ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent: Friday, February 27, 2009 11:20 AM
To: Getachew Tesfaye
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); KOWALSKI David J (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 165 (1855), FSARCh. 10
Attachments: RAI 165 Response US EPR DC.pdf

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 165 Response US EPR DC.pdf" provides technically correct and complete responses to 4 of the 4 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 165 Questions 10.03.06-7, 10.03.06-8, 10.03.06-9, and 10.03.06-10.

The following table indicates the respective pages in the response document, "RAI 165 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 165 — 10.03.06-7	2	2
RAI 165 — 10.03.06-8	3	3
RAI 165 — 10.03.06-9	4	4
RAI 165 — 10.03.06-10	5	5

This concludes the formal AREVA NP response to RAI 165, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
AREVA NP Inc.
An AREVA and Siemens company
3315 Old Forest Road
Lynchburg, VA 24506-0935
Phone: 434-832-3694
Cell: 434-841-8788

From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, January 28, 2009 3:44 PM
To: ZZ-DL-A-USEPR-DL
Cc: Robert Davis; David Terao; Peter Hearn; Joseph Colaccino; Meena Khanna; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 165 (1855), FSARCh. 10

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on December 30, 2008, and discussed with your staff on January 22, 2009. No changes were 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: 263

Mail Envelope Properties (5CEC4184E98FFE49A383961FAD402D31B4B926)

Subject: Response to U.S. EPR Design Certification Application RAI No. 165 (1855), FSARCh. 10
Sent Date: 2/27/2009 11:19:30 AM
Received Date: 2/27/2009 11:25:16 AM
From: Pederson Ronda M (AREVA NP INC)

Created By: Ronda.Pederson@areva.com

Recipients:
"DELANO Karen V (AREVA NP INC)" <Karen.Delano@areva.com>
Tracking Status: None
"BENNETT Kathy A (OFR) (AREVA NP INC)" <Kathy.Bennett@areva.com>
Tracking Status: None
"KOWALSKI David J (AREVA NP INC)" <David.Kowalski@areva.com>
Tracking Status: None
"Getachew Tesfaye" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	2389	2/27/2009 11:25:16 AM
RAI 165 Response US EPR DC.pdf	143547	

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

Response to

Request for Additional Information No. 165 (1855), Revision 0

01/28/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 10.03.06 - Steam and Feedwater System Materials
Application Section: 10.3.6

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

Question 10.03.06-7:

RAI 10.03.06-1 requested, in part, that the applicant modify the FSAR to list weld filler material specifications and classifications to be used in the ASME Code Class 2 and 3 portions of the steam and feedwater systems. The applicant's response, dated October 16, 2008, did not include this information but instead indicated that the weld filler metal classifications used in the ASME Code Class 2 and 3 portions of the main steam supply system and main feedwater supply system are given in detailed specifications provided to the Certificate of Authorization Holder performing the welding on behalf of the owner. Given that the selection of weld filler material holds the same level of importance to safety as the selection of materials for piping, fittings and valves, the staff needs to review this information to determine whether the weld filler materials selected by the applicant meet the requirements of GDC 1, 10 CFR 50.55a and ASME Code, Section III. Therefore, the staff requests that the applicant modify the FSAR to include weld filler material specifications and classifications for ASME Code Class 2 and 3 steam and feedwater system piping and components.

Response to Question 10.03.06-7:

For carbon steel piping in the ASME Code Class 2 and 3 portions of the main steam supply and main feedwater systems, which is evaluated and found not susceptible to flow accelerated corrosion (FAC), the applicable welding material specifications include: ASME Section II, Part C, SFA-5.17, SFA-5.18 and SFA-5.20. If the welding processes used during fabrication or construction are required to vary from the aforementioned, then the welding materials will be consistent to that of the connecting piping and similar to the aforementioned welding materials.

For carbon steel piping in the ASME Code Class 2 and 3 portions of the main steam supply and main feedwater systems, which is evaluated and determined to require resistance to FAC, the applicable welding material specifications include: ASME Section II, Part C, SFA-5.18 and SFA-5.20 with a minimum chromium content of 0.10 percent. If the welding processes used during fabrication or construction are required to vary from the aforementioned, then the welding materials will be consistent to that of the connecting piping and similar to the aforementioned welding materials with a minimum chromium content of 0.10 percent.

U.S. EPR FSAR Tier 2, Table 10.3-11—Main Steam Supply System and Main Feedwater System Material Data, Note 4, will be revised to include material specifications and classifications.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 10.3-11 will be revised as described in the response and indicated on the enclosed markup.

Question 10.03.06-8:

RAI 10.03.06-5 requested, in part, that the applicant modify the FSAR to include nondestructive examination requirements for tubular products in the ASME Code Class 2 and 3 portions of the MSSS and feedwater system. The applicant responded on October 16, 2008 and stated that it would modify the FSAR to reference ASME Code, Section III Articles NC-5000 and ND-5000. The staff finds this response acceptable because it addresses the examination requirements of fabricated components. However, the staff notes that the requirements for examination and repair of tubular materials are located in NC-2550/ND2550 through NC2570/NC-2570 of ASME Code, Section III. The staff requests that the applicant modify the FSAR accordingly to address the examination requirements for tubular materials.

Response to Question 10.03.06-8:

Examination of tubular products in the ASME Code Class 2 and 3 portions of the main steam supply and main feedwater systems are in accordance with ASME Section III, Division 1, sub-articles NC-2550/ND-2550 through NC-2560/NC-2560.

U.S. EPR FSAR Tier 2, Section 10.3.6.1 will be revised to include tubular material examination requirements.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 10.3.6.1 will be revised as described in the response and indicated on the enclosed markup.

Question 10.03.06-9:

In RAI 10.03.06-2, the staff requested that the applicant provide a note to Table 10.3-11 to indicate the minimum chromium content requirement for components that the applicant has determined are susceptible to flow-accelerated corrosion (FAC). The applicant responded on October 16, 2008 and provided a proposed revision of Table 10.3-11. The applicant's revised Table 10.3-11 now includes a note that states that the minimum chromium content of carbon steel piping, fittings and weld filler metals in the main steam supply system and main feedwater system shall be 0.10% for resistance to FAC, unless exempted by the system engineer. The staff finds this acceptable, but the staff notes that the applicant's revised table does not include the 0.10% chromium requirement for valves. The staff also notes that in accordance with EPRI guidelines in NSAC-202L-R3 (Section 4.4.1), components susceptible to FAC containing a minimum chromium content of 0.10% will require an examination at some point after the plant goes into operation to verify that no appreciable degradation has occurred as a result of FAC before it is determined that no further inspections are required. Given that valves can be susceptible to FAC, the staff requests that the applicant explain the exclusion of a minimum chromium requirement for valves that may be susceptible to FAC.

Response to Question 10.03.06-9:

For systems found to be susceptible to FAC, the piping, fittings, valves and weld filler metals material specifications will include a requirement for minimum chromium content of 0.10 percent.

U.S. EPR FSAR Tier 2, Section 10.3.6.3 and Table 10.3-11—Main Steam Supply System and Main Feedwater System Material Data, Note 2, will be revised to include the minimum chromium content requirement.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 10.3.6.3 and Table 10.3-11 will be revised as described in the response and indicated on the enclosed markup.

Question 10.03.06-10:

In RAI 10.03.06-4 the staff requested information related to the applicant's design of MSSS, feedwater and condensate system to mitigate the effects of FAC. Part of the staff's RAI requested that the applicant identify the computer program (e.g. CHECWORKS) or equivalent process used for system design. The applicant responded on October 16, 2008 and stated that CHECWORKS addresses FAC monitoring and analysis in existing operating plants and the applicant provided no additional information. The staff assumes that during the design phase, of main steam and feedwater systems that are potentially susceptible to service-induced degradation mechanisms, an analysis will be performed to provide reasonable assurance that the systems are resistant to FAC, erosion, corrosion and cavitation. The applicant is requested to address the extent to which the final design of systems will mitigate material degradation for the design life of the plant. To do so, the applicant should address flow rates, temperatures, pressure and other contributing factors that are taken into consideration in order to establish the design life of safety-related systems susceptible to FAC or other flow induced degradation mechanisms. The applicant's response should encompasses all ASME Code Class 2 and 3 systems as well as non-safety systems that could adversely impact safety-related systems susceptible to FAC and other flow-induced degradation mechanisms. In addition, the staff requests that the applicant identify its corrosion allowance for all Class 2 and 3 piping and components in the MSSS and feedwater system and a basis for its corrosion allowance for the 60-year design life of the plant. The staff requests that the above requested information be included in the FSAR.

Response to Question 10.03.06-10:

A design phase evaluation will be performed to identify portions of the main steam and main feedwater systems that are potentially susceptible to service-induced degradation mechanisms. The design phase evaluation will provide reasonable assurance that piping material selections are appropriate for the operating conditions and that the systems are resistant to FAC, erosion, corrosion, and cavitation.

As stated in the Response to RAI 44, Question 10.03.06-3, "Chrome-molybdenum or stainless steel piping may be used in other systems that are non-safety-related such as feedwater heater drains or cold reheat to prevent erosion and corrosion."

During the design phase, an evaluation of FAC will be performed for the main steam supply system, main feedwater system, condensate system, steam generator blowdown system, and the non-safety-related power conversion systems. In addition to main pipe lines, the evaluation will include drains, vents, and bypass piping in the main steam and main feedwater systems.

The minimum design wall thicknesses will be determined in the design phase by this process in order to allow the affected piping systems a minimum lifetime of at least 40 years.

U.S. EPR FSAR Tier 2, Section 10.3.6.3 will be revised to reflect the above information.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 10.3.6.3 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

10.3.5.6 Chemical Addition System

Equipment is provided to inject controlled quantities of treatment chemicals as part of the secondary water chemistry program. These treatment chemicals are injected into the condensate pump discharge header.

10.3.6 Steam and Feedwater System Materials

10.3.6.1 Material Selection and Fabrication

~~Table 10.3-11—Main Steam and Main Feedwater Piping Material Data~~Table 10.3-11—Main Steam Supply System and Main Feedwater System Material Data provides material data for the MSSS and main feedwater system ~~piping~~. The MSSS and main feedwater system do not use copper or copper alloy materials.

As required by GDC 1, material selection and fabrication requirements for Class 2 and 3 components per Reference 1 in safety-related portions of the MSSS and feedwater system are consistent with the quality group and seismic design classifications provided in ~~Table 3.2-1~~Table 3.2.2-1. RG 1.84 describes acceptable code cases that may be used in conjunction with the above specifications.

Cleaning and handling of Class 2 and Class 3 components of the MSSS and feedwater system is in accordance with the acceptable procedures described in RG 1.37.

The guidance in RG 1.71 for additional welder qualification is applied for welds on ASME Class 2 and 3 components of the MSSS and feedwater system in locations of restricted direct physical and visual accessibility.

The MSSS and feedwater system piping material is not low-alloy steel; therefore, control preheat temperatures for welding low-alloy steel as described in RG 1.50 is not applicable to these systems.

Preheat temperatures for carbon steel piping in the ASME Code Section III, Division 1, Class 2 and 3 portions of the MSSS and main feedwater system will follow the guidance provided in ASME Section III, Appendix D, Article D-1000. Preheat temperatures for carbon steel piping in the Non-ASME Section III portions of the MSSS and main feedwater system are in accordance with ASME B31.1.

10.03.06-8

Non-destructive examination (NDE) for tubular products in the ASME Code, Class 2 and 3 portions of MSSS and main feedwater system is in accordance with ASME Section III, Division 1, Sections NC-5000 and ND-5000.

Examination of tubular products in the ASME Code Class 2 and 3 portions of the main steam supply and main feedwater systems are in accordance with ASME Section III, Division 1, sub-articles NC-2550/ND-2550 through NC-2560/NC-2560.

Preservice and inservice inspection of Class 2 and 3 components per Reference 1 in the MSSS and feedwater system are addressed in Section 6.6. The following requirements apply to the non-safety-related portions of the MSSS and feedwater system:

- Components are carbon steel.
- Piping is ASME B36.10 (Reference 10).
- Fittings are ASME B16.9 and B16.11 (Reference 11).
- Flanges are ASME B16.5 (Reference 11).

10.3.6.2 Fracture Toughness

The material specifications for pressure retaining materials in safety-related portions of the MSSS and feedwater system meet the fracture toughness requirements specified in the following for Quality Group B and Quality Group C components, respectively:

- ASME BPV Code, Section III, Class 2, Article NC-2300, (Reference 12).
- ASME BPV Code, Section III, Class 3, Article ND-2300, (Reference 13).

10.3.6.3 Flow-Accelerated Corrosion

The design of the piping systems in the MSSS and main feedwater system, including applicable material standards and inspection programs, incorporates considerations to prevent the occurrence of erosion and corrosion in these systems. Industry guidance and requirements for inspection and monitoring programs is found in Generic Letter 89-08 (Reference 14) and NSAC-202L-R3 (Reference 15).

The design includes material selection, limits on flow velocity and limits on water chemistry to reduce flow accelerated corrosion (FAC), and erosion and corrosion of piping and piping components. The design meets the guidance contained in GL 89-08 (Reference 14) and NSAC-202L (Reference 15) concerning acceptable inspection programs.

10.03.06-9

MSSS and main feedwater system piping, valves ~~material is~~and fittings are ~~flow-accelerated corrosion (~~FAC~~)~~ resistant, unless the application is specifically evaluated and found to be non-susceptible to FAC degradation. ~~As a minimum, p~~Piping material resistant to FAC is constructed of carbon steel containing a minimum of 0.10 percent chromium. Chrome-molybdenum or stainless steel piping~~also~~ may be used in ~~certain parts of the MSSS and feedwater system~~other systems that are non-safety related, such as feedwater heater drains or cold reheat to prevent erosion and corrosion.

10.03.06-10

A design phase evaluation will be performed to identify portions of the main steam and main feedwater systems that are potentially susceptible to service-induced degradation mechanisms. The design phase evaluation provides reasonable assurance

10.03.06-10

that piping material selections are appropriate for the operating conditions and that the systems are resistant to FAC, erosion, corrosion, and cavitation.

During the design phase, an evaluation of FAC will be performed for the main steam supply system, main feedwater system, condensate system, steam generator blowdown system, and the non-safety-related power conversion systems. In addition to main pipe lines, the evaluation will include drains, vents, and bypass piping in the aforementioned systems.

The minimum design wall thicknesses will be determined in the design phase by the process previously described in order to allow for a minimum lifetime of the affected piping systems of at least 40 years.

The COL applicant that references the U.S. EPR design certification will develop and implement a FAC condition monitoring program that is consistent with Generic Letter 89-08 and NSAC-202L-R3 for the carbon steel portions of the steam and power conversion systems that contain water or wet steam prior to initial fuel loading.

10.3.7 References

1. ASME Boiler and Pressure Vessel Code, Section III, "Rules for Construction of Nuclear Facility Components," The American Society of Mechanical Engineers, 2004.

2. ANSI/ASME B31.1-2004, "Power Piping," The American Society of Mechanical Engineers, 2004.

3. ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NC including Article NC-7000:"Overpressure Protection," The American Society of Mechanical Engineers, 2004.

4. NUREG-0800, BTP 5-4, "Design Requirements of the Residual Heat Removal System," Nuclear Regulatory Commission, Rev. 3, March 2007.

5. NUREG-0138, Issue 1, "Staff Discussion of Fifteen Technical Issues," Nuclear Regulatory Commission, November 1976.

6. ASME Boiler and Pressure Vessel Code, Section XI: "Rules for Inservice Inspection of Nuclear Power Plant Components," The American Society of Mechanical Engineers, 2004.

7. NEI 97-06, "Steam Generator Program Guidelines," Nuclear Energy Institute, 1997.

8. NEI 03-08,"Guideline for the Management of Materials Issues," Nuclear Energy Institute, 2003.

Table 10.3-11—Main Steam Supply System and Main Feedwater System ~~Piping~~ Material Data

Segment	Material Specification		
Main Steam Line	Pipe (2)	Fittings (2) (5)	Valves (3)
Steam generator outlet to fixed restraint downstream of MSIV	ASME SA-106 Grade C	ASME SA-234 Grade WPC	ASME SA-216 Grade WCC or SA-105
Fixed restraint to high pressure turbine (1) (3)	ASTM A-106 Grade B	ASTM A-234 Grade WPB	ASTM A-216 Grade WCB or A-105
Main Feedwater Line			
Feedwater pump outlet to fixed restraint (1)	ASTM A-106 Grade B	ASTM A-234 Grade WPB	ASTM A-216 Grade WCB or A-105
Fixed restraint to steam generator	ASME SA-106 Grade B	ASME SA-234 Grade WPB	ASME SA-216 Grade WCB or SA-105

Notes:

10.03.06-9

1. Outside of the ASME Section III boundary.

2. The minimum chromium content of carbon steel piping, fittings, valves, and weld filler metals in the main steam supply system and main feedwater system shall be 0.10% for resistance to flow accelerated corrosion, unless exempted by the system design engineer. Portions of the main steam supply system and the main feedwater system that are not susceptible to flow accelerated corrosion degradation may be exempted.

3. Does not include the turbine stop and control valves or the turbine bypass valves.

4. The weld filler metal classifications used in the ASME Code Class 2 and 3 portions of the main steam supply system and main feedwater system are given in detailed specifications provided to the Certificate of Authorization Holder performing the welding on behalf of the owner. The Certificate of Authorization Holder is responsible for meeting the requirements of the detailed specifications, and the ASME code for weld filler metals. This includes requirements for strength, toughness, and other mechanical properties, service compatibility with the materials being joined, and other design criteria. The Certificate of Authorization Holder is an organization holding an ASME N certificate, NA certificate, or an NPT certificate to design and/or construct nuclear class 1, 2 or 3 components, install said components, or produce sub-assembly components.

10.03.06-7

For carbon steel piping in the ASME Code Class 2 and 3 portions of the main steam supply and main feedwater systems, which is evaluated and found not susceptible to flow accelerated corrosion (FAC), the applicable welding material specifications include: ASME Section II, Part C, SFA-5.17, SFA-5.18 and SFA-5.20. If the

10.03.06-7

welding processes used during fabrication or construction are required to vary from the aforementioned, then the welding materials will be consistent to that of the connecting piping and similar to the aforementioned welding materials.

For carbon steel piping in the ASME Code Class 2 and 3 portions of the main steam supply and main feedwater systems, which is evaluated and determined to require resistance to FAC, the applicable welding material specifications include: ASME Section II, Part C, SFA-5.18 and SFA-5.20 with a minimum chromium content of 0.10 percent. If the welding processes used during fabrication or construction are required to vary from the aforementioned, then the welding materials will be consistent to that of the connecting piping and similar to the aforementioned welding materials with a minimum chromium content of 0.10 percent.

5. Fittings include the pipe fittings furnished in accordance with ASME B16.9, such as tees, reducers, and laterals.