ArevaEPRDCPEm Resource

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Sent: Wednesday, August 18, 2010 1:46 PM
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Subject: Draft - U.S. EPR Design Certification Application RAI No. 437 (4953), FSAR Ch. 6
Attachments: Draft RAI_437_SPCV_4953.doc

Attached please find draft RAI No. 437 regarding your application for standard design certification of the U.S. EPR. If you have any question or need clarifications regarding this RAI, please let me know as soon as possible, I will have our technical Staff available to discuss them with you.

Please also review the RAI to ensure that we have not inadvertently included proprietary information. If there are any proprietary information, please let me know within the next ten days. If I do not hear from you within the next ten days, I will assume there are none and will make the draft RAI publicly available.

Thanks,
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Request for Additional Information No. 437(4953), Revision 1

8/18/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 06.02.01 - Containment Functional Design
Application Section: 6.02.01, 14.03

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

06.02.01-96

Follow-up to RAI 82, Question 06.02.02.02-1c3 (Related to Chapter 14.03)

In the absence of containment atmospheric sprays and fan coolers, the containment internal heat structures play a vital role in removing steam from the containment atmosphere following a high energy line break. The heat sink inventory used in containment overpressure analyses from LOCA and MSLB are given in Tier 2 Table 6.2.1.4. For containment overpressure analysis assumptions are made to conservatively maximize containment pressure. The response to RAI 82 Question 6.2.2.2-1c3-2 (Sup 3) stated that an ITAAC is being prepared to confirm the minimum heat sink surface area value after construction. It was stated that Tier 1, Section 2.1.1.1, Item 2.14 and Table 2.1.1-8, Item 2.14 will be added to require that deviations between as-built construction drawings and dimensions used in the containment analyses have been reconciled.

The heat sink inventory should also be shown to be less capable of heat removal than that which was assumed in the minimum containment pressure calculations that was used in the ECCS performance evaluations. For the minimum containment pressure calculation the estimated heat sink formulation of BTP 6-2 of the Standard Review plan was used. The minimum containment pressure calculations are described in Section 6.2.1.5 of the FSAR. Provide an ITAAC requirement to ensure that the as-built containment heat structure inventory does not exceed the heat removal capability assumed in Section 6.2.1.5 fo the FSAR.

06.02.01-97

Follow-up to RAI 340, Question 06.02.01-56

In RAI 340 Question 6.02.01-56, the Staff requested AREVA to provide justification the assumed for blockage of air flow from the containment into the RCS in RELAP5-BW LOCA calculations. Inflow of air from the containment to the RCS might affect heat transfer in the RCS, for example, condensation. The Supplement 1 response stated that scoping studies show that inflow from the containment causes oscillatory behaviors in RCS that enhances the condensation potential in the coolant loops. This response needs to be expanded. For postulated cold leg breaks at the suction and discharge of a reactor coolant pump, quantify the amount of air which might enter and the time periods for which the break flow might be negative. Provide these evaluations for the first 1200

seconds for DEG-CLPS break and for the first 3600 seconds for a DEG-CLPD break. Provide evaluations of the effect on containment pressure if air were ingested into the reactor system during these periods.

06.02.01-98

Follow-up to RAI 266, Question 06.02.01.04-4

The Supplement 7 response indicated that excess inventory in the affected SG adds to the containment peak pressure for a postulated MSLB. Provide an evaluation of the effect on containment pressure of the excess inventory added from a single failure producing the rapid full opening of an MFW control valve as compared with a postulated MSLB break with the single active failure of one MSIV to close as described in FSAR Sec. 6.2.1.1.3. Demonstrate that the analysis of record is conservative.

06.02.01-99

Follow-up to RAI 221, Question 06.02.01-23

Supplement 8 response lists compartments that are isolated from the main containment by doors but are connected by vents, drains and penetrations for piping and cable. The volume of these rooms is stated to be included in the calculations for bulk containment pressure.

a. Provide justification that the vents, drains and penetration openings connecting each of these compartments to the bulk containment are adequate to sufficiently equalize before the peak containment pressure is reached for design basis accidents.
b. The “Net Room Volumes” provided in Table 06.02.01-23-1 differs from the values for the compartments provided to the staff in the response to RAI 40. Provide a comparison between the volumes in the two responses. Identify which values are correct and discuss the reasons for which different values were given.

06.02.01-100

During an NRC’s audit review of the GOTHIC EPR model used to perform DBA containment analysis, a number of nodalization issues arose concerning the selection of rooms included in lumped control volumes (CVs) as described in AREVA’s response to RAI No. 40. For example, some rooms included in CV21 and CV22 appear, from reviews of the EPR general arrangement drawings and recently obtained tables from AREVA NP document 38-9028970-000, to be isolated from the assessable middle annulus space by doors (Rooms 11-025, 11-026, 11-031, and 11-021). In other cases, for example, in the upper annulus volumes, dead-ended rooms connected via small pathways to an open space are lumped into a single control volume CV24 (Rooms 29-022 and 34-022). Provide the following information to help us with our review of the GOTHIC EPR multi-cell model used to analyze containment DBA events:

a. Provide the nodalization methodology that was used to reduce the approximately 146 containment rooms or regions of the EPR containment into the small number of lumped parameter volumes that define the EPR multi-cell model, as described in the response to RAI No. 40. Include in the discussion a response to issues raised concerning isolated rooms or small connects to dead-ended rooms included in a lumped parameter volume.

b. Referencing the pathway numbers in Table 2 (Listing of Primary EPR Data: Connections) from NP document 38-9028970-000, list the pathway open or closed status that was used in the DBA calculations reported in chapter 6.2 of the EPR FSAR.

c. From Table 2 of NP document 38-9028970-000, the path between compartments UJA11-021 to UJA11-013 is indicated as “free opening”, see page 42, item No. 95. Page 4 from the RAI 340 Supplement 1, Question 06.02.01-54 response indicates there is a door between the two compartments. The AREVA RAI response No. 82, Supplement 3 Question 06.02.01-12-3d dated 10/03/2008 also indicates there is a door (see page 7 of 64). Explain this apparent inconsistency.

d. Provide a discussion of the QA requirements that the GOTHIC EPR multi-cell deck was subjected to prior to being used to provide input to chapter 6.2 of the EPR FSAR.

06.02.01-101

Follow-up to RAI 266, Question 06.02.01-11

Supplement 1 response indicated that the rupture foils would not open for a MSLB in the accessible space. The temperature and pressure in the equipment room was calculated to remain at the initial value until 18 seconds into the event when the mixing dampers were assumed to open. With the equipment space isolated from the rest of the containment for the first 18 seconds, the pressure in the accessible space spiked upward rapidly. The staff’s understanding is that the foils are designed to rupture on a differential pressure in either direction. At 18 seconds into the event the differential pressure is approximately 50 psid.

a. Provide the reverse differential pressure for which the foils are expected to open.

b. Provide the test results demonstrating the foil’s opening capability. When will this test data be available to the NRC staff?

c. If the foils do not open, by 18 seconds when the dampers are assumed to open there will be a very large differential pressure for them to open against. Provide justification that the dampers can open against this differential pressure.

d. If the damper opening time is increased slightly and the foils are not open, the containment design pressure will be exceeded. Discuss the uncertainty in damper opening time and justify that the containment design pressure will not be exceeded.