

ArevaEPRDCPEm Resource

From: WELLS Russell (AREVA) [Russell.Wells@areva.com]
Sent: Thursday, March 31, 2011 8:00 PM
To: Tesfaye, Getachew
Cc: GUCWA Len (EXTERNAL AREVA); BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No.457, FSAR Ch. 6, Supplement 1
Attachments: RAI 457 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to RAI No. 457 on January 27, 2011. The attached file, "RAI 457 Supplement 1 Response US EPR DC.pdf" provides a technically correct and complete response to 1 of the remaining 5 questions, as committed.

The following table indicates the respective pages in the response document, "RAI 457 Supplement 1 Response US EPR DC.pdf" that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 457 — 06.02.02-80	2	4

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

Question #	Response Date
RAI 457 — 06.02.02-81	May 19, 2011
RAI 457 — 06.02.01.02-5	May 19, 2011
RAI 457 — 06.02.01.02-6	May 19, 2011
RAI 457 — 06.02.01.02-7	April 6, 2011

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57

Lynchburg, VA 24506-0935

Phone: 434-832-3884 (work)

434-942-6375 (cell)

Fax: 434-382-3884

Russell.Wells@Areva.com

From: BRYAN Martin (External RS/NB)
Sent: Thursday, January 27, 2011 5:39 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.457, FSAR Ch. 6

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file provides a schedule since a technically correct and complete response to the 5 questions is not provided.

The following table indicates the respective pages in the response document, "RAI 457 Response US EPR DC.pdf," that contains AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 457 — 06.02.02-80	2	2
RAI 457 — 06.02.02-81	3	3
RAI 457 — 06.02.01.02-5	4	5
RAI 457 — 06.02.01.02-6	6	6
RAI 457 — 06.02.01.02-7	7	7

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

Question #	Response Date
RAI 457 — 06.02.02-80	May 4, 2011
RAI 457 — 06.02.02-81	May 19, 2011
RAI 457 — 06.02.01.02-5	May 19, 2011
RAI 457 — 06.02.01.02-6	May 19, 2011
RAI 457 — 06.02.01.02-7	April 6, 2011

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: Tuesday, December 21, 2010 10:39 AM

To: ZZ-DL-A-USEPR-DL

Cc: Strnisha, James; Terao, David; Ashley, Clinton; Jensen, Walton; Jackson, Christopher; McKirgan, John; Carneal, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource

Subject: U.S. EPR Design Certification Application RAI No.457(5169,5195,5202), FSAR Ch. 6

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on October 29, 2010, and discussed with your staff on December 17, 2010. Draft RAI Question 06.02.02-81 was modified 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, excluding the time period of **December 24, 2010 thru January 3, 2011, to account for the holiday season** as discussed with AREVA NP Inc. For any RAIs that cannot be answered **within 45 days**, it is expected that a date for receipt of this information will be provided to the staff within the 40-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: 2794

Mail Envelope Properties (1F1CC1BBDC66B842A46CAC03D6B1CD41042B9CDA)

Subject: Response to U.S. EPR Design Certification Application RAI No.457, FSAR Ch. 6,
Supplement 1
Sent Date: 3/31/2011 7:59:42 PM
Received Date: 3/31/2011 7:59:48 PM
From: WELLS Russell (AREVA)

Created By: Russell.Wells@areva.com

Recipients:

"GUCWA Len (EXTERNAL AREVA)" <Len.Gucwa.ext@areva.com>

Tracking Status: None

"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>

Tracking Status: None

"DELANO Karen (AREVA)" <Karen.Delano@areva.com>

Tracking Status: None

"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>

Tracking Status: None

"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>

Tracking Status: None

"Tsfaye, Getachew" <Getachew.Tsfaye@nrc.gov>

Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	Size	Date & Time
MESSAGE	4213	3/31/2011 7:59:48 PM
RAI 457 Supplement 1 Response US EPR DC.pdf		71254

Options

Priority: Standard

Return Notification: No

Reply Requested: No

Sensitivity: Normal

Expiration Date:

Recipients Received:

Response to

Request for Additional Information No. 457(5169, 5195, 5202), Revision 0

12/21/2010

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 06.02.02 - Containment Heat Removal Systems

SRP Section: 06.02.01.02 - Subcompartment Analysis

Application Section: 6.2.2

QUESTIONS for Component Integrity, Performance, and Testing Branch 1

(AP1000/EPR Projects) (CIB1)

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

(SPCV)

Question 06.02.02-80:

The evaluation of the ex-vessel downstream ECCS flow path components includes the plugging and wear models used for the piping, valve disks and seats, pump wear rings, pump bearings and seals, pump rotors and shafts, and heat exchanger tubes and shells. This includes the effects of individual equipment strainers, cyclone separators, branch lines, pump recirculation lines, and other components that may become plugged. This also includes the limiting assumptions to address possible variations in operational lineup and use of various systems (e.g., use of either HPSI or MHSI versus using only LPSI for hot leg injection or use of only one train versus multiple trains of ECCS flow). Therefore, the staff raised a question regarding plugging and wear of the ex-vessel downstream ECCS components and their ability to function for the necessary mission time.

In a December 8, 2008 response to RAI 111, Question 06.02.02-10, the applicant stated that both the HPSI and MHSI pumps are designed with increased clearances, appropriate hardening of parts for wear, and a filtration system for the mechanical seals. The applicant also stated that an analysis of the ECCS pumps showed negligible impact on the pump performance for debris-laden recirculation water conditions, and that the analysis was validated against existing qualification tests under equivalent pumping conditions. However, the specific ex-vessel downstream components have not yet been selected or designed for specific EPR plants, and the staff will base its findings regarding their ability to adequately perform their safety functions for the required mission time on a review of the applicable evaluation methods and acceptance criteria. Since no quantitative methods or acceptance criteria were provided, the staff requested additional information in a follow-up question.

In a February 16, 2010 response to RAI 297, Question 06.02.02-41, the applicant repeated its intent to evaluate the ex-vessel downstream components using samples of the test fluid downstream of the ECCS strainers during strainer testing. The applicant further stated its intent to provide the plant-specific component vendors with the debris bypass test data and its decay time characteristics and duration for which the equipment must operate. The applicant also stated that the vendor would then be required to evaluate the test debris composition for potential component wear and corrosion effects. The staff requires additional information to make a safety finding on this issue. Furthermore, the staff notes that tests which maximize the head loss across the strainer may not maximize the debris that passes downstream. The applicant has to date provided no specific methodology and acceptance criteria that the staff can review to determine if they appropriately address uncertainties.

Provide the methodology and acceptance criteria for evaluating the ex-vessel downstream components. Further, given the plant-specific ex-vessel downstream components are not yet designed or selected, provide a COL action item in Chapter 6 to require proper implementation of the component evaluations and an ITAAC to verify the implementation activity prior to plant operation. This should include assessing system or component flow resistance or flow balance changes as a result of wear, assessing system piping vibration response changes due to wear, the capability to isolate components under debris laden conditions, and the capability of credited operator actions.

Response to Question 06.02.02-80:

The ex-vessel downstream components of the emergency core cooling system (ECCS) were assessed to ascertain the effects of ingested sump debris on post-loss of coolant accident (LOCA) operation. The following is a summary of the methodology for this assessment:

1. The assessment identified the small break LOCA (SBLOCA) and the large-break LOCA (LBLOCA) as accident scenarios with potential for debris transportation to the in-containment refueling water storage tank containment sump screen. Since the LBLOCA results in higher loss of coolant inventory, higher temperature and pressure inside the containment, and a higher potential for debris generation than the SBLOCA, the large-break LOCA was selected as the limiting accident condition for the ex-vessel downstream evaluation.
2. The pumps, heat exchangers, valves, and orifices in the ECCS flow path during all post-LOCA scenarios were identified. The ex-vessel downstream evaluation is also limited to these components.
3. The mission time, which is the amount of time in which the components are required to fulfill their safety functions during post-LOCA conditions, was established to be 30 days of continuous operation.
4. The amount and concentration of all the debris source materials in the post-LOCA fluid were established based on conservative assumptions and results of bypass testing for latent fiber. The amount and concentration of debris materials in the post-LOCA fluid can be found in Table G.2-3 of Technical Report 43-10293NP-003 (Appendix G).
5. The ex-vessel ECCS downstream components were assessed for potential wear and plugging. As a minimum, various tests and analyses were identified to be provided by the ECCS component vendors and to be verified during procurement to provide reasonable assurance that there is continuous post-LOCA operation for a minimum of 30 days. The vendor responsibilities for these tests or analyses are as follows:

The low head safety injection (LHSI) and medium head safety injection (MHSI) pump vendors will provide the following:

- A list of the opening sizes and internal running clearances for the LHSI and MHSI pumps.
- Hydraulic performance test results that confirm that the LHSI and MHSI pumps can provide the required safety injection flow for at least 30 days of ECCS post-LOCA operation.
- A list of materials of wetted pump surfaces, such as wear rings, pump internals, bearing, and casing, and the hardness of each material (for example, Brinell hardness number).
- Mechanical performance test results and/or relevant analysis for pump vibration, rotor dynamics, and bearing load to confirm that there will be no adverse changes in system vibration response or rotor dynamics performance during ECCS operation for at least 30 days. The vendor will also provide relevant test results and/or relevant analysis to confirm that increases in internal bypass flow caused by impeller or casing wear will not decrease the performance of the pumps or cause accelerated internal wear for a minimum of 30 days of post-LOCA operation.

- Mechanical seal assembly performance test and/or analysis to confirm that ECCS operation with post-LOCA fluids will not impair seal performance and cause seal failure or significantly degrade seal leakage.
- The pump vendor will provide analysis to confirm that the cyclone separator, if applicable, is not susceptible to clogging or impairment by fiber or other particulates and that there will be no adverse impact on pump performance or reliability. If the cyclone separators will be impaired during operation with post-LOCA fluids, test results and/or analysis will be provided to demonstrate that the absence of cyclone separators yields acceptable seal performance during post-LOCA operation.
- The LHSI heat exchanger vendor will provide reasonable assurance that plugging or abrasive wear by post-LOCA debris constituents will not occur or adversely affect heat exchanger performance below specification. Tube leakage or failure because of abrasive wear will also be assessed and analysis will also be provided to support acceptable performance.
- An analysis of plugging and wear of valves and orifices will be performed to confirm that the overall resistance/pressure drop across the ECCS is consistent with the safety analysis results for 30 days of post-LOCA operation.

Acceptance Criteria:

The components in the ECCS flow path will maintain performance that supports the provision of the required safety injection flow for a minimum of 30 days. More specifically, the LHSI and MHSI pumps will provide their required safety injection flow rates; the LHSI heat exchanger will maintain the post-LOCA fluid at the established temperature; and the overall system resistance or pressure drop will be consistent with what is expected during post-LOCA operation.

The ITAAC for the ex-vessel downstream evaluation is provided with the response to RAI 111, Question 06.02.02-10.

FSAR Impact:

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