

REQUEST FOR ADDITIONAL INFORMATION NO. 67-715 REVISION 0

9/8/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 09.04.04 - Turbine Area Ventilation System

Application Section: Tier 2 FSAR Section 9.4.4

SPCV Branch

QUESTIONS

09.04.04-2

The following RAI questions were generated by the staff from its review of SRP 9.4.4 and DCD Section 9.4.4 subsequent to the teleconference with MHI on May 8, 2008 (Reference RAI 710):

RAI 9.4.4-7 For the temperature and humidity ranges listed in US APWR DCD Table 9.4-1 for "Abnormal Conditions" it not clear from the text of DCD Section 9.4.4 what these minimum and maximum values represent. For example, for the Electrical Equipment Area and SBO, what do these Min and Max values assume? Is the assumption that the function of the Turbine Building Ventilation System has been lost for the duration of the SBO coping event (i.e. 8 hours)? DCD Section 8.3.2.1.2 second paragraph reads "...*For conservatism, the batteries are sized to carry the worst case dc load profile for a duration of one hour. The loading conditions following a LOOP and an SBO have been considered to determine the worst case profile for the battery.*" Without any ventilation from the Turbine Building Area Ventilation System, what happens to the hydrogen levels within the battery rooms for the duration of the SBO or LOOP event?

Section 9.2.7.2.2 "Non-Essential Chilled Water System" third paragraph reads "*During the LOOP condition, the non-essential chilled water system is powered from the alternate AC power source.*" Is the TAVS subsystem Electrical Equipment Areas HVAC System powered from the AAC during a LOOP to allow the chilled water system to ventilate the Turbine building areas?

SRP 9.4.4 section III.1 requires a review for normal and emergency operations, and the ambient temperature limits for the areas serviced. Additional information needs to be included within DCD Section 9.4.4 to identify the implications (if any) of these questions with respect to TAVS operation.

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RAI 9.4.4-8 Tier 1 ITAAC Section 2.7.5.5 Turbine Building Area Ventilation System identifies three key design features for the system: (1) provide a suitable environment for equipment operation; (2) provide effective smoke evacuation in the building; and (3) maintain the hydrogen concentration below the explosive limit in the battery room.

10 CFR 52.47(b)(1) reads:

"The proposed inspections, tests, analyses, and acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the Act, and the Commission's rules and regulations..."

Similar words are contained in Item 4 of the Requirements in SRP Section 9.4.4, II Acceptance Criteria.

Appendix A to SRP 14.3, Section I.D.iii "Tier 2" reads *"Tier 2 information includes... iii. Supporting information on the inspections, tests, and analyses that should be performed to demonstrate that the acceptance criteria in the ITAAC have been met"*

Tier 2 DCD Section 9.4.4.4 "Inspection and Testing Requirements" does not require any system testing to demonstrate the three key design features. More directly, the ITAAC criteria for the acceptance criteria are too vague. The acceptance criteria need to be quantifiable. The staff requests that the DC applicant provide appropriate ITAAC for Tier 1 Section 2.7.5.5 and appropriate testing requirements for Tier 2 Section 9.4.4.4.

For example:

For (1) definition of a suitable environment would be defined by the minimum and maximum temperature and humidity values of Table 9.4-1 for normal and abnormal plant conditions. But these criteria could be very difficult to demonstrate during plant startup and before fuel load without all normal heat loads "on line" and active. It would be even more difficult to demonstrate these temperature and humidity values for abnormal conditions.

For (2) the Turbine Building Area Ventilation System has two subsystems each with a smoke purge function. What are the minimum flows measured at particular locations for each subsystem to be certified as acceptable system performance (i.e. with respect to smoke removal)?

For (3) the Electrical Equipment Area HVAC System is designed to maintain the hydrogen concentration within both battery rooms well below 2% by volume. By the ITACC statement, if the explosive limit for hydrogen is 4%, then a hydrogen concentration of 3.9% could be certified

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as acceptable system performance (i.e. with respect to hydrogen dilution)?

Adding an HVAC flow balancing table to the DCD that includes flows, inlet and outlet temperatures to particular areas within the Turbine Building could resolve some of the above noted deficiencies for Section 9.4.4.

SRP 14.3.7 II "SRP Acceptance Criteria" 1 reads "...Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.". Neither Tier 2 Section 14.2.121.110 Turbine Building Area Ventilation System (General Mechanical Area) Preoperational Test nor Tier 2 Section 14.2.121.111 Turbine Building Area Ventilation System (Electrical Equipment Area) Preoperational Test establishes a consistency with the requirements of the ITAAC acceptance criteria.

In addition, Appendix A to SRP 14.3, Section I.C.v "Tier 1" reads "*Tier 1 information includes: v. Significant interface requirements.*" Tier 1 Section 2.7.5.5 does not contain a section for significant interface requirements. For example, Fire Protection System (i.e. HVAC dampers) and Chilled Water System.

The staff requests that the DCD be revised to address these deficiencies for: Tier 1 Section 2.7.5.5, Tier 2 Section 9.4.4, Tier 2 Section 14.2.121.110 and Tier 2 Section 14.2.121.110.

RAI 9.4.4-9 SRP 14.3.7 Section II "SRP Acceptance Criteria" 1 reads "...Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.".

SRP 14.3.7 Section II "SRP Acceptance Criteria" 2 reads "... The following issues are identified to ensure comprehensive and consistent treatment in Tier 1 based on safety significance of the system being reviewed: ... (6) Control, alarms, and displays; (7) Logic; (8) interlocks ..."

Tier 2 DCD Section 14.3.4.7 ITAAC for Plant Systems pertains to HVAC systems. The seventh bullet reads that "*Commensurate with the importance of the design attribute to safety, verifying the following design attributes for plant systems:...*

- Controls, alarms, and displays ...
- Logic and interlocks...
- Required interfaces with other systems"

DCD Section 9.4.4.2.1 "General Mechanical Areas Ventilation System" 3rd paragraph reads "*In the event of the presence of smoke, selected roof fans are actuated to purge the smoke.*"

From this passage it is not clear whether the actuation of the roof fans to purge the smoke from the General Mechanical Areas is manual or automatic. What controls, alarms and displays and/or logic and interlocks are relevant for smoke or fire detected in this area? If a fire were

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detected in the Turbine Building, would the 27 roof fans automatically shut down until the fire is extinguished? Are there different fan speeds associated with the roof fans for normal operation versus the smoke purge mode?

The staff requests that the DC applicant provide additional information in answer to the above questions. This missing information should be added to Tier 2 Section 9.4.4.2.1.

RAI 9.4.4-10 Tier 2 DCD Section 14.2.12.1.110 "Turbine Building Area Ventilation System (General Mechanical Area) Preoperational Test", subsection C "Test Method" identifies four verifications required for preoperational test completion. C.1 reads "*Verify manual and automatic controls and functions in the operation and shutdown modes.*" DCD Section 9.4.4.2.1 does not discuss a shutdown mode. C.3 reads "*Verify alarms and status indications are functional.*" DCD Section 9.4.4.2.1 does not contain any information about alarms and status indications (e.g. locations of remote and/or local). SRP 9.4.4 section III.1 requires a review for normal and emergency operations. The staff requests additional information about this absence of detail in Section 9.4.4.2.1.

RAI 9.4.4-11 SRP 14.3.7 Section II "SRP Acceptance Criteria" 1 reads "...*Tier 1 should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2.*".

SRP 14.3.7 Section II "SRP Acceptance Criteria" 2 reads "... *The following issues are identified to ensure comprehensive and consistent treatment in Tier 1 based on safety significance of the system being reviewed: ... (6) Control, alarms, and displays; (7) Logic; (8) interlocks ...*"

Tier 2 DCD Section 14.3.4.7 ITAAC for Plant Systems pertains to HVAC systems. The seventh bullet reads that "*Commensurate with the importance of the design attribute to safety, verifying the following design attributes for plant systems:...*

- *Controls, alarms, and displays ...*
- *Logic and interlocks...*
- *Required interfaces with other systems"*

DCD Section 9.4.4.2.2 "Electrical Equipment Areas Ventilation System" 4th paragraph reads "*The battery rooms common exhaust has two 100% exhaust fans, with one in standby. This system maintains the hydrogen concentration well below 2% by volume in both battery rooms.*"

From this passage it is not clear what controls, alarms and displays and/or logic and interlocks are relevant in event of an abnormal hydrogen build up in the battery rooms. If abnormal hydrogen builds up in either of the battery rooms, how would the two exhaust fans react?

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The fifth paragraph indicates the automatic response of the air handling units in the presence of smoke. Would the presence of smoke cause any type of response by the two Non-Class 1E battery Room Exhaust Fans?

The staff requests that the DC applicant provide additional information in answer to the above questions. This missing information should be added to Tier 2 Section 9.4.4.2.2.

RAI 9.4.4-12 10 CFR 47(a) reads ... *“(a) The application must contain a final safety analysis report (FSAR) that describes the facility, presents the design bases and the limits on its operation, and presents a safety analysis of the structures, systems, and components and of the facility as a whole, and must include the following information:*

(24) A representative conceptual design for those portions of the plant for which the application does not seek certification, to aid the NRC in its review of the FSAR and to permit assessment of the adequacy of the interface requirements in paragraph (a)(25) of this section;

(25) The interface requirements to be met by those portions of the plant for which the application does not seek certification. These requirements must be sufficiently detailed to allow completion of the FSAR;”

The Fire Protection system Figure 9.4.4-1 (Sheet 2 of 2) “Turbine Building Area Ventilation System Flow Diagram” displays six symbols (i.e. circle with a diagonal line) in the flow process lines. These symbols are not identified in: (1) Figure 1.7-4 Legends for Piping and Instrumentation Diagrams of HVAC System; (2) any legend contained in DCD Chapter 9; (3) Tier 1. Review of DCD Section “9.5 Fire Protection” and Appendix 9A (reference Table 9A-3 for Fire Zones FA6-101-03 & FA6-101-14 and Figures 9A-21 & 9A-22) would lead to the conclusion that the six symbols are most likely fire dampers. The staff asks that the applicant remove the ambiguity of the six symbols from the DCD. If these symbols represent fire dampers, they should be described as a Fire Protection System interface in DCD Section 9.4.4 with respect to the Turbine Building Ventilation System. The staff request that clarification of the six symbols be added to DCD Section 9.4.4.