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July 28, 2009

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-09406

Subject: MHI's Responses to US-APWR DCD RAI 408-3170 Revision 0

Reference: 1) "REQUEST FOR ADDITIONAL INFORMATION 408-3170 REVISION 0, SRP Section: 10.04.09 - Auxiliary Feedwater System, Application Section: 10.4.9, dated June 24, 2009.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Responses to Request for Additional Information 408-3170 Revision 0."

Enclosed are the responses to 9 RAIs contained within 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:

1. Responses to Request for Additional Information 408-3170 Revision 0

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

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Docket No. 52-021
MHI Ref: UAP-HF-09406

Enclosure 1

UAP-HF-09406
Docket No. 52-021

Responses to Request for Additional Information No. 408-3170
Revision 0

July 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

7/28/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 408-3170 REVISION 0

SRP SECTION: 10.04.09 AUXILIARY FEEDWATER SYSTEM

APPLICATION SECTION: 10.4.9

DATE OF RAI ISSUE: 6/24/2009

QUESTION NO.: 10.04.09-23

[Followup/Supplementary RAI 10.4.9-1] In response to request for information (RAI) Question No. 10.04.09-6 issued 1-21-09, the applicant described certain design features and inspection items related to the Emergency Feedwater (EFW) pits that are not listed in the Revision 1 of the Design Control Document (DCD). For example, the response to RAI Question No. 10.04.09-6 notes that the EFW pits are completely enclosed structures. Stainless steel plate is used to line the interior surfaces of the pits. Water supplied to the pits is clean, demineralized water from the Demineralized Water StorageTank. It is further stated that sampling of EFW pit inventory is performed during each "regular inspection" to ensure turbidity does not exceed 1 ppm. "Feed and bleed" drainage and replenishment of the pit inventory would be used to correct deviations from the acceptable turbidity threshold. The applicant proposes to add this information to DCD Tier 2 Section 10.4.9.2, except for a description of the stainless steel liner. Also, the applicant does not specify the time interval between each "regular inspection."

Per Standard Review Plan (SRP) 9.2.6 Section III, Item 1.C, the applicant should discuss methods to protect the purity and cleanliness of the EFW pit inventory. Methods might include, for example, pit coatings, covers, and filtration.

Provide in the DCD : (a) a description of the stainless steel pit liner, and (b) a specification of the time interval between each "regular inspection." Provide a markup of applicable DCD sections in your response.

ANSWER:

Answer to (a): DCD Tier 2, section 10.4.9.2.1 D. Emergency feedwater pits will be revised to address purity and cleanliness as well as to include the response to RAI 10.04.09-25 as shown in Impact on DCD.

Answer to (b): Sampling of the EFW pits is performed monthly.

Impact on DCD

DCD Tier 2 section 10.4.9.2.1 D, 1st paragraph will be revised as shown below:

Two 50% EFW pits are provided. **The EFW pits are completely enclosed stainless steel lined structures that do not contain any operating equipment. All components inside the pit are also constructed of stainless steel. No foreign materials intrusion is anticipated. An access hatch located above the 100 % water level is available for inspections of pit interior areas. The EFW pit is filled with clean demineralized water. Filtration is not required.** Both EFW pits together contain the minimum water volume required for maintaining the plant at hot standby condition for 8 hours and performing plant cooldown for 6 hours until the RHRS can start to operate. The inside dimensions of each pit is approximately 28 feet long, approximately 42 feet wide and approximately 35 feet dep. With the minimum pit level at approximately 26 feet during normal plant condition, the volume of water in each pit available for the EFW is 186,200 gallon. With two pits, each pit with a capacity of 204,850 gallons, is sufficient to perform hot standby and plant cooldown until the RHRS starts to perform heat removal. And also each pit has adequate capacity for the pit low level alarm setpoint to allow at least 20 minutes for operator action in accordance with the additional short-term recommendation "Primary EFW Water Source Low Level Alarm," of generic recommendations of NUREG-0611 and NUREG-0635.

DCD Tier 2 section 10.4.9.2.1 D, 4th paragraph will be revised as shown below:

Sampling of the EFW pits is performed **monthly**~~regular inspection~~, and turbidity is ensured to be not over 1 ppm. Any deviation is corrected by utilizing bleed and feed method. Demineralized water from the Demineralized Water Storage Tank (make-up water source) is used for feeding the water inventory. **Complete inspections with the pits drained will be performed periodically per the ISI program.**

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

7/28/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 408-3170 REVISION 0

SRP SECTION: 10.04.09 AUXILIARY FEEDWATER SYSTEM

APPLICATION SECTION: 10.4.9

DATE OF RAI ISSUE: 6/24/2009

QUESTION NO.: 10.04.09-24

[Followup/Supplementary RAI 10.4.9-1] In response to request for information (RAI) , Question No. 10.04.09-8 issued 1-21-09, the applicant indicated that the turbine-driven EFWS pumps and associated valves are capable of operating from Class 1E batteries for at least two hours, except that ventilation for pump rooms may be required after one hour of pump operation. The applicant further states that room cooling is provided by air handling units that are operated by ac power and that the ac power needed to support room cooling can be provided by a single unit of the alternate alternating current (AAC) gas turbine generator (GTG) system, and that the AAC GTG would be started andoperated within one hour to provide pump room ventilation.

Based on response to RAI 10.04.09-8, the US-APWR emergency feedwater system is not in compliance with Generic Short Term Recommendation No. 5 (GS-5) in NUREG 0611 and NUREG-0635 which recommends the plant be capable of providing required EFW flow for at least two hours from one EFWS pump train independent of any ac power source.

The staff request that the applicant provide justification as to why the US-APWR EFWS capability for providing required EFWS flow for one hour instead of the two hoursrecommended in the NUREG is acceptable.

ANSWER:

The concern regarding loss of offsite and onsite ac power source event (SBO event) mentioned in NUREG-0611 is that some operating plants depended on ac power for all sources of AFW system supply, including the turbine-driven pump train when the NUREG was published in 1980. For these plants which depended on ac power for all sources, in the event of loss of offsite and onsite ac power, ac power-dependent component of the turbine-driven pump would stop, and/or manual and local actions would be required to initiate AFW flow from the turbine-driven pump by manually and locally opening the turbine steam supply valve and/or AFW system flow control valve. The recommendation in GS-5 mentions that the turbine-driven pump should be capable of providing the required flow for at least two hours from one train independent of any ac power, however, if the alternate ac power source which is available during SBO event exits, the concern regarding SBO mentioned in the NUREG will be resolved.
In US-APWR, at the SBO event, the onsite emergency ac power sources as well as offsite ac power cannot be used. However, the turbine-driven EFW pump automatically starts at SBO event

without using any ac power sources because all components for the turbine-driven pump operation are powered from class 1E dc power source.
After one hour of the turbine-driven pump operation, the ventilation which depends on ac power for the pump room cooling shall be required, however, US-APWR has two 6.9 kV non-Class 1E GTGs (A and B) as AAC sources. The AAC GTGs minimize the potential for common cause failures with the Class 1E GTG as described in DCD Tier 2 Section 8.4.1.3 "Alternate AC Power Sources". The provision of the AAC power source is allowed by RG 1.155 and the AAC GTGs of US-APWR conform to the RG 1.155. Therefore a weather-related event or a single failure could not disable all the onsite emergency ac sources and offsite ac power supplies simultaneously along with all the AAC sources.
From the above, because the AAC GTGs are available during SBO event, the turbine-driven EFW pump is able to continue to operate.

Impact on DCD

DCD 10.4.9.2.2 System Operation B. Operation during Plant Transients and Accidents (f) Station Blackout (SBO) will be revised as shown below:

A SBO results in the loss of normal offsite and emergency onsite ac power sources. The M/D-EFW pumps are inoperable because there is no ac power. Both T/D EFW pumps are available because of the dc power supplied by class 1E batteries with 2 hours capacities. EFW flow control is also available because the EFW flow control valves are powered by dc power which is available from class 1E batteries. In addition, at least within 1 hour after the SBO occurrence, 1 unit of the AAC-GTG is started, and by the operation of 1 unit of emergency feedwater pump (turbine-driven) area air handling unit, the integrity of 1 unit of T/D EFW pump is ensured. **The AAC-GTGs minimize the potential for common cause failures with the Class 1E GTG as discussed in Section 8.4.1.3.** From the above, **because the AAC GTGs are available during SBO event,** in accordance with the generic recommendations of NUREG-0611 and NUREG-0635 Generic Short Term Recommendation No. 5 (GS-5), the EFWS is capable of providing required EFW flow for at least two hours from one T/D-EFW pump ~~independent of any ac power source~~. After starting the operation of the AAC-GTG, charging to the Class 1E battery/batteries is resumed, therefore, the turbine-driven EFW pump is able to continue to operate after 2 hours of the SBO and is independent of any ac power source.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

7/28/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 408-3170 REVISION 0

SRP SECTION: 10.04.09 AUXILIARY FEEDWATER SYSTEM

APPLICATION SECTION: 10.4.9

DATE OF RAI ISSUE: 6/24/2009

QUESTION NO.: 10.04.09-25

[Followup/Supplementary RAI 10.4.9-3] In response to request for information (RAI) Question No. 10.04.09-12 issued 1-21-09, the applicant described certain design features and inspection items related to Emergency Feedwater (EFW) pits that are not listed in the Revision 1 of the Design Control Document (DCD). For example, the applicant states that all structural components inside the pit, including the pit liner, are constructed of stainless steel. An access hatch located above the 100% water level is available for inspections of pit interior areas. The pits do not contain any equipment. Once construction and installation is complete, an inspection will be performed to assure the integrity of the pit liner. Further, complete inspections with the pits drained will be performed per the ISI program. Given that the EFW pits are completely enclosed structures, intrusion of foreign materials is not anticipated. While these design and operational features are important with regard to pit inspections, the applicant does not propose to revise the DCD to include this information.

GDC 45 requires that systems providing essential cooling for safety-related equipment be designed to permit appropriate periodic inspection of important components.

Add to the DCD a summary of the response to RAI Question No. 10.04.09-12. Provide a markup in your response.

ANSWER:

DCD Tier 2 Section 10.4.9.2.1 "D. Emergency feedwater pits" will be revised to reflect the information contained in the response. The markup is provided in the response to RAI 10.04.09-23 above.

Impact on DCD

Refer to the response to RAI 10.04.09-23.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

7/28/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 408-3170 REVISION 0

SRP SECTION: 10.04.09 AUXILIARY FEEDWATER SYSTEM

APPLICATION SECTION: 10.4.9

DATE OF RAI ISSUE: 6/24/2009

QUESTION NO.: 10.04.09-26

[Followup/Supplementary RAI 10.4.9-4] In response to request for information (RAI) Question No. 10.04.09-14 issued 1-21-09, the applicant described a restoration procedure for addressing situations where bypass leakage through Emergency Feedwater System (EFWS) check valves is detected. However, the applicant does not specifically discuss operating procedures that would help prevent or lead to recognition of steam binding issues.

Generic Letter 88-03, "Resolution of Generic Safety Issue 93," recommends that procedures be in place for recognizing steam binding.

Describe operating procedures that would help prevent or lead to recognition of steam binding issues. Include this information in the Design Control Document (DCD) and provide a markup in your response.

ANSWER:

A new subsection "C. Water Hammer Prevention" was added as the response to RAI 10.04.09-4 in UAP-HF-09271 of Amended Response to RAI No. 160-1848 Revision 0. In this section, detection of a high temperature main feedwater back leakage from an EFW check valve which becomes the cause of water hammer is identified as water hammer prevention and mitigation measures in EFWS. And the Combined License Applicant is to provide operating and maintenance procedures including preventive measures in accordance with NUREG-0927. This was also addressed as a new COL item COL 10.4(6) in the UAP-HF-09271.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact no the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

7/28/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 408-3170 REVISION 0

SRP SECTION: 10.04.09 AUXILIARY FEEDWATER SYSTEM

APPLICATION SECTION: 10.4.9

DATE OF RAI ISSUE: 6/24/2009

QUESTION NO.: 10.04.09-27

[Followup/Supplementary RAI 10.4.9-5] In response to request for information (RAI) Question No. 10.04.09-16 issued 1-21-09, the applicant stated that the Technical Specifications for the US-APWR are based on NUREG-1431 ("Standard Technical Specifications Westinghouse Plants"), which does not include surveillance requirements for water chemistry related to Emergency Feedwater System (EFWS) suction sources. The applicant provides additional rationale for excluding surveillance requirements, though the staff found the related discussions to be unclear. Specifically, the applicant states that with regard to probabilistic risk assessment (PRA) or safety analysis, the water chemistry "expects nothing." In addition, with regard to the maximum design temperature of the EFW pit, the applicant states that "it is not the condition the SCC occurs."

10 CFR 52.47(a) 11) states that a design certification applicant is to propose Technical Specifications in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36(c)(3) requires that proposed Technical Specifications include Surveillance Requirements to assure that the necessary quality of systems and components is maintained and to meet LCOs.

Clarify the rationale used to exclude surveillance requirements for water chemistry related to EFWS suction sources. Include this information in the Design Control Document (DCD) and provide a markup in your response.

ANSWER:

Because of the specification, variations in water chemistry do not impact pit operability. The ability of the EFW pit to accomplish its safety function of heat removal is not affected by water quality as long as there is sufficient water. In the PRA or the safety analysis, what is expected to the EFW pit water is, to be fed to the steam generators, and to remove the heat from the Reactor Coolant System through steam generators. The water quality would not influence the ability of the EFW pit to accomplish its safety function of the heat removal as long as there is sufficient water. Regarding the integrity of EFW pit, the only concern is stress corrosion cracking which occurs by high level of dissolved oxygen. Because the EFW pits have the water supplied directly from condensate storage tank without deaerating and the inventory water of the pit contacts directly with atmosphere, the dissolved oxygen level of the pits inventory water is not zero.

However, because the design temperature of EFW pit is 105 degF, which is determined to exceed assumed maximum operating temperature of the EFWS, the stress corrosion cracking would not occur in such low temperature condition even if the level of dissolved oxygen is high. From the reasons above, in the US-APWR T-spec 3.7.6 Emergency Feedwater Pit (EFW Pit), Surveillance Requirements regarding the water chemistry of the EFW pit are not included.

Impact on DCD

Following will be added after the 3rd paragraph of the DCD Revision 1, Section 10.4.9.2.1 Description of Major Components, D. Emergency feedwater pits:

Because the EFW pits have the water supplied directly from condensate storage tank without deaerating and the inventory water of the pit has direct contact with atmosphere, the dissolved oxygen level of the pit inventory is not zero, however, because the design temperature of the EFW pit is 105 degF, which is determined to exceed assumed maximum operating temperature of the EFWS, the stress corrosion cracking would not occur in such low temperature condition even if the level of dissolved oxygen is high, therefore, the EFW pits have adequate integrity.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

7/28/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 408-3170 REVISION 0

SRP SECTION: 10.04.09 AUXILIARY FEEDWATER SYSTEM

APPLICATION SECTION: 10.4.9

DATE OF RAI ISSUE: 6/24/2009

QUESTION NO.: 10.04.09-28

[Followup/Supplementary RAI 10.4.9-6] In response to request for information (RAI) Question No. 10.04.09-18 issued 1-21-09, the applicant stated that Design Control Document (DCD) Tier 1, Table 2.7.1.11-5, "Emergency Feedwater System Inspections, Tests, Analyses, and Acceptance Criteria," will be revised to include an Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) entry related to limiting the maximum flow to a depressurized steam generator. However, the acceptance criteria portion of this proposed ITAAC entry includes the following statement: "...sum of maximum flow to each SG is less than 915 gpm with pumps running against a faulty SG pressure of 0 psig." The applicant does not provide a basis for the 915 gpm cited in this statement.

Standard Review Plan (SRP) 14.3, Appendix C, Item II.B.i states that operational/functional aspects of the system should be verified by ITAAC.

Provide the basis for the 915 gpm flow limit described above. Include this information in the DCD and provide a markup in your response. Provide all numerical quantities in metric units with English units provided as secondary in parentheses.

ANSWER:

In US-APWR, the maximum EFW flow rate to steam generator during main steam line break and steam generator tube rupture is limited by setting the piping flow resistance of the emergency feedwater pit to steam generator through emergency feedwater pumps. The resistance is limited by setting the emergency feedwater control valves (EFS-MOV-017A, B, C, D) as pre-set open position. The pre-set position is adjusted and set during pre-operational testing. This adjustment of the pre-set position during pre-operational testing shall be added as a new ITAAC to DCD Tier 1 Table 2.7.1.11-5.

In the previous response to RAI 10.04.09-18, MHI answered to add the new ITAAC item 15 that confirm the sum of maximum flow to each SG is less than 915 gpm (207.8 m^3/h) with pumps running against a faulty SG pressure of 0 psig. However, this flow rated is decided based on the piping flow resistance mentioned above, therefore, MHI will change ITAAC item 15 which was added in the response to RAI 10.04.09-18 to the confirmation of the decision process of the piping resistance.

The piping flow resistance will be decided that the EFW flow to steam generator will be 400 gpm (91 m^3/h) with the steam generator pressure 1221 psig (85.8 kg/cm^2 [gage]) which is design pressure of steam generator plus 3 percents margin. The decision includes correcting calculation to convert the result of the pre-operational test to the design condition with steam generator pressure 1221 psig (85.8 kg/cm^2 [gage]) because the pre-operational test can only be performed under hot shutdown condition with the steam generator pressure 1107 psia (77.8 kg/cm^2 [abs]). The ITAAC item 15 which is added in the previous response will be changed to confirm the process to determine the piping resistance as shown in Impact on DCD. This new ITAAC will include the basis for the piping resistance.

Impact on DCD

DCD Tier 1 Table 2.7.1.11-5 will be revised as shown below:

Table 2.7.1.11-5 Emergency Feedwater System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 5 of 5)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10. Displays of the parameters identified in Table 2.7.1.11-4 can be retrieved in the MCR.	10. Inspections will be performed for retrievability of the EFWS parameters in the as-built MCR.	10. The displays identified in Table 2.7.1.11-4 can be retrieved in the as-built MCR.
11. Remote shutdown console (RSC) displays and/or controls provided for the EFWS are identified in Table 2.7.1.11-4.	11. Inspections will be performed on the as-built RSC displays and/or controls for the EFWS.	11. Displays and/or controls exist on the as-built RSC as identified in Table 2.7.1.11-4.
12. Each EFW pump delivers at least the minimum flow required for removal of core decay heat using the SGs against a SG pressure up to the set pressure of the first stage of main steam safety valve plus 3 percent.	12 A test of each as-built EFW pump will be performed to determine system flow vs. SG pressure under preoperational condition. Analyses will be performed to convert the test results to the design conditions.	12 From the result of analyses, any two of the as-built EFW pumps deliver at least 705 gpm to the any of the two SGs against a SG pressure up to the set pressure of the first stage of main steam safety valve plus 3 percent.
13. Each EFW pit has a volume to permit plant cooldown from hot standby to hot shutdown condition (residual heat removal system initiation temperature) following the most limiting design basis event.	13. Inspections will be performed to verify the as-built EFW pits include sufficient volume of water.	13. The water volume of the each as-built EFW pit is greater than or equal to 186,200 gallons.
14. The EFW pumps have sufficient net positive suction heat (NPSH).	14 Tests to measure the as-built EFW pump suction pressure will be performed. Inspections and analysis to determine NPSH available to each pump will be performed.	14 The as-built system meets the design, and the analysis confirms that the NPSH available exceeds the required NPSH.

15.	The ~~emergency feedwater~~**EFW** control valves limit maximum flow to each SG **to less than the value assumed as the EFW pump design and the input value to the MSLB mass and energy release analysis, core performance analysis or SGTR steam generator overfill analysis**~~with pumps running against a faulty SG pressure of 0 psig~~.	15.	A test of each as-built EFW pump will be performed to determine system flow vs. SG pressure under preoperational condition. Analyses will be performed to convert the test results to the design conditions.	15.	From the result of the analyses, **the EFW control valve pre-set open position sets the piping resistance of each train from EFW pit to steam generator through EFW pump so that the EFW flow rate to the steam generator is 400 gpm (91 m^3/h) with the steam generator pressure 1221 psig (85.8 kg/cm^2 [gage])**~~the sum of maximum flow to each SG is less than 915 gpm with pumps running against a faulty SG pressure of 0 psig~~.
16.	The flow recirculation line from each EFW pump discharge back to its associated EFW pit permits testing each EFW pump at full flow.	16.	Testing of each EFW pump in the full flow test modes will be conducted with flow directed to the EFW pit through the pump's recirculation lines.	16.	Full flow from a M/D-EFW pump at least 450 gpm is returned to the EFW pit. Full flow from a T/D-EFW pump at least 550 gpm is returned to the EFW pit.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

7/28/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 408-3170 REVISION 0

SRP SECTION: 10.04.09 AUXILIARY FEEDWATER SYSTEM

APPLICATION SECTION: 10.4.9

DATE OF RAI ISSUE: 6/24/2009

QUESTION NO.: 10.04.09-29

[Followup/Supplementary RAI 10.4.9-7] In response to request for information (RAI) Question No. 10.04.09-20 issued 1-21-09, the applicant stated that revisions will be made to Design Control Document (DCD) Tier 1 to include check valves with an active safety function. The portions of the DCD Tier 1 to be revised to include Figure 2.7.1.11-1, "Emergency Feedwater System." The staff noted an apparent typographical error in the applicant's proposed revision to DCD Tier 1, Figure 2.7.1.11-1 with regard to the numbering of the check valves. In particular, what would appear to be check valve "VLV-109A" seems to be incorrectly labeled as check valve "VLV-109D."

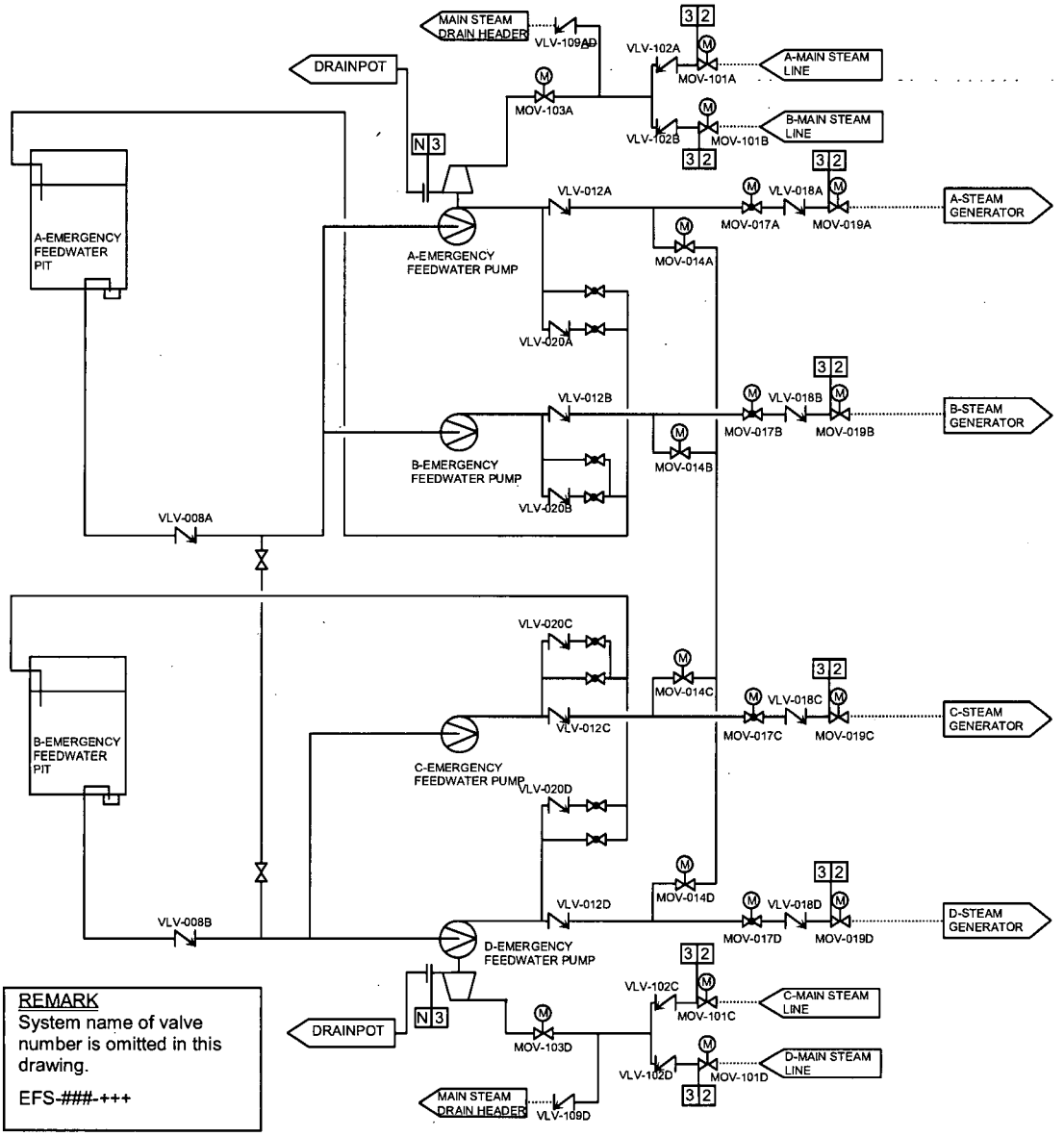
Verify weather the check valve is correctly labeled, and correct the proposed revision to DCD Tier 1, Figure 2.7.1.11-1 with regard to the mis-labeling of check valve "VLV-109A" if necessary." Include any revised information in the DCD and provide a markup in your response.

ANSWER:

A check valve in DCD Tier 1 Figure 2.7.1.11-2, "Emergency Feedwater System" is incorrectly labeled and the figure will be revised as shown in Impact on DCD.

Impact on DCD

The Tier 1 DCD, Figure 2.7.1.11-2 will be revised as shown below:



Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

7/28/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 408-3170 REVISION 0

SRP SECTION: 10.04.09 AUXILIARY FEEDWATER SYSTEM

APPLICATION SECTION: 10.4.9

DATE OF RAI ISSUE: 6/24/2009

QUESTION NO.: 10.04.09-30

[Followup/Supplementary RAI 10.4.9-8] In response to request for information (RAI) Question No. 10.04.09-21 issued 1-21-09, the applicant stated that 186,200 gallons represents the quantity of water per pit that is required for removing decay heat for 14 hours, based on 8 hours of hot standby and 6 hours of hot shutdown cooling. The applicant states that while Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) entry no. 13 in DCD Tier 1, Table 2.7.1.11-5, "Emergency Feedwater System Inspections, Tests, Analyses, and Acceptance Criteria," specifies a minimum pit capacity of 186,200 gallons, the actual available volume of water will be at least 204,850 gallons once design margins and instrumentation error allowances are accounted for. The applicant also provides a figure that displays a cross-section schematic of a pit, where various water levels are labeled. However, the applicant proposes to revise the DCD only with regard to DCD Tier 2, Section 10.4.9.3, "Safety Evaluation," by stating that the total required Emergency Feedwater (EFW) pit volume with a 10% margin is 204,850 gallons per pit, or 409,700 gallons combined for both pits. Technical Specification surveillance requirement (SR) 3.7.6.1 requires that the pit level be maintained at or above 204,850 gallons. Given that the applicant does not propose to revise the minimum pit capacity of 186,200 gallons in ITAAC entry no. 13, there remains an inconsistency regarding the minimum pit capacity cited in SR 3.7.6.1 and the ITAAC.

SRP 14.3, Section III, "Review Procedures," Item 10 directs the reviewer to ensure that the ITAAC are compatible with the Technical Specifications.

Reconcile the discrepancy between the minimum pit capacity cited in the ITACC and the minimum pit capacity cited in the Technical Specifications. Include this information in the DCD and provide a markup in your response. Provide all numerical quantities in metric units with English units provided as secondary in parentheses.

ANSWER:

DCD Tier 1 Table 2.7.1.11-5 item 13 will be revised to incorporate RAI comment

Impact on DCD

DCD Tier 1 Table 2.7.1.11-5 item 13 will be revised as shown below:

Table 2.7.1.11-5 Emergency Feedwater System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 5 of 5)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10. Displays of the parameters identified in Table 2.7.1.11-4 can be retrieved in the MCR.	10. Inspections will be performed for retrievability of the EFWS parameters in the as-built MCR.	10. The displays identified in Table 2.7.1.11-4 can be retrieved in the as-built MCR.
11. Remote shutdown console (RSC) displays and/or controls provided for the EFWS are identified in Table 2.7.1.11-4.	11. Inspections will be performed on the as-built RSC displays and/or controls for the EFWS.	11. Displays and/or controls exist on the as-built RSC as identified in Table 2.7.1.11-4.
12. Each EFW pump delivers at least the minimum flow required for removal of core decay heat using the SGs against a SG pressure up to the set pressure of the first stage of main steam safety valve plus 3 percent.	12 A test of each as-built EFW pump will be performed to determine system flow vs. SG pressure under preoperational condition. Analyses will be performed to convert the test results to the design conditions.	12 From the result of analyses, any two of the as-built EFW pumps deliver at least 705 gpm to the any of the two SGs against a SG pressure up to the set pressure of the first stage of main steam safety valve plus 3 percent.
13. Each EFW pit has a volume to permit plant cooldown from hot standby to hot shutdown condition (residual heat removal system initiation temperature) following the most limiting design basis event.	13. Inspections will be performed to verify the as-built EFW pits include sufficient volume of water.	13. The water volume of the each as-built EFW pit is greater than or equal to **204,850**~~186,200~~ gallons.
14. The EFW pumps have sufficient net positive suction heat (NPSH).	14 Tests to measure the as-built EFW pump suction pressure will be performed. Inspections and analysis to determine NPSH available to each pump will be performed.	14 The as-built system meets the design, and the analysis confirms that the NPSH available exceeds the required NPSH.
15. The ~~emergency feedwater~~**EFW** control valves limit maximum flow to each SG **to less than the value assumed as the EFW pump design and the input value to the MSLB mass and energy release analysis, core performance analysis or SGTR steam generator overfill analysis**~~with pumps running against a faulty SG pressure of 0 psig~~.	15. A test of each as-built EFW pump will be performed to determine system flow vs. SG pressure under preoperational condition. Analyses will be performed to convert the test results to the design conditions.	15. From the result of the analyses, **the EFW control valve pre-set open position sets the piping resistance of each train from EFW pit to steam generator through EFW pump so that the EFW flow rate to the steam generator is 400 gpm (91 m^3/h) with the steam generator pressure 1221 psig (85.8 kg/cm^2 [gage])**~~the sum of maximum flow to each SG is less than 915 gpm with pumps running against a faulty SG pressure of 0 psig~~.

16. The flow recirculation line from each EFW pump discharge back to its associated EFW pit permits testing each EFW pump at full flow.	16. Testing of each EFW pump in the full flow test modes will be conducted with flow directed to the EFW pit through the pump's recirculation lines.	16. Full flow from a M/D-EFW pump at least 450 gpm is returned to the EFW pit. Full flow from a T/D-EFW pump at least 550 gpm is returned to the EFW pit.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

7/28/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 408-3170 REVISION 0

SRP SECTION: 10.04.09 AUXILIARY FEEDWATER SYSTEM

APPLICATION SECTION: 10.4.9

DATE OF RAI ISSUE: 6/24/2009

QUESTION NO.: 10.04.09-31

[Followup/Supplementary RAI 10.4.9-9] In response to request for information (RAI) Question No. 10.04.09-22 issued 1-21-09, the applicant provided rationale for excluding testing of the pit water chemistry, though the staff found portions of the applicant's discussion to be unclear. Specifically, the applicant makes the following statement related to the maximum design temperature of the Emergency Feedwater (EFW) pit: "...at the low temperature like that, SCC does not occur."

In accordance with Standard Review Plan (SRP) 14.2, the applicant should verify the performance capabilities of systems, structures, and components (SSCs) that are used for safe shutdown of the reactor under transient conditions (SRP 14.2 Acceptance Criteria Item II.5.ii), are assumed to function in the facility accident analysis (SRP 14.2 Acceptance Criteria Item II.5.v), or are identified as risk significant in the design-specific probabilistic risk assessment (PRA) (SRP 14.2 Acceptance Criteria Item II.5.viii).

Clarify the rationale used to exclude testing of pit water chemistry. Include this information in the Design Control Document (DCD) and provide a markup in your response.

ANSWER:

See the response to RAI 10.04.09-27 above and the associated markups.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.