ArevaEPRDCPEm Resource

From: BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent: Wednesday, October 06, 2010 4:14 PM
To: Tesfaye, Getachew
Cc: DELANO Karen (AREVA); ROMINE Judy (AREVA); BENNETT Kathy (AREVA); GUCWA Len (EXTERNAL AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 389, FSAR Ch. 6, Supplement 3
Attachments: RAI 389 Supplement 3 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for technically correct and complete responses to the 5 questions in RAI 389 on June 30, 2010. On August 4, 2010 and September 1, 2010, AREVA NP provided revised response schedules in RAI 389 Supplement 1 and Supplement 2, respectively. The attached file "RAI 389 Supplement 3 Response US EPR DC.pdf," provides a technically correct and complete response to 1 of the remaining 5 questions.

The following table indicates the respective pages in the response document, "RAI 389 Supplement 3 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question. 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 389 Question 06.02.02-48.

Question #	Start Page	End Page
RAI 389 — 06.02.02-48	2	4

The schedule for technically correct and complete responses to the remaining 4 questions is unchanged and is provided below.

Question #	Response Date
RAI 389 — 06.02.02-47	October 13, 2010
RAI 389 — 06.02.02-49	October 13, 2010
RAI 389 — 06.02.02-50	October 13, 2010
RAI 389 — 06.02.02-51	October 13, 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 (External RS/NB)
Sent: Wednesday, September 01, 2010 6:42 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); GUCWA Len (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 389, FSAR Ch. 6, Supplement 2

Getachew,

On June 30, 2010, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 5 questions. On August 4, 2010, AREVA NP provided a revised schedule in Supplement 1. To provide additional time to interact with the staff on question 06.02.02-48, a revised schedule is provided below.

The schedule for technically correct and complete responses is changed and is provided below.

Question #	Response Date
RAI 389 — 06.02.02-47	October 13, 2010
RAI 389 — 06.02.02-48	**October 7, 2010**
RAI 389 — 06.02.02-49	October 13, 2010
RAI 389 — 06.02.02-50	October 13, 2010
RAI 389 — 06.02.02-51	October 13, 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, August 04, 2010 4:53 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); GUCWA Len T (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 389, FSAR Ch. 6, Supplement 1

Getachew,

On June 30, 2010, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 5 questions. To provide additional time to interact with the staff on question 06.02.02-48, a revised schedule is provided below.

The schedule for technically correct and complete responses is changed and is provided below.

Question #	Response Date
RAI 389 — 06.02.02-47	October 13, 2010
RAI 389 — 06.02.02-48	**September 1, 2010**
RAI 389 — 06.02.02-49	October 13, 2010
RAI 389 — 06.02.02-50	October 13, 2010
RAI 389 — 06.02.02-51	October 13, 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, June 30, 2010 7:34 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); GUCWA Len T (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 389, FSAR Ch. 6

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 389 Response US EPR DC.pdf" provides a schedule since technically correct and complete responses to the 5 questions are not provided.

The following table indicates the respective pages in the response document, "RAI 389 Response US EPR DC.pdf" that contain AREVA NP's responses to the subject questions.

Question #	Start Page	End Page
RAI 389 — 06.02.02-47	2	2
RAI 389 — 06.02.02-48	3	3
RAI 389 — 06.02.02-49	4	5
RAI 389 — 06.02.02-50	6	6
RAI 389 — 06.02.02-51	7	7

A complete answer is not provided for the 5 questions. The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 389 — 06.02.02-47	October 13, 2010
RAI 389 — 06.02.02-48	August 4, 2010
RAI 389 — 06.02.02-49	October 13, 2010
RAI 389 — 06.02.02-50	October 13, 2010
RAI 389 — 06.02.02-51	October 13, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
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Martin.Bryan.ext@areva.com

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, June 02, 2010 7:12 AM
To: ZZ-DL-A-USEPR-DL
Cc: Jensen, Walton; Peng, Shie-Jeng; Hayes(NRO), Michelle; Jackson, Christopher; McKirgan, John; Carneal, Jason;

Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 389 (4615), FSAR Ch. 6

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on April 12, 2010, and discussed with your staff on April 22, 2010 and May 6, 2010. Drat RAI Question 06.02.02-49 was modified as a result of those discussions. 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: 2099

Mail Envelope Properties (BC417D9255991046A37DD56CF597DB7107D20496)

Subject: Response to U.S. EPR Design Certification Application RAI No. 389, FSAR Ch. 6, Supplement 3
Sent Date: 10/6/2010 4:13:34 PM
Received Date: 10/6/2010 4:16:11 PM
From: BRYAN Martin (EXTERNAL AREVA)

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

Recipients:
"DELANO Karen (AREVA)" <Karen.Delano@areva.com>
Tracking Status: None
"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
Tracking Status: None
"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
Tracking Status: None
"GUCWA Len (EXTERNAL AREVA)" <Len.Gucwa.ext@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	6711	10/6/2010 4:16:11 PM
RAI 389 Supplement 3 Response US EPR DC.pdf	96065	

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

Response to

Request for Additional Information No. 389(4615), Supplement 3, Revision 1

6/2/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 06.02.02 - Containment Heat Removal Systems
Application Section: FSAR Chapter 6

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects)
(SPCV)

Question 06.02.02-48:

FOLLOW-UP TO RAI 297, QUESTION 06.02.01-49

Redundancy and diversity of the mixing damper opening signal is briefly mentioned in Response to RAI 297, Question 06.02.01-49; namely:

"The opening signal is provided by diverse means – either eight redundant delta pressure sensors or two redundant absolute pressure measurements sensors"

The CONVECT system is a safety-related system. The mixing dampers are part of the CONVECT system. Provide to the following additional information:

a. Has a failure mode analysis of the mixing dampers been performed? Where is the failure mode analysis documented? Describe these evaluations.

b. What is the actuation logic of the eight delta pressure sensors? What signal is needed to open the dampers? Is the delta pressure signal one directional?

c. Will the delta pressure signal open dampers if the break is in the annular space? What restrictions are placed on plant operation if one of the absolute pressure sensors is out of order?

d. Have potential common mode failure of the mixing dampers been addressed? Where is the common mode failure analysis documented? Describe these evaluations.

Response to Question 06.02.02-48:

a) The hydrogen mixing damper (HMD) is a passive device and does not require electrical power to perform its safety-related function. Eight HMDs are arranged in the lower annular rooms. During normal operation, a solenoid brake keeps the mixing dampers closed to maintain the separation of the equipment and accessible, operational rooms. In case of a loss of electrical power or upon receipt of an opening signal, power to the solenoid brake is removed and a spring opens the HMD. Based on this design, the fail-safe position of the HMD is open. The function of the damper to open is guaranteed even in the absence of electrical power.

   If a hydrogen mixing damper opens unintentionally, it can be closed by either the actuator or the mechanical backup closing mechanism. If the mixing damper stays open, the resulting leakage (cross sectional area approximately 8 ft^2), compared to the total leakage of the penetrations (like doors) across the equipment and operational rooms is negligible. The hydrogen mixing dampers are installed in the accessible area, which provides for maintenance access to the component during normal operation.

   The redundancy of the eight HMDs meets failure modes and effects analysis (FMEA) requirements so that one HMD can be out of service for maintenance and a single failure can occur at a second HMD without affecting the global convection between the equipment and operational rooms.

   The FMEA is documented in the combustible gas control system description and will be included in the Response to question 06.02.02-49.

b) The HMDs are safety grade and their operation and actuation logic is controlled by the protection system (PS), the safety automation system (SAS), and the diverse actuation system (DAS). There are two sensors per steam generator (SG) loop for a total of eight, safety grade differential pressure sensors powered from their respective electrical divisions. This arrangement meets FMEA requirements because a sensor can be out of service for maintenance and a single-failure can occur without affecting the HMD control. If two out of eight sensor signals exceed the differential pressure setpoint, the eight HMDs receive a signal to open.

   The differential pressure setpoint is 0.5 psi. The differential pressure is measured across the SG pressure equalization ceiling and measures the difference in pressure between the accessible and equipment areas. The differential pressure signal accounts for a pressure increase in either of the regions to provide an actuation signal for the HMDs. No feedback is provided to the pressure sensor.

c) The annular rooms are part of the accessible area. The differential pressure signal will open the HMDs if a pipe break occurs in the annular space as discussed in Part b) of this response.

   There are a total of four safety grade absolute pressure sensors, and their operation and actuation logic is controlled by the PS, the SAS, and the DAS. For each SG loop, an associated absolute pressure sensor is located in the accessible area of the containment. If two of the four absolute pressure sensors exceed the absolute pressure setpoint of 17.4 psia, the HMDs receive a signal to open. This arrangement and logic meets the FMEA requirements because a sensor can be out of service for maintenance and a single-failure can occur without affecting the HMD control. There are no restrictions placed on plant operation if one of the absolute pressure sensors is out of service.

   U.S. EPR FSAR Tier 2, Table 6.2.5-1 will be revised to show that the setpoint for opening the HMDs is 17.4 psia.

   The number of absolute pressure sensors was changed from two to four following the submittal of the Response to RAI 297, Supplement 2, Question 06.02.01-49 on February 16, 2010.

d) Common mode failure is addressed in the qualification program and through periodic testing. The sensors and instrumentation and controls (I&C) signals meet the criteria of diversity by absolute and differential pressure measurement and sensor redundancy.

   Diversity in the actuation system (as discussed in Item b.) and its fail-safe design provide assurance that the mixing dampers will meet the intended safety function.

   Eight hydrogen mixing dampers will be installed in the U.S. EPR containment as part of the CONVECT system. The HMDs are reliable by a fail safe (spring actuated) opening mechanism. These components are being qualified and installed in other EPR power plants in Europe and Asia. The reliability of these components will be verified by a qualification program for the U.S. EPR plants as part of the normal procurement process. Periodic testing on-site confirms the proper function of each installed HMD. Similar dampers are in operation in the heating, ventilation, and air conditioning (HVAC) systems of nuclear power plants.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 6.2.5-1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Table 6.2.5-1—CGCS Design and Performance Parameters

Parameter	Value
Large PARs	
• Number of units	41
• Nominal hydrogen reduction rate (per PAR)	11.8 lb_m/hr
• Catalyst	Pt / Pd ~~substrate~~coating
Small PARs	
• Number of units	6
• Nominal hydrogen reduction rate (per PAR)	2.6 lb^m/hr
• Catalyst	Pt / Pd ~~substrate~~coating
Hydrogen mixing dampers	
• Number of units	8
• Approximate opening cross section (total)	64 ft^2
• Nominal actuation pressure	0.5 psid or 17.4 psia
Rupture foils	
• Approximate opening cross section (total)	375 ft^2
• Nominal actuation pressure	0.7 psid
Convection foils	
• Approximate opening cross section (total)	480 ft^2
• Nominal actuation pressure	0.7 psid
• Nominal actuation temperature	180.5°F

06.02.02-48