REQUEST FOR ADDITIONAL INFORMATION 268-2181 REVISION 1

3/9/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 04.05.01 - Control Rod Drive Structural Materials
Application Section: 4.5.1

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

04.05.01-1

In order for the staff to conclude that the CRDM materials meet the requirements of GDC 1 and GDC 26, the staff requests that the applicant address the following:

1. Table 4.5-1 lists SA-213 Type 304 material. The staff notes that Type 304 should be listed as Grade TP304 to be consistent with SA-213 and ASME Code, Section II, Part D, Table 2A. The staff requests that the applicant modify the FSAR accordingly.

2. Table 4.5-1 indicates that "an equivalent" may be used for Haynes 25 and Stellite 6. The staff requests that the applicant modify Table 4.5-1 to include the specifications that will be used to procure these materials.

3. Table 4.5-1 lists weld filler material specifications as meeting SFA-5.9 or SFA-5.4. The staff requests that the applicant modify Table 4.5-1 to include weld filler metal classifications. In addition, the staff requests that the applicant provide a sketch of the CRDM indicating the location of all welds with a description of each weld including welding requirements.

4. Table 4.5-1 specifies SA356 Grade 60-40-18 for the coil assembly housing, the staff was unable to locate SA-356 in ASME Code, Section II. The staff requests that the applicant explain this discrepancy.

5. In order to provide clarity, the staff requests that the applicant identify the materials in Table 4.5-1 that are exposed to reactor coolant.

6. The FSAR states that the information in Subsection 4.5.1 addresses relevant requirements of General Design Criteria (GDC) of 10 CFR 50, Appendix A, GDC 1 and GDC 14. The applicant did not however reference GDC 26. Application of GDC 26 to the control rod drive system materials ensures that material selection and fabrication support reliable rod movement for reactivity control; it also preserves fuel and cladding integrity, the primary barriers to the release of fission products. The staff requests that the applicant modify Subsection 4.5.1 to address its compliance with GDC 26.

04.05.01-2

Cold working can increase the susceptibility of stress-corrosion cracking in austenitic stainless steels. The applicant states in FSAR Subsection 4.5.1.1 that strain-hardened, austenitic stainless steels are controlled to have a 0.2 percent offset yield strength that is no greater than 90,000 psi, which reduces the probability of stress-corrosion cracking in these materials. However, Subsection 5.2.3 which is referenced in Subsection 4.5.1.2 states that cold-worked, austenitic stainless steel is not used. The staff requests that the applicant clarify whether strain-hardened and/or cold-worked material is used for any CRDM, RCPB or non-pressure boundary components.

04.05.01-3

SA-182 Grade F316, SA-479 type 304 and SA-213 Grade TP304 permit a carbon content of up to 0.08%. The applicant states that it will follow RG 1.44, which recommends a carbon content not to exceed 0.03%. However, the applicant's Table 4.5-1 does not contain a supplemental requirement limiting carbon to 0.03%. The staff requests that the applicant modify Table 4.5-1 to include a note that limits carbon to no greater than 0.03% for austenitic stainless steels. In addition, the staff requests that the applicant list FSAR Subsection 4.5.1 in Table 1.9.1-1 under the line item for RG 1.44.

04.05.01-4

FSER Subsection 4.5.1.2 indicates that the delta ferrite content of the CRDM pressure boundary welds may be as low as 3FN for design temperatures above 800ºF. The staff's position, as indicated in RG 1.31, is that the delta ferrite content of austenitic stainless steel welds should be 5FN minimum. The staff requests that the applicant modify its minimum ferrite content to 5FN or provide a technical basis for using 3FN.

04.05.01-5

The control rod drive assembly coupling is fabricated from Type 403 martensitic stainless steel. The applicant did not provide any information related to the final condition of Type 403 used in the CRDM. The staff requestes that the applicant provide its heat treatment requirements, including a basis for its requirements, for Type 403 martensitic stainless steel and modify the FSAR accordingly.

04.05.01-6

Alloy X-750 (SA-637 N07750) is used for latch assembly and drive rod assembly springs. Table 4.5-1 indicates that additional requirements of MIL-N-24114 Class A No. 1 are applied. Alloy X-750 is a commonly used material in CRDM components, as referenced in SRP 4.5.1. The staff notes that the resistance of Alloy X-750 to stress-corrosion cracking is dependent on adequate processing and heat treatment requirements. The staff requests that the applicant discuss its processing and heat treatment requirements for X-750 and provide a basis for why they are optimal to prevent stress-corrosion cracking. In addition, the staff requests that the applicant

discuss any service-related industry failures of X-750 spring components that were fabricated and heat treated to the applicant's requirements.

04.05.01-7

Cleaning and cleanliness controls for the CRDM during manufacture and assembly are discussed in Subsection 5.2.3.4.1 as referenced in Subsection 4.5.1.4. Subsection 4.5.1.4 states, “Cleaning and cleanliness tests of the outer surface and the accessible area of the inner surface of subassemblies are performed after the functional test. Cleaning and cleanliness control should comply with description in Subsection 5.2.3.4.1.” The staff requests that the applicant modify the FSAR to change “should” to “will” or “shall” to provide clarity.