ArevaEPRDCPEm Resource

From: BRYAN Martin (EXT) [Martin.Bryan.ext@areva.com]
Sent: Monday, April 05, 2010 8:52 PM
To: Tesfaye, Getachew
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); HOLM Jerald S (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 318, FSAR Ch. 4 OPEN ITEM, Supplement 1
Attachments: RAI 318 Supplement 1 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 318 Supplement 1 Response US EPR DC.pdf" provides a technically correct and complete response to the question.

The following table indicates the respective pages in the response document, "RAI 318 Supplement 1 Response US EPR DC.pdf" that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 318 — 04.02-16	2	3

This concludes the formal AREVA NP response to RAI 318, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Martin (Marty) C. Bryan
Licensing Advisory Engineer
AREVA NP Inc.
Tel: (434) 832-3016
Martin.Bryan@areva.com

From: BRYAN Martin (EXT)
Sent: Monday, March 01, 2010 5:49 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); ROMINE Judy (AREVA NP INC); HOLM Jerald S (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 318, FSAR Ch. 4 OPEN ITEM

AREVA NP's schedule for providing a technically correct and complete response to thequestion in RAI 318 is provided below.

Question #	Response Date
RAI 318 — 04.02-16	April 30, 2010

Martin (Marty) C. Bryan
Licensing Advisory Engineer
AREVA NP Inc.

Tel: (434) 832-3016
Martin.Bryan@areva.com

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Monday, January 04, 2010 6:56 PM
To: ZZ-DL-A-USEPR-DL
Cc: Forsaty, Fred; Lu, Shanlai; Donoghue, Joseph; Carneal, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 318 (3842), FSARCh. 4 OPEN ITEM

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on October 22, 2009, and discussed with your staff on December 3, 2009. Draft RAI Question 04.02-16 was revised as a result of that discussion. The question in this RAI is an OPEN ITEM in the safety evaluation report for Chapter 4 for Phases 2 and 3 reviews. As such, the schedule we have established for your application assumes technically correct and complete responses prior to the start of Phase 4 review. For any RAI that cannot be answered prior to the start of Phase 4 review, it is expected that a date for receipt of this information will be provided so that the staff can assess how this information will impact the published schedule.

Thanks,

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

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 1292

Mail Envelope Properties (BC417D9255991046A37DD56CF597DB7105C299DD)

Subject: Response to U.S. EPR Design Certification Application RAI No. 318, FSAR Ch. 4 OPEN ITEM, Supplement 1
Sent Date: 4/5/2010 8:52:03 PM
Received Date: 4/5/2010 8:52:06 PM
From: BRYAN Martin (EXT)

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

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Tracking Status: None
"HOLM Jerald S (EXT)" <jerald.holm.ext@areva.com>
Tracking Status: None
"Tesfaye, Getachew" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

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Files	**Size**	**Date & Time**
MESSAGE	2709	4/5/2010 8:52:06 PM
RAI 318 Supplement 1 Response US EPR DC.pdf	73415	

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

Response to

Request for Additional Information No. 318, Supplement 1

12/04/2010

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 04.02 - Fuel System Design
Application Section: 04.02

QUESTIONS for Reactor System, Nuclear Performance and Code Review (SRSB)

Question 04.02-16:

OPEN ITEM:

Section 4.2.1.4 of the DCD references BAW-10133PA-01 as a representation of the seismic-LOCA analysis methodology and states that plastic deformation is not experienced for maximum loads. In addition, Section 5.3.4.1 of ANP-10285P provides the maximum impact loads and 95/95 lower bound impact loads that demonstrate the impact loads remain below those for plastic deformation. However, neither Section 4.2 nor the mechanical design topical report, ANP-10285P, documents the implementation of this methodology for the EPR fuel assembly. For example, the implementation of the seismic-LOCA methodology laid out in BAW-10133PA-01 involves the determination of various stiffness and damping constants specific to the EPR fuel assembly design based on pluck and shaker tests as well as dynamic crush and lateral impact tests to determine lower impact loads. The stiffness and damping values are the inputs to the calculations that determine the peak impact load.

Provide a summary of the methodology and the numbers at each step that would give enough confidence that the methodology has been followed correctly. The model inputs and a description of how they were determined needs to be provided. Provide the model outputs and show how they were combined into the peak impact force. If this information has already been submitted, identify where the seismic-LOCA evaluation of the EPR fuel assembly design is documented. If this has not already been formally documented, provide documentation to demonstrate that the methodology of BAW-10133PA-01 was followed for the EPR fuel assembly design.

Response to Question 04.02-16:

The information requested was provided during an audit by the NRC in AREVA NP's Lynchburg, VA and Richland, WA offices on January 15, 2010 where the calculation files showing the performance of the seismic-loss-of-coolant accident (LOCA) analysis in conformance with the NRC approved methodology in BAW-10133PA Revision 1 were reviewed. It is AREVA's understanding that the information audited by the NRC addressed this question.

Table 4.2-16-1 shows how the different steps of the model construction are based on test results as prescribed in BAW-10133PA Revision 1

During the audit, AREVA NP informed the NRC that the seismic-LOCA analysis for the U.S. EPR plant deviated from the methodology described in the NRC approved topical report, BAW10133PA, in one aspect. The topical report references the use of the Rayleigh damping method for lateral seismic and LOCA analysis. Modal damping, an alternative numerical method, has been used for the U.S. EPR seismic analysis. A condition report was issued within AREVA NP's Corrective Action Program to address the use of the modal damping numerical technique. While this technique is not in literal compliance with the approved methodology, an evaluation concluded that engineering experience demonstrates that the result using the modal damping method is more conservative than the result using the Rayleigh damping method. This error does not affect downstream calculations because the predicted mechanical loads are conservative using the modal damping technique.

Table 4.2-16-1—Tests Used in Developing Analytical Model

Test	Use in Developing Analytical Model
1. Shaker Tests (Forced Vibration Tests)	- Obtain the natural frequencies of the first five modes of vibration. - Determine higher order mode frequencies scaling ratio. Obtain best effective fuel assembly beam properties to benchmark analytical model.
2. Pluck Tests	- Obtain 1st mode natural frequency at 0.25 in [6 mm] amplitude. - Higher order target frequencies are obtained by the ratio of the higher order and the 1st frequencies obtained from the shaker tests. Obtain best effective fuel assembly beam properties to benchmark analytical model in conjunction with the results from the shaker tests.
3. Static Stiffness Tests	Obtain fuel assembly static stiffness and compare with analytical value.
4. Lateral Impact Tests	Derive one-sided spacer grid stiffness value by comparing analytical results with test impact forces and then derive the spacer grid in-grid stiffness.
5.a Dynamic Impact Tests	Obtain spacer grid through grid stiffness, damping and allowable elastic limit force.
5.b Rapid Compression Tests	Obtain spacer grid through grid stiffness and allowable elastic limit force.
6. Axial Stiffness Tests and Fuel Assembly Drop Tests	- Obtain the fuel assembly axial stiffness and drop impact loads for various drop heights. - Adjust lower end fitting stiffness and damping.

FSAR Impact:

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