ArevaEPRDCPEm Resource

From: BRYAN Martin (EXT) [Martin.Bryan.ext@areva.com]
Sent: Tuesday, April 06, 2010 11:49 AM
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); WELLS Russell D (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 314, FSAR Ch 6, Supplement 2
Attachments: RAI 314 Supplement 2 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 314 on November 24, 2009. AREVA NP provided responses to 2 of the 3 questions of RAI No. 314 on February 24, 2010. The attached file, “RAI 314 Supplement 2 Response US EPR DC.PDF” provides a technically correct and complete response to the remaining question as committed. 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 No. 314 Question 06.01.01-19.

The following table indicates the respective pages in the response document, “RAI 314 Supplement 2 Response US EPR DC.PDF,” that contain AREVA NP’s response to the subject question.

Question #	Start Page	End Page
RAI 314 — 06.01.01-19	2	3

This concludes the formal AREVA NP response to RAI No. 314, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Martin (Marty) C. Bryan
Licensing Advisory Engineer
AREVA NP Inc.
Tel: (434) 832-3016
Martin.Bryan@areva.com

From: BRYAN Martin (EXT)
Sent: Wednesday, February 24, 2010 1:14 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); ROMINE Judy (AREVA NP INC); GUCWA Len T (EXT); DUNCAN Leslie E (AFS)
Subject: Response to U.S. EPR Design Certification Application RAI No. 314, FSAR Ch 6, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 314 on November 24, 2009. The attached file, “RAI 314 Supplement 1 Response US EPR DC.PDF” provides a technically correct and complete response to 2 of the 3 questions as committed.

The following table indicates the respective pages in the response document, “RAI 314 Supplement 1 Response US EPR DC.PDF,” that contain AREVA NP’s response to the subject questions. Appended to this file are the affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 314 Question 06.01.01-21.

Question #	Start Page	End Page
RAI 314 — 06.01.01-20	2	2
RAI 314 — 06.01.01-21	3	3

The schedule for a technically correct and complete response to the remaining RAI No. 314 question is unchanged and is provided below:

Question #	Response Date
RAI 314 — 06.01.01-19	April 8, 2010

Sincerely,

Martin (Marty) C. Bryan
Licensing Advisory Engineer
AREVA NP Inc.
Tel: (434) 832-3016
Martin.Bryan@areva.com

From: WELLS Russell D (AREVA NP INC)
Sent: Tuesday, November 24, 2009 2:43 PM
To: 'Getachew Tesfaye'; 'Michael Miernicki'
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 314, FSAR Ch 6

Getachew,

Attached please find AREVA NP Inc.’s response to the subject request for additional information (RAI). The attached file, “RAI 314 Response US EPR DC.PDF” provides a schedule for a technically correct and complete response to the 3 questions.

The following table indicates the respective pages in the response document, “RAI 314 Response US EPR DC.PDF,” that contain AREVA NP’s response to the subject questions.

Question #	Start Page	End Page
RAI 314 — 06.01.01-19	2	2
RAI 314 — 06.01.01-20	3	3
RAI 314 — 06.01.01-21	4	4

A complete answer is not provided for 3 of the 3 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 314 — 06.01.01-19	April 8, 2010
RAI 314 — 06.01.01-20	February 25, 2010
RAI 314 — 06.01.01-21	February 25, 2010

Sincerely,

(Russ Wells on behalf of)
Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
New Plants Deployment
AREVA NP, Inc.
An AREVA and Siemens company
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Friday, October 30, 2009 4:32 PM
To: ZZ-DL-A-USEPR-DL
Cc: Davis, Robert; Terao, David; Carneal, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 314 (3843), FSARCh. 6

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on October 21, 2009, and on October 30, 2009, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. 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: 1294

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Subject: Response to U.S. EPR Design Certification Application RAI No. 314, FSAR Ch 6, Supplement 2
Sent Date: 4/6/2010 11:49:29 AM
Received Date: 4/6/2010 11:49:35 AM
From: BRYAN Martin (EXT)

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

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Tracking Status: None
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Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Response to

Request for Additional Information No. 314, Supplement 2

10/30/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 06.01.01 - Engineered Safety Features Materials
Application Section: 6.1.1

QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

Question 06.01.01-19:

In RAI 06.01.01-14(1) the staff requested that the applicant address potential thermal aging embrittlement of cast-austenitic-stainless-steel (CASS) components with service conditions above 482ºF (250º). The applicant responded and stated that the NRC letter from C. Grimes (USNRC) to D. Walters (Nuclear Energy Institute) dated May 19, 2009 that was referenced by the staff in RAI 06.01.01-14(1) does not require the screening of valve bodies and pump casings, which are the only types of CASS components used in ESF systems. The staff acknowledges that the NRC letter states that screening is not necessary because ASME Section XI inservice inspection (ISI) requirements are an acceptable method to manage potential degradation in these components for 20 years of continued operation beyond the initial 40-year license, without the implementation of an aging management program. However, the NRC letter does not state or imply that these components are not susceptible to thermal aging. The staff considers CASS components (operating above 482º F) with 2.0 % to 3.0 % Mo and a ferrite content of less than or equal to 14% and CASS components (operating above 482º F) with 0.5 % Mo maximum and a ferrite content of less than or equal to 20% as not susceptible to thermal aging embrittlement if ferrite content is calculated using Hull's equivalent factors. However, the FSAR does not state that ferrite content will be kept below these levels. Therefore, the staff requests that the applicant modify FSAR Section 6.1.1 and Table 6.1-1 to limit the ferrite content of high Mo CASS components (2.0-3.0% Mo) to equal to or less than 14% and limit the ferrite content of low Mo CASS components (0.50% max Mo) to equal to or less than 20% using Hull's equivalent factors to calculate ferrite content for components operating above 482º F.

Response to Question 06.01.01-19:

For cast austenitic stainless steel components that will experience service temperatures greater than 482°F, the delta ferrite content is limited to less than or equal to 20 percent for low molybdenum content statically cast materials, less than or equal to 14 percent for high molybdenum content statically cast materials, and less than or equal to 20 percent for high molybdenum content centrifugally cast materials. Low molybdenum content is defined as 0.5 weight percent maximum and high molybdenum content is defined as 2.0 to 3.0 weight percent. These restrictions reduce susceptibility to thermal aging. For cast austenitic stainless steel material used in engineered safety feature (ESF) systems, the percent ferrite is calculated using Hull's equivalent factors as indicated in NUREG/CR-4513, Revision 1 (Reference 1).

The above information will be added to U.S. EPR FSAR Tier 2, Section 6.1.1.1 and a reference will be added to U.S. EPR FSAR Tier 2, Section 6.1.3.

The cast austenitic stainless steel materials in U.S. EPR FSAR Tier 2, Table 6.1-1 and Table 10.4.9-2 will be classified as discussed in this response with the addition of Note 7 and Note 5, respectively.

References for Question 06.01.01-19:

1. NUREG/CR–4513, "Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems," Revision 1, U.S. Nuclear Regulatory Commission, May 1994.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 6.1.1.1, Section 6.1.3, Table 6.1-1, and Table 10.4.9-2 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

general corrosion resistance and ease of fabrication for the required applications. Following RG1.44 helps to minimize the potential stress corrosion degradation of austenitic stainless steels in the ESF systems environment, as shown through operational experience.

06.01.01-19

No cold-worked grade austenitic stainless steels are used in the ESF components.

For cast austenitic stainless steel components that will experience service temperatures greater than 482°F, the delta ferrite content is limited to less than or equal to 20 percent for low molybdenum content statically cast materials, less than or equal to 14 percent for high molybdenum content statically cast materials, and less than or equal to 20 percent for high molybdenum content centrifugally cast materials. Low molybdenum content is defined as 0.5 weight percent maximum and high molybdenum content is defined as 2.0 to 3.0 weight percent. These restrictions reduce susceptibility to thermal aging. For cast austenitic stainless steel material used in the ESF systems, the percent ferrite is calculated using Hull's equivalent factors as indicated in NUREG/CR-4513, Revision 1 (Reference 9).

Abrasive work on austenitic stainless steel is controlled to minimize the cold-working of surfaces and the introduction of contaminants that promote stress corrosion cracking per RG 1.37. Tools for abrasive work (e.g., grinding, polishing, wire brushing) do not contain, and are not contaminated by previous usage on, ferritic carbon steel or other materials that could contribute to intergranular cracking or stress-corrosion.

Ferritic materials used in ESF applications meet the fracture toughness requirements of the ASME Code Section III, Subarticles NB-2300, NC-2300, and ND-2300, as appropriate for the assigned quality group as stated in Section 3.2.2. The minimum preheat for welding of carbon and low alloy ferritic materials is in accordance with Appendix D (Article D-1000) of ASME Section III, Division I and RG 1.50. Moisture control on low hydrogen welding materials conforms to the requirements of the ASME Code, Section III, Articles NB, NC, or ND-2000 and 4000, and AWS D1.1 (Reference 3).

~~Nickel-base alloy base materials with primary pressure retaining applications are used in the solution annealed and thermally treated condition to optimize resistance to intergranular corrosion. The use of nickel-base alloys in primary pressure-retaining ESF applications is limited to Alloy 690 and its associated weld metals (Alloys 52, 52M, and 152). The EPRI Report MRP-111 (Reference 4) details the prevention of and resistance to primary water stress corrosion cracking (PWSCC) in Alloy 690, 52/52M and 152 in pressurized water reactors (PWR). The report concludes that wrought Alloy 690 and its weld metals (Alloys 52/52M and 152) are highly corrosion resistant materials deemed acceptable for replacing Alloy 600 in PWR applications. No stress corrosion degradation of Alloy 690 materials had been observed in any replacement~~

4. EPRI Report 1009801, “Materials Reliability Program: Resistance to Primary Water Stress Corrosion Cracking of Alloys 690, 52, and 152 in Pressurized Water Reactors (MRP-111),” Electric Power Research Institute, March 2004.

5. EPRI Report 1014986, “Pressurized Water Reactor Primary Water Chemistry Guidelines,” Revision 6, Electric Power Research Institute, December 2007.

6. ASTM D5144-00, “Standard Guide for Use of Protective Coating Standards in Nuclear Power Plants,” American Society for Testing and Materials, 2000.

7. ASME NQA-1-1994, “Quality Assurance Program Requirements for Nuclear Facilities,” American society of Mechanical Engineers, 2004.

06.01.01-19

8. ASTM D3843-00, “Standard Practice for Quality Assurance for Protective Coatings Applied to Nuclear Facilities,” American Society for Testing and Materials, 2000.

9. NUREG/CR–4513, “Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems,” Revision 1, U.S. Nuclear Regulatory Commission, May 1994.

Table 6.1-1—Pressure-Retaining Material Specifications for Engineered Safety Features
Sheet 1 of 6

Component	Material
~~**Reactor Building Liner and Penetrations**~~	
~~All~~	~~Refer to Sections 3.8.1.6.4 and 3.8.2~~
Safety Injection System/Residual Heat Removal System	
Piping	SA-312 Grade TP304L [1, 2, 4] SA-312 Grade TP316LN [1, 2, 4] ~~SA-106 Grade B~~
Fittings	SA-403 Grade WP304L Class S [1, 2] SA-403 Grade WP316LN [1] SA-182 Grade F304L [1] ~~SA-182 Grade F316L [1]~~ SA-182 Grade F316LN [1]
Valves	SA-182 Grade F304 [1, 2] SA-182 Grade F304L [1] SA-182 Grade F316 [1, 2] SA-182 Grade F316L [1] SA-351 Grade CF3 [7] SA-351 Grade CF3A [7] SA-351 Grade CF3M [7] SA-479 Type 304 [1, 2] SA-479 Type 304L [1] SA-479 Type 316 [1, 2] SA-479 Type 316L [1]
Accumulators	SA-182 Grade F304 [1, 2] SA-182 Grade F304L [1] SA-240 Type 304 [1, 2] SA-240 Type 304L [1] SA-336 Grade F304 [1, 2] SA-336 Grade F304L [1, 2] SA-479 Type 304 [1, 2] SA-479 Type 304L [1]

06.01.01-19

Table 6.1-1—Pressure-Retaining Material Specifications for Engineered Safety Features
Sheet 2 of 6

Component	Material
Low Head Safety Injection Heat Exchangers Tube Sheet, and Channel Head (primary side)	SA-182 Grade F304 [1, 2] SA-182 Grade F304L [1] SA-182 Grade F316 [1, 2] SA-182 Grade F316L [1] SA-240 Type 304 [1, 2] SA-240 Type 304L [1] SA-240 Type 316 [1, 2] SA-240 Type 316L [1] SA-336 Grade F304 [1, 2] SA-336 Grade F304L [1, 2] SA-336 Grade F316 [1, 2] SA-336 Grade F316L [1, 2] SA-479 Type 304 [1, 2] SA-479 Type 304L [1] SA-479 Type 316 [1, 2] SA-479 Type 316L [1] SA-508 Grade 3 Class 1 or Class 2 [6] SA-533 Type B Class 1 or Class 2 [3, 6]
Low Head Safety Injection Heat Exchangers Tube (primary side)	SA-213 Grade TP304 [1, 2] SA-213 Grade TP304L [1, 2] SA-213 Grade TP316 [1, 2] SA-213 Grade TP316L [1, 2]
Low Head Safety Injection Heat Exchangers Shell (secondary side) 06.01.01-19	SA-508 Grade 3 Class 1 or Class 2 SA-533 Type B Class 1 or Class 2 [3]
Low Head Safety Injection Pump	SA-351 Grade CF3 [7] SA-182 Grade F304 [1, 2] SA-182 Grade F304L [1] SA-336 Grade F304 [1, 2] SA-336 Grade F304L [1, 2] SA-564 Type 630 [3] SA-194 Grade 6 [3] SA-240 Type 304 [1, 2] SA-240 Type 304L [1] SA-240 Type 316 [1, 2] SA-240 Type 316L [1] SA-193 Grade B8 [1] SA-193 Grade B8M [1] SA-194 Grade 8 [1] SA-194 Grade 8M [1]

Table 6.1-1—Pressure-Retaining Material Specifications for Engineered Safety Features
Sheet 4 of 6

06.01.01-19

Component	Material
Fittings	SA-403 Grade WP304L Class S [1, 2] SA-182 Grade F304L [1]
Valves	SA-182 Grade F304 [1, 2] SA-182 Grade F304L [1] SA-182 Grade F316 [1, 2] SA-182 Grade F316L [1] SA-351 Grade CF3 [7] SA-351 Grade CF3A [7] SA-351 Grade CF3M [7] SA-479 Type 304 [1, 2] SA-479 Type 304L [1] SA-479 Type 316 [1, 2] SA-479 Type 316L [1]
Welding material (Austenitic Stainless Steel)	SFA 5.4 E308[2], E309[2], E316[2], E308L[2], E309L[2], E316L[2] SFA 5.9 ER308[2], ER309[2], ER316[2], ER308L, ER309L, ER316L SFA 5.22 E308[2], E309[2], E316[2], E308L[2], E309L[2], E316L[2]
Extra Borating System	
Tanks	SA-182 Grade F304 [1, 2] SA-182 Grade F304L [1] SA-182 Grade F316 [1, 2] SA-182 Grade F316L [1] SA-240 Type 304 [1, 2] SA-240 Type 304L [1] SA-240 Type 316 [1, 2] SA-240 Type 316L [1] SA-479 Type 304 [1, 2] SA-479 Type 304L [1] SA-479 Type 316 [1, 2] SA-479 Type 316L [1]
Process piping	SA-312 Grade TP304L [1, 2, 4]
Fittings	SA-403 Grade WP304L Class S [1, 2] SA-182 Grade F304L [1]

Table 6.1-1—Pressure-Retaining Material Specifications for Engineered Safety Features
Sheet 5 of 6

06.01.01-19

Component	Material
Valves	SA-182 Grade F304 [1, 2] SA-182 Grade F304L [1] SA-182 Grade F316 [1, 2] SA-182 Grade F316L [1] SA-351 Grade CF3 [7] SA-351 Grade CF3A [7] SA-351 Grade CF3M [7] SA-479 Type 304 [1, 2] SA-479 Type 304L [1] SA-479 Type 316 [1, 2] SA-479 Type 316L [1]
Pumps	SA-182 Grade F304 [1, 2] SA-182 Grade F304L [1] SA-336 Grade F304 [1, 2] SA-336 Grade F304L [1, 2] SA-453 Grade 660 SA-193 Grade B6 SA-194 Grade 6 [3]
Welding material (Austenitic Stainless Steel)	SFA 5.4 E308[2], E309[2], E316[2], E308L[2], E309L[2], E316L[2] SFA 5.9 ER308[2], ER309[2], ER316[2], ER308L, ER309L, ER316L SFA 5.22 E308[2], E309[2], E316[2], E308L[2], E309L[2], E316L[2]

Notes:

1. Solution annealed and rapidly cooled.
2. Carbon not exceeding 0.03 wt%.
3. Quenched and tempered.
4. Piping ~~should be~~is seamless.

06.01.01-19

5. Electrodes with "G" classification are excluded.
6. Clad with austenitic stainless steel on primary side.
7. For cast austenitic stainless steel components that will experience service temperatures greater than 482°F, the delta ferrite content is limited to less than or equal to 20% for low molybdenum content statically cast materials, less than or equal to 14% for high molybdenum content statically cast materials, and less than or equal to 20% for high molybdenum content centrifugally cast materials. Low molybdenum content is defined as 0.5 wt% maximum and high molybdenum content is defined as 2.0 to 3.0 wt%.

Table 10.4.9-2—Emergency Feedwater Material Specifications
Sheet 1 of 2

Component	Material
Tanks (liner)	SA-182 Grade F304[1, 2]
	SA-182 Grade F304L[1]
	SA-182 Grade F316[1, 2]
	SA-182 Grade F316L[1]
	SA-240 Type 304[1, 2]
	SA-240 Type 304L[1]
	SA-240 Type 316[1, 2]
	SA-240 Type 316L[1]
	SA-479 Type 304[1, 2]
	SA-479 Type 304L[1,]
	SA-479 Type 316[1, 2]
	SA-479 Type 316L[1]
Process Piping	SA-312 Grade TP304L[1, 2,4]
Fittings	SA-182 Grade F304L[1]
	SA-403 Grade WP304L Class S[1, 2]
Valves	SA-182 Grade F304[1, 2]
	SA-182 Grade F304L[1]
	SA-182 Grade F316[1,2]
	SA-182 Grade F316L[1]
	SA-351 Grade CF3[5]
	SA-351 Grade CF3A[5]
	SA-351 Grade CF3M[5]
	SA-479 Type 304[1, 2]
	SA-479 Type 304L[1]
	SA-479 Type 316[1, 2]
	SA-479 Type 316L[1]

06.01.01-19

06.01.01-19

5. For cast austenitic stainless steel components that will experience service temperatures greater than 482°F, the delta ferrite content is limited to less than or equal to 20% for low molybdenum content statically cast materials, less than or equal to 14% for high molybdenum content statically cast materials, and less than or equal to 20% for high molybdenum content centrifugally cast materials. Low molybdenum content is defined as 0.5 wt% maximum and high molybdenum content is defined as 2.0 to 3.0 wt%.