ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent: Wednesday, April 22, 2009 5:29 PM
To: Getachew Tesfaye
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); PANNELL George L (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 193 (2213), FSARCh. 18
Attachments: RAI 193 Response US EPR DC.pdf

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information RAI 193. The attached file, "RAI 193 Response US EPR DC" provides technically correct and complete responses to the 1 question of this RAI.

The following table indicates the respective pages in the response document, "RAI 193 Response US EPR DC," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 193 — 18-35	2	4

This concludes the formal AREVA NP response to RAI 193, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Ronda Pederson
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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Tuesday, March 24, 2009 3:17 PM
To: ZZ-DL-A-USEPR-DL
Cc: Jacqwan Walker; Molly Keefe; Michael Junge; James Steckel; Joseph Colaccino; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 193 (2213), FSARCh. 18

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on February 24, 2009, and discussed with your staff on March 4, 2009. No changes were made to the Draft RAI Questions 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: 421

Mail Envelope Properties (5CEC4184E98FFE49A383961FAD402D31D9A822)

Subject: Response to U.S. EPR Design Certification Application RAI No. 193 (2213), FSARCh. 18
Sent Date: 4/22/2009 5:29:25 PM
Received Date: 4/22/2009 5:29:28 PM
From: Pederson Ronda M (AREVA NP INC)

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Files	**Size**	**Date & Time**
MESSAGE	2077	4/22/2009 5:29:28 PM
RAI 193 Response US EPR DC.pdf	87951	

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

Request for Additional Information No. 193 (2213), Revision 0

03/24/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 18 - Human Factors Engineering
Application Section: 18.6

QUESTIONS for Operating Licensing and Human Performance Branch
(AP1000/EPR Projects) (COLP)

Question 18-35:

EPR FSAR Section 18.6 refers to the HRA Implementation plan (IP) and the FSAR Chapter 19, PRA, for a description of how the risk-significant human actions (HAs) were identified. The HRA IP provides an overview of the use of RAW and FV importance measures for the selection of the risk-significant HAs. RAI-40 on the HFE Topical Report requested the method and acceptance criteria for selection of the risk-significant HAs. The response did not provide the information but rather stated that the method was within the scope of PRA/HRA engineering. A review of Chapter 19 of the FSAR provided much of the needed information including lists of the risk-significant HAs determined from the various portions of the PRA. However, a few questions remain:

1. FSAR Table 19.1-7 lists the top cutset groups for Level 1 Internal Events of the PRA. The top cutset group in the PRA is LOOP-14, which has a recovery action [REC OSP 2HR], which is [the failure of operators to recover offsite power within 2 hours]. Tables 19.-10 and -11 contain the risk-significant HAs for Level 1 Internal Events based on FV and RAW. This particular action is not in the risk-significant tables and in general there are no recovery actions listed as risk significant. This does not appear correct. Please explain.
2. The contribution of operator action to initiating events does not appear to be consistently picked up in the tables. For example, FSAR Chapter 19, page 19.1-121 discusses the importance of operator failure to isolate FWDS break in the annulus, which is not in any table. However, for the shutdown PRA the contribution of HAs to initiating events is addressed. Please explain this discrepancy.
3. FSAR Section 19.1.5.1.2.3 discusses HAs in the seismic PRA cutsets. However, there do not appear to be any calculations or related tables for risk-significant HAs from the seismic PRA. Are these calculations and associated tables available for staff review? If so, please provide for staff review.

Response to Question 18-35:

1. The probabilistic risk assessment (PRA) event REC OSP 2HR is not treated as an operator action. It represents the probability that offsite power will not be restored within two hours, and it is based on data for the historic duration of loss of offsite power (LOOP) events in the U.S. (from NUREG/CR-6890). Therefore, it is not a risk-significant human action (HA) as defined by NUREG-0711.

   The number of recovery actions in the U.S. EPR PRA is small compared to most PRAs for current plants. This reflects both a conservative treatment (i.e., some actions that might be credited are not) and the fact that some actions required for current plants are not required for the U.S. EPR. As described in U.S. EPR FSAR, Tier 2, Section 19.1.3, the combination of proven technology and innovative design features—such as four independent safety divisions—contributes to low core damage frequency (CDF) and low large release frequency (LRF) compared to the current PWR fleet. Consequently, most event sequences in the PRA have a sufficiently low frequency without the need to model additional equipment recovery. Therefore, recovery actions are credited in only a very few cases where it is necessary to characterize a particular accident sequence appropriately, such as recovery of room cooling (OPF-SAC-2H). This is why the tables in U.S. EPR FSAR, Tier 2, Chapter 19 show few recovery actions for failed equipment.

2. The typical PRA practice is to acquire initiating event frequencies from historical operating experience. Since the main focus of PRA is on event mitigation, detailed modeling of the initiating event cause is usually not included, except for plant-specific initiators. The only human actions explicitly included in the U.S. EPR PRA at-power initiating events model are isolation of small pipe breaks in interfacing or auxiliary systems, such as the fire water distribution system (FWDS). These are included because the initiating events are plant-specific, and timely operator action can avert the initiating event before a reactor trip. The initiating event-specific operator actions are not carried over into the Chapter 19 tables of importance measures because these tables spotlight the post-accident mitigation part of the PRA model. However, these operator actions are included in the overall ranking of risk-significant HA for human factors engineering (HFE) if they meet the criteria for risk-significance (see below).

   The operator actions for initiating events in the shutdown PRA are treated differently than in the at-power model because in the shutdown operating modes the plant depends more upon manual control. Because initiating events develop more slowly during shutdown there is more opportunity for operator intervention, hence operator actions are important for accurate characterization of the initiating event.

3. The U.S. EPR plant design does not have a seismic PRA. The seismic analysis in U.S. EPR FSAR, Tier 2, Chapter 19 is a risk-based seismic margin assessment (SMA). The SMA methodology uses the existing PRA logic model for internal events, and overlays seismic fragilities. Human error probabilities (HEP) and systems not qualified for seismic loadings are set to a failure probability of 1.0. The SMA is primarily qualitative; it does not include quantification of CDF or LRF. Therefore, no unique risk-significant HA is identified. The operator actions of importance to the SMA tend to be the same HA that are modeled in the internal events PRA.

The risk-significant HA are derived from the PRA described in Chapter 19. However, the tables in Chapter 19 are not intended to be used for this purpose directly. The intent of the human reliability analysis (HRA)/HFE integration plan presented in U.S. EPR FSAR Tier 2 Section 18.6 is to generate a consolidated list of risk-significant HA at the appropriate times in the HFE design activity. In the consolidated list, the risk importance measures for all modeled human actions are calculated relative to the overall CDF or LRF. In contrast, the importance measures in Chapter 19 are calculated relative to the CDF or LRF of the individual analysis subject areas (internal events, flooding, fires, and shutdown). It is important that all of the risk-significant HA are generated using the same yardstick of overall risk, so that the HFE has an accurate representation of the relative risk importance of each human action.

The list of risk-significant HA will be developed using the standard PRA importance measures and acceptance criteria described in Chapter 19. Risk significance is based on meeting the threshold for either the Fussell-Vesely (FV) importance measure (FV ≥0.005), or the risk achievement worth (RAW) importance measure (RAW ≥2), relative to overall CDF or LRF. As directed by NUREG-0711, the list is derived from all of the human actions modeled in the Level 1 (core damage) and Level 2 (large offsite release) analyses of the PRA.

A representative list of initial risk-significant HA will be an appendix to the *U.S. EPR Implementation Plan for the Integration of Human Reliability Analysis (HRA) with the Human Factors Engineering (HFE) Program*. This is part of the HFE Program described in Section 18.6. This list of risk-significant HA will be updated in accordance with the HRA/HFE integration

plan and the PRA maintenance and upgrade process described in U.S. EPR FSAR, Tier 2, Section 19.1.2.4.

FSAR Impact:

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