ArevaEPRDCPEm Resource

From: BRYAN Martin (EXT) [Martin.Bryan.ext@areva.com]
Sent: Monday, April 26, 2010 4:02 PM
To: Tesfaye, Getachew
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); ROMINE Judy (AREVA NP INC); PANNELL George L (AREVA NP INC); BUDZIK Dennis M (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 374, FSAR Ch. 18
Attachments: RAI 374 Response US EPR DC.pdf

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI 374). The "U.S. EPR Implementation Plan for Functional Requirements Analysis and Functional Allocation" will be provided by May 17, 2010.

The following table indicates the respective pages in the response document, "RAI 374 Response US EPR DC.pdf" that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 374 — 18-143	2	2
RAI 374 — 18-144	3	3
RAI 374 — 18-145	4	4
RAI 374 — 18-146	5	5
RAI 374 — 18-147	6	6
RAI 374 — 18-148	7	7
RAI 374 — 18-149	8	8
RAI 374 — 18-150	9	9
RAI 374 — 18-151	10	10
RAI 374 — 18-152	11	11
RAI 374 — 18-153	12	12
RAI 374 — 18-154	13	13
RAI 374 — 18-155	14	14
RAI 374 — 18-156	15	15
RAI 374 — 18-157	16	16
RAI 374 — 18-158	17	17
RAI 374 — 18-159	18	18
RAI 374 — 18-160	19	19
RAI 374 — 18-161	20	20

A complete answer is not provided for 19 of the 19 questions. The schedule for a technically correct and complete response to these questions and submittal of the "U.S. EPR Implementation Plan for Functional Requirements Analysis and Functional Allocation" is provided below.

Question #	Response Date
RAI 374 — 18-143	May 17, 2010
RAI 374 — 18-144	May 17, 2010
RAI 374 — 18-145	May 17, 2010
RAI 374 — 18-146	May 17, 2010
RAI 374 — 18-147	May 17, 2010
RAI 374 — 18-148	May 17, 2010
RAI 374 — 18-149	May 17, 2010

RAI 374 — 18-150	May 17, 2010
RAI 374 — 18-151	May 17, 2010
RAI 374 — 18-152	May 17, 2010
RAI 374 — 18-153	May 17, 2010
RAI 374 — 18-154	May 17, 2010
RAI 374 — 18-155	May 17, 2010
RAI 374 — 18-156	May 17, 2010
RAI 374 — 18-157	May 17, 2010
RAI 374 — 18-158	May 17, 2010
RAI 374 — 18-159	May 17, 2010
RAI 374 — 18-160	May 17, 2010
RAI 374 — 18-161	May 17, 2010
U.S. EPR Implementation Plan for Functional Requirements Analysis and Functional Allocation	May 17, 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: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Thursday, March 25, 2010 11:40 AM
To: ZZ-DL-A-USEPR-DL
Cc: Bongarra, James; Marble, Julie; Junge, Michael; Steckel, James; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 374 (4025), FSAR Ch. 18

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on February 26, 2010, and discussed with your staff on March 18, 2010. No changes were made to the draft RAI 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: 1347

Mail Envelope Properties (BC417D9255991046A37DD56CF597DB7105F48E50)

Subject: Response to U.S. EPR Design Certification Application RAI No. 374, FSAR Ch. 18
Sent Date: 4/26/2010 4:01:57 PM
Received Date: 4/26/2010 4:02:16 PM
From: BRYAN Martin (EXT)

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

Recipients:
"DELANO Karen V (AREVA NP INC)" <Karen.Delano@areva.com>
Tracking Status: None
"BENNETT Kathy A (OFR) (AREVA NP INC)" <Kathy.Bennett@areva.com>
Tracking Status: None
"ROMINE Judy (AREVA NP INC)" <Judy.Romine@areva.com>
Tracking Status: None
"PANNELL George L (AREVA NP INC)" <George.Pannell@areva.com>
Tracking Status: None
"BUDZIK Dennis M (AREVA NP INC)" <Dennis.Budzik@areva.com>
Tracking Status: None
"Tesfaye, Getachew" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	3525	4/26/2010 4:02:16 PM
RAI 374 Response US EPR DC.pdf	101427	

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

Response to

Request for Additional Information No. 374 (3903), Revision 0

3/25/2010

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 18 - Human Factors Engineering
Application Section: 18.3

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

Question 18-143:

The EPR functional requirements analysis (FRA) and function allocation (FA) is described in the FSAR markup submitted as part of the response to RAI 240, Section 18.3, "Functional Requirements Analysis and Function Allocation." In addition, AREVA submitted a "Functional Requirements Analysis and Functional Allocation Implementation Plan" (document No. 118-9018214-002). However, there is no reference in the FSAR to this document (No. 118-9018214-002). Also, the Plan is titled, "Functional Requirements Analysis and Functional Allocation…" and the FSAR is titled, "Functional Requirements Analysis and Function Allocation.

Reconcile these inconsistencies (inconsistent titles and lack of citing document NO.118-9018214-002) in all cases where appropriate in FSAR.

Response to Question18-143:

A response to this question will be provided by May 17, 2010.

Question 18-144:

In the FSAR markup submitted as part of the response to RAI 240, Sub-Section 18.3.1, AREVA states that, "The purpose of the FRA and FA is to verify that plant safety functions have been defined and that the allocation of those functions to human and system resources has resulted in a role for personnel that takes advantage of human strengths and avoids human limitations…." While this statement is in conformance with NUREG-0711 and SRP Chapter 18, it is not the intended purpose for an applicant's FRA/FA. The NRC staff expects the applicant to develop and implement an FRA/FA. The NRC staff reviews the development and implementation of the applicant's FRA/FA and the NRC staff verifies that the applicant defines plant safety functions and that the allocation of those functions to human and system resources has resulted in a role for personnel that takes advantage of human strengths and avoids human limitations.

The applicant should clarify the purpose for performing an FRA/FA.

Response to Question 18-144:

A response to this question will be provided by May 17, 2010.

Question 18-145:

The FSAR markup submitted as part of the response to RAI 240 description in 18.3.1 is inconsistent with the FRA/FA Plan's Purpose, Objectives and Scope statements. The FRA/FA Plan states, "The purpose of this implementation plan is to establish methods, criteria and guidance for functional requirements analysis (FRA) and function allocation (FA) for the U.S. EPR plant design…."

Reconcile the inconsistency between the FSAR and FRA/FA Plan related to the purpose of FRA/FA.

Response to Question 18-145:

A response to this question will be provided by May 17, 2010.

Question 18-146:

The FSAR markup submitted as part of the response to RAI 240, Sub-Section 18.3.1, states that, “All functions are considered in-scope in that they need to be captured and allocated. Particular significance is placed on functions that satisfy safety objectives (i.e., critical safety functions, as defined by NUREG-0696 ….” The AREVA FRA/FA Plan, Section 1.4, “Purpose,” states that, “….The FRA identifies those functions that must be performed to satisfy plant safety and power generation objectives.” The scope of the FRA contained in FSAR Sub-Section 18.3.1 appears broader than the scope stated in the FRA/FA Plan.

Clarify or reconcile the inconsistency of scope between the FSAR and the FRA/FA Plan.

Response to Question 18-146:

A response to this question will be provided by May 17, 2010.

Question 18-147:

AREVA states in its US EPR Inheritance Plan "(Document No: 118-9101665-001) which is referenced on page 20 of the FRA/FA Plan, that OL3 is the predecessor plant for the US EPR HSI design. The Inheritance Plan indicates that OL3 did not follow NURG-0711 criteria in designing its HSI but rather used an IEC 60964 as guidance. To determine if OL3 (which does not have an operating history) provides an acceptable HSI design from which to compare the design of the US EPR's HSIs, the NRC staff needs additional explanation to understand how the OL3 HSIs meet applicable NUREG-0711 criteria.

Provide additional explanation for the NRC staff on how the OL3 HSIs meet the applicable criteria of NUREG-0711.

Response to Question 18-147:

A response to this question will be provided by May 17, 2010.

Document Name	Commitment Date
U.S. EPR Implementation Plan for Functional Requirements Analysis and Functional Allocation	5/17/2010

Question 18-148:

In support of addressing functional requirements analysis and function allocation, AREVA submitted the FRA/FA Plan. Sub-section 1.5.1 of the Plan states that it establishes, for example, methods to identify all functions necessary for achieving safe operation, satisfy plant safety objectives, etc. However, the FRA/FA Plan does not actually describe the specific methods to be used, e.g., to identify all functions necessary for achieving safe operation, or satisfy plant safety objectives, etc. It does include a description of one method, "gap analysis," which is used to ensure that all the necessary plant-level functions are met by the final system designs.

Describe all methods used to accomplish the activities identified in sub-section 1.5.1 of the Plan.

Response to Question 18-148:

A response to this question will be provided by May 17, 2010.

Question 18-149:

Sub-section 1.5.2 of the FRA/FA Plan, states that the FA establishes methods to:

- Consistently use the FRA to determine the requirements for plant control
- Allocate control functions that are appropriate to operator abilities, workload and situational awareness; to:
- Automatic Control
- Group Control
- Component-level control
- Provide inputs for TA and PRA/HRA

However, the FRA/FA Plan does not describe the methods used to accomplish these activities.

Describe methods used accomplish the activities identified in sub-section 1.5.2 of the Plan.

Response to Question 18-149:

A response to this question will be provided by May 17, 2010.

Question 18-150:

The FRA/FA Plan includes Figure 1-1, “HFE Process Integration,” to illustrate how the FRA/FA fits within the framework of the overall HFE integration process and how outputs of the FRA/FA are used in other HFE processes. The figure, however, only indicates that the FRA/FA provides output to one HFE process, Task Analysis.

Reconcile this discrepancy between the FRA/FA Plan’s text, which indicates that output from the FRA/FA is used in processes, and the figure, which shows that the FRA/FA is output to only the Task Analysis.

Response to Question 18-150:

A response to this question will be provided by May 17, 2010.

Question 18-151:

Sub-section 1.6 of the FRA/FA Plan, (“Definition of Terms”), defines functional requirements analysis as, “the mapping of functions that will be performed to satisfy plant safety and power generation objectives to prevent or mitigate the consequences of postulated accidents.”

Clarify this definition, especially what “mapping the functions” means.

Response to Question 18-151:

A response to this question will be provided by May 17, 2010.

Question 18-152:

Sub-section 1.6 of the FRA/FA Plan defines task analysis as, “The identification of requirements (i.e., specifying the requirements for the displays, data processing, controls, and job support aids) for accomplishing specific tasks that are group-related monitoring and control activities that have a common objective or goal with respect to the real-time dynamics of a process.” The important element of “plant personnel” seems lacking from this definition.

Clarify this definition (and reconcile with the FSAR Task Analysis section and with the Task Analysis Implementation Plan).

Response to Question 18-152:

A response to this question will be provided by May 17, 2010.

Question 18-153:

NUREG-0711, HSI Design Criterion (4) states, *A description should be provided for each high-level function which includes:*

- purpose of the high-level function
- conditions that indicate that the high-level function is needed
- parameters that indicate that the high-level function is available
- parameters that indicate the high-level function is operating (e.g., flow indication)
- parameters that indicate the high-level function is achieving its purpose (e.g., reactor vessel level returning to normal)
- parameters that indicate that operation of the high-level function can or should be terminated

Note that parameters may be described qualitatively (e.g., high or low). Specific data values or setpoints are not necessary at this stage.

The FSAR markup submitted as part of the response to RAI 240, Section 18.3, does not address this criterion.

The FRA/FA Plan, as part of 3.1, “Functional Requirements Analysis Implementation,” indicates that each high-level (plant-level) function will be described to include each of the characteristics of the NUREG-0711 criterion.

The FSAR should reference the FRA/FA Plan to indicate that this criterion is addressed in the Plan.

Response to Question 18-153:

A response to this question will be provided by May 17, 2010.

Question 18-154:

While Section 3.1.5, “Modifications,” of the FRA/FA Plan discusses “considerations” that are addressed when the FRA is applied to plant modifications, neither the FSAR markup submitted as part of the response to RAI 240 nor the FRA/FA Plan addresses this NUREG-0711 criterion of "The technical basis for modifications to high-level functions in the new design (compared to the predecessor design) should be documented."

Provide a description of the technical basis for modifications to high-level functions in accordance with Section 4.4, criterion 5 of NUREG-0711.

Response to Question 18-154:

A response to this question will be provided by May 17, 2010.

Question 18-155:

In partial fulfillment of this criterion for documenting a technical basis for all function allocations, the AREVA FSAR markup submitted as part of the response to RAI 240, Sub-section 18.3.3, states that,

Generally, functions automated in predecessor PWRs and in the OL3 EPR design are automated in the U.S. EPR design. Functions that are not automated are assigned to operators, either in the MCR or at LCSs. Any changes in automation are weighed against the total responsibilities of the operator to monitor automatic functions and to assume manual control during an automation system failure.

Provide a description of the applicable set of automation criteria used to assign and allocate functions.

Response to Question 18-155:

A response to this question will be provided by May 17, 2010.

Question 18-156:

In the FSAR markup submitted as part of the response to RAI 240, Sub-section 18.3.3, AREVA states that, “A specific objective of the V&V is to verify that the automation design decisions have resulted in an interface that permits accomplishment of the safety functions within human capabilities and identifies as human engineering discrepancies (HEDs) any ineffective function allocation observed. This V&V approach verifies that the FA uses human strengths and avoids human limitations.” While this description addresses that function allocation will be verified to assure coherent roles for plant personnel, the FSAR Section 18.3 does not address how functional requirements analysis will be verified, i.e., that all the high-level functions necessary for the achievement of safe operation are identified and that all requirements of each high-level function are identified.

The FRA/FA Plan, Section 3.1, “Functional Requirements Analysis Implementation,” describes a method to implement FRA, beginning with identifying top-level plant goals, plant-level safety functions, critical safety functions, system functions, and specific plant sub-systems. Figure 3-1 provides an overall structure of the FRA in the form of a “functional branch tree” which shows the FRA hierarchy and the relationships of the various plant, system, and component-level functions. This hierarchy depicts how high-level functions necessary to achieve safe operation. However, the FRA/FA Plan does not address how the requirements for each high-level function are identified or how functional requirements analysis will be verified, i.e., that all the high-level functions necessary for the achievement of safe operation are identified and that all requirements of each high-level function are identified.

Provide a description of how the requirements for each high-level function are identified and how functional requirements analysis will be verified, i.e., that all the high-level functions necessary for the achievement of safe operation are identified and that all requirements of each high-level function are identified.

Response to Question 18-156:

A response to this question will be provided by May 17, 2010.

Question 18-157:

FRA/FA, ITAAC-related Question: Items 2 and 3 of Table 3.4-1, column 1 (Commitment Wording), have titles for the implementation plan that are inconsistent with the title identified on the FRA/FA Plan. Please reconcile this discrepancy.

Response to Question 18-157:

A response to this question will be provided by May 17, 2010.

Question 18-158:

ITAAC-related: The “Acceptance Criteria” for items 2 and 3 (Table 3.4-1) are incomplete. For example, there should be a statement that the FRA and FA processes, methods (and NUREG-0711 criteria contained in the Plan) were implemented in accordance with the approved FRA/FA Implementation Plan (i.e., the results summary report should provide proof that the processes, methods and criteria were implemented). This discrepancy needs to be reconciled.

Response to Question 18-158:

A response to this question will be provided by May 17, 2010.

Question 18-159:

The FSAR markup submitted as part of the response to RAI 240, Sub-section 18.3.2, states that the FRA is divided into plant functions and system functions as described in the FRA/FA implementation plan. The FRA/FA Plan states that the FRA is divided into component level functions as well.

Clarify and reconcile the discrepancy between the FSAR and the FRA/FA Plan.

Response to Question 18-159:

A response to this question will be provided by May 17, 2010.

Question 18-160:

The FSAR markup submitted as part of the response to RAI 240, Sub-section 18.3.3 indicates that the plant-level and system-level FRA can be performed concurrently. Explain how this is accomplished and relate the explanation to Figure 3-1 contained in the FRA/FA Plan.

Response to Question 18-160:

A response to this question will be provided by May 17, 2010.

Question 18-161:

The FSAR markup submitted as part of the response to RAI 240, Sub-section 18.3.2, states that,

PFRA [plant-level FRA] and SFRA [systems-level FRA] are reconciled into a unified FRA by system function gap analysis (SFGA). During this process, system functions generated independently by PFRA and SFRA are mapped to one another. The functional relationships between plant functions and system functions are then reconciled. The output of SFGA confirms that plant design goals are met by incorporating the differences as design inputs.

Explain how this reconciliation process is accomplished (e.g., expand on the explanation provided in the FRA/FA Plan, Sections 3.2 and 4.2.) as appropriate.

Response to Question 18-161:

A response to this question will be provided by May 17, 2010.