



**Written submission from the
Royal Military College of Canada**

**Mémoire du
Collège militaire royal du Canada**

In the Matter of the

À l'égard de

Royal Military College of Canada

Collège militaire royal du Canada

Application from the Royal Military College of Canada to renew its non-power reactor operating licence for its SLOWPOKE-2 facility for a period of 10 years

Demande du Collège militaire royal du Canada concernant le renouvellement, pour 10 ans, de son permis d'exploitation d'un réacteur non producteur de puissance pour l'installation SLOWPOKE-2

Commission Public Hearing

Audience publique de la Commission

April 19, 2023

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ROYAL MILITARY COLLEGE of CANADA

**APPLICATION FOR THE RENEWAL OF THE NON-POWER REACTOR
OPERATING LICENCE FOR THE SLOWPOKE-2 REACTOR
AT THE ROYAL MILITARY COLLEGE OF CANADA**

Commission Member Document (CMD 23-H3.1)

10 January 2023



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EXECUTIVE SUMMARY

This CMD provides information to support a re-licencing request to the CNSC Commission Tribunal for the continued operation of the non-power, inherently safe nuclear research reactor, SLOWPOKE-2, at the Royal Military College of Canada (RMC). This CMD contains four main sections, which are broken down broadly into an Executive Summary, Safety and Control Areas, Other Regulatory Areas and a Change Requested by the Licensee. The RMC SLOWPOKE-2 licence renewal application was submitted to the office of the CNSC Commission Registry and Registrar on 01 March 2022. Although our Application was for a period of 10 years, RMC would welcome the renewal of the license for a longer period, such as 20 years, based on the Facility's excellent performance record, and to be consistent with recent trends in the Industry.

The purpose of this CMD is to facilitate the understanding by the Commission about the type and purpose of the nuclear facility that is requesting its sixth operating licence. The reactor first became critical in September 1985 and has operated successfully for 37 years with the original 1985 fuel charge and now continues to operate successfully with the second fuel charge installed in September 2021.

RMC is part of the Federal Government and an integral unit of the Department of National Defence (DND). RMC's funding is supplied by the Federal Government and the university operates under the regulations and practices of the Financial Administration Act. Its charter as a university to grant undergraduate and post graduate degrees was issued by the Government of the Province of Ontario. Its undergraduate students are members of the Canadian Forces (Navy, Army, Air Force) and on graduation enter the military for compulsory service. Postgraduate students come from commissioned officers of the Canadian military, military officers from NATO countries and from the civilian population.

The primary purposes of operating this research reactor at RMC is to provide an intense neutron source used for the education of the military and civilian students registered in the undergraduate and graduate programmes of the university, for education and training Canadian Armed Forces personnel, and for research to support DND, various other Federal Government Departments including Health Canada, Crown Corporations, research activities at other universities and Canadian industry. It also serves as a tool for the education of interested individuals in the general public about matters dealing with nuclear reactors and radioactivity.

The submitted licence application contains the details of the historic and current operations of the reactor at RMC. No changes documented in this CMD and the current submission will impact the safe operation of the SLOWPOKE-2 reactor. There are no outstanding issues to be resolved by CNSC staff and the SLOWPOKE-2 Facility staff. The reactor facility at RMC is requesting one amendment related to operating limits and conditions, as stated in this CMD.



1.0 INTRODUCTION

1.1 Background

The activity to be licensed is the operation of the non-power research reactor denoted SLOWPOKE-2 designed and built by Atomic Energy of Canada Ltd. The SLOWPOKE-2 Facility is located in the Sawyer Science and Engineering Building Module 5 at RMC within the City of Kingston, Ontario. RMC acknowledges that the land on which the RMC campus is situated is the traditional territory of the Haudenosaunee, Anishinaabe and Huron-Wendat peoples, where RMC is proud to deliver the successful Aboriginal Leadership Opportunity Year (ALOY) program.

RMC is a federal institution situated on Point Frederick near the demarcation line where Lake Ontario ends, and the St. Lawrence River begins its journey to the Atlantic Ocean. The property and the reactor belong to the Crown and are administered by DND in the name of the Commandant of RMC.

RMC has a Public Information Officer who is in charge of appropriately publicizing information about activities and features of RMC to the general public and to the media. The Director of the SLOWPOKE-2 Facility established a Public Information Programme, which manifests itself in a website accessible to the general public to keep the public informed of activities at the Facility. The Facility provides tours to high school students who are considering becoming cadets at RMC, to graduate students from other teaching institutions, to NATO officers and selected military attachés from embassies in Ottawa, and to visiting dignitaries from within Canada and from abroad. The SLOWPOKE-2 Facility participates in community events such as the highly attended, very successful, annual Science Rendezvous held in the spring in Kingston. The Facility responds to questions of interest from the general public and media.

1.2 Identification and Contact Information

The Licensee Identification is as follows:

Applicant Name: The Royal Military College of Canada/Collège militaire royal du Canada

RMC is situated on the traditional lands of the Haudenosaunee, Anishinaabe and Huron-Wendat peoples. RMC acknowledges the significance of these lands to the Indigenous peoples and RMC expresses its gratitude to be able to live and learn here.

Licensee Address: The Office of the Commandant
The Royal Military College of Canada
P.O. Box 17000, Stn. Forces
Kingston, ON
K7K 7B4

Physical Location: SLOWPOKE-2 Facility at RMC/CMR
Department of Chemistry & Chemical Engineering, Sawyer Building
Module 5



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1.3 Facility and Activities to be Licensed

The overall purpose of the application, submission date 01 March 2022, is to renew the SLOWPOKE-2 non-power reactor operating licence at RMC in order to permit the Commandant, Principal and RMC staff to continue providing and expanding general knowledge about reactors, radioactivity, and effects of such on the environment through teaching and research. This request for a licensing period of ten years was based on the historical licencing periods for the SLOWPOKE-2 reactor at RMC. Based on recent trends of issuing operating licences for longer periods, the inherent safety engineering design of the SLOWPOKE-2 reactor, the satisfactory infrastructure inspections by CNSC staff, and the confirmation by CNL underwater cameras of the excellent condition (nearly new) of the interior and exterior of the reactor container and all aspects of the pool, RMC would welcome a renewed licence period of greater than ten years, such as 20 years.

The SLOWPOKE-2 Reactor at RMC went critical in September 1985 when the first licence was issued for the period 1985-88. The reactor has operated for 36 years on one charge of Low Enriched Uranium (LEU) fuel. Four licence renewals were issued by the former Atomic Energy Control Board and now CNSC over the 37 years of operation with the periods as follows: 1988-93, 1993-2003, 2003-2013 and 2013-2023. A new LEU fuel core was installed in September 2021. The new core meets its design intent and has been operated successfully with no leakage of fission products. It is our expectation that the SLOWPOKE-2 reactor will operate for another 35 or more years.

Since the last review of aging management in 2013, improvements to the Facility have been incorporated at a steady pace in accordance with a plan for improvements and changes to the Facility that currently extends to 2028. This plan is updated annually by the Director of the Facility. In this plan, the steps and associated costs are detailed to address aging equipment, to make improvements with respect to routine maintenance in the Facility and to have physical and digital upgrades made to improve the functioning of the Facility.

The most important upgrades are focussed on electrical improvements for operation of the reactor. The upgrades include lowering voltages wherever possible, separating and shielding low voltage cables from



high voltage cables, and other means of lowering any electrical noise that interferes with the transmission of the current from the self-powered neutron flux detector to the receiving Keithley picoammeter. Extensive work by replacement with improved parts was done to the 1985, AECL “service box” to greatly improve access to parts of the service box, now called the “Headspace and Sample Air Control” panel. Digital neutron tomography is a new capability of the Facility. Further improvements will follow the plan as presented to the SLOWPOKE-2 Committee in 2021.

CNSC staff performed a compliance inspection of the RMC SLOWPOKE-2 Reactor refuelling project on August 28 and September 3, 2021. The inspection covered eleven safety and control areas and the Public Information Program. RMC was found compliant with all CNSC criteria. CNSC staff further noted the high level of professionalism, expertise and attention to safety that the refuelling team displayed during the project. RMC will continue to maintain and improve the operational safety of the SLOWPOKE-2 Facility.



2.0 SAFETY AND CONTROL AREAS

2.1 Management System

The management system for the SLOWPOKE-2 Facility is defined, planned and controlled in accordance with the CNSC Regulatory Documents REGDOC-2.1.1 “Management System” and REGDOC-2.1.2 “Safety Culture” and adheres to the principles stated in the Canadian Standards Association (CSA) N286-12 document.

The ADM-3: Management System Document for the SLOWPOKE-2 Facility at RMC defines the responsibilities for and purpose of the SLOWPOKE-2 Facility. ADM-3 helps to:

- i. provide detailed requirements for the SLOWPOKE-2 Facility;
- ii. identify objectives to achieve the requirements;
- iii. identify risks and control risks to the objectives;
- iv. establish plans, measures and targets; and
- v. establish monitoring procedures to ensure planned results are achieved.

The Management System Document describes the management positions at the SLOWPOKE-2 Facility at RMC and contains the organizational chart for the management structure.

The Quality Assurance Manual describes the program, which ensures compliance with Facility policies and documents covering Personal and Environmental Health and Safety, Radiation Protection, and Fire and Workplace Hazardous Materials Training. The impact on the environment of the operation of a SLOWPOKE-2 research reactor is required information by the CNSC, and compliance by the Facility is reported to the CNSC annually.

The advisory committee for the management of the Facility is the SLOWPOKE-2 Committee, which meets annually. However, because of the disruption of normal business due to COVID-19 and its variants, the CNSC was informed by the Manager of the SLOWPOKE-2 Facility that information and SLOWPOKE-2 activities would be communicated to the members of the SLOWPOKE-2 Committee as a year-end report. Copies of those reports were sent to the CNSC.

Inspections by organizations external to the Facility itself such as: the CNSC, the DND Fire Marshall’s Department, Canadian Forces Base (CFB) Kingston’s fire inspection unit, the internal inspections done by the Department of Chemistry and Chemical Engineering (CCE) and RMC’s Academic Wing Workplace Health and Safety Committee all contribute to the Facility providing a safe workplace for students, staff and visitors.

2.2 Human Performance Management

RMC maintains processes and procedures to support human performance in its operation by meeting the regulations in REGDOCs-2.2.2 “Personnel Training”, 2.2.3 “Personnel Certification”, 2.2.4 “Fitness for Duty” and 2.2.5 “Minimum Staff Complement”.



RMC ensures that an appropriate number of trained and certified staff are working at the SLOWPOKE-2 Facility. In general, positions within the Facility require a person with a science degree bestowed by a college or university that is recognized by educators and administrators in Canada. New technicians are trained by an experienced technician to perform a specific procedure. There is a documented Training Record for the teaching, learning, and targets of accomplishment. Refresher training/requalification can be done as needed, usually after the observation of a supervisor on a person's work or as a result of the outcome of an examination.

2.3 Operating Performance

RMC has processes and procedures in place to ensure that it operates in a safe manner and in compliance with its license conditions. An annual compliance report is submitted to the CNSC in accordance with REGDOC 3.1.2.

Records from weekly reactor maintenance and the daily operational data collected by the SLOWPOKE-2 Integrated Reactor Control & Instrumentation System (SIRCIS) govern the operation of the Facility. These data normally identify areas or equipment that require attention to ensure compliance with the current licence requirements.

Fewer than ten Reactor Operators, the Radiation Safety Officer (RadSO) and two technicians have access to the Control and Reactor rooms of the Facility. All visitors, contractors and students must have prior approval from the Director to work within the Facility. Generally, all persons entering the first floor of the SLOWPOKE-2 Facility must be accompanied by a CNSC-authorized reactor operator. Daily operation of the Facility is managed by the Director.

The SLOWPOKE-2 Committee for the RMC Facility is responsible for setting policies under which the Facility operates. The Commandant has the ultimate responsibility for the safe operation of the Facility. Under the Commandant's prerogative to designate authority, the Manager and Director of the SLOWPOKE-2 Facility are designated to maintain policies, make operating decisions, initiate maintenance, modify equipment, modify maintenance and operating procedures, and permit staff and all other categories of persons to enter the Facility. Experiments are reviewed and approved by the Director of the SLOWPOKE-2 Facility and the RadSO. The RadSO ensures compliance with CNSC, the Director General of Nuclear Safety (DGNS) and Transportation of Dangerous Goods (TDG) Act. The RadSO provides initial and continuing training about radiation, as discussed and explained in the Radiation Manual for RMC. Policies pertaining to the review and audit of operations are defined within the SLOWPOKE-2 Quality Assurance (QA) program under the authority of the Commandant through the Manager and Director of the Facility. The Director is mandated to ensure that the policies pertaining to regulatory compliance and incident reporting are met.



2.4 Safety Analysis

The Safety Analysis for the RMC SLOWPOKE-2 Reactor is documented in a site-specific “Safety Assessment and Operating Envelope for the SLOWPOKE-2 Reactor at RMC”. This document updates the generic document from Atomic Energy of Canada (Commercial Products Report, CPR 26). This updated and site-specific assessment acts as the report that further demonstrates the safe operation and inherent safety of the SLOWPOKE-2 reactor. A Reactor Manual, a Fire Protection Document, a Quality Assurance Document, a Training Program, and a document on safety analysis, CPR 77, provides the description and safety analysis for the SLOWPOKE-2 reactor with low enriched uranium (LEU) fuel. These documents support the safe operation of the RMC SLOWPOKE-2 Facility and contain the technical detailed information that meets REGDOC 2.4.1 “Deterministic Safety Analysis”.

The design of the SLOWPOKE-2 reactor provides for an inherently safe reactor that meets the requirements of REDOC-2.4.3. The negative temperature coefficient contributes greatly to the inherently safe characteristics of the SLOWPOKE-2 reactor. In addition, the reactor container is physically sealed and not permitted to be opened by RMC personnel. The excess reactivity is measured weekly during the reactor maintenance procedures. The core is cooled by natural convection, which means that the Facility does not have to rely on installed pumps for cooling. For personnel working in the Facility, the 4.4 meters of water above the reactor core provides sufficient shielding from the radioactivity of the core. The addition of the Radioscopy System in the pool results in some neutron activity in the Reactor Room when the Neutron Beam Tube is in use. To shield people from these neutrons, borated polyethylene has been added at strategic locations inside the Facility. During the 2012-2013 renovations to Mod 5 additional 2.4 m × 3.6 m, 2.54 cm thick sheets of borated polyethylene were attached to the ceiling of the Reactor Room.

The cadmium shut down capsules are used for the auxiliary shut down system for the reactor should the cadmium control rod fail in some manner and/or the reactor room cannot be entered. Cadmium capsules are stored next to each irradiation controller and are checked regularly to ensure that the irradiation vials containing cadmium are in good condition for the next use of them.

It is evident that the radioactivity releases from the Facility during normal reactor operation are small, and there has been no effect on individuals nor on the environment. These absolutely minimal releases of radiation are confirmed by the fact that no person working in the Facility has ever even reached the annual public dose of 1 milliSievert.

2.5 Physical Design

From its inception the SLOWPOKE philosophy has been to tailor the engineering design and operating procedures of a reactor exhibiting typical inherent safety characteristics, such that these inherent characteristics ensure the reactor’s safety during all conceivable conditions. RMC manages changes to ensure that the safety and physical design of the Facility are maintained in accordance with REGDOC-2.5.1 “General Design Consideration: Human Factors”.



To ensure that there are no unacceptable impacts on persons and/or the environment, the Facility practices the concept of “As Low As Reasonably Achievable” (ALARA). To this end, the Radiation Safety Officer maintains a dose management and tracking program for the staff, contractors, and visitors of the SLOWPOKE-2 Facility at RMC. The impact on the environment due to the operation of a SLOWPOKE-2 research reactor has been demonstrated as negligible, and annual compliance with regulations is demonstrated through annual compliance reports and CNSC inspections.

2.6 Fitness for Service

With respect to Fitness for Service the reactor facility has continued to achieve the design intention and function of a SLOWPOKE reactor. The SLOWPOKE-2 Facility at RMC addresses the maintenance requirements specified in REGDOC-2.6.3.

Before and for the current operating licence, NPROL-20.00/2023 for the SLOWPOKE-2 Reactor Facility at RMC, there have been no changes at the reactor facility that could negatively impact this Safety and Control Area (SCA). Maintenance on all parts and supporting devices for the reactor have been carried out diligently on a recorded, regular, scheduled basis. Aging management concerns are viewed and reported to the Director in parallel with the Weekly Reactor Maintenance tasks and at shims when the certified Reactor Technician opens the reactor container inspection plate so that lights and a camera can be used to view the conditions inside the reactor container. Periodic inspections are done as the availability to perform an inspection arises such as at a shim event or a refuelling event. Testing and calibrations of equipment are done on a regular, scheduled basis or as required.

Training records for all reactor operators, technicians and engineers are up-to-date.

2.7 Radiation Protection

The SLOWPOKE-2 Facility requires that each employee in the vicinity of, or directly handling, radiation sources be instructed on the radiation safety procedures. The Radiation Safety Manual clearly explains all aspects of Radiation Protection required and followed by the Facility.

Radiation protection measures are in place to minimize and control the potential for radiation exposure to both staff and public arising from the operation of SLOWPOKE-2 reactor at RMC. The Facility complies with the Radiation Protection Regulations, radiation protection orders of DND and REGDOC 2.7.1 “Radiation Protection” through the RMC Radiation Safety Manual and SEP-1: Radiation Safety for the SLOWPOKE-2 Facility document.

2.8 Conventional Health and Safety

The SLOWPOKE-2 Facility at RMC complies with REGDOC-2.8.1, Conventional Health and Safety as well as with orders in the DND general safety program published in the DND General Safety Program-



Policy and Program, Volumes 1, 2, & 3. In addition, RMC follows and conforms to the occupational health and safety rules and regulations stipulated by Part II of the Canada Labour Code and to Canada's Occupational Health and Safety Regulations.

The Canadian Labour Code is an act of the Canadian Parliament, which applies to civilian employees in federally regulated workplaces and therefore to RMC.

The Vice Chief of the Defence Staff oversees general safety in DND through the Directorate of General Safety (D Safe G). D Safe G Orders and Directives, DAOD 2007-1, state that each organization working for DND must establish:

- a. A signed safety policy statement.
- b. A safety organization and committee structure.
- c. A continuing program of safety including Workplace Hazardous Management Information System (WHMIS) training.
- d. A system of periodic safety inspections by qualified DND staff.
- e. An awareness of the Canada Labour Code Part II.

2.9 Environmental Protection

The Facility complies with REGDOC-2.9.1 and with all federal, provincial and municipal regulations with respect to the environment. Because RMC is a lodger unit of CFB Kingston, RMC and the Facility also comply with the environmental program run by the environmental officer for CFB Kingston. RMC also follows the orders and directives in DAOD 4003-0, Environmental Protection and Stewardship to:

- a. Conform to DND/CF environmental policy requirements.
- b. Conform to ADM(HR-Mil) and CFB Kingston policies.
- c. Maintain the Facility's activities while minimizing impact on the environment.

New stainless-steel weld-sealed exhaust ducts were installed on both floors of the SLOWPOKE-2 Facility during renovation in 2012. RMC performed an Environmental Risk Assessment (ERA) based on measured radioactivity values. The noble gas, Argon-41, is exhausted daily from irradiation sites to the roof of the building in which the reactor is housed. Using the average reactor operating hours from the last several years, the experimental gamma spectroscopic results and the argon-41 external dose coefficient for cloud shine, a dose rate to a worker on the roof of the N-W staircase of Sawyer Building Mod 5 of 62.5 $\mu\text{Sv}/\text{year}$ was calculated. The release amount of argon-41 to the roof has not changed during the past ten years because the number of hours of use of the reactor has not changed substantially as indicated in the Annual Compliance Reports. Similarly using measured gamma spectroscopic data, as reported from the Annual Compliance Report and the external dose coefficient for cloud shine for xenon-133, the dose to a worker on the roof during a weekly head space purge is $1.86 \times 10^{-4} \mu\text{Sv}/\text{year}$. Argon-41 and xenon-133 constitute the major gases purged weekly. As summarized in Table 1, these doses are totally negligible compared to the 1 mSv yearly allowed dose for the general public.



There are no radioactive liquid releases from the Facility. After the new fuel core was installed in September 2021, a sample of water from the reactor container was analyzed for gamma ray activity on a high purity germanium detector. The sample contained less than 0.3 Bq/L of argon-41 and 5.7 Bq/L of xenon-133. Traces of cobalt-60, sodium-24, barium-140, and strontium-91 were found. These results indicate that there are no defective welds on the new fuel pins. A minute amount of uranium contaminant is present on the fuel pins as a result of the fuel fabrication process. A sample of pool water was also analyzed and no radioactivity above background level was detected. Results from liquid scintillation analysis of reactor container water for alpha was less than 10 Bq per litre and beta activity 28,000 Bq per litre. These results are typical for the past ten years of operation as documented in the Annual Compliance Reports to the CNSC.

Table 1: Radionuclide and Hazardous Substances Discharged from the Facility.

Discharge Path	Typical Radionuclide
Release through exhaust fan from the operating irradiation controllers	Argon-41: Less than 62.5 μ Sv/year*
Weekly headspace purge to the roof of Sawyer Building Mod. 5	Xenon-133: Less than 1.86×10^{-4} μ Sv/year*

* Conservative dose rate assessed for a person working on the roof of the Sawyer Building Module 5 at RMC for a whole year.

2.10 Emergency Management and Fire Protection

The SLOWPOKE-2 Facility at RMC complies with the requirements of REGDOC 2.10.1 “Nuclear Emergency Preparedness and Response” through the Emergency Procedures listed in the Facility Reactor Manual, RMC’s College Standing Orders (CSO) 2100-2 “Responding to Emergencies”, Fire Protection Program, and emergency exercises conducted by RMC.

A satellite image, Figure 1, showing the position of the Sawyer Building Mod 5 to other buildings on the RMC Campus demonstrates that an emergency occurring at the reactor facility would be confined to Sawyer Science and Engineering Building Module 5. Sawyer Building Module 5 is the furthest building away from the majority of the other buildings on Campus. The building would be evacuated in the event of an emergency.



Figure 1: Aerial view of the RMC (Google Maps, 2021 CNES).

2.11 Waste Management

RMC maintains a waste management program that minimizes the generation of radioactive waste and is compliant with the requirements of REGDOC-2.11 “Framework for Radioactive Waste Management and Decommissioning in Canada” and REGDOC-2.11.1, Waste Management, Volume I: Management of



Radioactive Waste. The Radiation Safety Manual sections 13, 14 and 15 contain the relevant information about RMC's waste management program.

All waste that is generated shall be appropriately handled and disposed to minimize the risk to staff, members of the public, and the environment up to the point when the waste is removed from the Facility. The RMC Radiation Safety Officer has the authority and responsibility for the management of the radioactive waste program. The 99% of radioactive material that the SLOWPOKE-2 Facility produces, and stores consists of low- and intermediate-level radioactive waste. More than 80% of these samples are irradiated for fewer than 15 minutes resulting in the presence of radioisotopes with half-lives of 11 seconds to 35 hours. Thus, these irradiated samples, after a period of delay-and-decay and gamma and beta surveys taken before disposal, are treated as non-radioactive waste. These samples must also be separated into hazardous or non-hazardous waste depending on their chemical nature. Samples that are irradiated for periods of up to several hours will typically generate isotopes with longer half lives and thus have a longer storage period inside the SLOWPOKE-2 Facility before disposal.

The only high-level radioactive waste in the Facility was from the 1985 LEU fuel charge, which was removed from the reactor container by CNL in August 2021 and sent to Chalk River for examination and storage. CNL is a CNSC-licensed nuclear waste management facility for interim storage. As part of the RMC SLOWPOKE-2 Refuelling Project, CNL satisfied the requirements for approved external Waste Generators that produce waste to be shipped to CNL operating sites for processing/storage.

2.12 Security

The Facility benefits from the enhanced security that results from the Facility's location at RMC, and RMC being a lodger unit of CFB Kingston. RMC maintains a security program to control access to the SLOWPOKE-2 Reactor and to nuclear substances and to prescribe information. SLOWPOKE is compliant with REGDOCs 2.12.2 and 2.12.3.

Two main documents describe security measurements at the SLOWPOKE-2 Facility at RMC: Security Directives for the Facility and a Site Security Plan. Calian employees who work for/at SLOWPOKE-2 have a reliability clearance, as a minimum. Their security classification is valid when they are on-site at the Facility at RMC. The security clearance processes have recently changed at RMC. All upcoming SLOWPOKE contracts for civilian employees must have their fingerprints taken at the Kingston Police Centre.

The CNSC has proposed amendments to their Nuclear Security Regulations, which will impact Class 1A nuclear facilities, such as the SLOWPOKE-2 Facility, administratively and financially. For the CNSC to estimate the financial impact of the proposed amendments, responses from the SLOWPOKE-2 Facility staff were submitted on schedule as per a CNSC request in 2021.



2.13 Safeguards and Non-Proliferation

The SLOWPOKE-2 Facility at RMC complies with the responsibilities for safeguards and non-proliferation of nuclear material according to Canada's agreement to comply with the international nuclear non-proliferation treaty, INFCIRC/164.

The SLOWPOKE-2 safeguards program and procedures are prescribed information, subject to the requirements of the Nuclear Safety and Control Regulations.

RMC complies with the obligations from the Canada/IAEA safeguards agreements and all other measures arising from the Treaty. The SLOWPOKE-2 Facility at RMC complies with REGDOC 2.13.1 "Safeguards and Nuclear Materials Accountancy" through the annual Physical Inventory Taking (PIT) as well as through the periodic Physical Inventory Verification (PIV) performed by IAEA inspectors. The PIV that occurred on 1st November 2019 concluded that "all declared nuclear material has been accounted for and that there were no indications of the undeclared presence, production or processing of nuclear material". The most recent PIV took place in November 2022.

2.14 Packaging and Transport

The process of packaging and transporting radioactive material are conducted in accordance with safety standards and applicable regulations issued by Transport Canada and by the CNSC REGDOC-2.14.1. The packaging and transport of radioactive material in the Facility complies with the regulatory programs through the Radiation Safety Manual, Transportation of Radioactive Material procedure and SLOWPOKE-2 Facility Radiation Safety protocols.

The Radiation Safety Manual contains sections on Packaging and Transport of Nuclear Substances and Radiation Devices, section 11, and gives an example of a shipper's declaration form, section 27.

RMC personnel that have the responsibility to conduct activities involving the packaging and transport of radioactive materials take a course that explains the applicable regulations in regulatory documents. In addition, these personnel have experience and knowledge in radiation safety and protection, handling of radioactive materials, use of radiation survey instrumentation as well as being certified in TDG Class 7 radioactive substances.



3.0 OTHER REGULATORY AREA

3.1 Public Information and Disclosure Program

The SLOWPOKE-2 Facility at RMC maintains a Public Information Program (PIP) and Disclosure Protocol that meets the requirements of the REGDOC 3.2.1: Public Information and Disclosure.

The primary objective of the PIP is to communicate effectively the information relating to the health, safety and security of individuals living and/or working “near” a nuclear reactor and to explain Canada’s international obligations with respect to the peaceful use of nuclear energy.

An important secondary objective that helps to build and sustain trust and confidence in nuclear power by local communities is to promote education with respect to the RMC SLOWPOKE-2 reactor and other nuclear facilities. In conjunction with communications planning and the public affairs office at RMC, education about radiation safety is promoted in the general Kingston community. One of the key elements here is the commitment to disclose information in a transparent, consistent and timely manner as described in the PIP.

Three major groups are targeted by the Public Information Program, namely:

- All military and civilian employees working at RMC,
- Kingston-based DND employees, and
- General public of the Kingston area.

Information about routine operations of the Facility as well as planned and unplanned events is disseminated within these groups via publications on the RMC SLOWPOKE-2 website (<https://www.rmc-cmr.ca/en/chemistry-and-chemical-engineering/slowpoke-2-facility>), local and social media, and scientific publications.

The SLOWPOKE-2 Facility at RMC regularly participates in the annual scientific family-oriented festival Science Rendezvous that popularize science for the general public.

The SLOWPOKE-2 Facility will continue to explore opportunities to enhance the public information program for target audiences.

The successful completion of the Refuelling Project, under the compliance oversight of CNSC staff, as printed in the online newspaper (the Kingstonist) is an example of the transparency shown by the Facility to the public.

3.2 Indigenous Engagement

RMC is situated on the traditional lands of the Haudenosaunee, Anishinaabe and Huron-Wendat peoples. RMC acknowledges the significance of these lands to the Indigenous peoples and RMC expresses its gratitude to be able to live and learn here. The RMC Action Plan on Institutional Equity, Diversity, and Inclusion could be found from the RMC website. Since the commissioning of SLOWPOKE-2 Facility at



RMC in 1985, SLOWPOKE has not had any adverse effects on the land surrounding RMC nor on the CFB Kingston, the City of Kingston and the Barriefield residential community. RMC addresses the requirements stated in REGDOC-3.2.2.

The Director General Indigenous Affairs (DGIA) within ADM(IE) is the DND/CAF lead on “Indigenous Engagement and the Duty to Consult”. The website to obtain information, templates and tools, reference material and shared documentation on consultations on public engagement activities across the federal government is available for staff from an Intranet. DGIA has posted guidelines for federal officials to fulfill the Duty to Consult, which was published by the Department of Aboriginal Affairs and Northern Development. A Guide to Acknowledge Indigenous People and Traditional Territory was further distributed to all units within the CFB Kingston (including RMC). An Indigenous Policy Advisor from the Military Personnel Generation Group, National Defence (Government of Canada) is also available within RMC for consultation and communication.

RMC established a program for indigenous youth from across the country called Aboriginal Leadership Opportunity Year (ALOY). ALOY cadets are enrolled in the Canadian Armed Forces for an 11-month period. During that time, they participate in undergraduate programs at RMC, and they participate in many activities with the Officer Cadets. They achieve basic military qualification and other military training. They participate weekly in indigenous education led by an indigenous educator/elder. When students finish the program, they have many options from which to choose, such as the: Regular Officer Training Program at RMC or Non-Commissioned Member (NCM) in the regular force or Primary Reserve (officer or NCM). ALOY cadets may simply go back to their communities having learned more about their leadership abilities, their culture and education capabilities. These students also visit the SLOWPOKE-2 reactor at RMC, as part of their learning on nuclear and radiation safety. RMC has also established an Indigenous Knowledge and Learning Working Group (IKLWG). This group is a core advisory group of committed military and civilian professionals and students who share a common interest in advancing RMC’s diversity and inclusion efforts.

Further Information on the ALOY program, IKLWG’s mission and acknowledgements from the RMC Commandant and the Principal on indigenous knowledge and learning could be found on the RMC website.

3.3 Cost Recovery

In accordance with the Canadian Nuclear Safety Commission Cost Recovery Fees Regulations, RMC is exempt from any fees associated with the planned regulatory efforts.

3.4 Financial Guarantee

Costs associated with the future decommissioning of this Facility are addressed in the Preliminary Decommissioning Plan (PDP), which was updated in 2022. These costs were calculated in accordance with REGDOC 3.3.1. The Deputy Minister of National Defence has reaffirmed the commitment by DND to provide a financial guarantee for the decommissioning of the SLOWPOKE-2 nuclear reactor.



4.0 CHANGE REQUESTED BY THE LICENSEE

RMC is requesting a licensing change under Appendix A “Operating Limits”, Clause 2 of NPROL-20.00/2023. The SLOWPOKE-2 Facility requests that the current statement “The Licensee shall ensure that the maximum excess reactivity of the reactor does not exceed 4.0 mk.” be replaced by the following statement:

“The Licensee shall ensure that the maximum excess reactivity of the reactor does not exceed 4.3 mk.”

Appendix C of the license renewal application submitted in March 2022 contains an assessment that supports this licensing change requested by RMC. The impetus for this request is to:

- maintain the useful life of the reactor for 30+ years as per the current design after a successful refuelling with an empty shim tray in September 2021.
- mitigate the burden/dependence on reactor shimming in the future with a slightly higher excess reactivity for the reactor; and
- further enhance worker and radiation safety during shimming (by perhaps decreasing the frequency of maneuvering shim plates to reach the target limit).

Appendix C was originated for the refuelling project. The impact assessment and the safety demonstrated for the 4.3 mk LEU core remain the same for reactor shimming.

The approval of this change will facilitate reactor shimming be achieved slightly above the administrative maximum excess reactivity of 4.0 mk to approximately 4.3 mk. This change is mainly to avoid unnecessary handling of hot shims by SLOWPOKE maintainers as per ALARA. In the past 36 years shimming was performed approximately every three years. With an allowed slightly higher maximum excess reactivity of 4.3 mk, the frequency of shimming could be extended to five years with the aforementioned safety consideration resulting from the reduced handling of radioactive shims (beryllium) by the SLOWPOKE-2 maintainers.



CONCLUSION

The SLOWPOKE-2 Facility located at RMC respectfully acknowledges that the land on which the RMC campus is situated is the traditional territory of the Haudenosaunee, Anishinaabe and Huron-Wendat peoples.

The SLOWPOKE-2 Facility at RMC has an admirable 38-year history supported by the demonstrably safe and responsible operation of the reactor. The Facility wishes to continue fulfilling its objectives of teaching the students at RMC, the Canadian Armed Forces, and to the general population about reactors and radioactivity. RMC requests a ten-year operating licence for the period 01 July 2023 to 30 June 2033, and would welcome a longer period, such as 20 years, for the SLOWPOKE-2 reactor. This Facility and its reactor are accessible, welcoming and low risk.