PROTECTION OF HEALTH, SAFETY AND ENVIRONMENT DURING POINT LEPREAU REFURBISHMENT

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Summary

On July 29, 2005 Premier Bernard Lord announced that the Province of New Brunswick will proceed with the refurbishment of Point Lepreau Generating Station with Atomic Energy of Canada Limited (AECL) as the general contractor. The work involves:

- the completion of the detailed planning, engineering and procurement work that has been underway since the year 2000,
- the construction of waste storage structures at the Solid Radioactive Waste Storage Facility in 2006,
- the establishment of temporary facilities to support the outage, and
- the maintenance outage itself which is scheduled to run from April 2008 through to September 2009.

The major activity during the outage would be the replacement of all three hundred and eighty Fuel Channels, Calandria Tubes and connecting feeder pipes. This activity is referred to as ***Retube***. NB Power Nuclear would also take advantage of this outage to conduct a number of additional repairs, replacements, inspections and upgrades. These collective activities are referred to as ***Refurbishment***. This would allow the station to operate for an additional 25 to 30 years.

A key component of the planning and execution of the outage is the consideration and planning required to ensure the protection of health, safety and environment (HSE). This paper provides a high level overview of the steps being taken to achieve the required protection.

Overview

The environmental approvals for the project [Ref] were based in part on the fact that the existing HSE programs would continue and be the basis for work undertaken during the outage. In particular, work during the outage will be conducted under Point Lepreau Generating Station's processes related to radiation protection, conventional safety, emergency preparedness, environmental management, safeguards, security, etc. This ensures consistency with the licence requirements, and is also a key component of the application for renewal of the licence.

However, as part of the planning process, a systematic review of project activities is being undertaken to ensure that any unique hazards associated with the outage work are identified and, where necessary, existing processes, procedures and training will be augmented to ensure the protection of the public, the workers, and the environment. The focus is on the unique hazards introduced by the outage, since the existing station processes and procedures address those hazards (either conventional or nuclear) associated with outages. In particular, many of the individual activities being undertaken as part of the outage are not unique – for example, the station and the industry has lots of experience (and hence procedures) in replacing feeders, fuel channels, working on the moderator etc. One of the key objectives is therefore to augment the existing procedures to address unique HSE issues associated with this particular outage. The following sections describe key components of the Project approach to protection of HSE.

Organization

With regard to the organizational framework for HSE, the responsibilities and expectations have been identified in high level documentation for the project. At the highest level, since NB Power Nuclear is the licensee, AECL is required to abide by all applicable existing station requirements for HSE, in terms of both radiation protection and conventional health and safety and environment. These expectations are reflected in NB Power's Project Execution Plan and Project Quality Assurance Plan, while at the station level, these expectations are detailed in existing Station documentation.

Since AECL is the designer for modifications related to the project, and will be managing the outage, AECL have translated these expectations into its own high level documentation. Specifically, the AECL Retube Quality Assurance Plan and the AECL Refurbishment Quality Assurance Manual, both identify responsibilities and expectations with regard to HSE.

By maintaining consistency with existing station processes, there is significantly less "new work" to be undertaken to protect HSE. For example, the existing emergency procedures (EP) remain in place, and there is no need to develop an entire new EP program.

Design

HSE considerations are addressed in the design process. Issues such as human factors, contamination control and ALARA are specifically included in relevant Design Requirements and have been examined during the design reviews that have been

undertaken. In addition, HSE is taken into consideration during the development of the new tooling required for the outage, and is reviewed during actual testing of this tooling. Specific examples include review of contamination control during tooling tests at AECL facilities in the presence of both Station and AECL radiation protection experts, and the investigation of new tools for radiography, which may reduce workplace hazards.

Outage Planning

A framework for ongoing HSE related activities has been developed and documented in the form of a work activity plan. This plan was based on discussions between Station and AECL technical experts, with input from non-project related staff. The key steps in the plan include:

1. Conducting an initial or preliminary hazards analysis to identify procedural or process gaps, in particular those related to new risks introduced by the work being undertaken during the outage;
2. The preliminary hazards analysis will assist in mapping or linking the AECL and station HSE requirements, and will be a key step in identifying areas where new documentation, tooling, or training (for example) is required;
3. New documents will be developed to fill the identified gaps, including the normal review and comment processes, and this will be used in final process or tool development, training, etc.
4. Thereafter, as further engineering proceeds, the HSE hazards analysis, and related HSE analyses, will be used to continue to ensure suitable consideration of HSE in all aspects of the outage work. Again, where existing documentation or training does not provide adequate controls, specific documentation and training will be produced.

Some of the key documentation that is likely to be required to support the outage includes:

1. a project specific occupational health and safety plan;
2. HSE design guides for contamination control and target criteria, shielding requirements, and occupational limits for personal protection;
3. physical demand assessments documents for different activities;
4. an project specific ALARA Plan, consistent with Station ALARA requirements; and
5. HSE related training packages.

Preliminary Hazards Identification Workshop

As noted above, a key component of the HSE program is the identification of any hazards that are unique to the outage, to ensure the necessary controls can be put in place to manage those hazards.

To start the process of identifying unique hazards, a Preliminary Process Hazard Analysis (PPHA) has been conducted. The PPHA took the form of a five day facilitated workshop involving disciplinary experts from both AECL and NB Power, during which the

available design information for the project was reviewed. Overall, the exercise indicated that the processes and procedures currently in use at PLGS are sufficiently robust and extensive to cover many of the activities planned for the project. The exercise identified a number of specific items for follow up. Four high level items are noted below:

1. Some of the existing procedures will require review and minor revision to reflect address the changed state that the reactor during the outage. For instance, unlike most outages, the reactor will be defuelled and the primary heat transport system and the moderator systems will be drained (the defuelled core state). This changes some of the hazards, and as a result certain existing procedures will require revision.
2. Although many of the individual activities have been performed in previous maintenance outages (for instance, feeder replacement, single fuel channel replacement, etc.), the number of retubing activities will be much greater, and many of the activities will be carried out repetitively or in parallel with other activities. Therefore, a number of new procedures will be required to control hazards and risks associated with the amount of work (as opposed to the nature of the work) and to ensure parallel activities are appropriately management. Mock-up training is expected to be an important part of preparing staff for the performance of these activities.
3. Although normal station processes require an ALARA assessment as part of Work Planning, the workshop reinforced the need to implement a project wide ALARA plan even before some of the design details are finalized.
4. Given the repetitive and sometimes complex operations and reliance on tooling, the need for Failure Modes and Effects Analyses, considering both human and component failure, was identified.

The PPHA was the first stage in an iterative process whereby unique hazards will be identified, procedures and controls will be assessed, and any gaps addressed as the project proceeds.

ALARA Program

As was noted in the PPHA, and consistent with normal station processes, the need to manage the dose received by personnel in accordance with ALARA is well recognized in the project team, and was discussed in the licence renewal process.

In parallel with, and consistent with the results of the PPHA, work has progressed on the development and implementation of a project specific ALARA plan. This plan is intended to ensure that the refurbishment project applies ALARA in a systematic manner to optimize radiation protection, and the risk of radiation exposure is kept as low as reasonably achievable, economic and social factors taken into consideration.

The plan follows the principles of both AECL and NB Power ALARA procedures by considering ALARA throughout all phases (tool design, work planning and operation) of the refurbishment project. The plan logically connects ALARA issues with the refurbishment activities, and integrates other aspects of radiation protection, e.g., radiation monitoring, zoning and contamination control etc., into the ALARA program.

The essential components of the ALARA plan for refurbishment will be described in key project documents, and cover both the plan, design guides, measurements of existing radiation fields in different locations and predictions of fields at different stages of the outage. It is expected that a total job dose related to the outage will be generated following the completion of the work.

Conclusion

In conclusion, the project recognises the importance of addressing HSE issues through each stage of the project. The commitment is reflected in the highest level documents, and through the continued oversight by both project personnel and third parties. The approach to managing HSE issues is focussed in part on the identification of those aspects of the outage that are unique, and require a change or development of new procedures, along with the necessary training.

HSE issues have been and will continue to be taken into account during design, outage planning, layup, installation, commissioning and restart activities, consistent with the station licence and processes.

References

1. "Point Lepreau Refurbishment: Environmental Assessment Experiences and the Role of the Public", by C. Hickman, et al., paper presented at the 25th Annual conference of the Canadian Nuclear Society, held in Toronto in June 2004.

2. "Co-ordination of Federal and Provincial Environmental Assessment Processes for the Point Lepreau Generating Station Solid Radioactive Waste Management Facility Modifications", by C.N Hickman, P.D. Thompson and J. Barnes, paper presented at the Canadian Nuclear Society conference on Waste Management, Decommissioning and Environmental Restoration for Canada's Nuclear Activities: Current Practices and Future Needs, held in Ottawa in May 2005.