ArevaEPRDCPEm Resource

From: WELLS Russell D (AREVA NP INC) [Russell.Wells@areva.com]
Sent: Tuesday, January 27, 2009 1:56 PM
To: Getachew Tesfaye
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. 2, FSAR Ch 19, Supplement 2
Attachments: RAI 2 Supplement 2 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided responses to 38 of the 46 questions of RAI No. 2 on April 30, 2008. A Supplement 1 response to RAI No. 2 was sent on May 30, 2008 to address the remaining 8 questions.

Attached please find Supplement 2 to AREVA NP's response to RAI No. 2. The attached file, "RAI 2 Supplement 2 Response US EPR DC.pdf" provides a revised technically correct response to RAI No. 2, Questions 19-05. This response supersedes the previously submitted response, as described in the response document.

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 2 Question 19-05.

The following table provides the pages in the response document, "RAI 2 Supplement 2 Response US EPR DC.pdf" containing the response to the one question.

Question #	Start Page	End Page
RAI 2 —19-05	2	3

This concludes the formal AREVA NP response to RAI 2, 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
3315 Old Forest Road
Lynchburg, VA 24506-0935
Phone: 434-832-3694
Cell: 434-841-8788

From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, May 30, 2008 6:52 PM
To: 'Getachew Tesfaye'
Cc: 'John Rycyna'; SHAHROKHI F (AREVA NP INC); MCINTYRE Brian (AREVA NP INC); SLOAN Sandra M (AREVA NP INC);

BENNETT Kathy A (OFR) (AREVA NP INC); NOXON David B (AREVA NP INC)
Subject: Re: U.S. EPR Design Certification Application RAI No. 2

Getachew,

Attached is the AREVA NP Inc. supplemental response to the subject request for additional information (RAI). AREVA NP Inc. provided responses to 38 of the 46 questions on April 30, 2008. The attached file, "RAI 2 Response Supplement 1-US EPR DC.pdf" provides technically correct and complete responses to the remaining 8 questions. The attached file, "RAI 2 Response Supplement 1-US EPR FSAR Changes.pdf" provides affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format.

Question #	Start Page	End Page
RAI 2—19-01	2	3
RAI 2—19-02	4	4
RAI 2—19-05	5	7
RAI 2—19-07	8	12
RAI 2—19-27	13	18
RAI 2—19-29	19	19
RAI 2—19-33	20	23
RAI 2—19-38	24	24

The provided response meets NRC's stated expectation and supports the established review schedule for the U.S. EPR design certification application.

Sincerely,

Ronda Pederson
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From: Pederson Ronda M (AREVA NP INC)
Sent: Wednesday, April 30, 2008 5:16 PM
To: 'Getachew Tesfaye'
Cc: 'John Rycyna'; SHAHROKHI F (AREVA NP INC)
Subject: Re: U.S. EPR Design Certification Application RAI No. 2

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 2 Response-US EPR DC.pdf" provides technically correct and complete responses to 38 of the 46 questions. The attached file, "RAI 2 US EPR FSAR Changes.pdf" provides affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format.

Answers are not provided for eight of the questions. The schedule for technically correct and complete response to the eight questions is provided below.

Question	Response Date
19-1	May 30, 2008
19-2	May 30, 2008
19-5	May 30, 2008
19-7	May 30, 2008
19-27	May 30, 2008
19-29	May 30, 2008
19-33	May 30, 2008
19-38	May 30, 2008

The provided response and schedule meet NRC's stated expectation and support the established review schedule for the U.S. EPR Design Certification application.

Sincerely,

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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Thursday, April 10, 2008 11:23 AM
To: ZZ-DL-A-USEPR-DL
Cc: Pederson Ronda M (AREVA NP INC); Joseph Colaccino; John Rycyna; Theresa Clark; Hanh Phan; Lynn Mrowca; Hossein Hamzehee; Edward Fuller
Subject: U.S. EPR Design Certification Application RAI No. 2

Attached please find the subject request for additional information (RAI). This RAI was discussed with your staff on March 20, 2008. 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.

Getachew Tesfaye
Office of New Reactors
U.S. Nuclear Regulatory Commission
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 152

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Subject: Response to U.S. EPR Design Certification Application RAI No. 2, FSAR Ch 19, Supplement 2
Sent Date: 1/27/2009 1:56:22 PM
Received Date: 1/27/2009 1:56:25 PM
From: WELLS Russell D (AREVA NP INC)

Created By: Russell.Wells@areva.com

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Tracking Status: None
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Tracking Status: None
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Tracking Status: None

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Files	**Size**	**Date & Time**
MESSAGE	5690	1/27/2009 1:56:25 PM
RAI 2 Supplement 2 Response US EPR DC.pdf	116236	

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

Response to

Request for Additional Information No. 2, Supplement 2, Revision 0

4/10/2008
U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation
Application Section: 19
SPLA Branch

Question 19-05:

The values presented in the "Risk Metrics" sections throughout Chapter 19 appear to be point estimates. NRC guidance, as well as the American Society of Mechanical Engineers (ASME) PRA standard, specifically requests mean values rather than point estimates. (See Regulatory Guide (RG) 1.174, section 2.2.5.5; RG 1.206, Section C.I.19, Appendix A; SRP 19.0, section III; ASME RA-Sb-2005, Supporting Requirement QU-A2b; and RG 1.200, Table A-1, clarification of requirement QU-A2b.)

Also, the uncertainty cases for which diesel generator uncertainty was eliminated are not appropriate. The footnote to the supporting requirement on uncertainty in the ASME PRA standard refers to a 1981 paper (G. Apostolakis and S. Kaplan, "Pitfalls in Risk Calculations," Reliability Engineering, Vol. 2, pp 135-145, 1981.) that identifies the importance of handling state-of-knowledge dependencies correctly because of the potential understatement of both the mean and variance of a probability distribution. The worst-case underestimation is a system with four redundant components, where the mean is underestimated by a factor of 300 and the 95th percentile by a factor of 25 for the simple example presented in the paper. The high mean for a probability distribution that includes redundant equipment failures is therefore an important insight, not an artifact that should be handled by removing uncertainty distributions on certain components.

Therefore, the final safety analysis report (FSAR) should be revised to reflect:
(a) Mean values for risk metrics (i.e., core damage frequency (CDF) and large release frequency (LRF)) in all appropriate sections
(b) Any changes to risk insights or importance measures as a result of using the mean value
(c) Clarified discussion of the impact of redundant equipment with the same state-of-knowledge-based probability distribution
(d) Discussion of why the impact is different for the internal events, fire, flooding, shutdown and Level 2 PRA elements.

Additionally, the response to this RAI should include a list of the correlation classes used in the PRA model and the components that are assigned to each class. If there is any difference between the correlation class grouping and common cause grouping (especially for the emergency and station blackout diesel generators), please identify and justify these differences.

Response to Question 19-05:

The U.S. EPR FSAR mark-up for RAI 2 Supplement 1, Question 19-05, incorrectly listed the point estimate for the internal flooding core damage frequency rather than the mean value from U.S. EPR FSAR Tier 2, Section 19.1.5.2.2.7. The U.S. EPR FSAR will be revised to correct this error. The attached U.S. EPR FSAR mark-up page supersedes the original mark-up page submitted with the response. The remainder of the original response to the question remains unchanged.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 19.1.5.2.2.7 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

19.1.5.2.2.7 Uncertainty Analysis

The results of the uncertainty evaluation for the Level 1 Flooding Events CDF are presented in Figure 19.1-13—U.S. EPR Level 1 Internal Flooding Events Uncertainty Analysis Results – Cumulative Distribution for Flood Events CDF.

The uncertainty results are summarized below:

19-05

- CDF Internal Flooding Events Mean Value: 8.8E-08/yr.
- CDF Internal Flooding Events 5 percent Value: 3.1E-09/yr.
- CDF Internal Flooding Events 95 percent Value: 2.2E-07/yr.

This ninety-fifth percentile CDF value is more than two orders of magnitude below the NRC goal of 1E-04/yr.

Uncertainty on the Level 1 Flooding PRA results is quantified using a process similar to that described for the internal events in ~~Section 19.1.4.1.2.6~~ Section 19.1.4.1.2.7. Parametric uncertainty was represented by selecting an uncertainty distribution for each parameter type~~,~~ including flooding initiating events, as described in ~~Section 19.1.4.1.2.6~~ Section 19.1.4.1.2.7. ~~Modeling uncertainty was represented with limited scope by adding uncertainty to the success criteria of EFW pumps and primary relief valves, and by adding uncertainty to the times to overheat for electrical equipment on a loss of HVAC, and to the effectiveness of creative alternate cooling means. These modeling uncertainties are described in detail in Section 19.1.4.1.2.6.~~

~~The results of the uncertainty analysis for flooding events are shown in Figure 19.1-13—U.S. EPR Internal Flooding Events Uncertainty Analysis Results – Cumulative Distribution Function for CDF. Two distributions are presented, one that only incorporates parametric uncertainty; and one that incorporates the three cases of modeling uncertainty in addition to the parametric uncertainty. The inclusion of modeling uncertainties increases the point estimate by about a factor of two and reduces the ratio of the mean to the point estimate, indicating a reduction in the impact from "state-of-knowledge" correlation.~~

19.1.5.2.2.8 PRA Insights

The largest contributor to the flooding CDF is the flood in the annulus. It accounts for 50 percent of the overall flooding CDF. This high contribution to the plant risk highlights a vulnerability of annulus pipe break events. It is also the result of conservative assumptions made due to the lack of a detailed design of the annulus electrical penetrations.

Flooding in the SB 1 or SB 4 is dominated by the seal LOCA scenarios, because this flood causes a complete loss of seal cooling to two of the RCPs, and a single failure in