

JOINT PROGRAMME OFFICE

**REPORT ON THE JOINT REGULATORS' TEAM INSPECTION OF AECL's
ARRANGEMENTS AS PART OF GENERIC DESIGN ASSESSMENT
(QUALITY MANAGEMENT ARRANGEMENTS)**

OCTOBER - NOVEMBER 2007

REQUESTING PARTY:	AECL	FILE REF.:	
SITE:	Sheridan Park, Toronto	CC:	
DATE:	29 October-1 November 2007		
INSPECTION No.:	01/07		
SUBJECT	Inspection of AECL quality management arrangements in support of the GDA process.		
INSPECTION OBJECTIVES:	<p>-To check that AECL has Quality Management Systems that provide organisational and procedural arrangements that adequately support production of the submission.</p> <p>- Through inspection, to establish that AECL has implemented and continues to review arrangements that adequately control their GDA related activities.</p> <p>- To inform the UK Nuclear Regulators' assessment of AECL's submission.</p>		
INSPECTION BACKGROUND:	<p>As part of the GDA process the UK Nuclear Regulators, from HSE Nuclear Directorate and the Environment Agency, carried out an inspection of the AECL's QMS and in particular those arrangements relating to the development of the submission (environmental, safety, security report). A member of the Canadian Nuclear Safety Commission (CNSC), attended throughout the inspection as an observer. CNSC asked some questions of AECL and sought clarification on some issues and provided the UK Nuclear Regulators with useful insight into the Canadian regulatory process.</p>		
FACILITY/AREA:	New Build CANDU (NBC) Sheridan Park, Mississauga.		

SUMMARY OF INSPECTION

SUMMARY

AECL has a well defined ACR-1000 project organisation and related quality management system, which is developed from and linked to mature corporate QA arrangements. There are clearly defined responsibilities, and staff deployed on the New Build CANDU (NBC) project have considerable experience and knowledge in the nuclear industry and of CANDU specifically. AECL use few contractors on the design phase of the project and operate a succession planning process aimed at maintaining in-house knowledge and experience.

Although the codification and documentation of processes is generally good, the ongoing development from the CANDU 6 reference design through the ACR 700 to the ACR-1000 is not clear. However, AECL was able to demonstrate that changes have gone through due process and that the ALARP principle has been applied. Many of the processes including design, planning, configuration and document control and action tracking are operated and recorded using IT applications. AECL recognise that controls need to be robust with protection and accuracy of data being paramount.

Project planning and control is well developed with R&D, safety/environmental analysis and verification requirements being included as deliverables and as such these must be fully completed before acceptance as part of the design or its justification. An element of AECL's current programme is geared to delivering safety reports to CNSC. AECL is feeding the learning from this into the UK GDA process. AECL has introduced controls similar to Independent Nuclear Safety Assessment (INSA) and Nuclear Safety Committee processes with these being further developed. Particularly noteworthy is the operational experience feedback (OEF) process applied to both operating reactors and plant under design and development.

The main issue for AECL is the uncertainty about its ability to deliver the safety, security and environmental submission in sufficient detail to allow the UK Nuclear Regulators' to carry out adequate assessments to meet the GDA timeframe. Difficulties with respect to the classification of commercial-in-confidence documents that would hinder the GDA process were generally resolved during the inspection.

The QA arrangements for the NBC project are designed to meet relevant Canadian national and international QA standards (including CSA N286.2 for the design phase) and as such are considered adequate. Further assessment and inspections will consider the adequacy of implementation of these arrangements including the adequacy of the IT controls applied to configuration management and document control.

There was an initial lack of clarity on integration of environmental safety issues in the design, although further discussions provided evidence that the design process

addressed measures to achieve reductions in emissions, dose and waste. The tracking of environmental objectives and associated deliverables needs to be actively managed. The planned re-establishment of the Senior Environment Committee would facilitate this process.

The UK Regulators' conclusion is that:

AECL operates an appropriate and adequate QMS which includes and integrates aspects that control the content and accuracy of its submissions to the Joint Programme Office. AECL has very experienced, knowledgeable and dedicated staff working on the GDA project. On that basis the UK nuclear regulators have confidence that the production and update of submission is adequately controlled for this stage of the GDA process and that any comments or queries raised will be properly dealt with.

New Build CANDU Organisational Overview

1. The organisational structure of the NBC organisation is shown in Appendix A of 164-01913-QAM-001 Rev 1. The New Build CANDU Project Director, who heads the structure, reports to the Vice President Projects Business Unit and has the specific responsibility for the development, design and licensing of the ACR-1000 and the related NBC QA Programme.
2. There are approximately 275 direct reports to the NBC Project Director with an additional 150 staff, about 85 from safety, licensing and development, supporting the project on a full time basis. AECL is continuing to recruit for the project. From the cross section of AECL staff involved in the inspection there is a great deal of experience within the project of nuclear technology and CANDU particularly. AECL does employ a small number of consultants who are used to supplement AECL knowledge and experience, however, the vast majority of those working on the NBC project are direct employees of AECL. Obviously the number of contractors will increase as the project moves from design via procurement into manufacturing and construction.
3. AECL has established a succession planning process that is aimed at ensuring that personnel are recruited, developed, managed and retained. Recognising the increasing global interest in nuclear power the corporate HR function has developed recruitment targets and uses a variety of means to achieve these including recruitment to the general resource pool as well as against identified posts.
4. The project organisation and resource levels indicate AECL's commitment to the generic ACR-1000 design. This underpins a continuing programme of work to address CNSC comments, although the Canadian Regulator has suspended assessment work on the design. The UK Regulators believe that AECL's programme of work should provide a sound basis for the UK GDA process.
5. There is a clear intention to provide the UK Nuclear Regulators with a submission sufficiently detailed to allow an appropriate level of assessment

as the project develops. However, failure to achieve this does present a potential risk to the project with respect to the delivery of information within the timescales of the GDA process.

6. The R&D Programme in place together with the Design Review Processes enable technology gaps, including environmental and safety considerations, to be identified and research to address such gaps has been implemented to assist the design decision process and product definition. For example, the R&D programme addressed environmental safety considerations, and developed improvements in the area of radioactive waste and emissions.

QA Arrangements Overview

7. AECL operates a well established Quality Management System (QMS) which AECL considers central to AECL's implementation of Environment, Security and Health and Safety policies.
8. The AECL documentation structure which is headed by the AECL Management Manual is supported by documents that make up the Corporate QA Programme. Of particular interest was the link from the top tier documents to project specific QA manuals and plans and the related operating instructions.
9. AECL's QMS has been developed to meet the requirements of CSA N286 series, ISO 9000, and IAEA 50-C/SG-Q and as such, at this stage, provides adequate confidence that the QMS is soundly based and is appropriate to the design phase of the project.
10. The ACR-1000 (NBC) project has its own QA Manual which is clearly linked to corporate arrangements. This manual defines the NBC organisation and processes used for performing all aspects of NBC work. The manual references documents that are either project specific or corporate. These include procedures on design verification, change control, personnel capability and programme assessment. The sections of the NBC QA Manual are mapped against the clauses of CSA N286.2-00 entitled Design Quality Assurance for Nuclear Power Plants. This provides a useful comparison and assurance that all requirements of the standard have been covered.
11. AECL has a comprehensive series of procedures and operating instructions (OIs) in place governing AECL design processes. AECL's Trak system provides comprehensive tracking of documentation, acts as a repository for documents, and as a system for records management.
12. The application of the QA manual and related procedures is mandatory across all AECL line units, projects and nuclear facilities. Commitment to the application of the QMS has been signed by all executives including the President and CEO. AECL has achieved certification to ISO 9001:2000 for a wide scope which includes 'Design Engineering' in addition to satisfying the requirements of national and international quality standards, including

CSA N286 series, US NQA-01, 10CFR 50 and IAEA 50-C/SG-Q.
Development of the QMS is ongoing with a move towards an integrated management system in line with the recently published IAEA GSR-3.

13. The discussion provided the inspection team with confidence that QA was a major discipline within AECL which, together with appropriate organisational structures, enables the codification and documentation of processes and activities that are central to ensuring that environmental, security and safety aspects are integral aspects of the design process. The corporate QA system is mature having operated for over 15 years and the related project specific arrangements have been developed for and applied to a number of major projects. The team saw examples of the implementation of processes such as design document review and comment, of particular note is AECL's approach to lessons learned from all sources as a basis for continuing improvement. There is a comprehensive feedback process in place where lessons learned are incorporated in the design process for the ACR-1000. Any issues are fed back to operating plants in a pro-active manner. Design change and verification appeared to be robust. Internal auditing is well established, however, there maybe a focus on detail rather than taking a more strategic view. Corporate Quality, however, does provide an oversight of the management system and initiate improvements.

14. There are a series of environmental objectives identified for New Build CANDU (NBC) Products and Services whose progress is tracked by the Senior Environment Committee (SEC). The SEC is mandated to continuously review and report on the fulfilment of AECL's environmental performance including delivery of products and services worldwide. Examples of CANDU Technology Development and Reactor Development objectives were seen for 2005. These objectives relate to prevention and reduction in emissions, waste management strategies for both radioactive and non-radioactive wastes, interim storage strategy for spent fuel and environmental impact of spent fuel, and development of models to assess impacts on non-human species. There are similar objectives for FY07/08 including the preparation of a report on radioactive emissions and solid wastes for ACR-1000, with the identification of potential improvements eg contributing to the reduction of emissions. Progress in meeting these objectives is evident. However, the SEC has not met since April 2007, and the tracking of progress with the environmental objectives is unclear.

Observations

15. AECL has an adequate Quality Management System that has been designed to meet the requirements of national and international QA standards. The use of CSA N286.2 is particularly appropriate to the design process and provides a good structure to the arrangements.

16. AECL's NBC project organisational design provides evidence that AECL have committed significant time and resource to the development of the ACR-1000 product and have deployed experienced staff in key positions.
17. AECL use a well established project planning system to ensure that design functions are included, integrated, progressed and completed before elements of the work are deemed acceptable. It was unclear to what degree this has been applied to the UK GDA process.
18. AECL has demonstrated that it operates appropriate and established processes including OEF, action tracking, auditing, design verification, change control and document control.
19. AECL could, but with some difficulty, demonstrate that it has applied and continues to apply appropriate controls, including the application of ALARP, to the process of developing from the CANDU 600 reference design to the ACR-1000.
20. AECL, via the Senior Environmental Committee, appear to have tracked ongoing work to complete its defined Environment Objectives. However, the SEC has not met for some time and accordingly it is unclear whether all objectives have been completed. There are organisational changes taking place in environmental management including the establishment of the Office of the Chief Environmental Officer.
21. AECL is heavily reliant on the use of IT applications for many of its processes. This has obvious advantages of ready access, integration of data and retention of records, however, there is a risk associated with this reliance (eg. data loss or corruption) and as some of the applications and data are ultimately to be used by operators, controls need to be proportionate.
22. AECL is committed to addressing CNSC's comments on the CANDU 6 and CANDU 700 designs. This work will provide additional justification for the ACR-1000 where applicable.

Recommendations for AECL

23. Recommendation 1: AECL should consider writing a document that describes the history of the development of the CANDU design including the application of BAT and ALARP principles leading to the current design.
24. Recommendation 2: AECL should consider carrying out a review to ensure

that it can deliver a sufficiently detailed safety analysis in line with the requirements of the GDA process.

25. Recommendation 3: AECL should continue to develop a means of making the audit process more effective.
26. Recommendation 4: AECL should consider the development of an overarching procedure to show how integration of environmental, safety and security occurs during the design process.
27. Recommendation 5: AECL should ensure that its IT applications are adequately protected and backed up and develop in line with ongoing technology change.
28. Recommendation 6: AECL should consider finalising the work started on producing a document detailing how commercial documents are protectively marked together with the justification.
29. Recommendation 7: AECL should consider a means of ensuring that its published Environmental Objectives are progressed and tracked to completion.