April 23, 2004

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 ON THE EVENT CATEGORIZATION - ACR-700 PRE-APPLICATION REVIEW (TAC NO. MB5765)

Dear Mr. Langman:

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

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 topic covered in these RAIs include event categorizations for the ACR-700. An advanced copy of the RAIs were sent to you via electronic mail on March 22, 2004. On April 6, 2004, AECL participated in a meeting with the staff to discuss the content of the RAIs and agreed to provide the ACR-700 information requested in the RAIs by May 31, 2004.

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

April 23, 2004

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 ON THE EVENT CATEGORIZATION - ACR-700 PRE-APPLICATION REVIEW (TAC NO. MB5765)

Dear Mr. Langman:

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

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 topic covered in these RAIs include event categorizations for the ACR-700. An advanced copy of the RAIs were sent to you via electronic mail on March 22, 2004. On April 6, 2004, AECL participated in a meeting with the staff to discuss the content of the RAIs and agreed to provide the ACR-700 information requested in the RAIs by May 31, 2004.

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

Distribution:

Hard Copy	E-Mail	
PUBLIC	DMatthews	ACRS
JKim	FGillespie	SSun
BSosa	JLyons	DCarlson
LDudes	OGC	JLee

ACCESSION NO. ML041100609

OFFICE	RNRP/PM	DSSA/SRXB	SC:RNRP
NAME	JKim	SSun	LDudes
DATE	4/20/04	4/20/04	4/22/04

OFFICIAL RECORD COPY

Enclosure 1

Requests for Additional Information (RAIs)-Letter 7
ACR-700 Pre-Application Review - Event Categorization

224. Tables 2-1 and 2-2 of Reference 1 list initiating events under Classes 1 through 5 categories. The associated acceptance criteria are summarized in Table 2-3 for the ACR-700 analysis. Please provide the following information:

(1) Discuss the methods, plant operating experience, and test data that are used to determine the event categories. List the frequency of occurrence for each initiating event listed in Tables 2-1 and 2-2. Where applicable, please define the event categories using the frequency of occurrence for the Classes 1 through 5 events.

(2) Compare the event category and the associated acceptance criteria for each initiating event documented in Tables 2-1 and 2-2 of Reference 1 with those specified in Chapter 15 of NUREG-0800, "Standard Review Plan (SRP)," (Ref. 2), and address the ACR-700's compliance with the SRP Chapter 15 guidance in the event categorization and the associated acceptance criteria for each initiating event. Justification for any deviations from SRP needs to be discussed.

(3) Compare the event category and the associated acceptance criteria for each initiating event documented in Tables 2-1 and 2-2 of Reference 1 with those specified in Tables 4.1 and 4.9 of Draft Regulatory Guide (DRG) C-006 (Reference 3), "Safety Analysis of CANDU Nuclear Power Plants," and address the ACR-700's compliance with the DRG C-006 guidance in the event categorization and the associated acceptance criteria for each initiating event. Justification for any deviations from DRG C-600 needs to be discussed.

225. The requirements of loss-of-coolant-accidents (LOCAs) analyses for light water reactors are documented in 10 CFR 50.46 (Ref. 4), which requires that the LOCA analyses consider different postulated break sizes and locations. The results of the analyses must satisfy the following acceptance criteria: (1) PCT less than 2200 °F; (2) maximum local oxidation of the cladding less than 17% of the total cladding thickness; (3) hydrogen generated from the chemical reaction of the cladding with water or steam less than 1 percent of total metal in the cladding cylinders surrounding the fuel; (4) no loss of core cooling capability; and (5) long-term cooling capability

Please address AECL's compliance with the 10 CFR 50.46 requirements regarding the scope of LOCA analyses and the acceptance criteria. Discuss any resolutions in the situation where the 10 CFR 50.46 requirements are not met.

226. Table 2-1 of Reference 1 indicates that some design-basis-events (DBEs) (such as single steam generator (SG) tube rupture) consider the licensee vendor inspection program (LCVIP) and some (such as Class 1 events) do not. When the DBEs consider LCVIP, the event class recategorizes to the next higher class for some combined events. For example, the partial single channel flow blockage is a class 2

event while the same event with a combination of LCVIP becomes a class 3 event. For some other DBEs (such as main steam line break), the event class remains unchanged for cases with and without LCVIP.

(1) Please discuss the criteria that are used to determine the inclusion of LCVIP in the DBE analysis and to recategorize the combined events, and identify the causes that may result in LCVIP.

(2) With regard to the requirements of loss of offsite power (LOOP) analysis, please address the ACR-700's compliance with the requirement of General Design Criteria (GDC)-17 (Ref. 5) that states, in part, that: "... An onsite electric power system and an offsite electric power system shall be provided to permit functioning of structures, systems and components important to safety. The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences (AOOs) and (2) the core is cooled and containment and other vital functions are maintained in the event of postulated accidents."

Appendix A to 10 CFR Part 50 (Ref. 6) defines AOOs as those conditions of normal operation which are expected to occur one or more times during the life of nuclear power unit and include but are not limited to loss of power to all recirculation pumps, tripping of the turbine generator set, isolation of the main condenser, and loss of all offsite power.

In accordance with the GDC 17 requirements, a loss of offsite power (LOOP) must not be considered as single-failure event and must be assumed in the analysis for each of the design-basis AOOs (that encompass Classes 1 and 2 events) and postulated accidents (that encompass Classes 3 events and some of the Classes 4 and 5 events) without changing the event category.

227. Table 2-2 of Reference 2 indicates that limits core damage accident consists of initiating events with a combination of loss of emergency core coolant (LOECC). Please identify the causes that may result in LOECC and confirm whether a single failure event could result in LOECC or not.

As defined in Appendix A to 10 CFR 50 (Ref. 6), "a single failure means an occurrence which results in the loss of capability to perform its intended safety functions. Multiple failures resulting from a single occurrence are considered to be a single failure. Fluid and electric systems are considered to be designed against an assumed single failure if neither (1) a single failure of any active component (assuming passive components re function properly) nor (2) a single of a passive component (assuming active components function properly), results in loss of the capability of the system to perform safety functions."

228. Please define the term, "limited failures, used in Table 2-3 of Reference 1 for the fuel acceptance criterion for Class 3 events.

References

1. ACR-700-10810-03510-AB-001(Rev. 0),"Initial Conditions and Standard Assumptions Safety Analysis Basis," dated August 14, 2003.

2. NUREG-0800 (Revision 2), "Standard Review Plan," dated July 1981.

3. Draft Regulatory Guide C-006 (R1(E)), "Safety Analysis of CANDU Nuclear Power Plants," dated September 1999.

4. CFR50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-water Nuclear Power Reactors."

5. General Design Criterion (GDC) 17, "Electric Power System."

6. Appendix A, "General Design Criteria for Nuclear Power Plants," to Code of Federal Regulation (CFR) 10, Part 50, "Domestic Licensing of Production and Utilization Facilities."

cc:
Mr. Charles Brinkman
Westinghouse Electric Co.
Washington Operations
12300 Twinbrook Parkway, Suite 330
Rockville, MD 20852

Mr. Thomas P. Miller
U.S. Department of Energy
NE-20, Rm. A286
Headquarters - Germantown
19901 Germantown Road
Germantown, MD 20874-1290

Mr. David Lochbaum
Nuclear Safety Engineer
Union of Concerned Scientists
1707 H Street, NW, Suite 600
Washington, DC 20006-3919

Mr. Paul Gunter
Nuclear Information & Resource Service
1424 16th Street, NW, Suite 404
Washington, DC 20036

Mr. James Riccio
Greenpeace
702 H Street, NW, Suite 300
Washington, DC 20001

Mr. Ron Simard
Nuclear Energy Institute
Suite 400
1776 I Street, NW
Washington, DC 20006-3708

Ms. Patricia Campbell
Winston & Strawn
1400 L Street, NW
Washington, DC 20005

Mr. Paul Leventhal
Nuclear Control Institute
1000 Connecticut Avenue, NW
Suite 410
Washington, DC 20036

Mr. Jack W. Roe
SCIENTECH, INC.
910 Clopper Road
Gaithersburg, MD 20878

Mr. David Ritter
Research Associate on Nuclear Energy
Public Citizens Critical Mass Energy
and Environmental Program
215 Pennsylvania Avenue, SE
Washington, DC 20003

Mr. James F. Mallay, Director
Regulatory Affairs
FRAMATOME, ANP
3315 Old Forest Road
Lynchburg, VA. 24501

Mr. Tom Clements
6703 Gude Avenue
Takoma Park, MD 20912

Mr. Vince Langman
Licensing Manager
Atomic Energy of Canada Limited
2251 Speakman Drive
Mississauga, Ontario
Canada L5K 1B2

Mr. Victor G. Snell
Director of Safety and Licensing
Atomic Energy of Canada Limited
2251 Speakman Drive
Mississauga, Ontario
Canada L5K 1B2

Mr. Glenn R. George
PA Consulting Group
130 Potter Street
Haddonfield, NJ 08033

J. Alan Beard
GE Nuclear Energy
13113 Chestnut Oak Drive
Darnestown, MD 20878-3554

Mr. Ian M. Grant
Canadian Nuclear Safety Commission
280 Slater Street, Station B
P.O. Box 1046
Ottawa, Ontario
K1P 5S9

Mr. Gary Wright, Manager
Office of Nuclear Facility Safety
Illinois Department of Nuclear Safety
1035 Outer Park Drive
Springfield, IL 62704

Dr. Gail H. Marcus
U.S. Department of Energy
Room 5A-143
1000 Independence Ave., SW
Washington, DC 20585

Mr. Ronald P. Vijuk
Manager of Passive Plant Engineering
AP1000 Project
Westinghouse Electric Company
P. O. Box 355
Pittsburgh, PA 15230-0355

Dr. Greg Rzentkowski
Canadian Nuclear Safety Commission
P.O. Box 1046, Station 'B'
280 Slater Street,
Ottawa, ON, K1P 5S9
Canada

Mr. Ed Wallace, General Manager
Projects
PBMR Pty LTD
PO Box 9396
Centurion 0046
Republic of South Africa

Mr. John Polcyn, President
AECL Technologies Inc.
481 North Frederick Avenue
Suite 405
Gaithersburg, MD 20877

Mr. Russell Bell
Nuclear Energy Institute
Suite 400
1776 I Street, NW
Washington, DC 20006-3708