ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Friday, January 06, 2012 11:22 AM
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. 508 (6005,6000,5994), FSAR Ch. 3, Supplement 2
Attachments: RAI 508 Supplement 2 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to the three questions in RAI No. 508 on September 23, 2011. On December 1, 2011, AREVA NP submitted Supplement 1 to provide a revised schedule for Question 03.03.01-5 and Question 03.07.03-41.

The attached file, "RAI 508 Supplement 2 Response US EPR DC.pdf," provides a technically correct and complete final response to Question 03.07.03-41. 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 508 Question 03.07.03-41.

The following table indicates the respective pages in the response document, "RAI 508 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 508 — 03.07.03-41	2	2

The schedule for providing a technically correct and complete final response to the remaining two questions has been revised as provided below.

Question #	Response Date
RAI 508 — 03.03.01-5	March 7, 2012
RAI 508 — 03.09.02-169	August 16, 2012

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, December 01, 2011 2:52 PM

To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 508 (6005,6000,5994), FSAR Ch. 3, Supplement 1

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to the three questions in RAI No. 508 on September 23, 2011.

The schedule for providing a response to Questions 03.03.01-5 and 03.07.03-41 has been revised as provided below. The schedule for a response to Question 03.09.02-169 remains unchanged.

Question #	Response Date
RAI 508 — 03.03.01-5	**January 6, 2012**
RAI 508 — 03.07.03-41	**January 6, 2012**
RAI 508 — 03.09.02-169	January 6, 2012

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, September 23, 2011 10:02 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 508 (6005,6000,5994), FSAR Ch. 3

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 508 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the 3 questions cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 508 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 508 — 03.03.01-5	2	2
RAI 508 — 03.07.03-41	3	3

RAI 508 — 03.09.02-169	4	4

A complete answer is not provided for the 3 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 508 — 03.03.01-5	December 1, 2011
RAI 508 — 03.07.03-41	December 1, 2011
RAI 508 — 03.09.02-169	January 6, 2012

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Friday, August 26, 2011 8:45 AM
To: ZZ-DL-A-USEPR-DL
Cc: Chakravorty, Manas; Xu, Jim; Thomas, Brian; Wong, Yuken; Dixon-Herrity, Jennifer; Miernicki, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 508 (6005,6000,5994), FSAR Ch. 3

Attached please find the subject request for additional information (RAI). A draft of the RAI was provided to you on August 22, 2011, and on August 24, 2011, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. 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: 3674

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D4A53795)

Subject: Response to U.S. EPR Design Certification Application RAI No. 508 (6005,6000,5994), FSAR Ch. 3, Supplement 2
Sent Date: 1/6/2012 11:22:19 AM
Received Date: 1/6/2012 11:22:28 AM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

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MESSAGE	5494	1/6/2012 11:22:28 AM
RAI 508 Supplement 2 Response US EPR DC.pdf	54171	

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

Response to

Request for Additional Information No. 508 (6005, 6000, 5994), Revision 0, Supplement 2

8/26/2011

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.03.01 - Wind Loading
SRP Section: 03.07.03 - Seismic Subsystem Analysis
SRP Section: 03.09.02 - Dynamic Testing and Analysis of Systems Structures and Components

Application Section: 03.03.01

QUESTIONS for Structural Engineering Branch 2 (ESBWR/ABWR Projects) (SEB2)
QUESTIONS for Engineering Mechanics Branch 2 (ESBWR/ABWR Projects) (EMB2)

Question 03.07.03-41:

Included in FSAR Tier 2, Section 3.7.3.12, Revision 2, are criteria related to the limitation of tensile strains for buried carbon steel and stainless steel pipe. Also discussed are limits on compressive strains, although no compressive limits are provided. No reference is given for this information. As discussed in FSAR Tier 2, Section 03.07.03.12, Revision 2, it is up to the COL applicant to provide the design requirements for buried pipe. Therefore, it is not clear why this information was included in the FSAR. As a result, the staff requests that the applicant supply additional information providing the basis for this criteria and why it was included in the FSAR.

Response to Question 03.07.03-41:

U.S. EPR FSAR Tier 2, Section 3.8.4.4.5 describes the general design requirements for buried Seismic Category I piping and conduits. This section requires the combined license (COL) applicant to fully describe the design and analysis procedures used for buried conduit and duct banks, and for buried pipe and pipe ducts.

The information related to design requirements, including strain criteria, will be removed from U.S. EPR FSAR Tier 2, Section 3.7.3.12 and a reference to Section 3.8.4.4.5 will be added to Section 3.7.3.12. Section 3.7.3.15, References, will be revised to remove reference the reference to ACI 349R-01, Appendix C, “Code Requirements for Nuclear Safety Related Concrete Structures and Commentary,” American Concrete Institute, January 2001, since it is a design requirement identified in Section 3.8.4.4.5 and is not referenced elsewhere in Section 3.7.3.

FSAR Impact:

US EPR FSAR Tier 2, Sections 3.7.3.12 and 3.7.3.15 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

3.7.3.11 Torsional Effects of Eccentric Masses

Torsional effects due to the effect of eccentric masses connected to a subsystem are included in that subsystem analysis. For rigid components (i.e., those with natural frequencies greater than the ZPA cutoff frequency of 50 Hz), the lumped mass is modeled at the center of gravity of the component with a rigid link to the subsystem member centerline. For flexible components having a frequency less than the ZPA, the subsystem model is expanded to include an appropriate model of the component.

3.7.3.12 Buried Seismic Category I Piping and Conduits

Seismic Category I buried pipe and electrical conduit bank are used in the U.S. EPR design. Examples of such utilities include pipe encased in concrete box, electrical conduit bank, pipe encased in another pipe, and pipes buried in the soil. In some cases, these structural components are anchored to adjacent buildings. Some of these underground utilities are classified as safety-related since seismic and other loads could adversely affect their function. Based on observations of past earthquakes, seismic-induced damage to buried utilities is largely due to wave propagation or permanent ground deformation resulting from fault movement, landslide, and liquefaction-induced lateral spread. Other forms of damage include seismic-induced settlement due to soil compaction and rearrangement. For the case of utilities anchored to an adjacent building, strain development in the utility due to settlement of the building requires evaluation.

Methods for seismic analysis and design of safety-related pipe buried in soil are presented in Section 3.10 of Reference 1.

The seismic design of buried utilities other than piping buried in soil, is in accordance with ASCE Report, "Seismic Response of Buried Pipes and Structural Components" (Reference 3). Axial and bending strain in buried utilities due to propagation of compression, shear, and surface waves is considered. It is assumed that there is no relative motion between the utility and soil so that wave-induced strain in the surrounding soil is equally transmitted to the utility. Based on the axial and bending strains developed in the buried utility, the corresponding axial load and bending stress can be computed.

03.07.03-41

~~Concrete components of buried utilities are designed to satisfy requirements of ACI 349 (Reference 10). Tensile strains, ε_t, in pipes made of carbon steel and stainless steel shall be limited to one percent and two percent of the pipe diameter, respectively. To eliminate compressive wrinkling of the pipe, the allowable axial strain is computed. These strain limits apply to both encased pipes and pipes surrounded by soil. For the case of pipes anchored to a building with potential for ground settlement, total allowable strain limit, ε_a, is limited to four percent of the pipe diameter in addition to satisfying the axial strain limit.~~

03.07.03-41

Section 3.8.4.1.8 describes requirements placed on the COL applicants to provide a description of Seismic Category I buried conduit and duct banks.

Section 3.8.4.4.5 describes the design requirements for buried Seismic Category I piping and conduits.

3.7.3.13 Methods for Seismic Analysis of Category I Concrete Dams

There are no Seismic Category I concrete dams in the U.S. EPR design. A COL applicant that references the U. S. EPR design certification will provide a description of methods used for seismic analysis of site-specific Category I concrete dams, if applicable.

3.7.3.14 Methods for Seismic Analysis of Aboveground Tanks

Dynamic pressure on fluid containers in the in-containment refueling water storage tank (IRWST), spent fuel pool, and other fluid reservoirs due to the SSE are considered in accordance with ASCE 4-98 (Reference 4). Section 3.7.1.2 presents damping values for seismic analysis of aboveground tanks. Damping values for concrete aboveground tanks are seven percent of critical for impulsive modes and 0.5 percent for sloshing mode. These damping values are taken from Table 3.7.1-1.

Seismic analyses of concrete above-ground tanks consider impulsive and convective forces of the water, as well as the flexibility of the tank walls and floor, and ceiling of the tank. For the spent fuel pool, cask loading pit, cask washdown pit, and fuel transfer canal, the impulsive loads are calculated by considering a portion of the water mass responding with the concrete walls (see Section 3.7.2.3). Impulsive forces are calculated by conventional methods for tanks determined to be rigid. For non-rigid tanks, the effect of tank flexibility on spectral acceleration is included when determining the hydrodynamic pressure on the tank wall for the impulsive mode.

Convective forces resulting from the sloshing of water are calculated based on the natural frequency of the sloshing water. The natural frequency is used with the 0.5 percent damping curve to determine the spectral acceleration. Guidance from USAEC TID-7024 (Reference 11) is used to calculate the forces which are applied as pressures and used in the design of the tank structure.

The IRWST is analyzed using finite element methods by including it in the 3D FEM model of the internal structures described in Section 3.7.2 and detailed in Section 3.8.3.

3.7.3.15 References

1. ANP-10264NP-A, Revision 0, "U.S. EPR Piping Analysis and Support Design Topical Report," AREVA NP Inc., November 2008.

2. Deleted.

3. ASCE "Seismic Response of Buried Pipe and Structural Components," ASCE Committee on Seismic Analysis of Nuclear Structures and Material, American Society of Civil Engineers, 1983.

4. ASCE Standard 4-98, "Seismic Analysis of Safety-Related Nuclear Structures and Commentary," American Society of Civil Engineers, September 1986.

5. SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water (ALWR) Designs," U.S. Nuclear Regulatory Commission, July 1993.

6. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, March 2007.

7. IEEE 344-2004, "Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," Institute of Electrical and Electronics Engineers, 2004.

8. NUREG-1061, "Report of the U.S. Nuclear Regulatory Commission Piping Review Committee," U.S. Nuclear Regulatory Commission, (Vol. 1) August 1984, (Vol. 2) April 1985, (Vol. 3) November 1984, (Vol. 4) December 1984, (Vol. 5) April 1985.

9. W.S. Tseng, "Equipment Response Spectra Including Equipment–Structure Interaction Effects," 1989 Pressure Vessel and Piping Conference, ASME PVP, Volume 155.

03.07.03-41

10. Deleted. ~~ACI 349-01/349R-01, Appendix C, "Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary," American Concrete Institute, January 2001.~~

11. USAEC TID-7024, "Nuclear Reactors and Earthquakes," U.S. Atomic Energy Commission, August 1963.

12. ASME Boiler and Pressure Vessel Code, Section III, "Rules for Construction of Nuclear Facility Components," American Society of Mechanical Engineers, 2004.

Next File