July 7, 1997

Mr. Nicholas J. Liparulo, Manager
Nuclear Safety and Regulatory Analysis
Nuclear and Advanced Technology Division
Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, PA 15230

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION (RAIs) ON THE AP600 STANDARD SAFETY ANALYSIS REPORT (SSAR) CHAPTER 15 ACCIDENT ANALYSES

Dear Mr. Liparulo:

The Nuclear Regulatory Commission (NRC) staff is reviewing the AP600 Chapter 15 Post-Loss-of-Coolant-Accident Long Term Cooling (LTC) Analyses (Section 15.6.5.4C) which has been substantially revised in Revision 13 of the AP600 SSAR. The staff has determined that additional information will be needed to complete its review of the new Chapter 15 material. The staff's RAIs on the Chapter 15 LTC analyses are provided as an enclosure to this letter.

If you have any questions regarding this matter, you may contact me at (301) 415-1141.

Sincerely,

original signed by:

William C. Huffman, Project Manager
Standardization Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 52-003

Enclosure: As stated

cc w/encl: See next page

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Mr. Nicholas J. Liparulo
Westinghouse Electric Corporation

Docket No. 52-003
AP600

cc: Mr. B. A. McIntyre
Advanced Plant Safety & Licensing
Westinghouse Electric Corporation
Energy Systems Business Unit
P.O. Box 355
Pittsburgh, PA 15230

Mr. Cindy L. Haag
Advanced Plant Safety & Licensing
Westinghouse Electric Corporation
Energy Systems Business Unit
Box 355
Pittsburgh, PA 15230

Mr. S. M. Modro
Nuclear Systems Analysis Technologies
Lockheed Idaho Technologies Company
Post Office Box 1625
Idaho Falls, ID 83415

Mr. Sterling Franks
U.S. Department of Energy
NE-50
19901 Germantown Road
Germantown, MD 20874

Mr. Frank A. Ross
U.S. Department of Energy, NE-42
Office of LWR Safety and Technology
19901 Germantown Road
Germantown, MD 20874

Mr. Charles Thompson, Nuclear Engineer
AP600 Certification
NE-50
19901 Germantown Road
Germantown, MD 20874

Mr. Ronald Simard, Director
Advanced Reactor Programs
Nuclear Energy Institute
1776 Eye Street, N.W.
Suite 300
Washington, DC 20006-3706

Ms. Lynn Connor
Doc-Search Associates
Post Office Box 34
Cabin John, MD 20818

Mr. James E. Quinn, Projects Manager
LMR and SBWR Programs
GE Nuclear Energy
175 Curtner Avenue, M/C 165
San Jose, CA 95125

Mr. Robert H. Buchholz
GE Nuclear Energy
175 Curtner Avenue, MC-781
San Jose, CA 95125

Barton Z. Cowan, Esq.
Eckert Seamans Cherin & Mellott
600 Grant Street 42nd Floor
Pittsburgh, PA 15219

Mr. Ed Rodwell, Manager
PWR Design Certification
Electric Power Research Institute
3412 Hillview Avenue
Palo Alto, CA 94303

NUCLEAR REGULATORY COMMISSION

REQUESTS FOR ADDITIONAL INFORMATION ON

WESTINGHOUSE AP600 SSAR

CHAPTER 15 LONG TERM COOLING ACCIDENT ANALYSES

Containment Pressure during LOCA Transients

RAI 440.664

Review of Section 15.6.5.4C indicates that the pressure in all of the transients analyzed is assumed constant at a low value which is assumed to be conservative.

(a) In a March 12, 1997, meeting Westinghouse presented a calculational model which involved interactive use of WGOTHIC to estimate the containment pressure during the transient. Apparently this model was not used for the SSAR analyses. Why not?

(b) It is not clear that assuming a constant low pressure value for containment pressure is conservative. Decreasing pressure during the boiling phase may be more severe than the constant low pressure case. In Subsection 15.6.5.4C.3.10 (and elsewhere) it is stated that "Pressure spikes produced by boiling in the core can cause the mass flow to reverse momentarily.." This flow reversal can also be seen from the graph correlation of RCS pressure and core collapsed liquid level as a function of time. It is noted that some LOCA transients involve a steep containment pressure reduction after the initial pressure peak (see for example, SSAR figure 6.2.1.1-5). It is also noted that the lower the pressure, the higher the void fraction for a given quality. Consequently, depending on conditions assumed, low pressure could give higher void fraction and predict a "swelled" mixture level greater than that at an elevated pressure. This could possibly predict a covered core instead of an uncovered core, i.e. a non conservative outcome, in the worst case. Please provide additional justification for the choice of a low constant pressure. Westinghouse should consider an appropriate window analysis to investigate the effects of decreasing pressure in the containment.

(c) In some of the window analyses, it is not clear (e.g., Section 15.6.5.4C.3.2) how the location of the window in the time coordinate relates to LOCA initiation. Please state those times for all of the window analyses presented.

Containment Condensate Collection Gutters

440.665

How long of a time interval is typically required from LOCA initiation to attain significant (semi-steady state) flow to the IRWST from condensate return off the containment walls via the gutter system?

Enclosure

Core Collapsed Coolant Level

440.666

In Subsection 15.6.5.4C.3.5 (and elsewhere) it is stated that in the WCOBRA/TRAC noding the core is divided into two axial levels, each 6 feet long. The same paragraph references Figure 15.6.5.4C.3.5-3 which records a detailed core level variation.

(a) How can two axial segments produce such detail in the collapsed liquid level? What accuracy should be expected in the determination of the collapsed liquid level?

(b) In this transient and other instances the collapsed liquid level falls (for short periods of time) significantly below the top of the active fuel.

1. How is the actual mixture level calculated in these cases and what is the expected accuracy of this determination?

2. What constitutes core uncovery?

3. What criteria are used to determine if the upper part of the core is uncovered?

4. How is core heat-up calculated if core uncovery is predicted?

5. Are two axial nodes sufficient to permit the determination of actual mixture level and core uncovery?

6. Has the methodology used to calculate peak clad temperature been qualified? If yes, how?