

LICENSING OF WASTE REMEDIATION PROJECTS AT CRL: AECL's APPROACH AND EXPERIENCE

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ABSTRACT

AECL is executing a number of waste remediation projects that require regulatory approval at its Chalk River Laboratories (CRL) research site. This site has been in operation since 1946, and the purpose of the projects is to address legacy liabilities. The current set of projects varies from modest scale feasibility studies to construction of buildings and structures containing substantial nuclear processes. An internal AECL client organization oversees the projects to ensure they are completed in a timely fashion within the approved funding envelope. Most of the projects require regulatory approvals from the Canadian Nuclear Safety Commission (CNSC). A key aspect of timely project execution is the predictability of CNSC licensing reviews and approvals. AECL has been developing a regulatory certainty process to support the project management of these projects. This paper describes this trial process and the licensing experience with one of the larger projects.

1. INTRODUCTION

The CRL site has been in operation for about 60 years, and has various nuclear facilities and laboratories used for nuclear power research and the production of medical and industrial radioisotopes. The site has accumulated radioactive wastes from these operations and several of the nuclear facilities are redundant due to changing research and development needs. The waste remediation projects address the liabilities from older waste storage structures and redundant facilities.

The projects are executed within the framework of CRL's existing operating licence. This licence, referred to as a Nuclear Research and Test Establishment Operating Licence, addresses the wide variety of facilities and activities on the site. It covers 14 operating nuclear facilities, six permanently shutdown facilities, and over 80 radioisotope laboratories. Many of the projects can be licensed as modifications to one or more of the existing facilities. This can result in a logistically simpler approval process than licensing the projects as new nuclear facilities. The project can be authorized by a single licence amendment rather than the three separate licences needed for a new nuclear facility.

Another important aspect of the CRL Operating Licence is that it imposes many pre-defined requirements on the projects through Health, Safety, Security and Environmental compliance programs. A benefit of these programs from the licensing perspective is that CNSC licensing reviews of projects tend to focus on aspects that are not already addressed by these programs. As a result, the scope of the CNSC licensing reviews may be reduced in comparison to 'greenfield' projects where there is no pre-existing licence or a narrower scope of licensee programs.

The CNSC licensing reviews that do take place often involve subject areas where there are few prescribed regulatory criteria for obtaining approvals. There are so few projects of these types that the CNSC has not developed specific regulatory guidance. This leaves the project proponents with considerable uncertainty over the technical basis that will be applied to regulatory decisions. The absence of directly relevant precedents and specific regulatory guides contribute to regulatory uncertainties being considered a major project execution risk.

The licensing approach is to establish a predictable regulatory framework, and establish communications and management mechanisms to oversee and control the schedule for key activities. This approach has been developed into a regulatory certainty process described in the remainder of this paper.

2. THE REGULATORY CERTAINTY PROCESS

The regulatory certainty process involves engaging the CNSC early in a project to progressively define the approval steps and criteria that are expected to be applied in licensing. It also involves up-front planning and scheduling of regulatory reviews so that they can be synchronized with other project activities such as conceptual design and safety analysis. Internal systems are put in place to ensure the projects follow through on commitments made during interactions with the CNSC. This provides predictability for both the project and the regulator.

The concepts of regulatory certainty evolved out of AECL's planning for new Class IB nuclear facilities for waste remediation. These are non-reactor Nuclear Facilities under the Class I Nuclear Facilities Regulations. The facilities have few directly applicable licensing precedents. The existing CNSC and regulatory guides that would apply are typically general engineering and radiological hazard guides.

The regulatory certainty process reduces the constraints of the regulatory approval process by securing feedback from the CNSC that can be used to reduce project risk without impacting on the ultimate licensing decision.

Basic Elements of Regulatory Certainty

The regulatory certainty process consists of the following basic elements:

- 1. Identification of regulatory aspects and risks in the business case:** An accurate assessment of regulatory approvals, submissions and risks at the outset of a project is very important. If incorrect assumptions are made regarding regulatory matters, the project can head off in the wrong direction and correct its path only when clear evidence becomes available that the assumptions are incorrect. AECL has experience with a number of nuclear facility projects over the last ten years that can be used as input to assessing regulatory aspects and risks. However, past experience needs to be combined with knowledge of changes in legislation, regulations and regulatory standards and practices to evaluate current requirements and risks.
- 2. Early engagement of the CNSC in planning approvals:** Once a project is officially launched, it is important to engage the regulator early on to identify the regulatory approvals required and the information that the licensee must submit in support of these approvals. This information can then be entered into the work plans for the project to ensure that information is

produced on the required timescale and that project activities are scheduled around the required approvals. Conceptual information is often sufficient for these early planning activities, even though more specific analysis, design, and operational information is needed for the regulatory approvals.

3. **Proactive communication on potentially contentious issues:** Some regulatory issues can become difficult to resolve due to misunderstandings and incomplete information transfer. It is important to recognize areas of regulatory interest early on and have a forum to discuss issues so that information of interest to the regulator is communicated with the appropriate context.
4. **Careful follow-through on commitments:** When a conclusion is reached with the regulator on an acceptable submission, it is important to have a system to carefully track and follow through on commitments. Commitments are often made during conceptual design when the final configuration has not been defined. The detailed implementation may change the implications of commitments or make them apparently obsolete. Under such circumstances, it is important to clarify commitments and obtain the necessary re-interpretation with the involvement of the regulator.

These basic elements of regulatory certainty are being applied to waste remediation projects involving the following types of licensing actions and approvals:

- **New nuclear facilities requiring licences for site preparation, construction and operation** – A liquid waste solidification plant is an example of such a project.
- **Nuclear facility modifications requiring a licence amendment** – The construction of a new liquid waste storage system for high- and intermediate-level liquid waste that is part of an existing facility is an example of such a modification.
- **Nuclear facility modifications requiring CNSC staff approval** – Non-routine transfer of waste requiring safety-significant changes to a listed nuclear facility is an example of such a modification.
- **Nuclear facility modifications that can be approved by designated persons within AECL** – A change to process instrumentation in the low-level radioactive liquid waste treatment centre that is not safety-significant is an example of such a modification.

The regulatory certainty interactions with the CNSC have been developed most extensively for nuclear facility modifications requiring a licence amendment. These modifications may vary substantially in scale. In their simplest form, they involve new licensed activities that entail limited or no change to equipment and modest changes to operating procedures. At the other end of the scale, they may involve substantial new construction and activities such as a new waste management area and storage facility. The Project-CNSC regulatory certainty interactions for larger scale modifications are illustrated in Appendix 1 and described as follows.

a. Pre-project discussions

These discussions are aimed at getting CNSC staff feedback on the likely approvals and submissions prior to project launch. The objective is to secure information to substantiate regulatory assumptions in the business case and perform business risk analysis.

b. Letter of Notification

The letter of notification advises CNSC of an AECL management intent to proceed with a project having a defined scope and schedule. The letter of notification formally requests a determination of the CNSC approvals required for the project and includes a project

description and schedule. The CNSC also make a determination of the application of the Canadian Environmental Assessment Act based on the project description.

c. Environmental Assessment (EA) Guidelines

If the CNSC determines that an environmental assessment is required, they will prepare environmental assessment guidelines. These guidelines are a CNSC activity that contributes to regulatory certainty by providing a roadmap to be used by AECL in preparing the Environmental Assessment Study.

d. Licensing Basis Document (LBD)

The LBD defines how the project will comply with the conditions of the CRL Operating licence. It also identifies the codes and standards and CNSC regulatory documents that apply to the project and the basic approach to ensuring safety. AECL requests that CNSC staff review the LBD and advise on its completeness.

e. Reference Concept

A reference concept report describes the project in sufficient detail for CNSC staff to determine what specialist groups will need to review the project and the scope and extent of their reviews. AECL requests that CNSC staff identify the information needed in the licence application for these reviews.

f. Licensing Criteria Meetings

The licensing criteria meetings allow AECL to get a specific definition of the scope and detail of information needed in the licence and approval applications. The results of the meetings are documented in meeting records and follow-up letters. These correspondences allow AECL to focus its efforts in preparing the correct information needed for licensing submissions.

g. Licence and Approval Applications

At this stage, the regulatory certainty interactions are complete and AECL proceeds to make applications based on all of the prior knowledge gained during these interactions. When the CNSC has determined that an environmental assessment is required, the application is accompanied or preceded by an environmental assessment study submission. The regulatory certainty interactions help to familiarize CNSC staff with the projects, and define the requirements and criteria for the licence application in considerable depth. The licensing issues associated with securing the approvals are expected to be relatively straightforward and more easily resolved, given the preceding regulatory certainty work.

3. LICENSING EXPERIENCE WITH THE LIQUID WASTE TRANSFER AND STORAGE PROJECT

The Liquid Waste Transfer & Storage (LWTS) Project involves the construction of a storage tank building for storing high- and intermediate-level radioactive liquid wastes. The project also involves the transfer of wastes from 21 existing tanks to the new building, where the wastes will be consolidated, conditioned, and stored. The new building contains three large (200 to 300 m³) storage tanks, two that will contain waste and a spare provided to address the unlikely event of a tank failing. Smaller receiving and holding tanks are provided to support the waste receiving and consolidation process. A conceptual illustration of the project is shown in Figure 1.



Figure 1: Conceptual Illustration of LWTS Project

The waste will be transferred to the new waste storage system using temporary aboveground pipelines and a cask and liner on a truck trailer. The waste transport by truck trailer is on roads within the CRL property. One of the wastes is currently subject to frequent monitoring and control for criticality safety. This waste will be conditioned with low uranium-235 isotopic content uranyl nitrate solution to reduce the monitoring requirements and simplify future solidification of the waste. Also, caustic Cobalt-60 solution waste will be conditioned with acid to make it compatible with the other waste types.

The two storage tanks in the new storage system will segregate the wastes based on specific radioactivity, uranium enrichment, acidity and mercury content. One tank will contain highly acidic, slightly enriched uranium solution. This tank will contain most of the radioactivity and the mercury. This tank will not contain any solids. The other tank will contain moderately acidic waste with low mercury contents. The uranium enrichment is expected to be near natural. This tank may contain some solids.

An amendment to the CRL Operating Licence is required to construct the new liquid waste storage building. CNSC approvals are expected to be required for modification of one of the existing tanks and transfer of the waste to the new building. Other CNSC approvals may be required, depending on the modifications needed for the existing tanks and changes to operation.

A letter of notification for the LWTS Project was issued to the CNSC in June of 2003. The environmental assessment and regulatory certainty activities leading up to the waste storage building construction approval application are well advanced. The remainder of this paper will review the experience to-date with the regulatory certainty activities on the project.

The description of the regulatory certainty experience is organized into the basic elements described earlier in this paper. The regulatory interactions and associated schedule are illustrated in Appendix 1.

Identification of Regulatory Aspects and Risks in the LWTS Business Case

Prior to launching the LWTS Project, there was a comprehensive evaluation of project risks including an assessment of their potential impact on project cost, completion date, and mission. Regulatory risk was one of the most significant risks identified. While various mechanisms were identified for this risk to materialize, the risks were generally in the form of uncertainties in the time required to obtain project licensing approvals. The impact of schedule uncertainties was greatest when the approval was on the project critical path and a large number of staff were working on the project at the time. In this situation, a lag in the regulatory approval has at least a one-to-one impact on the project completion date, and the cost impact is high if staff cannot be re-allocated or demobilized.

The regulatory schedule impact could be magnified further if AECL had agreements in place with contractors that implied a given project schedule, and contractors sought damages for delays to their work. This was a particular concern since AECL is pursuing turn-key contracts for major elements of this project.

AECL engaged the CNSC staff in discussions prior to issuing the Letter of Notification with the aim of obtaining information to improve the accuracy of the estimate of regulatory related costs and reduce the value of regulatory risk. Key questions that AECL wished to have answered:

- What types of licences / approvals would be required from the CNSC?
- How many approvals would be needed?
- At what level would the approvals be granted, CNSC Commission or Designated Officer?
- Would an environmental assessment be needed, and if yes, its type and scope?

Meetings were held with CNSC staff to gain insight into these issues. The CNSC staff provided sufficient information on the regulatory rationale to allow AECL staff to conclude the likely outcome. In particular, the discussions enabled AECL to conclude that:

- The new storage tank building would likely require an amendment to the CRL Operating Licence.
- CNSC approvals would likely be required for construction and operation.
- An environmental assessment would be required and it would likely be a screening under the Canadian Environmental Assessment Act (CEAA).
- The length of time to conduct the environmental assessment, including all aspects leading up to a decision, would be approximately two years.

This information allowed AECL to refine the cost estimate and schedule for the project, and reduce the probability and value of the financial allocation for regulatory risks.

Experience to-date on the project is that the above assumptions have either been confirmed to be correct, or are on track to be confirmed to be correct.

Early Engagement of the Regulator in Planning LWTS Approvals

The LWTS Letter of Notification formally launched the regulatory process for the LWTS Project and initiated discussions on planning the regulatory approvals. Two of the first objectives were to confirm the regulatory approval and environmental assessment requirements. The Letter of Notification included a specific request on these topics.

AECL received written replies on these two points. Ten weeks after the Letter of Notification was issued, AECL was advised that an Environmental Screening would be required pursuant to the CEAA. Five months after the letter was issued, AECL was advised that the approval for the environmental assessment and the construction and operation of the LWTS Project was expected to be decided by a Designated Officer of the CNSC. The above-mentioned durations were not out of line with AECL's expectations.

AECL was concerned about uncertainties in the schedule for the environmental assessment and discussed this issue with CNSC staff. As a result, CNSC staff developed a detailed listing of their activities and interactions with AECL, and provided a letter with target timeframes for each CNSC task. The experience to date is that the target time frames have been mostly met except for the CNSC and Federal Authorities review of AECL's Environmental Assessment Study. This review is longer than we had anticipated, based on target frames.

AECL made a presentation to CNSC staff to introduce them to the project and the conceptual design before the reviews of technical documents commenced. This presentation was attended by CNSC specialist groups and appeared to be particularly helpful in giving them an overall understanding of the project. As a result, few written comments were received during licensing reviews that were attributed to any misunderstanding of the project.

Proactive Communication on Potentially Contentious Issues

AECL solicited feedback on regulatory issues by submitting a Licensing Basis Document and Reference Concept Report for the LWTS Project to the CNSC staff for review.

The CNSC review of the licensing basis document resulted in clarification of how the CRL licence conditions applied to the project and several issues affecting the technical basis of the project. The comments relating to the technical basis covered hazards affecting site selection and design, and the training requirements for drivers of vehicles used to move the waste.

CNSC staff review of the Reference Concept report resulted in the identification of seven topic areas where AECL was requested to provide further details in future licensing submissions. Five of these were straightforward whereas the remaining two, nuclear criticality safety and structural integrity, were more complex. For the latter two topics, AECL requested meetings with CNSC staff where the information required in the approval application and the review criteria were clarified. The meetings were particularly helpful in revealing a CNSC staff interest in the topic of standards.

To facilitate the environmental assessment review and approvals, CNSC specialist reviewers and Federal Authority staff accepted an AECL invitation to visit the CRL site. During the visit, they viewed the existing storage facilities and the proposed location of the new facility, and received a presentation on the project and Environmental Assessment study. The visit provided an opportunity for AECL to receive some informal comments and suggestions. The comments were answered at the meeting, and the text of parts of the draft Environmental Assessment study were modified to better cover the reviewers' areas of interest and questions. The site visit helped build an appreciation for the project amongst reviewers, and allowed AECL an opportunity to adjust the Environmental Assessment in a more efficient fashion than is possible with the formal review process.

AECL is currently assembling the approval application for construction of the waste storage system incorporating the information requested by the CNSC staff in the previous 18 months of regulatory certainty interactions. It is expected to be submitted in 2005 September.

To date, the regulatory aspects of the LWTS Project have been communicated clearly on a timely basis. The only licensing 'surprise issues' were the requirements for stakeholder input to the Valued Ecosystem Components used in the environmental assessment and the approach to presenting nuclear criticality safety information at the design stage. In both of these areas, the LWTS Project followed an approach that had been found acceptable to the CNSC in previous environmental assessments and licensing submissions. AECL needed to develop new approaches to these topics when CNSC staff indicated that they had new expectations in these areas. These issues were identified relatively early in the licensing process through the proactive communications in the regulatory certainty phase, and have not impacted the overall project schedule. This experience is now being applied to projects following the LWTS Project.

Careful Follow-Through on Commitments

The LWTS Project uses an established AECL system to track and follow through on commitments made in writing to the CNSC. This database system, the Actions & Issues Management System (AIMS), is operated by AECL's licensing single point of contact office. All commitments are recorded, and the database administrator follows up with the project until the actions are closed.

In addition to the use of the AIMS for tracking commitments recorded in licensing correspondence, the waste remediation projects organization maintains a database of safety features and controls that track the implementation of design, construction and operational safety controls throughout the life-cycle of a project. This database helps to ensure that features described in licensing and safety analysis documentation are verified at appropriate stages of the project. The database currently contains over 100 entries for the LWTS Project.

4. CONCLUSIONS AND RECOMMENDATIONS

Regulatory certainty is contributing to the predictability of waste remediation projects by avoiding major regulatory surprises during project execution. While no major licensing disruptions have been encountered, improvements in project efficiency would be gained by minimizing the minor disruptions. Two areas where improvements may be gained are:

- Licensee detection and analysis of emerging regulatory trends that are resulting in previously acceptable approaches being no longer accepted; and
- Protocols for responding to missed target dates for completion of regulatory reviews.

While AECL has a system for internal sharing of information on new regulatory developments, a new regulatory trend is sometimes only apparent after an AECL project has been delayed during the licensing process. More extensive analysis of industry-wide experience might help to identify licensing issues encountered by other licensees that can be applied to waste remediation projects. CNSC staff communication of new licensing expectations at the outset of a project would also help avoid project delays.

While many regulatory activities on waste remediation projects have been completed within pre-established timeframes, there have been a few activities that are substantially delayed. The environmental assessment process is particularly problematic for controlling / limiting delays due to the multiple organizations involved (CNSC and various federal departments). Improved protocols are needed to respond to delays once target dates for regulatory reviews are missed. The CNSC Project Officer is the prime point of contact for communication, but resolution of delays often appears to be beyond the direct control of the Project Officer.

APPENDIX 1: Regulatory Certainty Interactions for the LWTS Project

