

ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent: Thursday, April 23, 2009 3:06 PM
To: Getachew Tesfaye
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); BEELMAN Ronald J (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 203, FSAR Ch. 6
Attachments: RAI 203 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 203 Response US EPR DC.pdf," provides technically correct and complete responses to 3 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 203 Questions 06.01.02-7, 06.01.02-8 and 06.01.02.9.

The following table indicates the respective pages in the response document, "RAI 203 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 203 — 06.01.02-7	2	4
RAI 203 — 06.01.02-8	5	5
RAI 203 — 06.01.02-9	6	7
RAI 203 — 06.02.01-13	8	8

A complete answer is not provided for 1 of the 4 questions. The schedule for a technically correct and complete response to this question is provided below.

Question #	Response Date
RAI 203 — 06.02.01-13	May 15, 2009

Sincerely,

Ronda Pederson

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Licensing Manager, U.S. EPR Design Certification

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

Sent: Wednesday, March 25, 2009 2:39 PM

To: ZZ-DL-A-USEPR-DL

Cc: Jeffrey Poehler; David Terao; Walton Jensen; Christopher Jackson; Michael Miernicki; Joseph Colaccino;

ArevaEPRDCPEm Resource

Subject: U.S. EPR Design Certification Application RAI No. 203 (2253_2276),FSAR Ch. 6

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on March 12, 2009, and discussed with your staff on March 25, 2009. RAI Questions 06.02.01-13 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. 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: 423

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Subject: Response to U.S. EPR Design Certification Application RAI No. 203, FSAR Ch. 6
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From: Pederson Ronda M (AREVA NP INC)

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Options

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Response to

Request for Additional Information No. 203 (2253, 2276), Revision 0

3/25/2009

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 06.01.02 - Protective Coating Systems (Paints) - Organic Materials

SRP Section: 06.02.01 - Containment Functional Design

Application FSAR Ch.: 6

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 06.01.02-7:Background

RAI 6.1.2-1 asked how the proposed definition of Service Level I and II coating classifications by the applicant in FSAR Tier 2, Section 6.1.2.1.2.1 met the regulatory requirements. More specifically, it asked the applicant to provide additional detail regarding the specific areas of containment in which Service Level II coatings are proposed to be used and to provide justification as to why coatings in these areas do not have the potential to be affected by a design-basis accident or affect the operation of any emergency safety features. The applicant responded that the specific areas within reactor containment in which Service Level II coatings would be used have not yet been identified, but that these areas will be based on the design of the containment sump and the flow characteristics inside containment, and that these areas are compartmentalized. Furthermore, the applicant indicated that the use of Service Level II coatings in containment has a precedent in the industry and cited NRC Accession Number ML 080640544 as a reference. However, the staff was unable to confirm that there is a precedent for the use of Service Level II coatings inside containment based on the reference cited.

Requested Information

1. Please clarify the criteria that will be used to conclude that there will be no path to the containment sump for Service Level II coatings that may fail during a DBA.
2. Please verify the reference supporting the precedent for the use of Service Level II coatings is correct and provide the specific location in the document (page number, paragraph number, etc.) of the statements in this reference that would support your argument.

Response to Question 06.01.02-7:

1. AREVA NP will perform structures, systems, and components (SSC) safety classifications for the coatings within containment during the Detailed Design Engineering (DDE) phase to determine what areas will be classified as Service Level II inside the containment. Those areas inside containment that are not classified as Service Level II will be classified as Service Level I. The Service Level II classification inside containment is based on the inability of the coating system to transport out and communicate with post-accident fluid systems. These areas are configured such that the coating systems cannot be transported to the in-containment refueling water storage tank (IRWST), because they are not subject to any fluid wash-down during a loss of coolant accident (LOCA), main steam line break (MSLB), main feed water line break (MFWLB) or high energy line break (HELB).

In a response to Generic Letter (GL) 2004-02 (see NRC Accession Number ML052450332 dated 2005-3-4), a licensee stated that they had two quality levels of qualified coatings within their containment. The licensee defined Service Level I as a coating applied to areas within containment where failure in a post-LOCA environment could have a detrimental effect on plant safety. The licensee defined Service Level II (inside containment) as a coating applied to areas outside the Service Level I areas, where transport of failed coatings to the sump during post-LOCA recirculation is unlikely.

For the U.S. EPR, Service Level II coatings inside containment fit the Regulatory Guide (RG) 1.54, Rev. 1 definition exactly, except that they are inside the reactor containment (versus only outside containment). The RG 1.54, Rev. 1 definition of Service Level I does not fit as a definition for these coated Service Level II areas because there is no need for the coating system to be safety-related. Since these coating systems cannot communicate with post-accident fluid systems, the coating systems cannot adversely affect the operation of those post-accident fluid systems. The RG's Service Level III definition also does not fit as a definition for these coated Service Level II areas, as Service Level III areas are defined as areas outside containment that could adversely affect the safety function of a safety-related structure, system, or component.

Section 6, RG 1.54, Rev. 1 states:

“Additional information on the selection, application, inspection, and maintenance of nuclear plant safety-related protective coatings is provided in EPRI Report TR-109937, which provides a detailed discussion of important considerations related to protective coatings and can be used to supplement the ASTM Standards guidelines as deemed necessary.”

EPRI Report TR-109937, Section 2.2.1 discusses safety-related coating systems; Figure 2-1 shows the locations of safety-related and non-safety-related coatings. As noted below the figure, although not shown on the figure, the report states that there are some areas inside containment that do not communicate with the emergency core cooling system (ECCS) pump suction, where the use of safety-related coatings is not required.

Though the EPRI document cannot be considered a standard, it does provide important industry guidance regarding plant coatings programs, and it is referred to in RG 1.54, Rev. 1 (where the RG notes that the EPRI Report can supplement the ASTM Standards as deemed necessary).

The definitions for Service Level I, II, and III coating systems within ASTM Standard D5144-00 are essentially the same as those in RG 1.54, Rev. 1. The original form of these definitions (with some wording variations) was originally developed by ASTM Committee D-1 (Subcommittee D01.43) and published by ASTM in 1979 in the “Manual of Coating Work for Light-Water Nuclear Power Plant Primary Containment and Other Safety-Related Facilities” (commonly referred to in the industry as the “Green Book”). This book was published to provide a guide to the then-current state of the art of nuclear power industry coating systems.

It should be noted these definitions were developed for the then-existing fleet of operating nuclear plants, and not for the next generation of plants.

Therefore, based on the following considerations, it is prudent and reasonable to modify the Service Level II definition for the U.S. EPR to include certain coated compartmentalized areas inside the containment since:

- a) The current service level definitions in ASTM D5144-00 and RG 1.54, Rev. 1 do not completely envelope the service levels that would apply to the U.S. EPR.

- b) EPRI Report TR-109937, referred to in RG 1.54, Rev. 1, recognizes that there may be areas inside containment that do not communicate with the ECCS pump suction, where the use of safety-related coatings (i.e., Service Level I coatings) is not required.
 - c) A Service Level II definition for coatings inside containment has been used by a licensee within the existing operating fleet (see NRC Accession Number ML052450332 with a document date of 2005-3-4).
2. As noted above, a licensee response to GL 2004-02 (NRC Accession Number ML052450332) supports the precedent for using Service Level II coatings within containment. Enclosure 1, Page 2, Item No. 3 of that reference notes that there are two quality levels of qualified epoxy coatings. Enclosure 1, Page 3 notes that Service Level II coatings are defined as coatings applied to areas outside the Service Level I areas, where transport of failed coatings to the sump during post-LOCA recirculation is unlikely. The response to GL 2004-02 pertains to coating systems within containment, as well as other debris sources, such as insulation.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Section 6.1.2.4 will be revised as described in the response and indicated on the enclosed markup.

Question 06.01.02-8:Background

The applicant proposes to use ANSI N101.2-1972 instead of ASTM 3911 as an acceptable standard for qualification of Service Level I coatings in FSAR Tier 2, Section 6.1.2.4. In the applicant's response to RAI 6.1.2-2, it was indicated that the testing requirements in the two standards are the same, but the acceptance criteria are different. The applicant also proposes to use ASTM 3911-03 instead of ASTM 3911-95 that was endorsed in RG 1.54, Rev. 1.

Requested Information

Please explain why ASTM 3911-03 will be used instead of ASTM 3911-95. ANSI N101.2-1972 provides specific acceptance criteria for DBA testing of Service Level 1 coating whereas ASTM 3911-03 indicates the license holder is responsible for establishing acceptance criteria for Service Level 1 coatings. What specific acceptance criteria are proposed?

Response to Question 06.01.02-8:

AREVA NP uses ASTM D3911-03 because it is invoked in Section 6.1.2 of NUREG-0800 (Standard Review Plan), Revision 3, March 2007 under the Section II SRP Acceptance Criteria and within the Section IV Evaluation Findings.

U.S. EPR FSAR Tier 2, Section 6.2.1.4 will be amended to include specific acceptance criteria that will be utilized for all Service Level I coatings, regardless of whether they were tested under ASTM D3911-03 or ANSI N101.2-1972, as follows:

- Peeling shall not be permitted.
- Delamination shall not be permitted.
- Cracking is not considered a failure unless accompanied by delamination or loss of adhesion.
- Blisters shall be limited to intact blisters that are completely surrounded by sound coating bonded to the surface.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Section 6.1.2.4 will be revised as described in the response and indicated on the enclosed markup.

Question 06.01.02-9:Background

RG 1.54 Revision 1, endorses ASTM 5962-96 as providing guidance that is acceptable for maintaining DBA unqualified coatings. FSAR Tier 2, Section 6.1.2.4, states that ASTM D5962-96 is not considered to be an acceptable standard for maintaining DBA-unqualified coatings in Service Level I areas. In the applicants response to RAI 6.1.2-3, it was indicated that ASTM D5962-96 only addresses the maintenance of known unqualified coatings and that the applicant would manage the allowed quantity of unqualified coatings based on containment sump analyses, net positive suction head analyses, and possibly transport analyses. ASTM D5962-96 does address the total allowed quantity of unqualified coatings which is consistent with the applicant's proposed approach. However, it also provides guidance to maintenance such as re-coating.

Requested Information

1. Since the applicant is proposing to use DBA-unqualified Service Level II coatings in some areas of the containment, why would the EPR coatings program not reference ASTM D5962-96 for maintenance of these coatings?
2. For DBA-unqualified coatings, please identify the procedure or standard will be used for maintenance activities such as recoating.

Response to Question 06.01.02-9:

1. The terminology "DBA-unqualified" refers to coatings that are used in Service Level I areas that have not been design basis accident (DBA) tested or DBA-qualified. By definition, Service Level II coatings do not have to be DBA-qualified, are non-safety related, and therefore should not be referred to as "DBA-unqualified." This is because they are not used in Service Level I areas of the containment where their failure could impair safe shutdown by adversely affecting the post-accident operation of fluid systems, including engineered safety features and safety-related functions of the plant's structures, systems, or components (SSCs). AREVA NP does not intend to use Service Level II coatings in areas that are classified as Service Level I areas.

As noted in the response to RAI Question 06.01.02-7, the criteria for designating an area as Service Level II inside containment is based on the inability of the coating system to transport outside the coated Service Level II area. These areas are configured such that the coating systems have no potential to transport to the in-containment refueling water storage tank (IRWST) because they are not subject to any fluid wash-down that would occur during a loss of coolant accident (LOCA), main steam line break (MSLB), main feed water line break (MFWLB) or high energy line break (HELB). Therefore, it is not appropriate to use a standard such as ASTM D5962-96 that is for maintenance of unqualified coatings (i.e., coatings that are not DBA-qualified) within Service Level I areas, since the coatings in Service Level II areas (which are Service Level II coatings) do not have to be DBA-qualified and by definition are not unqualified. ASTM D5962-96 was issued to provide guidance for unqualified coatings in Service Level I areas only, and the standard does not provide any guidance regarding Service Level II coatings.

2. AREVA NP does not intend to have DBA-unqualified coatings within Service Level I areas of the U.S. EPR containment. However, AREVA NP intends to use ASTM D7491-08 (Standard Guide for Management of Non-Conforming Coatings in Coating Service Level I Areas of Nuclear Power Plants) for Service Level I areas. This particular standard—which replaces the withdrawn ASTM D5962-96 standard—provides much more relevant guidance. Standard ASTM D7491-08 defines a non-conforming coating to include degraded previously DBA-qualified or acceptable coatings, unqualified coatings, unknown coatings, and unacceptable coatings. This standard goes beyond Standard ASTM D5962-96, which only pertained to unqualified coatings. This newer standard, which addresses unqualified coatings, also addresses degraded previously DBA-qualified coatings that occur during the operating phase of the plant. The standard provides guidance for determining the amount of non-conforming coatings, guidance on managing non-conforming coatings, and has incorporated lessons learned from Generic Safety Issue (GSI) 191. In conclusion, AREVA NP considers ASTM Standard D7491-08 to be superior to ASTM D5962-96, and intends to use D7491-08 to manage non-conforming coatings in Service Level I areas of the containment.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Section 6.1.2.4 will be revised as described in the response and indicated on the enclosed markup.

Question 06.02.01-13:

As discussed in our public meeting of February 26, 2009, the staff is performing audit calculations using the TRACE computer code to evaluate reactor vessel mixing following hot leg injection and using the MELCOR computer code to evaluate containment temperature and pressure. The following information is needed so that the staff can perform this work. We believe that this information will be readily available based on the work you have already done in developing Containment Technical Report ANP-10299P.

For the postulated double ended pump suction break analyzed with the new evaluation model of ANP-10299P, provide the following information in electronic tabular form.

1. Flow rate and temperature of the MHSI as a function of time into each cold leg.
2. Flow rate and temperature of the LHSI as a function of time into each cold leg and into each hot leg after hot leg injection begins. For our realistic TRACE analysis we request the actual temperature exiting the RHR heat exchangers (for design basis two pump operation).
3. Steam flow rate and enthalpy leaving each side of the break and liquid flow rate and enthalpy leaving each side of the break.
4. Figures 9-8 through 9-10 of ANP-10299P provide the containment atmospheric pressure and temperature and IRWST temperature as a function of time. Provide this information in electronic tabular form.

Response to Question 06.02.01-13:

A response to this question will be provided by May 15, 2009.

U.S. EPR Final Safety Analysis Report Markups

The guidance provided by RG 1.54, Revision 1 is also used to assess the coatings on buried pipes and tanks. These coatings are evaluated to limit possible damage, based on the soils or other environment encasing the pipes and tanks.

6.1.2.4 Exceptions to Regulatory Guide 1.54, Revision 1

The following exceptions are taken to RG 1.54, Revision 1:

Q.06.01.02-8

- ASTM D5139-01 (ASTM D5139-90, Re-approved in 2001) is used instead of RG 1.54, Rev. 1 endorsed ASTM D5139-96 (ASTM D5139-90, Re-approved in 1996).

- ~~ASTM D3911-03 is used instead of RG 1.54, Rev. 1 endorsed ASTM D3911-95.~~
The acceptance criteria that will be utilized for ASTM D3911-03 will be as follows:

- Peeling shall not be permitted.
- Delamination shall not be permitted.
- Cracking is not considered a failure unless accompanied by delamination or loss of adhesion.
- Blisters shall be limited to intact blisters that are completely surrounded by sound coating bonded to the surface.

- ~~ANSI N101.2-1972, (“Protective Coatings [(Paints)] for Light Water Nuclear Reactor Containment Facilities”) is an acceptable standard for qualification of Service Level 1 coatings. However, acceptance criteria are based on ASTM D3911-03 to be used are the same as noted above for ASTM D3911-03.~~

Q.06.01.02-8

- ~~ASTM D4082-02 is used instead of RG 1.54, Rev. 1 endorsed D4082-95.~~
- ASTM D4537-04a is used instead of RG 1.54, Rev. 1 endorsed D4537-96.
- ASTM D5498-01 is used instead of RG 1.54, Rev. 1 endorsed D5498-94.
- ASTM D4227-05 is used instead of RG 1.54, Rev. 1 endorsed D4227-95.
- ASTM D4228-05 is used instead of RG 1.54, Rev. 1 endorsed D4228-95.
- ASTM D4286-99 (ASTM D4286-90, Re-approved in 1999) is used instead of RG 1.54, Rev. 1 endorsed ASTM D4286-96 (ASTM D4286-90, Re-approved in 1996).
- ASTM D5163-05a is used instead of RG 1.54, Rev. 1 endorsed D5163-96.
- ASTM D4541-02 is used instead of RG 1.54, Rev. 1 endorsed D4541-95.
- ASTM D3359-02 is used instead of RG 1.54, Rev. 1 endorsed D3359-95, Rev. A.
- ASTM D5962-96 is not used. It is not considered to be an acceptable standard for maintaining DBA-unqualified coatings within Service Level 1 areas. In lieu of this

Q.06.01.02-9.2

standard, ~~when necessary, the maintenance of DBA-unqualified coatings is based on the allowable quantity of DBA-unqualified coating within the containment-based on containment sumps analyses, net positive suction head analyses, and possibly transport analyses~~ the applicant intends to utilize ASTM D7491-08 (Standard Guide for Management of Non-Conforming Coatings in Coating Service Level I Areas of Nuclear Power Plants).

- ASTM D4538-05 is used instead of RG 1.54, Rev. 1 endorsed D4538-95.
- EPRI Report 1003102, November 2001, (~~“Guideline on Nuclear Safety-Related Coatings”~~) is used for additional information in lieu of using EPRI Report TR-109937 (referred to in RG 1.54, Rev. 1).

Q.06.01.02-7.1

- For the U.S. EPR, the Service Level II coating classification refers to coatings applied in radiologically controlled areas inside and outside of containment where coating failure could impair, but not prevent, normal operating performance.

6.1.3

References

1. ASME Boiler and Pressure Vessel Code, Section III, “Rules for Construction of Nuclear Plant Power Components,” The American Society of Mechanical Engineers, 2004.
2. ASME Boiler and Pressure Vessel Code, Section II, “Materials,” The American Society of Mechanical Engineers, 2004.
3. ANSI/AWS D1.1/D1.1M, “Structural Welding Code – Steel,” American National Standards Institute/American Welding Society, 2006.
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 ~~1002884~~1014986, “Pressurized Water Reactor Primary Water Chemistry Guidelines,” Revision 56, Electric Power Research Institute, ~~September~~December 20073.
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.
8. ASTM D3843-00, “Standard Practice for Quality Assurance for Protective Coatings Applied to Nuclear Facilities,” American Society for Testing and Materials, 2000.