REQUEST FOR ADDITIONAL INFORMATION 379-2756 REVISION 0

5/29/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

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)

06.01.01-1

FSAR Table 6.1-1 and 6.1-2 list materials specifications and grades for ESF components. In order for the staff to confirm the suitability of materials for their intended application, the staff requests that the applicant modify FSAR Tables 6.1-1 and 6.1-2 to identify ESF systems that will be fabricated using each of the materials specifications and grades listed. Each ESF system should be identified and broken down by components, such as valves, piping, fittings, accumulators, pumps, heat exchanges etc., so the staff can identify the application of each material. In addition, the staff requests that the applicant include weld filler material specifications and classifications that will be used in each ESF system.

06.01.01-2

Tables 6.1-1 and 6.1-2 indicate that ASTM A-500 Gr. B material will be used in accordance with Code Case N-71-10. The staff notes that the most recent version of this Code Case is N-71-18 which is approved for use in RG 1.84 “Design, Fabrication, and Materials Code Case Acceptability, ASME Section III, Revision 34, August 2007.” The staff requests that the applicant modify FSAR Tables 6.1-1 and 6.1-2 to use Code Case N-71-18 in lieu of N-71-10 and state that the conditions listed in RG 1.84 will be followed. A similar issue exists with the applicant’s use of ASTM 668 Class C in Table 6.1-2. In addition, the staff requests that the applicant identify the components fabricated from these materials and list any other materials that will be used in accordance with this Code Case. Also identify any other Code Cases that will be used to fabricate ESF systems components and modify the FSAR accordingly.

06.01.01-3

The Emergency Feedwater System (EFWS) components materials specifications and grades are not listed in FSAR Table 6.1-1 or FSAR Chapter 10. The staff notes that per SRP 10.4.9, the compatibility of EFWS materials is reviewed by the staff under SRP 6.1.1. In order for the staff to find that the EFWS materials meet the acceptance criteria listed in SRP Section 6.1.1, the staff requests that the applicant modify FSAR Section 10.4.9 or 6.1.1 to list material specifications and grades for EFWS components (pumps, piping, valves, fittings, etc.) including weld filler materials. In addition, verify compliance with the guidance provided in RGs 1.31, 1.37, 1.44, 1.50 and preheat guidelines in

ASME Code Section III, Appendix D, Article D-1000 for carbon steel and low alloy steel. Where the applicant deviates from staff guidance in these RGs or ASME Code Section III, Appendix D, the staff requests that the applicant provide justification for the deviation and describe any alternatives and the basis for such alternative approach. The staff notes that some of the aforementioned documents may not be applicable depending on the materials selected by the applicant. Also provide, in the FSAR, a justification for the materials selected based on the operating environment and include a discussion regarding the corrosion allowance for EFWS components and the basis for the corrosion allowance.

06.01.01-4

FSAR Subsection 6.1.1.2.1 states "The materials used in the fabrication of the ESF components are corrosion resistant in normal operation and the post-LOCA environment. General corrosion is negligible with the exception of low-alloy and carbon steels." In order for the staff to evaluate the applicant's corrosion allowance for ferritic materials used in ESF systems, the staff requests that the applicant modify FSAR Section 6.1.1 to identify the corrosion allowance for ferritic materials and state the technical basis for the corrosion allowance for ferritic materials used in ESF systems to ensure that it is sufficient for the design life of the plant.

06.01.01-5

FSAR Section 6.1.1.1 indicates that Alloy 690 is used in some ESF systems and is identified in Table 6.1-1. Although not listed in Table 6.1-1, the staff assumes that Alloys 52/52M/152 will be used to weld Alloy 690 to Alloy 690, Alloy 690 to stainless steel and possibly stainless steel to carbon steel or Alloy 690 to ferritic materials. In order for the staff to complete its review, the staff requests that the applicant provide the following:

a. Identify ESF components fabricated from Alloy 690 and include them in Table 6.1-1. Also include weld filler metal specifications and classifications for welding Alloy 690 components and filler metal specifications and classifications used in dissimilar metal welds**.**

b. For components containing dissimilar-metal welds in ESF systems, provide a detailed description of how these welds are performed. The applicant's detailed description should include the following:

1. Provide base material combinations.

2. Describe the welding processes used.

3. Describe special fabrication process requirements employed in dissimilar metal welds to limit the effects of cold work and residual stress, caused by grinding/repair or other fabrication processes on surfaces that come into contact with ESF and RCS fluids in order to minimize the susceptibility of components to stress corrosion cracking for the design life of the plant.

4. Discuss welding process controls employed to reduce weld metal dilution in order to retain the maximum percentage of Chromium possible in order to decrease the susceptibility of components to stress corrosion cracking for the life of the plant.

5. Given the susceptibility of Alloys 52, 52M and 152 to ductility dip cracking and other types of welding flaws that have resulted in extensive repairs during repair and replacement activities for current operating PWRs, provide a description of special process controls used to minimize welding flaws.

06.01.01-6

The staff was unable to locate ITAAC for the containment liner system relative to verifying compliance with ASME Codes for fabrication, welding and nondestructive examination. The staff requests that the applicant identify where the aforementioned information is addressed in FSAR Tier 1. If this is not addressed in Tier 1 information, modify the FSAR accordingly.

06.01.01-7

FSAR Subsection 6.1.1.2.2 states that Chapter 5, Subsection 5.2.3 describes control of welding, heat treatment, welder qualification, and contamination protection during ferritic and austenitic stainless steels material fabrication which are also applicable to ESFs. FSAR Subsection 6.1 indicates that the ESF systems comply with the guidance provided in RGs 1.44 and 1.71. In order to provide clarity regarding the applicant's compliance with guidance provided in applicable RGs, the staff requests that the applicant modify FSAR Subsection 6.1.1, to state that it complies with the guidance provided in RGs 1.31 and 1.50. In addition, modify FSAR Table 1.9.1-1 to list RGs 1.31, 1.44, 1.50 and 1.71 as being applicable to FSAR Subsection 6.1.1.

06.01.01-8

FSAR Subsection 6.1.1.1 states "Cold-worked austenitic stainless steel is not used for pressure boundary applications. If such material is used for other applications when there is no proven alternative available, cold work is controlled, measured and documented during each fabrication process. The COL Applicant is responsible to develop an augmented ISI program to ensure the structural integrity of such components during service [COL Item 6.1(2)]. Cold-worked austenitic stainless steels have a maximum 0.2 percent offset yield strength of 620 MPa (90,000 psi) to reduce the probability of stress-corrosion cracking in ESF systems." Supplemental information supplied by the applicant on November 7, 2008 modifies FSAR Subsection 6.1.1.1 to delete COL Item 6.1(2) and add the following statement in its place: "An augmented inservice inspection (ISI) is conducted to ensure the structural integrity of such components during service, which is described in Section 6.6." However, FSAR Section 6.6 does not contain a description of any augmented inspection program for cold worked austenitic stainless steel. The staff requests that the applicant modify the FSAR to correct this inconsistency.

06.01.01-9

Table 6.1-1 indicates that non-low carbon austenitic stainless steels will be used to fabricate some ESF components. Given that the use of stainless steels, in LWRs, with a maximum carbon content of 0.03% has been shown to be highly resistant to stress corrosion cracking, the staff requests that the applicant modify FSAR Section 6.1.1 and Table 6.1-1 to limit the carbon content of austenitic stainless steel to 0.03% maximum or provide a technical basis for why this is not necessary.

06.01.01-10

FSAR Subsection 6.1.1.2 indicates that the chemistry of the borated reactor coolant and the borated water in the RWSP is controlled such that the concentrations of chlorides and fluorides is below 0.15 ppm. Subsection 6.1.1.2 also states that during periods of high temperatures, dissolved oxygen concentrations remain below 0.10 ppm. Subsection 6.1.1.2 further states that the controls on water chemistry include the chemical and volume control system (CVCS) and the spent fuel pit cooling and purification system (SFPCS). Details on these control systems are provided in Chapter 9, Subsection 9.3.4, for the CVCS and in Subsection 9.1.3 for the SFPCS. The staff notes that for refueling water storage tanks, the EPRI PWR Primary Water Chemistry Guidelines (EPRI Guidelines) recommend sampling several other parameters in addition to chloride and fluoride, such as sulfate. Also, FSAR Subsection 6.1.1.2.1 states that the water quality requirements for
the RCS and RWSP are described in Chapter 9, Subsection 9.3.4. However, Section 9.3.4 only describes the RCS water quality requirements. The staff therefore requests that the applicant provide the following:

1. Discuss consistency of the impurity limits for the RWSP with the recommendations of the EPRI PWR Primary Water Chemistry Guidelines and modify the FSAR accordingly.

2. Confirm that the limit on dissolved oxygen of 0.10 ppm is applicable to the RWSP.

3. Modify Subsection 9.3.4 to include water quality requirements for the RWSP.