

REQUEST FOR ADDITIONAL INFORMATION 488-3745 REVISION 1

11/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 14.03.11 - Containment Systems and Severe Accidents - Inspections, Tests, Analyses,
and Acceptance Criteria
Application Section: 14.3.4.11

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

14.03.11-40

RAI 14.3.4.11-28:

The staff requested, in RAI 51-916, Question 14.3.11-2 (14.3.4.11-2) and RAI 222-1933, Question 14.3.11-19 (14.3.4.11-19) that the applicant provide additional information on how critical assumptions from transient and accident analyses are verified by ITAAC.

The Staff asked the applicant to provide, the cross references from containment safety analyses that are used to define specific ITAAC. The staff asked the applicant to discuss how the cross references have been used in developing the ITAAC, and for each ITAAC item identified, a discussion on how the ITAAC acceptance criteria will provide verification of the critical assumption from containment safety analyses.

In a letter dated September 18, 2008, Mitsubishi responded to RAI 51-916, Question 14.3.11-2 (14.3.4.11-2) that DCD Tier 2 Table 14.3-1 addresses the cross-reference with Tier 1 and Tier 2, and also includes key parameters (specifications) in the containment transient and accident analyses. This table especially focuses on the numerical performance parameters of the safety function, flood protection, fire protection, severe accident function and so on per SRP 14.3.

These key parameters are directly incorporated in the corresponding design description of the referenced Tier 1 section, and are verified in the ITAAC.

MHI stated that they will expand Table 14.3-1 and directly extract the design commitments from Section 6.2.1 of Tier 2 regarding the containment transient and accident analyses. The comparison with the assumptions in the containment transient and accident analyses will be resolved with the enhancement of Table 14.3-1

In a letter dated April 23, 2009, Mitsubishi responded to RAI 222-1933, Question 14.3.11-19 (14.3.4.11-19) with revised DCD Tier 2 Table 14.3-1 which identifies which particular analysis (DBA, Severe Accident, Flooding, etc) was used to create each assumption. In addition, several assumptions were added.

The staff has reviewed the response and has identified that the following needs to be addressed by the applicant:

Although the proposed change to Tier 2 Table 14.3.-1 now clearly indicates which particular analysis is used to create each assumption, the NRC staff has noted that how ITAAC are defined to address them are not clearly delineated.

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In Table 14.3-1 a, b, c, d, e, f, a Tier 1 reference is given which provides Tier 1 Section and/or Table reference. It does not provide the specific ITAAC item #(s) that verifies the design feature/assumption. Without the specific reference, it is difficult to discern the adequacy of the ITAAC defined.

Provide a reference to the ITAAC item addressing the key design feature/assumption in Table 14.3-1.

Follow-up RAI based on 8/6/2009 Conference call.

14.03.11-41

RAI 14.3.4.11-29:

The staff requested, in RAI 51-916, Question 14.3.11-3 (14.3.4.11-3), that the applicant provide cross-references or roadmaps from severe accident analyses that are used to define specific ITAAC addressing severe accident prevention and mitigation features. Also, for each ITAAC item identified, the staff requested a discussion on how the ITAAC acceptance criteria provide verification of the critical assumptions/requirements in severe accident analyses.

In a letter dated September 18, 2008, Mitsubishi responded to RAI 51-916, Question 14.3.11-3 (14.3.4.11-3) that:

MHI will revise the title of Table 14.3-1 to "Tier 1 and Tier 2 Cross-References". Also, the title of the middle column will be changed to "Key Design Features/PRA Insights/Severe Accident Mitigation Features". For example, the key design features of diverse actuation systems has been addressed in Table 14.3-1 (Sheet 3 of 6) of Tier 2 and Subsection 2.5.3.1 of Tier 1 as an ATWS feature specified in Subsection 19.2.2.1. And, two independent alternative ac power sources have been also addressed in Table 14.3-1 (Sheet 3 of 6) of Tier 2 and Subsection 2.6.5.1 of Tier 1 as a station blackout feature specified in Subsection 19.2.2.3. These design features are verified in the individual ITAAC in the corresponding Tier 1 sections and tables.

In the RAI response, the applicant provided a comparison table of the US-APWR design features for mitigating severe accidents, with the location of Tier 1 information and Tier 2 information.

The applicant pointed out that some of the severe accident mitigation features are not specified in Table 14.3-1, but the existence of these features is verified in the ITAAC as mostly inspections of the functional arrangement and/or design description.

Thus, the verification of the existence of design features for severe accident prevention and mitigation is accomplished in the simple ITAAC as the inspection of the functional arrangement and/or design description in general, but some of the specific design features are verified in a separate ITAAC per the specific requirement of RG 1.206 and SRP 14.3

The applicant indicated that as part of its RAI response process, MHI found that some of the design features were not specified in Table 14.3-1 and the existence of the SSCs used as the severe accident prevention and mitigation features were not

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clearly described in Tier 1. The applicant stated that MHI will add these unspecified design features in each design description in Tier 1 and provide the corresponding cross-reference in Table 14.3-1 of Tier 2, respectively.

The staff has reviewed the response and has identified that the following needs to be addressed by the applicant:

1) Table 14.3-1 provided in the Tier 2 DCD and the modification planned in response to RAI 51-916, Question 14.3.11-3 (14.3.4.11-3) does not provide a roadmap or show how key insights and assumptions from PRA and severe accident analyses are addressed in the design information in the DCD. Table 14.3-1 lists (or will list) the key design features/PRA insights/severe accident mitigation features along with references to the applicable sections in Tier 1 and Tier 2 DCD. The table or the accompanying discussion should also identify the specific design feature(s) that should be verified for each of the item and the ITAAC defined to address them. Essentially, the steps or the analyses conducted to develop Table 14.3-1 should be included in accompanying discussion or should be apparent from the information provided in the table. Some of the discussions provided in response to RAI 51-916, Question 14.3.11-3 (14.3.4.11-3) presents the analysis being conducted and such analyses, as completed to address all relevant issues, should be included in Section 14.3.4.11.

In a letter dated April 23, 2009, Mitsubishi responded to RAI 222-1933, Question 14.3.11-20 (14.3.4.11-20) with revised DCD Tier 2 Table 14.3-1 which identifies which particular analysis (DBA, Severe Accident, Flooding, etc) was used to create each assumption. In addition, several assumptions were added.

The NRC staff has reviewed the response and has identified that the following need to be addressed by the applicant.

Although the proposed change to Tier 2 Table 14.3.-1 now clearly indicates which particular analysis is used to create each assumption, the NRC staff has noted that how the critical assumptions from transient and accident analyses are identified are not clearly delineated.

MHI does not provide a roadmap of how the key design features are delineated and accordingly, it is not clear that all the key design features have been identified. A roadmap should (a) identify the key design features and assumptions delineated in an analysis, (b) include in Table 14.3-1 and relate to the key design feature and assumptions in the analysis (c) cross-reference the ITAAC defined to address the design feature and/or the assumption. A review of the roadmap will assure that all the key design features and assumptions are included for development of ITAAC and that for each, ITAAC are developed or it is judged that ITAAC are not necessary.

One key design feature related to Section 2.11 and 14.3.11 identified in the PRA and Severe Accident Analysis was not included in Table 14.3-1.

· hydrogen igniter power supply is provided from two non-Class 1E buses with alternate AC generation.

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Please provide a roadmap as discussed above, that directly addresses all the key design features and assumptions for which ITAAC should be developed. Justify if any of the key design features and assumptions is not addressed in the ITAAC.

Follow-up RAI based on 8/6/2009 Conference call.

14.03.11-42

RAI 14.3.4.11-30:

The staff requested, in RAI 51-916, Question 14.3.11-8 (14.3.4.11-8), and RAI 222-1933, Question 14.3.11-24 that the applicant provide ITAAC required to verify the minimum inventory of alarms, displays and controls associated with the containment instrumentation shown on Figure 2.11.2-1, that are not listed in Table 2.11.2-1, and to amend Table 2.11.2-1 as required. The staff also requested that for systems with containment isolation functions (e.g., CVCS, SGBDS, PSS), the applicant provide ITAAC to verify the display of position indication of the containment isolation valves in the MCR, to include the displays of the CIV positions in the respective system tables. The staff requested the applicant provide ITAAC required to verify the minimum inventory of alarms, displays and controls are provided for the CHS system, as described in the design description paragraph 2.11.4.1.

In a letter dated September 18, 2008, Mitsubishi responded to RAI 51-916, Question 14.3.11-8 (14.3.4.11-8) that:

- Tier 1 of the DCD Revision 2 document will be revised to add the instruments (PT-2390 and 2391') in Table 2.11.2-1
- ITAAC to verify the display of position indication of the containment isolation valves in the MCR will be added in the respective system tables.
- Containment isolation valves in CVCS will be added in Tier 1 Table 2.4.6-4.
- SGBDS and PSS tables of equipment, alarm, displays, and control functions for containment isolation valves will be added and containment isolation valves will be listed in these tables. ITAAC for containment isolation function will be added in Table 2.7.1.10-3 (SGBDS).

1) In a letter dated April 23, 2009, Mitsubishi responded to RAI 222-1933, Question 14.3.11-24 (14.3.4.11-24) that The CHS design description will be revised to add the hydrogen concentration alarm function, but did not commit to add the verification of the existence of such alarm in table 2.11.4-1.

The staff believes that ITAAC to verify the alarm function of the CHS system is appropriate. MHI has stated in RAI responses in section 6.2.5, that an alarm function will be required for the hydrogen monitor. (see response to RAI 6.2.5-4) Therefore a discreet ITAAC to verify the existence of the alarm function for this system would be consistent with the Containment Isolation System ITAAC selection criteria specified in Tier 2 chapter 14.3.4.11, and would verify the location and functional arrangement description that MHI has proposed in response to RAI 222-1933, Question 14.3.11-24 (14.3.4.11-24).

Provide ITAAC required to verify existence of CHS alarm function.

2) In a letter dated April 23, 2009, Mitsubishi responded to RAI 222-1933, Question 14.3.11-24 (14.3.4.11-24) that Tier 1 table 2.11.2-1 will be revised to consolidate all

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valves with containment isolation function to make them subject to CIS ITAAC in Tier 1 table 2.11.2-2. MHI also indicated that DCD Tier 1 will be revised as needed to ensure each of the CIVs in the revised table 2.11.2-1 is included in it's appropriate table of alarms, displays and controls.

The NRC Staff has reviewed the response and has determined that a detailed review of all revised ITAAC tables will be conducted upon receipt of DCD revision 2 in order to ensure that all containment isolation valves and their required functions and capabilities are correctly verified via ITAAC.

Follow-up RAI based on 8/6/2009 Conference call.