December 15, 2003

Mr. Vince Langman
ACR Licensing Manager
Atomic Energy of Canada Limited (AECL) Technology, Inc.
481 North Frederick Avenue, Suite 405
Gaithersburg, MD 20877

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION - ACR-700 PRE-APPLICATION REVIEW (TAC NO. MB5765)

Dear Mr. Langman:

On June 19, 2002, Atomic Energy of Canada Limited (AECL) submitted a formal request for a pre-application review of the Advanced CANDU Reactor (ACR-700) design.

The Nuclear Regulatory Commission (NRC) staff is reviewing technical information provided by AECL as part of the ongoing pre-application review activities for the ACR-700 design. The NRC staff has determined that additional information is necessary to continue the review. The requests for additional information (RAIs) are included in the enclosure. The topics covered in these RAIs include the computer codes and validation adequacy and the ACR technology base. An advanced copy of the RAIs was sent to you via electronic mail on September 11, 2003. On September 25, 2003, AECL participated in a teleconference with the staff to discuss the content of the RAIs and agreed to provide the ACR-700 information requested in the RAIs.

If you have any questions or comments concerning this matter, you may contact the undersigned at (301) 415-4125 or jsk@nrc.gov.

Sincerely,

/RA/

James Kim, Project Manager
New Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Project No. 722

Enclosure: As stated

cc: See next page

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ACCESSION NO. ML033430384

OFFICE	RNRP/PM	SC:RNRP
NAME	JKim	LDudes
DATE	12/10/03	12/12/03

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Distribution for Request For Additional Information Dated December 15, 2003

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Requests for Additional Information (RAIs) #2
ACR-700 Pre-Application Review

In the context of its ongoing pre-application review activities for the ACR-700 design, the Nuclear Regulatory Commission (NRC) staff plans to perform an initial independent analysis of the RD-14M scaling and is currently developing the TRACE computer model for independent confirmatory assessment of the ACR-700 design. These planned analysis activities will support the staff's efforts on key focus topics as identified in the Atomic Energy of Canada, Limited (AECL) Technologies' letter 108US-013210-021-001, dated July 30, 2003. Specific focus topics to be served by the planned analysis include: Computer Codes and Validation Adequacy (FT#3), and ACR Technology Base (FT#12).

During Phase 2 of pre-application, RAI #2 will support RELAP Input Model Development, scaling evaluation, and data adequacy assessments for code validation. TRACE Input Model Development, should start during pre-application in order to support ACR-700 design review. The staff's analysis efforts in this area will require that detailed information be provided on the Cold Water Injection Test (CWIT) facility and the RD-14M facility. In order to review the scaling of RD-14M, the staff needs to also look at separate effects/component tests specific to CANDU plants. Of particular interest are the tests on header/feeder flows, fuel channel flow regime/heat transfer, and counter current flow limitation (CCFL). Additionally they need to perform early assessment of the codes to guide the longer term development efforts. The staff is currently reviewing the RD14M Facility Description and Characterization for the ACR Configuration, DP. Byskal, R.S Swartz, dated March 2003, along with other relevant documents submitted during Phase 1 of pre-application. However, specific information is needed to review the RD-14M scaling. The following information is requested at this time, to the extent that it currently exists:

15. ACR-700 or other CANDU PIRT (phenomena identification and ranking table) upon which the scaling is based.

16. Single channel and multiple channel experiments done at Stern Labs.

17. Small and large scale pump behavior tests done with two phase inlet conditions (if available).

18. Experiments to look at CCFL in feeder tube and elbow arrangement.

19. Experimental results on hydrodynamic forces and propagation of pressure tube and feeder breaks.

20. Scaling reports or papers for RD-14, RD-14M, and RD-14/ACR, and for other separate effects/component tests mentioned here. Discussion of local scaling and design approaches including flow regime transitions, geometric distortions, local volume distortions, local flow path distortions, heat transfer area distortions, heat flux distortions,

volume versus elevation. Both top down and bottom up analysis should be included to the extent available. Discussion of structural heat sources and heat sinks. Discussion of parametric ranges covered in the experiment should be discussed and compared to expected plant ranges.

21. Each known distortion should be discussed with respect to its effect on experiments and is relevance to the prototype. Two techniques of identifying facility distortions are:

    a. Identify from evaluating the facility with respect to highly ranked phenomena from the PIRT and from examination of the experimental results; and

    b. Identify from considering the geometrical and scaling design compromises in the facility.

22. Test matrix rationale (e.g. break size, break location, transients, parametric ranges).

Facility design information for input model development

The staff is using RELAP for audit calculations during the pre-application review of the ACR-700 but will switch to TRACE during design certification to assessed the ACR-700 design. To facilitate TRACE code development in time to support ACR design certification, we recommend AECL Technologies provide the following information at this time:

23. Facility drawings and descriptions for the CWIT. A detailed facility description should be provided including its isometric layout, insulation, and heat tracing. CATHENA input model, and notebook documenting the model for the CWIT.

24. Facility drawings and descriptions for Stern Lab and other rod bundle channel tests that have been used for heater transfer/flow regime studies to support CATHENA development, validation or assessment.

25. Facility drawings and descriptions for the header test facilities. This includes the Large Scale Header Facility and other header tests used for CATHENA development, validation or assessment.

26. Complete description of instrumentation type, location, and accuracy for each facility.

27. Facility operating procedures.

28. Results from facility characterization tests, including available measurements of facility heat loss and heat loss distribution, and pressure drops throughout the loops. A representative test report with initial and boundary conditions (e.g. injection rate) will be needed to initialize the model.

29. Calculated CATHENA results and experimental data from at least one RD-14M header break experiment, in electronic form.

The information requested above should be provided in appropriate printed and/or electronic formats, which may include text, tabulations, graphs, charts, sketches, diagrams, engineering drawings, CAD documents, spreadsheets, and/or data bases. Please note that the staff is currently reviewing the following information:

- CATHENA input manual.
- CATHENA input model and notebook for ACR-700.
- CATHENA input model for RD-14M.
- RD-14M Facility Description and Characterization for the ACR Configuration, DP. Byskal, R.S Swartz, March 2003.

30. Please provide the calculational notebook documenting the RD-14M CATHENA model.

31. The NRC Staff was provided with a report titled "RD-14M Facility Description and Characterization for the ACR Configuration 108-126410-470Revision R0," Edited by D.P. Byskal and R.S. Swartz. This report includes only components which were modified for the ACR configuration. We were provided with a CATHENA input deck for RD-14M Test B9401. Please provide a description of the RD-14M facility as it was configured for Test B9401.

32. Please provide an RD-14M CATHENA deck as it is configured for ACR-700 tests and the corresponding calculational notebook.

ACR-700

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