ArevaEPRDCPEm Resource

From: Tesfaye, Getachew
Sent: Wednesday, April 28, 2010 9:59 AM
To: 'BRYAN Martin (EXT)'
Cc: GUCWA Len T (EXT); Carneal, Jason
Subject: FW: Containment audit plan April 30 2010 FINAL.doc
Attachments: Containment audit plan April 30 2010 FINAL.doc

Importance: High

Marty,

Attached is the subject final audit plan with AREVA's comments addressed. AREVA is available until 1:00p.m., and we may need to schedule another meeting if we don't get through all the material. Jason has suggested that they start earlier, at 8:30a.m., to make best use of our time.

Thanks,

Getachew

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 1353

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From: Tesfaye, Getachew

Created By: Getachew.Tesfaye@nrc.gov

Recipients:
"GUCWA Len T (EXT)" <Len.Gucwa.ext@areva.com>
Tracking Status: None
"Carneal, Jason" <Jason.Carneal@nrc.gov>
Tracking Status: None
"'BRYAN Martin (EXT)'" <Martin.Bryan.ext@areva.com>
Tracking Status: None

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AUDIT PLAN TO REVIEW SELECTED AREAS RELATED TO
U.S. EPR FSAR CHAPTER 6 AND SUPPORTING TECHNICAL REPORTS

APPLICANT:	AREVA NP, Inc.
APPLICANT CONTACTS:	Martin Bryan Len Gucwa
TIME:	8:30 am to 1:00 pm on 4/30/2010
LOCATION:	AREVA NP, Inc. 1700 Rockville Pike Suite 400 Rockville, MD 20852
REVIEWERS:	Walton Jensen (NRO, Audit Lead) Shie-Jeng Peng (NRO) Jason Carneal (NRO) Zoltan Rosztoczy (Numark Associates)

BACKGROUND

AREVA NP, Inc. has submitted to the U.S. Nuclear Regulatory Commission (NRC) a Final Safety Analysis Report (FSAR) for its application of the U.S. Evolutionary Power Reactor (EPR) in December, 2007. NRC staff has initiated the design certification review on March 19, 2008. The U.S. EPR design does not rely on active containment cooling systems for post-accident containment mixing. As a result, to adequately justify the level of mixing in the containment and the level of steam condensation in the reactor coolant system credited in the post-accident analysis, the staff issued a request for additional information which required long lead items to properly address the issue at the beginning of Phase 1. On January 28, 2009, AREVA provided a response to the RAI in the submittal of ANP-10299P Revision 0, "Applicability of AREVA NP Containment Response Evaluation Methodology to the U.S. EPR for Large Break LOCA Analysis Technical Report." An audit was held concerning Revision 0 of ANP-10299P on April 6 and 7, 2009 at the AREVA headquarters in Lynchburg, VA. On July 31, 2009, AREVA provided Revision 1 to ANP-10299P for NRC staff review. On September 1 and 2, 2009 an audit was held at the AREVA offices in Rockville, MD to review the material submitted in Revision 1 to ANP-10299P. On December 2, 2009, AREVA submitted Revision 2 to ANP-10299P for NRC review.

In order to cover important review areas handled by the NRO Containment and Ventilation Branch, the staff is proposing an audit that will be carried out at the AREVA office in Rockville, MD. The review of the additional technical documents, made available by AREVA at its local office, will be facilitated by the presence of AREVA personnel at the audit. Specifically, the staff request that the applicant provide documentation relevant to the discussion topics provided in Attachment B. The

requested documentation includes pertinent technical documents that support the topics identified in Attachment B. The audit is needed to resolve existing questions in accomplishing the U.S. EPR review schedule in an efficient manner and to support the review in conformance with SRP Section 6.2.1.

PURPOSE AND APPROACH

The purpose of this audit is to review additional documents and calculations provided by AREVA that pertain to the generation of ANP-10299P, "Applicability of AREVA NP Containment Response Evaluation Methodology to the U.S. EPR for Large Break LOCA Analysis Technical Report." In addition, AREVA will provide information on the subcompartment analysis in support of the U.S. EPR FSAR Chapter 6 that will be submitted at a later date. The topics covered in the audit will specifically focus on the containment functional design, loss of coolant accident (LOCA) mass and energy release, main steam line break (MSLB) mass and energy release, containment heat removal, and other topics as identified in Attachment B.

To achieve the review goals in an efficient manner, the staff assembled an interdisciplinary audit team. The audit team will include experts from NRC and consulting organizations. To facilitate and expedite the work, it is foreseen that the audit will be attended by representatives from AREVA who will introduce the audit topics and provide supporting documents and technical evidence to the reviewers. The staff will document the audit findings in an audit report.

AUDIT ACTIVITIES AND SCHEDULE

The NRC staff will conduct the review over a period of one business day. If necessary, NRC may request an ad-hoc extension of the audit at the same location if findings during the ongoing audit reveal the need for additional time. Such an extension will be requested before the meeting is adjourned on 04/30/2010 by the NRC staff responsible for the audit. At this time, it is anticipated that an audit extension at a later date will be necessary to cover all the discussion topics contained in Attachment B.

Following the audit, each technical reviewer will prepare a separate audit report with specific findings will send the report to Jason Carneal by 05/14/2010. The NRC staff responsible for the audit will assemble and prepare a final audit report. The final report will be made available to all contributors for their concurrence by 05/21/2020. Any final notes by the contributors will be communicated to Jason Carneal no later than 05/19/2010.

A detailed agenda for the audit is presented in Attachment A. A detailed list of discussion topics is presented in Attachment B. If necessary, any circumstances related to the conductance of the audit will be communicated to Walton Jensen (NRC) at 301-415-2856 or at Walton.Jensen@nrc.gov.

Attachment A

Agenda
NRC Containment Analysis Audit
Pertaining to the Review of the U.S. EPR FSAR, Chapter 6
April 30, 2010
Rockville, MD

Friday, April 30, 2010, MORNING SESSION: AUDIT - proprietary

08:30-08:45	Audit Entrance / Introduction	[NRC/AREVA]
08:45-9:45	Subcompartment Analysis	[AREVA]
09:45-12:15	Main Steam Line Break Analysis	[AREVA]
12:15-12:45	Discussion Topics as Identified in Attachment B	[AREVA]
12:45-13:00	Audit Exit / Summary	[NRC/AREVA]

Attachment B

Suggested US-EPR Containment Audit Topics
April 30, 2010

Containment Functional Design

1. The successful mitigation of postulated LOCAs in the pressurizer is dependent on the opening of 6 safety related doors. The applicant has not yet described these doors in the FSAR or demonstrated that the doors meet safety related requirements. (See RAI 368 06.02.01-66, 06.02.01-67 and 06.02.01-68)

2. The staff requested that AREVA demonstrate that the noding detail of the 30-node GOTHIC simulation of the US-EPR containment is adequate to model the effects of containment stratification and to demonstrate that the noding arrangement does not produce artificial circulation patterns as discussed Section 22.10 of the GOTHIC Users Manual. This information has not yet been provided by AREVA. (See RAI 209 06.02.01-14 and RAI 368 06.02.01-73)

3. The applicant needs to document why the GOTHIC US-EPR modeling is acceptable given the large distortion found for certain phenomena of significant importance during the scaling analysis between US-EPR and the qualification test. (See RAI 368 06.02.01-58)

4. The applicant needs to provide additional LOCA scoping calculations with the multi-noded GOTHIC model to select the limiting cold leg break size, location and single failure assumptions. These calculations should not credit any equipment which is not safety related. (RAI 378 06.02.01-93)

5. The applicant needs to provide the results from postulated small breaks in the service space and provide a discussion on the performance of the CONVECT system during small break accidents. (See RAI 378 06.02.01-90)

6. The staff requested that the applicant analyze the containment pressure response from MSLBs using the same core reactivity and single failure assumptions as used in FSAR Chapter 15. (See RAI 266 06.02.01.04-4 and RAI 297 06.02.01-51)

7. The equipment qualification temperature profile should be updated to envelope the updated containment calculations. (See RAI 368 06.02.01-80)

8. The amount of heat transferred to structures depends on the assumed thermal conductivity and heat capacity of the concrete. Structural concrete used at different sites differ in properties which may change as the concrete ages. The change in properties with aging is a function of the environment to which the concrete is exposed. Describe the inspections which will be conducted to ensure that the containment concrete for each site will adsorb at least as much heat as assumed in the FSAR. Describe the surveillances which will be performed to ensure that the concrete properties do not change with time so as to provide less heat absorption capability than that assumed in the FSAR. (RAI 389 06.02.02-50a)

9. The amount of heat transferred to the containment concrete shell is dependent on the gap thickness between the liner and the concrete. Justify the selection of this gap thickness. Describe the inspections which will be conducted to ensure that the liner to concrete gap thickness at each site will not exceed that assumed in the GOTHIC calculations. Describe the surveillances which will be performed to ensure that the gap thickness does not change with time so as to provide less heat absorption capability as that assumed in the GOTHIC calculations. (RAI 389 06.02.02-50b)

10. There is not enough information in Section 6.2.1.1 of the FSAR – SRP acceptance criteria are not addressed; various items important to establishing safety of the containment are not addressed in Section 6.2.1.1.

Subcompartment Analysis

11. Provide a status of the ongoing subcompartment analysis and latest information on submittal dates if possible.

LOCA M&E Release

12. Provide a description of how the methodology in ANP-10299 was modified for hot leg break mass and energy predictions and justify that conservative results are obtained. (RAI 368 06.02.01-59 and 06.02.01-60)

13. Provide justification that the cold legs will not be blocked following a CLPD break before 3600 seconds or provide analyses of the containment response resulting from earlier loop seal formation. (RAI 368 06.02.01-61)

14. Provide justification that the methodology for evaluating mass and energy release for split breaks and small breaks is conservative for that purpose. (RAI 368 06.02.01-62)

15. Provide justification that the methodology for evaluating mass and energy release for breaks in the pressurizer compartment is conservative for that purpose. (RAI 368 06.02.01-66)

16. 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. See RAI#340 6.02.01-56. The applicant responded in supplement 1 that a scoping study had been done and showed no problem. The scoping study was not described. What is the total time the flow could be reversed? How much air could enter the RCS? What would be the effect?

17. Provide justification that the assumption for liquid flow distribution between the broken and unbroken loops during the post reflood period is conservatively calculated. See RAI#221 06.02.01-35b and RAI#368 06.02.01-74

18. Provide justification that the assumption for liquid entrainment from the core

during the post reflood period is conservatively calculated. See RAI#221 06.02.01-35a and RAI#389 06.02.02-47.

19. For the US-EPR the applicant proposed to procedurally require that hot leg injection be implemented no later than 60 minutes following a LOCA. The staff has requested a list of the actions which the operators must take to perform this function, a discussion of when are they must begin these actions and on what control room signal will the actions be initiated. (RAI 368 06.02.01-72)

20. Justify that sufficient break sizes have been analyzed using the methodology of ANP-10299P including the multi-noded GOTHIC containment model, that the limiting break size at each location has been identified. (RAI 368 06.02.01-63)

MSLB M&E

21. The applicant needs to provide the steam generator fluid inventories that were used in the safety analyses, address how these values were made conservative for the US-EPR and describe how the inventories will be verified for the as built plant. (RAI #378 06.02.01-82)

22. The applicant needs to perform a containment analysis for MSLB inside containment with an assumed MSRCV failure as the single failure. (RAI #266 06.02.01.04-4 and RAI #297 06.02.01-51)

23. The applicant has added high containment pressure as one of the signals to initiate steam generator isolation. This signal has not yet been incorporated into the steam generator isolation discussions of FSAR Chapter 7.3 "Engineered Safety Features Systems". The staff will monitor that this signal is properly included in the FSAR discussions. (RAI#389 06.02.02-51)

24. Although the applicant calculated other break sizes and conditions to produce lower containment pressures and temperatures, a smaller break might produce elevated temperatures for a longer duration which might have a more detrimental consequence on the operation of safety equipment than a higher temperature of shorter duration. So that the staff could investigate containment temperature conditions for a small break size, the staff requested that the applicant provide an additional M&E table. **(**RAI #378 06.02.01-87)

Containment Heat Removal

25. Failure mode analysis of mixing dampers. Will the delta pressure signal open dampers if the break is in the annular space? Common mode failure analysis. (RAI No. 389 06.2.02-48)

26. Section 6.2.2 of the FSAR does not contain the information specified by RG 2.106 and does not address compliance with the acceptance criteria of Section 6.2.2 of the SRP. (RAI No. 389 06.02.02-49)

27. Report on the rupture foil and convection foil tests to verify the foils design parameters. (RAI 368 06.02.01-75)

28. Update Task Abstract #013 of FSAR Section 14.2 to properly address initial testing of the CONVECT system.

ITAAC and Technical Specifications

29. Develop ITAAC for the CONVECT system. (RAI 104 14-03.2)

30. Develop Technical Specifications for the CONVECT system. (RAI 221 06.02.01-24)

31. Provide technical specifications which ensure the LHSI system will continue to deliver at least 75% of the total flow from two trains to the hot legs if diverted there by plant operators after a LOCA. See RAI#221 06.02.01-38b.

32. Provide an ITAAC to demonstrate that the LHSI system will deliver at least 75% of the total flow from two LHSI trains to the hot legs if diverted there by plant operators after a LOCA. See RAI#221 06.02.01-38b.

33. Properties of Concrete - thermal conductivity and heat capacity (RAI 389 06.02.02-50a)

34. Liner to concrete gap thickness (RAI 389 06.02.02-50b)

35. Containment heat sink capability greater than assumed in FSAR Section 6.2.1.1 and less that that assumed in FSAR Section 6.2.1.5 (RAI# 6.2.1.1-1c3 and a future RAI on Section 14.3.11)

36. RHR heat exchanger fouling See RAI#82 6.02.02-1a, RAI#266 6.02.02-33 and RAI#297 06.02.02-42.

37. Steam generator inventory (RAI #378 06.02.01-82)

38. COL interface that in-containment equipment meets EQ curve (See RAI#82 6.2.1.1-a3 and RAI 368 06.02.01-80)

39. Opening characteristics and operability requirements for foils, dampers and safety related doors (See RAI 368 06.02.01-66, 06.02.01-67 and 06.02.01-68)

40. Subcompartment vent areas See RAI#104 14.03-1a3, RAI#22106.02.02-24 and RAI#266 06.02.01.01-3.