

# REQUEST FOR ADDITIONAL INFORMATION 269-2155 REVISION 1

3/9/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 04.05.02 - Reactor Internal and Core Support Structure Materials  
Application Section: 4.5.2 Reactor Internals and Core Support Structure Materials

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

04.05.02-1

Tables 4.5-1 and 4.5-2 specify weld material specifications SFA-5.9 or SFA-5.4 for the welding of CRDMs and reactor vessel internals. In addition, please provide the weld material types (e.g. ER308) to be used for welding CRDMs and reactor vessel internals.

04.05.02-2

Table 4.5-2 provides material specifications used for reactor internals. FSAR Section 3.9.5 provides a description of the neutron reflector and states that it replaces the baffle structure used in existing reactors.

- a) Provide in the FSAR a detailed drawing of the neutron reflector and its components. Confirm that the materials for the neutron reflector and its components are listed in Table 4.5-2 or, preferably, list the neutron reflector material as a separate item.
- b) Discuss how the ring blocks and alignment pins are machined to prevent notches that can act as stress concentrations and crack-initiation sites, thereby, leading to a potential loss-of-function of the neutron reflector.
- c) Discuss the effects of void swelling, if any, on the neutron reflector.
- d) Will the neutron reflector experience a fluence of  $5 \times 10^{20}$  n/cm<sup>2</sup> (E>1.0 MeV) or greater in the proposed 60-year life of the USAPWR, thereby making the neutron reflector susceptible to irradiated-assisted, stress-corrosion cracking (IASCC)?

04.05.02-3

Section 4.5.2.1 states that Alloy 690 is used for the radial-support clevis inserts. Section 4.5.2.5 states that the Alloy 690 radial-support clevis inserts are bolted to the radial support keys. Section 3.9.5.2.1 states that the radial support keys are attached to the outside rim of the lower, core-support plate.

- a) Describe how the Alloy 690 radial-support clevis inserts are attached to the reactor vessel. If welding processes are used, discuss what weld materials are used, preheat and interpass controls, and subsequent heat treatments to the reactor vessel.
- b) Are radial support keys and the lower-core support plate considered "reactor vessel internals – primary material" as described in Table 4.5-2? Describe how

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the radial support keys are attached to the outer rim of the lower-core support plate. Discuss welding processes, if welding is used.

- c) Are radial-support keys and radial-support clevis inserts subjected to a fluence of  $5 \times 10^{20}$  n/cm<sup>2</sup> (E>1.0 MeV) or greater in the proposed 60-year life of the USAPWR, thereby making them susceptible to irradiated-assisted, stress-corrosion cracking (IASCC)?

04.05.02-4

Section 3.9.5.2.1 states that the following welds are used in the core-barrel assembly:

- Forged-flange-to-upper-core-barrel welds
- Upper-core-barrel-to-lower-core-barrel welds
- Lower-core-barrel-to-lower-core-support-plate welds

- a) Are any other welds used in the core-barrel assembly?
- b) Will any of the core-barrel welds be subjected to a fluence of  $5 \times 10^{20}$  n/cm<sup>2</sup> (E>1.0 MeV) or greater in the proposed 60-year life of the USAPWR, thereby making the core barrel susceptible to irradiated-assisted, stress-corrosion cracking (IASCC)?

04.05.02-5

Section 4.5.2.2 provides a description of controls on welding of reactor internals and core-support structures.

- a) Section 4.5.2.2 states, "For design temperatures up to and including 800F, the minimum acceptance delta ferrite is 5FN." Provide the upper delta ferrite limit for this temperature range.
- b) Section 4.5.2.2 also states, "For design temperatures exceeding 800F, the delta ferrite is limited to the range FN3-FN10." Since RG1.31 specifies a lower ferrite limit of 5FN to avoid microfissuring in welds, provide the technical basis for specifying a lower delta ferrite limit of 3FN for this temperature range.