ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Wednesday, September 07, 2011 12:22 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); WELLS Russell (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 503 (5961,5929,5444), FSAR Ch. 3
Attachments: RAI 503 Response US EPR DC.pdf

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 503 Response US EPR DC.pdf" provides technically correct and complete final responses to 2 of the 4 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 503 Questions 03.06.01-11 and 03.06.01-12.

The following table indicates the respective pages in the response document, "RAI 503 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 503 — 03.06.01-11	2	2
RAI 503 — 03.06.01-12	3	3
RAI 503 — 03.09.02-168	4	4
RAI 503 — 03.09.03-26	5	5

A complete answer is not provided for 2 of the 4 questions. The schedule for a technically correct and complete final response to these questions is provided below.

Question #	Response Date
RAI 503 — 03.09.02-168	December 9, 2011
RAI 503 — 03.09.03-26	December 9, 2011

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Tuesday, August 16, 2011 4:48 PM
To: ZZ-DL-A-USEPR-DL
Cc: Hernandez, Raul; Segala, John; Lee, Samuel; Wong, Yuken; Le, Tuan; Dixon-Herrity, Jennifer; Miernicki, Michael; Clark, Phyllis; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 503 (5961,5929,5444), FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on July 29, 2011, and discussed with your staff on August 16, 2011. No change is made to the draft RAI 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,

Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 3391

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Subject: Response to U.S. EPR Design Certification Application RAI No. 503 (5961,5929,5444), FSAR Ch. 3
Sent Date: 9/7/2011 12:21:36 PM
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From: WILLIFORD Dennis (AREVA)

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MESSAGE	2624	9/7/2011 12:21:46 PM
RAI 503 Response US EPR DC.pdf	452445	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
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Expiration Date:
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Response to

Request for Additional Information No. 503

8/16/2011

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.06.01 - Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside Containment
SRP Section: 03.09.02 - Dynamic Testing and Analysis of Systems Structures and Components
SRP Section: 03.09.03 - ASME Code Class 1, 2, and 3 Components

Application Section: FSAR Chapter 3

QUESTIONS for Balance of Plant Branch 1 (SBPA)
QUESTIONS for Engineering Mechanics Branch 2 (ESBWR/ABWR Projects) (EMB2)

Question 03.06.01-11:

In response to RAIs 3.6.2-17, 3.6.2-31 and 3.6.2-42, the applicant proposed a new FSAR Tier 1 Section 3.8. This new ITAAC requires the completion of the as designed pipe break hazards analyses summary. The applicant also proposed to modify FSAR Tier 2 COL Item 3.6-1 to instruct the COL applicant to reconcile the deviations between the as-built configuration and the as-designed analysis.

In the proposed wording for the FSAR Tier 1 Section 3.8, Table 3.8-1, "Piping Hazard Analysis ITAAC," the applicant makes reference to the completion of the pipe break hazards analyses summary. The staff found the proposed wording unacceptable. In order to demonstrate that all SSCs, that are needed to perform a safety related function or are needed to safely shutdown the plant, are protected against or qualified to withstand the dynamic and environmental effects associated with postulated pipe breaks, the applicant needs to complete the pipe break hazards analyses report, as described in FSAR Tier 2 Section 3.6.1 and Section 3.6.2, not a summary.

Therefore, the staff requests the applicant to modify FSAR Tier 1 Section 3.8, Table 3.8-1, "Piping Hazard Analysis ITAAC," to require the completion of a pipe break hazards analyses report.

Response to Question 03.06.01-11:

U.S. EPR FSAR Tier 1, Table 3.8-1, item 2.1 will be revised to state “A pipe break hazards analysis report exists and concludes. . .”

FSAR Impact:

U.S. EPR FSAR, Tier 1, Table 3.8-1, item 2.1 will be revised as described in the response and indicated on the enclosed markup.

Question 03.06.01-12:

In response to RAIs 3.6.2-17, 3.6.2-31 and 3.6.2-42, the applicant proposed to add the description of the content of the pipe break hazards analyses report in FSAR Tier 2, Section 3.6.2. This summary does not explicitly include the evaluation non-mechanistic longitudinal pipe break of one square foot cross-sectional area within the pipe break exclusion zone, as recommended in SRP Section 3.6.1, and as discussed in FSAR Tier 2, Section 3.6.1.1.6.

The staff requests the applicant to update FSAR Tier 2 Section 3.6.2.1 to include the evaluation of the impact of a 1 square foot break on the main steam and main feed lines, within the pipe break exclusion zone.

Response to Question 03.06.01-12:

U.S. EPR FSAR Tier 2, Section 3.6.2.1 will be revised as requested in the above question.

FSAR Impact:

U.S. EPR FSAR, Tier 2 Section 3.6.2.1 will be revised as described in the response and indicated on the enclosed markup.

Question 03.09.02-168:

Standard Review Plan, Section 3.9.2.I.5, states that dynamic system analyses should confirm the structural design adequacy and ability, with no loss of function, of the reactor internals and unbroken loops of the reactor coolant piping to withstand the loads from a loss-of-coolant accident (LOCA) in combination with the safe-shutdown earthquake (SSE).

The applicant stated in US EPR FSAR, Section 3.9.2 that the forcing functions obtained from hydraulic analysis of the safety injection line breaks are defined at points in the RPV internals where changes in cross-section or direction of flow occur, such that differential loads are generated during the blowdown transient. Additional details of the structural analysis of the RPV isolated model for LOCA loading are given in Appendix 3C.

The staff reviewed Appendix 3C, Section 3C.2.2, "Reactor Pressure Vessel Isolated Structural Model," and determined that the RPV isolated structural model consists of representations of the RPV pressure boundary, CRDMs, CRDM nozzles, closure head equipment (CHE), lower internals, upper internals, and fuel assemblies.

In view of the foregoing, the NRC staff requests that the applicant provide the following additional information:

a. List all components that the applicant has included in their definition of "reactor internals."

b. Does the list of #1 above include all components within the reactor vessel or have any components been excluded?

c. Do the developed forcing functions, the analysis and the interpretation of result by the applicant's thermal-hydraulic modeling and analysis correctly determine the necessary dynamic parameters (such as forces, accelerations, velocities, displacements, mass, stiffness, damping, amplitudes, frequencies, frequency ranges, time, duration and other relevant parameters) to confirm the structural design adequacy and the ability to perform the function of all reactor vessel internal components?

d. Do the developed forcing functions, the analysis and the interpretation of results by the applicant's SSE structural modeling and analysis correctly determine the necessary dynamic parameters (such as forces, accelerations, velocities, displacements, mass, stiffness, damping, amplitudes, frequencies, frequency ranges, time, duration and other relevant parameters) to confirm the structural design adequacy and the ability to perform the function of all reactor vessel internal components?

Response to Question 03.09.02-168:

A response to this question will be provided by December 9, 2011.

Question 03.09.03-26:

OPEN ITEM

Follow-up to RAI 107, Question No. 03.09.03-3.

In EPR FSAR Rev. 2, Section 3.9.3.1.1 "Loads for Components, Component Supports, and Core Support Structures," under Pipe Break subject heading, both Service Levels C and D were identified for design basis pipe breaks (DBPBs). However, FSAR Rev.2, Section 3.9.3, Table 3.9.3-1 and Topical Report ANP-1026NP-A, Rev. 0 identified only Service Level D to be used for design basis pipe breaks, but not Service Level C.

FSAR Rev. 2, Section 3.9.3, Table 3.9.3-1 and Topical Report ANP-1026NP-A, Rev. 0 did not correctly identify DBPBs in service load combination for both Service Levels C and D. The staff requests a clarification of inconsistent information and update to the following documents:

a. EPR FSAR, Section 3.9.3, Table 3.9.3-1
   Revise Table 3.9.3-1 "Load Combinations and Acceptance Criteria for ASME Class 1 Components" to include the DBPBs to be in service load combination of both Service Levels C and D.

b. Topical Report ANP-10264NP-A, "U.S. EPR Piping Analysis and Pipe Support Design Topical Report"
   Revise Table 3-1, "Design Conditions, Load Combination and Stress Criteria for ASME Class 1 Piping" to include the DBPBs to be in service load combination of both Service Levels C and D.

Response to Question 03.09.03-26:

A response to this question will be provided by December 9, 2011.

U.S. EPR Final Safety Analysis Report Markups

For ASME Class 1, 2, and 3 piping, breaks are postulated at terminal end locations which are determined according to the applicable piping isometrics. Intermediate breaks and cracks in ASME Class 1, 2, and 3 piping are postulated per the guidance described in the sections that follow. A COL applicant that references the U.S. EPR design certification will perform the pipe break hazards analysis and reconcile deviations in the as-built configuration to the as-designed analysis.

The pipe break hazards analysis identifies each piping run considered for break postulation. For complex systems (e.g., those containing arrangements of headers and parallel piping running between headers) the piping is included within a designated run for the purposes of break postulation. The following information will be provided in the pipe break hazards analysis report:

- A summary of the dynamic analyses applicable to high-energy piping systems, including:
  - Sketches showing the locations of the resulting postulated pipe ruptures, including identification of longitudinal and circumferential breaks; structural barriers, if any; restraint locations; and the constrained directions in each restraint.
  - A summary of the data developed to select postulated break locations, including, for each point, the calculated stress, the calculated primary plus secondary stress/stress intensity range, and the calculated cumulative usage factor as delineated in BTP 3-4.
  - An evaluation of the impact of a one square foot break on the main steam and main feed lines, within the pipe break exclusion zone.

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- For failure in the moderate-energy piping systems, descriptions showing how safety-related systems are protected from spray wetting, flooding, and other adverse environmental effects.
- Identification of protective measures provided against the effects of postulated pipe failures for protection of each of the essential systems and components.
- A conclusion that the plant can be shut down safely and maintained in cold safe shutdown following a pipe break with loss of offsite power.

3.6.2.1.1 Locations of High-Energy Line Breaks and Leakage Cracks

3.6.2.1.1.1 Break Locations in Containment Penetration Areas

For the portions of fluid systems in containment penetration areas, breaks and cracks are not postulated from the containment wall up to and including the inboard and outboard containment isolation valves, when the systems meet the requirements of Subarticle NE-1120 in Section III of the ASME Boiler and Pressure Vessel Code

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Table 3.8-1—Piping Hazard Analysis ITAAC (2 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	Systems, structures, and components that are required to be functional during and following an SSE are protected against or qualified to withstand the dynamic and environmental effects associated with postulated failures in Seismic Category 1 and non-safety-related piping systems.	a. A~~n as-designed~~ pipe break hazards analysis will be performed. **{{DAC}}**	a. A pipe break hazards analysi~~e~~s ~~summary~~ report exists ~~that~~ and concludes the plant can be shut down safely and maintained in cold safe shutdown following a pipe break with loss of offsite power. For postulated pipe breaks, the pipe break hazards analysi~~e~~s report confirms that: – Piping stresses in the RCB penetration area are within allowable stress limits. – Pipe whip restraints and jet shield designs for protection of the essential systems and components can mitigate pipe break loads. – Loads on safety-related SSCs are within design load limits. – SSCs are protected or qualified to withstand the dynamic and environmental effects of postulated failures, including cubicle pressurization effects. – A summary of the dynamic analyses applicable to high-energy piping systems, including: – Sketches showing the location of the resulting postulated pipe ruptures, including identification of longitudinal and circumferential breaks; structural barriers, if