ArevaEPRDCPEm Resource

From: Tesfaye, Getachew
Sent: Friday, January 29, 2010 10:23 AM
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Cc: Jensen, Walton; Jackson, Christopher; Snodderly, Michael; Carneal, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 340 (4094), FSAR Ch. 6
Attachments: RAI_340_SPCV_4094.doc

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on December 6, 2009, and discussed with your staff on January 20, 2010. Drat RAI Questions 06.02.01-53 was modified as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
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Hearing Identifier: AREVA_EPR_DC_RAIs
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Request for Additional Information No. 340 (4094), Revision 1

01/29/2010

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

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

06.02.01-53

One purpose of the GOTHIC multi-node calculations is to predict natural circulation flow patterns and heat transfer in the containment. Chapter 9.0 of Technical Report ANP-10299, Revision 1, presents a sample containment calculation for LOCA. Detailed computer outputs for pressure, temperature and flow rate are provided in the Response to RAI No. 1, Supplement 7. This calculation assumes opening of containment doors as expected. AREVA's safety analysis method does not take credit for opening of non-safety doors.

Please provide detailed results, similar to the RAI 1, Supplement 7 data, for a DE CLPS LOCA with non-safety doors closed. Also, provide discussion and illustration of flow patterns observed during the early blowdown phase and just prior to initiation of hot leg injection. Discuss observed thermal stratification in the entire containment (do not limit the discussion to the dome).

Also provide data on calculated non-condensable distribution in the containment during the event and on heat transfer rates at various parts of the containment. What was the integrated energy deposition to major heat sinks? Discuss the above results.

06.02.01-54

Figure 9-7 of Technical Report ANP-10299, Revision 1 presents the GOTHIC nodalization diagram for the sample LOCA containment analysis. The containment design is complex, with many vertical and horizontal dividing walls. It contains approximately 150 subcompartments. There is no description in the Report of how the containment space, including subcompartments, was assigned to the 30 nodes represented in the calculations.

Provide a description of the dividing boundaries used for development of the multi-node GOTHIC model. This could be done, for example, in terms of an overlay of the GOTHIC nodalization and the various containment drawings as was presented at the October 23, 2009 Audit.

06.02.01-55

In the event of a LOCA the reactor protection system initiates both, MHSI and LHSI. In addition, the accumulators will start to discharge when the RCS pressure drops below the accumulator's pressure. The delivery lines merge, and inject into the RCS through a single line for each loop. The merging flows interfere with one another. This issue has already been addressed in RAIs and responses to RAIs, but no actual calculation was available to justify the ECC flow used in containment analysis. The staff understand that AREVA has now performed calculations to complete the justification.

In order for the staff to verify the ECC flow used in containment analysis, provide sample ECC flow calculations with simultaneous MHSI, LHSI, and accumulator discharge. The calculations should cover both, water discharge and nitrogen discharge from the accumulators.

06.02.01-56

In LOCA calculations air inflow from the containment into the RCS is blocked. It is stated, that this step is conservative and results in higher containment temperature and pressure. There is no mention of the basis for this conclusion. Inflow of air from the containment to the RCS can affect heat transfer in the RCS, for example, condensation. Are there calculations available with the airflow not blocked showing the effect of the air on heat transfer in the RCS?

Provide justification for blockage of air flow from the containment into the RCS in LOCA containment calculations. Provide the basis that establishes that the assumption associated with air flow blockage is conservative.

06.02.01-57

On November 18, 2009, the staff performed an audit of work package NI-1-3380 describing the calculation of IRWST level following a loss of coolant accident to be used in determining the NPSH available to safety related pumps that draw suction from the IRWST.

Describe how this calculation is made conservative for the NPSH calculation. Include the following considerations.

a. The volume of water assumed to remain in the reactor system.

b. The initial water volume in the IRWST.

c. The water retained on the floors: Include the geometric retention, floors with weirs and those without weirs. Include the dynamic retention with justification for the flow rate assumed to spill upon the floor. Appropriate reference and justification should be provided for the calculational methodology. Include all horizontal surfaces taking into account the approximately 150 compartments of the containment. Provide surface areas and assumed water heights. Provide the dimensions (height and width) of all water retaining weirs.

d. The water retained on vertical surfaces as a film: The film thickness will be a function of the surface height. Justify that a conservative height was used. Provide estimated vertical surface areas for all compartments (~150) and corresponding heights used in the calculations.

e. Water retention within potentially clogged strainers and trash racks. Justify the assumptions used.

f. Vapor and droplets in the containment atmosphere. Justify that a conservative pressure was used to calculate the vapor mass and that droplets were conservatively considered.

g. Water retention behind doors. Identify compartments where water retention could occur behind doors. Provide and justify the calculated water retention.

h. Identify each room that is assumed not to drain, thus filled with water in the water retention estimate. Indicate the size of the room and the assumed water height.

i. Describe other assumptions used and justify that they are conservative including the temperature of the water on the floors and IRWST, operation of the drain system, and any other assumptions made.

j. Provide a proposed ITAAC for inspection of the as built containment. The purpose of the inspection is to confirm that all potential water retention locations have been identified and the amount of water retention has been conservatively estimated for each potential location.