REQUEST FOR ADDITIONAL INFORMATION 579-4481 REVISION 2

4/28/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 03.04.01 - Internal Flood Protection for Onsite Equipment Failures
Application Section: 3.4.1

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

03.04.01-21

In response to request for information (RAI) Question No. 3.4.1-01, Mitsubishi stated that the power source fuel storage vaults (PSFSVs) and essential service water pipe tunnel (ESWPT) are included in the standard plant design. However, it is not clear that the Design Control Document (DCD) has identified the set of systems, structures, and components (SSCs) located inside the PSFSVs and ESWPT that should be protected from flooding. Per DCD Tier 2 Table 3.2-2, “Classification of Mechanical and Fluid Systems, Components, and Equipment,” and DCD Tier 2 Section 9.5.3.4, the PSFSVs contain seismic category I SSCs, specifically fuel oil storage tanks for the gas turbine generators. Also, DCD Tier 2 Table 3.2-2 indicates that the ESWPT contains some seismic category I SSCs, including essential service water valves. Furthermore, the DCD does not describe how internal flood protection is achieved for safety-related SSCs located inside the PSFSVs and ESWPT.

As discussed in Standard Review Plan (SRP) 3.4.1, Section II, "Acceptance Criteria," General Design Criteria (GDC) 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." SRP Section 3.4.1, Acceptance Criteria 1 states that acceptable guidance for meeting the seismic design and classification requirements of GDC 2 can be based on meeting Regulatory Guide (RG) 1.29, "Seismic Design Classification," Revision 4, March 2007, Position C.1 for safety-related SSCs and Position C.2 for nonsafety-related SSCs. Also, per SRP 3.4.1, Item I.1, the set of SSCs that should be protected from flooding should be reviewed, and therefore, should be identified in the DCD. Meeting the requirements of GDC 2 includes evaluating the effects of flooding from full circumferential failures of non-seismic, moderate-energy piping.

Also discussed in SRP3.4.1, Section II, "Acceptance Criteria," the requirements of GDC 4 relate to SSCs important to safety being designed to accommodate the effects of environmental conditions associated with postulated accidents, including loss-of-coolant accidents. Meeting the requirements of GDC 4 includes ensuring that SSCs important-to-safety are protected from potential flooding from liquid carrying components in the plant. In accordance with SRP 3.4.1, Section I, “Areas of Review,” there are a number of specific areas that should be reviewed, including SSCs that could be sources of internal flooding, the adequacy of flood isolation, provisions for protection against possible in-leakage sources, and design features used to mitigate the effects of internal flooding.

Provide a complete list of SSCs located within the PSFSVs and ESWPT that require protection from internal flood. Also, demonstrate how these SSCs are protected from internal flooding in accordance with SRP 3.4.1. Describe and demonstrate the adequacy of instrumentation for flood detection within the PSFSVs and ESWPT. Include this information in the DCD, identify which revision will include the change, and provide a markup in your response.

Reference: MHI's Responses to US-APWR DCD RAI No. 220-2058; MHI Ref: UAP-HF-09152; Dated April 8, 2009; ML091030066.

03.04.01-22

In the amended May 21,2009 response to request for information (RAI) Question No. 3.4.1-06, Mitsubishi stated that the Design Control Document (DCD) Tier 2 will be revised to include a complete list of systems, structures, and components (SSCs) inside the PS/B that require flood protection. A copy of this list has been included as part of Mitsubishi's response. This list contains numerous equipment items, including the Class 1E turbine generators and Class 1E batteries. However, neither this list nor the DCD Tier 2 identifies the need to protect electrical interconnections among components (e.g., cables) within the PS/B.

General Design Criteria (GDC) 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." Per Standard Review Plan (SRP) 3.4.1, Item 1.1, the set of SSCs that must be protected from flooding should be reviewed, and therefore, should be identified in the DCD.

Identify the electrical interconnections among components located within the PS/B that require protection from internal flooding (e.g., cables). Include this information in the DCD, identify which revision will include the change, and provide a markup in your response.

Reference: Amended MHI's Responses to US-APWR DCD RAI No. 220-2058; MHI Ref: UAP-HF-09251; Dated May 21, 2009; ML091480377.

03.04.01-23

In the amended May 21, 2009 response to request for information (RAI) Question No. 3.4.1-10, Mitsubishi stated that the Design Control Document (DCD) Tier 2 will be revised to include a complete list of systems, structures, and components (SSCs) inside the prestressed concrete containment vessel (PCCV) that require flood protection and the location of these SSCs relative to the flood level. A copy of this list has been included as part of Mitsubishi's response. The list reports maximum flood levels as measured above the nominal floor elevations of each SSC. For each SSC, the maximum flood level is reported to be 7.7m (25' 3") above the nominal floor elevation,

even though the SSCs are distributed among several different floor elevations. Based on a review of the PCCV interior layout and the discussion provided in DCD Tier 2 Section 3.4.1.5.1, it does not appear that the maximum flood level would always be 7.7 m (25 ft. 3 in.) above each of the nominal floor elevations.

In accordance with Standard Review Plan (SRP) 3.4.1, Item I.2, the locations of safety-related SSCs relative to the internal flood level should be reviewed, and therefore, should be identified in the DCD.

Verify the locations of safety-related SSCs inside the PCCV relative to the internal flood level as reported in your response to (RAI) Question No. 3.4.1-10. Update the internal flood level information as necessary. Include this information in the DCD, identify the revision in which it will be included, and provide a markup in your response.

Reference: Amended MHI's Responses to US-APWR DCD RAI No. 220-2058; MHI Ref: UAP-HF-09251; Dated May 21, 2009; ML091480377.

03.04.01-24

In the amended May 21,2009 response to request for information (RAI) Question No. 3.4.1-11, Mitsubishi provided a list of systems, structures, and components (SSCs) inside the containment annulus that require flood protection and the location of these SSCs relative to the flood level. However, Mitsubishi did not provide a description of instrumentation for flood detection, as was requested in RAI Question 3.4.1-11.

As discussed in SRP 3.4.1, Section II, "Acceptance Criteria," General Design Criteria (GDC) 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." Meeting the requirements of GDC 2 includes evaluating the effects of flooding from full circumferential failures of non-seismic, moderate-energy piping. As also discussed in Standard Review Plan (SRP) 3.4.1, Section II, "Acceptance Criteria," the requirements of GDC 4 relate to SSCs important to safety being designed to accommodate the effects of environmental conditions associated with postulated accidents, including loss-of-coolant accidents. Meeting the requirements of GDC 4 includes ensuring that SSCs important to safety are protected from potential flooding from liquid-carrying components in the plant.

Describe and demonstrate the adequacy of instrumentation for flood detection within the containment annulus. Include this information in the Design Control Document (DCD), identify which revision will include the change, and provide a markup in your response.

Reference: Amended MHI's Responses to US-APWR DCD RAI No. 220-2058; MHI Ref: UAP-HF-09251; Dated May 21, 2009; ML091480377.

03.04.01-25

In the amended May 21, 2009 response to request for information (RAI) Question No. 3.4.1-14, Mitsubishi stated that sanitary piping represents the only sources of water inside the Main Control Room (MCR). Mitsubishi further states that internal flood

countermeasures are not required inside the MCR because the “water lines are less than or equal to 1B.” However, this statement is not clear, as Mitsubishi does not explain or define the term “1B.” Furthermore, Mitsubishi does not propose to revise the Design Control Document (DCD) to describe how the MCR is protected from water sources inside the MCR.

As discussed in Standard Review Plan (SRP) 3.4.1, Section II, "Acceptance Criteria," General Design Criteria (GDC) 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." Meeting the requirements of GDC 2 includes evaluating the effects of flooding from full circumferential failures of non-seismic, moderate-energy piping. As also discussed in SRP 3.4.1, Section II, "Acceptance Criteria," the requirements of GDC 4 relate to systems, structures, and components (SSCs) important to safety being designed to accommodate the effects of environmental conditions associated with postulated accidents. Meeting the requirements of GDC 4 includes ensuring that SSCs important to safety are protected from potential flooding from liquid carrying components in the plant.

Explain how safety-related equipment in the MCR is protected from internal floods related to sanitary piping located inside the MCR. Define any abbreviations or special terminology used in this explanation (e.g. “1B”). Include this information in the DCD, identify the revision in which it will be included, and provide a markup in your response.

Reference: Amended MHI's Responses to US-APWR DCD RAI No. 220-2058; MHI Ref: UAP-HF-09251; Dated May 21, 2009; ML091480377.

03.04.01-26

In the amended May 21, 2009 response to request for information (RAI) Question No. 3.4.1-16, Mitsubishi provided a list of SSCs inside the power source buildings (PS/B) that require flood protection and the location of these SSCs relative to the flood level. However, Mitsubishi did not demonstrate how safety-related SSCs located in the PS/B are protected from internal flood, as was requested in RAI Question 3.4.1-16.

As discussed in Standard Review Plan (SRP) 3.4.1, Section II, "Acceptance Criteria," General Design Criteria (GDC) 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as ... floods ... without loss of capability to perform their safety functions." Meeting the requirements of GDC 2 includes evaluating the effects of flooding from full circumferential failures of non-seismic, moderate-energy piping. As also discussed in SRP 3.4.1, Section II, "Acceptance Criteria," the requirements of GDC 4 relate to SSCs important to safety being designed to accommodate the effects of environmental conditions associated with postulated accidents, including loss-of-coolant accidents. Meeting the requirements of GDC 4 includes ensuring that SSCs important to safety are protected from potential flooding from liquid-carrying components in the plant. In accordance with SRP 3.4.1, Section I, “Areas of Review,” there are a number of specific areas that should be reviewed, including SSCs that could be sources of internal flooding, the adequacy of flood isolation, provisions for protection against possible in-leakage sources, and design features used to mitigate the effects of internal flooding.

Demonstrate how safety-related SSCs located in the PS/B are protected from internal flood. Specifically address the review items listed in SRP 3.4.1, Section I, “Areas of Review,” including SSCs that could be sources of internal flooding, the adequacy of flood isolation, provisions for protection against possible in-leakage sources, and design features used to mitigate the effects of internal flooding. Describe how the worst case flooding sources were identified, and describe instrumentation used for flood detection. Include this information in the Design Control Document (DCD), identify the revision in which it will be included, and provide a markup in your response.

Reference: Amended MHI's Responses to US-APWR DCD RAI No. 220-2058; MHI Ref: UAP-HF-09251; Dated May 21, 2009; ML091480377.

03.04.01-27

In response to request for information (RAI) Question No. 3.4.1-17, Mitsubishi stated that several means are used to assure the functionality of watertight doors, including remote indication of door positions provided to operators, and periodic visual inspections and functional tests. Mitsubishi proposes to revise the Tier 2 Design Control Document (DCD) Section 3.4.1.3 to include a brief discussion that outlines this approach. However, in the proposed revision to the Tier 2 DCD, Mitsubishi makes reference to door “position indication” instead of door “remote position indication.” Furthermore the Tier 2 DCD does not indicate that remote position indication is available to operators. The ability of operators to remotely monitor the position of watertight doors is important in assuring door functionality.

In accordance with Standard Review Plan (SRP) 3.4.1, Item III.2, the staff is to review the adequacy of techniques used to prevent flooding, including the use of watertight doors.

Propose an update to DCD Section 3.4.1.3 that includes incorporation of the information provided in the RAI response for Question 3.4.1-17 concerning the provisions allowing for remote position indication for the watertight doors by operators. Indicate in which revision the update will be included and provide a markup in your response.

Reference: Amended MHI's Responses to US-APWR DCD RAI No. 220-2058; MHI Ref: UAP-HF-09251; Dated May 21, 2009; ML091480377.

03.04.01-28

In response to request for RAI Question 3.4.1-18, Mitsubishi stated that the design will preclude submergence of components that require active operation to achieve safety functions. This design constraint applies to both the design certification (DC) and combined license (COL) application stages. Mitsubishi further states that there are other safety-related systems, structures, and components (SSCs) that are permitted to be submerged and environmentally protected as described in Tier 2 DCD Section 3.11. However, Tier 2 DCD Section 3.11 and its associated tables (e.g., Table 3D-2, “US-APWR Environmental Qualification Equipment List”) do not explicitly identify those

components that are credited for operation while being submerged. It is noted that Mitsubishi's responses to RAI Questions 3.4.1-02, and 3.4.1-05 identify instances in which credit was taken for submergence of safety-related SSCs in the PCCV and the NRCA portion of the R/B. However, it is not clear that Mitsubishi has identified all instances in which credit was taken for a submerged SSC (e.g., there does not appear to be any instance of credit taken for a submerged SSC located outside of the PCCV and the NRCA portion of the R/B). Furthermore, Mitsubishi does not explain how the DCD will ensure that the COL applicant will address the operability of submerged SSCs that do not require active operation.

Per Standard Review Plan (SRP) Section 3.4.1, Item III.5, safety-related SSCs being located below the flood level should be reviewed, and therefore, should be identified in the DCD. Also, it must be demonstrated that these SSCs are capable of their normal function while submerged.

Explicitly identify all of the safety-related SSCs that are credited for operation while being submerged and demonstrate how these SSCs will retain their normal function while submerged. Also, explain how the DCD will ensure that the COL applicant will address the operability of submerged SSCs that do not require active operation. Include this information in the DCD, identify in which revision it will be included, and provide a markup in your response.

References:
MHI's Responses to US-APWR DCD RAI No. 220-2058; MHI Ref: UAP-HF-09152; Dated April 8, 2009; ML091030066.
Amended MHI's Responses to US-APWR DCD RAI No. 220-2058; MHI Ref: UAP-HF-09251; Dated May 21, 2009; ML091480377.