## ArevaEPRDCPEm Resource

**From:** Tesfaye, Getachew
**Sent:** Monday, August 17, 2009 10:24 PM
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**Cc:** Davis, Robert; Downey, Steven; Terao, David; Roy, Tarun; Colaccino, Joseph; ArevaEPRDCPEm Resource
**Subject:** Draft - U.S. EPR Design Certification Application RAI No. 278 (3466, 3506), FSAR Ch. 5
**Attachments:** Draft RAI_278_CIB1_3466_3506.doc

Attached please find draft RAI No. 278 regarding your application for standard design certification of the U.S. EPR. If you have any question or need clarifications regarding this RAI, please let me know as soon as possible, I will have our technical Staff available to discuss them with you.

Please also review the RAI to ensure that we have not inadvertently included proprietary information. If there are any proprietary information, please let me know within the next ten days. If I do not hear from you within the next ten days, I will assume there are none and will make the draft RAI publicly available.

Thanks,
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**Hearing Identifier:** AREVA_EPR_DC_RAIs
**Email Number:** 739

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Draft

Request for Additional Information No. 378 (3466, 3506), Revision 0

8/17/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 05.02.03 - Reactor Coolant Pressure Boundary Materials
SRP Section: 05.03.02 - Pressure-Temperature Limits, Upper-Shelf Energy, and Pressurized Thermal Shock

Application Section: FSAR Ch. 5

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

05.02.03-20

In RAI 05.02.03-18, the staff requested, in part, that the applicant modify Table 5.2-2 to list weld filler metal specifications and classifications used to weld various material types and combinations in the RCPB. The applicant responded, by letter dated April 23, 2009, and stated that weld filler material specifications are listed in U.S. FSAR Section 5.2.3.1 and that no revision to Table 5.2-2 is required. The staff notes that Table 5.2-2 lists weld filler material specifications and classifications for fabrication of the reactor coolant pump, and CRDM but does not provide weld filler material specifications and classifications for fabrication of the RCPB piping, steam generators or pressurizer. The staff requests that the applicant modify Table 5.2-2 to lists the weld filler material specifications and classifications for components listed in Table 5.2-2.

05.02.03-21

FSAR Section 5.2.3.4.6 states:

> The RCP casing is made from ASME SA-351 Grade CF3 material with additional restrictions on silicon (1.5% maximum) and niobium (restricted to trace elements). In addition, the ferrite content of cast austenitic stainless components in the RCPB will be limited to a ferrite content of less than 20 percent. These restrictions reduce susceptibility to thermal aging (Section 3.6.3.3.6). For cast austenitic stainless steel material used in the RCPB, the percent ferrite is calculated using Hull's equivalent factors as indicated in NUREG/CR-4513 Rev. 1 (May 1994).

The FSAR statement above is acceptable for CASS materials currently listed in Table 5.2-2 which contain a maximum of 0.5 % molybdenum. However, in response to RAI 05.02.03-18, the applicant provided a proposed modification to Table 5.2-2. The applicant's proposed modified Table 5.2-2 includes RCPB valve specifications and grades as requested by the staff in RAI 05.02.03-18. The staff notes that the applicant's proposed revised Table now includes CASS grades CF3M and CF8M for the fabrication of RCPB valves. These two materials contain molybdenum ranging between 2.0-3.0%

which increases their susceptibility to thermal aging embrittlement. To be consistent with staff guidance, these materials should have a ferrite content of ≤14% to be considered not susceptible to thermal aging embrittlement. The staff requests that the applicant modify the FSAR to limit the ferrite content of high Molybdenum RCPB CASS components, such as CF3M and CF8M, to ≤14%.

05.02.03-22

In FSAR Section 5.2.3.4.1, the applicant states that stabilized grades of austenitic stainless steels have a stabilizing heat treatment above 800°F. The only stabilized stainless steel material (Grade 347), identified by the staff, used to fabricate components in the RCS pressure boundary, is used to fabricate the CRDM pressure housing. In response to RAI 05.02.03-17, dated June 5, 2009, the applicant stated that no stabilizing heat treatment will be performed for Grade 347 used for the CRDM pressure housing. There appears to be an inconsistency between the FSAR, which references stabilizing heat treatments and the applicant's response to RAI 05.02.03-17 which indicates that Grade 347 used to fabricate the CRDM will not receive a stabilizing heat treatment. The staff requests that the applicant address this inconsistency and modify the FSAR accordingly.

05.02.03-23

FSAR Section 5.2.3.2.2 states that unstabilized austenitic stainless steels are not heated above 800°F, other than locally by welding operations, after the final heat treatment. FSAR Section 5.2.3.4.1 states that utilization of materials in the solution annealed plus rapidly cooled condition and the prohibition of subsequent heat treatments in the 800°F to 1500°F temperature range is one of five methods used to avoid intergranular attack in austenitic stainless steel. These statements appear to be inconsistent with the applicant's process for joining low alloy steel nozzles to austenitic stainless steel safe-ends which requires that safe-ends be subject to post weld heat treatment.
The staff requests that the applicant modify the FSAR to address these inconsistencies by discussing those components used in the solution annealed and rapidly cooled condition and those that will be used in the solution annealed and rapidly cooled condition followed by post weld heat treatment after welding.

In addition, in order to make the FSAR clear as to the requirements for testing of post weld heat treated stainless steel safe-ends, the staff requests that the applicant modify FSAR Section 5.2.3 to state that for post weld heat treated austenitic stainless steel safe-ends, non-sensitization of the safe-ends will be verified in accordance with RG 1.44.

05.03.02-7

Provide a table of the data points (reactor coolant temperature vs. pressure) for each P-T curve displayed in Technical Report ANP-10283, Revision 1.

05.03.02-8

Clarify the vessel thickness used to calculate the fluence at the 1/4t and 3/4t locations for all materials provided in Technical Report ANP-10283, Rev.1.

05.03.02-9

Provide all values (i.e chemistry factors, fluence factors, margins, $\Delta RT_{NDT}$, etc.) used to calculate the ART at the 1/4t and 3/4t locations for all applicable materials provided in Technical Report ANP-10283, Rev. 1.

05.03.02-10

To address PTLR Criterion 4(GL 96-03), Clearly identify both the limiting adjusted reference temperature (ART) values and limiting materials at the 1/4t and 3/4 t locations (t= vessel thickness) used in the development of the P-T limits.