ArevaEPRDCPEm Resource

From: BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent: Thursday, July 29, 2010 6:21 PM
To: Tesfaye, Getachew
Cc: DELANO Karen (AREVA); ROMINE Judy (AREVA); BENNETT Kathy (AREVA); CORNELL Veronica (EXTERNAL AREVA); VAN NOY Mark (EXTERNAL AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 384, FSAR Ch. 3, Supplement 1
Attachments: RAI 384 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for responses to 9 of the 9 questions of RAI No. 384 on June 22, 2010. An editorial correction to the table was provided on July 7, 2010.

The attached file, "RAI 384 Supplement 1 Response U.S. EPR DC.pdf" provides technically correct and complete response to Question 03.03.02-05.

The following table indicates the respective pages in the response document, "RAI 384 Supplement 1 Response U.S. EPR DC - .pdf," that contain AREVA NP's final response to the subject question.

Question #	Start Page	End Page
RAI 384 — 03.03-02-05	2	3

The schedule for technically correct and complete INTERIM (1) and FINAL (8) responses to the remaining questions is unchanged and provided below:

Question #	Interim Response Date	Response Date
RAI 384 — 03.04.02-13	July 29, 2010	January 17, 2011
RAI 384 — 03.04.02-14	N/A	August 12, 2010
RAI 384 — 03.08.04-11	N/A	August 30, 2010
RAI 384 — 03.08.04-12	N/A	August 30, 2010
RAI 384 — 03.08.04-13	N/A	August 30, 2010
RAI 384 — 03.08.04-14	N/A	August 30, 2010
RAI 384 — 03.09.02-68	N/A	August 30, 2010
RAI 384 — 03.10-31	N/A	September 7, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Wednesday, July 07, 2010 1:46 PM
To: 'Tesfaye, Getachew'

Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); RYAN Tom (AREVA NP INC); CORNELL Veronica (EXT); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 384, FSAR Ch. 3

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 384 Response US EPR DC.pdf" provides a schedule since a technically correct and complete response to the 9 questions is not provided.

The following table indicates the respective pages in the response document, "RAI 384 Response US EPR DC.pdf" that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 384 — 03.03.02-05	2	2
RAI 384 — 03.04.02-13	3	3
RAI 384 — 03.04.02-14	4	4
RAI 384 — 03.08.04-11	5	5
RAI 384 — 03.08.04-12	6	7
RAI 384 — 03.08.04-13	8	8
RAI 384 — 03.08.04-14	9	9
RAI 384 — 03.09.02-68	10	10
RAI 384 — 03.10-31	11	11

A complete answer is not provided for 9 of the 9 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Interim Response Date	Response Date
RAI 384 — 03.03.02-05	N/A	July 29, 2010
RAI 384 — 03.04.02-13	July 29, 2010	January 17, 2011
RAI 384 — 03.04.02-14	N/A	August 12, 2010
RAI 384 — 03.08.04-11	N/A	August 30, 2010
RAI 384 — 03.08.04-12	N/A	August 30, 2010
RAI 384 — 03.08.04-13	N/A	August 30, 2010
RAI 384 — 03.08.04-14	N/A	August 30, 2010
RAI 384 — 03.09.02-68	N/A	August 30, 2010
RAI 384 — 03.10-31	N/A	September 7, 2010

Sincerely,

Martin (Marty) C. Bryan
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Thursday, May 20, 2010 11:38 AM
To: ZZ-DL-A-USEPR-DL

Cc: Jeng, David; Kazi, Abdul; Hawkins, Kimberly; Wong, Yuken; Chen, Pei-Ying; Dixon-Herrity, Jennifer; Miernicki, Michael; Patel, Jay; Carneal, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 384(4350,4351,4469,4498,4527), FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on March 23, 2010, and on May 18, 2010, 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: 1751

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Subject: Response to U.S. EPR Design Certification Application RAI No. 384, FSAR Ch. 3, Supplement 1
Sent Date: 7/29/2010 6:21:01 PM
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From: BRYAN Martin (EXTERNAL AREVA)

Created By: Martin.Bryan.ext@areva.com

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

Response to

Request for Additional Information No. 384, Supplement 1

5/20/10

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.03.02 - Tornado Loads
SRP Section: 03.04.02 - Analysis Procedures
SRP Section: 03.08.04 - Other Seismic Category I Structures
SRP Section: 03.09.02 - Dynamic Testing and Analysis of Systems Structures and Components
SRP Section: 03.10 - Seismic and Dynamic Qualification of Mechanical and Electrical Equipment

Application Section: FSAR Chapter 3

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

Question 03.03.02-5:

Follow-up to RAI 211, Question 03.03.02-3

In its response to question 03.03.02-3, the applicant states that due to the proximity of the NAB, TB and ACB to Seismic Category I structures, there is a potential for tornado wind load induced interaction. Therefore, the RG 1.76 tornado wind characteristic guidance is incorporated into the design of these structures. Tornado wind loads are calculated and the results considered in the design in accordance with the approved structural design codes for each structure so that no unanalyzed loads are transferred to the protected Category I SSC. Stating that no unanalyzed loads are transferred to the protected Category I SSC is ambiguous and doesn't preclude an analyzed load from being transferred to the protected Category I structure. The applicant is requested to clearly state in the FSAR whether or not a load will be transferred from the NAB, TB or ACB to the protected Category I structure due to a tornado having RG 1.76 tornado wind characteristics. If it is intended that a load transfer is acceptable the applicant is requested to provide the following information and include it in the FSAR:

a. The failure mechanism of the NAB, TB or ACB that creates the load.

b. The assumptions and methodology used to determine the load transferred to the Category I SSC.

c. The Category I structures which are impacted by the loads and their expected damage.

d. The acceptance criteria for the Category I SSC to ensure it meets its intended safety function under the transferred load.

e. If it is intended under the RG 1.76 tornado wind characteristics that no load will be transferred to a Category I SSC, the applicant should state this in the FSAR and provide the design criteria for the NAB, TB and ACB to include the following information: The methodology for converting the tornado wind velocity to a load on the structure.

Response to Question 03.03.02-5:

U.S. EPR FSAR Tier 2, Section 3.3.2.3 states that the Nuclear Auxiliary Building (NAB), Access Building (ACB), and Turbine Building (TB) are analyzed using RG 1.76 tornado wind characteristic guidance. The NAB, ACB, and TB are classified as Seismic Category II structures. The Response to RAI 370 Question 03.07.02-64, and the associated markup to U.S. EPR FSAR, Tier 2, Section 3.7.2.3.3, state that Category II structures are:

> "…designed to the codes and standards associated with Seismic Category I structures so that the margin of safety is equivalent to that of a Category I structure with the exception of sliding and overturning criteria. Because Category II structures do not have a safety function, they may slide or uplift provided that the gap between the Category II structure and any Category I structure is adequate to prevent interaction."

Since the RG 1.76 tornado wind characteristic guidance and Category I design codes are used and sufficient gap distance is provided, the NAB, ACB, and TB will not collapse onto or interact with adjacent Category I structures. The phrase "unanalyzed loads" will be removed from U.S. EPR FSAR Tier 2, Section 3.3.2.3 to make it clear that no loads will be transferred from the NAB, ACB, and TB to adjacent Category I structures.

In response to item (e), the methodology for converting tornado wind velocity to a load on the structure is stated in Section 3.3.2.2 of the U.S. EPR FSAR.

The last two sentences of the third paragraph of U.S. EPR FSAR Tier 2, Section 3.3.2.3 will be replaced with:

> "Therefore, these structures are analyzed using RG 1.76 tornado wind characteristics and designed to the codes and standards associated with Seismic Category I structures so that the margin of safety is equivalent to that of a Category I structure with the exception of sliding and overturning criteria. Because the ACB does not have a safety function, it may slide or uplift provided that the gap between the ACB and any Category I structure is adequate to prevent interaction."

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 3.3.2.3 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

qz = 0.00256 Kz Kzt Kd V2 I (lb/ft2),

Where:

q_z = velocity pressure in pounds per square foot at height "z."

K_z = ~~1.0~~0.87, tornado wind velocity pressure is considered constant with height.

~~(This is an exception to NUREG 0800 SRP Section 3.3.2, which recommends K_z = 0.87).~~

K_{zt} = 1.0, a topographic factor of unity is used because tornado maximum wind speed is not determined based on site topography.

K_d = 1.0, a wind directionality factor of unity is used.

V = 230 mph, tornado maximum wind speed in miles per hour.

I = ~~1.0~~1.15, ~~the~~ importance factor ~~is taken as unity~~.

~~(This is an exception to NUREG 0800 SRP Section 3.3.2, which recommends I = 1.15).~~

~~Based on the stated definitions, the expression for effective tornado wind velocity pressure reduces to the following:~~

~~qz = 0.00256 V2~~

Effective tornado wind pressure loads (W_w) on exterior surfaces of structural elements and members are determined in conformance with the applicable requirements of Reference 1, Sections 6.5.12 and 6.5.13. Gust factors are taken as unity for tornado wind.

Tornado atmospheric pressure change effect parameters (W_p) and tornado-generated missile impact parameters (W_m) are in conformance with RG 1.76.

03.03.02-5

The following combinations of the parameters of the total tornado load (W_t) are evaluated in the design of Seismic Category I structures and ~~structures that have the potential to interact with Seismic Category I structures under tornado load conditions~~Seismic Category II structures, where W_w is the load from tornado wind effect, W_p is the load from tornado atmospheric pressure change effect, and W_m is the load from tornado missile impact effect:

Wt = Wp

Wt = Ww + 0.5Wp + Wm

Exterior walls and roofs of Seismic Category I structures are designed for the maximum differential pressure of 1.2 psi. When the tornado pressure boundary is not established by exterior walls or roofs, the differential pressure is taken as zero.

~~3.3.2.2.1~~ ~~Note on Values Used~~

~~The use of the values stated previously for K_z = 1.0 and I = 1.0 provides essentially identical results as those recommended in NUREG 0800, SRP Section 3.3.2, for K_z = 0.87 and I = 1.15. That is, the product of the U.S. EPR values is 1.0 x 1.0 = 1.0, whereas the product of SRP Section 3.3.2 values is 0.87 x 1.15 = 1.0005.~~

03.03.02-5

3.3.2.3 Interaction of Non-Seismic Category I Structures with Seismic Category I Structures~~Effect of Failure of Structures or Components not Designed for Tornado Loads~~

~~Non-Seismic Category I structures are not designed for tornado loads unless their failure during a tornado could adversely affect nearby Seismic Category I SSC. Seismic Category I structures are protected from failure of adjacent non-Seismic Category I structures during a tornado by one of the following methods:~~

- ~~The adjacent non-Seismic Category I structure is designed to resist applicable tornado loadings.~~
- ~~The integrity of a Seismic Category I structure is evaluated for failure of an adjacent non-Seismic Category I structure during a design basis tornado to verify the functionality and continued operation of the Seismic Category I structure during and after the tornado.~~
- ~~A structural barrier(s) is provided to protect the Seismic Category I structure from failure of the adjacent non-Seismic Category I structure as a result of a tornado.~~

The non-Seismic Category I structures that are adjacent to the Seismic Category I Nuclear Island Common Basemat Structure, Emergency Power Generation Buildings (EPGB), and Essential Service Water Buildings (ESWB) include the Vent Stack (VSTK), Nuclear Auxiliary Building (NAB), Radioactive Waste Processing Building (RWB), Access Building (ACB), and Turbine Building (TB). Figure 3B-1 provides a site plan of the U.S. EPR standard plant showing the plant layout.

The Vent Stack is a steel structure which is categorized as a Seismic Category II structure. It is supported on the roof slab of the Seismic Category I stair tower located between the Seismic Category I Fuel Building and the Seismic Category I Safeguard Building 4. Due to the proximity of the vent stack to other Seismic Category I structures, it is conservatively treated as a Seismic Category I structure for the purposes of global design.

03.03.02-5

The NAB, ACB, and TB are non-Seismic Category 1 structures. However, due to proximity of these structures to Seismic Category 1 structures there is a potential for tornado wind load induced interaction. [[Therefore, these structures are analyzed using RG 1.76 tornado wind characteristics and designed to the codes and standards associated with Seismic Category I structures so that the margin of safety is equivalent to that of a Category I structure with the exception of sliding and overturning criteria. Because the NAB, ACB, and TB do not have a safety function, they may slide or uplift provided that the gap between them and any Category I structure is adequate to prevent interaction.]]

~~The NAB is a reinforced concrete structure. The methodology of ASCE 43 (Limit State A) (Reference 4) is utilized to ensure that the NAB will not collapse under tornado loads and affect Seismic Category I Nuclear Island Common Basemat structures. Additionally, the NAB is evaluated for tornado loadings per RG 1.143 due to its classification as RW-IIa per RG 1.143.~~

03.03.02-5

The RWPB is a reinforced concrete shear wall structure designed for tornado loading per RG 1.143 due to its classification as a RW-IIa structure. The NAB is a reinforced concrete structure located between the RWPB and the NI. Both the RWPB and the NAB are designed using the codes associated with Category I structures, resulting in inherently robust designs. Therefore, there is no potential for indirect interaction between the RWPB and the NI structures. ~~The RWB is a reinforced concrete structure which is required to be designed for tornado loading per RG 1.143 due its classification as RW-IIa per RG 1.143. RWB has no potential to interact with either the NI Common Basemat Structures or the other nearby Seismic Category I Structure, the EPGB. The NAB is located between the RWB and the NI Common Basemat Structure and shields it from potential interaction.~~ Potential interaction between the RWB and the EPGB is precluded by separation and design. The RWB is embedded over 31.5 ft below grade and has a clear height above grade of 52.5 ft; whereas, the clearance between the two structures is 52.06 ft. ~~Furthermore the failure of the RWB in such a manner as to adversely impact the functionality and continued operation of the EPGB is not considered credible because of the design of the RWB for ½ SSE.~~

~~The ACB is a reinforced concrete or steel frame building. One of the methodologies identified in the preceding three bullets will be utilized to provide reasonable assurance that the ACB will not collapse under tornado loads and affect Seismic Category I Nuclear Island Common Basemat structures.~~

~~The TB is a steel frame building. One of the methodologies identified in the preceding three bullets will be utilized to provide reasonable assurance that the TB will not collapse under tornado loads and affect Seismic Category I Nuclear Island Common Basemat structures.~~

Next File