

REQUEST FOR ADDITIONAL INFORMATION 582-4456 REVISION 2

5/10/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 09.04.01 - Control Room Area Ventilation System

Application Section: DCD Section 9.4.1

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

09.04.01-16

This is a follow-up RAI to RAI No. 63(-849) / Question No. 09.04.01-19. The staff found the committed to revision of Figure 9.4.1-1 and Figures 6.4-2 through 6.4-4 as incomplete. The applicant maintains that most of the instrumentation displayed on these four Figures is non-safety related (NSR).

Chapter 3 of the DCD reads that the MCR HVAC system is designed to Equipment Class 3, Seismic Category I standards. The CRE is an area of the control room complex in the power block. Accordingly, the CRE is, by definition, the same equipment class and seismic category (e.g., Equipment Class 3, Seismic Category I) as the MCR.

The staff observes that most if not all the instrumentation displayed on Figure 9.4.1-1 and Figures 6.4-2 through 6.4-4 breach the boundary of the CRE. Any tubing or appendages to the CRE boundary related to these instruments are in fact part of the CRE. By the definition above, these instruments and related tubing, tube fittings etc are Equipment Class 3, Seismic Category I. There is no line of demarcation between the Class 3, Seismic Category I instrumentation piece parts and Seismic Category II portions of the NSR instrument loops displayed on these Figures. In particular, these figures need to depict where the boundary of the CRE ends and where the Seismic Category II boundary ends.

In addition, Table 3.2-2 does not contain a line item(s) for the dampers of the MCR HVAC System. The third line item of page 46 of 57 of this table reads: "Ductwork and dampers excluding main control room exhaust and smoke purge ductwork and dampers between and excluding VRS-AOD-122, 132, VRS-OTD-124, 133". The staff is confused what this line item statement includes or does not include. Should this line item not reference the back draft dampers?

The staff repeats the basis of the original RAI No. 63, Question No. 09.04.01-19 in that an excerpt from SRP 9.4.1 Section III "Review Procedures" 2.B reads: "... SAR component and system descriptions of mechanical and performance characteristics are reviewed to verify that the

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classifications are included and that the P&IDs indicate any points of change in design classification."

Table 3.2-2, Figure 9.4.1-1 and Figures 6.4-2 through 6.4-4 as contained in Revision 2 of the DCD, do not satisfy this SRP guidance. The staff requests that the DCD applicant amend this Table and these Figures to satisfy the guidance of SRP 9.4.1.

Reference: MHI's Responses to US-APWR DCD RAI No. 63; MHI Ref: UAP-HF-08215; dated October 3, 2008; ML082810407.

09.04.01-17

This is a follow-up RAI to RAI No. 63(-849), Question No. 09.04.01-21. The applicant committed to revise the second paragraph of DCD subsection 9.4.1.4 with the following words:

"The MCR HVAC system is designed to permit periodic inspection and testing of major components, such as fans, motors, dampers, coils, filters and ducts to verify their integrity, operability and capability. The MCR HVAC system equipment and components are provided with proper access for initial and periodic inspection and maintenance activities."

The second paragraph of DCD (i.e. Revision 2) subsection 9.4.1.4 reads:

"The MCR HVAC system is designed to permit periodic inspection and testing of major components, such as fans, motors, dampers, coils, filters and ducts to verify their integrity, provided with proper access for initial and periodic inspection and maintenance activities."

The applicant failed to amend the second paragraph with the underlined words above. The staff requests that the applicant amend the second paragraph of subsection 9.4.1.4 per the applicant's response to RAI No. 63, Question No. 09.04.01-21.

In addition, the applicant's response to Question No. 09.04.01-21 included the words:

"A table or list of probable "degraded" component conditions (i.e. cooling coil failure, supply fan failure, damper sealing deficiencies) that result in loss of cooling function or damper leakage does not currently exist. It is thought that this information is probably best denoted within the context of a Table or list associated with an FMEA study. The FMEA for MCR HVAC system will be added in DCD revision 2. Refer to Question No. 09.04.01-8."

The applicant did not in Revision 2 of the DCD, create a Table or include the degraded component conditions in Table 9.4.1-2 "Main Control Room HVAC System Failure Modes and Effects Analysis". The staff requests that

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the applicant amend Table 9.4.1.2 to include these degraded component conditions.

Reference: MHI's Responses to US-APWR DCD RAI No. 63(-849); MHI Ref: UAP-HF-08215; dated October 3, 2008; ML082810407.

09.04.01-18

This is a follow-up RAI to RAI No. 63(-849), Question No. 09.04.01-8.

The staff's review of Table 9.4.1-2 found the FMEA did not address a failure mode of concern. This Table was added to Revision 2 of the DCD as a result of RAI No. 63, Question No. 09.04.01-8. The staff notes that the HVAC AHUs are directly above the Main Control Room. What design features will prevent the failure of a service water cooling coil leak inside the HVAC AHUs above from adversely impacting the Main Control Room below?

Reference: MHI's Responses to US-APWR DCD RAI No. 63(-849); MHI Ref: UAP-HF-08215; dated October 3, 2008; ML082810407.

09.04.01-19

This is a follow-up RAI question to RAI No. 327-2401, Question No. 09.04.01-3 and its subsequent follow-up RAI No. 475-3780, Question No. 09.04.01-13.

Table 9.4-1 Area Design Temperature and Relative Humidity provides minimum and maximum humidity parameters of 25%RH and 60%RH respectively, for the Normal Condition. The applicant's response to Question No. 09.04.01-13 read "*Safety related electrical equipment and instrumentation in the MCR are qualified for maximum 95% (non-condensing).*" The applicant did not provide in its response a minimum RH% value that the electrical equipment and instrumentation in the MCR are qualified for.

The function of the humidifier is to keep the relative humidity levels within the main control room above 25% during all seasons of the year. The applicant maintains that, ". . . the MCR HVAC System humidifier is installed in the supply air duct to the MCR to provide humidification of the MCR environment for personnel comfort purposes" and that the humidifier maintains no safety function.

The staff requests that the applicant:

- (a) provide an FSAR design commitment with ITAAC, if appropriate, that all safety-related electrical equipment and instrumentation in the MCR

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will be qualified to maintain operability down to a relative humidity of 0%:

OR

- (b) provide a US-APWR design that includes redundant safety-related humidifiers capable of maintaining main control room relative humidity levels above the minimum relative humidity levels contained in the purchase specifications for all safety-related electrical equipment and instrumentation in the MCR.**

The staff submits this request for additional information per the guidance of SRP 9.4.1 section IV.1 “Evaluation Findings” as documented in up RAI No. 327-2401, Question No. 09.04.01-3.

References:

MHI's Responses to US-APWR DCD RAI No. 327-2401; MHI Ref: UAP-HF-09323; dated June 19, 2009; ML091751095.

MHI's Responses to US-APWR DCD RAI No. 475-3780; MHI Ref: UAP-HF-09531; dated November 20, 2009; ML093290031.

09.04.01-20

This is a follow-up RAI to RAI No. 63(-849), Question No. 09.04.01-18; RAI No. 327-2401, Question No. 09.04.01-6; & RAI 475-3780, Question No. 09.04.01-14.

The staff does not agree with the applicant’s conclusion that RG 1.155 and NSAC-108 allows site specific EDG reliability, or in this case a site specific GTG reliability, to be based on industry operating experience. NSAC-108 is a survey documenting EDG reliabilities from the early 1980s and identifies what criteria (i.e. testing methodologies) were used to form the bases of the documented historical liabilities.

Regulatory Guide 1.155 Section 3.3.5, #5 reads in its entirety:

“The AAC power system should be inspected, maintained, and tested periodically to demonstrate operability and reliability. The reliability of the AAC power system should meet or exceed 95 percent as determined in accordance with NSAC-108 (Ref. 11) or equivalent methodology.”

This clearly indicates that site specific AAC reliability is to be based on site specific testing and analysis. More specifically, the AAC reliability can not be based on analysis alone of historical industry data.

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Based on the above, the staff repeats its request of RAI 475-3780, Question No. 09.04.01-14 that the applicant change the ITA for line item 12 of ITAAC Table 2.6.5-1, from "An analysis of the reliability of the as-built AAC power sources will be performed" to read "Demonstrate through testing and analysis the reliability of the as-built AAC power source".

References:

MHI's Responses to US-APWR DCD RAI No. 63(-849); MHI Ref: UAP-HF-08215; dated October 3, 2008; ML082810407.

MHI's Responses to US-APWR DCD RAI No. 327-2401; MHI Ref: UAP-HF-09323; dated June 19, 2009; ML091751095.

MHI's Responses to US-APWR DCD RAI No. 475-3780; MHI Ref: UAP-HF-09531; dated November 20, 2009; ML093290031.

09.04.01-21

This is a follow-up RAI to RAI No. 63(-849), Question No. 09.04.01-30.

The staff found the applicant's response (RAI No. 63, Question No. 09.04.01-30) as fundamentally acceptable but incomplete. With the supplemental information provided the applicant adequately fills in the gaps in information specific to fire protection system operation and its impact on the MCR HVAC system. However, the applicant did not commit to add this information to the DCD in either subsections 9.4.1 or 9.5.1.

The staff requests that the applicant amend DCD subsection 9.4.1 with the fire protection attributes described in the response of RAI No. 63, Question No. 09.04.01-30.

Reference: MHI's Responses to US-APWR DCD RAI No. 63(-849); MHI Ref: UAP-HF-08215; dated October 3, 2008; ML082810407.

09.04.01-22

This is a follow-up RAI to RAI No. 63(-849), Question No. 09.04.01-26

The staff notes that the applicant did complete in Revision 2 of the DCD the committed to change of RAI No. 63, Question No. 09.04.01-26. However, the implementation was not in synch with other cause and effect changes of the DCD. The applicant did revise DCD Subsection 9.4.1.5, "Instrumentation Requirements" to add the following new paragraph at the end of the section: "*The requirements for controls and instrumentation associated with fire protection for the control room are provided in Section 9.5.1, and Appendix 9A, Subsection 9A.3.44 Main Control Room.*" However, the staff found that Subsection 9A.3.44 in Revision 2 of the DCD is no

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longer entitled “FA2-308 Main Control Room” as in previous revisions of the DCD. “FA2-308 Main Control Room” is listed against subsection 9A.3.51 in Revision 2 of the DCD.

The staff requests that applicant amend Revision 2 the DCD to correct this deficiency.

References:

MHI's Responses to US-APWR DCD RAI No. 63(-849); MHI Ref: UAP-HF-08215; dated October 3, 2008; ML082810407.

MHI's Responses to US-APWR DCD RAI No. 327-2401; MHI Ref: UAP-HF-09323; dated June 19, 2009; ML091751095.

MHI's Responses to US-APWR DCD RAI No. 475-3780; MHI Ref: UAP-HF-09531; dated November 20, 2009; ML093290031

09.04.01-23

This is a follow-up RAI to RAI No. 63(-849), Question No. 09.04.01-6.

The applicant wrongly concludes in their response to Question No. 09.04.01-6 that “ ... the MCR HVAC system does not need to satisfy GDC 60 requirement.” The staff notes that the MCR HVAC System contains an ESF filter trains governed by the regulatory guidance of subsection C.3 “Design Criteria” of Regulatory Guide 1.52.

The staff further notes that “Acceptance Criteria” #5 of SRP 9.5.1 and it’s associated “Technical Rational” #5 read:

Control of Releases of Radioactive Material to the Environment. Information that

addresses the requirements of GDC 60 regarding the suitable control of the release of gaseous radioactive effluents to the environment will be considered acceptable if the guidance of RGs 1.52 and 1.140 as related to design, inspection, testing, and maintenance criteria for post-accident and normal atmosphere cleanup systems, ventilation exhaust systems, air filtration, and adsorption units of light-water-cooled nuclear power plants are appropriately addressed. For RG 1.52 rev 2, the applicable regulatory position is C.2. For RG 1.52 rev 3, the applicable regulatory position is C.3. ...

...GDC 60 requires nuclear power unit designs to include provisions to control the release of radioactive materials entrained in gaseous effluents during normal reactor operation, including anticipated operational occurrences. RGs 1.140 and 1.52 offer design, testing, and inspection criteria

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acceptable to the staff for air filtration and adsorption units of normal ventilation systems and for post-accident engineered-safety-feature atmosphere cleanup systems in light-water-cooled nuclear power plants. Atmosphere cleanup systems are included in the design to reduce the quantities of radioactive materials entrained in gaseous effluents released to the environment.”

The staff requests that the applicant amend DCD subsection 9.4.1, to document as to how the ESF filter trains of the of the MCR HVAC system satisfy the “System Design Criteria” of subsection C.3 “Design Criteria” of Regulatory Guide 1.52.

Reference: MHI's Responses to US-APWR DCD RAI No. 63(-849); MHI Ref: UAP-HF-08215; dated October 3, 2008; ML082810407.