ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Wednesday, May 01, 2013 5:32 PM
To: Snyder, Amy
Cc: Miernicki, Michael; ANDERSON Katherine (EXTERNAL AREVA); DELANO Karen (AREVA); LEIGHLITER John (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); HONMA George (EXTERNAL AREVA)
Subject: Response to U.S. EPR Design Certification Application FINAL RAI No. 580, FSAR Ch.3-- NEW PHASE 4
Attachments: RAI 580 Response US EPR DC.pdf

Amy,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 580 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the three questions cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 580 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 580 — 03.08.04-28	2	3
RAI 580 — 03.08.04-29	4	5
RAI 580 — 03.08.04-30	6	6

The schedule for a technically correct and complete response to these questions is provided below.

Question #	Advanced Response Date	NRC Comment Request Date	Final Response Date
RAI 580 — 03.08.04-28	June 28, 2013	August 16, 2013	August 30, 2013
RAI 580 — 03.08.04-29	June 28, 2013	August 16, 2013	August 30, 2013
RAI 580 — 03.08.04-30	June 28, 2013	August 16, 2013	August 30, 2013

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
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From: Snyder, Amy [mailto:Amy.Snyder@nrc.gov]
Sent: Thursday, April 04, 2013 3:56 PM
To: ZZ-DL-A-USEPR-DL
Cc: Miernicki, Michael; Xu, Jim; Segala, John
Subject: U.S. EPR Design Certification Application FINAL RAI No. 580, FSAR Ch.3-- NEW PHASE 4

Attached please find the subject request for additional information (RAI). Draft RAI was provided to you on March 18, 2013. On March 26, 2013, you requested a clarification call. On April 2, 2013, the draft RAI was discussed with your staff. As a result of this discussion, the draft RAI was revised and you informed us that with the change the revised RAI

is clear and does not contain AREVA Proprietary information. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of this Final RAI or by **May 6, 2013**. If this RAI question 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

Thank You,
Amy

Amy Snyder, U.S. EPR Design Certification Lead Project Manager
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Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 4399

Mail Envelope Properties (554210743EFE354B8D5741BEB695E6561514B0)

Subject: Response to U.S. EPR Design Certification Application FINAL RAI No. 580, FSAR Ch.3-- NEW PHASE 4
Sent Date: 5/1/2013 5:31:36 PM
Received Date: 5/1/2013 5:31:42 PM
From: WILLIFORD Dennis (AREVA)

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Files	**Size**	**Date & Time**
MESSAGE	2825	5/1/2013 5:31:42 PM
RAI 580 Response US EPR DC.pdf	99243	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Response to

Request for Additional Information No.580, Revision 0

4/4/2013
U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.08.04 - Other Seismic Category I Structures
Application Section: SRP
SRSB Branch

Question 03.08.04-28:

The EPR vent stack, located atop the roof of the Fuel Building, is classified as seismic Category I and is included in FSAR Tier 2, Appendix 3E, as one of the EPR critical structural sections for which an essentially complete design should be provided in accordance with 10 CFR 52.47(c). During the audit conducted on February 25 – 28, 2013, the staff reviewed calculation "U.S. EPR Standard Plant DC Fuel Building Design - Vent Stack Design & Reaction Loads (CS-36)." A number of technical issues were identified as a result of this review, which the staff believes are important to its evaluation of the design for meeting 10 CFR Part 50, General Design Criteria (GDC) 1 and 2, as they relate to the stack being designed to perform its intended functions under natural phenomenon loads. Therefore, the staff requests that the applicant to address the following issues:

(1) The structural design of the seismic Category I vent stack is based on the standard ASME STS-1-2006 "Steel Stacks," which has not been endorsed by the NRC. The guidance in SRP 3.8.4 indicates that an acceptable design code for the seismic Category I steel structures is ANSI/AISC N690-1994, including the 2004 supplement, and for the seismic Category I concrete structures, ACI 349 with certain additional criteria. The applicant is therefore requested to provide comparisons between the ASME STS-1-2006 and the SRP 3.8.4 acceptance criteria to demonstrate that the use of ASME STS-1-2006 for the seismic Category I stack design is consistent with the acceptance criteria in SRP 3.8.4. This should include materials, loads, load combinations, and allowable stresses considered in the design. In addition, for wind and tornado-induced pressure loads, including vortex shedding, explain how the ASME STS-1-2006 methodology for determining these loads is consistent with the methodology in ASCE/SEI7-05 and the guidance in SRP 3.3.1 and 3.3.2.

(2) The stack design relies on tuned mass dampers (TMD) to reduce the vortex shedding loads. The applicant is requested to describe the conceptual design of the TMD (location, mass, stiffness, damping) and explain how they were credited in the design analysis. In addition, provide performance requirements in the FSAR that ensure the TMD will be seismically qualified.

(3) The stack design considers steel material with 70 ksi yield strength (ASTM A913 Grade 70), which falls outside of the range of the application of the ASME STS-1-2006 code equations. The staff understands that the applicant has requested the ASME STS-1-2006 code committee to approve the use of 70 ksi steel in the application of ASME STS-1-2006 code equations. The applicant is requested to provide alternative means to demonstrate the adequacy of the design in case the code committee does not approve the applicant's request.

(4) The vent stack is anchored to the supporting concrete roof slab of the Fuel Building by means of 76 two-inch diameter through-bolts (ASTM A354, 130 ksi yield strength). Heavy plates and anchor chairs provide the necessary strength and stiffness for load transfer. However, the design calculation does not include a check for the adequacy of bearing stresses on the concrete slab. The applicant is requested to evaluate these stresses. In addition, the through-bolts appear to have a substantial length, approximately 100 inches. The applicant is requested to identify if these through-bolts

will be preloaded and if so, to identify the corresponding preload. Finally, the applicant is requested to evaluate the impact of any potential elongation of the through-bolts on the rotational flexibility of the vent stack base and, in particular, on the overall dynamic response and on the horizontal displacement at the top of the vent stack.

The applicant is requested to provide an update to the relevant sections of the FSAR Tier 1, Tier 2, and ITAAC, to include the vent stack design information, TMD description and performance requirements, and reference to the ASME STS-1-2006 standard.

Response to Question 03.08.04-28:

A response to this question will be provided by August 30, 2013.

Question 03.08.04-29:

The liner plate for the concrete containment is identified as one of EPR critical structural sections for which an essentially complete design should be provided in accordance with 10 CFR 52.47(c). During the audit conducted on February 25 – 28, 2013, the staff reviewed calculation "U.S. EPR Standard Plant DC Containment Design – Typical Liner Plate & Liner Plate Anchorage System (CS-01)." A number of technical issues were identified as a result of this review, which the staff believes are important to its evaluation of the design for meeting 10 CFR Part 50, General Design Criteria (GDC) 1, 4, 16 and 50 as well as 10 CFR 50.44, as they relate to the containment liner's capability to maintain leak tightness under various postulated containment loads. Therefore, the staff requests the applicant to address the following issues:

(1) The methodology for designing the liner plate and liner plate anchorage system described in the design calculations generally follows Bechtel Topical Report BC-TOP-1 [1], which addresses the implementation of Article CC-3810 of ASME Section III, Division 2, for containment liner designs. The liner plate anchors consist of WT 5x11 elements, which are different from the L3x2x1/4 angles specified in BC-TOP-1. The design of the liner plate anchorage system utilized the force-displacement characteristic relationship for the WT anchors; however, this relationship was developed from test results that were reported in a conference paper [2]. Since the staff cannot determine the quality and reliability of these test data from unverified information described in a conference paper, the applicant is requested to provide adequate documentation including description of test specimens, test conditions, quality controls, etc., which establishes the quality of the test data that is applicable to the configuration of the applicant's liner plate anchorage system. In addition, the applicant should describe how the force-displacement characteristic relationship is developed from the test data.

(2) The design calculations for the liner plate anchorage system do not consider the liner plate strains associated with combustible gas loads (pressure and temperature conditions), which is inconsistent with FSAR Tier 2, Section 3.8.1.3.2 and SRP 3.8.1 acceptance criteria. Therefore, the staff cannot determine whether the liner design meets 10 CFR 50.44 as it relates to maintaining the leak tightness of the liner under pressure and temperature loads induced by postulated 100% metal-water reaction followed by the hydrogen burn. The applicant is requested to provide the technical basis for not considering these strains. The staff noted that the applicant has demonstrated that the liner plate can withstand the strains induced by combustible gas loads under the assumption that the liner plate is "glued" to the concrete containment shell. For this assumption to be valid, the applicant also needs to demonstrate the liner plate anchorage system is adequate to withstand the induced strains.

References

[1] T.E. Johnsonand B.W. Wedellsborg, "Topical Report BC-TOP-1 Revision 1: Containment Building Liner Plate Design Report," Bechtel Corp., 1972. Approved by the AEC on February 7, 1974.

[2] P.L. Chang-lo, T.E. Johnson, and B.W. Pfeifer, "Containment liner plate anchors and steel embedments test results,"Transactions of the 4thSMiRT Conference,pp. J5/9, 1977.

Response to Question 03.08.04-29:

A response to this question will be provided by August 30, 2013.

Question 03.08.04-30:

FSAR Tier 2, Appendix 3E, describes the methodology used to select the EPR critical structural sections. An integral part of this methodology is the "supplemental methodology" by which a number of critical structural sections were selected on the basis of engineering judgment as needed to comprise an essentially complete design of each seismic Category I structure and provide reasonable assurance of the EPR design adequacy, in accordance with 10 CFR 52.47(c).
During the audit conducted on February 25 – 28, 2013, the staff reviewed calculation "U.S. EPR Standard Plant DC General Design - Typical Beams and Columns for the Nuclear Island (CS-24)." The staff determined that the scope of the design calculations did not include representative connections between steel structural elements or between steel and concrete structural elements. Since connections are key elements in the structural load path, the applicant is requested to provide the following additional information:
(1) Identify critical structural section designs that exclude steel-to-steel and steel-to-concrete connections as part of their scope. In each case, explain why such structural connections are excluded.

(2) Since structural connections were excluded from the scope of critical structural section CS-24 "Typical Beams and Columns for the Nuclear Island," explain why a separate critical structural section corresponding to structural connections was not selected per the "supplemental methodology".

Response to Question 03.08.04-30:

A response to this question will be provided by August 30, 2013.