Record of Proceedings, Including Reasons for Decision

In the Matter of

Applicant: Dalhousie University

Subject: Renewal of the Non-Power Operating Licence for the SLOWPOKE-2 Reactor

Date: June 25, 2003
RECORD OF PROCEEDINGS

Applicant: Dalhousie University

Address/Location: 321, Arts and Administration Building, Halifax, Nova Scotia, B3H 456

Purpose: Renewal of the Non-Power Operating Licence for the SLOWPOKE-2 Reactor

Application received: November 21, 2002

One-Day Hearing: May 22, 2003

Location: Canadian Nuclear Safety Commission (CNSC) Public Hearing Room, 280 Slater St., 14th. Floor, Ottawa, Ontario

Members present: L.J. Keen, Chair A.R. Graham
                  C.R. Barnes L.J. MacLachlan
                  J.A. Dosman J. M. McDill
                  Y.M. Giroux

Counsel: I. V. Gendron
Secretary: M.A. Leblanc
Recording Secretary: C.N. Taylor

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<th>Applicant Represented by</th>
<th>Document Number</th>
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<td>A. Chatt</td>
<td>CMD 03-H16.1</td>
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<td>C.W. Breckenridge, Vice-President of Research</td>
<td>CMD 03-H16.1A</td>
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<td>P. Jones, Radiation Safety Officer</td>
<td>CMD 03-H16.1</td>
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<th>CNSC Staff</th>
<th>Document Number</th>
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<td>B. Howden</td>
<td>CMD 03-H16</td>
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<td>G. Lamarre</td>
<td>CMD 03-H16.A</td>
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<td>S. Cook</td>
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Decision and Reasons:

**Licence:** Issued

**Date of Decision:** May 22, 2003
1. Introduction

The Dalhousie University has applied to the Canadian Nuclear Safety Commission to have the Non-Power Reactor Operating Licence for its SLOWPOKE-2 research reactor renewed for a period of ten years. The current licence (NPROL-17.01/2003) expires on June 30, 2003.

The SLOWPOKE-2 reactor is a 20 kilowatt (thermal) sealed-container in-pool type research reactor located on the Studley campus of Dalhousie University in Halifax, Nova Scotia. The reactor has been in operation for approximately 27 years.

Issues:

In considering the application, the Canadian Nuclear Safety Commission (the Commission) was required to decide, pursuant to subsection 24(4) of the Nuclear Safety and Control Act, if:

a) Dalhousie University is qualified to carry on the activity that the licence would authorize; and

b) if, in carrying on that activity, Dalhousie University would 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.

Public Hearing:

The Commission, in making its decision, considered information presented for a one-day public hearing held on May 22, 2003 in Ottawa, Ontario. The public hearing was conducted in accordance with the Canadian Nuclear Safety Commission Rules of Procedure. During the public hearing, the Commission received written submissions and heard oral presentations from Dalhousie University (CMD 03-H16.1 and CMD 03-H16.1A) and CNSC staff (CMD 03-H16 and CMD 03-H16.A). There were no intervenors.

2. Decision

Based on its consideration of the matter, as described in more detail in the following sections of this Record of Proceedings, the Commission concluded that Dalhousie University is qualified to carry on the activity that the licence will authorize. The Commission also determined that Dalhousie University, in carrying on that activity, will 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.
Therefore, the Commission, pursuant to section 24 of the Nuclear Safety and Control Act, issues to the Dalhousie University Non-Power Reactor Operating Licence No.NPROL-17.00/2013 for the SLOWPOKE-2 Reactor. The licence is valid from July 1, 2003 to June 30, 2013 unless suspended, amended, revoked or replaced.

The Commission includes in the licence the conditions recommended by CNSC staff as set out in the draft licence attached to CMD03-H16.A.

With this decision, the Commission requests that CNSC staff present to the Commission a mid-term status report on the condition and performance of the facility (due in approximately May 2008).

In addition to the mid-term report, the Commission requests that CNSC staff submit a report to the Commission when the issues related to the training program, the quality assurance program and the decommissioning financial guarantee have all been resolved to the satisfaction of CNSC staff. (i.e., one report when all three areas are considered satisfactory). As discussed further below in this Record of Proceedings, aspects of these programs need to be completed or improved.

The Commission also confirms that the Director General, Directorate of Nuclear Cycle and Facilities Regulation is authorized to approve the decommissioning financial guarantee for the facility when that Designated Officer is satisfied that the financial guarantee meets the requirements of the CNSC.

3. Issues and Commission Findings

In making its licensing decision under section 24 of the Nuclear Safety and Control Act, the Commission considered a number of issues relating to Dalhousie University’s qualifications to carry out the proposed activities, and the adequacy of the proposed measures for protecting the environment, the health and safety of persons, national security and international obligations to which Canada has agreed. The Commission’s findings on these issues are summarized below.

The Commission notes that many of the issues examined are interdependent. For example, determining the adequacy of performance in a specific safety area often requires an examination of the licensee’s past and current performance in that area, together with the relevant aspects of performance assurance and adequacy of the facility condition and design that will affect future performance. As such, the findings of the Commission presented below are based on the Commission’s consideration of all the information and submissions available for reference on the record for the hearing.
3.1 Radiation Protection

As part of its evaluation of the adequacy of provisions for protecting the health and safety of persons at the Dalhousie University SLOWPOKE-2 facility, the Commission considered the past performance and programs of Dalhousie University in the area of radiation protection.

In this regard, CNSC staff expressed its view that the Dalhousie University Radiation Protection Program fully meets the CNSC’s requirements and expectations, and that it can be expected to do so during the 10-year licence period proposed by CNSC staff. CNSC staff noted that the doses to workers have remained well below the regulatory limits and that little or no occupational exposures have been recorded. Dalhousie University added that radiation monitoring is conducted weekly in all areas, and also every morning before the startup of the reactor. In addition, Dalhousie University inspects the reactor container water for radioactivity every four weeks. CNSC staff also reported that the estimated doses to the public have been, and are expected to remain, a very small fraction of the regulatory limit for members of the public.

Dalhousie University added that, as part of its Radiation Protection Program, all workers must attend a Radiation Safety Training Course given by the Radiation Safety Officer. Dalhousie University also noted that continuing awareness and orientation to potential radiation hazards and ALARA (as low as reasonably achievable) practices is delivered through continuous on-the-job training. A Radiation Safety Training Manual is required to be maintained on site at all time for reference. Also, the support staff that carries out housekeeping and maintenance is required to participate in training provided by the Radiation Safety Officer.

In response to a question from the Commission on the Radiation Safety Committee, Dalhousie University confirmed that the committee carries out independent third party audits, and oversees the Dalhousie University SLOWPOKE-2 reactor. The same principle is also applied to the Environmental Health and Safety Committee.

Based on this information, the Commission concludes that Dalhousie University has made, and will continue to make, adequate provisions for the protection of persons from radiation at the SLOWPOKE-2 reactor facility.

3.2 Conventional Health and Safety

Further with respect to the protection of persons at the Dalhousie University SLOWPOKE-2 facility, CNSC staff reported that Dalhousie University has an occupational health and safety program that meets the requirements of the Canada Labour Code, Part II. With respect to that program, Dalhousie University noted that regular safety checks of the workplace are carried out and that any required corrective actions are verified complete. Furthermore, Dalhousie University stated that all new workers are required to attend a safety orientation session.

CNSC staff reported that there were no reported lost-time accidents at the Dalhousie University SLOWPOKE-2 facility during the current licence period. Dalhousie University added that there
have been no such accidents attributable to the laboratory hazards during the 27-year life of the facility.

Based on this evidence, the Commission is satisfied that Dalhousie University has made, and will continue to make adequate provisions for the protection of persons from non-radiological hazards at the Dalhousie University SLOWPOKE-2 facility.

### 3.3 Environmental Protection

To determine whether Dalhousie University will make adequate provisions to protect the environment while carrying out the proposed activities at the SLOWPOKE-2 facility, the Commission considered the potential for the facility operations to adversely affect the environment.

In this regard, CNSC staff stated that it finds Dalhousie University’s programs, policies and procedures for protecting the environment, and their implementation, to be satisfactory and that they meet CNSC expectations. CNSC staff noted that, due to the type of facility, very small amounts of radioactive substances are released to the environment. The small potential for airborne release (primarily Xenon-133) is substantially mitigated by delaying the venting of the reactor container until after 48 hours of non-operation (i.e., following each weekend). This allows for much of the radioactivity to decay in the container prior to release. Dalhousie University added that a new ventilation system, featuring high volume exhaust fans with absolute filters, was installed at the Dalhousie University facility.

CNSC staff also noted that the facility produces very small quantities of solid radioactive waste. That waste is accumulated on site in a shielded room to allow the low-level and medium-level waste to decay prior to transfer to either a licensed radioactive waste management facility or a conventional waste facility as appropriate. Dalhousie University has not yet accumulated enough radioactive waste to fill a drum.

CNSC staff further reported that Dalhousie University handles and disposes of all other types of hazardous materials in accordance with the applicable regulations.

Based on this information, the Commission concludes that Dalhousie University has made, and will continue to make, adequate provision for the protection of the environment at the Dalhousie University SLOWPOKE-2 reactor facility.

### 3.4 Operation and Maintenance

The Commission considered the operating performance and maintenance of the Dalhousie University SLOWPOKE-2 reactor, including the effects of aging on safety-critical components, and adequacy of quality assurance, as a further indication of Dalhousie University’s qualifications and protection measures.
Operating Performance:

With respect to operating performance during the current licence period, CNSC staff reported that there were no significant occurrences and that the facility operated consistently within the established safety envelope. Furthermore, CNSC staff reported that there were no significant non-conformances identified from CNSC inspections of the facility; all minor items identified during those inspections were promptly and appropriately addressed by Dalhousie University.

In response to a question from the Commission on the nature of any non-reportable events, Dalhousie University described how in the last 27 years they have had only one minor incident, where the pool water level increased and they had to remove 200 liters of extra water.

With respect to the facility operation in general, Dalhousie University stated that the reactor design is inherently safe due to the large negative temperature coefficient of reactivity and to the small and limited excess reactivity. As a result, the reactor can be safety operated remotely; an operator does not need to be in attendance at all times.

Aging and Maintenance:

With respect to the maintenance of the reactor and issues that may be related to the aging of safety-critical components and systems, CNSC staff reported that all such components and systems are monitored and maintained on a regular basis and that, in CNSC staff opinion, they are in a physical condition that will be adequate for the proposed 10-year licence period. Dalhousie University added that the reactor pool is specially designed for a trouble-free long life.

In response to follow-up questions from the Commission on the aging and remaining life of the facility, Dalhousie University explained that the reactor operates up to 8 hours a day, five days a week, 50 weeks per year at a power level of about 8kW. Because of this extensive usage, Dalhousie University added an extra beryllium annulus on top of the original one in 1986 to maintain the reactivity. Dalhousie University was the first SLOWPOKE-2 facility to do so. With this extra shim, Dalhousie University estimates the reactor can operate for another 10 years before replacing the fuel. Dalhousie University also stated that at every re-shimming, all components are visually inspected, and to this point, there is no sign of corrosion on any components.

While the Commission accepts that the Dalhousie University SLOWPOKE-2 reactor is in good condition and that it will, with proper maintenance, remain fit-for-service for the proposed 10-year licence period, the Commission notes that the facility will be operating well beyond the original intended design life. For this reason, the Commission requests CNSC staff to pay particular attention to the issue of materials and component aging and degradation mechanisms during the next licence period and to report to the Commission on this, together with any other relevant issues, at the time of the mid-term performance status report (see section 3.13 concerning the requirement for a mid-term report).
Quality Assurance:

On the matter of quality assurance, CNSC staff reported that, while the existing SLOWPOKE-2 Reactor Manual for the facility forms a good foundation for an acceptable Quality Assurance Program, further upgrades to the program are necessary before it will fully meet the CNSC’s requirements. CNSC staff stated that, while it is satisfied with the management system for quality that is practiced at the facility, the documentation of that system is not such that it could be verified by a third party.

CNSC staff stated that it expects Dalhousie University to complete the documentation of the quality assurance program in 2003 and have a fully acceptable quality assurance programs in place in 2004. Dalhousie University stated its commitment to comply with the CNSC’s directives in this regard.

Conclusion on Operation and Maintenance:

Based on the above information and considerations, the Commission concludes that the Dalhousie University SLOWPOKE-2 reactor has operated, and will continue to operate safely during the proposed 10 year period of the licence. Furthermore, the Commission is satisfied that Dalhousie University has an adequate inspection, maintenance and quality assurance program in place to assure that that future performance is realized. While the Commission notes that the quality assurance program currently lacks the required program documentation, the Commission is satisfied that appropriate measures are being taken to address this deficiency in a timely manner.

3.5 Training and Qualifications

The Commission examined the training and qualifications of the staff at the Dalhousie University SLOWPOKE-2 reactor as a further indication of the licensee’s qualifications to carry out the activities under the proposed licence.

In this regard, CNSC staff reported that the certifications for the Reactor Operators, Reactor Engineers and Reactor Technicians remain valid until May 2005; however, neither the training programs in place for the recertification of those individuals, nor the training programs for the certification of new staff in those positions meet the CNSC’s expectations for a Systematic Approach to Training (SAT). CNSC staff has requested that Dalhousie University have a SAT program in place by December 1, 2003.

Dalhousie University noted that it is planning to train and certify a third Licensed Operator. A training manual will be prepared in conjunction with the training of this person. Dalhousie University will also train a sufficient number of Authorized Researchers and develop an appropriate training program for them. Dalhousie University noted that it will base its training program on US Nuclear Regulatory Commission document Non-Power Reactor Training.
Dalhousie University further noted that, while it has the capability to develop a SAT program for the Reactor Operators, it will rely on Atomic Energy of Canada Limited (AECL) for assistance in preparing similar training programs for the Reactor Technicians and Reactor Engineers. Dalhousie University will use the same program provided by AECL and develop the safety manual module from that basis. In addition, the nuclear maintenance of Dalhousie University’s reactor is provided by AECL and the availability of nuclear maintenance staff is secured through a contractual agreement with AECL. In this regard, CNSC staff noted that AECL will likely continue to provide qualified Reactor Technicians and Reactor Engineers to the SLOWPOKE-2 operator community; however, the requirement for the training programs for these positions remains with each SLOWPOKE-2 operator, including Dalhousie University. For efficiency, it is expected therefore that, with AECL’s assistance, the Dalhousie University’s training programs for these positions will be the same as, or very similar to, the programs that will be put in place at the other SLOWPOKE-2 facilities in Canada. Dalhousie University confirmed that the evaluation of the revised program will be completed in early 2004 and implemented by mid-2004.

Based on this information, the Commission concludes that Dalhousie University is qualified to operate the reactor and carry out the other activities authorized under the licence. The Commission is also satisfied that appropriate measures are being taken to ensure the training programs for maintaining a qualified workforce meet the CNSC’s requirements.

### 3.6 Emergency Preparedness

CNSC staff reported that Dalhousie University has an Emergency Response Plan and Procedures in place and that this meets the CNSC’s requirements and expectations. The Emergency Response Plan and Procedures address all applicable nuclear and non-nuclear events.

Dalhousie University added that they now have a fully uninterruptible power supply, including back-up power supplied by three rechargeable lead-acid batteries for the reactor water temperature recorder and the radiation monitors on the reactor control console panel. In response to a question by the Commission about the back-up diesel generator, Dalhousie University answered that the diesel generator only provides power for lighting.

With respect to the Commission’s question on emergency shutdown of the reactor, Dalhousie University described how cadmium capsules are the primary shutdown system. If power fails and the shut off rod does not drop into the core, the operator puts the capsules in the irradiation channels to shut down the reactor. This process is tested every three to six months.

Based on this information, the Commission is satisfied that Dalhousie University is adequately prepared for emergencies that may arise at the Dalhousie University SLOWPOKE-2 facility.
3.7 Security

CNSC staff reported that an acceptable security program is in place at the Dalhousie University SLOWPOKE-2 facility and that improvements continue to be made to that program since the events of September 11, 2001.

The last CNSC inspection was conducted on January 24, 2003 and, as a result, CNSC staff made some recommendations for improvements which Dalhousie University is addressing appropriately.

The Commission is therefore satisfied that Dalhousie University is taking the steps necessary to adequately maintain the physical security of the Dalhousie University SLOWPOKE-2 reactor facility.

3.8 Safeguards

CNSC staff reported that Dalhousie University’s safeguards program for the SLOWPOKE-2 facility meets, and is expected to continue to meet, all applicable requirements.

The Commission concludes therefore that Dalhousie University has made, and will continue to make, adequate provisions in the area of safeguards at the SLOWPOKE-2 facility that are necessary for maintaining national security and measures necessary for implementing international agreements to which Canada has agreed.

3.9 Decommissioning and Financial Guarantees

In order to ensure that adequate resources will be available to meet the regulatory requirements for safety, environmental protection and security during the future decommissioning of the Dalhousie University SLOWPOKE-2 reactor, the Commission requires that adequate plans and financial guarantees for decommissioning be put in place and maintained acceptable to the CNSC.

In this regard, CNSC staff reported that Dalhousie University’s revised Preliminary Decommissioning Plan (PDP) for the facility was submitted on March 8, 1998. CNSC staff informed Dalhousie University in March 2003 that the proposal is acceptable in principle and that a detailed review would be conducted. Dalhousie University received staff comments on May 1, 2003, and is committed to submit a revised PDP. Dalhousie University also sent a letter with the application on the financial guarantee explaining that specific funds were set aside to cover the cost of decommissioning. Dalhousie University is prepared to revise the financial guarantee after a review of CNSC staff comments. CNSC staff indicated that it is reviewing the financial guarantee proposal and expects that an acceptable PDP and decommissioning financial guarantee will be in place by June 2004. In this regard, CNSC staff requested that the Commission delegate the authority to approve the financial guarantee to the applicable CNSC staff Designated Officer.
Dalhousie University added that they are still in discussion with AECL to determine who will assume specific costs. In response to a follow-up question from the Commission, Dalhousie University explained that they are discussing with AECL who will assume the cost of the fuel removal and disposal. However, Dalhousie University reiterated their commitment to establish a viable financial guarantee and explained how they are prepared to establish a Restricted Trust Fund, with a minimum balance of $500,000 until such time as the reactor is to be decommissioned. In response to a question from the Commission about the percentage of the fund already established, Dalhousie University explained that about one fifth is in place at this time, but the rest of the money for the first phase of decommissioning will be secured by June 30, 2004.

Based on this information, the Commission is satisfied that the appropriate steps are being taken to ensure the CNSC’s requirements for decommissioning planning and related financial guarantee are met in a timely manner. The Commission further confirms that the Director General, Directorate of Nuclear Cycle and Facilities Regulation is authorized to approve the financial guarantee when that Designated Officer is satisfied that the financial guarantee meets the applicable requirements.

3.10 Public Information Program

Dalhousie provides to interested parties information on environment, health and safety issues concerning the facility. The Director of the facility, the Radiation Safety Officer and the Director of the Environmental Health and Safety Office are available for interviews on request.

Based on this information and the information provided by CNSC staff concerning Dalhousie University’s public information program in CMD 03-H16, the Commission is satisfied that the program meets, and will continue to meet, the applicable regulatory requirements.

3.11 Canadian Environmental Assessment Act

CNSC staff stated its conclusion that an environmental assessment, pursuant to the requirements of the Canadian Environmental Assessment Act (CEAA), is not required before the Commission may consider and make a decision on the application for licence renewal. This is because the act of renewing the licence is not a trigger for such an assessment under the CEAA.

The Commission concurs with the CNSC staff’s interpretation of the application of CEAA in this instance and therefore concludes that an environmental assessment under the CEAA is not required prior to the Commission making a licensing decision.
3.12 Licence Length and Interim Reporting

CNSC staff, with reference to its general criteria for recommending licence lengths (as set out in CMD 02-M12), recommended that the Commission accept the proposed 10-year term. In this regard, CNSC staff noted that the Dalhousie University SLOWPOKE-2 facility poses a very low risk. CNSC staff also noted that there have been no reportable incidents during the 27-year operating life of the facility and that Dalhousie University has consistently maintained good safety performance and compliance with the regulatory requirements. Furthermore, CNSC staff stated that there are effective compliance programs and protective measures in place. In addition, CNSC staff noted that a 10-year licence would align the next expiry of the licence with the recommended expiry dates for the other SLOWPOKE-2 facilities in Canada, thereby improving the efficiency of the re-licensing processes.

Recognizing that 10 years is a long period of time before the matter of licensing the facility would again come before the Commission in a public forum, CNSC staff offered to provide the Commission with a status report on performance at the approximate mid-point in the term of the licence. CNSC staff recommended that such a mid-term report may be appropriate for any licence length approved by the Commission for the facility in excess of 3 years.

The Commission considered the application of Dalhousie University and recommendations of CNSC staff and decided to issue the licence for a period of 10 years. The Commission also accepted the CNSC staff recommendation concerning a mid-term report and therefore requests that CNSC staff provide a status report on the performance of the facility and licensee in approximately 5 years (i.e., in approximately May 2008). The report will be presented at a public proceeding at the Commission.

With respect to the mid-term status report, the Commission is particularly interested in receiving information on the physical condition of the reactor’s safety-critical components and systems, including the impact of any aging mechanisms that may be affecting those components and systems. The Commission notes that CNSC staff will also report on any significant developments that arise at the Dalhousie University SLOWPOKE-2 facilities at regularly scheduled meetings of the Commission.

In addition to the mid-term report, the Commission requests that CNSC staff submit a report to the Commission when all of the above-noted deficiencies in the training program, the quality assurance program and the decommissioning financial guarantee have been satisfactorily resolved.

4. Conclusion

The Commission has considered the information and submissions of the applicant and CNSC staff as presented in the material available for reference on the record, as well as the oral and written submissions provided at the hearing.
The Commission therefore issues, pursuant to section 24 of the *Nuclear Safety and Control Act*, to the Dalhousie University a Non-Power Reactor operating Licence No. NPROL-17.00/2013 for the SLOWPOKE-2 Reactor. The licence is valid from July 1, 2003, to June 30, 2013 unless suspended, amended, revoked or replaced.

With this decision, the Commission requests that CNSC staff present to the Commission, at a public proceeding of the Commission, a mid-term status report on the condition and performance of the facility (due in approximately May 2008).

In addition to the mid-term report, the Commission requests that CNSC staff submit a report to the Commission when the issues related to the training program, the quality assurance program and the decommissioning financial guarantee have all been resolved to the satisfaction of CNSC staff. (i.e., one report when all three areas are considered satisfactory).

The Commission also confirms that the Director General, Directorate of Nuclear Cycle and Facilities Regulation is authorized to approve the decommissioning financial guarantee for the facility when that Designated Officer is satisfied that the financial guarantee meets the requirements of the CNSC.

Marc A. Leblanc  
Secretary,  
Canadian Nuclear Safety Commission

Date of decision: May 22, 2003  
Date of release of Reasons for Decision: June 25, 2003