REQUEST FOR ADDITIONAL INFORMATION 571-4365 REVISION 0

4/13/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 09.02.02 - Reactor Auxiliary Cooling Water Systems
Application Section: 9.2.2

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

09.02.02-47

Follow-up to RAI 362-2278, Question 09.02.02-23

Based on the staff's review of the applicant's response to RAI 09.02.02-23, the following items should be addressed related to Items 4 and 5:

The RAI response stated that all piping and valves associated with headers A2 and C2, except containment isolation portions, are equipment class 4, quality group D. Based on the staff's review of DCD Tier 1 Figure 2.7.3.3-1, there are several valves within headers A2 and C2 that are class 3 which are described in the note section of sheet 25 of Table 3.2-2. The wording in the RAI response is misleading and should be revised to be consistent with the DCD markup.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-48

Follow-up to RAI 362-2278, question 09.02.02-24

Based on the staff's review of the applicant's response to RAI 09.02.02-24, the following items should be addressed:

1. The total effects of a seismic event and the breach of the non-safety piping header A2 or C2 was discussed in the RAI response, including a discussion on how the safety related headers A1 or C1 may drain down in addition to headers A2 or C2 until they are isolated by the automatic closure signal from the surge tank low level. However, the consequence of isolation of cooling flow to the charging pumps, spent fuel pool, reactor cooling pumps (RCPs) was not explained for this event (potential loss of RCP seal and thermal barrier cooling). This discussion needs to be included in the RAI response and in the DCD.
2. Specifically, describe the operator actions required to re-establish flow to headers A1 or C1 once the non-safety headers A2 or C2 are isolated.
3. Describe what valves are to be closed by the operators for this event since some valves have automatic closure signals on surge tank low level.

4. The isolation of air operated valves (for example AOV-661A) for the non-safety loads was not part of this RAI discussion and should be addressed in the RAI response and in the DCD.
5. The proposed Tier 2 DCD markup text (added in Revision 2) does not provide the detail that was provided in the response to the RAI as would be appropriate in the DCD. Provide additional details in the DCD related to non-safety related CCW header isolation. The discussion of the non-safety seismic category II piping system was not part of the RAI discussion and should be included in DCD.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-49

Follow-up to RAI 362-2278, question 09.02.02-25

Based on the staff's review of the applicant's response to RAI 09.02.02-25, the following items should be addressed related to Question 2 in the original RAI:

- Table 3.9-14, "Valve Inservice Test Requirements," should be modified to address the safety-related mission and the leak rate testing for 14 valves that automatically close on a sensed low-low surge tank level to preserve the function of the CCWS after a seismic event that breaches the non-safety piping system.

- Where specific leakage criteria are not identified, the staff noted that the application of criteria from ASME OM Code, subparagraph ISTC-3630(e) could result in leakage as high as 18.9 liters per minute (5 gpm) for each closed valve (0.5 x diameter gal/min or 5 gpm for 10" diameter or larger). Since leakage testing is not required, the applicant should provide a detailed description of emergency makeup flow rate capacity to the surge tanks.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-50

Follow-up to RAI 362-2278, question 09.02.02-26

Based on the staff's review of the applicant's response to RAI 09.02.02-26, the following items should be addressed:

1. All of the CCWS headers which penetrate containment were not addressed related to the possibility of two-phase flow; for example cooling lines to the excess letdown or letdown. This should be included in the RAI response and added to the DCD as required.

2. Procedures that direct operators to slowly open the valves (inching of valves) during an accident or post accident, related to the possibility of two-phase flow in headers inside containment, should be included in the DCD as a COL Information Item.

3. System voiding and water hammer mitigation were not addressed in the RAI response for a seismic event that drains down the CCWS surge tank due to a failure of the non safety related portion of the piping.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09388; dated July 16, 2009; ML092080393.

09.02.02-51

Follow-up to RAI 362-2278, question 09.02.02-27

Based on the staff's review of the applicant's response to RAI 09.02.02-27, the following items should be addressed related to items 2, 4 and 6:

Item 2: The design details should be provided such as system operating temperatures, pressures, and flow rates for all operating modes and alignments. Alternatively, bounding values could be provided.

Item 4: The Class 1E power supplies for the CCWS valves should be included in Tier 1 DCD Table 2.7.3.3-2. In addition, specific Class 1E power was not shown in Tier 1 for valves that are non-divisionalized, such as NCS-MOV-511, -517, and NCS-AOV 601, -602, -661A, -661B, -662A, and -662B etc.

Item 6: The surge tank water normal makeup and seismic category I makeup should be shown in Tier 1. Since each surge tank is shared between two divisions, the water makeup to the surge tank is necessary for the CCWS to perform its safety function, post seismic event.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09388; dated July 16, 2009; ML092080393.

09.02.02-52

Follow-up to RAI 362-2278, question 09.02.02-28

Based on the staff's review of the applicant's response to RAI 09.02.02-28, the following items should be addressed:

- The proposed revisions to the DCD did not sufficiently address the original RAI. Section 9.2.2 should fully describe and explain what the minimum system heat transfer and flow requirements are for normal operating, refueling, and accident

conditions, the bases for these requirements including limiting assumptions that apply (such as temperature considerations), how much excess margin is available and how this was determined, and what limiting system temperatures and pressures are assumed with supporting basis. In addition, there were no supporting bases for the design. The RAI response should re-address these items and clearly address excess margin that is available.

- The response indicated that DCD Tier 2 Section 9.2.2.2.2.1, "Normal Power Operation," would be revised per an attached markup to clarify CCWS temperature control; however, this attachment did not appear in the response, nor did DCD revision 2 indicate any changes.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09388; dated July 16, 2009; ML092080393.

09.02.02-53

Follow-up to RAI 362-2278, question 09.02.02-29

Original question

The component cooling water system (CCWS) must be capable of removing heat from systems, structures and components (SSCs) important to safety during normal operating and accident conditions over the life of the plant in accordance with General Design Criterion (GDC) 44 requirements. The Design Control Document (DCD) system description does not adequately explain the basis for sizing the CCWS pumps. Considerations that need to be addressed include head losses in the cooling water inlet piping based on full power flow conditions, fluctuations in the supplied electrical frequency, increased pipe roughness due to aging and fouling, fouled filters (if added), maximum pressure drop through the system heat exchangers, and the actual amount of excess margin that is provided by the CCWS pump design including the basis for this determination. In order for the staff to confirm that the CCWS pumps have been adequately sized, the applicant needs to include additional information in Tier 2, DCD Section 9.2.2 to address these considerations.

Follow-up question

Based on the staff's review of the applicant's response to RAI 09.02.02-29, the following item should be addressed:

The intent of the RAI was to solicit a full presentation of the details of the design process and parameters. The brief addition provided in the response has insufficient detail and did not proved the amount of excess margin for the CCWS pump design or state that the full power flow condition were bounding. The applicant is asked to include a description of the design process and quantitative design parameters.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-54

Follow-up to RAI 362-2278, question 09.02.02-30

Based on the staff's review of the applicant's response to RAI 09.02.02-30, the following items should be addressed for items 1 through 4:

Describe the heat loads for individual components (only header heat loads were provided). Describe key assumptions for heat exchanger heat loads. Alternatively, bounding headloads could be provided or calculations could be made available for staff audit.

Describe the flow rates for all safety related or major loads. Describe key assumptions for flow rates or as an alternative, bounding flow rates could be provided or calculations could be made available for staff audit. The flows to these systems are directly relevant to the issue of the design of the CCWS and the data should be compiled in Section 9.2.2.
Address the adequacy of two 50 x 10^6 BTU/Hr CCWS heat exchangers which can remove 190.0 x 10^6 BTU/Hr during safe shutdown conditions.

Provide a description of the heat load and flow rate differences between accident and safe shutdown.

Explain how the minimum required CCWS flow to the CCWS heat exchanger was determined.

Provide flow rates for the CCWS motor cooler or alternatively, provide bounding flow rates.

There is a possible flow rate error for header A2 on Table 9.2.2-5. Under accident conditions, heat loads for header A2 (Table 9.2.2-4) is zero but A2 flow rates is 310 GPM (Table 9.2.2-5). Provide an explanation for this flow rate of 310 GPM or provide a correction to Table 9.2.2-5.

Item 5: For the containment spray heat exchanger outlet valve, explain the basis for why the valves have to be closed initially while in system standby and explain if this valve provides CCWS pump minimum flow protection with the cross connect valves closed. In addition, the text added as part of Revision 2 of the Tier 2 DCD was slightly different from the text provided as a DCD markup to Section 9.2.2.2.1.5 and the words "at once" were added by the RAI response to RAI 09.02.02-36. Determine which DCD markup is correct (between RAI 09.02.02-36 and RAI 09.02.02-30 responses).

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-55

Follow-up to RAI 362-2278, question 09.02.02-31

Based on the staff's review of the applicant's response to RAI 09.02.02-31, the following items should be addressed for items 1, 3 and 4:

Item 1: The text provided by the applicant is not well written and is confusing; therefore, should be corrected in the DCD.

- Describe in the DCD detailed discussion of the MCR controls, permissives and interlocks associated with the header isolation.
- Describe in the DCD a COL Information Item related to the development of procedures (including time durations) for conditions that allow the operator to override an automatic action to reopen the closed the header valves post S+UV or P.
- Section 9.2.2.2.2.6, "Water Hammer Prevention," states that system valves are slow acting; however, Section 9.2.2.2.1.5, "Valves" indicates the header tie line isolation valves will automatically close in about 10 seconds. Provide clarification in the DCD for these two sections (slow acting valves verses 10 second valve closure).

Item 3: Describe in the DCD that the 24" diameter valves which close in less than 10 seconds have been adequately reviewed against water hammer.

Item 4: Valve seat leakage should be discussed in Section 9.2.2 of the Tier 2 DCD and the seat leakage should be limited to a specific maximum amount in the closed position for fulfillment of their required function (ASME OM Code – IST Category A).

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09388; dated July 16, 2009; ML092080393.

09.02.02-56

Follow-up to RAI 362-2278, question 09.02.02-32

Based on the staff's review of the applicant's response to RAI 09.02.02-32, the following items should be addressed.

- Describe the bases for the design arrangement and any operator time restraints for getting this cross-tie aligned.
- Describe any COL information items related to procedures and controls for this abnormal lineup which ties together four safety trains.
- Describe how quickly this line up would be made available since the four locked closed valves would have to be unlocked (locked closed tags would have to be cleared and then four breakers need to be reclosed in the field).
- Describe the main control room controls for the valves.
- Describe the conditions or Technical Specification Modes for when these cross tie valves would be allowed to be opened.
- Describe the Technical Specification LCO when in this lineup and describe the consequences to the operating CCWS divisions.

- Describe the relevant failure modes and effects analysis for this operation.
- Describe any special valve leakage requirements for MOV-234A/B and VLV-231A/B to ensure system flow requirements are maintained to the RCPs.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-57

Follow-up to RAI 362-2278, question 09.02.02-33

Based on the staff's review of the applicant's response to RAI 09.02.02-33, the following items should be addressed.

Item 1: The applicant should address the following concerns:

- The minimum NPSH that is needed for CCWS operation needs to be specified and explained.
- How the required minimum NPSH is satisfied by the system design when taking vortex formation into consideration is not discussed.
- How much excess margin is available for the most limiting case is not included.
- Insufficient information to enable the staff to independently confirm the adequacy of the design with regard to NPSH, including limiting assumptions and supporting justification is not included.
- The proposed DCD text is confusing. The DCD text states, since the difference of installation elevation between the surge tanks and the pumps is large enough, as NPSH available, there is sufficient margin. The applicant should consider revising this statement.
- Describe if the CCWS pumps trip based on sensed low water level in the surge tank.

Item 2: The applicant should address the following concerns:

- Describe in the DCD the bases for the surge tank setpoints water level.
- Describe in the DCD the surge tank design details such as system internal volume, temperature extremes that are accommodated by the design.
- The surge tank volume should be listed in both DCD Tier 1 and Tier 2 sections/tables.
- Describe in the DCD the maximum leakage rate that is assumed including justification.
- Describe in the DCD the key assumptions and conclusions from the design calculations for sizing the component cooling water system surge tanks.
- Since one surge tank services two safety-related CCWS trains, describe in the DCD possible surge tank level instrument interactions.
- Describe in the DCD if the surge tank internal partition plates can be internally inspected (manways provided).

Item 3: Gas accumulation in safety-related system needs to be addressed by the applicant. Gas accumulation is addressed in INPO Significant Event Report (SER) 2-05, "Gas Intrusion in Safety Systems," San Onofre event and information in Generic Letter

(GL) 2008-01, “Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal and Containment Spray Systems. Describe in the DCD that nitrogen accumulation has been adequately evaluated.

Item 4: The following concerns should be addressed in the response:

- Describe in the DCD the surge tank makeup water flow rates requirements.
- Describe in the DCD the makeup water flow paths and their safety related status.
- Describe in Tier 1, DCD Section 2.7.3.3, any safety related makeup water source to the surge tanks. In addition, appropriate Tier 1 requirements should be established for the makeup function.

Item 5: In accordance with Figure 9.2.2-1, vacuum breakers are installed on top of the surge tank. The applicant states in this RAI response that the vacuum breakers are installed ‘in the’ surge tank. The applicant should consider correcting this to “on the” surge tank. Also, note 6 on Figure 9.2.2-1 should be modified to indicate this is a vacuum breaker. In addition, the surge tank vacuum breakers are an important design feature to ensure the surge tanks remain operable under all design conditions and should be shown in the Tier 1 Figures.

Item 6: Provide a discussion in Tier 2, DCD Section 9.2.2 related to the ‘protection functions’ statement in the Technical Specifications Basis, Section B3.7.7 which state that surge tanks in the system provide pump trip protection functions to ensure that sufficient net positive suction head is available. Describe the protection functions in the DCD since the low-low water level alarm on the surge tank is not considered a pump trip protection function.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09388; dated July 16, 2009; ML092080393.

09.02.02-58

Follow-up to RAI 362-2278, question 09.02.02-34

Based on the staff’s review of the applicant’s response to RAI 09.02.02-34, the following items should be addressed.

Item 2: The discussion in response to RAI 09.02.02-34, item 2 should be added to the DCD.

Item 3: Although the additional text explained the re-supply water function and operation of the associated valves (NCS-MOV-445A/B, MOV-447A/B, and MOV-448A/B), it does not discuss the bases for the 4 diameter bypass lines. The discussion should be added to the DCD.

The US-APWR design related to the CCWS supply to the RCPs isolates on a containment isolation signal (MOV-401A and B, MOV-402A and B, MOV-436A and B, and MOV 438A and B) which is counter to the guidance of SRP 9.2.2, Section II. “Acceptance Criteria”, Item 4. D which states:

> "Remote manual isolation of the RCP seal coolant water by the main control room operator for continued long-term pump operation in an actual event".

In addition, SRP 9.2.2. Section III, "Review Procedure," Item 4.F. states:

> "Design provisions are made for isolation of component cooling water supply and return lines to the RCP by remote manual means only".

In accordance with 10 CFR 52.47 (a) (9), an evaluation shall discuss how the proposed alternative provides an acceptable method of complying with the Commission's regulations. The applicant should revise Table 1.9.2-9, "US-APWR Conformance with Standard Review Plan Chapter 9 Auxiliary Systems," stating the bases for an exception or departure related to GDC 44 and the guidance of SRP Section 9.2.2.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-59

Follow-up to RAI 362-2278, question 09.02.02-35

Based on the staff's review of the applicant's response to RAI 09.02.02-35, the following item should be addressed.

The applicant referenced DCD Tier 2, Section 9.2.2.1 stating that the CCWS supply to the RCPs is required by GDC 44. The DCD is unclear as to whether the CCWS supply lines to the RCPs meet the guidance in the SRP and that the component cooling water supply to each pump is designed to withstand a single, active failure or a moderate-energy line crack as defined in Branch Technical Position 3-3 and to seismic Category I, Quality Group C, and American Society of Mechanical Engineers (ASME) Section III Class 3 requirements. The CCWS supply system to the RCPs should be adequately described in the DCD related to the SRP.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-60

Follow-up to RAI 362-2278, question 09.02.02-36

Based on the staff's review of the applicant's response to RAI 09.02.02-36, the staff determined that for except for the ninth (9th) bullet (CCWS radiation monitors), the RAI responses were not adequately described or resolved. Specifically, the interlocks, setpoints, power supplies and logic were not described. Therefore, additional information and details should be provided.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-61

Follow-up to RAI 362-2278, question 09.02.02-37

Based on the staff's review of the applicant's response to RAI 09.02.02-37, the applicant should address how periodic surveillance tests provide adequate assurance that the CCWS safety functions will not be compromised by water hammer events.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09388; dated July 16, 2009; ML092080393.

09.02.02-62

Follow-up to RAI 362-2278, question 09.02.02-38

The staff reviewed the applicant's response to RAI 09.02.02-38. Although this RAI response addresses the issue, this information should be added to the DCD Tier 2 Section 9.2.2. In addition, testing should verify that cavitation is not present in the area of butterfly throttle valves and this testing should be specified in Section 14.2.12.1.87, item C.3.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09388; dated July 16, 2009; ML092080393.

09.02.02-63

Follow-up to RAI 362-2278, question 09.02.02-39

Based on the staff's review of the applicant's response to RAI 09.02.02-39, the applicant's markups of the DCD changes should be incorporated correctly into Revision 2 of the DCD. In addition, misspelled or awkward words should be corrected. For example, 'lecate' should be changed to 'locate' and 'check valves series' should be changed to 'check valves in series'.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-64

Follow-up to RAI 362-2278, question 09.02.02-40

Based on the staff's review of the applicant's response to RAI 09.02.02-40, the applicant should specifically state that the CCWS is designed so that periodic inspections of piping and components can be performed. Also, the extent and nature of all the inspections is not adequately covered in Section 9.2.2 that are outside the scope of the Inservice Testing Programs (ITP), nor are the references to the general inspection procedures adequate (COL Information Items). For example, the surge tanks were not described as

having provisions for the inspection of the internal separation plate. The applicant should describe in the DCD that the surge tank design has provisions for the internal inspections of the separation plate.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-65

Follow-up to RAI 362-2278, question 09.02.02-41

Based on the staff's review of the applicant's response to RAI 09.02.02-41, the applicant should specifically state that periodic pressure and functional testing of components can be performed to assure the structural and leak tight integrity of system components. Also, the extent and nature of all the periodic pressure and functional testing of components is not adequately covered in Section 9.2.2, nor are the references to the general inspection procedures adequate (COL Information Items). Therefore, the applicant should address these items in the DCD.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-66

Follow-up to RAI 362-2278, question 09.02.02-42

Original question
Regulatory Guide (RG) 1.21 "Measuring, Evaluation and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquids and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants" indicates that monitoring should be included for anticipated operational occurrences. Standard Review Plan (SRP) Section 9.2.2, Areas for Review, Section I.10 specifies review of the means provided for detecting leakage of radioactivity from one system to another and for precluding its release to the environment. The staff noted that component cooling water system (CCWS) radiation monitors were discussed in Tier 2, DCD Section 9.2.2 which describes one radiation monitor for each of the two independent subsystems (A and B, C and D) with six radiation monitor sample points located in the A, B, C, D, A-1 and C-1 headers, downstream of the CCWS heat exchangers. The CCWS radiation monitors provide main control room indication and alarms and in the event the radiation setpoint is exceeded, the CCWS surge tank vent valve will automatically close. Based on the staff's review of the CCWS radiation monitors, if radioactively from a higher pressure component leaks to the CCWS it should be detected; however, it was noted from the P&ID of the six monitoring points, only two sample points are normally open and four sample points are locked closed. Based on a review of the information that was provided, the applicant needs to revise the DCD to address the following:

- The CCWS radiation monitors are relied upon for satisfying 10 CFR 20.1406 and GDC 64 requirements and are considered to be important system design

features. Therefore, these monitors should be identified in Tier 1, DCD and shown in Tier 1, Figure 2.7.3.3-1.

- As shown in Tier 2, DCD Figure 9.2.2-1, four of the root valves for CCWS radiation monitoring are shown as locked closed. In the event the A and B or C and D headers become isolated (safety injection with bus under voltage, high containment pressure, low surge tank level) there will be no available system radiation monitoring since the root valves are lock closed. The bases for the lock closed valves radiation root valves need to be described in the DCD.

Follow-up question

Based on the staff's review of the applicant's response to RAI 09.02.02-42, the applicant should describe what actions are required to align the radiation monitors after the cross-tie valves between divisions are closed and the CCWS divisions are 'split out' and required actions to isolate the radiation monitor on the header now without CCWS flow. This could be described as a COL Information Item to develop procedures for the isolation and realignment of the CCWS radiation monitors. In addition, since the primary makeup water system (PMWS) and refueling water storage system (RWS) supply the surge tanks for backup makeup water and both water sources are potentially contaminated, address how a single 'normally closed' isolation valve is sufficient to prevent the CCWS from becoming contaminated.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.

09.02.02-67

Follow-up to RAI 362-2278, question 09.02.02-44

Based on the staff's review of the applicant's response to RAI 09.02.02-44, the following previously identified items need to be further addressed.

Item 1: The staff was unable to accept the response since the RAI response did not provide a DCD markup of the changes that will be incorporated into Tier 2, Section 9.2.2. Therefore, the DCD markup for the changes should to be provided.

Item 3: The staff was unable to accept the response since the proposed DCD markup was not correctly incorporated in Revision 2 of the DCD. Therefore, the DCD markup for the changes should to be provided. Or, verify that the response incorrectly referenced section 9.2.2.4.1, instead of 9.2.2.4.2, for which there was a markup which was correctly incorporated in Revision 2 of the DCD.

Item 7: In order to perform a complete evaluation of the system, Tier 1, should state how the system maintains temperature and how flow is controlled.

Items 8 and Item 10: The staff was unable to accept the response since it was unclear as to whether the surge tank is sized for system leakage for 7 days without makeup or if credit is taken for a seismic source for 7 days. The tank size and seismic makeup should be address in Tier 1.

Item 11: The staff was unable to accept the response since instrumentation was not described on the Tier 1 figures. The applicant should describe if any of the following apply for the CCWS (see SRP 14.3 Appendix C I B, “Figures”);

- As a minimum, the instruments (pressure, temperature, etc.) required to perform Generic Technical Guidelines (e.g., ERGs, EPGs)(as described in the DCD Tier 2 Chapter 18) should be shown on the figures, or described in the design description (DD).

- The minimum inventory of alarms, indications, and controls, if established in the main control room or remote shutdown panel ITAAC, do not have to be discussed in individual DD's or shown on figures. Other "essential" alarms (e.g., associated with shutdown cooling system (SCS) high pressure, SCS performance monitoring indications) not part of the minimum inventory should be shown on the figures.

- Identification of all alarms, displays and controls on the remote shutdown panel should be included in the system diagram or alternatively in the remote shutdown panel ITAAC.

Item 14: The staff was unable to accept the response since the proposed DCD markup and the information that was incorporated into Revision 2 of the DCD was different (flow mark numbers).

Item 15: The staff was unable to accept the response since the Tier 1 figures and Tier 2 figures disagree. Specifically, the placement of the thermal barrier cross-tie header is upstream of the charging pump as shown on the Tier 2 figures and the placement of MOV-234A/B are incorrect on the Tier 1 figures. Check valves VLV-231A and VLV-231B are important design features as part of the thermal barrier cross-tie and should be shown in the Tier 1 figures.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09388; dated July 16, 2009; ML092080393.

09.02.02-68

Follow-up to RAI 362-2278, question 09.02.02-45
Based on the staff’s review of the applicant’s response to RAI 09.02.02-45, the following previously identified items need to be further addressed.

Item (1)1: The power supplies for the CCWS valves are not specifically included in Tier 1 DCD Table 2.7.3.3-2. This table only references the components as being Class 1E powered. In addition, the specific Class IE power was not listed for valves that are non-divisionalized, such as NCS-MOV-511, -517, and NCS-AOV 601, -602, -661A, -661B, -662A, and -662B etc. Table 2.7.3.3-2 should clearly state the divisional power supplies for each component.

Item (1)2: The specific heat removal rate was not identified in the ITAAC and should be included in Tier 1 ITAAC.

Item (1)3: It was stated that the applicant will revise the description, but the markup of the description was not provided. In addition, the PSMS column for Tier 1 Table 2.7.3.3-2, listed MOVs that close on containment isolation signals “phase a” or “phase b” which are not described in Tier 2 Table 6.2.4-3, “List of Containment Penetrations and System Isolation Position,” This Tier 2 table lists containment isolation signals as “T” and “P”. The Tier 1 and Tier 2 information related to isolation signals should be consistent.

Item (1)4: The response did not include the detail requested by the staff. That is, the CCWS pump testing should demonstrate that adequate net positive suction head, at the maximum CCWS flow rate conditions, with the inventory in the surge tank at the lowest allowable level (as corrected to account for actual temperature). The maximum CCWS flow rate and minimum allowable surge tank water level, along with the corresponding design basis water temperature that apply need to be listed to assure that test conditions are properly established.

Item (2): Flow rates for the important user should be provided in Tier 1.

Item (3)1: In response to RAI 09.02.02-45 the applicant listed an elevated surge tank and slow acting system valves as design features to minimize water hammer. In addition, it was noted in the response to RAI 09.02.02-31, Item 3, and added text to Tier 2, Section 9.2.2.2.1.5, “Valves.” It indicates that the header tie line isolation valves will automatically close in about 10 seconds (which is not considered a slow acting valves) and a potential for a system water hammer event. The applicant should consider an ITAAC of the fast closing valves in Tier 1 to verify that a water hammer event does not occur.

Item (3)4: The surge tank volume verification should be added to the Tier 1 ITAAC as stated in the SRP 14.3 Appendix C I.A.iii.(5) and the safety-related or seismic qualified makeup water supply should be added in Tier 1 ITAAC for the 7 days leakage requirements. Specifically, the capacity of the surge tank should be verified if the tank is needed to perform the direct safety function. For example, in the case of the RCW surge tank a certain volume is required to meet the specific system leakage assumptions.

Item (3)5; The Tier 1 markup for valves NCS-VLV-016A, B, C, D was incorporated differently in Revision 2 of the DCD. In addition, check valves NCS-VLV-231A/B (thermal barrier cross-tie) are missing from the Tier 1 Tables.

Item (3)6: The Tier 1 markup was not provided as part of the applicant’s response and these should be provided.

Item (4): Numeric values; for example heat transfer, flow rates and valve timing, were not provided in the RAI response and the RAI was not adequately addressed.

Reference: MHI's Responses to US-APWR DCD RAI No. 362-2278; MHI Ref: UAP-HF-09333; dated June 19, 2009; ML091760624.