MITSUBISHI HEAVY INDUSTRIES, LTD.
16-5, KONAN 2-CHOME, MINATO-KU
TOKYO, JAPAN

June 8, 2010

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-10160

Subject: MHI's Responses to US-APWR DCD RAI No. 571-4365

Reference: [1] "Request for Additional Information No. 571-4365 Revision 0, SRP Section: 09.02.02 – REACOR AUXILIARY COOLING WATER SYSTEM – Design Certification and New License Applicants, Application Section: 9.2.2," dated April 13, 2010.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Response to Request for Additional Information No. 571-4365 Revision 0".

Enclosed are the responses to questions 9.2.2-47 to 68 of the RAI (Reference 1).
Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of the submittals. His contact information is below.

Sincerely,

Y. Ogata

Yoshiki Ogata,
General Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosure:

CC: J. A. Ciocco
C. K. Paulson

Contact Information
C. Keith Paulson, Senior Technical Manager
Mitsubishi Nuclear Energy Systems, Inc.
300 Oxford Drive, Suite 301
Monroeville, PA 15146
E-mail: ck_paulson@mnes-us.com
Telephone: (412) 373-6466

D081
NRO

Docket No. 52-021
MHI Ref: UAP-HF-10160

Enclosure 1

UAP-HF-10160
Docket No. 52-021

Responses to Request for Additional Information
No. 571-4365 Revision 0
(Follow up to No. 362-2278 Revision 0)

June 2010

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:

The fourth sentence of the previous answer to Question 09.02.02-47 submitted by the reference noted above should be revised as follows:

"All piping and valves associated with headers A2 and C2~~, except containment isolation portions,~~ are equipment class 4, quality group D **except as noted in Tier 2 DCD Table 3.2-2.**"

Impact on DCD
None

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:

Tier 2 DCD Subsection 9.2.2.2 will be revised to include the detail from the previous RAI response.

Additionally please see the follow up responses to Questions 09.02.02-55 and 09.02.02-63 along with the associated Tier 2 DCD Subsection 9.2.2.2.1.5, first and seventh bullets respectively.

Impact on DCD
DCD Tier 2 Subsection 9.2.2.2 will be revised as follows:

There is the header tie line between trains A and B, and between trains C and D. The header tie line in each subsystem branches into two loops **A1 and A2 from the Header Tie Line between A and B and C1 and C2 from the Header Tie Line between C and D**. See Table 9.2.2-1 for the components supplied by each loop.

The impacts of non-safety related SSC failures in the CCW system will not adversely affect safety-related SSCs to perform their safety related function since the direct impact of a pipe break in the non-safety portion of the system can be accommodated. **Each non-safety CCW header is isolated by the motor operated Header Tie Line Isolation Valves and the air operated Isolation valve between seismic category I portion and non-seismic category I portion. Motor operated valves NCS-MOV-020A, NCS-MOV-020B, NCS-MOV-020C and NCS-MOV-020D on supply side are located upstream of the manual valves NCS-VLV-033A and NCS-VLV-033B. Motor operated valves NCS-MOV-007A, NCS-MOV-007B, NCS-MOV-007C and NCS-MOV-007D on return side of these headers are located downstream of the manual valves NCS-VLV-034A and NCS-VLV-034B. Air operated valves NCS-AOV-601, NCS-AOV-602, NCS-AOV-661A, NCS-AOV-661B, NCS-AOV-662A and NCS-AOV-662B are located on R/B side between seismic category I portion and non-seismic category I portion. All non-safety related components are supplied from two non-safety CCW headers A2 and C2 (refer to Table 9.2.2-1). After Header Tie Line Isolation valves close, the operators open the Header Tie Line Isolation valves to re-establish flow to RCP, Charging pump and SFP Heat exchanger. Since pipe between manual valve and AOV is Seismic category II, the pipe is not susceptible to failure. Therefore,** the CCW system's safety function will be maintained as a result of the nonsafety-related piping failure, and the indirect impact of the pipe break will not impact any SSC safety function.

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:
Since emergency makeup flow rate capacity to the surge tanks is 5 gpm or more, the leak rate testing is not added to the IST for the 14 valves that automatically close on a sensed low-low surge tank level.

In addition, the safety related mission of transfer closed shown in Tier 2 DCD Table 3.9-14 is correct for these valves.

Impact on DCD
None

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:

1. The following is added to the RAI response for other CCWS headers which penetrate containment.

   "At the RCP thermal barrier part, it is possible that two-phase flow is generated because of the temperature rise due to the isolation of the header or the containment, etc. during an accident. In this case, water hammer is prevented by operator action such as following a valve opening procedure or very small opening of throttling valves. **Other CCWS headers (cooling water supply lines to the excess letdown heat exchanger and the letdown heat exchanger) which penetrate containment do not need to be realigned after containment isolation.** "

2. Tier 2 DCD Subsection 9.2.2.2.2.6 will be revised to address throttling operation of RCP cooling water supply line containment isolation bypass valve.

3. When a seismic event occurs that drains down the CCWS surge tank due to a failure of the non-safety related portion of the piping, the possibility that water hammer by boiling

will occur in the CCWS is low (See Impact on DCD below).

Impact on DCD
DCD Tier 2 Subsection 9.2.2.2.2.6 will be revised as follows:

The CCWS is designed in consideration of water hammer prevention and mitigation in accordance with the following as discussed in NUREG-0927. An elevated surge tank to keep the system filled and layout ensures that the fluid pressure is above saturation conditions at all locations.

- Vents for venting components and piping at all high points in the system.
- After any system drainage, venting is assured by personnel training and procedures
- Periodic In-service and Surveillance testing
- **Throttling operation of RCP cooling water supply line containment isolation bypass valve during accident.**

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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-9388; dated July 16, 2009; ML092080393.

ANSWER:

Item 2: DCD Subsection 9.2.2.1.2 will be revised to reference system parameter for operating modes as provided in Tier 2 DCD Tables 9.2.2-4 and 9.2.2-5.

Item 4: Tier 1 DCD Table 2.7.3.3-2 is provided in a standard format used for all Tier 1 system information and the format should not be changed independent of the other section tables. It is noted in Tier 1 Subsection 2.7.3.3 that:

> "The CCWS components identified in Table 2.7.3.3-2 as Class 1E are powered from their respective Class 1E divisions, and separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable."

Tier 2 DCD Subsection 9.2.2.2 will be revised to elaborate on the assignments.

Item 6: The surge tank water normal makeup is not directly significant to the safety function of the CCWS. Therefore, MHI believes it is unnecessary to include the surge tank water normal makeup line in Figure 2.7.3.3.-1.

DCD Tier 1 figure 2.7.3.3-1 will be revised to show the surge tank water seismic category I makeup Line.

Impact on DCD
DCD Tier 2 Subsection 9.2.2.1.2.1 will be revised as follows:

The CCWS is sized such that the component cooling water supply temperature to plant components is not more than 100°F. **Design values for heat load and flow during normal operation are shown in Tables 9.2.2-4 and 9.2.2-5 respectively.**

DCD Tier 2 Subsection 9.2.2.1.2.2 will be revised as follows:

The component cooling water system is sized to reduce the temperature of the reactor coolant system from 350°F at approximately 4 hours after reactor shutdown to 140°F using 4 trains while maintaining the component cooling water supply below 110°F. **Design values for heat load and flow during normal plant cooldown are shown in Tables 9.2.2-4 and 9.2.2-5 respectively. If required, CCW temperature is adjusted by adding or shutting down additional CCW trains.**

DCD Tier 2 Section 9.2.2.2 will be revised as follows:

Electrical power to the CCWS is supplied from Class 1E buses that are backed up by Class 1E power supply so that the system is capable to operate during a loss of off site power.
Four train components designated A, B, C, or D are powered from 1E divisions A, B, C, or D as are the instruments for each train. Inside and Outside containment isolation valves are different Class-1E power source trains. In addition, the valves in series, such as NCS-AOV-601 and 602, are powered from different Class-1E power source trains.

Please see the Response to Question 09.02.02-57 regarding correction of DCD Tier 1 Figure 2.7.3.3-1.

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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 Subsection 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.

ANSWER:

- Please refer to table 9.2.2-4 provided in Tier 2 DCD Revision 02 for heat transfer and flow requirements. Also please see Tier 2 DCD Subsection 5.4.7.3 for heat balance methods and assumptions. Tier 2 DCD Subsection 9.2.2.2.1.1 will be revised to clarify key assumptions and bases. Additional assumptions and margins are contained in specific sizing calculations. These calculations are to be available for audit by the NRC staff.

- CCW heat exchangers are designed so that it may be possible to remove heat load from each component, even if design assumption if the ESW temperature reaches its design limit of 95°F. In addition, CCW temperature is not controlled by ESW flow rate.

Impact on DCD
DCD Tier 2 Section 9.2.2.2.1.1 will be revised as follows:

The CCW HXs are designated quality group C as defined in Regulatory Guide 1.26 (Ref. 9.2.11-3), seismic category I, and are designed in accordance with the requirements of the ASME Section III, class 3. **The heat transfer capacities of heat exchangers are designed so that it may be possible to remove heat load during all modes of operation.**

The heat exchangers are sized to provide cooling water at no greater than 100 °F during normal operation and at no greater than 110 °F during shutdown operation. The heat exchanger fouling factors are based on each heat exchanger in accordance with manufacturer's standards and the system water chemistry.

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:

Design processes including sizing of components of all US APWR systems including the CCWS are conducted in accordance with accepted engineering practices and in conformance with the appropriate codes and standards as described in DCD Tier 2 Chapter 3. Please see the response to Question 09.02.02-52 and Question 09.02.02-57 regarding of Tier 2 DCD Subsections 9.2.2.2.1 and 9.2.2.2.3 to clarify key assumptions and bases. Also please see Tier 2 DCD Subsection 5.4.7.3 for heat balance methods and assumptions. Additional assumptions and margins are contained in specific sizing calculations for the CCW System as well as all other US APWR Systems. These calculations are to be, available for audit by the NRC staff.

In addition, the pump design flow rate shown in Table 9.2.2-2 has a margin enough to the demand flow rate shown in Table 9.2.2-5.

Impact on DCD
DCD Tier 2 Subsection 9.2.2.2.1.2 will be revised as follows:

The pumps are designed in consideration of head losses in the cooling water inlet piping based on full power flow conditions, increased pipe roughness, maximum pressure drop through the system heat exchangers, and the actual amount of excess margin etc. **The pump design flow rate shown in Table 9.2.2-2 has a margin enough to meet the required flow rate shown in Table 9.2.2-5.**

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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 106 BTU/Hr CCWS heat exchangers which can remove 190.0 x 106 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.

ANSWER:

Items: 1-4: Calculations showing individual heat loads and flow rates including the CCW pump motor cooler as well as the overall sizing of the CCW heat exchanger are available for audit by the NRC Staff.

During plant normal condition, the CCWS is designed so that the temperature of the cooling water to be supplied will be 100°F when the temperature of the ESW is 95°F. In safe shutdown condition, the CCWS is designed to cool the RCS to 200°F within 36 hours from reactor shutdown, together with operation of the RHRS. CCW temperature in safe shutdown condition is limited to a maximum of 110°F. Therefore, CCWS is able to remove 190.0 x 10^6 BTU/Hr during safe shutdown conditions by permitting the rise of CCW water temperature.

Heat removal capability of safe shutdown is described in Tier 2 DCD Section 5.4.7 and shown in figures 5.4.7-5 and 5.4.7-6.

Under accident condition (e.g., LOCA) significant sensible heat is removed by the resulting accident condition as well as the operating safety systems (Safety Injection and Containment Spray). For safe shutdown as described in Tier 2 DCD Subsection 5.4.7.2.3.4 all heat removal is through the RHRS to the CCWS.

Table 9.2.2-4 reflects flow through some components without appreciable heat load following reopening of Header Tie Line Isolation valves.

Item 5: Circulation through the CS/RHR heat exchanger while they are in the standby mode is undesirable in that it would significantly increases the flow and hence the power drawn by the CCW pumps and would be an overall plant inefficiency. It plays no role in minimum flow protection. The phrase "at once" is inexact and will be deleted from Tier2 DCD Subsection 9.2.2.2.1.5.

Impact on DCD
Please see the Response to Question 09.02.02-55 about correction of DCD Tier 2 Subsection 9.2.2.2.1.5.

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:
Item 1 and 3:
Tier 2 Subsection 9.2.2.2.1.5 has been revised for clarity. The clerical error closure time has been corrected to "within 30 seconds". The 30-second closure time of the cross-connect valves ensures to reduce the probability of water hammer occurrence.
Item 1: Tier 2 Subsection 9.2.2.2.1.5 will be revised for clarity and adds that operating procedures

for reopening Header Isolation Valves is defined in Subsection 13.5.2.

Item 4: Please see the Response to Question 09.02.02-49.

Impact on DCD
DCD Tier 2 Subsection 9.2.2.2.1.5 first bullet will be revised as follows:

· **Header tie line isolation valve**

The function of this motor operated valve is to separate each subsystem into two independent trains during abnormal and accident conditions. This ensures each safety train is isolated from any potential passive failure in the non-safety portion or another safety train of the CCWS. This valve **is remotely operated from the MCR and is** automatically close~~ds at once~~ upon the following signals:

- Low- low water level signal of a CCW surge tank
- ECCS actuation signal and under voltage signal
- Containment Spray signal

Each safety train has both a Supply and Return Header Tie Line Isolation Valve so that a single failure of one of the safety trains will not impact the other safety trains. ~~Header isolation meets the single failure criteria by incorporating two header tie line isolation valves.~~ The header isolation valves are designed to close within 30 seconds upon a**n** S+UV signal, P signal, or surge tank water low-low level. Then, in order to resume supply of the cooling water to the RCP thermal barrier heat exchanger and the spent fuel pit heat exchanger, the isolation signal can be bypassed and the isolation valves ~~respone~~d**reopened**. In addition, the header isolation valves are opened in order to supply cooling water to A, B, A1 and A2 trains (or C, D, C1 and C2 trains) by one CCW pump during normal operation. **A milestone schedule for implementation of the operating procedure for bypassing and reopening Header Tie Line Isolation Valves is defined in Subsection 13.5.2.**

The Header Tie Line Isolation Interlock is described Subsection 7.6.1.5. and shown in Figure 7.6-6. The actuation logic is shown in Figure 7.2-2 (sheet 12).

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:
Tier 2 DCD Subsections 9.2.2.2.2.1 will be revised to provide additional detail regarding RCP cross tied operation and adds that the preparation of procedures for operation with one CCW train isolated for maintenance is defined in Subsection 13.5.2.

The RCP cross ties are required to be open only when one of the four trains of CCW are isolated for maintenance and there is a failure in the operating train of that subsystem. Isolation for maintenance is a planned evolution to be conducted in accordance with the procedure required above. Since LCO 3.7.7 requires three trains of CCW be operable, conduct of maintenances in this system alignment is completed within the Technical Specification limits. There are no special

leakage requirements or special controls.

Impact on DCD
DCD Tier 2 Subsection 9.2.2.2.2.1 first bullet will be revised as follows:

CCWPs which are not in service are placed in standby and automatically start upon a low pressure signal of CCW header pressure.

During normal power operation one of the two standby trains of CCW may be isolated for maintenance. Opening the RCP Cross Tie Isolation Valves provide a flow path for RCP cooling if there should be a failure of the operating train in Subsystem with the isolated CCW train.

A milestone schedule for implementation of the operating and maintenance procedures for isolating one train of CCW for maintenance including the use of RCP cross connect valves to provide seal cooling in the case of CCW failure with one train isolated is defined in Subsection 13.5.2.

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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 as 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.

ANSWER:

- Item 1: Design processes including specification of minimum required NPSH and calculation of available NPSH of all US APWR pump including the CCW Pumps are conducted in accordance with accepted engineering practices and in conformance with the appropriate codes and standards as described in DCD Tier 2 Chapter 3. Tier 2 DCD Subsection 9.2.2.2.1.2 will be revised to clarify the text. Additional assumptions and margins are contained in specifications and calculations for the CCW System as well as all other US APWR Systems. These specifications and calculations are to be available for audit by the NRC staff. In addition, the CCWS pumps do not trip by low water level in the surge tank.

- Item 2: Tier 2, DCD Subsection 9.2.2.2.1.3 will be revised to further describe the Surge tank design. Tier 1 DCD Table 2.7.3.3-5 will be revised to include Surge Tank Volume.

- Item 3: Tier 2, DCD Subsection 9.2.2.2.1.3 will be revised to address gas accumulation.

- Item 4: Tier 2, DCD Subsection 9.2.2.2.1.3 will be revised to clarify the description of makeup water requirements. See the response to RAI 09.02.02-51 regarding the addition of make up water sources to Tier 1 DCD Subsection 2.7.3.3.

- Item 5: DCD Tier 1 Table 2.7.3.3-1 will be revised to add vacuum breaker.
  In addition, the symbol for vacuum breakers is shown in Figure 1.7-1. Therefore, Note 6 on Figure 9.2.2-1 does not need to be revised to indicate this is a vacuum breaker.

- Item 6: Tier 2 DCD Subsection 9.2.2.2.1.2 will be revised to add the statement from the approved PWR Standard Technical Specification Bases.

Impact on DCD
Please see the Response to Question 09.02.02-57 about correction of DCD Tier 1 Figure 2.7.3.3-1.

DCD Tier 2 Subsection 9.2.2.2.1.2 will be revised as follows:

The pumps are designed in consideration of head losses in the cooling water inlet piping based on full power flow conditions, increased pipe roughness, maximum pressure drop through the system heat exchangers, and the actual amount of excess margin etc.

The component cooling water surge tank is located at a higher elevation (upper level of the Reactor Building) than the component cooling water pumps (lower level of the Reactor building). This provides a pump trip protective function by ensuring flooded suction and maintaining a constant pressure at the suction side of the pump with sufficient Net Positive Suction Head.
~~The surge tanks are located at a higher elevation than the pumps to ensure sufficint NPSH margin is available.~~

DCD Tier 2 Subsection 9.2.2.2.1.3 will be revised as follows:

The CCW surge tanks are constructed of carbon steel and located in the upper level of the Reactor Building. They are connected to the suction side of the CCWP. The surge tank accommodates the thermal expansion and contraction of the cooling water and potential leakage into or from the CCWS **over the full range of operating conditions.** Makeup water is supplied to the respective surge line.
The CCW surge tank is designated quality group C as defined in Regulatory Guide 1.26, seismic category I, and is designed to the requirements of the ASME Subsection III, class 3.
In case of a small leak out of the system, makeup water is supplied as necessary until the leak is isolated.
The makeup water can be supplied from the following systems:

- Demineralized water system (DWS) which supplies the demineralized water
- Primary makeup water system (PMWS) which supplies the deaerated water and primary makeup water
- Refueling water storage system (RWS) which supplies the refueling water

Deaerated water is used for initial filling of this system and demineralized water is used for automatic makeup when the tank water level reaches a low level setpoint.
If necessary, primary makeup water and refueling water may be used during an emergency.
Refueling water storage pit is water source of seismic category I.

Water chemistry control of CCWS is performed by adding chemicals to the CCW surge tank to prevent long term corrosion that may degrade system performance. The CCW in the surge tank is covered with nitrogen gas to maintain water chemistry. **The elevation of the surge**

tank and piping arrangement avoids the potential for nitrogen accumulation elsewhere in system.
In order to provide redundancy for a passive failure (a loss of system integrity resulting in abnormal leakage), an internal partition plate is provided in the tank so that two separate surge tank volumes are maintained. **Accessibility is provided for inspection of the partition plate.**
The CCW surge tank **normal free** capacity of 50% is able to ~~receive the amount~~ **accommodate** ~~of inleak~~ **maximum expected leak rate** from RCP thermal barrier **Heat Exchanger**~~x~~ **over the time frame of 3 minutes to detect and isolate the leak** ~~in consideration of isolation time.~~ **Relief valves provide overpressure protection and discharge to the Reactor Building sump.**
~~Regarding the makeup water source of T~~the RWSP ~~to be~~**provides a** seismic category I~~, this~~ makeup water source ~~provides~~**with the** capacity to accommodate **maximum expected** system leakage for seven days. Makeup water supply is performed by an operator by locally operating the manual valves. A vacuum breaker is installed on the surge tank to prevent damaging the tank in the event of a sudden decrease in water level.

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:

- Item 2: Tier 2, DCD Subsection 9.2.2.3.2 will be revised to describe why there is low potential for leakage into the RCS.

- Item 3: The 8 inch lines and valves are sized for all plant operating conditions. The 4 inch by pass lines and valves are intended to only provide sufficient cooling for the RCP thermal barrier under the conditions associated with containment isolation. Specific sizing calculations are available for NRC audit. Tier 2 DCD Subsection 9.2.2.3.5 will be revised per the attached markup to describe that the 4 inch by pass provides sufficient cooling water following containment isolation.

- New item: Tier 2, DCD Table 1.9.2-9 will be revised to state: "conformance with exception; Automatic isolation with remote manual restoration of flow to RCP seals for continued long term cooling". Automatic isolation of safety trains ensures that cooling water will be available under accident conditions and meets SRP 9.2.2. Acceptance Criteria 4A, B & C Manual restoration after evaluation of the CCWS operation ensures continued long term cooling to the RCP seals.

Impact on DCD

DCD Tier 2 Subsection 9.2.2.3.2 will be revised as follows:

Seismic Category I make up to the component cooling surge tank is available from the refueling water storage pit. **Component cooling water leakage to the RCS would only occur when the RCS pressure falls below the CCWS pressure. The RCS pressure falls below the CCWS pressure only during plant shutdown, and a load which is so large as to cause damage to the thermal barrier is unlikely because the RCS side is at low temperature and low pressure. For these reasons, it is considered that there is a very low potential for inleakage of component cooling water into the RCS.**

DCD Tier 2 Subsection 9.2.2.3.5 will be revised as follows:

To re-supply water to the thermal barrier after the isolation of the containment vessel during an accident, the cooling water for the thermal barrier is ensured by opening 4 **inch bypass valves** NCS-MOV-445A/B, NCS-MOV-447A/B, and NCS-MOV-448A/B **which will provide sufficient cooling to the thermal barrier with RCPs idle following containment isolation**.

DCD Tier 2 Table 1.9.2-9 will be revised as follows:

Table 1.9.2-9 US-APWR Conformance with Standard Review Plan Chapter 9 Auxiliary Systems (sheet 7 of 30)

SRP Section and Title	SRP Excerpt Indicating Acceptance Criteria for DCD	Status	Appears in DCD Chapter/Section
9.2.2 Reactor Auxiliary Cooling Water Systems	1. Protection Against Natural Phenomena. Information that addresses the requirements of GDC 2 regarding the capability of structures housing the reactor auxiliary CWS and the reactor auxiliary CWS itself to withstand the effects of natural phenomena will be considered acceptable if the guidance of Regulatory Guide (RG) 1.29, Position C.1 for safety-related portions of the reactor auxiliary CWS and Position C.2 for nonsafety-related portions of the reactor auxiliary CWS are appropriately addressed. 2. Environmental and Dynamic Effects. Information that addresses the requirements of GDC 4 regarding consideration of environmental and dynamic effects will be considered acceptable if the acceptance criteria in the following SRP sections, as they apply to the reactor auxiliary CWS, are met: SRP Sections 3.5.1.1, 3.5.1.4, 3.5.2, and SRP Section 3.6.1. In addition, the information will be considered acceptable if the design provisions presented in GL 96-06 and GL 96-06, Supplement 1 are appropriately addressed. 3. Sharing of SSCs. Information that addresses the requirements of GDC 5 regarding the capability of shared systems and components important to safety to perform required safety functions will be considered acceptable if the use of the reactor auxiliary CWS in multiple-unit plants during an accident in one unit does not significantly affect the capability to conduct a safe and orderly shutdown and cool-down in the unaffected unit(s).	Conformance with ~~no exceptions identified.~~ conformance with exception; Automatic isolation with remote manual restoration of flow to RCP seals for continued long term cooling	9.2.2

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:

Tier 2 Subsection 9.2.2.2.1.4 will be revised to address CCWS piping to the RCPs.

Impact on DCD
DCD Tier 2 Subsection 9.2.2.2.1.4 will be revised as follows:

Carbon steel is used for the **CCWS** piping ~~of the CCWS~~. Piping joints and connections are welded, except where flanged connections are required.

CCWS supply lines which supply cooling water to the safety related SSCs and to the RCPs are designed to withstand the high energy line break (HELB) as defined in BTP ASB 3-1, and to the requirements of seismic Category I, Quality Group C, and ASME Section III Class 3.

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:
The level of detail provided is consistent with that of other sections of the US APWR Submittal. Additional design details such as setpoint calculations, logic and interlock diagram are to be available for NRC Audit.

Impact on DCD
None

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:
Please see the Response to Question 09.02.02-50 and Tier 2 Subsection 9.2.2.2.2.6 which has been revised address periodic in-service testing and surveillance.

Impact on DCD
None

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:

Tier 2 Subsection 14.2.12.1.87 item D.3 will be revised to add an acceptance criteria.

Impact on DCD
DCD Tier 2 Subsection 9.2.2.2 will be revised as follows:

Butterfly valves are used to set or adjust flow for some components in the CCWS design. However, severe throttling, resulting in large pressure drops and cavitations are avoided through appropriate sizing. Testing and flow balancing will verify correct sizing. Once positioned, frequent repositioning of the valves is not intended.

DCD Tier 2 Subsection 14.2.12.1.87 item D.3 Acceptance Criteria will be revised as follows:

System flows are balanced, as required, and then verified in each mode of operation. **Cavitation is not present in the area of butterfly throttle valves.** Testing includes verification of coolant flow to the thermal barrier via cross-tie.

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:

DCD Tier 2 Subsection 9.2.2.2.1.5 will be revised with noted corrections.

Impact on DCD
DCD Tier 2 Subsection 9.2.2.2.1.5 seventh bullet will be revised as follows:

· **Isolation valve between seismic category I portion and non-seismic category I portion**

The CCW system supplies cooling water to components located in the non-seismic Category I buildings (turbine building and auxiliary building). Each CCW supply line (A2 and C2) has two in-series air operated isolation valves. **These valves close automatically to protect against out-leakage from the seismic category I portion of the CCWS due to a leak in the non-seismic category I portions. Following automatic closure, these valves remain closed isolating the associated non safety components if Header Tie Line Isolation Valves are reopened to establish cooling to headers A1 and C1.** ~~Each CCW supply line (A2 and C2) has two in series air operated isolation valves. These valves close automatically to isolate the non-seismic Category I portion of the CCW system upon receipt of a S+UV signal, P signal or surge tank low-lwo level signal.~~ In-series check valves are provided on the CCW return lines from the non-seismic Category I portion of the CCW system (See Figure 9.2.2-1, Sheet 9 of 9)

The CCW supply header (A2 and C2) isolation valves close automatically when one of the

following occurs (See Figure 9.2.2-1, Sheet 9 of 9).

The isolation valves on auxiliary building supply line **close on:**

- Low- low water level signal of the component cooling water surge tank
- ECCS actuation signal
- Containment spray signal

~~b)~~The isolation valves on turbine building supply line **close on:**

- Low- low water level signal of the component cooling water surge tank
- ECCS actuation signal and under voltage signal
- Containment spray signal

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:
Tier 2 DCD Subsection 9.2.2.1.1 contains the following Safety Design Bases:

- The CCWS is designed for periodic inservice testing and inspection of components in accordance with ASME Code Section XI.

Tier 2 DCD Subsection 9.2.2.2 will be revised to specifically state that the CCWS is designed so that periodic inspections of piping and components can be performed. Regarding Inspection of the Surge tank please see the response to Question 09.02.02- 33 and the associated markup to Tier 2 DCD Subsection 9.2.2.2.1.3.

Impact on DCD
DCD Tier 2 Subsection 9.2.2.2 will be revised by adding the following before Subsection 9.2.2.2.1 as follows:

The CCWS is designed so that periodic inspections of piping and components can be performed.

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:
Tier 2 DCD Subsection 9.2.2.4.2 will be revised to specifically state that periodic pressure and functional testing of components can be performed to assure the structural and leak tight integrity of system components.

Impact on DCD
DCD Tier 2 Subsection 9.2.2.4.2 will be revised as follows:

Periodic pressure and functional testing of components will be performed to assure the structural and leak tight integrity of system components. Pumps and valves are inspected in accordance with Section XI of the ASME code. During normal operation, the standby pump and CCW HX are periodically tested for operability or, alternatively, placed in service in place of the train which has been operating. **Routinely during plant shutdown, automatically operated pumps and valves are tested in accordance with surveillance requirements SR 3.7.7.2 and SR 3.7.7.3.** Additionally periodic flow testing is performed to verify correct flow balancing among individual heat loads.

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:
Tier 2 DCD Subsection 9.2.2.5.2 will be revised for the isolation and realignment of the CCWS radiation monitors.
Normally closed valves NCS-VLV -062 A/B, NCS-VLV -063 A/B, NCS-VLV -064 A/B and NCS-VLV -066 A/B provide two valve isolation from PMWS and RWS.

Impact on DCD
DCD Tier 2 Subsection 9.2.2.5.2 will be revised as follows:

Radiation monitors are located downstream of the supply headers and the signal is ~~indicated~~ **displayed** in the MCR. When the signal exceeds the setpoint, an alarm is transmitted and the CCW surge tank vent valve is closed. **After header tie line isolation, the radiation monitor line root valves are operated in order to realign radiation monitoring.**

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:
Item 1: Tier 2 DCD Section 9.2.2 Rev 2 incorporates the previous markups. That, along with the new markups provided in this submittal, provides the required level of detail for Tier 2 material consistent with previously approved certifications.

Item 3: It is verified that the previous response incorrectly referenced section 9.2.2.4.1, instead of 9.2.2.4.2, for which there was a markup that was correctly incorporated in Revision 2 of the DCD.

Item 7: Please see the response to question 09.02.02-52.

Item 8 and 10: Please see the response to RAI 09.02.02-51 regarding the addition of makeup water sources to Tier 1 DCD Figure 2.7.3.3-1 and Question 09.02.02-57 regarding the addition of Surge Tank volume to Tier 1 DCD Table 2.7.3.3-5.

Item 11: The Information requested is provided in the Tier 2 P&IDs and as such is available for review. Inclusion for certification in the Tier 1 flow diagrams is not warranted in that it is not high level information. Additionally it is not consistent with the remainder of the US APWR Tier 1 submittal nor, based on review of certified design's DCDs, has it been included in the past.

Item 14: The tag numbers provided in the previous response were incorrect. DCD Revision 2 contains the correct tag numbers.

Item 15: Tier 1 DCD Figure 2.7.3.3-1 will be revised per the attached to show check valves VLV-231A and VLV-231B. The placement of the thermal barrier cross-tie header on the Tier 1 figure has not been changed. As a functional flow diagram the Tier 1 figure is not intended to show the relative position of branches in a continuous pipe line since there is no functional difference. Likewise a future change in the relative position with no functional change should not require a Tier 1 revision.

Impact on DCD

Mark up to DCD Tier 1 Subsection 2.7.3.3.1:
Key Design Features of the CCWS are provided below:

- **Seismic qualified make up water is supplied from the RWSP**

A new ITAAC Item 7.iii in Table 2.7.3.3-5 will be added as shown below:

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
	7.iii Tests will be performed to confirm the as-built CCW Surge Tank Volume.	**7.iii The as-built CCW Surge Tank Volume is greater than the design Volume of 283 ft^3.**

- DCD Tier 1 Figure 2.7.3.3-1 will be revised as shown below:

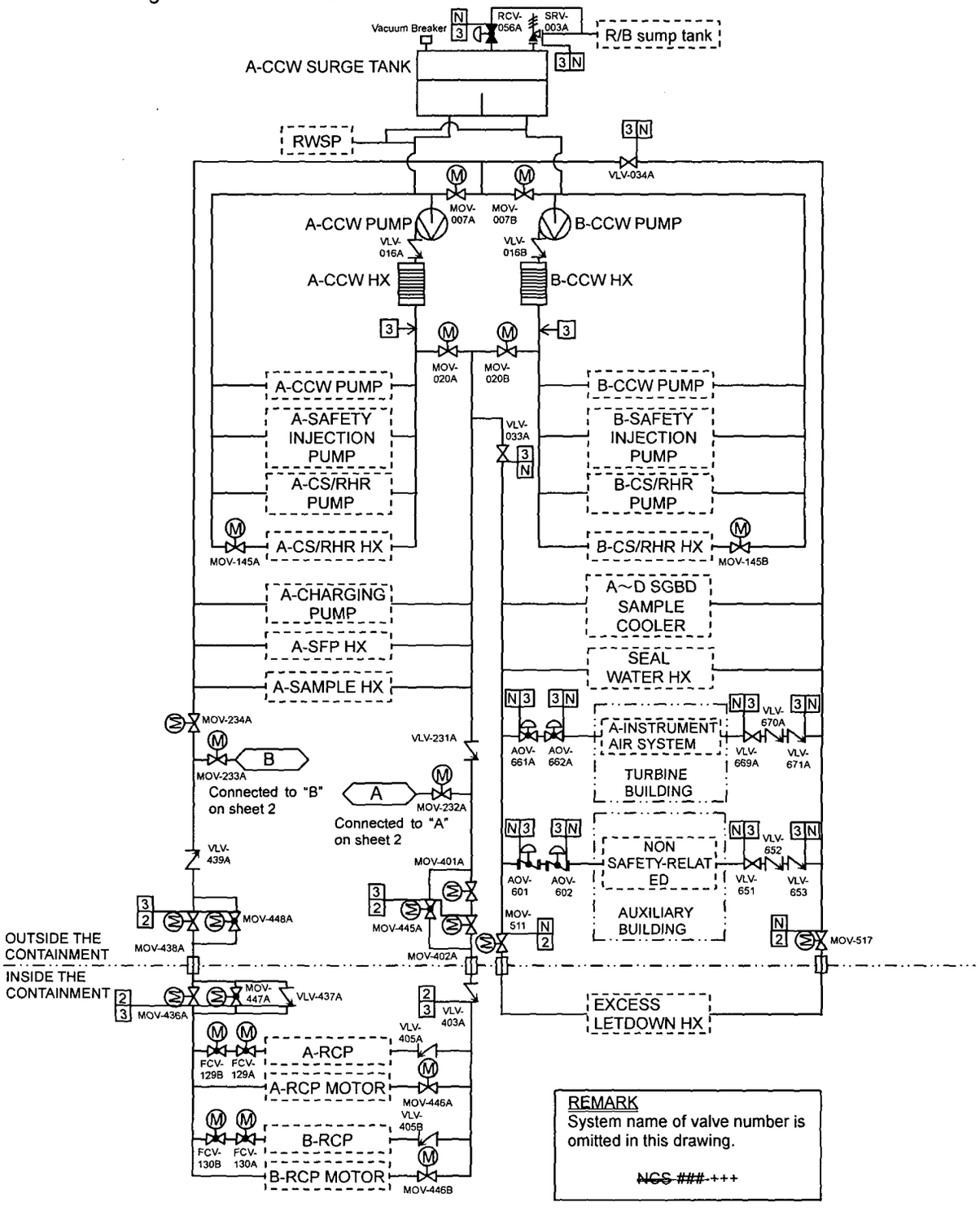

Figure 2.7.3.3-1 Component Cooling Water System (Sheet 1 of 2)

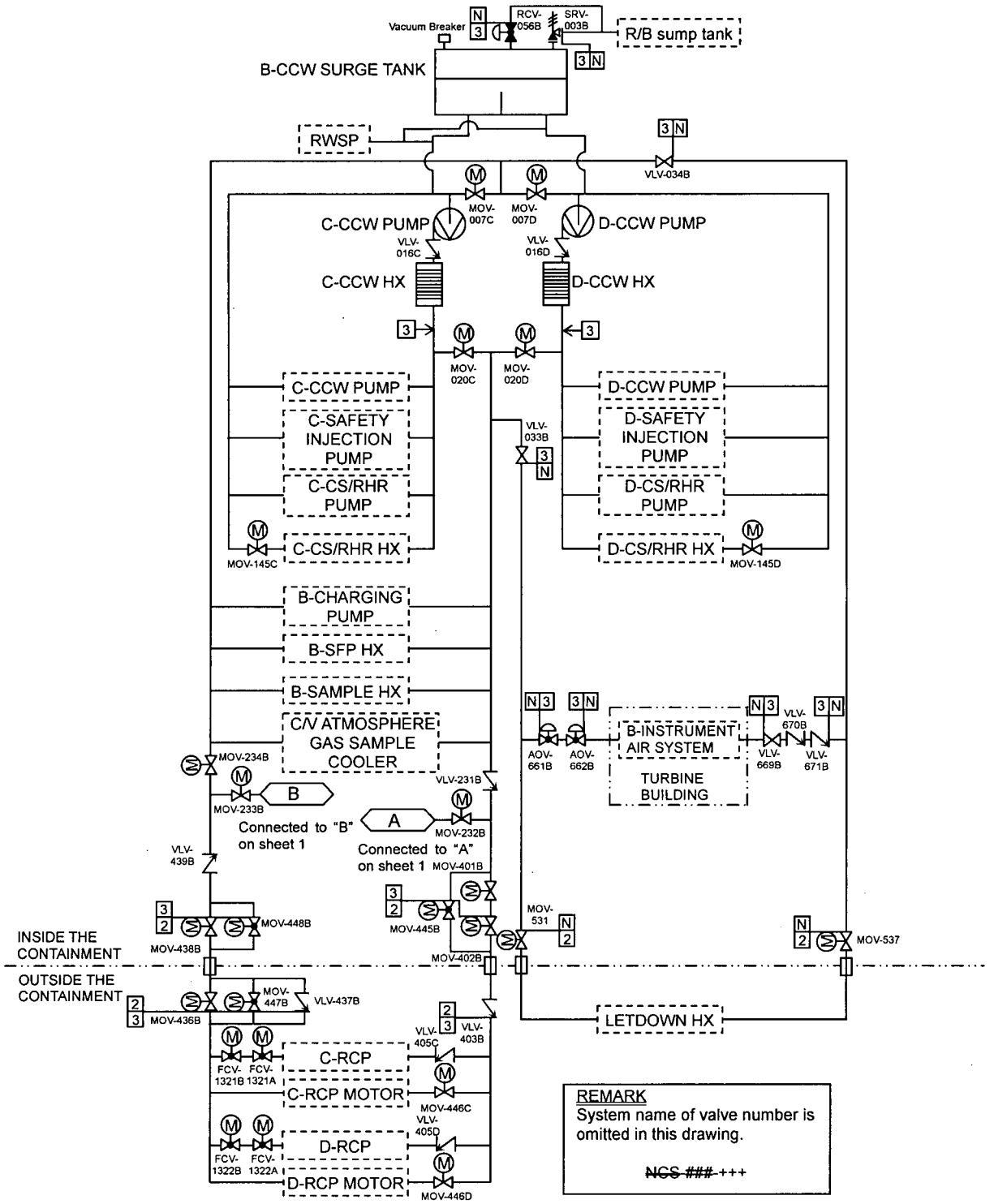

Figure 2.7.3.3-1 Component Cooling Water System (Sheet 2 of 2)

Impact on COLA
None

Impact on PRA
None

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 571-4365 REVISION 0**
SRP SECTION:	**09.02.02 – REACTOR AUXILIARY COOLING WATER SYSTEM**
APPLICATION SECTION:	**9.2.2**
DATE OF RAI ISSUE:	**4/13/2010**

QUESTION NO.: 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.

ANSWER:
Item (1) 1: Please see the response to question 09.02.02-51 Item 4.

Item (1) 2: Tier 1 DCD Table 2.7.3.3-5 will be revised to add the required heat transfer rate and other numerical values.

Item (1) 3: "T" and "P" are the abbreviations for Containment Isolation Signal and Containment Spray Signal respectively as define in Tier 2 DCD Figure. 1.7-3. Containment Isolation Phase A & B are described in Tier 2 DCD Subsection 7.3.1.5.4 and 7.3.1.5.5 and shown in Figure7.2-2 (sheet 12). A list of abbreviations in DCD Table 6.2.4-3 (Sheet 10 of 12) will be revised to add "Containment Isolation Phase A" as the explanation of "T" and "Containment Isolation Phase B" as the explanation of "P".

Item (1) 4 Tier 1 DCD Table 2.7.3.3-5 will be revised to add the required test conditions.

Item (2): Specific flow rates for individual components are a level of detail not appropriated for Tier 1. ITAAC Item 7 will require a report to conclude that the as-built CCWS provides adequate flow for heat removal during all plant operating conditions.

Item (3) 1: Please see the response to Question 09.02.02-55.

Item (3) 4: Tier 1 Table 2.7.3.3-5 will be revised to include verification of Surge Tank volume. Please see the response to Question 09.02.02-51 regarding inclusion of seismic qualified makeup.

Item (3) 5: Tier 1 table 2.7.3.3-2 will be revised to include check valves NCS-VLV-231A/B.

Item (3) 6: The markup of the last RAI response is added to Impact on DCD. In addition, DCD Revision 2 is reflecting this correction.

Item (4): Please see the response to Item (1) 2.

Impact on DCD

Tier 1 DCD Table 2.7.3.3-5 has been revised as follows:

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5.a The seismic Category I equipment identified in Table 2.7.3.3-2 can withstand seismic design basis loads without loss of safety function.	5.a.i Inspections will be performed to verify that the structural adequacy of seismic Category I as-built equipment identified in Table 2.7.3.3-2 is located in ~~the safety-related buildings.~~ **the containment and reactor building.**	5.a.i The seismic Category I asbuilt equipment identified in Table 2.7.3.3-2 is located in ~~the safety-related buildings~~ **the containment and reactor building.**

Tier 1 DCD Table 2.7.3.3-5 will be revised as follows:

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. The CCWS components identified in Table 2.7.3.3-2 remove heat from various components during all plant operating conditions, including normal plant operating, abnormal and accident conditions.	7.i An inspection for the existence of a report that determines the heat removal capability of the as-built heat exchangers will be performed.	7.i A report exists and concludes that the product of the overall heat transfer coefficient and the heat exchange area of the asbuilt CCWS heat exchanger identified in Table 2.7.3.3-2 is greater than or equal to ~~the design values for all plant operating conditions, including normal plant operating, abnormal and accident conditions.~~ **that needed to achieve the design heat transfer rate of 50 x 10^6 BTU /Hr at the reported temperature difference.**

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
	7.ii Tests will be performed to confirm that the as-built CCWS pumps can provide flow to the CCW heat exchangers.	7.ii The as-built CCWS pumps identified in Table 2.7.3.3-2 are capable of achieving their design flow rate **of 11000 gpm**.

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
13. The CCW pumps have sufficient net positive suction head (NPSH).	13. Tests to measure the asbuilt CCW pump suction pressure will be performed. Inspections and analyses to determine NPSH available to each pump will be performed.	13. The as-built system meets the design, and the analysis confirms that the NPSH available exceeds the required NPSH **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).**

DCD Tier 1 Table 2.7.3.3-2 will be revised as follows:

Equipment Name	Tag No.	ASME Code Section III Class	Seismic Category I	Remotely Operated Valve	Class 1E/ Qual. For Harsh Envir.	PSMS Control	Active Safety Function	Loss of Motive Power Position
RCP CCW supply line check valves	NCS-VLV-231 A, B	3	Yes	-	-/-	-	Transfer Open/ Transfer Closed	-

Revise Note 3 of Table 6.2.4-3 as follows:

T Containment Vessel Isolation Signal (Same as ~~S signal~~ **Containment Isolation Phase A**)
P Containment Vessel Isolation Signal (Same as ~~CV spray signal~~**Containment Isolation Phase B**)

Impact on COLA
None

Impact on PRA
None