



Licensing Package

Renewal (2006) of the CRL Site
Operating Licence - Information
Presented for the Day Two CNSC
Public Hearing (2006 June 28)

Licensing-Single Point of Contact

**CRL-00521-LP-003
Revision 0**

2006 June

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ABSTRACT

This document was prepared in support of the AECL presentation at the CNSC Public Hearing (Day Two) for the renewal of the Chalk River Laboratories site operating licence. The document has been prepared by Licensing-Single Point of Contact following input received from various subject matter specialists across the Chalk River Laboratories site.

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CHAPTER 1 INTRODUCTION

1.1 Scope

This document has been prepared to assist the Canadian Nuclear Safety Commission (CNSC) members in their assessment of the application from Atomic Energy of Canada Limited (AECL) to renew the Nuclear Research and Test Establishment Operating Licence (NRTEOL) [1-1] for Chalk River Laboratories (CRL). This document has been compiled following consideration of the discussions that took place at the CNSC Day One Public Hearing held in Ottawa on 2006 April 26, recent discussions with CNSC staff, and having taken into consideration the material submitted by interveners for the CNSC Day Two Public Hearing to be held on 2006 June 28. Furthermore, additional material is presented to support the continued operation of the National Research Universal (NRU) Reactor, to update the Commissioners on a recent significant announcement regarding decommissioning funding and to discuss key developments at CRL since the Day One Public Hearing.

1.2 Purpose of this Submission

AECL is submitting this document to the Commission to provide appropriate and sufficient information to enable Commission members to effect an informed judgement of the 63-month application period that is under consideration. The proposed renewal period is longer than previous CRL licence durations, and has been made in accordance with applicable Commission Member Documents (CMD) [1-2 and 1-3]. Reference [1-2] identifies guidelines for a licence period up to five years or longer, and AECL's view is that these guidelines have been met, as supported by the information contained herein and previously submitted for consideration at the CNSC Day One Public Hearing [1-4].

1.3 References

- [1-1] Nuclear Research and Test Establishment Operating Licence, Chalk River Laboratories, NRTEOL-1.04/2006. Expiry Date: 2006 July 31.
- [1-2] CNSC, *New Staff Approach to Recommending Licence Periods*, CMD 02-M12, 2002 March.
- [1-3] CNSC, *New Staff Approach to Recommending Licence Periods (Supplementary Information)*, CMD 02-M12.A, 2002 March.
- [1-4] AECL, *Renewal (2006) of the CRL Site Operating Licence – Information Presented for the Day One CNSC Public Hearing (2006 April 26)*, CRL-00521-LP-002, Revision 0, 2006 March (CMD 06-H9.1).

CHAPTER 2 INFORMATION REQUESTED AT DAY ONE HEARING

2.1 Introduction

Itemized below are various topics that were raised by Commission members at the CNSC Day One Public Hearing held on 2006 April 26, where further follow up was required or where AECL indicated that further information would be provided at the Day Two Public Hearing.

These matters are presented in chronological order as per the Day One transcript.

The reference appended to each comment from the Day One transcript is a guide only for readers.

2.2 Legacy Quality Assurance Issues (Day One Transcript, Pages 61 and 64)

The topic of legacy quality assurance issues was raised through reference to Section 3.1.2 of CMD 06-H9 [2-1]. This related to the conformance of AECL's quality assurance program with the CSA N286 series of standards and presented information gathered during the 2002 November audit by CNSC staff of five programs at CRL, and the NRU Upgrades Quality Assurance audit by CNSC staff, held 2006 February 20 to March 01. AECL indicated in their response at the Day One Hearing that additional information would be provided at the Day Two Hearing.

Also, the topic of AECL's lower tier quality assurance documents was raised, and the associated timeframe for completion and improvement.

AECL submitted to CNSC staff, during the current CRL licence term, the quality assurance (QA) manuals listed below, to be compliant with CSA N286 sub-tier standards. These documents collectively address the legacy quality assurance issues, and they are currently under review by CNSC staff:

- *Company-Wide Procurement Quality Assurance Manual, 00-01913-QAM-011, Revision 2, 2004 September.*
- *Company-Wide Design Quality Assurance Manual, 00-01913-QAM-005, Revision 2, 2003 August.*
- *Company-Wide Construction Quality Assurance Manual, 00-01913-QAM-013, Revision. 0, 2004 September.*
- *Nuclear Laboratories, Nuclear Operations Quality Assurance Manual, 145-0193-QAM-001, Revision 1, 2005 August.*
- *Company-Wide Decommissioning Quality Assurance Manual, 00-01913-QAM-016, Revision 0, 2002 November.*
- *Company Wide, Analytical, Scientific and Design Computer Programs-Requirements, CW-507230-QAM-102, Volumes 1 and 2, Revision 0, 2005 April.*

For lower tier QA documents, our remaining activities and time frame for completion are as follows:

- CRL Design QA Plan to support CRL licence-listed facilities has been issued to address improvements and alignment with Corporate Design and Procurement QA Program.
- Revised AECL Construction Manual to be issued by Q4 2006.
- AECL Commissioning Manual to be issued by Q4 2006.
- Revision to Operation Procedures to align with industry best practices to be completed by Q4 2006.

In addition to discussions between AECL and CNSC staff on overall QA issues, AECL staff is progressing the response to the Type I Compliance Inspection Report for the NRU Upgrades Audit as presented below:

- AECL will undertake a Safety System Function Audit to confirm the NRU Reactor remains safe to operate, and that the safety upgrades would perform as required, if called upon. (Target Date: 2006 October 31 for the Emergency Power Supply and Liquid Confinement Vented Confinement upgrades.) The Safety System Function Audit technique is commonly used in the nuclear industry to assess the capability of systems to meet their requirements.
- Complete the review of design manuals for the NRU upgrades ensuring that the requirements of the CSA N286.2 standard and the CRL Design QA Plan are met. (Target Date: 2006 October 31)
- AECL is currently assessing documented special processes for welding, material examination, leak testing, etc. (Target Date: 2006 September 30 for any required update.)
- AECL is currently re-inspecting all NRU upgrades construction activities to ensure the documentation meets the requirements of the current *Company Wide Construction Quality Assurance* manual, and for the results of special processes will take remedial action where such inspection is not practicable. (Target Date: 2006 October 31)
- Refresher training will provided to construction, quality assurance, design, and inspection staff on the current Company Wide Construction QA Program. (Target Date: 2006 September 30)
- Refresher training on the current iProcurement process (including quality category selection) to design, procurement and quality assurance staff will be completed. (Target Date: 2006 September 30)
- The commissioning reports for all seven upgrades will be reviewed by Design and Safety representatives to ensure compliance with the NRU Upgrade Project Commissioning Plans and Design Requirements. (Target Date: 2007 July 31)
- The Self Assessment Plan for the CRL Procurement department will be completed and implemented. (Target Date: 2006 December 31)
- The plan for transferring of CRL Procurement permanent records to CRL document record management system, TRAK, will be completed. (Target Date: 2007 March 31)

2.3 Schedule for Systematic Approach to Training Program (Day One Transcript, Page 83)

The topic of AECL's Systematic Approach to Training for NRU was raised and the schedule to achieve a "B" rating ("C" rating for implementation was determined in Section 3.1.4 of CMD 06-H9 [2-1]). Need to provide an established timeframe with deliverable dates.

The NRU training activity will focus on three areas over the fiscal year 2006/2007; these are Senior Reactor Shift Engineer (SRSE) program development, Nuclear Operator Training, and training development and delivery in support of the NRU Improvement Initiative.

The SRSE training activity is driven by certification requirements and development of the Systematic Approach to Training based training program. The SRSE training related activities for 2006/2007 and 2007/2008 include the following:

- development and conduct of the SRSE transitional examination,
- certification request of the seven existing qualified SRSEs,
- conduct and completion of the SRSE Training Task Analysis,
- conduct and completion of the SRSE Training Gap Analysis, and
- delivery of SRSE training program.

Nuclear Operator Training is an ongoing Systematic Approach to Training based training program that has been in place since 2003 July. This operator qualification program utilizes classroom and On-the-Job Training. Currently there are 25 Nuclear Operator Trainees at various stages of progression enrolled in the program. In addition to Nuclear Operator Trainees, qualified Operators participate in continuing training (update/refreshers).

The NRU Improvement Initiative activities have led to the identification and introduction of several training undertakings. Program activity in the following areas is currently underway:

- Event Free Tools Training,
- Coaching and Observation, and
- Foreign Material Exclusion.

Other training department deliverables will include the provision of support with respect to the NRU Organizational Review and certain Corporate led training initiatives, for example, Leadership Development Program, Safety Culture and Event Free Tools.

Information on implementation of training activities and target dates is presented in Table 2-1.

Table 2-1: NRU Training Schedule

Task	Target Completion Date	Comments
SRSE Transitional Certification Examination	2006 Jun 27	One individual will be writing this transitional examination.
Certification of Existing SRSEs – (7 Candidates)	2006 Jul 31	Requests issued to CNSC staff, 2006 June 16.
Completion of SRSE Training Task Analysis	2006 Jul 31	Analysis nearing completion. This will address the identification of the SRSE training objectives.
Completion of SRSE Training Gap Analysis (Based on review of current training versus competed task analysis.)	2006 Aug 31	Gap analysis underway. This will address the identification of the SRSE training to be delivered/developed.
Delivery of Systematic Approach to Training Based Nuclear Operator Training Program	Ongoing – Continuing	Continuous program designed to develop Nuclear Operator Training on strength and new hires. This is an established classroom and On-the-Job Training based program.
Introduction of Event Free Tools	2006 Sep 30	Programs developed and delivered to 90% of NRU Operations Workforce: <ul style="list-style-type: none"> • Conservative Decision Making, • Pre-Job Brief, • Verification, and • Self-Checking. Programs recently piloted/under development: <ul style="list-style-type: none"> • Verbal Communication, • Safe Practices, and • Procedural Use and Adherence.
Coaching and Observation Training	Ongoing – Continuing	Forty-seven employees participated in initial training, field checkouts underway.
Foreign Material Exclusion Training	2006 Sep 30	Design, development and delivery of training based on Foreign Material Exclusion procedure.
Infrequently Performed Tests and Evolutions	2006 Sep 30	Under development.
Support to NRU Organizational Review and Implementation	2007 Aug 31	Ongoing - Continuing

2.4 Proposed New Licence Conditions (Day One Transcript, Page 101)

Various new licence conditions in the draft licence were proposed by CNSC staff in CMD 06-H9 [2-1], particularly with respect to Environmental Protection and the continued operation of the NRU Reactor. Brian McGee indicated that a “speedy resolution” would be achieved with a target date of 2006 May 28.

A formal written response to the draft licence contained in CNSC staff’s CMD for the Day One hearing was provided to CNSC staff on 2006 May 09, and a meeting was held two days later with CNSC staff in Ottawa to discuss AECL’s comments on the proposed licence conditions. Numerous discussions have also taken place subsequently. The discussions with CNSC staff were very useful, and AECL believes that the proposed licence in CNSC staff’s Day Two CMD generally contains appropriate conditions.

The only item not fully resolved at this time is the proposed set of conditions on criticality safety. AECL fully agrees with the licence condition to document our criticality safety program by 2006 December 31. However, there are still issues with the additional requirements contained in Section 14.2, sub-section 2. AECL has communicated to CNSC staff our concerns that these requirements are premature for inclusion in a licence. However, AECL believes there will be opportunities to address these concerns as we document the criticality safety program. If necessary, we will apply for an amendment of the licence to resolve any issues with these conditions.

2.5 Plume Downstream of NRU (Day One Transcript, Page 145)

A question was raised concerning the level of leakage from the NRU Rod Bays area and the determination of leakage source.

Information on the NRU rod bays leak may be found in Section 3.5.

2.6 Reduction of Argon-41 Releases from NRU Reactor (Day One Transcript, Pages 150 and 151)

The question was asked as to what would the level of Argon-41 reduction be, if all three of the feasible design changes to the reactor were performed (i.e., redesign of the shielding plugs, elimination of air spaces between graphite sections, installation of a gas purging system).

Based on the ALARA assessment that was performed, partial implementation of the three methodologies will be implemented during the next licence period. A best estimate of the total reduction achieved for Argon-41 release will be of the order of 20% of current release rates.

2.7 Non-Radiological Liquid Effluents (Day One Transcript, Pages 152 and 153)

With regard to Table 3.7 on Page 56 of CMD 06-H9.1 [2-2], AECL's submission document for the Day One Public Hearing, the question was asked regarding the exceedances of monthly guidelines for non-radiological liquid effluents during 2005. There appears to have been a sudden increase in the number of exceedances during 2005 relative to the reduced annual target of 14. Can this be explained?

The data presented in AECL's Day One CMD [2-2] entitled "Exceedances of Monthly Guidelines for Non-Radiological Liquid Effluents" has one error, in that the 2005 target should have been 17, rather than 14.

In 2005, there was a total of 30 exceedances, as described immediately below.

Table 2-2: Summary of 2005 Exceedances

Parameter	Waste Treatment Centre	Sewage Treatment Plant	Building 205 Tanks
pH	7		
Phenolics	9		
Mercury	8*		
Total Suspended Solids		4	
Iron			2
<i>Sub-Total</i>	24	4	2
<i>Total</i>	30		

* Mercury exceedances are for the daily guideline of 1 µg/L.

In 2004, the total number of exceedances was 21. On this basis, the target for 2005 for total number of exceedances was set at 17. The new target was based on the major improvement efforts underway at the Waste Treatment Centre, primarily to reduce the number of mercury exceedances.

An exceedance is an emission in excess of an AECL Internal Guideline. The AECL Internal Guideline is set at 1 µg/L for mercury released from the Waste Treatment Centre into the Process Sewer. In 2004, the total number of exceedances for mercury was five, with an average concentration of 2.091 µg/L. The total calculated loading to the Ottawa River for the year was 0.008 kg.

In 2005, the total number of exceedances for mercury was eight, with an average concentration of 1.087 µg/L. The 2005 average mercury concentration was the lowest reported in the last six years, and the total calculated mercury loading to the Ottawa River for the year was < 0.004 kg.

Although the mercury abatement efforts were successful in reducing the total mercury loading to the Ottawa River, the efforts proved less successful in reducing the number of times an exceedance occurred. Major efforts to reduce the number of mercury exceedances from the Waste Treatment Centre continue in 2006.

In addition, there was an increased number of exceedances of phenolics recorded in 2005 at the Waste Treatment Centre. The average concentration reported was 27.4 µg/L, compared to the AECL monthly Guideline of 20.0 µg/L. Additional sampling to identify the source(s) was undertaken and completed in 2005 December. As a result, a number of potential sources have been eliminated and work continues in 2006 to define the primary source or sources.

2.8 Laval Report – Milk Sampling (Day One Transcript, Pages 165 and 166)

A question was asked regarding the presentation in the Laval document [2-3] of tritium in milk sampling results presented in Table 4 on Page 9, and with specific regard to their level of significance.

There are no Canadian standards for limits of tritium in milk; however, the maximum drinking water concentration is 7,000 Bq/L. When compared to that level, the radioactivity measured in milk collected around Pembroke is low.

2.9 2005 Annual Report for AECL (Day One Transcript, Page 172)

A question was asked regarding the availability of the 2005 Annual Report for AECL.

AECL's annual report for 2005 was recently provided under separate cover by Licensing – Single Point of Contact to the CNSC Secretariat for onward provision to Commissioner Barnes.

2.10 Ecological Effects Review – Recommendations 2, 3 and 4 (Day One Transcript, Pages 191 and 192)

A question was asked regarding the status of Recommendations 2, 3 and 4 of the Environmental Effects Review (see Appendix D of CMD 06-H9.1, [2-2]).

The following information presents an update for the Ecological Effects Review Recommendations 2, 3 and 4.

Recommendation 2: It is recommended that a rigorous evaluation of background concentrations of metals be completed in the Ottawa River and in inland waters (water, sediment). This should be carried out prior to completion of follow-up monitoring of chemical effects at potentially impacted locations. In most cases, it is expected that an improved picture of background concentrations will demonstrate that most potential metal effects identified here are indistinguishable from background, and would not warrant further assessment.

Current Status: AECL has collected a large quantity of information which is required to provide an understanding of contributions of contaminants to the natural environment from anthropogenic sources, and specifically, to characterize contributions of contaminants from CRL relative to baseline values. In preparing to do so, a detailed sampling plan and safety plan were developed to select sampling locations in the Ottawa River, in inland waters, and on the CRL site. A sampling plan, including screening criteria, was developed to select and prioritize

sampling locations. More than 600 water bodies in Algonquin Park were then assessed and prioritized based on the developed screening criteria. Of these, 21 inland locations and 6 locations in the Ottawa River (representing areas upstream of, downstream of, and adjacent to the CRL site) were selected and sampled for sediments and water quality. Additional off-site sampling was carried out to collect sediments, surface waters and non-human biota from 44 water bodies that are closer to CRL than the Algonquin Park water bodies, but that are not expected to be influenced by routine operations at the CRL site. To complement off-site sampling locations, 12 sampling locations were selected and sampled on the CRL site. Concentrations of contaminants of potential environmental concern (COPECs) have been measured in surface waters and sediments that had been collected at each on-site and off-site sampling location. In addition, two documents have been drafted that compare COPEC concentrations in water and sediments collected at on-site relative to off-site sampling locations, respectively. The documents are in final AECL review and will be issued on schedule.

Work is underway to quantify COPEC concentrations in non-human biota that have been collected at both CRL and off-site locations.

Recommendation 3: Since groundwater-monitoring wells near the Chemical Pit have detected polychlorinated biphenyls (PCBs) and tetrachlorodibenzofurans (TCDFs), it is recommended that the potential for migration of these substances should be addressed, either by modelling or by monitoring in East Swamp.

Current Status: A preliminary sampling campaign was conducted in the autumn of 2005 to quantify concentrations of PCBs, TCDDs¹ and TCDFs in surface water, sediment and non-human biota collected at locations upstream of and downstream of the weir in the East Swamp stream. These locations were selected to correspond with the sampling locations that are routinely monitored as part of AECL's routine radiological monitoring programs.

In general, total PCB concentrations in the East Swamp stream surface waters fell below both the analytical detection limit of less than 0.001 mg/L, as well as the Ecological Effects Review recommended benchmark values of 0.04 mg/L and 1.2 mg/L for fish/frogs and snails/benthos, respectively.

Work is ongoing to compile TCDD and TCDF data that have been measured in surface water, sediments and biota collected in the East Swamp stream.

Two reports have been drafted and will be issued on schedule 2006 August 31.

Recommendation 4: The lack of monitoring data for metals in the water and sediments of West Swamp should be rectified in future monitoring programs so that potential metal doses to riparian wildlife can be addressed. Mercury and lead are of particular interest, since these metals have been detected in upgradient groundwater.

Current Status: A sampling campaign has been carried out in the West Swamp in the summer and autumn of 2005 to quantify concentrations of COPECs, including metals, mercury and lead. This work complemented preliminary metals data that had been collected in the West Swamp during previous years. A document summarizing 2003 metal results has been drafted to highlight

¹ TCDD: tetrachlorodibenzodioxin

concentration data for surface water and sediments. The analytical data is being currently assessed, and results will be published by the end of 2006 September.

2.11 NRU Reactor – Material Analysis (Day One Transcript, Pages 195 and 200)

There was some discussion regarding the destructive analysis of some of the essential material of the NRU Reactor. Information was presented by AECL and CNSC staff after which it was pointed out there was some “lack of convergence”.

Information on the material analysis for the NRU Reactor may be found in Section 3.6 of this document.

2.12 References

- [2-1] CNSC, *Application for Renewal of the Chalk River Laboratories Nuclear Research and Test Establishment Operating Licence*, CMD 06-H9, 2006 March.
- [2-2] AECL, *Renewal (2006) of the CRL Site Operating Licence – Information Presented for the Day One CNSC Public Hearing (2006 April 26)*, CRL-00521-LP-002, Revision 0, 2006 March (CMD 06-H9.1).
- [2-3] Université Laval, *Radiological Environmental Survey Outside the Chalk River Laboratories Site*, LRUL 2006-1, 2006 February (CMD 06-H9.1E).

CHAPTER 3 NRU LICENSABILITY EXTENSION

3.1 Introduction

This chapter presents additional information in support of continued operation of the National Research Universal (NRU) Reactor at CRL. The primary purpose is to present an updated status and to provide additional clarification to the discussions that took place at the CNSC Day One Public Hearing. In particular, information is presented regarding AECL's commitments to address short-term actions described in the CNSC staff's Licensing Strategy [3-1].

3.2 CNSC Staff Licensing Strategy

The CNSC staff licensing strategy on the AECL NRU Licensability Extension Project was issued on 2006 February 28 [3-1], and it lists a number of prerequisites with acceptance criteria for continued operation of NRU. These prerequisites are grouped as short-term actions, medium-term actions and ongoing generic issues. There are a total of 11 short-term actions, which require AECL to commit and present an action plan with schedule and milestones for each of the prerequisites. Correspondingly, AECL has submitted 11 action plans. Each individual action plan is designed to address the specific acceptance criteria and has explicit milestones and schedules. AECL will manage these action plans according to the proposed schedules, and is committed to ensure that each of these action plans has adequate resources to meet the milestones.

3.3 NRU Safety Upgrades

CNSC staff carried out a Type I Compliance Inspection to assess the adequacy and completeness of the managed processes used to control the design, procurement, construction, commissioning, maintenance, and operation of two of the seven systems of the NRU Upgrades Project. The two selected systems were the Emergency Power Supply and the Liquid Confinement Vented Confinement systems. The resulting NRU Upgrades QA Audit report [3-2] was subsequently provided to AECL, with 10 Directives, 5 Action Notices and 2 Recommendations. AECL has committed a detailed corrective action plan to address each of the Directives, Action Notices and Recommendations.

3.4 NRU Improvement Initiative

3.4.1 Program Introduction

The NRU Improvement Initiative Program objective is to achieve rapid implementation of short-term measures that will improve safety at NRU, and ensure that both short-term and long-term improvements are sustainable. Part of the objective is to achieve industry best practices in operations and maintenance within three years, while continuing to operate NRU safely and delivering products and services, including isotopes, to NRU clients.

The scope of the program covers the following areas for improvement identified by an industry peer review team that conducted an extensive review of NRU operations and maintenance in 2005:

- **Human Performance:** Improve human performance through application of error reduction tools such as procedure adherence, pre-job briefings, self-checking, and three-way communications.
- **Operational Decision Making:** Apply defence-in-depth in operational decision-making processes.
- **Plant Status Control:** Improve methods of tracking the status of plant systems and equipment.
- **Housekeeping:** Establish formal housekeeping standards and implement.
- **Learning Organization:** Apply the knowledge gained in the rest of the industry regarding methods for improving performance and sustaining that improvement.
- **Foreign Material Exclusion:** Implement procedures for avoiding inadvertent introduction of foreign material into the reactor and other plant systems.
- **Conduct of Maintenance:** Improve maintenance processes and practices to the level of industry standards.
- **Management Effectiveness:** Improve corporate oversight of the facility as well as facility management establishing high standards and holding staff accountable.

The short-term activities cover the following:

- raise staff awareness and provide a sense of urgency for change;
- improve facility condition by raising standards of housekeeping and at the same time reducing fire hazards;
- implement event free tools with focus on self-checking, verification, and pre-job briefing;
- provide more day-to-day management safety oversight;
- improve management effectiveness; and
- provide adequate resources (Workforce Study).

These activities are intended to achieve immediate improvements, and to reduce the nuclear safety risk of operation.

The long-term activities cover the following:

- improve skills/work methods,
- improve processes,
- improve NRU status control,
- improve NRU facility condition, and
- improve support to NRU.

The frequency and severity of events are expected to decline as a result of implementing this program. The long-term actions are also intended to increase NRU nuclear safety performance to the levels achieved within Canadian utilities.

The schedule takes into account experience from previous similar improvement programs at other facilities. This experience indicates that being overly aggressive in implementing process improvements at operating facilities carries a high risk of program failure, and loss of credibility with staff at the facility. Therefore, the schedule recognizes the need for expeditious improvements while at the same time being realistic in terms of the pace of change in an operating facility.

Several methods are used to ensure that the NRU Improvement Initiative meets its objectives. The measures include the following:

- Detailed activity plans to track and verify the effectiveness of each of the major improvement activities as they are completed.
- The Observation and Coaching Program is used for observing and reinforcing correct behaviours. The use of event free tools, accountability for meeting commitments, and discipline in work permit preparation are examples of areas that are well suited to these methods.
- Initial benchmarking of Canadian nuclear utilities.
- Use of industry experts with knowledge and experience from Canadian utilities.
- A follow-up industry peer review will be conducted at an appropriate point in the implementation of the overall program.

The OPEX Program will periodically review NRU events to assess performance trends and the effectiveness of corrective actions.

3.4.2 Status of Program as of 2006 June

The following is a summary of the status of the activities in the NRU Improvement Initiative:

1. Raise staff awareness:
 - Communication plan prepared.
 - Program objectives presented to NRU staff, CRL Site Management Team, all CRL staff, CRL based unions and oversight committees including the Safety Review Committee and the Research and Development Advisory Panel.
 - Ongoing updates provided to NRU staff.
 - Communication tools prepared to assist use of industry methods.
 - Leadership team established, observation and coaching training delivered to all leadership team members (51 members), and field observations are about to be launched within NRU.
2. Improve facility condition by raising standards of housekeeping and at the same time reducing fire hazards:
 - Conduct of Operations procedure regarding housekeeping expectations and roles and responsibilities has been issued.
 - The hiring of a Plant Inspection Coordinator whose responsibility includes the enforcement of the new housekeeping procedure is progressing with interviews completed and selection underway.

3. Implement event free tools:

There are a total of seven event free tools identified.

- Four event free tools awareness training packages have been delivered to NRU staff:
 - self-checking,
 - verification,
 - pre-job briefing, and
 - conservative decision making.
 - Two event free tools awareness training packages have been piloted:
 - verbal communication protocol, and
 - safe practices.
 - One event free tool is in final development stage:
 - procedural use and adherence.
4. Provide more day-to-day management safety oversight:
- Activities under this heading are completed with the release and use of the new Facility Restart Policy, and the new Operating Decision Making Process.
5. Improve management effectiveness:
- Four of six identified management positions have been filled (Training Manager, Operations Manager, Technical Support Manager, and the Nuclear Safety and Licensing Manager).
 - Two additional positions are being recruited (Support Programs Manager and Maintenance Manager).
 - Daily senior management operations meetings continue.
6. Provide adequate resources:
- Staff levels have increased from 118 to 142, including 15 new professionals, 8 operators and 1 technician.
 - Positions for Maintenance Engineering and Planning, in support of NRU improvement initiatives, have been staffed and work is progressing on the maintenance, housekeeping, training, and staffing fronts.
 - The NRU Workforce study continues. All interviews are now complete. The draft study for shift staffing is issued for internal review, with two other reports dealing with day shift and maintenance staffing due to be issued by end of 2006 June.
7. Improve skills/work methods:
- Phase 2 implementation continues for event free tools.
 - Expectation documents are in review and comment stage for the following: Procedural Use and Adherence, Safe Practices, and Infrequently Performed Tasks and Evolutions.
 - Work continues on the review and revision of the 324 maintenance procedures with approximately 100 completed.

8. Improve processes:

- The Foreign Material Exclusion expectation document has been drafted and is in the final review stage.
- Staffing increased in maintenance program area for the development and delivery of specific Foreign Material Exclusion training and procedures.

9. Improve NRU status control:

- Work on position assurance continues with the development of a process of how to achieve position assurance on valve status and the overall quality of the tagging and identification system.
- Start-up checks - reviewing industry standards.
- Work permits: investigating means of relieving burden on SRSE regarding work permit approvals at start of shift, and reviewing work permits for inclusion of pre-job brief and arc-flash protection.

10. Improve NRU facility condition:

- Work to clean up the rod bays continues.
- The contract for the new storage building has been awarded, and construction is expected to be completed by 2006 mid-August.
- Work continues in rooms at the 300-elevation and 500-elevation for housekeeping and fire-load reduction.

11. Improve support to NRU:

- Strengthen corporate oversight: the remaining action is to complete the inclusion of QA oversight in corporate documents - 90% complete.
- Increase resources in key groups: additional resources have been added to key support groups as planned - action completed.

3.4.3 Concluding Remarks

Phase 1 of the Improvement Initiative has been completed with all of the short-term tools and standards prepared and implemented. At the end of 2006 May, 58 of 60 short-term commitments and 7 of 35 long-term commitments have been met. The overall progress is presented in Figure 3-1. One activity (due in 2006 March) related to the issuance of a shift turnover document is progressing, with the release of a draft for formal review. All remaining activities have been assigned to a lead manager and are being tracked and monitored in accordance with the commitment plan.

The most noticeable change in NRU is the implementation of the new housekeeping standard and the resulting improvement in facility condition and reduction of fire-load. Phase 1 for the implementation of event free tools is ongoing with active use throughout NRU, and with training on the remaining tools either underway or planned. NRU supervisors are applying observation and coaching methods to verify the use of the event free tools and to monitor work performance. Safety oversight is enhanced through the use of Operational Decision Making and Reactor Restart Policies. Line management and the support groups are actively involved in NRU operations through the daily senior management operations meeting.

3.5 Plume Downstream of NRU

3.5.1 Inspection Methodology

The following is a description of the activities undertaken by AECL staff to locate any specific leakage from the NRU rod bays area.

Inspection and testing for leaks in the NRU rod bays began on 2006 March 20 using a dye inspection technique. The focus for the leak search has been on accessible areas that are deemed as having the potential to leak. These areas are corners, both wall-to-wall and floor-to-wall, large cracks or gouges, and penetrations into or through the concrete. The Inspection Bay was the first bay searched. The four wall-to-wall corners were tested for leaks in all accessible areas. All four walls were then inspected and tested for leaks at large cracks, and penetrations. There was no leakage detectable from this bay in the areas searched. All locations tested and visually inspected were logged. Areas not able to be tested and not visible from above the surface were video recorded to determine if testing should be considered in these locations. The next area of the bays searched was the west wall of the Long Rod Bay. Only the northwest corner and the first few feet along this wall were tested for leaks before the dye injection pump stopped functioning properly.

The dye injection system used to search for leaks is difficult to control. It uses a pump with variable stroke and frequency to deliver a pulse of dye. The pump was being operated at its lowest range. This made it very difficult to set up the pump for the appropriate injection amount. A new pump has recently been delivered that is more suitable for this application. It is possible a bypass on the pump may be required to help control the amount of dye injected. If this is not successful, then another approach is being considered. Searching has been temporarily halted since 2006 March 29, pending arrival of the replacement pump. The recently received pump appears to function as desired and search efforts will resume using the same control technique for the dye.

3.5.2 Summary of Ongoing Work

Ongoing work is summarized as follows:

- Field trials have been completed with the newly developed remote camera tooling. This enabled the search for leaks to begin while refining the operational techniques, and tooling requirements.
 - ~ 4 weeks inspecting, and testing for leaks, and
 - ~ 8 weeks modifying and testing the dye injection system.
- A second phase of searching will shortly commence with the replacement pump.
- Various methods of leak sealing are under investigation, since different leak sources require different methods of sealing.
- Development continues for a satisfactory method for removing the water from the sand filled space immediately adjacent to the rod bay (Inside the Rod Bay Room).
- Setting up a sampling/monitoring schedule for the eight wells surrounding the NRU rod bays.
- Addition of two more wells for monitoring and sampling to estimate a leak rate from the bays, to aid in locating the source of the leak, and to intercept the tritiated water before it enters the water table outside of NRU.

- Three new groundwater monitoring wells have been added down gradient from the NRU rod bays in 2006 April.
- Results from one well suggest that the East Delay Tank is not the primary contributor to the plume.

3.6 Plant Life Management

The Plant Life Management (PLiM) program provides for the systematic assessment, timely detection, mitigation, recording, and reporting of significant aging effects in systems, structures and components. The PLiM program also uses processes that provide assurance that aging effects are adequately addressed in plant maintenance, surveillance, and inspection programs and within the current operating context.

The PLiM program is based on a comprehensive, multifaceted and integrated approach to address the underlying issues related to plant aging, to understand the relevant degradation mechanisms, and to develop appropriate mitigation plans. The overall approach is to consider all issues relating to plant aging. The physical plant assessment focuses on the continuing ability of the structure or system component to meet the specified performance standards. A Life Assessment provides a detailed assessment of a component's passive degradation mechanisms at a subcomponent level. The outcomes provide the technical basis for future decisions regarding aging management of the specific component.

The following sub-sections focus on specific elements of the PLiM program that were discussed during the Day One Public Hearing.

3.6.1 Reactor Vessel and Bottom Header Material Condition

As documented in the Life Assessment of the NRU Reactor vessel, the investigation of the effect of fluence on the ductility of the Bottom Header material (304 SS) is discussed. Since the bottom header cannot be sampled directly, the material assessment focused on a fast neutron cup, which is subjected to bottom header pressure and significantly higher neutron flux as it is exposed to the reactor core. The assessment results included a summary of material properties from an analysis of a fast neutron rod-cup that had been in service in the reactor from 1974 until 1992. In 2004 another material analysis was performed on another fast neutron rod-cup, which was removed (2004 August 10), that had been installed at the same time as the previously tested rod-cup. The 1992 test concluded that the mechanical properties of the bottom header were similar to unirradiated material after 18 years of service, and the 2004 test results confirmed the 1992 results, that the additional radiation exposure had not caused any change in material properties.

The threaded portion of this rod-cup (area of highest stress) was removed and subjected to visual examination for cracks using a light microscope (3.5 x objective). No crack was observed. Upon comparison of all the data produced from the testing performed in 1992 and 2004, there has been no significant reduction in tensile properties. The ultimate tensile strength, the maximum strength reached, from the 2004 tests is effectively the same as from the 1992 tests.

From the results of this additional testing, it can be confirmed that an additional 12 years exposure to the fluence within the NRU Reactor had not resulted in any noteworthy change in the tensile properties of the 304 SS.

It should be noted that due to the design of the bottom header which is shielded by baffle blocks, the neutron flux on the bottom header is a small fraction of what would be seen by the fast neutron cups. The robust design of the header also provides additional assurance of continued operating life.

As per the EPRI Fatigue Handbook, fatigue is not considered a plausible failure mechanism for either the headers or vessel given the low temperature of operation (55°C), which is well below the threshold of 130°C. In addition, there are no appreciable cycles within the NRU Reactor vessel. However, in 1992, stress and fatigue analyses were carried out on the reactor top and bottom headers. These analyses concluded that for stress, both the top and bottom header met the requirements of ASME Section VIII, Division 2, Alternate Rules, 1989 edition. In addition, the fatigue analyses, using an extremely conservative number of cycles concluded that fatigue was not a concern. These analyses were re-evaluated in 2004, doubling the number of cycles and confirming that the 1990s assessment was still valid and could be used to support the NRU Reactor vessel life assessments.

It can therefore be concluded that the material condition of the NRU Reactor vessel has not deteriorated and is fit for continued operation.

3.6.2 Inspections

Performing inspections is also an important component of the Plant Life Assessments. Inspections carried out included special inspections to support aging assessment conclusions and periodic inspections have been carried out in conformance with design codes. A Periodic Inspection Program for the heavy-water system pressure boundary has been submitted to CNSC staff for approval. Inspections have also been performed in accordance with this Periodic Inspection Program and approximately 95% of these inspections are completed; NRU is on target to complete the first inspection cycle by 2006 December. The results of the inspections performed to date support the prognosis that the reactor's critical systems, structures, and components support continued operation safely and reliably.

3.7 Summary and Conclusions

AECL is committed to ensure that NRU has the resources to complete all the actions and meet the milestones described above. In addition, AECL has already committed to implement the Aging Management Program to ensure the material condition in NRU remains fit for service. These actions will provide AECL and CNSC staff with confidence that NRU can continue to operate safely for a prolonged period of time.

3.8 References

- [3-1] G. Lamarre, Letter to B.E. McGee, *Licensing Strategy for AECL's NRU Licensability Extension Project*, 2006 February 28.
- [3-2] C. Nache, Letter to J.P. Létourneau, *Type I Compliance Inspection Report OMSD-AECL-2006-T1743-QA-02 NRU Upgrades QA Audit*, 2006 April 20.

NRU Improvement Plan Implementation

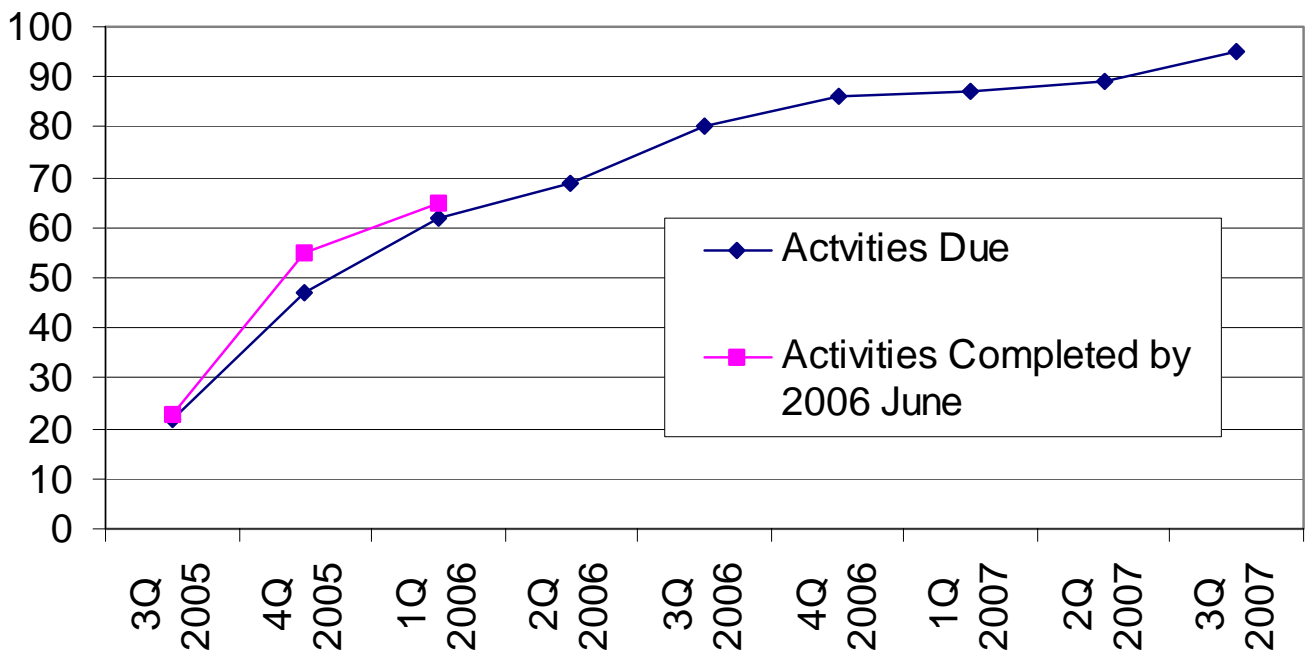


Figure 3-1: Planned Progress (%) for NRU Improvement Plan Implementation

CHAPTER 4 INFORMATION FOR INTERVENERS

4.1 Introduction

The intent of this chapter is to provide information related to topics of concern raised in interventions submitted to the Commission regarding the CRL site licence renewal. AECL's objective in providing this supplemental information is to assist in the process of addressing intervener's concerns, as it is recognized that the interventions are submitted to the Commission, not to AECL. Nevertheless, we trust that the information in this chapter will be beneficial in the overall licence renewal process.

CRL-specific concerns raised by interveners are summarized in the following areas:

- Long-term legacy waste management issues, including AECL's five-year implementation plan.
- Site-Wide Environmental Assessment and Panel Review under the Canadian Environmental Assessment Act (CEAA).
- Environmental Protection issues.
- AECL's Public Consultation Program.
- Resource levels and allocation at CRL.
- Comprehensive Preliminary Decommissioning Plan and cost estimate.
- Radioactive material in the Ottawa River.
- Safety of the Fissile Solution Storage Tank.
- Reporting of internal events at CRL.
- Safety of on-site drinking water.
- Overall safety of Building 250.

Information on these topics is included in the following sub-sections.

4.2 Long-Term Legacy Waste Management Issues, Including AECL's Five-Year Implementation Plan

4.2.1 General

Interveners expressed a number of concerns relating to the long-term management of radioactive wastes at CRL, some of which include: the need for a Panel Review, issues relating to managing wastes in aboveground or underground disposal facilities, and waste inventory characterization. These comments are addressed in this section.

4.2.2 Plume Remediation

AECL has identified and located a number of plumes containing radioactive material over the past number of years at the CRL site. The plumes are primarily the result of waste management practices exercised in the 1940s, 1950s and 1960s. The presence of these plumes has been identified in previously published, publicly available documents.

We have made and are continuing to make significant progress in addressing these plumes, as evidenced by the following actions:

- Major upgrades have been completed to the Waste Treatment Centre at a cost in excess of \$10M. These upgrades have allowed AECL to discontinue discharges (permitted under the CRL licence) that were contributing to groundwater contamination.
- Three groundwater treatment facilities have been in operation for a number of years to remove contaminants from groundwater.
- A pilot study was started last summer to evaluate how best to install a reactive barrier to intercept a plume in South and East swamps.
- Impermeable covers have been installed over parts of two Waste Management Areas to reduce water infiltration.
- An extensive ground water sampling and analysis program was established in 1997 to ensure that the behaviour and nature of contaminated groundwater was closely monitored.
- Work has commenced on emptying the NRX fuel bays, a source of one of the ten distinct groundwater plumes (see Section 6.2).
- Projects have been initiated to address plumes whose origins lie with leaks in tanks or fuel storage facilities. Monitoring results indicate that there appear to be improvements as a result of the actions associated with these projects.

4.2.3 Long-Term Management of Radioactive Waste

Plans for the long-term management of radioactive wastes at the CRL site will be subject to full regulatory review and licensing including the CEAA process, which will involve the technical evaluation of alternative sites and technologies and the development of a comprehensive safety analysis to determine the potential impacts to current and future generations and the environment. The geology of CRL has been the subject of several previous investigations, including the Siting Task Force effort in the mid-1990s, looking at the possibility of locating long-term management facilities at the site. The Siting Task Force recommendation (which was independent of AECL, established by Natural Resources Canada (NRCAN) and reporting to NRCAN) was that the CRL site had suitable geology to manage wastes for the long term. AECL is currently assembling information from previous studies, and establishing the functionality of some of the investigative deep boreholes installed by the Siting Task Force and the Geological Survey of Canada (1970s). This information is being assembled to provide an up-to-date analysis of the CRL site geology for preliminary work on the long-term management of wastes.

The Government of Canada has committed \$520 million for managing Canada's decommissioning and waste management liabilities. These funds are provided specifically for a five-year plan to initiate the long-term decommissioning strategy. Of the total sum of \$520 million, expenditures at CRL will be broken down as indicated in Table 4-1 with a resulting expenditure of about \$320 million.

Table 4-1: Five-Year Decommissioning and Waste Management Budget at CRL

Fiscal Year	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011
Amount (\$ million)	39.6	73.7	81.5	51.4	72.5
Five-Year Total	318.7				

The major projects identified in the plan include:

- Accelerate the decommissioning of obsolete buildings at CRL.
- Design and construct new groundwater treatment facility.
- Environmental restoration of contaminated lands on AECL managed sites.
- Construct new facilities to permit waste processing, storage and long-term management.

Furthermore, AECL will support NRCAN in public consultations to further develop the long-term strategy in the best interests of Canadians. The consultations are expected to begin in late 2006 or 2007.

4.2.4 Inventory of Radioactive and Non-Radioactive Wastes on the CRL Site

The CRL Conceptual Preliminary Decommissioning Plan (CPDP) [4-1] contains summary information for the wastes in the CRL Waste Management Facilities (Table D1, specifically). Total volumes of wastes from decommissioning of facilities (including Waste Management Areas) are also presented (Table E4). As the Waste Management Areas are remediated, additional characterization information will be obtained to support waste recovery, processing and disposition. As well, the Waste Management Areas will be characterized once the wastes are removed to support abandonment safety cases.

4.2.5 Definition of Intermediate Level Waste

Intermediate Level Waste or Intermediate Level Radioactive Waste is defined as waste with elevated levels of radioactivity that require enhanced storage and handling provisions such as containment packaging and radiation shielding to protect workers, the public and the environment. Waste acceptance criteria are used to distinguish between low and intermediate levels wastes, and the model for the evaluation and management of these waste types is described in general terms in the CRL CPDP (Figure E12). The criteria for distinguishing between the two waste categories include basic aspects such as radionuclide half-life and external radiation field.

4.2.6 Sources of Intermediate Level Waste for Geological Facility

Intermediate Level Waste or Intermediate Level Radioactive Waste will be generated from the decommissioning of the waste management areas at CRL (refer to CPDP Table D1). A small component of this waste classification will come from the decommissioning of nuclear facilities (e.g., certain reactor components) and from the disposal of calibration sources. All wastes

generated from the decommissioning activities will be evaluated and managed following the process shown in Figure E14 of the CRL CPDP. A key component of this process is the characterization of the wastes as they are generated, for which a comprehensive waste characterization program is being established.

4.3 Site-Wide Environmental Assessment and Panel Review under the Canadian Environmental Assessment Act

AECL offers the following information regarding intervenor concerns relating to a site-wide environmental assessment and a desire for a full Panel Review under CEEA.

The CNSC, through its regulatory powers, is responsible for the determination of Environmental Assessment requirements for nuclear facilities at CRL, including nuclear waste management, decommissioning activities, as appropriate, including the need for a Panel Review for activities at the CRL site. Consideration of cumulative effects is included in the various individual project Environmental Assessments.

The CRL site is expected to continue in operation for a wide range of nuclear R&D/Industrial and production activities for many years to come. The decommissioning model for the CRL site, including Waste Management Areas, is one of individual decommissioning projects over time rather than a single project for the site as a whole. AECL has proposed, and will continue to propose, grouping of projects under one Environmental Assessment where these are linked or interconnected according to guidance provided by the Canadian Environmental Assessment Agency.

4.4 Environmental Protection Issues

Concerns regarding various environmental issues and practices at the CRL site were expressed in some intervenor submissions.

4.4.1 Sewage Sludge

With respect to the long-term management of sewage sludge, this matter was previously fully discussed before the Commissioners (2005 January 12, 2005 April 06 and 2005 December 01), and information was previously presented for consideration at the Day One Public Hearing.

In the interim, AECL continues to de-water the sewage sludge and place the de-watered material in steel containers located in Waste Management Area "C" with CNSC staff acceptance of this practice.

A safety assessment has been prepared and submitted to CNSC staff that concludes the trace levels of radioactivity in the sludge are well below (3% of) those that result in a 10 μ Sv per year dose to individual members of the public (10 μ Sv/yr being an internationally accepted threshold). A site selection process has been completed for the landfill to be located at CRL. The contract for the design of the landfill has been awarded and a Notice of Commencement of Landfill project has been posted with the CEEA registry.

Letters have been issued to federal and provincial stakeholders regarding the intent to construct and operate the landfill on the CRL property. Following these communications, a site visit took place on 2006 June 01 for three interested groups.

Steps are continuing to mitigate the levels of contamination in the sewage sludge. To this effect, a line from one of the buildings has been capped and some improvement has been observed. In addition, considerations are underway to shut down the CRL laundry facility, which is also believed to be contributing to radioactivity in the sewage sludge.

4.4.2 NRU Rod Bays

An intervener questioned the continued placement of NRU fuel into the rod bays, since this area has been identified as the source of a plume close to the Ottawa River. A number of detailed associated questions were also raised.

AECL has fully communicated with CNSC staff with respect to the raised tritium levels initially identified in two manholes downgradient from the east wall of the NRU Reactor.

With respect to previous reporting of this plume, AECL confirms that during the CRL licence renewal process of 2002/2003, the plume was identified in Section 3.2 of the supplementary material presented by AECL for consideration at the Day Two hearing, held 2003 April 09. Furthermore, relevant data indicating elevated tritium levels downgradient of the NRU Reactor were presented in the annual reports on effluent monitoring at CRL for 2003, 2004 and 2005. The plume was further considered during the 2005 June 29 public hearing regarding the Environmental Assessment Screening Report for continued operation of the NRU Reactor.

A number of other radioactive contaminants are likely to have accompanied the tritium into the ground at the point(s) of leakage from the NRU bays. The contaminants would primarily be comprised of low quantities of Cesium-137, Cobalt-60, etc., although small quantities of activation products may also be present. The concentrations of the fission and activation products released would be the same as the concentrations in the NRU bays water generally. However, due to the chemical characteristics of the contaminants other than tritium, the contaminants are unlikely to have moved more than a few metres from the point(s) of release from the NRU bays to the ground. Thus, radioactive contaminants (other than tritium) from the NRU bays are not being released into the Ottawa River. Confirmation of this fact has been verified by AECL's routine environmental monitoring program.

AECL has not yet confirmed that the tritium plume is originating from the NRU bays, since efforts to locate actual leaks have not been successful to date. Further information on these investigations is presented in Section 3.5 of this document. However, AECL believes that the source of the tritium is likely the NRU bays and this was originally advised to CNSC staff during 2003 February. The Event Notification Form dated 2003 April 04 stated that, "...there are four possible sources of tritium in the vicinity of manhole MH-26. These are; NRU (B150)..."

With respect to future mitigation, the first priority for AECL is to identify the precise source of the tritium to the ground, and put in place measures to terminate the release as soon as possible.

Once the source of the tritium is confirmed and the leak terminated, AECL will develop an action plan, based on risk to the environment. The action plan will specifically consider and evaluate future mitigation and remediation efforts.

4.5 AECL's Public Consultation Program

4.5.1 Introduction

This section provides the latest information regarding AECL's Public Consultation Program, including additional information to address topics raised in intervenor Commission Member Documents, and information regarding the recently released AECL external website, which has been completely redesigned and which includes information on AECL's environmental performance and safety performance.

4.5.2 Information for Intervenors

To facilitate ongoing communications, any new intervenors will be added to the list used by AECL for the distribution of future information. Offers to tour the CRL site are made on an individual basis and at least one is in the course of being arranged for this summer.

Those intervenors who provided written submissions will be invited to join the stakeholder distribution list.

4.5.3 Provincial Government (Ontario and Québec) Involvement in Decommissioning and Other Activities

AECL is committed to public consultation on activities at the CRL site including decommissioning activities, and the consultation process includes involvement of the Ontario and Québec governments. Provincial and federal governments are engaged in the review of Decommissioning Projects and Activities through the Federal Environmental Assessment Process under CEAA. The CNSC, through its regulatory powers, is responsible for the conduct of these assessments, which involves public consultation, and federal and provincial government department review of the environmental assessments. Federal and provincial government departments that participate in the review process include Environment Canada, Health Canada, Natural Resources Canada and Ontario Ministry of the Environment. AECL-led public consultation undertaken in support of environmental assessments includes consultation with a wide range of stakeholders, including residents in local communities, interest groups, local municipal, provincial and federal elected officials (Ontario and Québec) and first nations groups. Over the last 10 years there have been 15 environmental assessments triggered under CEAA. In addition, AECL regularly updates the public of activities at the AECL site through our public communication program and an Environmental Stewardship Council is currently being formed (see Section 6.3). The Minister of Natural Resources Canada, in his funding announcement on 2006 June 02, also indicated that NRCan will begin "high-level" consultations on the overall decommissioning strategy.

4.5.4 AECL External Website

AECL announced, on 2006 June 16, the launch of a completely revised external website (www.aecl.ca) after many months of hard work for those involved. It will be found to be a much more user-friendly and vibrant site that will highlight breaking news, focus on key corporate and project information, and bring users back again and again.

A new section dedicated to AECL's regulatory and licensing activities has been incorporated as well as monthly reports on AECL's ongoing environmental and safety performance (see Appendices C and D).

Information has been re-arranged in such a way that navigation is more intuitive, including a much more robust search function, the ability to conduct Quick Polls, undertake customer-specific surveys, house a greater number of videos, and host web casts and Question and Answer forums.

4.6 Resource Levels and Allocation at CRL

An intervener expressed the opinion that more attention is needed in environmental performance at AECL, and disappointment that the "general focus" of new staff at CRL was toward NRU maintenance and operator training.

The training program for all new staff covers safety, radiation protection and environmental protection related training. Implementation of improvements or commitments to safety and environmental protection are as much with the staff in the field – the maintenance workers, the operators and technicians who do the work, as they are with environmental and safety specialists. Environmental Protection staff gives guidance, direction and support while the staff in the field do the work in conformance with environmental protection requirements. It is therefore important to hire and train the necessary facility and maintenance workers to implement the Environmental Protection Program and to work safely.

AECL is committed to have the necessary qualified resources to meet the requirements of the Environmental Protection Program. For example, a resource needs analysis was conducted a few years ago on what is required to meet the requirements of the Environmental Protection Program, both for implementation and ongoing program maintenance. The analysis looked at the requirements for Environmental Protection staff and facility staff. In response to this, AECL has already hired two additional Environmental Protection Specialists at CRL, and is in the process of hiring an additional specialist to complete the response to the resource needs analysis. AECL has also hired consultants to help address specific areas, such as conducting the Ecological Effects Review and upgrading and implementing our Environmental Management System to meet ISO-14001.

In addition, the projects to address Canada's nuclear legacy liability at Chalk River will involve new staff specifically for this work and staffing levels will increase accordingly. For example, the CRL Projects staff complement has increased by 39 since 2005 September.

4.7 Comprehensive Preliminary Decommissioning Plan and Cost Estimate

Intervenors expressed concerns regarding the CRL CPDP [4-1], the Basis for the Cost Estimate, and the acceptability of the communication and public consultation plan.

AECL offers the following information:

- AECL has committed to update the CPDP on at least a five-year basis, and the update will involve consulting and communicating with the public. This will provide ongoing opportunities to address the concerns of community members.
- The Cost Estimate was examined by a number of parties including the Office of the Auditor General and an outside reviewer engaged by the Office of the Auditor General.
- The Communications Plan was revised to address issues raised by intervenors at previous meetings.

The CPDP meets or exceeds the content guidelines provided by G-219, the CNSC regulatory guide for decommissioning plans. AECL concurs with the CNSC staff position that the CPDP (and other required documentation) forms the basis of an acceptable Financial Guarantee.

The basis for the estimated cost to decommission CRL is the result of a process spanning several years to develop a decommissioning plan for the lands and structures currently present at CRL. In parallel with the development of the plan, projects were defined to implement the required decommissioning activities. These projects have provided the basis for estimating the cost of the liability and provide the information needed to characterize the overall liability. These project costs have been developed and refined progressively over time, and several projects are underway (and have been the subject of environmental assessment and public consultation).

The cost estimate was the subject of an audit by the office of the Auditor General and the liability estimate was published in the AECL 2005 Annual Report. The schedule and costs are “going forward” and do not include past accomplishments. The cost for decommissioning AECL’s CRL as presented in the AECL 2005 Annual Report has a Net Present Value of \$1.97 billion. This is part of the \$2.75 billion liability reported in the AECL 2005 Annual Report.

It is anticipated that this estimate will undergo future revisions where improvements will be made to the estimate as the experience base is further developed (currently we have about 15 years of decommissioning activities on which the estimate is based). The schedule for future revisions will be set as required by AECL’s financial management process. In addition, as public input to the plan is received (as one of the activities planned to be conducted in the first five years) changes may be made to address this input.

The cost estimating methodology, employed in developing the legacy liability associated with the CRL site, is consistent with the requirements in the CNSC Guide G-206. The methodology applied to derive the cost estimate used information developed on the basis of:

1. ongoing operational costs (e.g., Storage with Surveillance, groundwater treatment systems),
2. ongoing monitoring (environmental monitoring),
3. current project estimates (for projects that are established and underway),
4. cost models for building decommissioning and Waste Management Area decommissioning,

5. scaling from existing facilities and projects for future facilities, and
6. expert opinion.

As a result of discussions with the Office of the Auditor General, the overall cost estimate carries a contingency of 20%. From G-206, Grade C estimates are described as: “estimates are generally performed quickly using shortcut techniques, such as escalating and/or scale up from previous estimates, cost curves, and/or preliminary process design and equipment sizing, without plot plans or major equipment quotations”. However, some activities estimated as part of the legacy liability are Grade A or B estimates since they are based on costs already experienced within ongoing programs (e.g., monitoring or Storage with Surveillance costs), or are based on project estimates which have been through AECL’s formal project review process and/or include cost estimates which have been prepared and/or detailed design has been completed to support a bidding process for delivery of the activity. Consistent with G-206, elements 1 to 3 in the list above are generally considered to provide Grade A estimates, element 4 generally provides Grade B estimates, and elements 5 and 6 provide Grade C estimates.

The responsibilities for waste liabilities are discussed in the CRL CPDP (Section 1.1.3). While AECL currently manages the waste liabilities, the federal government is ultimately responsible for the liabilities. The formal transfer of liabilities to the federal government is presently underway. This transfer of responsibility will better-enable AECL to implement the decommissioning plan. In association with this transfer of responsibility, funding for decommissioning and remediation activities is provided by the Federal government’s Treasury Board. Essentially, AECL is tasked with implementing the decommissioning plan described in the CPDP using funding allocated from the federal government. NRCan is the federal department interacting with AECL on behalf of the federal government, with its lead roles in the process being to allocate funding to the program and to monitor AECL’s progress in implementing the program.

4.8 Radioactive Material in the Ottawa River

With respect to the interveners particular concerns, AECL has never engaged in “illegal dumping of radioactive materials into the Ottawa River” from CRL or any other AECL site in Canada.

AECL continues to rigorously monitor all surface waters leaving the CRL site entering the Ottawa River for radioactive and non-radioactive contaminants. The quantities of radioactive and non-radioactive materials being released into the public domain are small and well within defined legal limits. The results of AECL’s various effluent and environmental monitoring programs are collected and published in annual reports presented to CNSC staff and made available to the public in the spring of each year. CRL has had good environmental performance over the years. To help maintain and improve this good performance, AECL’s environmental management has been strengthened such that CRL is now certified under the ISO 14001:2004 standard.

4.9 Safety of the Fissile Solution Storage Tank

An intervener expressed concerns regarding the condition and state of the Fissile Solution Storage Tank (FISST) and what has been done or is planned to assure it is in a safe-to-operate condition.

Since 1970, AECL has been involved in the production of the radioactive Mo-99 isotope, for medical diagnostic purposes, from irradiated U-235 target material. Starting in 1986, fissile liquid wastes from the Mo-99 production process have been safely stored in the FISST. Various safety analyses have been performed which conclude that the FISST provides and will continue to provide a safe storage of these fissile liquid wastes.

The FISST is a double-walled stainless-steel tank, located in an underground, biologically shielded structure. The building above it houses equipment and systems associated with operating and monitoring FISST. Concrete slabs between the shielded structure and the floor of the building provide the required shielding from the high radiation emitted from FISST. The concrete structure is sealed but ventilated, and the outlet ventilation stream is monitored for radiation. The inner storage tank (2.74 m in diameter and 4.53 m long) has a volume of 24,000 L. The outer tank, which is concentric with the inner tank, is fabricated from the same materials, and could, if necessary, contain the entire contents of the inner tank.

The FISST is constructed from welded Type 304L stainless steel. Type 304L stainless steel is the recommended material for welded components used in nitric acid service because it is not susceptible to localized attack either in the weld heat affected zones, or from pitting corrosion. Rather, there is a slow, uniform corrosion of the tank's inner surface by the nitric acid solution. The corrosion design allowance for FISST inner and outer tanks is 1.5 mm on a 6.35 mm tank wall.

Corrosion of FISST has been well characterized through (i) analysis of coupons of the original 304L stainless steel plate, welded using the FISST welding procedure and immersed in simulated FISST solutions, and (ii) quarterly analysis of the concentrations of chromium, nickel and iron in a sample of the FISST solution.

Particulars of these studies are as follows:

- Coupon analysis indicates a maximum corrosion rate of 7.5 microns/yr.
- Dissolved species (Chromium, Nickel, Iron) in the FISST solution were found to be present in proportions similar to that found in Type 304L stainless steel and analysis indicates an average inner tank corrosion rate of 8.9 microns/yr or 0.16 mm since the FISST in-service date of 1986 August.

These independent assessments agree with each other and support the conclusion that, from a corrosion perspective, the life of the inner tank of FISST is greater than 50 years and the inner tank has no corrosion related problems. The outer tank could, if necessary, also contain the entire contents of the inner tank and it has not been exposed to corrosive solutions. Therefore, in the unlikely event of inner tank leakage, an additional safety margin of 50 years is available from a corrosion perspective.

4.10 Reporting of Internal Events at CRL

An intervener questioned the investigation structure presently in place at Chalk River for the reporting of, and investigation of, internal and external contamination. Information relating to regulatory reporting requirements and records management relating to these investigations was also sought.

All abnormal internal and external radiation exposures are reported and investigated in accordance with the requirements of AECL's Radiation Protection Program. Events that have or could reasonably have led to an exposure in excess of an action level or resulted in surface contamination in excess of an administrative limit are reported following the OPEX processes using the Event Notification Form (ENF), and based on the degree of breakdown in radiation protection controls and magnitude or potential for higher intake, may be investigated by an Apparent Cause Analysis or Root Cause Analysis. Exposures exceeding a dose Action Level are promptly reported to CNSC staff in accordance with AECL's site licence requirements.

The investigations are performed independently and the reports are available to AECL personnel upon request. All reports generated under the OPEX processes (e.g., ENFs) are reviewed by AECL's Safety Review Committee and shared with the joint employee management Site Safety and Health Committee.

An Employee Contamination Record is completed for all skin contamination incidents and an estimate is made of the likelihood of an internal intake, which determines any required special bioassay. An assessment is also made of possible skin dose from contamination on the skin. An ENF and follow-up investigation is performed if external contamination results in a skin dose reaching or exceeding 5 mSv.

Most internal and external contamination events do not result in significant doses and are therefore not considered minor injuries, and are not reportable to Workers Compensation. The events are documented via the Employee Contamination Record with a copy sent to the AECL Occupational Health Nurse. If a dose is likely to exceed 50% of the regulatory limit, the event will be investigated and reported as specified in Section 10.4 of the Canadian Occupational Health & Safety Regulations. Notifications of "High Bioassay Result", where a potential exists for a committed effective dose exceeding 1 mSv (bioassay result at the Removal Level), are sent to the AECL Occupational Health and Safety Manager and AECL's medical physician, as well as the result of any subsequent dose assessments.

AECL sends a report annually to CNSC staff, summarizing all measured doses resulting from internal and external exposures received in a calendar year. Any unplanned internal or external exposure exceeding the Action Level, as defined in AECL's operating licence, is reported immediately to CNSC staff.

4.11 Safety of On-Site Drinking Water

An intervener questioned the quality of the CRL cafeteria water and also whether the water used for showering and washing at CRL is acceptable. Following is AECL's summary of initiatives underway to ensure the supply of water to AECL staff remains suitable.

4.11.1 Drinking Water

Bottled water is provided at various locations in each facility for drinking water at CRL since the existing service water does not meet with the current Drinking Water Quality regulations. Bottled water is replenished on a regular basis at all locations. The water coolers are cleaned and disinfected on a regular basis in accordance with an approved procedure.

Adequate signs are placed at washrooms sinks and other locations warning staff that the Service Water (i.e., tap water) should not be used for drinking.

Further, the site service water is chlorinated for disinfection and water quality is monitored on a regular basis with water quality tested by an outside-accredited testing laboratory for Total Coliform plus E. Coli. The results are reviewed by the CRL Senior Hygienist as these are received.

4.11.2 Cafeteria Water

The Water Treatment Plant was recently upgraded (in 2005) in the Cafeteria to conform to the latest Drinking Water Quality regulations. The water at the Cafeteria is monitored on a weekly basis for the following parameters: Total Coliform + E. Coli, Heterotrophic Plate Count, Turbidity + Colour + pH + Aluminum and Total and Free Chlorine Residual and Trihalomethanes. The results are reviewed by the CRL Senior Hygienist as these are received.

4.11.3 Water for Washing and Showering

Thirty-three buildings have a shower facility on the CRL site. Each building has individual water sand filter(s) to remove turbidity. This water does not meet with the latest Drinking Water Quality regulations. Accordingly, signs are posted at each shower facility warning staff that the shower water is not suitable for drinking.

The operating procedure ensures that the physical and biological qualities of water for domestic use are monitored and corrective actions, if necessary, are taken in accordance with the CRL Potable Water Quality Assurance Plan and consistent with the Guidelines for Canadian Drinking Water Quality.

4.11.4 General Comment

AECL has recently assessed options for the provision of potable water at CRL. A consultant was retained to prepare a plan for the provision of potable water.

The plan will be implemented in a phased approach since the implementation requires in-depth study and investigation of existing infrastructure, site facilities and business operations for safety considerations. Also, the option for procuring potable water requires final review and approval by AECL management.

4.12 Overall Safety of Building 250

A question was raised regarding whether the recent fire that took place in Building 250 had any effect on the state of the building.

There are no outstanding fire-related issues as a result of the recent fire in Building 250. All repairs to fire protection systems were completed and the systems put back into operation within 24 hours of the fire being extinguished.

Please refer to Chapter 5 for further information.

4.13 References

- [4-1] AECL, *Comprehensive Preliminary Decommissioning Plan for AECL's Chalk River Laboratories*, CPDP-01600-PDP-002, Revision 1, 2006 February (CMD 06-H9.1B).

CHAPTER 5 FIRE IN BUILDING 250

5.1 Introduction

This chapter relates to a fire, which occurred in Building 250 at CRL on 2006 May 04 involving an oxygen system within a fumehood. Information is presented with regard to the ongoing investigation and building recovery for Building 250. Furthermore, some specific information is provided on the use of oxygen systems at CRL.

There were no releases of radioactivity as a result of this event, which was addressed before the Commission members through Significant Development Report SDR 2006-4.

5.2 Description of Event

On 2006 May 04, an employee was working with the newly completed “trickle-bed/gas-phase recombiner test facility” in Lab 241, Building 250. At around 1:30 pm, the employee opened a manual valve on an oxygen line (stainless steel tubing 3/8” OD) to pressurize the line upstream of a high-pressure regulator. At this time, debris from the pressure regulator that was located approximately 15 cm downstream of the manual valve caused a laceration on the employee’s right wrist. Simultaneously, the employee noticed flames originating from the regulator and immediately retreated. The employee alerted co-workers who activated the fire alarm and called the AECL Emergency Line, then ran down to ground level outside of the building to shut off the oxygen gas supply, while the staff evacuated the building. The employee also isolated the hydrogen supply to other facilities within Lab 241 and bled off the hydrogen line outside to prevent hydrogen hazard during the fire. AECL’s Fire Department responded immediately and declared the fire extinguished by 2:30 pm.

A site-wide stay-in was declared as required under the Emergency Preparedness Program due to the possibility of radioactivity release as a result of the fire. The stay-in ended by about 3:30 pm. There were no releases of radioactivity as a result of this event.

5.3 Recovery and Investigation

The fire scene, Lab 241, is currently secured with a Hasp lock. During the recovery phase, access and Work Permits to Building 250 were by permission only. Yellow posters were installed at all entrances indicating that access to the building was controlled.

The insurance company sent a fire forensics engineer to conduct an assessment of the cause of the fire. AECL contracted an independent investigator to conduct a forensic examination of the fire scene and of the oxygen equipment involved in the fire.

The insurance adjuster contracted a firm specializing in electronic equipment restoration to conduct an assessment.

The adjuster also consulted a specialty fire restoration organization to assist and advise with the recovery efforts and development and implementation of a work plan to restore operations and repair damaged areas.

Following the fire, a radiological hazard review was conducted of the affected area of the building over a period of approximately two weeks. It was determined that there were no radiological releases or contamination as a result of the fire, however, all wastes removed from Building 250 were treated as suspect for contamination and therefore were categorized and placed in containers for storage. Any wet items (e.g., wet ceiling tiles, wet drywall) were sent to the Waste Treatment Centre for compaction and removal of water for treatment prior to appropriate storage.

The five fire sprinkler heads that went off as a result of the fire were placed back in service and declared operational. The standpipe hose outside Room 241 was replaced, re-racked and made ready for use. The fire alarm system in Building 250, with the exception of the Room 241 alarm, which was tagged out, was assessed and declared operating.

An industrial hygiene review was conducted to assess the following potential concerns:

- mould,
- presence of damaged asbestos insulation (pre-existing and as a result of water damage from the fire),
- biological contaminants above tiles (animal debris, remains),
- particulates (direct reading samples),
- odour, and
- safety concerns (damaged floor tiles, structural damage).

The following additional assessments were undertaken to ensure the safety of the building and appropriate measures to resolve findings were taken:

- electrical systems,
- mechanical systems (such as elevators, building ventilation systems, specialized piping),
- architectural systems (such as ceiling tile, drywall), and
- hydrogen alarm system.

On 2006 June 02, all labs, offices and common areas north of the central stairwell in Building 250 were re-opened. Normal operation of this section of the building was resumed. Since that time, several additional labs in the south section of the building, which suffered little or minor damage, have been cleaned and re-opened.

Restricted access to portions of Building 250 south wing remains in effect while work continues on cleaning and repairing damaged portions of the wing. Labs and offices in the south wing will be brought back into service as deemed safe and as cleaning and restoration efforts progress. All staff were reminded that personal safety comes first, and were cautioned to respect plastic barriers and posted instructions while restoration continues.

At the time of preparing this document, forensic evidence is not available to definitively pinpoint the cause of the event. However, the likely cause of the fire is considered to be adiabatic compression of oxygen at the pressure regulating valve to temperatures sufficient enough to ignite “fuel” to a fire. It is believed that a small amount of oil was present in the line, and there was a reaction of oxygen with hydrocarbon oil.

5.4 Use of Oxygen at CRL

After the Building 250 fire, the oxygen systems on site were quarantined and a check for adequacy of compatible components for oxygen systems were carried out. Currently, the use of oxygen on site must have Branch Manager approval until our investigation is completed and corrective actions have been incorporated. Components of the failed oxygen system were sent to an independent forensics laboratory for analysis and results are pending.

Industry operational experience (OPEX) has been reviewed and safety issues related to oxygen systems have been communicated to all employees via the company internal web. A review of external OPEX has provided valuable insight into the cause of the AECL event, and is being incorporated into the investigation. Recommendations from Ontario Power Generation fire experts who were brought in to do a preliminary analysis of the Building 250 fire have been acted upon and incorporated in the event investigation.

Other AECL facilities (Sheridan Park and Whiteshell) were notified and a review of their respective oxygen systems were carried out. The Nuclear Industry was notified via CANDU Owners Group (COG) immediately after the AECL event to alert others and in order to prevent a similar event at their facilities.

The final investigation report will address the programmatic issues and identify corrective actions to reduce the risk of a similar event occurring.

CHAPTER 6 OTHER SIGNIFICANT LICENSING MATTERS

6.1 Introduction

This chapter provides supplementary information on key developments at CRL since the CNSC Day One Public Hearing.

6.2 Building 204 Rod Bays

The Building 204 Rod Bays are situated adjacent to the permanently shutdown NRX Reactor building.

Work towards emptying the Building 204 Fuel Rod Storage and Handling Bays is progressing steadily and the actual pumping is expected to begin late 2006 June.

In preparation for the water removal, all the components were removed from the Building 204A bays and the bays are being vacuumed one final time. The vacuuming and other water cleanup equipment is being removed in final preparation for the water removal. The NRX “Chimney” has been cleaned up with high-pressure water and a seal has been installed to ensure NRX is properly isolated from the storage bays after the water has been removed. Following the installation of the seal, the make up water was shut off. Thus, at that point, the water level started to go down.

The pump to be used for the water removal has been positioned and the hoses connecting the bays to the active drain system via Building 200 have been pressure tested and dry fitted. Once the water removal has started, decommissioning staff will complete the cleaning of the Building 204B bays to prepare the bays for the next phase of the water removal. Drive points have been assembled and will be installed in the sand-filled bays to enable the removal of the pore water present in those bays.

In addition to the work leading to the drainage of the fuel storage and handling bays, preparatory work has begun to allow the creation of a fire separation between Building 204 and NRX. This will be done after the water has been drained from Building 204A. Bay covers, a new north wall for Building 204 and supports for the steam lines currently running through Building 204A are being designed. Services are being verified and prepared for relocation. Services that are no longer required will be abandoned and removed from the north end of the bays.

6.3 Environmental Stewardship Council – Terms of Reference

There was some discussion at the Day One Public Hearing regarding the establishment of an Environmental Stewardship Council with specific regard to its composition, terms of reference and the date of the first meeting of the council.

The terms of reference (Appendix A) and objectives (Appendix B) for the Environmental Stewardship Council remain in advanced draft form, until such time that the Council members have had an opportunity to review and discuss them. It is important to note that these drafts were developed to begin the dialogue and are for discussion purposes only.

The first meeting of this diverse association of interested parties is planned for 2006 July or early August, and further information will be provided to CNSC staff when available.

Invitations to attend have been issued (RSVP by 2006 June 16), and a professional facilitator has been contacted to meet with individual Council members to ensure impartiality. Each member's concerns will be presented at the first meeting as a way of initiating the discussion. Groups that have committed to participate on the Council are shown in Appendix A, and it is expected that additional community and interest groups will join the Council in the near future.

6.4 Safety Culture Initiative

The Safety Culture Initiative started in 2005 in the Nuclear Laboratories business unit and has had some notable positive results. Ninety-seven percent of Nuclear Laboratories staff have attended a half-day safety culture workshop led by their managers, which prompted participants to consider elements of safety culture within the nuclear industry and how these applied to their work. Feedback from participants was very positive, and appreciation for the fact that the managers were personally involved in conveying the messages was often expressed. The sessions resulted in a number of actions from each group designed to improve safety in their areas, which have largely been completed. Positive feedback about the workshop led to it being requested and run by managers in the Advanced CANDU Reactor and CANDU Services business units.

At the workshops, all participants completed a detailed safety culture survey, based on 60 key indicators of safety culture taken from the CNSC draft document *Guide to Licensee Self Assessment*. Approximately 600 of these surveys representing six facilities or groups have been processed, with profiles for each group being produced. This work will continue over the coming months and the profiles will be used as a baseline for comparison for a similar survey in 2008. A more comprehensive safety culture assessment process will also be developed, in collaboration with other nuclear partners.

A Human Performance Program is being established to further drive and sustain safe behaviours and mindsets throughout the organization. A set of Company-wide procedures on event free tools is in draft form, soon to be finalized and released. Managers, will provide an overview presentation to all staff over the summer months, explaining Human Performance and the benefits of event free tools. This will be followed by more comprehensive training in event free tools. All leaders in targeted facilities will also be required to take Observation and Coaching training, then follow the process for Occupational Development and Training tours and reporting findings. The Safety Culture and Human Performance branch will be integrating with OPEX to identify trends and opportunities for lessons learned and improvements in safety culture, as well as partnering closely with other operations and design and engineering groups to integrate efforts and ensure all needs are being met.

Appendix A: Terms of Reference for Environmental Stewardship Council

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DRAFT Terms of Reference

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Always refer to AECL's InfoNet for latest and OFFICIAL version.

ENVIRONMENTAL STEWARDSHIP COUNCIL

1. SCOPE

The management of Atomic Energy of Canada Limited (AECL) respects the communities' interests in and expectations of the operational activities of the Chalk River Laboratories. In this regard, and in keeping with our policy of transparent information sharing, AECL is establishing an Environmental Stewardship Council at Chalk River Laboratories, the function of which will be similar to that of utility-established Community Advisory Groups. The Council will provide more opportunities for face-to-face meetings and will build an enhanced working relationship through effective two-way dialogue. Council Members will be informed about and updated on activities that have an impact on their communities. Council Members will voice their opinions to management on these activities, and will be kept apprised of the company's proposed actions on issues that are raised.

This document defines the objectives and mandate of the Environmental Stewardship Council, the responsibilities of its Members, and the process for carrying out their duties.

The document includes the membership (as Appendix A). This appendix is updated as required by the Secretary.

2. OBJECTIVE

The objective of the Environmental Stewardship Council is to be recognized as the community's environmental leader by building a working relationship and creating opportunities for open dialogue between community stakeholders and AECL's Chalk River Laboratories.

3. MANDATE

The Environmental Stewardship Council aims to work cooperatively in order to:

- build an open, productive and positive working relationship;
- create opportunities for dialogue and feedback;
- openly discuss a broad range of topics of mutual interest to both AECL and the community;
- provide advice towards viable solutions in order to remediate and/or continually improve AECL's environmental and operational performance;
- recognize, respect and consider the interests of all parties;
- ensure that the wider community receives accurate and timely information about

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AECL's business and the Council's undertakings

- foster a relationship of continuous improvement with respect to sharing information with the public; and
- establish a framework for ongoing and consistent two-way interactions with community stakeholders to discuss AECL's business as it relates to environmental protection, as well as health and safety, economics and social effects as applicable.

4. MEETING FACILITATION

To ensure that the interests of the Council are served, without bias, AECL will contract the services of an experienced Facilitator to coordinate and advise on matters brought forward to the Environmental Stewardship Council. AECL will provide administrative personnel to support this process.

At the end of every fiscal year (March 31), Council Members will select a Facilitator for the next year.

5. MEETING PROCESS

5.1 Membership

Under the sponsorship of the Vice President of the Nuclear Laboratories, the Council will listen to concerns and seek advice from the Members. To ensure that the Council is representative of community opinion, membership will be as broad as possible, within the limits set by Council effectiveness.

Based on their desire to participate, Members of the Environmental Stewardship Council will generally be comprised of:

- four (4) Members from AECL including the Vice President of the Nuclear Laboratories; the Manager of Site and Community Affairs; the General Manager, Decommissioning and Waste Management; and the Senior Director, Nuclear Programs. Other staff will be invited as required;
- one (1) Member of the Algonquins of Pikwàkanagàn First Nations;
- one (1) Member representing the Upper Valley Chapter of Ducks Unlimited;
- one (1) Member representing the Concerned Citizens of Renfrew County;
- one (1) Member representing the Ottawa River Keeper;
- one (1) Member representing the Ottawa-Vanier Greens/Verts et Vertes d'Ottawa Vanier;
- six (6) Members appointed by local councils representing the United Townships of Head, Clara and Maria; the Town of Laurentian Hills; the Town of Deep River; the Town of Petawawa; the City of Pembroke and Les Muncipalitiés régionale de Comté de Pontiac.

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5.2 Changes in Membership

Organizations represented via the members of the Environmental Stewardship Council may request a change in their representation as required. The Council may also choose to add to or decrease the membership of the Council and can initiate any requested changes in membership.

Groups or individuals who wish to be represented on the Environmental Stewardship Council should make their request known through the Chair of the Environmental Stewardship Council (see Section 6.3). The Chair will bring the request forward to the Council for review and response. Should the Council decide not to elect a Chair, the request will come through the Facilitator.

A general review of membership will be conducted annually.

5.3 Attendance

In order to ensure that the interests of all parties are recognized and respected, it is imperative that Members attend all Environmental Stewardship Council meetings. If repeated absence occurs, and the ability of the group to successfully meet its mandate is impacted, the Member may be asked to resign from the Council.

5.4 Frequency of Meetings

The Environmental Stewardship Council will be expected to meet a minimum of four (4) times per year. Additional meetings will be held on an as needed basis.

The quorum required to hold a valid Council meeting is a majority of the Members.

6. ROLES AND RESPONSIBILITIES

6.1 AECL

AECL will:

- provide operating and scientific expertise from internal resources to support the work of the Council;
- participate in discussions in order to meet the objectives of the Council and to enable the development of viable solutions for the company;
- solicit feedback from the Council on the tone, objectivity and content of proposed communications;
- provide feedback on progress and decisions taken; and
- cover the contractual expenses for the Facilitator.

6.2 Facilitator

The Facilitator will:

- prepare the agenda for each meeting;

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- facilitate all meetings;
- facilitate contact between Council Members to ensure that expectations are met;
- provide assistance to presenters in order that presentation materials are understandable, free of industry jargon and in line with the needs of the Members;
- prepare reports, as applicable, with direction from Council Members (this would include, for instance, an annual report of progress);
- ensure all points of view given are appropriately reflected in the minutes of meeting; and
- work with the Council to maintain a plan. Key priorities should be identified and a timeline given for each issue proposed for discussion.

6.3 Chair

The Council will determine if a Chair is required. If the Council agrees to have a Chair, the Chair will be elected by Council Members and will act as the Council Spokesperson. The Chair is responsible for the overall direction of the Environmental Stewardship Council and for ensuring that the Terms of Reference are met.

6.4 Secretary

The Secretary will provide administrative support to the Facilitator and is responsible for organization of meetings including facility and logistical arrangements, issuing agenda, distributing minutes of meetings and providing progress reports as required.

6.5 Members

All Members of the Environmental Stewardship Council will be considered equals. Members will be expected to be active participants to ensure that their position or the position of the organization they represent is understood. Members will work toward providing advice and recommendations to the Vice President of the Nuclear Laboratories. On occasions when the advice and recommendations are not accepted, the Vice President of the Nuclear Laboratories will make the decision and will provide the Council with the reasons for his/her decisions.

The members will:

- respectfully represent their respective areas of expertise and/or roles in the community as it relates to the mandate outlined herein; and
- regularly communicate any relevant information to their stakeholders.

The Council must approve all public communications associated with Council business prior to release.

7. MINUTES OF MEETING

Broad-based discussions and recommendations will be reflected in the minutes of meeting. Comments made during discussion will not be attributed to a particular person or group

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unless specifically requested. The minutes provided will be a summarized version of the discussion and will show the full range of opinions voiced.

Minutes will be kept and approved by Council at the next meeting.

8. EXPENSE REIMBURSEMENT

Council membership is voluntary; members will not be reimbursed for time spent working on Council activities. However, AECL will reimburse reasonable travel and out-of-pocket expenses incurred as a result of attending meetings of the Council. These expenses will be paid in accordance with AECL's reimbursement guidelines.

9. CONFIDENTIALITY

In order to protect AECL's business position and its technology, there may be times certain information will be considered confidential. At those times, AECL will be required to specify what audiences should be allowed to receive the information and for what length of time the information must remain confidential. Council Members will be allowed to decide whether they wish to receive the information or, alternatively, choose to withdraw. If they decide to receive the information, they will be required to respect the confidentiality of the information for the length of time indicated. Meetings where confidential information will be presented or discussed will be in camera.

10. CONFLICT OF INTEREST

Members are required to identify all issues with which they may have a conflict of interest. The Environmental Stewardship Council will then have responsibility for reviewing these issues and deciding whether a conflict exists and the Member should be excused from the discussion.

In addition all Members must disclose any donations, grants and contracts they may receive from AECL, whether they are received personally or via the organization they represent.

11. APPENDIX

A. Environmental Stewardship Council Membership

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Appendix A**Environmental Stewardship Council Membership**

(As of 2006 June)

Based on their desire to participate, the Environmental Stewardship Council will be generally comprise:

Role	Title	Name
Facilitator	To be confirmed	
Chair	To be elected by Council	
Secretary	To be confirmed	
Member	Vice President, Nuclear Laboratories, AECL	B.E. (Brian) McGee
Member	Manager, Site and Community Affairs, AECL	Donna Roach
Member	General Manager, Decommissioning and Waste Management, AECL	W.C.H. (Bill) Kupferschmidt
Member	Senior Director, Nuclear Programs, AECL	Jean-Pierre Létourneau
Member	Algonquins of Pikwàkanagàn First Nations	
Member	Upper Valley Chapter of Ducks Unlimited	
Member	Concerned Citizens of Renfrew County	
Member	Ottawa River Keeper	
Member	Ottawa-Vanier Greens/Verts et Vertes d'Ottawa Vanier	
Member	United Townships of Head, Clara and Maria	
Member	The Town of Laurentian Hills	
Member	The Town of Deep River	
Member	The Town of Petawawa	
Member	The City of Pembroke	
Member	Les Municipalités régionale de Comté de Pontiac	

Appendix B: Environmental Stewardship Council Objectives

DRAFT (for Council discussion/ approval)

Environmental Stewardship Council AECL - Chalk River Laboratories

Objectives

The objective of the Environmental Stewardship Council is to be recognized as the community's environmental leader by building a working relationship and creating opportunities for open dialogue between community stakeholders and Atomic Energy of Canada Limited's (AECL) Chalk River Laboratories.

The Environmental Stewardship Council aims to work cooperatively in order to:

- build an open, productive and positive working relationship;
- create opportunities for dialogue and feedback;
- openly discuss a broad range of topics of mutual interest to both the community and AECL;
- provide advice towards viable solutions in order to remediate and/or continually improve AECL's environmental and operational performance;
- recognize, respect and consider the interests of all parties;
- ensure that the wider community receives accurate and timely information about AECL's business and the Council's undertakings;
- foster a relationship of continuous improvement with respect to the sharing information with the public; and
- establish a framework for ongoing and consistent two-way interactions with community stakeholders to discuss AECL's business as it relates to environmental protection, as well as health and safety, economics and social effects as applicable.

Appendix C: Chalk River Laboratories Environmental Performance

Chalk River Laboratories' Environmental Performance 2006 June

As an ISO 9001:2000 Quality Management Systems and ISO 14001:2004 Environmental Management Systems registered organization, AECL is committed to both studying and continuously improving the low impact of our operations on the environment. We maintain a comprehensive effluent and environmental monitoring program of more than 400 sampling locations with approximately 30,000 analyses performed each year at our Chalk River Laboratories (CRL). Monitoring is regularly conducted on various media, including ambient air, surface waters, vegetation, soil and sediments, and game animals, at various [locations](#) on and off the site.

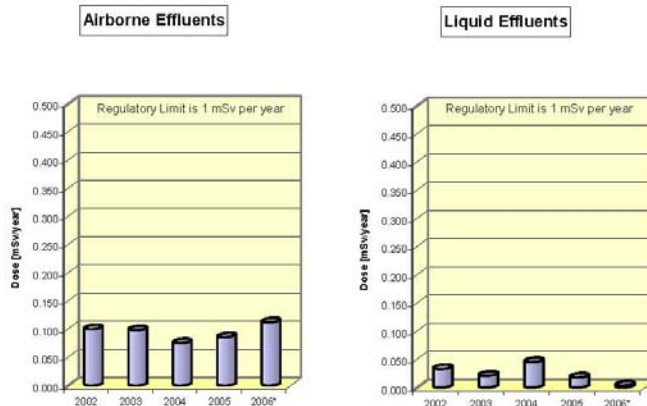
Airborne and liquid emissions as well as the results of our environmental monitoring program are regularly submitted to the Canadian Nuclear Safety Commission (CNSC) as confirmation that we are operating safely. This information is also available to the public through our website, upon request and through other community relations initiatives. Click here for the most recent report [AECL Annual Environmental Performance Report](#).

Radiation Exposures to the Public (total maximum allowable limit = 1 mSv/year)

The dose of radiation is expressed as *millisieverts (mSv)*, an internationally accepted unit for measuring radiation and its biological effects.

Total radiation exposure is calculated to identify the maximum possible radiation exposure that a person living at the Chalk River Laboratories boundary would receive if they constantly breathed the air, drank the water and ate the fish from the site. The actual exposure to neighboring communities is considerably less than the limit and decreases rapidly with distance from the site. The CNSC regulatory public limit excludes exposures from natural background and medical applications.

Typically, Canadians receive between 2 and 4 mSv per year from a number of sources shown below.



*Data for 2006 are estimated from the average of weekly release monitoring data to date, not environmental impact monitoring data, and thus represent a predicted annual dose. The actual annual dose may be lower or higher than shown.

Comparison of Radiation Sources

Source	Amount Per Year
Inside the Body (air—radon)	2
Inside the Body (food and water)	0.40
Earth's Crust (sea level)	0.23
Outer Space [Cosmic Rays] (5,000-6,000 ft)	0.55
Outer Space [Cosmic Rays] (sea level)	0.26
Medical X-Ray	0.40
Living in stone, brick, or concrete building	0.07
Airline Flight (round-trip cross-country)	0.05
Airline Flight (per 1,000 miles flown)	0.01
Watching TV	0.01–0.02
Computer terminal	0.001
Luminous Wristwatch	0.0006
Coal-Fired Power Plant (living within 50 miles)	0.0003
Nuclear Power Plant (living within 50 miles)	0.00009
Smoke Detector	0.00008

Sources: National Council on Radiation Protection & Measurements (NCRP), U.S. Environmental Protection Agency (EPA) and Nuclear Energy Institute (NEI)

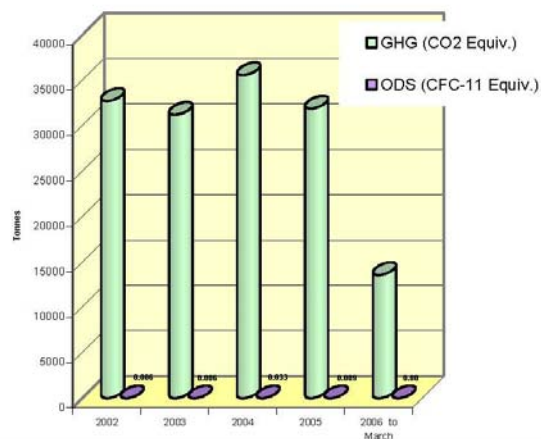
Non-Radiological Emissions

Greenhouse Gas (GHG) emissions from CRL include carbon dioxide (CO₂), methane, nitrous oxide, hydrofluorocarbons (HFCs), chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) and halons. Emissions, measured in CO₂ Equivalent, primarily result from combustion of oil and propane for onsite heating. Other small contributions result from leaks of halocarbons from air conditioning, cooling equipment, and some research uses.

Emissions of Ozone Depleting Substances (ODSs), measured in CFC-11 Equivalent, include releases of CFCs, HCFCs, and halons (which are also included in GHG emissions).

There have been no releases of these substances to date in 2006. AECL is working hard to find replacement substances for halons and CFCs, the two ODSs currently being phased out by Environment Canada.

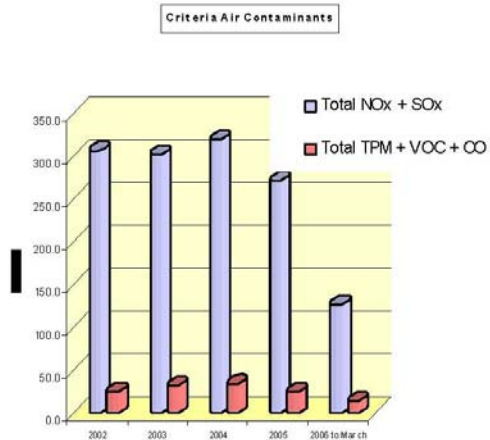
Greenhouse Gas and Ozone Depleting Substance Emissions



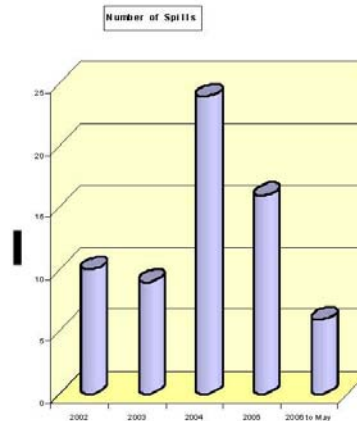
CO₂ Equivalent: A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). For example, the GWP for methane is 24.5. This means that emissions of one million metric tons of methane are equivalent to emissions of 24.5 million metric tons of carbon dioxide. *Source: US Environmental Protection Agency*

CFC-11 Equivalent: A metric measure used to compare the emissions from various ozone depleting substances based on their ozone-depleting potential expressed in amounts equivalent to that of CFC-11.

AECL reports annually to the [National Pollutant Release Inventory \(NPRI\)](#) as required under the Canadian Environmental Protection Act (CEPA). Criteria Air Contaminants released include Carbon Monoxide (CO), oxides of nitrogen and sulphur (NOx and SOx), Total Particulate Matter (TPM), and Volatile Organic Compounds (VOCs). Releases are calculated from fuel consumption data using recommended emission factors.

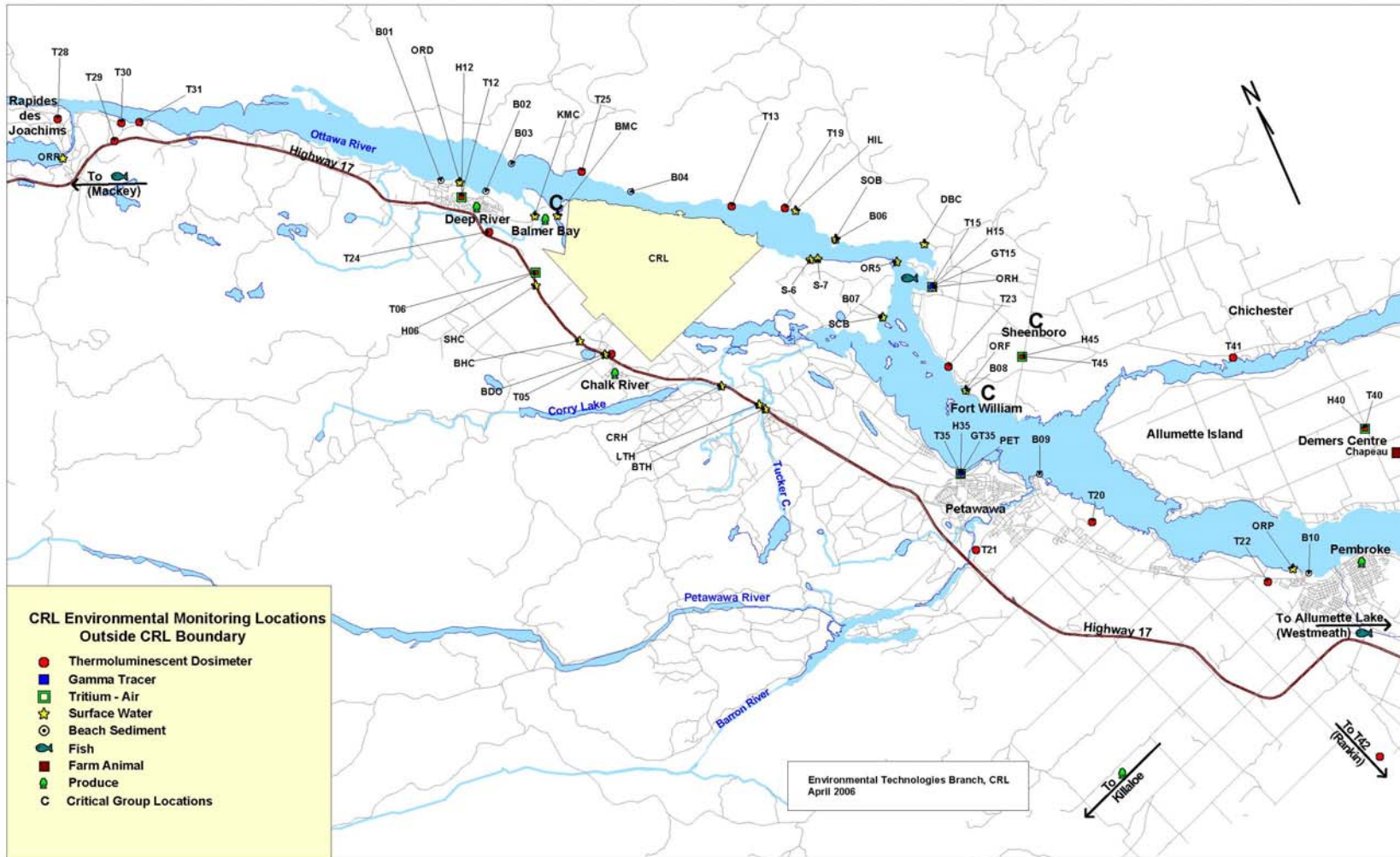


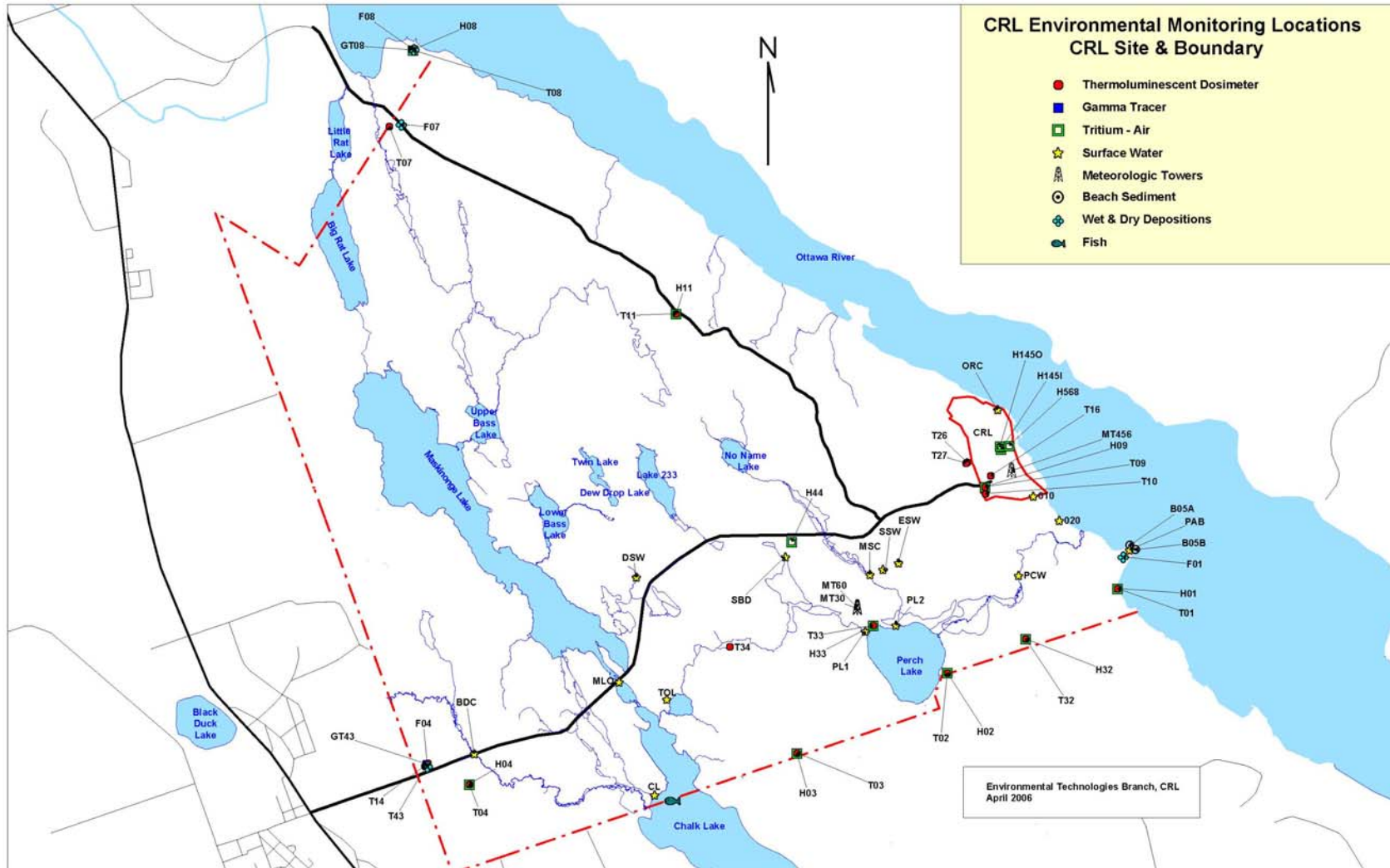
The number of spills includes Halocarbon Releases (as reported to Environment Canada under the Federal Halocarbon Regulations) and on-ground spills at CRL.



As part of continual improvement efforts, we recently conducted an Ecological Effects Review of the CRL. The [Ecological Effects Review](#) is a lower-tier ecological risk assessment, the objective of which was to quantify, using available data, the potential effects of operations and activities at the site, including effects on and off the site.

To ensure independent verification of our monitoring results, we contracted Laval University to conduct a [Radiological Environmental Survey outside the Chalk River Laboratories Site](#).





Appendix D: Chalk River Laboratories Employee Safety Performance

Chalk River Laboratories' Employee Safety Performance

AECL's [Health and Safety Policy #00-009](#) commits AECL to limit exposures to radioactive materials to ensure that doses are kept below regulatory limits and are as low as reasonably achievable, taking into account social and economic factors (the ALARA principle).

AECL has an extensive dosimetry monitoring program to measure the dose to AECL's employees, contractors and visitors. This program meets the regulatory standard S-106 and is licenced by the Canadian Nuclear Safety Commission (CNSC). Dosimetry results are regularly submitted to the Canadian Nuclear Safety Commission (CNSC) as confirmation that we are operating safely. This information is also available to the public through our website, upon request and through other community relations initiatives.

Click here for the most recent report [Health and Safety Performance Report](#).

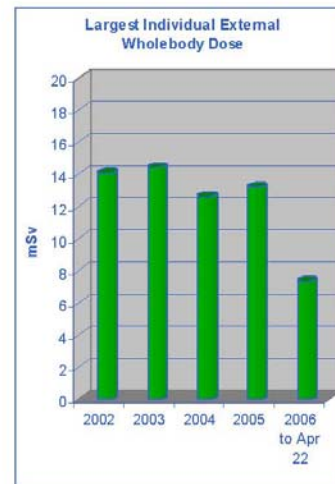
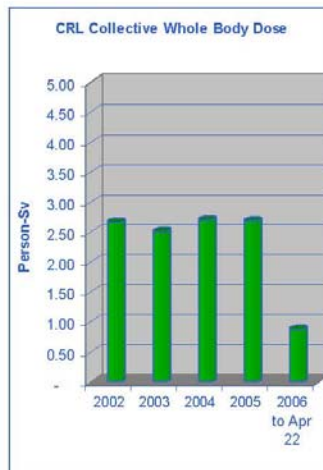
Radiation Dose Experience at CRL

The dose of radiation is expressed as *millisieverts (mSv)*, an internationally accepted unit for measuring radiation and its biological effects.

The CNSC regulatory limit of wholebody dose for a Nuclear Energy Worker is **50 mSv per year and 100 mSv in a 5-year period**.

Typically, Canadians receive between 2 and 4 mSv per year from a number of sources shown in the following link:
[Comparison of Radiation Sources](#)
[link to table on Env web-page]

Over the past five years, doses to Chalk River workers have shown a consistent trend of being well below regulatory limits. This is expected to continue in 2006 even with a projected rise in collective doses to workers due to the increase in the number of staff working at the site and because of the initiation of various decommissioning and other site-related projects.



*Data for 2006 to date. Employees' personal dosimetry badges are regularly read and processed every four weeks.

Conventional (Occupational) Safety Performance at AECL

AECL is committed to protecting our employees, contractors working at all sites and visitors from hazardous conditions, accidents and injuries in the workplace. AECL, as a federal Crown corporation, complies with the requirements of the Canada Labour Code Part II and of the Canada Occupational Health and Safety (COHS) Regulations made under the Code.

AECL maintains several measures of safety performance. The two shown here are "frequency", defined as the number of injuries to AECL employees resulting in a recordable lost time per 200,000 person-hours worked, and "severity", defined as the number of lost workdays per 200,000 person-hours worked. The typical frequency and severity for the average industry in North America is approximately 1.5 and 35 respectively.

AECL's joint employee/management Site Safety and Health Committees are committed to addressing safety concerns and improving our safety performance at our various sites.

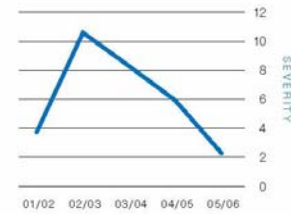
AECL's 2005-2006 Safety Performance Record

AECL's drive toward industry best practices continues to be reflected in the ongoing reduction in the frequency and severity of our lost time injuries. Our FY 2005 - 2006 frequency and severity rate reduction targets (15% less than average of previous 2 years) were achieved. The launch of a new Safety Culture initiative in early 2005, including awareness training in the areas of human performance and error-free tools, contributed to our continuing performance improvements.

Safety Performance Frequency



Safety Performance Severity



Frequency = Number of Recordable Lost Time Injuries (RLTI) per 200,000 person-hours of exposure.
Severity = Number of work days lost as a result of RLTI per 200,000 person-hours of exposure.