-design-basis accidents. From a supervision programs perspective, regulatory efforts were carried out to re-assess and validate procedures/guidelines and safety assessments for: • severe accident management guidelines (SAMGs) • emergency mitigating equipment guidelines for the use and deployment of mobile and multiple means to supply cooling water and backup power that were installed in response to the Fukushima accident • integrated emergency plans that consider the

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					provincial, regional and municipal nuclear emergency response plans • safety assessments and re-evaluation of site-specific magnitudes of external events, including multi-unit and spent fuel pool events for high winds, seismic margin assessment/seismic probabilistic safety assessment, tsunamis and flooding • demonstration of adequacy or provision of additional relief capacity to the reactor during severe accident • structural integrity assessment of spent fuel pools for temperatures above design values • re-assessment of main control rooms and secondary control room habitability • instrumentation qualification for severe accident conditions
149	China	Article 18.1	Annex 19(IV) / p. 310	It's mentioned that "The majority of Fukushima-related design modifications have been implemented at Point Lepreau with the exception of providing external water to the calandria for moderator water makeup as part of an enhanced in-vessel retention strategy." Question: Why didn't the Point Lepreau NPP implement this design modification? Has the modification been implemented at the other CANDU NPPs in Canada?	NB Power was delayed on this work as the valve that was added to the system did not pass a factory acceptance test prior to installation. The valve has now been installed and the moderator makeup is available for use. This modification was installed in Units 1 and 2 by Bruce Power during its return-to-service activities in 2012. All Bruce Power units have SAMG provisions to provide makeup water to the calandria. Additionally, all Bruce Power units will have moderator makeup modifications completed by 2020 with the exception of Unit 6, which will have the modification installed during its refurbishment outage,

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					which starts in 2020. For OPG, because the existing design features are adequate, Pickering does not require modifications. For Darlington, the modification has been completed.
150	United Kingdom	Article 18.1	p. 301	The National Report mentions that NPP licensees have evaluated means to provide additional coolant makeup from alternate sources and that some modifications are complete or are in progress. Can Canada please provide further information on the scope and timescales for these modifications?	Following the Fukushima Daiichi accident, NPP licensees have designed, procured and tested fleets of mobile water pumps and installed connections and piping within their NPPs to ensure an alternate and independent supply of makeup water to steam generators, primary heat transport systems, calandria vessels, shield tanks and irradiated fuel bays. For example, Bruce Power has purchased a fleet of five high-capacity pumper trucks capable of drawing 3,000 gallons of water per minute from a series of newly-installed dry hydrants near the outfalls at each of its NPPs. Makeup water is pumped directly from Lake Huron to the NPPs using connections familiar to fire crews. Three of the pumper trucks are stored offsite to ensure availability. Two redundant quick connections that allow water from the portable pumpers to be directed to the steam generators have been installed in Bruce Power units since 2013 (the first connection point was completed in 2012). Modifications for additional cooling water connections to other reactor systems are in progress and are expected to be completed by 2020.
151	United Kingdom	Article 18.1	pp. 166-167	The IAEA guidance in SSR-2/1 Rev 1 (Paragraph 2.13) describes the five distinct levels of defence-in-depth (DiD) and notes that the "independent effectiveness of the	Requirement 7 of IAEA document SSR-2/1, *Safety of Nuclear Power Plants: Design*, concerns the application of defence in depth and states that "the design of a nuclear power plant shall incorporate

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				different levels of defence is a necessary element." The National Report states that the level of DiD at all NPPs was deemed acceptable by the Canadian Nuclear Safety Commission (CNSC). Could Canada please explain what the regulatory requirements are in terms of: • The need for provisions across all five levels of DiD. • Ensuring adequate independence between the levels of DiD (e.g. in terms of electrical power sources).	defence in depth. The levels of defence in depth shall be independent **as far as is practicable**." [**emphasis added**]. The CNSC considers that the requirement and associated clauses are more relevant than the statement in paragraph 2.13 (taken from IAEA document SF-1, *Fundamental Safety Principles*). The CNSC is not aware of any current reactor design that can achieve full independence of systems associated with the different levels of defence in depth. For example, the reactor containment has a role in all five levels of defence in depth, but no reactor has (or needs) five independent containments. Furthermore, the CNSC does not see how several independent implementations of operational programs (for example, the management system or maintenance program) can be implemented for the different levels. It is assumed that these programmatic aspects of defence in depth were not intended to be independent at each level. Ensuring adequate independence, at least for equipment, is best performed through a probabilistic safety assessment (PSA). NPP licensees are required to maintain PSAs for their plants in accordance with CNSC regulatory document REGDOC-2.4.2, *Probabilistic Safety Assessment (PSA) for Nuclear Power Plants*. The CNSC notes that a PSA does not cover the operational programs discussed above. Canada does not have a formal method for assessing defence in depth. Existing methods, such as those described in IAEA Safety Report Series SRS-46, *Assessment of Defence in Depth for Nuclear Power*

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					Plants, seem to cover only the design and analysis aspects of defence in depth in any detail. Operational aspects (such as management system, safety culture, maintenance and inspection) do not seem to be well addressed. Licensing and compliance verification of Canadian NPPs is structured around the CNSC's 14 safety and control areas (SCAs). These are an extension of the safety factors included in a periodic safety review (PSR) as described in IAEA document SSG-25, *Periodic Safety Review for Nuclear Power Plants*. The CNSC's regulatory framework, the annual *Regulatory Oversight Report for Canadian Nuclear Power Plants* and the requirements for PSR published in CNSC regulatory document REGDOC-2.3.3, *Periodic Safety Reviews*, all use the SCAs. The CNSC's SCAs cover all the safety factors, embracing operation, design and analysis of an NPP. The CNSC considers the Canadian approach to fully embed the philosophy of defence in depth.
Article 19: Operation					
152	Germany	Article 19	p. 173, Ch. 19 (iii)	Does the CNSC participate in modifications and improvements of nuclear installations? Or, in other words, if modifications are carried out on systems related to safety on a high level, does the CNSC supervise the process?	The licensee is responsible for carrying out modifications and improvements at nuclear installations. Prior to undertaking significant modifications, such as replacing a major component, the licensee must inform CNSC staff and provide a plan for its work. CNSC staff will assess the plan and conduct inspections of the work being carried out by the licensee. With the introduction of CNSC regulatory document REGDOC-2.3.3, the licensees are

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					expected to carry out periodic safety reviews. These will further increase CNSC staff oversight in the process of major improvements. As an example of CNSC involvement in licensee's modifications and improvements, for the refurbishment project at the Darlington, Ontario Power Generation (OPG) conducted a full integrated safety review under CNSC regulatory document RD-360, *Life Extension of Nuclear Power Plants*. This review included an integrated implementation plan that was approved by the Commission. CNSC does not supervise the work of the licensees, including modifications to systems related to safety, but verifies and enforces the licensee's compliance with regulatory requirements.
153	Romania	Article 19.2	p. 172	Does the CNSC require and/or have the licensees established operational limits and conditions for the structures, systems, components and equipment (including mobile equipment)/complementary design features and emergency mitigating equipment relied upon to support severe accident management?	Operational limits and conditions in Canada are currently limited to the safety analysis on which the plant was licensed, typically the safety systems and safety-related systems for design-basis accidents. Refer to CSA standard N290.15, *Requirements for the safe operating envelope for nuclear power plants*, for detailed information regarding the operational limits and conditions. CSA standard N290.16-16, *Requirements for beyond design basis accidents*, has information related to complementary design features and emergency mitigating equipment.
154	Russian Federation	Article 19.3	para 14 (ii) (b), p. 127	Experience with several significant material degradation mechanisms during the life of the NPPs currently operated in	Aging management programs for Canadian NPPs do include modification (or upgrading) of the plant's systems/components.

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				Canada has led to the development, formalization and documentation of a number of aging management programmes. Question: Do aging management programmes include modification (upgrading) of plant systems/components? - If "yes", questions: How is planning made for modification (upgrading) of plant systems/components? Who (what department) acts as the customer for modification (upgrading) of plant systems/components? How is operating experience taken into account in planning modification (upgrading) of plant systems/components? - If "no", question: How are the technical characteristics of systems/components made to meet prescribed parameters in case of amendments of nuclear regulation requirements and/or in case of regulator demand?	A well-established project control process is used to plan modifications from conceptual engineering through to close-out. Engineering is conducted via engineering change control processes. Depending on the size and complexity of the modification (i.e., single-discipline versus multiple-discipline modifications) the customer may be within design engineering itself (such as a division or department manager) or be a project manager within the project management and construction division. When planning a modification to a system or component, operating experience is discussed in detail at the start during the conceptual engineering phase and then reinforced through to close-out. This is noted in the design plan. Operating experience is gathered by the owner's engineer (i.e., lead engineer) and includes key stakeholders early in the modification process. In case of an amendment to the regulatory requirements or in case of regulator demand, design requirements and technical specifications are produced and each design requirement and technical specification requirement is tracked using a requirement traceability matrix (RTM). The RTM is then traced through to testing.
155	Russian Federation	Article 19.3	para 19 (iii), p. 173	Could you please describe the participation of NPP personnel in the development of operation, maintenance, inspection and testing procedures.	One example illustrating the participation of NPP personnel comes from OPG, which has developed operations, maintenance, inspection and testing procedures groups within the centre-led organization that prepares, verifies, reviews and approves

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				How mature is this practice?	procedures using experienced staff members. The procedures organization is made up of staff from all levels of the organization and develops procedures from a standard template of instructions. For example, the operations procedures group consists of field operators, licensed panel operators, licensed control room supervisors and shift managers. The groups are physically located at the NPP site but are under the leadership of the central organization. The NPP sites play an integral role in the acceptance of the procedures for use. Input into procedures is expected by the station line organization to ensure their accuracy. This is a mature and well-established practice at the NPP sites.
156	India	Article 19.4	Annex 19(iv), p. 310	It is stated "SAMG and other procedures have been revised to ensure that emergency mitigation equipment can be deployed reliably within a time frame defined by critical performance objectives derived from severe accident analysis timing and other assessment" and "Training and drills have been performed to verify that the equipment can be deployed with confidence within required time frames." Could Canada share information regarding accident scenario in SAMGs that require minimum time for deployment of emergency mitigating equipment; and typically what is the time frame?	All licensees verify that their emergency mitigating equipment can be deployed as needed at least once per year during their annual corporate training exercises. As an example, both OPG and Bruce Power have conducted full-scale, multi-day exercises simulating a station blackout (specifically, an extended loss of electrical power due to tornado strikes on their NPPs) that required the deployment of emergency mitigating equipment. During Bruce Power's Huron Challenge and Huron Resolve exercises, emergency mitigating equipment was successfully tested to ensure that steam generator water makeup through inter-unit feedwater ties was established within 30 minutes or less, and emergency steam generator makeup to individual units within 90 minutes.

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157	India	Article 19.4	Section 19(iv), p. 177	It is stated that "Verification of the SAMG/EMEG documentation and training, along with the validation of the SAM program are being done mainly through table-top exercises, plant drills or large-scale emergency exercises that simulate severe accident scenarios." Can Canada share information if simulators or any other computer based aids are used for training on SAMGs?	Computer-based aids are not directly used for severe accident management guideline (SAMG) training. Computer-based systems, such as plant simulators, have a high degree of fidelity for which there is greater certainty of plant response to a given action. A severe accident by its very nature involves processes and plant conditions that come with a high degree of uncertainty (i.e., order of magnitude predictions). Therefore, it is not technically feasible to develop a computer-based model of severe accidents until such time that the uncertainties of severe accidents are greatly reduced.
158	India	Article 19.4	Section 19(iv), p. 177	It is stated that "Integration of plant procedures (e.g., abnormal incident manuals, emergency operating procedures) with SAMGs and EMEGs is ongoing." Can Canada elaborate on rationale of integrating plant procedures with SAMGs and EMEGs; as SAMGs have their own entry criteria and EMEGs have their own deployment criteria? How is transition from one plant state to another handled in this integration?	The individual suites of the abnormal incident manuals (AIMs), emergency mitigating equipment guidelines (EMEGs) and SAMG procedures are considered to be "integrated" in that they provide a continuum of responses to an event as conditions progress from design basis to beyond-design-basis and severe accident. However, the three suites of procedures are not physically combined into a single procedure set. AIMs are used when plant conditions are within the design basis for which there is certainty of outcome upon deployment of mitigating functions. EMEGs are used when plant conditions progress beyond design basis. In this response regime, plant mitigating capabilities are outside the design basis. However, plant damage may not be outside of design basis. With EMEGs, the certainty of outcome upon deployment of mitigating functions remains high. SAMGs are used when plant mitigating capabilities

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					and plant damage are outside the design basis with the outcome upon deployment of mitigating functions potentially uncertain. With SAMGs, technical support staff are called upon to evaluate both the benefits and the negative impacts of possible response strategies. The entry conditions for AIMs, EMEGs and SAMGs are based on plant monitoring to determine the status of mitigating capabilities and plant damage state.
159	India	Article 19.4	Annex 19 (iv), p. 310	With regard to the water injection to calandria for in-vessel retention strategy for CANDU reactors, any system of light water addition into a heavy water system (calandria) requires a positive isolation. However, such positive isolation means may have implications with respect to time taken for making the injection path through. How is this conflict resolved in the case of a water injection path to the calandria?	It is uncertain why a positive isolation of light water and heavy water is necessary following an accident. Maintaining isotopic purity of reactor-grade heavy water is essential for normal operation. However, following an event for which emergency injection is required, the use of light water is acceptable given that heavy water downgrading is not a figure of merit for accident response.
160	India	Article 19.4	Annex 19(iv), p. 307	As a part of Post-Fukushima extension of SAMG program, Annexure 19(iv) brings out comprehensively the status of SAMG provisions implemented by CANDU Operators. Further, in Annexure-8, item 2.8, it is mentioned that Containment Filtered Venting is committed at most NPPs. In this context, can Canada share the information at which NPPs Containment Filtered Venting is planned/implemented	The response to this question is subdivided for each of the three licensees with operating reactors in Canada. **Bruce Power** Bruce Power is in the final phase of conceptual engineering for enhanced containment filtered venting system (CFVS) options to augment its existing emergency filtered air discharge systems. A decision is expected by early 2017 on options to deliver the highest filter performance using a system that could be fitted within the existing plant structure.

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				and what alternate measures are being considered to address this requirement in other reactors?	**NB Power** NB Power installed and commissioned the CFVS during the Point Lepreau refurbishment outage (2009–2011). The CFVS was available on return to commercial operation in November 2012. **OPG** OPG has installed a severe accident-grade CFVS at Darlington. Installation of a severe accident-grade CFVS was ruled out for the Pickering NPP as there are major technical challenges with implementing such a system at that site due to compatibility issues with its unique containment design. To compensate, the SAMG response has been optimized to essentially eliminate the reliance on such a potential response. Note that Pickering has a filtered vent system designed for design-basis accidents. This method of venting is included in the severe accident response.
161	Korea, Republic of	Article 19.4	p. 175	With reference to article 19.4, page 175 of the Canadian national report, Korea would like to inquire the following questions: 1) Is there an automatic reactor trip system in place for earthquakes? 2) If so, would it possible to provide an explanation on the system (ex: system configuration, and safety or non-safety system) and criteria including setpoints for automatic reactor trip? 3) What is the criteria (including setpoints) for a manual reactor trip due to	1) There are no automatic trips in place at Canadian NPPs for earthquakes. 2) Not applicable given the response to 1) 3) Regarding the criteria used for manual reactor trips in the event of earthquake, as an example from one licensee, Bruce Power has no specific setpoints for a manual trip. The emergency response procedures for seismic events dictate a manual reactor trip if there is any impairment or deficiencies in the control of reactor power or heat sinks. 4) With regard to earthquake-specific guidelines, Bruce Power has post-seismic event response

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				earthquakes? 4) Are there any guidelines for NPP response to earthquakes? If so, what are the specific guidelines?	procedures that detail shutdown criteria and required equipment checks. This includes operator plant walkdowns, seismic damage assessments and seismic damage intensity assessments.
162	Romania	Article 19.4	p. 177	Please provide more details about the emergency mitigating equipment guidelines (EMEGs), with regard to their scope, the type of equipment and actions addressed and their relation to the Enabling Instructions (EIs).	This question can be responded to using Bruce Power as an example, which has procured the following emergency mitigating equipment: • five fire trucks (pumpers) capable of drawing 3,000 gallons (11,356 litres) of water per minute from a series of newly installed dry hydrants near the outfalls at each of the NPPs o In response situations, two trucks are deployed to Bruce A and two trucks to Bruce B. • three 400 kW generators and seven 100 kW generators o In response situations, one 400 kW generator is deployed to Bruce A, six 100 kW generators are deployed to Bruce B and one 400kW generator is deployed to the emergency management centre. • one fuelling truck that is capable of refuelling the pumpers and generators Regarding enabling instructions, the EMEGs provide instruction on connection points and plant alignment for cooling and electrical power requirements. In the case of the pumpers, connections to the plants are made using standard fire hoses with standard fire

Ser	Country	Original reference	Reference in report	Questions/comment	Response
					hose quick connections. The operators would then use the EMEGs to properly align plant equipment to allow the water to flow to the appropriate plant system (e.g.., irradiated fuel bays, steam generators, primary heat transport system, moderator system, shield tank) for fuel cooling purposes. For the EME generators, connections at Bruce A are through the qualified power system via a colour-coded quick-connect panel. At Bruce B, the generators are connected through the emergency power system via welding receptacles. The EMEGs provide instruction on the connection and plant alignment requirements to provide lighting, instrumentation and power to certain valves required for event mitigation.
163	Romania	Article 19.4	p. 177	Do the licensees perform periodic plant drills simulating the response to transients and accidents and exercising the emergency operating procedures, the emergency response tasks, SAMGs and EMEGs? If yes, what is the periodicity of such exercises and how are they conducted? Do such exercises include the simulation of actions in the installations and on site?	The licensees do perform the periodic plant drills specified in the question. At least once per year, each duty crew conducts a plant drill simulating a response to transients and accidents. These drills consist of exercising the emergency operating procedures and emergency response tasks, and are conducted either in the plant or within the CNSC's training simulator. Licensees are required to conduct a SAMG drill once every three years and SAMG drills are simulated with a mock control room being used to respond to the drill.