ArevaEPRDCPEm Resource

From: WELLS Russell D (AREVA NP INC) [Russell.Wells@areva.com]
Sent: Tuesday, October 27, 2009 1:51 PM
To: Tesfaye, Getachew
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 161, FSAR Ch 3, Supplement 1
Attachments: RAI 161 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided technically correct and complete responses to 27 of the 31 questions of RAI No. 161 on February 27, 2009. The attached file, "RAI 161 Supplement 1 Response US EPR DC.pdf" provides a technically correct and complete response to the remaining 4 questions, as committed.

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 161 Question 03.10-18.

The following table indicates the respective pages in the response document, "RAI 161 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 161 — 03.10-17	2	3
RAI 161 — 03.10-18	4	4
RAI 161 — 03.10-19	5	5
RAI 161 — 03.10-20	6	6

This concludes the formal AREVA NP response to RAI 161, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

(Russ Wells on behalf of)
Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
New Plants Deployment
AREVA NP, Inc.
An AREVA and Siemens company
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From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, February 27, 2009 2:56 PM
To: Getachew Tesfaye
Cc: WELLS Russell D (AREVA NP INC); DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 161 (1876, 1830,1880), FSAR Ch. 3

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 161 Response US EPR DC.pdf" provides technically correct and complete responses to 27 of the 31 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 161 Questions 03.10-2, 03.10-5, 03.10-7, 03.10-10, 03.10-21, 03.12-11.

The following table indicates the respective pages in the response document, "RAI 161 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 161 — 03.10-2	2	2
RAI 161 — 03.10-3	3	3
RAI 161 — 03.10-4	4	5
RAI 161 — 03.10-5	6	6
RAI 161 — 03.10-6	7	7
RAI 161 — 03.10-7	8	8
RAI 161 — 03.10-8	9	9
RAI 161 — 03.10-9	10	10
RAI 161 — 03.10-10	11	11
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RAI 161 — 03.10-12	13	13
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RAI 161 — 03.10-14	15	16
RAI 161 — 03.10-15	17	18
RAI 161 — 03.10-16	19	19
RAI 161 — 03.10-17	20	20
RAI 161 — 03.10-18	21	21
RAI 161 — 03.10-19	22	22
RAI 161 — 03.10-20	23	23
RAI 161 — 03.10-21	24	24
RAI 161 — 03.10-22	25	26
RAI 161 — 03.10-23	27	28
RAI 161 — 03.12-1	29	29
RAI 161 — 03.12-2	30	30
RAI 161 — 03.12-4	31	31
RAI 161 — 03.12-5	32	32
RAI 161 — 03.12-7	33	33
RAI 161 — 03.12-8	34	34
RAI 161 — 03.12-9	35	36
RAI 161 — 03.12-10	37	37
RAI 161 — 03.12-11	38	38

A complete answer is not provided for 4 of the 31 questions. The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 161 — 03.10-17	October 30, 2009
RAI 161 — 03.10-18	October 30, 2009
RAI 161 — 03.10-19	October 30, 2009
RAI 161 — 03.10-20	October 30, 2009

Sincerely,

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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, January 28, 2009 8:09 PM
To: ZZ-DL-A-USEPR-DL
Cc: Pei-Ying Chen; Kaihwa Hsu; Jennifer Dixon-Herrity; Anthony Hsia; Michael Miernicki; Joseph Colaccino; Meena Khanna; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 161 (1876, 1830,1880), FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on December 22, 2008, and discussed with your staff on January 13, 2009. Draft RAI Questions 03.10-1, 03.10-6(1), 03.12-3, and 03.12-6 were deleted and Draft RAI Questions 03.12-11 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,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 914

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MESSAGE	5368	10/27/2009 1:51:18 PM
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Recipients Received:

Response to

Request for Additional Information No. 161 (1876, 1830, 1880), Supplement 1, Revision 0

01/28/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.10 - Seismic and Dynamic Qualification of Mechanical and Electrical Equipment
SRP Section: 03.12 - ASME Code Class 1, 2, and 3 Piping Systems and Piping Components and Their Associated Supports

Application Section: FSAR Ch 3

QUESTIONS for Engineering Mechanics Branch 2 (ESBWR/ABWR Projects) (EMB2)
QUESTIONS for Engineering Mechanics Branch 1 (AP1000/EPR Projects) (EMB1)

Question 03.10-17:

Although Section 3.7.1.1 of the applicant's submittal indicates that the US-EPR design concept is targeted for application to CEUS sites, the applicant's submittal does not contain adequate information about treatment of the HF seismic motions characteristic of such sites. The NRC staff has developed "Interim Staff Guidance (ISG) on Seismic Issues" that suggests related requirements for interface issues and ITAAC pertaining to HF ground-motion effects. Therefore, the applicant is requested to provide clarifying information on the proposed treatment of HF ground motions in the seismic qualification approach for US-EPR. The applicant's response should include demonstration of compliance with SRP interface requirements as they pertain to the issue of HF ground motion analysis, and also explain the applicant's approach for ITAAC pertaining to HF ground motion effects on qualification of equipment.

Response to Question 03.10-17:

While U.S. EPR FSAR Tier 2, Section 3.7.1.1 states that the "certified design is suitable for most of the potential sites in the Central and Eastern United States (CEUS)," the seismic design basis of the U.S. EPR is representative of only the COLA sites referencing the U.S. EPR design (this clarification also applies to Questions 03.10-18, 03.10-19, and 03.10-20). This is consistent with the NRC position in Question 03.10-20, which states:

> "Therefore, the applicant is requested to consider to re-define a seismic input basis that generally satisfies NRC's regulations and guidance for all foreseen cases of application of a US EPR standard design, or provide general criteria and procedures for use by COL applicants who may be faced with the case that the proposed US-EPR standard plant design SSE does not meet USNRC regulations and guidance (as pertaining to site-specific motions input for seismic design and seismic qualification of equipment) with respect to their proposed site(s)."

A revision to U.S. EPR FSAR Tier 2, Section 3.7.1.1 to reflect this clarification will be provided in the Response to RAI 248, Question 03.07.02-44. The Response to RAI 248, Question 03.07.02-44 will address the high frequency (HF) ground motions for the U.S. EPR design for the COLA sites in accordance with the recommendations of DC/COL-ISG-1, "Interim Staff Guidance on Seismic Issues of High Frequency Ground Motion." The Response to RAI 248, Question 03.07.02-44 will also include the revised certified seismic design response spectra (CSDRS), which will include the addition of ground motions to represent HF content at identified COL sites, in a revision to U.S. EPR FSAR, Tier 2, Section 3.7.1.1.

U.S. EPR FSAR Tier 2, Section 3.10.1 describes how the information in U.S. EPR FSAR, Tier 2, Section 3.7.1 is used for seismic qualification of equipment. Section 3.7.1 describes the in-structure response spectra (ISRS) at equipment mounting locations. These ISRS are requirements for seismic qualification. Additionally, as stated in U.S. EPR FSAR, Tier 2, Section 3.10.1.1, the U.S. EPR follows the guidance of IEEE 344 for the seismic qualification of equipment.

ITAAC in U.S. EPR FSAR Tier 1 do not specify details of the equipment qualification processes. Details of equipment qualification processes are provided in U.S. EPR FSAR Tier 2, Chapter 3. The seismology site parameters used for the design certification are provided in U.S. EPR FSAR Tier 1, Table 5.0-1, and Figure 5.0-1.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 03.10-18:

Section 3.7.1 of the applicant's submittal proposes use of three control ground motions (EUR control motions) that are representative of common general safety requirements for European conditions. These motions were not developed according to any NRC regulatory guidance, and the submittal does not adequately clarify how these three control motions will be used for developing realistic input motions (representing the HF input for CEUS sites) for seismic qualification of US-EPR, in accordance with SRP 3.10. Additionally, for purposes of certification of a standard design for US-EPR, it needs to be established whether the seismic qualification testing will be done once for an enveloping of the in-structure responses and effects of all three control motions, or will be done three times to address the specific responses and effects for each of the three control motions. Therefore, the applicant is requested to fully explain, in relation to effects on motions used for seismic qualification, the applicability of the EUR control ground motions to NRC regulations, and how the three control motions of the standard design for US-EPR will be addressed in the applicant's seismic qualification program, including suitable clarification and justification of the development of input motions, or sets of input motions, at equipment mounting locations. The applicant should accordingly revise Section 3.10 of the submittal to reflect these explanations, clarifications and justifications.

Response to Question 03.10-18:

Seismic qualification testing will be done once for an envelope of the in-structure response spectra resulting from the entire set of revised certified seismic design response spectra (as part of the Response to RAI 248, Question 03.07.02-44, see the response to Question 03.10-17) including additional ground motions for the COL sites with high frequency content. U.S. EPR FSAR Tier 2, Section 3.10.1 will be revised to reflect the information in this RAI response.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 3.10.1 will be revised as described in the response and indicated on the enclosed markup.

Question 03.10-19:

General comparison of design-representative site-specific spectra for relevant CEUS sites, against the design-basis ground-motion spectra for the three control motions of the proposed US-EPR standard plant design SSE (as conveyed in Section 3.7.1 of the applicant' submittal), reveals that the applicant's proposed design basis would be inadequate over a significant range of high frequencies, for many of the CEUS sites. This situation indicates that the applicant's guiding intent (stated in submittal Section 3.7.1.1) – i.e., for the certified design to be suitable for most of the potential CEUS sites – may not be realized.

According to NRC's regulations, the SSE is established based on site-specific consideration of the maximum earthquake potential considering the regional and local geology, seismology, and specific characteristics of local subsurface material. Furthermore, developing site-representative inputs for soil-structure interaction and/or structural analyses (used to determine in-structure responses) is needed in order to obtain representative input motions for purposes of equipment qualification. Correspondingly, SRP 3.10 indicates that motion inputs used for seismic qualification should be conservatively representative of the actual input motions at equipment mounting locations. Additionally, IEEE Std 344-1987 indicates that, for seismic qualification purposes, the goal of seismic simulation is to reproduce the postulated earthquake environment in a realistic manner. Developing input motions for equipment qualification that are not representative of, or demonstrably more severe in all cases than, what is actually expected for a given site, is an inadequate approach.

Accordingly, the staff finds that the applicant's submittal does not adequately demonstrate that the input motions (e.g., time histories at equipment locations) will suitably represent the character (including HF effects) of motions expected at CEUS sites. Therefore, the applicant is requested to provide complete justification demonstrating that the input motions to be used for seismic qualification of equipment will be suitably representative (or a conservatively bounding representation) of the actual design-level input motions for equipment. The applicant should revise Section 3.10 to accordingly justify the input motions to be used for equipment qualification.

Response to Question 03.10-19:

The input motions (in-structure response spectra) at the equipment mounting locations are generated from the revised set of certified seismic design response spectra, which includes additional ground motions for the identified COL sites with high frequency content (as part of the Response to RAI 248, Question 03.07.02-44, see the response to Question 03.10-17). Since these input motions for seismic qualification of equipment are representative of the design-level input motions for the equipment, no changes to U.S. EPR FSAR Tier 2, Section 3.10 are required.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 03.10-20:

As suggested from preceding RAIs (No. 17 to 18), the applicant's submittal is likely to not produce suitably representative motion input, for purposes of equipment qualification, for a significant set of CEUS sites. This situation may present potentially significant implications/difficulties during the COL stage, and thereby may significantly limit the potential utility of the US-EPR design concept. Therefore, the applicant is requested to consider to re-define a seismic input basis that generally satisfies NRC's regulations and guidance for all foreseen cases of application of a US EPR standard design, or provide general criteria and procedures for use by COL applicants who may be faced with the case that the proposed US-EPR standard plant design SSE does not meet USNRC regulations and guidance (as pertaining to site-specific motions input for seismic design and seismic qualification of equipment) with respect to their proposed site(s).

Response to Question 03.10-20:

See the response to Question 03.10-17.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

U.S. EPR Final Safety Analysis Report Markups

Seismic qualification testing will be done once for an envelope of the in-structure response spectra resulting from the entire set of certified seismic design response spectra (CSDRS), including ground motions for the COL sites with high frequency content.

03.10-18

The U.S. EPR electrical and I&C equipment are covered by an EQ program in compliance with 10 CFR 50.49. A list of electrical and I&C equipment that are located in a harsh environment, and are being seismically qualified in accordance with IEEE Std 344, is provided in Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment. Electrical and I&C equipment that are not located in a harsh environment, but are being seismically qualified in accordance with IEEE Std 344, are included in Table 3.10-1—List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment. This table is comprehensive, in that it includes all Seismic Category I and II components in the systems screened for seismic qualification. Table 3.10-1 currently does not include the assumptions previously identified for defining the scope of equipment requiring seismic qualification. The list of equipment in Table 3.10-1 also includes postaccident monitoring (PAM) components based on the variables in RG 1.97, Revision 4. As noted in Section 7.5, the list of PAM equipment will be evaluated as the emergency operating procedures for the U.S. EPR are developed. Table 3.10-1 provides a more extensive list of PAM equipment than the minimum PAM list provided in Section 7.5. This is a result of the EQ and Seismic qualification systems screening process that identified additional components as potentially supporting PAM instrumentation. These lists will be reconciled when the complete PAM list is developed, as explained in Section 7.5, and subsequently incorporated into the COL applicant's or holder's FSAR. This will also necessitate an evaluation of the equipment listed in Table 3.10-1, including the assumptions previously identified for defining the scope of equipment requiring seismic qualification. Mechanical equipment is covered by the engineering design process and is in compliance with 10 CFR 50, Appendix A and GDC 4. A list of mechanical equipment that is being seismically qualified in accordance with IEEE Std 344 is provided in Table 3.10-1.

A COL applicant that references the U.S. EPR design certification will identify any additional site-specific components that need to be added to the equipment list in Table 3.10-1. A list of systems screened for seismic qualification is provided in Table 3.10-2—List of U.S. EPR Important-to-Safety Systems Screened for the Seismic Qualification Program.

The EQ program for electrical equipment is described in Section 3.11. The seismic qualification procedures for mechanical and electrical equipment are described in more detail in Attachment E to Appendix 3D. A list of safety-related active valves, in accordance with the guidance of RG 1.148, is in Section 3.9.6.

3.10.1.2 Performance Requirements for Seismic Qualification

A seismic qualification data package (SQDP) is developed for each equipment (or equipment class) on the list to document the qualification results that establish the seismic capability of the equipment. A sample SQDP format is included in Attachment F to Appendix 3D. The SQDP includes a specification of performance requirements that establish the safety-related functions of the equipment that must be performed during and after a seismic event.

3.10.1.3 Acceptance Criteria

The seismic qualification of electrical, instrumentation, and mechanical components demonstrates that the equipment is capable of performing its safety-related functions while subjected to normal operating loads, accident load conditions, and the maximum expected seismic loads (e.g., the SSE loads) at the location of the equipment. Non-active mechanical components are required to maintain their structural and pressure boundary integrity during and after the required seismic event.

3.10.1.4 Input Motion

03.10-18

The basis for the required response spectra (RRS) is provided by an envelope of the in-structure response spectra (ISRS) developed from soil conditions at the location of the equipment from the building or subsystem analysis, as described in Section 3.7. The RRS reflects the additional amplification of the ISRS due to the flexibility of the equipment supporting structure. Damping values to be used in the qualification of systems are also discussed in Section 3.7. The ISRS, at the specified damping value, provide the basis to derive a corresponding RRS at the location of the equipment. The RRS defines the minimum seismic input motion for the qualification process for the component. The seismic loads are then added to other applicable loads, such as normal and transient operating and accident loads.

The equipment RRS and other applicable loads are used to verify the qualification of the equipment and are identified and listed in the SQDP.

3.10.2 Methods and Procedures for Qualifying Mechanical, Electrical and I&C Equipment

The seismic qualification of mechanical, electrical, and I&C equipment is performed in accordance with the requirements of IEEE Std 344. The qualification can be demonstrated by testing, analysis, or a combination of both. The method of qualification selected is based on the applicability of the method for the size, type, complexity, and functional requirements of the equipment.