

ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Wednesday, July 06, 2011 4:25 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); GUCWA Len (EXTERNAL AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No.457, FSAR Ch. 6, Supplement 5
Attachments: RAI 457 Supplement 5 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to RAI 457 on January 27, 2011. AREVA provided Supplement 1 response to RAI 457 on March 31, 2011 to provide a technically correct and complete response to Question 06.02.02-80. AREVA provided Supplement 2 response to RAI 457 on April 6, 2011 to revise the response schedule for Question 06.02.01.02-7. AREVA provided Supplement 3 response to RAI 457 on May 11, 2011 to revise the schedule for Questions 06.02.02-81, 06.02.01.02-5, 06.02.01.02-6 and 06.02.01.02-7. AREVA provided Supplement 4 response to RAI 457 on June 3, 2011 to provide technically correct and complete responses to 3 (Questions 06.02.01.02-5, 06.02.01.02-6 and 06.02.01.02-7) of the remaining 4 questions.

The attached file, "RAI 457 Supplement 5 Response US EPR DC.pdf" provides a technically correct and complete response to the remaining question.

The following table indicates the respective pages in the response document, "RAI 457 Supplement 5 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 457 — 06.02.02-81	2	5

This concludes the formal AREVA NP response to RAI 457, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager

AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: RYAN Tom (RS/NB)
Sent: Friday, June 03, 2011 4:38 PM
To: Tesfaye, Getachew
Cc: GUCWA Len (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLIFORD Dennis (RS/NB)
Subject: PROPRIETARY Response to U.S. EPR Design Certification Application RAI No.457, FSAR Ch. 6, Supplement 4

Getachew,

Attached is AREVA NP Inc. letter NRC:11:058 with affidavit, and the proprietary and non-proprietary versions of the response to RAI 457 Supplement 4.

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager

AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
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Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: RYAN Tom (RS/NB)
Sent: Friday, June 03, 2011 4:33 PM
To: 'Tesfaye, Getachew'
Cc: GUCWA Len (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLIFORD Dennis (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No.457, FSAR Ch. 6, Supplement 4

Getachew,

AREVA NP Inc. letter NRC 11:058 dated June 3, 2011 provides a technically correct and complete response to 3 of the 4 remaining questions for RAI 457. AREVA NP considers some of the material contained in the response to be proprietary information. As required by 10 CFR 2.390(b), an affidavit is provided to support the withholding of the proprietary information from public disclosure. A proprietary and non-proprietary version of the enclosure to this letter are provided separately.

The following table indicates the respective pages in the enclosure that contain AREVA NP's final response to the subject questions.

Question #	Start Page	End Page
RAI 457 - 06.02.01.02-5	2	13
RAI 457 - 06.02.01.02-6	14	24
RAI 457 - 06.02.01.02-7	25	27

The schedule for a technically correct and complete final response to the remaining question is unchanged and is provided below.

Question #	Response Date
RAI 457 — 06.02.02-81	July 6, 2011

Sincerely,

Tom Ryan for
Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager

AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WELLS Russell (RS/NB)
Sent: Wednesday, May 11, 2011 5:07 PM
To: Tesfaye, Getachew
Cc: GUCWA Len (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No.457, FSAR Ch. 6, Supplement 3

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to RAI No. 457 on January 27, 2011. AREVA provided Supplement 1 response to RAI 457 on March 31, 2011 to provide a technically correct and complete response to Question 06.02.02-80. AREVA provided Supplement 2 response to RAI 457 on April 6, 2011 to revise the response schedule for Question 06.02.01.02-7.

On May 9-10, 2011 NRC conducted an audit of AREVA's containment subcompartment pressurization analysis. As a result of the audit, clarifications are being made to the responses to some of the remaining questions. The response schedule for Questions 06.02.02-81, 06.02.01.02-5, 06.02.01.02-6 and 06.02.01.02-7 is changed as shown below to provide for the clarifications and to provide additional opportunity to interact with the NRC staff regarding Question 06.02.02-81.

Question #	Response Date
RAI 457 — 06.02.02-81	July 6, 2011
RAI 457 — 06.02.01.02-5	June 8, 2011
RAI 457 — 06.02.01.02-6	June 8, 2011
RAI 457 — 06.02.01.02-7	June 8, 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)

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Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)
Sent: Wednesday, April 06, 2011 1:46 PM
To: 'Tesfaye, Getachew'
Cc: GUCWA Len (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No.457, FSAR Ch. 6, Supplement 2

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to RAI No. 457 on January 27, 2011. AREVA provided Supplement 1 response to RAI 457 on March 31, 2011 to provide a technically correct and complete response to Question 06.02.02-80.

The response schedule for Question 06.02.01.02-7 is changed to provide additional opportunity to interact with the NRC staff as shown below.

The schedule for technically correct and complete responses to the remaining 3 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	May 11, 2011

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

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Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)

Sent: Thursday, March 31, 2011 8:00 PM

To: 'Tesfaye, Getachew'

Cc: GUCWA Len (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No.457, FSAR Ch. 6, Supplement 1

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
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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

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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: 3223

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D47AF767)

Subject: Response to U.S. EPR Design Certification Application RAI No.457, FSAR Ch. 6,
Supplement 5
Sent Date: 7/6/2011 4:24:54 PM
Received Date: 7/6/2011 4:24:57 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

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Tracking Status: None
"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
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Files	Size	Date & Time
MESSAGE	11947	7/6/2011 4:24:57 PM
RAI 457 Supplement 5 Response US EPR DC.pdf		75079

Options

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

Response to

Request for Additional Information No. 457, Supplement 5

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 06.02.02-81:

Containment accident pressure (CAP) is the pressure in containment during a postulated accident. RG 1.82 (and RG 1.1) state that pump performance should be independent of the calculated increases in containment pressure caused by postulated LOCAs and also states that sufficient available NPSH should be provided to system pumps assuming no increase in containment pressure from that present prior to the postulated LOCA. SRP 6.2.2 states that if “containment accident pressure is credited in determining available NPSH, an evaluation of the contribution to plant risk from inadequate containment pressure should be made.” The U.S. EPR design uses containment accident pressure in evaluating the net positive suction head (NPSH) for pumps that perform emergency core cooling and containment heat removal functions. (See also RAI 416, Question 06.03-15). Perform a risk assessment and provide the results, along with a summary description of the methods used and assumptions made, to the staff for review. The risk assessment should address all plant accident conditions where CAP is credited for reliable operation of the ECCS and containment heat removal system pumps and discuss the bases (e.g., results of thermal-hydraulic analyses) for determining whether CAP credit is needed. All accident initiating events (internal and external) and modes of operation modeled in the U.S. EPR design-specific PRA should be addressed in assessing the risk associated with CAP credit. Qualitative arguments can be used to demonstrate that the risk associated with certain initiating events or accident sequences is insignificant or smaller than the risk associated with analyzed cases, as applicable. In particular, the risk analysis and its documentation should address the following items, as applicable:

- a. Method, assumptions, and results for each LOCA initiating event category.
- b. Method, assumptions, and results for non-LOCA accident initiating event categories which include feed-and-bleed operation, stuck-open safety valves, or any other means of providing heat to the in-containment refueling water storage tank.
- c. Investigate any potential adverse interaction among the operator actions credited in the PRA for accident mitigation and the need to prevent human actions that could lead to inadvertent opening of the containment isolation valves or to containment depressurization.
- d. Investigate the risk impact of operating emergency core cooling and containment heat removal systems with impaired containment integrity (e.g., undetected pre-existing containment opening) or operation of containment heat removal systems at too high a rate.

In addition, describe the monitoring program that demonstrates that the actual performance of plant equipment is consistent with the performance assumed in the engineering and probabilistic analyses used to justify CAP in determining NPSH available.

Response to Question 06.02.02-81:

Containment accident pressure is not credited in the probabilistic risk assessment (PRA) model to support operation of the safety injection pumps and the containment heat removal pump during the 24 hours mission time. In-containment refueling water storage tank (IRWST) cooling is required for successful mitigation of loss of coolant accident (LOCA) and feed-and-bleed sequences in the PRA model. The post-accident IRWST cooling function can be provided by either the low head safety injection (LHSI) or severe accident heat removal (SAHR) heat exchangers. IRWST temperatures were not initially documented because the Modular Accident

Analysis Program (MAAP) analysis supporting the Level 1 PRA focused on success criteria for core damage mitigation. To support this response, additional MAAP runs were performed, and IRWST temperatures were documented for each of the scenarios requested. Table 06.02.02-81-1 summarizes the results from these analyses.

- a) For small loss of coolant accident (SLOCA) (including stuck open safety valves) and medium loss of coolant accident (MLOCA) initiators, the PRA model credits the following IRWST cooling means:
- One LHSI train with heat exchanger (automatically actuated for safety injection).
 - SAHR train with heat exchanger (manually actuated in four hours and aligned to the IRWST cooling mode).

For the large loss of coolant accident (LLOCA) category, only LHSI IRWST cooling was credited.

Table 06.02.02-81-1 shows that in LOCA scenarios (Scenarios 2a, 2b, 3a, 3b, and 4a), the maximum IRWST temperature is below 212°F, verifying that adequate net-positive pump suction head remains available, even with containment accident pressure (CAP) at atmospheric pressure.

- b) For non-LOCA initiators, which include feed-and-bleed operation, the PRA model credits the following IRWST cooling means:
- One LHSI train with heat exchanger (manually actuated for feed-and-bleed).
 - SAHR with heat exchanger (manually actuated in four hours and aligned to the IRWST cooling mode).

The SLOCA category includes the stuck open safety valve.

Table 06.02.02-81-1 shows that in feed-and-bleed scenarios (Scenarios 1a and 1b), the maximum IRWST temperature is below 212°F, verifying adequate net pump suction head, even with CAP at atmospheric pressure.

- c) and d) Based on the results in Table 06.02.02-81-1 and discussed in the responses to a) and b), no successful PRA LOCA or feed-and-bleed scenario was identified that led to temperatures higher than 212°F in the IRWST. CAP is not a concern, and the containment isolation and integrity status was not evaluated in the Level 1 PRA.

This analysis is performed for power operation modes and is assumed to be bounding for the low power and shutdown modes when the RCS has less stored energy and lower decay heat rates.

Regarding equipment monitoring programs, the performance of plant equipment is governed by established monitoring programs (Technical Specifications, reliability assurance program, maintenance rule, and inservice inspection and testing), described in respective U.S. EPR FSAR sections.

FSAR Impact:

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

Table 06.02.02-81-1—MAAP IRWST Temperature Results for the Selected Scenarios

SCENARIO	Event	IRWST Long Term Cooling	MAX IRWST Temperature within 24 hours (°F)	Time of Maximum Temperature (hrs)
SCENARIO 1a	Loss of Secondary Side Cooling; Feed-and-bleed initiated in 90 minutes by opening the three pressurizer safety valves, or by opening one primary depressurization line	One LHSI train with heat exchanger actuated at the start of feed-and-bleed	209.9	16.1
SCENARIO 1b	Loss of Secondary Side Cooling; Feed-and-bleed initiated in 90 minutes by opening the three pressurizer safety valves, or by opening one primary depressurization line	SAHR initiated manually in four hours and aligned to the IRWST cooling mode	177.3	24
SCENARIO 2a	SLOCA, 3" hot leg	One LHSI train with heat exchanger automatically actuated for safety injection	198.5	16.1
SCENARIO 2b	SLOCA, 3" hot leg	SAHR initiated manually in four hours and aligned to the IRWST cooling mode	178.6	24
SCENARIO 3a	MLOCA, 6" hot leg	One LHSI train with heat exchanger automatically actuated for safety injection	199.3	14.9
SCENARIO 3b	MLOCA, 6" hot leg	SAHR initiated manually in four hours and aligned to the IRWST cooling mode	183.6	24
SCENARIO 4a	LLOCA: double guillotine hot leg rupture	One LHSI train with heat exchanger automatically actuated for safety injection	206.9	11.9