



Oral Presentation

Submission from Nuclear Waste Watch and Inter-Church Uranium Committee Educational Cooperative

In the Matter of

**Saskatchewan Research Council,
SLOWPOKE-2 Reactor**

Request by the Saskatchewan Research Council to authorize the decommissioning of the SLOWPOKE-2 reactor

Commission Public Hearing

September 26, 2019

Exposé oral

Mémoire d'Action Déchets Nucléaires et Inter-Church Uranium Committee Educational Cooperative

À l'égard de

**Saskatchewan Research Council
Installation nucléaire SLOWPOKE-2**

Demande du Saskatchewan Research Council afin d'autoriser le déclasséement du réacteur SLOWPOKE-2

Audience publique de la Commission

Le 26 septembre 2019

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Decommissioning of Saskatchewan Research Council SLOWPOKE-2 Reactor (Ref. 2019-H-100)

**Nuclear Waste Watch and
Inter-Church Uranium Committee
Educational Cooperative's
Submission to the Canadian Nuclear
Safety Commission**

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August 30, 2019

ISBN: 978-1-77189-996-3

Publication No. 1290

SUMMARY OF RECOMMENDATIONS

Recommendation 1: In order to facilitate public participation, all Commission Member Documents (CMDs) and accompanying references should be made available on the CNSC's website at least 60 days in advance of intervention deadlines and remain on the website for future public use.

Recommendation 2: Based on our review of applicable requirements governing decommissioning in Canada, we request that the CNSC:

1. Develop a principled overall policy framework underpinning a robust, clear, and enforceable regulatory regime for the decommissioning of nuclear facilities as well as the waste that arises from nuclear and decommissioning activities;
2. Stipulate the required evidentiary basis for a licensee's preferred decommissioning strategy and provide rationally based, clear, and enforceable conditions for its implementation.
3. Include enforceable conditions and detailed requirements for compliance within the approval for decommissioning activities.
4. Utilize the international best practices and standards as a guide to assess decommissioning planning and develop a comprehensive decommissioning policy and regulatory framework

Recommendation 3: The CNSC should utilize the best practices of IAEA standards as a guide to assess decommissioning planning and develop a comprehensive decommissioning policy and regulatory framework.

Recommendation 4: The CNSC should cease reliance on CSA standards for any matters relevant to nuclear licensing, and instead conduct all standard setting and guidance within the CNSC's processes.

Recommendation 5: The CNSC should develop publicly acceptable policies and strategies for managing radioactive wastes and the decommissioning of nuclear facilities that reflect international best practices and have been developed in consultation with Indigenous peoples and the Canadian public. This should include, as a prerequisite, the development of a national classification scheme for radioactive waste, decommissioning strategies, and decommissioning execution that are scientifically sound and publicly acceptable.

Recommendation 6: The CNSC should clarify the scenarios in which in situ confinement will be considered an appropriate decommissioning strategy. Current international standards indicate that, short of an emergency scenario, this strategy should be limited to nuclear facilities that only contain short-lived or limited concentrations of long-lived radionuclides. The CNSC should provide clear definitions for what constitutes an “emergency scenario”, “short-lived radionuclides”, “limited concentrations” and “long-lived radionuclides” or any other criterion used to determine the viability of in situ confinement as a decommissioning strategy for nuclear facilities.

Recommendation 7: The CNSC should require that a detailed decommissioning plan is submitted for approval within two to five years of permanent shutdown.

Recommendation 8: Approval for termination of decommissioning activities should not be granted unless:

1. The CNSC verifies that the licensee has demonstrated that the end state criteria as specified in the final decommissioning plan and any additional regulatory requirements have been met;
2. The end state criteria reflect the best available science and highest level of safety feasible for Canadians and the environment;
3. The public has been consulted before authorization for decommissioning is terminated, and the site of the nuclear facility is released from regulatory control.

Recommendation 9: In the context of this licensing hearing, CNSC should review the feasibility of the licensee’s contingency plan and its efficacy.

Recommendation 10: In light of the potential for human error, CNSC must ensure the licensee’s application includes sufficient precautions to protect the health and safety of workers and the public, including worst-case exposure scenarios and ongoing consultation with all relevant stakeholders.

Recommendation 11: Should there be an apparent lack of public involvement or interest in a licensing matter, the CNSC should inquire with the licensee, the extent to which they have been proactive in advancing public engagement and information sharing.

Recommendation 12: CNSC staff should produce lessons-learned reports for the benefit of future decommissioning projects and make these reports publicly available.

Recommendation 13: In light of the lessons learned by U of T and the IAEA, we request the Commission to review each in turn, and consider their relevancy to this application to decommission the SRC's SLOWPOKE-2 reactor.

Recommendation 14: In the context of this licensing hearing, we request that the CNSC ensure the reliability and effectiveness of all systems, equipment and components affecting the safety of the reactor.

Recommendation 15: The CNSC should apply the precautionary principle in the context of decommissioning by prioritizing environmental protection, and human health and safety.

Recommendation 16: The CNSC should prepare and make publicly available comprehensive lessons learned reports following each decommissioning project, and incorporate those lessons when reviewing future decommissioning licence applications.

Recommendation 17: The CNSC staff's CMD should include greater detail and provide a comprehensive review and assessment of a proponent's licencing application and supporting documentation.

Recommendation 18: The CNSC should require a draft LCH specific to decommissioning as part of SRC's licencing application and ensure that it reflects the CNSC's most up-to-date guidance documents.

Recommendation 19: The SRC's decommissioning licence should not be granted by the CNSC unless SRC's financial guarantee is sufficient to cover the total estimated cost of proposed decommissioning work.

Recommendation 20: The CNSC should require that the decommissioning of SRC's SLOWPOKE-2 reactor involve the total dismantlement and clean-up of the reactor pool structure.

Recommendation 21: The CNSC should perform an independent analysis of core samples from the reactor pool as part of its inspection.

Recommendation 22: None of the radioactively contaminated waste generated from the decommissioning of SRC's SLOWPOKE-2 reactor should be subject to clearance

levels and approved for general release or recycling. Rather, such waste must be retained under regulatory control in appropriate radioactive waste management facilities.

Recommendation 23: The CNSC should not permit the release of approximately 28,380 liters of treated radioactive water into the public sewer system without a careful assessment of the cumulative or additive effects of the release.

Recommendation 24: The CNSC should require on-going monitoring post-decommissioning and abandonment of a nuclear facility.

1. INTRODUCTION

Nuclear Waste Watch (NWW) and Inter-Church Uranium Committee Educational Cooperative (ICUCEC) submit this report in response to the Canadian Nuclear Safety Commission's (CNSC) Public Notice dated June 27, 2019, requesting comments on the proposed licence to authorize Saskatchewan Research Council (SRC) to carry out decommissioning activities of the SLOWPOKE-2 reactor and its associated facilities ("SLOWPOKE-2 reactor").¹ The Canadian Environmental Law Association (CELA) prepared this submission on behalf NWW and ICUCEC.

1.1 Interest and Expertise of the Intervenor

NWW is a network of organizations concerned about radioactive waste in Canada, and was founded in 2003 to provide a public-interest response to nuclear waste proposals and policies. NWW is primarily focused on high-level radioactive waste and its generation through the use of nuclear power, but shares the concerns of communities and organizations with respect to decommissioning projects, including concerns related to the generation of radioactive wastes through decommissioning of nuclear facilities. NWW's website can be visited at: <https://nuclearwastewatch.weebly.com/>.

ICUCEC is an inter-church coalition that works to educate people about the nuclear industry in Saskatchewan and halt all nuclear development in the province, including mining of uranium. ICUCEC's role is that of a nuclear "watchdog" in Saskatchewan and

¹ Canadian Nuclear Safety Commission, "Revised Notice of Public Hearing and Participant Funding (Ref. 2019-H-100)" (27 June 2019), online: <http://www.nuclearsafety.gc.ca/eng/the-commission/pdf/NoticeHearingRevised-SRC-19-H100-e.pdf>

its members make submissions to panels and government regulatory agencies. ICUCEC website can be visited at: <http://icucec.org>.

NWW and ICUCEC are represented by CELA in this intervention. CELA is a non-profit, public interest law organization. CELA is funded by Legal Aid Ontario as a speciality legal clinic to provide equitable access to justice to those otherwise unable to afford representation for their environmental problems. For nearly 50 years, CELA has used legal tools to advance the public interest, through advocacy and law reform, in order to increase environmental protection and safeguard communities across Canada. CELA has been involved in number of nuclear facility licensing and regulatory matters before the CNSC.

1.2 Background

The SRC's SLOWPOKE-2 (Safe Low Power Kritical Experiment) nuclear research reactor is a 20 kW-thermal sealed-container-in-pool type research reactor.² The reactor is light water cooled and moderated, and operates on high-enriched uranium (HEU). The reactor has been in operation since 1981. The SRC operates the SLOWPOKE-2 reactor under the existing Non-Power Reactor Operating Licence NPROL-19.00/2023 ("NPROL"), which is set to expire on June 30, 2023. The facility is located within the Innovation Place Research Park, in Saskatoon, Saskatchewan, directly north of University of Saskatchewan campus and approximately 400 metres east of the South Saskatchewan River.³

The SRC has applied for a licence amendment to the existing licence in order to allow for activities required for the decommissioning of its SLOWPOKE-2 reactor. According to the SRC, the objective for the decommissioning of the SLOWPOKE-2 facility is to achieve conditions that will allow SRC the unrestricted use of the building and services remaining in the facility.⁴ The SRC intends to apply for a Licence to Abandon the SLOWPOKE-2 facility upon decommissioning.

² CNSC Staff CMD 19-H100, "Licence Amendment Saskatchewan Research Council SLOWPOKE-2 Reactor Facility" (10 June, 2019) [CNSC Staff CMD 19-H100], at 2.

³ CNSC, "Environmental Protection Review Report: Amendment of the Operating Licence for Saskatchewan Research Council's Safe Low-Power Kritical Experiment Reactor (SLOWPOKE-2)", (June 2019), at 4. [CNSC EPR SRC]

⁴ SRC CMD 19-H100.1, "Written Submissions from Saskatchewan Research Council, SLOWPOKE 2- Reactor Facility" (July 2019) [SRC CMD], at 55.

1.3 Scope of Review

In this report, NWW and ICUCEC seek to respond to SRC's application for a licence to decommission its SLOWPOKE-2 reactor.

In reviewing the regulatory framework which governs decommissioning in Canada we have sought to identify gaps and compare Canada's approach to international guidelines (see Section 3).

We also review past incidents involving SLOWPOKE-2 reactors which have been raised in past decommissioning licensing hearings held by the CNSC. Based on these events, we also discuss lessons learned and make recommendations pertinent to this licensing review (see Section 4).

Lastly, we review of the adequacy of SRC's decommissioning licence application and supporting references, alongside the CNSC staff's review and recommendations. Where relevant, we also compare these licensing documents to other decommissioned SLOWPOKE-2 reactors in Canada (see Section 5).

2. PRELIMINARY MATTERS & ISSUES LIST

2.1 Procedural Fairness and Public Participation

While NWW and ICUCEC welcome the opportunity to provide comments to facilitate their review of the licence application, we reiterate our concern that without the efforts of Northwatch, ICUCEC, the Concerned Citizens of Renfrew County and Area, and CELA, there would have only been 13 days to review licensing documents, draft an intervention and submit our comments to the CNSC on this matter.

As CELA raised in its letter to the CNSC dated June 20, 2019,⁵ the CNSC did not provide adequate public notice when it issued its Notice of hearing on June 12, 2019 and required intervenor submissions by June 25, 2019. On behalf of these organizations, CELA requested the CNSC revise its Notice of Hearing regarding SRC's application to amend the operating licence of its SLOWPOKE-2 reactor to a decommissioning licence, to ensure adequate and fair notice.

⁵ Kerrie Blaise, "Re: Notice of Hearing, June 12, 2019 for the SLOWPOKE-2 Facility (Ref. 2019-H-100)" Letter to Marc Leblanc, Canadian Nuclear Safety Commission Secretary (June 20, 2019), online at <https://www.cela.ca/sites/cela.ca/files/1283-NoticeOfHearing.pdf>

As CELA raised in the letter, the CNSC's failure to provide adequate notice breached fairness and was contrary to its governing statute, the *Nuclear Safety and Control Act* ("NSCA"). Disregard for these procedural and public protections raises issues regarding the validity of any decision related to the reactor's licence. In response to CELA's request for a full and fair hearing with adequate notice, the CNSC revised its Notice of Hearing and agreed to hold a public hearing in September 2019.

We raise this as a preliminary procedural matter to be considered by the CNSC, not only in the context of this licensing application, but in other hearing matters as well.

We reiterate that fairness requires consistency in procedure. The CNSC continuously imparts the message that the public is engaged and consulted in its decision-making processes⁶ and that public participation is "encouraged in all licensing decisions".⁷ This gives rise to a legitimate expectation that the public is to be able to fully and adequately respond to a licence application before it proceeds to the CNSC for final deliberation.

We submit that as a quasi-judicial tribunal, the CNSC must ensure the timeliness of its Hearing Notices are sufficient. This requires that enough time elapse between the provision of notice and commencement of the hearing, so that interested individuals and the public have sufficient time to prepare and respond.

2.2 Accessibility of Documents

NWW and ICUCEC recommend that all Commission Member Documents ("CMD") and accompanying references for CNSC hearings or meetings should be posted in their

⁶ See for instance: CNSC, "Remarks by President Velshi at the Office for Nuclear Regulation Annual Industry Conference (5 June 2019)," online <http://nuclearsafety.gc.ca/eng/resources/presentations/president-velshi-remarks-office-nuclear-regulation-annual-industry-conference.cfm> where President Velshi stated:

"First, as regulators, we need to be as transparent and open as possible. In a time of rapid change, it is more essential than ever that people have as much information as possible – and that this information can be easily understood. People want to know what is happening in the industry, and they want to be assured that we are working with skill and dedication to ensure public safety. In Canada, our decision-making commission holds public hearings and meetings that welcome public participation. These sessions are broadcast over the Internet."

⁷ RegDoc 3.5.1 *Licensing Process for Class I Nuclear Facilities and Uranium Mines and Mills* (Version 2), s. 3.2.

entirety on the CNSC's website at least 60 days in advance of intervention deadlines, and remain on the website for future public use.

This will not only alleviate the burden on the CNSC staff to respond to individual requests for documents but allow any interested party to access the document immediately, without delay.

Recommendation 1: In order to facilitate public participation, all Commission Member Documents (CMDs) and accompanying references should be made available on the CNSC's website at least 60 days in advance of intervention deadlines and remain on the CNSC's website for future use.

2.3 Issues to be Reviewed by the CNSC

In deciding whether to grant the licence, in whole or in part as proposed by SRC in its licence application, the CNSC must apply section 24(4) of the *NSCA*. Section 24(4) sets out the legal test that CNSC members must apply to all licencing decisions:

Conditions for issuance, etc.

24 (4) No licence shall be issued, renewed, amended or replaced — and no authorization to transfer one given — unless, in the opinion of the Commission, the applicant or, in the case of an application for an authorization to transfer the licence, the transferee

(a) is qualified to carry on the activity that the licence will authorize the licensee to carry on; and

(b) will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

Section 24(4) of the *NSCA* requires the CNSC to carry out a comprehensive assessment of the applicant's ability and readiness to fulfill the licensing requirements imposed by the *NSCA* and its regulations, as well as any conditions set out in the licence and licence conditions handbook ("LCH"). Together, these rules and standards form the basis upon which the CNSC has to determine whether the applicant will indeed make adequate provision for:

- the protection of the environment,
- the health and safety of persons and the maintenance of national security, and
- measures required to implement international obligations to which Canada has agreed.

In fulfilling its mandate, the CNSC has wide discretion and, as stated in s.24(5), a licence may contain any term or condition that the CNSC considers necessary for the purposes of the *NSCA*. Where the CNSC is not satisfied by the draft licence, it may decide to impose further requirements, to ensure that the applicant fulfills the relevant rules and standards.

3. CANADIAN REGULATORY FRAMEWORK FOR DECOMMISSIONING

3.1 Inadequate Regulatory Framework for Decommissioning

In this section, we review the range of regulations, regulatory documents, industry and international standards which inform the CNSC's approach to decommissioning.

Based on our review, NWW and ICUCEC conclude that Canada does not have a comprehensive regulatory framework that adequately addresses decommissioning of nuclear facilities or waste generated from decommissioning. The regulatory framework established under the *NSCA*, its regulations, and other guidance documents lack cohesion and often, are piecemeal in approach. They are also too general in scope and do not provide necessary level of detail to adequately guide the CNSC's review of a decommissioning proposal.

Recommendation 2: Based on our review of applicable requirements governing decommissioning in Canada, we request that the CNSC:

1. Develop a principled overall policy framework underpinning a robust, clear, and enforceable regulatory regime for the decommissioning of nuclear facilities as well as the waste that arises from nuclear and decommissioning activities;
2. Stipulate the required evidentiary basis for a licensee's preferred decommissioning strategy and provide rationally based, clear, and enforceable conditions for its implementation.
3. Include enforceable conditions and detailed requirements for compliance within the approval for decommissioning activities.
4. Utilize the international best practices and standards as a guide to assess decommissioning planning and develop a comprehensive decommissioning policy and regulatory framework

3.2 International Standards for Decommissioning

The International Atomic Energy Agency (IAEA) is an independent intergovernmental organization within the United Nations created to promote peaceful applications of atomic energy worldwide for humanity's benefit while guarding against the spread of its destructive use. Under Article III of its Statute, the IAEA is authorized to establish standards of safety for protection of health and minimization of danger to life and property and to provide for the application of these standards. The IAEA establishes and publishes these standards under the IAEA Safety Standards Series and Safety Reports Series.

IAEA Safety Standards Series No. GSR Part 6, Decommissioning of Facilities, establishes internationally agreed requirements for the decommissioning of facilities based on the fundamental safety objective and fundamental safety principles established in the Safety Fundamentals.⁸ GSR Part 6 establishes the general safety requirements to be met during planning for decommissioning, during the conduct of decommissioning actions and during termination of the authorization for decommissioning.

In 2014, the CNSC commissioned a report, *International Benchmarking on Decommissioning Strategies*, RSP-0303,⁹ that compared the Canadian regulatory framework and standards to the requirements of IAEA *Safety Requirements, Decommissioning of Facilities Using Radioactive Material*, WS-R-5, as well as other international jurisdictions. Since that time, WS-R-5 has been superseded by IAEA *General Safety Requirements Part 6*, GSR Part 6. While an update, GSR Part 6 has substantially the same requirements as WS-R-5. In addition, while Canada's regulatory framework has also undergone some change in the interim, its approach to regulating nuclear decommissioning activities has remained largely unchanged. Consequently, the conclusions drawn by RSP-0303 concerning the adequacy of the Canadian regulatory regimes compliance with IAEA requirements remain relevant today.

⁸ IAEA, Decommissioning of Facilities Using Radioactive Material, IAEA Safety Standards Series No. GSR Part 6, IAEA, Vienna (2016). <online: <http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1652web-83896570.pdf>> [GSR Part 6]; IAEA Decommissioning Strategies for Facilities Using Radioactive Material, IAEA SRS 50, IAEA, Vienna (2007). <online: http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1281_web.pdf> [SRS 50]

⁹ Candesco, International Benchmarking on Decommissioning Strategies, RSP-0303, (2014), online: <http://www.nuclearsafety.gc.ca/eng/pdfs/about/researchsupport/reportabstracts/RSP-0303-Final-Report-eng.pdf>, p 9 [RSP-0303].

The report found that while many of the IAEA requirements were adequately reflected in the Canadian regulatory framework or commissioned standards, a number were not. Moreover, it also found that the Canadian regulatory framework does not systematically and with sufficient detail address the execution of decommissioning or the release of a nuclear site following decommissioning.¹⁰ The statutes, regulations, licence conditions, codes and standards are primarily focused on addressing planning for decommissioning, estimating the cost of decommissioning and assuring that funding will be available. This remains a key gap in Canada's regulatory framework for decommissioning and we submit it is premature for the CNSC to consider any decommissioning activity, in light of this gap.

Recommendation 3: The CNSC should utilize the best practices of IAEA standards as a guide to assess decommissioning planning and develop a comprehensive decommissioning policy and regulatory framework.

3.3 Canadian Regulatory and Standards Documents

Section 3 of the *General Nuclear Safety and Control Regulations* sets the general requirements for a licencing application, including a licence to decommission, such as identification and contact information, the facility and activities to be licenced, and other relevant information. Section 7 of the *Class I Nuclear Facilities Regulation* sets out additional general requirements for a licence to decommission.

Regulatory documents support the CNSC's regulatory framework, by expanding on expectations set out in the *NSCA*, its regulations and legal instruments, such as licences and orders. These documents provide instruction, assistance and information to the licensees.

One such regulatory document is Regulatory Guide G-219, *Decommissioning Planning for Licensed Activities*, which provides guidance regarding the preparation of decommissioning plans for activities licensed by the CNSC. It also provides the basis for calculating the financial guarantees discussed in the Regulatory Guide G- 206, *Financial Guarantees for the Decommissioning of Licensed Activities*. This guide describes those decommissioning planning requirements and the regulatory and policy basis for them.

¹⁰ RSP-0303, *supra* note 9, p 18.

It has also become common practice for the CNSC to mandate compliance with CSA N294-09, *Decommissioning of facilities containing nuclear substances*, and other CSA standards by adding a condition to the licences issued to major nuclear facilities. CSA standards are privately developed standards, which are not subject to the same level of public scrutiny as the legislative process for public laws and regulations.¹¹

From our perspective, the CNSC's reliance on CSA standards inappropriately delegates the setting of regulatory standards to an industry body, not easily accessible by the public. Further, while recognizing that the individuals can request 'free' access to nuclear-related CSA standards, this gratuitous setting lacks the functionality of paid memberships and subscriptions. Users who do not pay are not able to download the standards as PDFs, can only view in the CSA web-based document viewer and are prohibited from quoting or reproducing any parts of the text due to copyright.

Recommendation 4: The CNSC should cease reliance on CSA standards for any matters relevant to nuclear licensing, and instead conduct all standard setting and guidance within the CNSC's processes.

3.4 Decommissioning Requirements

NNW and ICUCEC have reviewed the documents which, according to the CNSC, informs its assessment of licensing applications and are meant to provide guidance to licensees through the lifecycle of a nuclear facility. We find that the documents lack cohesion, are often piecemeal in approach, and do not provide sufficient guidance or reflect IAEA standards.

3.4.1 Decommission Strategy

The CNSC requires that decommissioning planning be completed in two phases: first, the preliminary decommissioning plan, and second, the detailed decommissioning plan.

The preliminary decommissioning plan is filed with the CNSC as early as possible in the life-cycle of the activity or facility and should be revisited and updated as necessary. The preliminary decommissioning plan documents should include:

- the preferred decommissioning strategy and end-state objectives;

¹¹ CSA, "N294-09 (R2014) Decommissioning of facilities containing nuclear substances" (2014) [CSA N294-09]

- the major decontamination, disassembly and remediation steps;
- the approximate quantities and types of waste generated;
- an overview of the principal hazards and protection strategies;
- an estimate of cost;
- and the methods of guaranteeing financing for the decommissioning activities.

There is no stated preference in either policy or regulation in Canada for a specific decommissioning strategy. G-219 recommends that the following basic alternative decommissioning strategies should be evaluated:

- prompt removal;
- deferred removal (to allow for the decay of relatively short-lived nuclides (e.g. half-lives of less than 10 years), or to await the availability of waste disposal capacity);
- in-situ confinement (to secure and abandon the affected portions of the facility in place); and
- combinations of the above.¹²

G-219, however, does not provide any guidance on which decommissioning strategies may be acceptable or preferred, apart from the vague and general statement that a preliminary decommissioning plan should include a “preferred decommissioning strategy which, considering current knowledge, represents a technically feasible, safe and environmentally acceptable approach”. Likewise, CSA N294-09 does not mandate or recommend any one strategy. CSA N294-09 states that a decommissioning strategy should contain a high-level approach and rationale for decommissioning a facility, be developed early, and be updated as new information is obtained.

In contrast, the IAEA GSR Part 6 stipulates the preferred decommissioning strategy as immediate dismantling, but that when all relevant factors are considered, there may be situations where immediate dismantling is not a practical strategy.¹³ The IAEA does not consider entombment (i.e. in-situ confinement), as an acceptable decommissioning strategy in the case of a planned permanent shutdown. Short of an emergency scenario, this strategy should be limited to nuclear facilities that only contain short-lived or limited concentrations of long-lived radionuclides.¹⁴ Since the end state of an entombed site is equivalent to a waste disposal site, the end state cannot satisfy unrestricted

¹² CNSC Regulatory Guide G-219, Decommissioning Planning for Licensed Activities (June 2000). <online: http://nuclearsafety.gc.ca/pubs_catalogue/uploads/G219_e.pdf>[G-219]

¹³ GSR Part 6, *supra*, note 8, at 5.1.

¹⁴ SRS 50, *supra*, note 8, at 3.2.2.

release conditions; it will require some measure of institutional control well into the future.¹⁵

SRS 50 suggests that the selection of a decommissioning strategy is dependent on waste generation and waste management. When selecting a decommissioning strategy, it is important to consider national waste management policies or to seek the establishment of a policy where one does not exist. The policy should establish both, an overall national framework for the management of all types of waste generated during decommissioning activities, and the classification of the waste and its final disposal.¹⁶

Recommendation 5: The Government of Canada should develop publicly acceptable policies and strategies for managing radioactive wastes and the decommissioning of nuclear facilities that reflect international best practices and have been developed in consultation with Indigenous peoples and the Canadian public. This should include, as a prerequisite, the development of a national classification scheme for radioactive waste, decommissioning strategies, and decommissioning execution that are scientifically sound and publicly acceptable.

Recommendation 6: The CNSC should clarify the scenarios in which in situ confinement will be considered an appropriate decommissioning strategy. Current international standards indicate that, short of an emergency scenario, this strategy should be limited to nuclear facilities that only contain short-lived or limited concentrations of long-lived radionuclides. The CNSC should provide clear definitions for what constitutes an “emergency scenario”, “short-lived radionuclides”, “limited concentrations” and “long-lived radionuclides” or any other criterion used to determine the viability of in situ confinement as a decommissioning strategy for nuclear facilities.

3.4.2 Detailed Decommissioning Plan

GSR Part 6 requires that prior to decommissioning actions, a final decommissioning plan must be prepared and submitted to the regulatory body for approval:¹⁷

The licensee shall inform the regulatory body (or the government, if so required) prior to shutting down a facility permanently. If a facility is permanently shut down and/or is no longer used for its intended purpose, a final decommissioning

¹⁵ SRS 50, *supra*, note 8, at 3.3.3.

¹⁶ SRS 50, *supra*, note 8, at 3.7.

¹⁷ GSR Part 6, *supra*, note 8 at Requirement 11.

plan shall be submitted to the regulatory body for approval within a period agreed with the regulatory body (typically within two to five years of permanent shutdown). [emphasis added]

The final decommissioning plan and supporting documents shall cover the following: the selected decommissioning strategy; the schedule, type and sequence of decommissioning actions; the waste management strategy applied, including clearance, the proposed end state and how the licensee will demonstrate that the end state has been achieved; the storage and disposal of the waste from decommissioning; the timeframe for decommissioning; and financing for the completion of decommissioning.¹⁸

The *Class I Nuclear Facilities Regulations* under the *NSCA* require that an application for a licence to decommission a Class I nuclear facility (such as the SRC's SLOWPOKE-2 reactor) must contain a detailed decommissioning plan ("DDP") which includes the following information:

- (a) a description of and the proposed schedule for the decommissioning, including the proposed starting date and the expected completion date of the decommissioning and the rationale for the schedule;
- (b) the nuclear substances, hazardous substances, land, buildings, structures, systems and equipment that will be affected by the decommissioning;
- (c) the proposed measures, methods and procedures for carrying on the decommissioning;
- (d) the proposed measures to facilitate Canada's compliance with any applicable safeguards agreement;
- (e) the nature and extent of any radioactive contamination at the nuclear facility;
- (f) the effects on the environment and the health and safety of persons that may result from the decommissioning, and the measures that will be taken to prevent or mitigate those effects;
- (g) the proposed location of points of release, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics;
- (h) the proposed measures to control releases of nuclear substances and hazardous substances into the environment;
- (i) the proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment, the health and safety of persons and the maintenance of national security, including an emergency response plan;

¹⁸ *Ibid.* at 7.9-7.10.

- (j) the proposed qualification requirements and training program for workers; and
- (k) a description of the planned state of the site on completion of the decommissioning.

CSA N294-09 stipulates the contents of a DDP must specify the detailed work program, safety and environmental protection procedures, and management systems to be followed during decommissioning. Clause 7.8.2 provides a description of the specific inclusions in the DDP based on the complexity of an NPP being decommissioned. Despite the required level of detail, CSA N294-09 does not provide any requirement or guidance on when the DDP is to be submitted.

The Canadian regulations and standards meet the minimum international standards for the content of a DDP but fall short of providing a schedule for its submission. The timely development of the DDP allows for the vetting of the proposed plan before any irrevocable decisions are made. This allows the regulator to evaluate the licensee's justification and plans.

Recommendation 7: The CNSC should require that a detailed decommissioning plan is submitted for approval within two to five years of permanent shutdown.

3.4.3 Duration of Decommissioning

CNSC's regulatory guide G-219 recommends that an end-state report should be submitted to the CNSC on completion of decommissioning:

This report should review the completed decommissioning process, noting any significant deviations from the detailed decommissioning plan. It should clearly document (using actual survey results) that the planned end-state conditions have been met and, if not, why not. The report should describe any proposed further licence requirements, or long-term institutional controls for the site.¹⁹

CSA N294-09 requires that the final end state will only be considered reached and a facility released from regulator control once the planned decontamination, demolition, dismantling are completed, and all materials, wastes, equipment, and structures have been removed in accordance with the requirements of the DDP.²⁰

¹⁹ G-219, *supra*, note 12, at s. 18.

²⁰ CSA N294-09, *supra*, note 11.

IAEA GSR Part 6 requires that the licensee meet the end state requirements stipulated in the final decommissioning plan and authorization for decommissioning before gaining approval for the termination of decommissioning and release of the site from regulatory control:

On the completion of decommissioning actions, the licensee shall demonstrate that the end state criteria as specified in the final decommissioning plan and any additional regulatory requirements have been met. The regulatory body shall verify compliance with the end state criteria and shall decide on termination of the authorization for decommissioning.

...

Inputs from the public shall be addressed before authorization for decommissioning is terminated.

Recommendation 8: Approval for termination of decommissioning activities should not be granted unless:

1. The CNSC verifies that the licensee has demonstrated that the end state criteria as specified in the final decommissioning plan and any additional regulatory requirements have been met;
2. The end state criteria reflect the best available science and highest level of safety feasible for Canadians and the environment;
3. The public has been consulted before authorization for decommissioning is terminated, and the site of the nuclear facility is released from regulatory control.

4. LESSONS LEARNED: PAST DECOMMISSIONING OF SLOWPOKE-2 REACTORS IN CANADA

This section reviews past incidents that have been raised in licensing hearings held by the CNSC involving the decommissioning of SLOWPOKE-2 reactors at the University of Toronto ("U of T") and University Dalhousie ("U of D"), and highlights lessons learned. Based on these events and lessons learned, NNW and ICUCEC provide recommendations which are pertinent to the proposed decommissioning of the SRC's SLOWPOKE-2 reactor.

4.1 University of Toronto

The CNSC granted U of T a licence to decommission its SLOWPOKE-2 reactor on November 10, 2000. A licence to abandon was subsequently issued on February 8, 2001.

During decommissioning, an incident occurred involving in the management of the beryllium reflector. As the beryllium reflector was more radioactive than initially anticipated, when the beryllium was removed from the reactor and transferred into its container, the operators found that while exposure rates at the surface of the container met the regulatory requirements, the exposure rate of about 0.25 mSv/h at 1 meter was in excess of the prescribed transport index of 0.1 mSv or below. Estimates had been based on assuming a point source. The excess radiation was likely due to the large size of the beryllium sources.²¹

U of T had a contract with a transportation company which called for removal of the container from the campus within 24 hours after loading.²² The container was to be transported to Savannah River site, in the United States of America. Transportation of the package above transport index would have required an approval from the United States which may have taken six months or more.²³ The detailed decommissioning plan did not contain alternative transport arrangements. The detailed decommissioning plan contained a contingency plan which consisted of applying a lead shield to the container to control the excess radiation field. However, lead shielding was not available onsite during the incident. Lead shielding was ordered and applied to the container the following day.²⁴

Recommendation 9: In the context of this licensing hearing, CNSC should review the feasibility of the licensee's contingency plan and its efficacy.

Another issue that arose during this incident was the potential exposure of workers in other parts of the university. The container was located in a lane between two buildings; the lane was blocked at one end and the other was established as an exclusion zone.²⁵ Based on previous measurements taken by U of T operators, it was not anticipated that there would be any significant radiation fields above the university constraint of 2.5 $\mu\text{Sv/h}$ in any of the surrounding buildings. On the day of the incident, a CNSC inspector noted that the operators had made an error in the readings and that the actual radiation field at the exclusion barrier was about 17.8 $\mu\text{Sv/h}$. Nearby buildings were

²¹ CNSC, "One Day Hearing 00-H34.1 University of Toronto: Abandonment of SLOWPOKE-2 Nuclear Reactor" Transcript, (February 2001), at 90. [**U of T Abandonment Transcript**]

²² U of T Abandonment Transcript, *supra*, note 21, at 12.

²³ *Ibid.*, at 13.

²⁴ *Ibid.*, at 18.

²⁵ *Ibid.*, at 16.

then surveyed and found that the radiation field exceeded 2.5 µSv in some nearby areas.²⁶ Notices were posted in these areas and access was excluded through a police barrier. In light of this occurrence, we request the CNSC review and extend this lesson learned to inform its recommendations to the SRC.

Recommendation 10: In light of the potential for human error, the CNSC must ensure the SRC's application includes sufficient precautions to protect the health and safety of workers and the public, including worst-case exposure scenarios and ongoing consultation with all relevant stakeholders.

The United Steelworkers of America, Local Union 1998 intervened at the CNSC's public hearing held for the licence to abandon the U of T's SLOWPOKE-2 reactor and raised an additional concern.²⁷ The intervenor communicated their major concern regarding the lack of public consultation during the decommissioning process. In particular, that there was insufficient notification of public meetings and lack of information sharing. For instance, a number of Health Safety Committees in nearby buildings were never informed that decommissioning work was underway on the day of the incident in question.

As this is an issue which similarly arose in the review of this licence application, we are concerned by the CNSC's apparent disregard – or trend – in placing less public importance on SLOWPOKE decommissioning. The CNSC, as a regulator vested in acting in the public interest, should take every opportunity to disseminate information to the public and not, narrowly define the interested public so as to exclude potentially interested civil society organizations, potentially affected individuals or unions. Further, the CNSC should review the extent to which licensees have complied with their obligations – as a condition of their licence – to disseminate public information and increase awareness.

Recommendation 11: Should there be an apparent lack of public involvement or interest in a licensing matter, the CNSC should inquire with the licensee, the extent to which they have been proactive in advancing public engagement and information sharing.

²⁶ *Ibid*, at 16-17.

During the licence to abandon hearing, U of T decommissioning representatives reflected on lessons learned from this incident and highlighted the following considerations and recommendations for future SLOWPOKE-2 reactor decommissioning projects:²⁸

- A Canadian alternative to shipping spent fuel to the United States in the event that the United States will no longer accept spent fuel in the future.
- A specially designed container with internal shielding to ship beryllium reflectors in order to meet the transportation index criterion available on site during the decommissioning work.
- Provisions for interim storage of containers in transportation plans.
- The need to identify and consult all relevant stakeholders at the start of the decommissioning process.
- Candour and full disclosure in the event of an unforeseen incident.
- Recognition of human error as a cause of accidents.

Following the hearing, the CNSC, in its Record of Proceedings, Including Reasons for Decision directed CNSC staff to “report back to the Commission on the lessons learned from the decommissioning of the University of Toronto’s facility, taking into consideration the recommendations made by the intervenor in the submission to the Commission”.²⁹ CELA submitted an information request to the CNSC but never received this report or an acknowledgement of the existence of this report.

Recommendation 12: CNSC staff should produce lessons-learned reports for the benefit of future decommissioning projects and make these reports publicly available.

The IAEA Nuclear Energy Series Publication No. NW-T-2.6, *Decommissioning of Pools in Nuclear Facilities*, identified the following lessons learned from the U of T incident:³⁰

- The recognition that radiological characterization (e.g. exposure rates) of materials resulting from nuclear decommissioning is subject to uncertainties and exposure scenarios should include a reasonable conservatism.

²⁸ *Ibid*, at 29-31.

²⁹ CNSC, Record of Proceedings, Including Reasons for Decision, University of Toronto, Application for a Licence to Abandon a SLOWPOKE-2 Nuclear Reactor Facility” (8 February 2001), at 4.

³⁰ IAEA, “*Decommissioning of Pools in Nuclear Facilities*”, IAEA Nuclear Energy Series Publication No. NW-T-2.6, at 173.

- The need for containers with internal shielding to ship beryllium reflectors in order to meet the transport index.
- The inclusion of provisions for interim or alternative storage included in transportation plans.

Recommendation 13: In light of the lessons learned by U of T and the IAEA, we request the Commission to review each in turn, and consider their relevancy to this application to decommission the SRC's SLOWPOKE-2 reactor.

4.2 University of Dalhousie

The CNSC issued a licence on January 20, 2011, to the U of D to decommission its SLOWPOKE-2 reactor. A licence to abandon was granted on August 31, 2011.

CNSC staff noted in its CMD-11-H122 that one reportable unplanned event occurred during decommissioning.³¹ A reactor control rod was inadvertently extracted out of the guide tube in the shim tray above the reactor core during the removal of the reactor beryllium reflectors. CNSC staff reported that the incident was immediately identified, and decommissioning staff followed appropriate procedures to safely shutdown and re-set the reactor. The cause of the event was related to surface tension causing two overlying beryllium shims to cling together, overwhelming the ability of the suction cup handling tool to remove them. CNSC staff also reported that this event did not result in an increase in radiation dose rate in the reactor room, but in a small increase in radiation dose to four decommissioning personnel required to spend additional time in the reactor room (increase of 12 μSv per worker involved). All decommissioning staff were designated Nuclear Energy Workers (NEW).

Recommendation 14: In the context of this licensing hearing, we request that the CNSC ensure the reliability and effectiveness of all systems, equipment and components affecting the safety of the reactor.

The CNSC's CMD states that a report of the event was provided to the CNSC Project Officer on January 31, 2011 and a subsequent written report was submitted on February 15, 2011, and that a lessons-learned report was prepared for benefit of any future

³¹ CNSC Staff CMD-11-H122, "Licence to Abandon Dalhousie University SLOWPOKE-2 Reactor Facility", (19 August 2011), at 10.

decommissioning activities for SLOWPOKE-2 reactors. As recommended above in the context of the U of T decommissioning, we request that these reports be made available to the CNSC and reviewed by Commission for relevancy, and be made publicly available.

4.3 Discussion

A main conclusion from this overview of past SLOWPOKE-2 reactor decommissioning projects is that while the decommissioning of research reactors is often described in terms of its relative simplicity³², the risk of unplanned events must be taken seriously and planned for as they have the potential to adversely impact the environment, and human health and safety.

In reviewing the SRC's application, we urge the CNSC to adopt a precautionary approach. The precautionary principle states that lack of scientific certainty must not be used as a reason to ignore or postpone preventive or remedial action when there are other good reasons to act, such as in circumstances of potentially serious or irreversible environmental harm.³³ Applied in the context of decommissioning, the precautionary principle requires that the planning and execution of decommissioning activities prioritizes environmental protection, and human health and safety.

Furthermore, we recommend that experiences from past SLOWPOKE-2 reactor decommissioning projects should be considered and, where appropriate, incorporated into future decommissioning plans. Comprehensive lessons learned reports should be produced by the CNSC for each SLOWPOKE-2 reactor decommissioning project and made publicly available for the benefit of future decommissioning projects.

Recommendation 15: The CNSC should apply the precautionary principle in the context of decommissioning by prioritizing environmental protection, and human health and safety.

³² CNS Staff CMD 17-H106, "Licence Amendment University of Alberta SLOWPOKE-2 Research Reactor", (14, August 2017), at 1 ("The decommissioning of the SLOWPOKE-2 reactor is a relatively simple project which can be safely completed within four to six months"; SRC CMD, *supra*, note 4, at 52 ("The SRCFSF is a relatively simple structure of modest size and its disassembly will involve correspondingly simple manual processes."))

³³ European Environment Agency, *Late Lessons from Early Warnings: The Precautionary Principle 1896-2000* (Copenhagen: EEA, 2002) at 13, 15; Nicolas de Sadeleer, "The Principles of Prevention and Precaution in International Law: Two Heads of the Same Coin?", chapter 9 in *Research Handbook on International Environmental Law*, Malgosia Fitzmaurice, David M. Ong and Panos Merkouris, eds (United Kingdom: Edward Elgar, 2014) at 184.

Recommendation 16: The CNSC should prepare and make publicly available comprehensive lessons learned reports following each decommissioning project, and incorporate those lessons when reviewing future decommissioning licence applications.

5. ASSESSING THE ADEQUACY OF SRC'S DECOMMISSIONING LICENCE & CNSC STAFF REVIEW

5.1 Environmental Assessment and Protection

NWW and ICUCEC have examined the SRC's environmental and health objectives as outlined in their licensing application and supporting materials, in tandem with CNSC guidance on environmental protection, pursuant to the environmental assessment component of the CNSC licensing process.

Unlike the decommissioning of the SLOWPOKE-2 reactors at U of T and U of D, the decommissioning of SRC's SLOWPOKE reactor is not subject to a federal environmental assessment (EA) under the *Canadian Environmental Assessment Act (CEAA), 2012* nor its recent replacement, the *Impact Assessment Act (IAA)*.

In lieu of a federal EA under *CEAA 2012* or *IAA*, the CNSC asserts that it conducts an environmental assessment within its licensing and hearing process, pursuant to section 24(4) of the *NSCA*. This provision states that no licence shall be issued, renewed, amended or replaced unless the Commission is of the opinion that the applicant will "in carrying on that activity, make adequate provision for the protection of the environment." Upon this basis, the CNSC asserts it conducts an EA.

NWW and ICUCEC submit that an EA conducted under the *NSCA* is not an adequate nor equal substitute for a federally directed EA, particularly as it relates to the level of public engagement and opportunities for review by technical experts. An EA under the *NSCA* is primarily based on information that the applicant or licensee is required to submit to the CNSC through the established licensing process, such as the licence application and its supporting documentation, and information on environmental protection measures.³⁴ As a technical assessment with a narrower scope and without the requirement to consider the factors underlying section 19 of *CEAA 2012*, an EA under

³⁴ CNSC, "Environmental assessments" online: <http://nuclearsafety.gc.ca/eng/resources/environmental-assessments/index.cfm>

the *NCSA* cannot be considered an assessment that would ensure a proponent would make adequate provision for the protection of the environment and health and safety of persons while carrying on a licensed activity.

5.2 Limited Scope of CNSC Staff Review

NWW and ICUCEC have reviewed the CNSC staff's CMD for the SRC's decommissioning licence.³⁵ We find that its review is insufficient, as its assessment of SRC's application and supporting documents presented in the CMD lack detail and critical analysis. CNSC staff, in its CMD, reviewed only the following "relevant" Safety Control Areas (SCAs): Human Performance Management, Radiation Protection, Environmental Protection, and Waste Management. With respect to the other ten SCAs (such as emergency planning), CNSC staff noted that they "are relevant in broader context of the operation of the facility and are assessed through ongoing oversight activities. The baseline compliance program provides assurance that all SCAs remain satisfactory during the entire lifecycle of the facility, including decommissioning operations."³⁶

In comparison, CNSC staff in its CMD for U of D's application to decommission its SLOWPOKE-2 reactor included an assessment of all SCAs and related documents.³⁷

We urge the Commission to undertake a more comprehensive review and assessment of a proponent's licencing application and supporting documentation. The review and recommendations provided by CNSC staff in its CMD are often relied upon by the CNSC when rendering its decision on a licensing application. In addition, members of the public, who may not have the expertise to review and assess the supporting documentation provided by a proponent are likely to rely on the assessment of CNSC staff.

Recommendation 17: The CNSC staff's CMD should include greater detail and provide a comprehensive review and assessment of a proponent's licencing application and supporting documentation.

³⁶ CNSC Staff CMD 19-H100, *supra*, note 2, at 7.

³⁷ CNSC Staff CMD 11-H104, "Application by the University of Dalhousie for Decommission Licence SLOWPOKE-2 Research Reactor" (10 January 2011) [**CNSC Staff U of D Decommissioning**].

5.3 Licence Conditions Handbook

The CNSC staff's CMD does not include a revised draft LCH for the proposed decommissioning licence. The current LCH addresses operational matters and was updated recently only to allow for activities for the removal/replacement of fuel and defueling of the reactor, which are already permitted under the existing NPROL.

In comparison, CNSC staff's CMD for the decommissioning of the U of D's SLOWPOKE reactor included a proposed LCH specific to the decommissioning project.³⁸

We are aware that the CNSC is currently seeking public comments on the draft REGDOC-2.11.2, *Decommissioning*.³⁹ Therefore, we request that the CNSC explain how it will ensure the SRC's LCH, if the requested licence amendment is granted, will comply with the requirements of the new decommissioning REGDOC once it is released at a later date.

Recommendation 18: The CNSC should require a draft LCH specific to decommissioning as part of SRC's licencing application and ensure that it reflects the CNSC's most up-to-date guidance documents.

5.4 Financial Guarantee

As stated in the SRC's Detailed Decommission Plan (DDP), the total cost estimate to decommission the SLOWPOKE-2 reactor is \$6,665,826.00 (including taxes).⁴⁰ The DDP and SRC's CMD states that a financial guarantee was approved in a formal motion on December 1, 2017 which reads as follows: "The Board of Directors approves the decommissioning of the SLOWPOKE reactor, potentially sending the fuel from the reactor to the United States, and authorizes the President/CEO to negotiate and execute any contracts required up to \$7.5M."⁴¹

The CNSC's CMD, dated June 10, 2019 states that the "SRC has a financial guarantee in the amount of \$5.76 million, which will be used to fund a large portion of the decommissioning project. SRC's Board of Directors has approved the decommissioning

³⁸ CNSC Staff U of D Decommissioning, *supra*, note 37.

³⁹ RegDoc 2.11.2, Decommissioning (draft), online at : <http://nuclearsafety.gc.ca/eng/acts-and-regulations/consultation/comment/regdoc2-11-2.cfm>

⁴⁰ SRC, SLOWPOKE-2 Detailed Decommissioning Plan, (4 March 2019) at 49 [SRC DDP].

⁴¹ SRC DDP, *supra*, note 40, at 51.

of the SLOWPOKE-2 reactor and authorized the President/CEO to negotiate and execute any contracts required up to \$7.5.”⁴²

Given this discrepancy, we request that the CNSC clarify whether SRC’s financial guarantee is \$5.76 million or \$7.5 million. We are particularly concerned about a financial guarantee of \$5.76 million when the proponent’s DDP clearly states that the estimated cost of the decommissioning is \$6,665,826.00. Guidance Document G-206, *Financial Guarantees for the Decommissioning of Licensed Activities*, and the draft REGDOC- 3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities*, both clearly state that financial guarantees must be sufficient to cover the cost of decommissioning work resulting from licensed activities.⁴³

Recommendation 19: The SRC’s decommissioning licence should not be granted by the CNSC unless SRC’s financial guarantee is sufficient to cover the total estimated cost of proposed decommissioning work.

5.5 Decommissioning Strategy

Although SRC describes the proposed decommissioning strategy for the SLOWPOKE reactor to be that of prompt dismantlement,⁴⁴ NWW and ICUCEC submit that this characterization is not entirely accurate in light of SRC’s plan to maintain the reactor pool structure and fill it with concrete (‘entombed’).

NWW and ICUCEC have concerns regarding the proposed plan to entomb the reactor pool structure. While SRC and CNSC staff state that the reactor pool will only be filled with concrete once compliance with clearance levels is confirmed, we are nevertheless concerned that radioactive contamination will remain in the entombed pool structure.

First, although core samples would be taken from the reactor pool floor to “confirm” that clearance levels are met, analyses of these core samples would not measure long-

⁴² CNSC Staff CMD SRC, *supra*, note 2, at 16

⁴³G-206, *Financial Guarantees for the Decommissioning of Licensed Activities*, at 1; REGDOC- 3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities* (draft), online at: <http://nuclearsafety.gc.ca/eng/acts-and-regulations/consultation/comment/regdoc3-3-1.cfm>

⁴⁴ SRC CMD, *supra*, note 4, at 55.

lived, hard-to-measure radioactive substances such as tritium, carbon-14 and calcium-41, which pose serious health hazards.

Second, our review of the University of Alberta's End State Report ⁴⁵ for the decommissioning of its SLOWPOKE-2 reactor reveals that the Commission approved still-radioactive portions of the reactor to be entombed before release from regulatory oversight and control through a licence to abandon.

The U of A's End State Report notes that a small portion of the remaining concrete of the reactor pool floor still had radionuclide concentrations above the release limit when it was filled with concrete.⁴⁶ The rationale provided in the report was that the overall specific activity of dominant radionuclides of the bulk pool concrete had been calculated to be below the defined unconditional clearance release criteria and it was determined that removing additional concrete may affect the integrity of the pool structure. The report also notes that 20 litres of slurry was generated during wet cutting of the concrete core samples, which had concentration Eu-152 "slightly" higher than the unconditional clearance level specified in Schedule 2 of the Nuclear Substances and radiation Devices regulations.⁴⁷ The CNSC approved the slurry being placed at the bottom of the reactor pool before being filled with concrete, without, to our knowledge, any additional assessment of the potential environmental or health impacts.⁴⁸

Despite the findings of the End State Report, the CNSC, through a one-person panel, granted a licence to abandon for the U of A's SLOWPOKE-2 reactor, noting that CNSC staff confirmed the information provided by U of A that facility had been cleaned and surveyed to ensure that no radiological contaminants remained in the facility.⁴⁹

Given the willingness of the CNSC to approve the abandonment of a SLOWPOKE-2 reactor which still contains radioactive contamination, and the potential presence of hard-to-measure radioactive substances such as tritium, carbon-14 and calcium-41, we submit that the appropriate decommissioning strategy for SRC's SLOWPOKE-2 reactor requires the total dismantlement and clean-up of the reactor pool structure.

⁴⁵ UASF, SLOWPOKE 2 Decommissioning - End State Decommissioning Report, (12 December 2017) [**UOFA End-State-Report**]

⁴⁶ UOFA End-State-Report, *supra*, note 45, at 17.

⁴⁷ UOFA End-State-Report, *supra*, note 45, at 10.

⁴⁸ *Ibid*, at 19.

⁴⁹ CNSC, "Record of Decision, Application to Revoke the Non-Power Reactor Licence and to Issue a Licence to Abandon for the University of Alberta SLOWPOKE-2 Reactor Facility" (25 May 2018), at 7.

Furthermore, NWW and ICUCEC seek clarification with respect to the proposed method of the cleanup of the reactor pool to meet clearance criteria. On page 11 of SRC's Decommissioning Radiation Physics Assessment, it states that "Portions of the pool concrete floor may need to be excavated to reduce the overall activity of the pool concrete to within the unconditional release acceptance criteria."⁵⁰ Then, on page 26, it states definitively that the floor pool needs to be excavated to meet clearance limits: "Without removal of any part of the pool floor, the bulk nuclide activity exceeds the unconditional clearance level limit....Removal of 80-cm diameter x 12-cm thickness concrete floor will reduce the bulk activity of the pool concrete within the unconditional clearance level limit....".⁵¹ The CNSC staff's CMD does not mention the excavation of the reactor pool floor; it only refers to the removal of concrete shielding blocks above the reactor and the extraction of concrete core samples from pool structure. We request clarification with respect to the excavation of the reactor pool floor.

In addition, CNSC staff states in its CMD that the CNSC will perform an "inspection" to verify the completion of the decommissioning work and the results from the radiological survey before the pool is filled with concrete. We request that the CNSC specify what this "inspection" entails. For example, CNSC Staff's CMD for the decommissioning of the University of Toronto SLOWPOKE-2 reactor clearly stated that CNSC staff will undertake its own analysis of duplicate reactor pool concrete samples at a CNSC laboratory to compare against the results reported by the University.⁵² Likewise, CNSC staff should undertake its own laboratory analysis of concrete samples from the SRC's SLOWPOKE-2 reactor.

Recommendation 20: The CNSC should require that the decommissioning of SRC's SLOWPOKE-2 reactor involve the total dismantlement and clean-up of the reactor pool structure.

Recommendation 21: The CNSC should perform an independent analysis of core samples from the reactor pool as part of its inspection.

⁵⁰ SRC, SLOWPOKE-2 Decommissioning Radiation Physics Assessment, (10 October 2018), at 11. **[SRC Radiation Physics Assessment]**

⁵¹ SRC Radiation Physics Assessment, *supra*, note 50, at 26.

⁵² CNSC Staff CMD-00-H34, "University of Toronto Application for a Licence to Abandon a SLOWPOKE-2 Nuclear Research Reactor", (10 November 2011).

5.6 Waste

5.6.1 Solid Waste

According to SRC's Waste Management Plan, "materials and items of equipment with activity below the unconditional release limits will be released from the SRCSF after the materials/items are surveyed for radioactive contamination. These releases include hazardous and non-hazardous waste that are transported to local waste disposal and recycling facilities".⁵³ In particular, the SRC's Environmental Impact Statement states that demolition debris will be determined to be free of contamination, as defined by allowable release limits, and transported to a landfill authorized to accept the particular type of waste.⁵⁴

While the CNSC and SRC in their documentation state that the levels will be below clearance levels, this does not mean that they are not radioactive or there is no potential for a cumulative or additive risk. Reactor wastes contain large amounts of long-lived fission products. Furthermore, during operation, non-radioactive elements (hydrogen, carbon, chlorine, iron, nickel, etc.) in concrete and metal reactor components are transformed into their radioactive counterparts by neutron bombardment. The radioactivity of some of these "activation products" approaches levels in spent fuel and can persist for tens to hundreds of thousands of years. Forms of radiation that cannot be accurately measures with radiological surveys include tritium (the radioactive form of hydrogen), carbon-14, chlorine-36, and calcium-41, which can pose serious health hazards. For example, carbon-14 and calcium-41 both have long half-lives (5,700 and 100,000 years, respectively), are mobile in the environment, and persist in the body (in DNA and bones, respectively).

NWW and ICUCEC submit that none of the low-level radioactively contaminated waste or decommissioned material that is the subject of this licence amendment application should be subjected to clearance levels and approved for general release or recycling. This an inappropriate approach to dealing with low-level radioactive or contaminated waste generated from the decommissioning of the SLOWPOKE-2 Facility. Rather, such waste must be retained under regulatory control in appropriate radioactive waste management facilities.

⁵³ SRC, SLOWPOKE-2 Waste Management Plan, at 14.

⁵⁴ SRC CMD, *supra* note 4, at 25.

The SRC's Environmental Impact Statement concludes that the disposal of waste classified for "unconditional release" will have "little impact on the environment as the quantity of waste to be disposed is small, representing only a small fraction of the total waste generated by the SRC annually".⁵⁵ NWW and ICUCEC submit that this is not a sufficient assessment of the environmental impact of the general release of low-level radioactive waste or decommissioned material.

We are also concerned about potential leachate of low-level radiation material into the South Saskatchewan River if waste classified for unconditional release is disposed of at the Saskatoon Landfill, given the proximity of the landfill to the river. No hydrogeological studies have been undertaken by either the proponent or the CNSC to determine leaching rates.

NWW and ICUCEC also request clarification regarding the classification and disposal method for the activated or contaminated 80-cm diameter x 12-cm excavated concrete pool floor. While the SRC's Waste Management Plan and Radiation Physics Assessment states that concrete core samples will be placed directly into a Type A package for transport to CNL, it does not discuss the disposal of the excavated concrete pool floor. NWW and ICUCEC submit that it would be unacceptable for the excavated concrete structure to be classified as unrestricted release material.

Recommendation 22: None of the radioactively contaminated waste generated from the decommissioning of the SRC SLOWPOKE-2 reactor should be subject to clearance levels and approved for general release or recycling. Rather, such waste must be retained under regulatory control in appropriate radioactive waste management facilities.

5.6.2 Liquid Waste

As set out in the Environmental Protection Report prepared by CNSC staff, the radioactive reactor pool water will be processed through ion exchange columns and monitored using utilizing gamma ray spectroscopy "until it meets the release criteria described in REGDOC-1.6.1: Licence Application Guide: Nuclear Substances and Radiation Devices and criteria specified in the City of Saskatoon Sewage Use Bylaw No.

⁵⁵ SRC, SLOWPOKE-2 Environmental Impact Statement, (April 2019), at 40.

9466” before being released to the municipal wastewater treatment system. Approximately 28,380 liters of water will be discharged.⁵⁶

Unfortunately, Sewage Use Bylaw No. 9466 does not establish any independent release criteria for radioactive waste and instead defers to the standards set by the CNSC. Although the Sewage Use Bylaw No. 9466 lists radioactive waste as an unacceptable waste in Schedule A of, it is permitted “within such limits as are permitted by the licence issued by the Canadian Nuclear Safety Commission.” As such, it is circular for CNSC staff to attempt to justify this release by arguing that it will meet the requirements of the sewer bylaw, while the sewer bylaw allows this release if it is approved by the CNSC.

Even with the proposed treatment, we are concerned about the potential for cumulative or additive effects of the planned release of the entire contents of the reactor pool water. A careful assessment of the cumulative or additive effects has not been undertaken by the CNSC or the proponent.

Recommendation 23: The CNSC should not permit the release of approximately 28,380 liters of treated radioactive water into the public sewer system without a careful assessment of the cumulative or additive effects of the release.

5.7 Need for On-Going Monitoring Post-Abandonment

A major gap in the decommissioning of SLOWPOKE-2 reactors in Canada is the lack of a requirement for on-going monitoring once a licence to abandon has been issued. In the case of the U of T, U of D, and U of A SLOWPOKE-2 reactors, the CNSC, upon completion of the decommissioning work, issued licences to abandon allowing unrestricted use of the facilities without the need for on-going monitoring or any institutional controls. Similarly, the SRC and CNSC staff in their CMDs contemplate the unrestricted use of the SRC facility upon decommissioning, without any requirement for on-going monitoring or some measure of institutional control. This is a major concern given that reactor waste contains large amounts of long-lived fusion products. NWW and ICUCEC submit that the CNSC should require on-going monitoring should it approve the SRC’s decommissioning licence application and any future application by the SRC to abandon the SLOWPOKE-2 reactor.

⁵⁶ CNSC EPR SRC, *supra*, note 3, at 9.

Recommendation 24: The CNSC should require on-going monitoring post-decommissioning and abandonment of a nuclear facility.

6. CONCLUSION

NWW and ICUCEC have sought to identify gaps in the SRC's licence amendment application and supporting documentation, and assess the adequacy CNSC staff's review and recommendations. In order to do so, we first reviewed the regulatory and policy framework which governs decommissioning in Canada and identified gaps in the framework through a comparison with international guidelines. We then reviewed past decommissioning and abandonment of SLOWPOKE-2 reactors in Canada and made recommendations for this licence review based on those past experiences.

As it stands, Canada lacks a comprehensive regulatory framework that adequately addresses the decommissioning of nuclear facilities or the management of nuclear waste generated from decommissioning. Past experiences demonstrate that the decommissioning of SLOWPOKE-2 reactors is not without incident, and that the CNSC is willing to approve the decommissioning and abandonment of these reactors despite outstanding concerns and issues.

We therefore submit that given these omissions, the CNSC should only approve the decommissioning of the SRC's SLOWPOKE-2 reactor subject to the recommendations provided in this report.

All of which is respectfully submitted this 30th day of August, 2019:

NUCLEAR WASTE WATCH AND INTER-CHURCH URANIUMM COMMITTEE EDUCATIONAL COOPERATIVE



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CANADIAN ENVIRONMENTAL LAW ASSOCIATION

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