

ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Wednesday, August 17, 2011 5:42 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. 471 (5387, 5426, 5389), FSAR Ch. 6, Supplement 4
Attachments: RAI 471 Supplement 4 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for responding to the 6 questions of RAI 471 on March 17, 2011. AREVA NP submitted Supplement 1 response to RAI 471 on March 31, 2011 to address one question (Question 06.02.02-84). Supplement 2 and Supplement 3 responses to RAI 471 were sent on May 25, 2011 and July 27, 2011, respectively, to revise the response schedule for Questions 06.02.02-85, 06.02.05-20, 06.02.05-21, 06.02.05-22 and 06.02.05-23.

The attached file, "RAI 471 Supplement 4 Response US EPR DC.pdf" provides a technically correct and complete response to 1 of the remaining 5 questions. 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 471 Question 06.02.05-22.

The following table indicates the respective pages in the response document, "RAI 471 Supplement 4 Response US EPR DC.pdf" that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 471 — 06.02.05-22	2	2

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

Question #	Response Date
RAI 471 — 06.02.02-85	September 21, 2011
RAI 471 — 06.02.05-20	December 22, 2011
RAI 471 — 06.02.05-21	December 22, 2011
RAI 471 — 06.02.05-23	December 22, 2011

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: WELLS Russell (RS/NB)
Sent: Wednesday, July 27, 2011 7:33 PM
To: 'Tesfaye, Getachew'
Cc: GUCWA Len (External RS/NB); WILLIFORD Dennis (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 471 (5387, 5426, 5389), FSAR Ch. 6, Supplement 3

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for responding to the 6 questions of RAI 471 on March 17, 2011. AREVA NP submitted Supplement 1 response to RAI 471 on March 31, 2011 to address one question (Question 06.02.02-84). Supplement 2 response to RAI 471 was sent on May 25, 2011 to revise the response schedule for Questions 06.02.02-85, 06.02.05-20, 06.02.05-21, 06.02.05-22 and 06.02.05-23.

AREVA NP is providing a revised schedule for responding to Questions 06.02.02-85, 06.02.05-20, 06.02.05-21, 06.02.05-22 and 06.02.05-23. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 471 — 06.02.02-85	September 21, 2011
RAI 471 — 06.02.05-20	December 22, 2011
RAI 471 — 06.02.05-21	December 22, 2011
RAI 471 — 06.02.05-22	September 21, 2011
RAI 471 — 06.02.05-23	December 22, 2011

Sincerely,

Russ Wells 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
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From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, May 25, 2011 10:37 AM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); GUCWA Len (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 471 (5387, 5426, 5389), FSAR Ch. 6, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for responding to the 6 questions of RAI 471 on March 17, 2011. AREVA NP submitted Supplement 1 response to RAI 471 on March 31, 2011 to address one question (Question 06.02.02-84).

AREVA NP is providing a revised schedule for responding to Questions 06.02.02-85, 06.02.05-20, 06.02.05-21, 06.02.05-22 and 06.02.05-23. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 471 — 06.02.02-85	July 27, 2011
RAI 471 — 06.02.05-20	July 27, 2011
RAI 471 — 06.02.05-21	July 27, 2011
RAI 471 — 06.02.05-22	July 27, 2011
RAI 471 — 06.02.05-23	July 27, 2011

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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From: WELLS Russell (RS/NB)
Sent: Thursday, March 31, 2011 11:10 AM
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. 471 (5387, 5426, 5389), FSAR Ch. 6, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for responding to the 6 questions of RAI 471 on March 17, 2011. The attached file, "RAI 471 Supplement 1 Response US EPR DC.pdf" provides a technically correct and complete response to one question (Question 06.02.02-84).

The following table indicates the respective pages in the response document, "RAI 471 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 471 — 06.02.02-84	2	2

The response schedule for the remaining 5 questions is unchanged and is provided below:

Question #	Response Date
RAI 471 — 06.02.02-85	May 26, 2011
RAI 471 — 06.02.05-20	May 26, 2011
RAI 471 — 06.02.05-21	May 26, 2011
RAI 471 — 06.02.05-22	May 26, 2011
RAI 471 — 06.02.05-23	May 26, 2011

Sincerely,

From: WELLS Russell (RS/NB)

Sent: Thursday, March 17, 2011 6:42 AM

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. 471 (5387, 5426, 5389), FSAR Ch. 6

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 471 Response US EPR DC.pdf" provides a schedule since technically correct and complete responses to the 6 questions are not provided.

The following table indicates the respective pages in the response document, "RAI 471 Response US EPR DC.pdf" that contain AREVA NP's responses to the subject questions.

Question #	Start Page	End Page
RAI 471 — 06.02.02-84	2	2
RAI 471 — 06.02.02-85	3	3
RAI 471 — 06.02.05-20	4	4
RAI 471 — 06.02.05-21	5	5
RAI 471 — 06.02.05-22	6	6
RAI 471 — 06.02.05-23	7	7

A complete answer is not provided for the 6 questions. The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 471 — 06.02.02-84	March 31, 2011
RAI 471 — 06.02.02-85	May 26, 2011
RAI 471 — 06.02.05-20	May 26, 2011
RAI 471 — 06.02.05-21	May 26, 2011
RAI 471 — 06.02.05-22	May 26, 2011

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

3315 Old Forest Road, P.O. Box 10935

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Lynchburg, VA 24506-0935

Phone: 434-832-3884 (work)

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Russell.Wells@Areva.com

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]

Sent: Tuesday, February 15, 2011 2:04 PM

To: ZZ-DL-A-USEPR-DL

Cc: Makar, Gregory; Terao, David; Jackson, Christopher; Grady, Anne-Marie; McKirgan, John; Carneal, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource

Subject: U.S. EPR Design Certification Application RAI No. 471 (5387, 5426, 5389), FSAR Ch. 6

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on January 26, 2011, and discussed with your staff on February 15, 2011. No change is 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: 3339

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D486C89D)

Subject: Response to U.S. EPR Design Certification Application RAI No. 471 (5387, 5426, 5389), FSAR Ch. 6, Supplement 4
Sent Date: 8/17/2011 5:41:36 PM
Received Date: 8/17/2011 5:42:16 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>
Tracking Status: None
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Files	Size	Date & Time
MESSAGE	9014	8/17/2011 5:42:16 PM
RAI 471 Supplement 4 Response US EPR DC.pdf		100551

Options

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

Response to

Request for Additional Information No. 471, Supplement 4

2/15/2011

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 06.02.02 - Containment Heat Removal Systems

SRP Section: 06.02.05 - Combustible Gas Control in Containment

Application Section: 6.2

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

Question 06.02.05-22:**POTENTIAL OPEN ITEM**

Confirm that the MAAP4 analysis used the H₂ production curves provided in the response to RAI 6, Question 19-95h, for both the small and large PARs. If the MAAP4 analysis is based on different production curves, provide the curves used in the analysis.

Revise FSAR Tier 2, Section 6.2.5 to include the curves on which PAR performance is credited. Revise FSAR Tier 1, Section 2.3.1 to add the design H₂ recombination rates to the nominal rates provided in Table 2.3.1-1 –CGCS Equipment Design.

AREVA has committed to revising FSAR Tier 2, Section 6.2.5 to include the performance criteria of components required for severe accidents in response to RAI 410, Question 6.2.5-16. FSAR Tier 2, Section 6.2.5 is where the detailed design of the CGCS is described.

Response to Question 06.02.05-22:

The MAAP4 analysis uses the same passive autocatalytic recombiner (PAR) efficiency curves for the small and large PARs as given in the response to RAI 6, Question 19-95-h. These curves are based on the respective hydrogen reduction rates for the small and large PARs. ANP-10299P, Revision 2, Supplement 1, Figure 1 and Figure 2 provide the PAR efficiency curves used in the MAAP4 analysis. The nominal hydrogen reduction rates are specified in Table 2 of ANP-10299P, Revision 2, Supplement 1.

ANP-10299P is incorporated by reference into the U.S. EPR FSAR, Tier 2. Supplement 1 to Revision 2 of ANP-10299P is provided via AREVA NP letter NRC 11:090, dated August 17, 2011.

The PARs are described in the U.S. EPR FSAR Tier 2, Section 6.2.5. To confirm their existence, an ITAAC regarding PAR locations inside containment is included in U.S. EPR FSAR Tier 1, Table 2.3.1-1. The U.S. EPR PARs are non-safety-related equipment and are not required to mitigate design basis accidents. The type of information and the level of detail in Tier 1 are based on a graded approach commensurate with the safety significance of the structures, systems, and components (SSCs). In general, the performance characteristics of severe accident equipment are not included in Tier 1 of the U.S. EPR FSAR. On this basis, the capabilities of the PARs need not be included in Tier 1.

The U.S. EPR FSAR Tier 2, Section 6.2.5 will be revised to include reference to ANP-10299P, Revision 2, Supplement 1. Conforming changes will be made to U.S. EPR FSAR Tier 2, Table 1.6-1 and Section 6.2.8.

FSAR Impact:

The U.S. EPR FSAR Tier 2, Table 1.6-1, Section 6.2.5 and Section 6.2.8, will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Table 1.6-1—Reports Referenced
Sheet 2 of 4

Report No. (See Notes 1, 2, and 3)	Title	Date Submitted to NRC	FSAR Section Number(s)
ANP-10287P ANP-10287NP	Incore Trip Setpoint and Transient Methodology for U.S. EPR Topical Report	11/27/07	4.3, 4.4, 7.1, 7.2, 15.0, 15.1, 15.2, 15.3, 15.4, 15.6, 16
ANP-10288P ANP-10288NP Revision 1	U.S. EPR Post-LOCA Boron Precipitation and Boron Dilution Technical Report	01/10	15
ANP-10290 Revision 1	AREVA NP Environmental Report Standard Design Certification	9/11/09	19.2
ANP-10291P ANP-10291NP	Small Break LOCA and Non-LOCA Sensitivity Studies and Methodology Technical Report	5/09	15
ANP-10292 Revision 1	U.S. EPR Conformance with Standard Review Plan (NUREG-0800) Technical Report	5/09	1.9
ANP-10293, Revision 3	U.S. EPR Design Features to Address GSI-191 Technical Report	3/11	6.3 and 15.6.5.4.3
ANP-10294 Revision 1	U.S. EPR Reactor Coolant Pump Motor Flywheel Structural Analysis Technical Report	3/09	5.4.1.6.6
ANP-10295 Revision 1	U.S. EPR Security Design Features	10/09	13.6
ANP-10296	U.S. EPR Design Features that Enhance Security	12/08	13.6
ANP-10299P Revision 2	Applicability of AREVA NP Containment Response Evaluation Methodology to the U.S. EPR for Large Break LOCA Analysis, <u>including Supplement 1, August 2011.</u>	12/09	6.2.1 and 6.2.2 ⁵
ANP-10304 Revision 4	U.S. EPR Diversity and Defense in Depth Assessment Technical Report	6/11	1.9, 7.1, 7.2, 7.3, 7.8, 18.7, 19.1
ANP-10306P	Comprehensive Vibration Assessment Program for U.S. EPR Reactor Internals Technical Report	12/09	3.9.2.1.1, 3.9.2.3, 3.9.2.4, and 3.9.2.7
ANP-10318P	Pipe Rupture External Loading Effects on U.S. EPR Essential Structures, Systems, and Components Technical Report	3/11	3.6.2

06.02.05-22

Mixing Dampers

Mixing dampers consist of a spring loaded actuator that is held closed during normal operation by an energized solenoid. The second part of the mixing damper is the flap with a horizontal opening axis, similar to a butterfly valve. This design allows the mixing damper to open against a pressure differential. The flap separates the air space of the IRWST and the lower part of the annular rooms in containment. The mixing dampers open if the differential pressure between operational and equipment rooms exceed 0.5 psi; or if the containment pressure exceeds 17.4 psia. The mixing dampers open fail-safe on a loss of power to the solenoid-operated actuators and can be manually opened by the operator.

The mixing dampers are safety-related items and are included in the equipment qualification program.

Passive Autocatalytic Recombiners

The PARs are part of the combustible gas control system. Unlike the rupture foils, convection foils, and mixing dampers, they are not safety-related components; instead, they are designed for severe accident condition applications.

Large and small PARs are arranged in containment to support global convection, homogenize the containment atmosphere, and reduce local and global peak hydrogen concentrations. The location of the PARs is shown in Figure 6.2.5-1—Arrangement and Location of the Passive Autocatalytic Recombiners.

A PAR consists of a metal housing with a gas inlet at the bottom and a lateral gas outlet at the top to promote convection. Numerous parallel plates with a catalytically active coating are arranged vertically in the bottom of the housing. Gas mixtures containing hydrogen are recombined upon contact with the catalyst, with the recombination rate depending primarily on the concentration of hydrogen at the PAR. The PAR recombination efficiencies at different environmental conditions are provided in Supplement 1 to technical report ANP-10299P, Revision 2, "Applicability of AREVA NP Containment Response Evaluation Methodology to the U.S. EPR for Large Break LOCA Analysis," (Reference 15). In the presence of oxygen, the PARs will start automatically if the threshold hydrogen concentration is reached at the catalytic surfaces. The heat released from the catalyst helps drive gas flow through the PARs, resulting in high recombination efficiency.

06.02.05-22

The PARs are arranged inside the equipment rooms to promote convection within the containment, and thereby homogenize the atmosphere and reduce local peak hydrogen concentrations. PARs are also located in the containment dome and in the upper part of the annular rooms to support global convection and to prevent gas stratification. The PARs are installed above the floor to provide unobstructed inflow and for easy access to facilitate maintenance. They are located to avoid direct contact

14. ASME Boiler and Pressure Vessel Code, Section III, "Rules for Construction of Nuclear Facility Components," The American Society of Mechanical Engineers, 2004 Edition.
15. ANP-10299P, Revision 2, "Applicability of AREVA NP Containment Response Evaluation Methodology to the U.S. EPR for Large Break LOCA Analysis," AREVA NP Inc., December 2009, (including Supplement 1, August 2011).
16. Frank Kreith, "Principles of Heat Transfer," 3rd edition, New York: Intext Educational Publishers, 1973.
17. IEEE 334-1974, "IEEE Standard for Type Tests of Continuous-Duty Class 1E Motors for Nuclear Power Generating Stations", Institute of Electrical and Electronics Engineers, 1974.
18. ANSI/AMCA-210-99, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating," American National Standards Institute/Air Movement and Control Association International, December 1999.
19. ANSI/AMCA 211-1987, "Certified Ratings Program -Air Performance," American National Standards Institute/Air Movement and Control Association International, 1987.
20. ANSI/AMCA-300-1985, "Reverberant Room Method of Testing Fans for Rating Purposes," American National Standards Institute/Air Movement and Control Association International, 1985.
21. ANSI/ASHRAE Standard 52.2-1999, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size," American Society of Heating, Refrigerating and Air Conditioning Engineers, 1999.
22. "HVAC Air Duct Leakage Test Manual," Sheet Metal and Air Conditioning Contractors' National Association, 1985.
23. ASME N510-1989 (R1995), "Testing of Nuclear Air-Treatment Systems," The American Society of Mechanical Engineers, 1989.
24. ASME AG-1, "Code on Nuclear Air and Gas Treatment," The American Society of Mechanical Engineers, 1997 (including the AG-1a-2000, "Housings" Addenda).
25. NRC Regulatory Guide 1.52, Rev. 3, "Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post Accident Engineered Safety Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants," 2001.
26. ASTM D3803-1989, reapproved 1995, "Standard Test Method for Nuclear Grade Activated Carbon," 1989.
27. ASME N509-1989, "Nuclear Power Plant Air Cleaning Units and Components," The American Society of Mechanical Engineers, 1989.

06.02.05-22

Next File