

**REQUEST FOR ADDITIONAL INFORMATION NO. 163-1923 REVISION 0**

1/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 05.04.07 - Residual Heat Removal (RHR) System  
Application Section: 5.4.7

QUESTIONS for Reactor System, Nuclear Performance and Code Review (SRSB)

05.04.07-1

**RAI 5.4.7-1**

DCD Tier 2 Section 5.4.7.2 describes the CS/RHR pump minimum flow line and pump testing during normal operations. The staff requires the reference or additional information be provided relative to the mini-flow line in order to ensure compliance with the in-service inspection requirements of 10 CFR 50.55a(g) pertaining to RHRS pump testing and the guidelines of Generic Letters GL 88-04 and GL 89-04:

- a. Confirm adequate sizing of the line and presence of an installed flow measurement device; and describe the design function of the installed flow restrictor to preclude pump damage during testing.
- b. Describe the CS/RHR pump testing during normal operations.
- c. Address whether a single failure can result in conditions causing a “dead-head” no flow condition of the CS/RHR pumps during min-flow operation.

This information is needed in order to ensure that potential generic deficiency associated with in-service testing of pumps utilizing minimum flow lines as described in Generic Letter 89-04 has been adequately addressed.

05.04.07-2

**RAI 5.4.7- 2**

The US-APWR RHR is provided with a leakage detection system designed to detect and minimize the leakage from those portions of the RHR system outside of the containment structure that contain or may contain radioactive material following an accident. The DCD also states that plant programs and procedures will detect, monitor, and control RHR leakage. DCD Tier 2 Section 5.2.5.3.1 describes the RHRS leakage detection instrumentation; and the requirements for a leakage control program, including schedule for re-testing, are addressed in DCD Tier 2 Chapter 16, Technical Specification 5.5.2, “Programs and Manuals – Primary Coolant Sources Outside Containment.” However, in order for the staff to complete its review of the RHRS design and determine that the design basis meets the design requirements of 10 CFR 50.34(f)(2)(xxvi), additional information regarding the RHRS leakage detection system and initial testing of the

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leakage detection system is required. Provide the reference or additional information describing the leakage detection system outside the containment and identify the initial test of DCD Tier 2 Section 14.2 in regard to testing of the leakage detection system.

05.04.07-3

### **RAI 5.4.7-3**

In the US-APWR DCD Subsection 5.4.7.2.3.6, "Mid-loop and Drain Down Operations", Part E, "Water supply from spent fuel pit", the applicant states when the water level of RCS abnormally drops whereby none of the RHR pumps can be operated because of air intake, the operator can manually configure the interface between the spent fuel pit (SFP) and RHR to provide SFP water to the reactor vessel. The piping at the SFP structure is physically located four feet below the normal SFP water surface and the water is supplied to the RHR by gravity. Based on the review of Section 5.4.7, the SRSB staff has several questions:

- 1) Is the approximately 34,042 gallons injected to the RHR system sufficient inventory to recover RHR level to allow restart of the RHR pumps?
- 2) In startup test 14.2.12.1.22, "Residual Heat Removal System (RHRS) Preoperational Test", Objective 5 is to demonstrate proper operation of the RHRS during low RCS water level (e.g., mid-nozzle level) and to verify sufficient margins exist to prevent vortexing or air entrainment in the suction lines and Test Method 4 verifies operation of the RHRS during RCS mid-loop hot leg water level operation, no provision was found to verify proper configuration interface between the SFP and RHR. Explain why a test is not needed to verify proper operation of the SFP gravity drain injection to the RHR.

05.04.07-4

### **RAI 5.4.7-4**

In the DCD Section 5.4.7, it is not apparent that the applicant describes the reasons for the RHRS satisfying the requirements of GDC 4. Provide the reference that describes the RHRS in regard to satisfying GDC 4 requirements that SSCs important to safety be designed to accommodate the effects of and be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accident conditions, including dynamic effects of such events as flow instabilities and water hammer.

05.04.07-5

### **RAI 5.4.7-5**

To complete the review of the RHRS in accordance with SRP 5.4.7 and RG-1.68, provide the P&IDs of the RHRS and systems that interface with the RHRS.

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05.04.07-6

### **RAI 5.4.7-6**

In the US-APWR DCD, rev. 1, subsection 5.4.7.1, "Design Bases," the applicant states, "The RHRS pressure boundary and pressure boundary components are designed to meet ... RG 1.139." In June 2008, the NRC withdrew Regulatory Guide 1.139, "Guidance for Residual Heat Removal" (see Federal Register Notice 73 FR 32750).

Since March 2007, SRP 5.4.7 has referenced Branch Technical Position (BTP) 5-4, "DESIGN REQUIREMENTS OF THE RESIDUAL HEAT REMOVAL SYSTEM." Verify that DCD section 5.4.7 meets the requirements of BTP 5-4 as stated in SRP 5.4.7. Provide the results of this verification. If necessary, revise DCD section 5.4.7 and provide markups of the revisions.