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

February 20, 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-09062

Subject: MHI's Responses to US-APWR DCD RAI No.160-1848 Revision 0

Reference: 1) "REQUEST FOR ADDITIONAL INFORMATION NO. 160-1848 REVISION 0, SRP Section: 10.04.09 - Auxiliary Feedwater System (PWR), Application Section: 10.4.9, dated January 21, 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 No.160-1848 Revision 0."

Enclosed are the responses to 22 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 No.160-1848 Revision 0

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

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NRO

<u>Contact Information</u>

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

Docket No. 52-021
MHI Ref: UAP-HF-09062

Enclosure 1

UAP-HF-09062
Docket No. 52-021

Responses to Request for Additional Information No.160-1848
Revision 0

February 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/20/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 160-1848 REVISION 0**
SRP SECTION:	**10.4.9 AUXILIARY FEEDWATER SYSTEM (PWR)**
APPLICATION SECTION:	**10.4.9**
DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-1

DCD Tier 1, Section 2.7.1.11.1, states that all of the emergency feedwater system (EFWS) components are located in the Reactor Building. However, Sheet 1 of DCD Tier 1 Table 2.7.1.11-1 indicates that the "A-emergency feedwater isolation valve" is located inside containment. Also, in DCD Tier 2 Section 10.4.9.1, the third bulleted item references "buildings where the EFWS components are located," thus implying that EFWS components are distributed among multiple buildings.

GDC 2 establishes requirements with respect to the EFWS design regarding protection against the effects of natural phenomena such as earthquakes, tornados, hurricanes and floods.

Verify the location of the EFWS components as presented in the DCD and update this information if necessary. If there are any EFWS components located outside the Reactor Building, explain how these components are protected against natural phenomena in accordance with the requirements of GDC 2. Include this information in the DCD and provide a markup in your response.

ANSWER:

All the components of the EFWS are installed inside the Reactor Building. Therefore, the location of "A-emergency feedwater isolation valve" in Sheet 1 of DCD Tier 1 Table 2.7.1.11-1 is the "Reactor Building".
Also, the description in the third bulleted item in DCD Tier 2 Section 10.4.9.1, should be " The building where the EFWS components are located is designed for and provided with suitable flood protection during abnormally high water levels (adequate flood protection considering the probable maximum flood) to ensure functional capability."

Impact on DCD

Location of the item "A-emergency feedwater isolation valve" in Sheet 1 of DCD Tier 1 Table 2.7.1.11-1 will be changed to the "Reactor Building"
Also, the description of the second sentence of the third bulleted item in DCD Tier 2 Section

10.4.9.1 will be revised as "The building where the EFWS components are located is designed for and provided with suitable flood protection during abnormally high water levels (adequate flood protection considering the probable maximum flood) to ensure functional capability."

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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RAI NO.:	**NO. 160-1848 REVISION 0**
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APPLICATION SECTION:	**10.4.9**
DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-2

The EFW pits are seismic category I as indicated in DCD Tier 1 Table 2.7.1.11-2, DCD Tier 2 Table 3.2-2, DCD Tier 1 Figure 2.7.1.11-1, and DCD Tier 2 Figure 10.4.9-1.
However, the seismic categorization of the EFW pit breather lines (vent lines) does not appear to be explicitly identified in the DCD.

GDC 2 establishes requirements with respect to the EFWS design regarding protection against the effects of natural phenomena, including earthquakes.

Identify the seismic classification of the EFW pit breather lines (vent lines). If these lines are not seismic category I, explain how the design of these lines meets the requirements of GDC 2. Include this information in the DCD and provide a markup in your response.

ANSWER:

The seismic categorization of the EFW pit breather lines is also seismic category I.
In Figure 10.4.9-1, there are no classification boundary symbols on the breather lines, so the equipment class of the lines is the same as EFW pits whose seismic categories are I.

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.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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APPLICATION SECTION:	**10.4.9**
DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-3

Section 10.4.9.3 of the Tier 2 DCD states that safety-related portions of the EFWS are protected from missiles as described in Section 3.5. However, based on the review of the information in the DCD, the staff could not find sufficient information in regard to the provisions and plant design features to ensure adequate protection of the EFWS against the effects of internally and externally generated missiles.

GDC 4 establishes requirements with respect to the EFWS design regarding the capability of the system and the structure housing the system to withstand the effects of internally and externally generated missiles.

Provide an explanation of the provisions and plant design features to ensure adequate protection of the EFWS against the effects of internally and externally generated missiles, in accordance with the requirements of GDC 4. Include this information in the DCD and provide a markup in your response.

ANSWER:

DCD Section 3.5 is to be re-formatted in Revision 2 to reflect that the EFWS is to be protected against the effects of internally and externally generated missiles.

Impact on DCD

DCD Revision 2 will incorporate the following changes:

- Replace the last 4 paragraphs (3rd through 6th paragraph) of Tier 2, Section 3.5 with the following:

The SSCs to be protected from postulated missiles are identified in the Appendix of RG 1.117, Tornado Design Classification (Reference 3.5-18), and summarized by the following:

1. The RCPB.
2. Those portions of the MSS and main feedwater system up to and including the outermost isolation valves.
3. The reactor core and individual fuel assemblies at all times, including during refueling.

4. Systems or portions of systems that are required for (1) attaining safe shutdown; (2) RHR; (3) cooling the SFP; (4) mitigating the consequences of a tornado-caused steam line break; (5) primary makeup water system; and (6) supporting the above systems, such as essential service water, UHS, air supply, EFW, and safety-related ventilation systems.

5. The SFP, to the extent necessary to preclude significant loss of watertight integrity of the storage pit, and to prevent missiles from contacting fuel within the pit.

6. The reactivity control systems, e.g., control rod drives and boron system.

7. The MCR, including all equipment needed to maintain the MCR within safe habitability limits for personnel and safe environmental limits for tornado-protected equipment.

8. Those portions of the gaseous waste management system whose failure due to tornado effects could result in potential offsite exposures greater than the 25% of the guideline exposures of 10 CFR 100 using appropriately conservative analytical methods and assumptions.

9. Systems or portions of systems that are required for monitoring, actuating, and operating tornado protected portions of systems listed in items 4, 6, 7, and 13.

10. All electric and mechanical devices and circuitry between the process sensors and the input terminals of the actuator systems involved in generating signals that initiate protective actions by tornado protected portions of systems listed in items 4, 6, 7, and 13.

11. Those portions of the long-term ECCS that would be required to maintain the plant in a safe condition for an extended time after a LOCA.

12. PCCV and other safety related structures, such as the R/B and PS/B, to the extent that they not collapse, allow perforation by missiles, or generation of secondary missiles, any of which could cause unacceptable damage to tornado-protected items. However, the primary containment need not necessarily maintain its leaktight integrity.

13. The Class 1E electric systems, including the auxiliary systems for the onsite electric power supplies, that provide the emergency electric power needed for the functioning of plant features included in items 1 through 11 above.

14. Those portions of SSCs whose continued function is not required but whose failure could reduce to an unacceptable safety level the functional capability of any plant features included in items 1 through 13 above or could result in incapacitating injury to occupants of the MCR.

Missiles are postulated to be associated with failures of pressurized high-energy fluid system components, over-speed failures of rotating machinery (e.g., motor-driven pumps and fans), explosions within and outside the plant, falling objects, including falling objects resulting from a non-seismically designed SSC during a seismic event, and by tornados or transportation accidents external to the plant. This section discusses missile protection for the following sources:

- Internally generated missiles (Outside PCCV)
- Internally generated missiles (Inside PCCV)
- Turbine missiles
- Missiles generated by tornadoes and extreme winds
- Site proximity missiles (Except aircraft)
- Aircraft hazards

Missiles that could prevent SSCs from performing their intended safety functions are considered statistically significant. Potential missile sources are identified and statistically evaluated in subsequent subsections using the following methodology:

1. When a potential missile source is identified, the statistical significance of missile generation is evaluated by a probability analysis. The probability of occurrence (P_1) of generating a missile by any source is not statistically significant if it is less than 10^{-7} per year.

2. When the probability of occurrence, P_1, is greater than 10^{-7} per year for any potential missile source, the probability of impact (P_2) on a significant target is also determined. When considering both the probability of missile occurrence and the probability of missile impact, the missile is not statistically significant if the product of P_1 and P_2 is less than 10^{-7} per year. If the product of P_1 and P_2 is greater than 10^{-7} per year, the probability of significant damage (P_3) is determined.

3. For those cases where the product of P_1 and P_2 is greater than 10^{-7} per year, the missiles are evaluated for the probability of significant damage (P_3) based on the size, energy, and trajectory of the postulated missile, and the proximity to any potentially impacted SSCs. Alternately, an evaluation is performed to determine if sufficient redundancy remains to achieve and maintain a safe shutdown condition. No additional missile protection is required if the evaluations determine that the ability to achieve and maintain safe shutdown is maintained. If the combined probability ($P_1 \times P_2 \times P_3$) is less than 10^{-7} per year, the potential missile is not considered statistically significant.

Therefore, factors contributing to missile protection of potentially targeted SSCs is provided by one or more of the following methods:

- Locating the system or component in a missile-proof structure
- Separating redundant systems or components for the missile path or range
- Providing local shields and barriers for systems and components
- Designing the equipment to withstand the impact of the most damaging missile
- Providing design features to prevent the generation of missiles
- Orienting missile sources to prevent missiles from striking safety-related equipment

When necessary, missile barriers are designed in accordance with Subsection 3.5.3.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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RAI NO.:	**NO. 160-1848 REVISION 0**
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APPLICATION SECTION:	**10.4.9**
DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-4

In DCD Tier 2 Section 14.2, the applicant includes instructions for the COL Holder to check for water hammer during normal system startup and operation conditions during motor-driven EFWS preoperational testing (14.2.12.1.24) and during turbine-driven EFWS preoperational testing (14.2.12.1.25). The COL Holder is also instructed to check for unacceptable water hammer during restoration of normal steam generator level from low water level as part of feedwater preoperational testing (14.2.12.1.29). The staff reviewed the design and test provisions, and considered them to be appropriate for minimizing water hammer events, but there was no information presented in the DCD that will ensure development of operating and maintenance procedures by the COL applicant that will minimize the potential for water hammer in the EFWS during operation. Additionally, there is no mention that lines need to be water-solid to prevent air entrainment.

Compliance with the requirements of GDC 4 includes meeting the guidance of Branch Technical Position (BTP) 10-2, "Design Guidelines to Avoid Water Hammer in Steam Generators." Also, Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," states that lines should be sufficiently filled with water to ensure that any gas accumulation is below the amount needed to challenge system operability.

Explain how the DCD will ensure development of operating and maintenance procedures by the COL applicant that will minimize the potential for water hammer in the EFWS during operation. Also, explain how the DCD will ensure that the COL applicant will maintain EFWS piping sufficiently filled with water such that any gas accumulation is below the amount needed to challenge system operability. Include this information in the DCD and provide a markup in your response.

ANSWER:

The US-APWR addresses in the design stage those items cited as the items which should be described in the operating and maintenance procedures in NUREG-0927. However, venting is required prior to system operation. Venting before system operation and confirmation of the system line up will be specified in the operation manual. The similar answer is given in UAP-HF-08310, the answer to RAI No.124-1638 Revision 1 on a water hammer.
Justification for reflecting venting only as the operation procedure in the operation manual against the requirements for the EFWS in NUREG-0927, and the measures to maintain the EFWS piping sufficiently filled with water are stated below.

The following items are recommended in NUREG-0927 to be included in "operating and maintenance procedures".

A) Prevention of rapid valve motion
B) Proper filling and venting of water-filled lines and components
C) Introduction of voids into water-filled lines and components
D) Introduction of steam or heated water that can flash into water-filled lines
E) Introduction of water into steam-filled lines or components
F) Proper warmup of steam-filled lines
G) Proper drainage of steam-filled lines
H) The effects of valve alignments on line conditions

The items which are adopted for the safety-related portion of the EFWS are A, B, C, D and H as described below.

A) Prevention of rapid valve motion.
No rapid closure of the valve exits.
B) Proper filling and venting of water-filled lines and components
Vent valves are installed such that the venting of piping or equipment can be performed properly. Also, strict venting requirements before system operation will be specified in the operation manual.
C) Introduction of voids into water-filled lines and components
Because the system is vented appropriately before operation, there is little possibility of the void introduction into the system at the plant's start-up, shutdown, and power operation. Venting before system operation will be specified in the operation manual as is described in B).
Therefore, the possibility of water hammer due to void introduction into water-filled lines and components is extremely low.
D) Introduction of steam or heated water that can flash into water-filled lines
If there is steam binding in the EFWS, it would be the case of back leakage occurrence from the EFW check valve. In the Feed Water System, about 450 deg F of feedwater flows during power operation, and if this feedwater leaks to the EFWS through the check valve, it would boil and steam voids would be formed, which may cause water hammer at the pump actuation, or in the case the void generation continues, the void would be carried over to the EFW pump casing and suction piping, and the loss of the EFW pump function would occur. In US-APWR, a temperature gauge is installed in the upstream of the check valve so that even when heated water leaks by any reason, it can be detected, and furthermore, by installing the EFW pump at the elevation sufficiently lower than the check valve, steam voids are prevented from reaching the EFW pump even when there is a leakage. From the above, there is extremely little possibility for heated water to flow into the water filled line in the EFWS, and even when the heated water leaks into the EFWS, it is handled with the facility, by detecting it and preventing the damage from spreading.
H) The effects of valve alignments on line conditions
In the case stand piping is installed in the EFWS, the height of it is restricted so that water column separation does not occur. Therefore, the valves are arranged such that void which could cause water hammer by the pump restarting is not formed by the closure of the EFWS valves or by the stoppage of EFW pumps.

Impact on DCD

DCD 10.4.9.3 Safety Evaluation of 8th paragraph will be revised as following:

The EFWS is designed to reduce the probability of steam binding. When a back leakage from an EFW check valve occurs, high temperature water from the main feedwater line ~~reaches into EFW pump casing and into suction line. S~~will retain around the check valve, and then steam voids may be formed due to the back leakage, which may become the cause of water hammer. When the leakage continues the voids reaches into EFW-pump casing and into suction line and therefore, steam binding may occur which would make the EFW pump inoperable. To avoid water hammer and steam binding to the EFW pump, monitoring of the EFW discharge line temperature upstream of the EFW check valves provides detection of back leakage, which requires prompt corrective action. Furthermore, by installing the EFW pump at the elevation sufficiently lower than the check valve, the steam voids are prevented from reaching to the EFW pump even when there is the leakage. These are especially important during OLM because the pump discharge tie line is opened and the possibility of all EFW becoming inoperable increases. In the case leakage from the EFW check valve is detected, restoration is performed by the following procedure.

1. Isolate the relevant line using the EFW isolation valve (EFS-MOV-019), EFW pump outlet manual isolation valve (EFS-VLV-013) and EFW pump discharge cross-connect line isolation valve (EFS-MOV-014).
2. After draining the isolated area, perform the maintenance of the check valve.
3. After performing the water filling of the isolated area, complete the restoration verifying that there is no temperature rise at the temperature gauge in the upstream of the EFW check valve.

Also, in the case 1 train is isolated for the restoration, the condition of the EFWS should be shifted to T-spec 3.7.5 CONDITION B. In this case, it is necessary to complete the restoration within the completion time of 72 hours. In the case restoration cannot be performed within 72 hours, the condition of the EFWS must be shifted to CONDITION C and plant operation condition shall be shifted to MODE 3 within 6 hours, then, it must be shifted to MODE 4 within further 18 hours.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

2/20/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 160-1848 REVISION 0**
SRP SECTION:	**10.4.9 AUXILIARY FEEDWATER SYSTEM (PWR)**
APPLICATION SECTION:	**10.4.9**
DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-5

In DCD Tier 2 Section 10.4.9.2.2, Item A (b) "Normal Plant Operation," p.10.4-83, the second paragraph states the following: "The manual valves in the suction line flow paths from the EFW pits to the M/D and T/D EFW pumps are normally closed." However, in Figure 10.4.9-1, it appears that these pump suction valves are normally open.

Compliance with the requirements of GDC 34 and 44 includes the capability to transfer heat loads from the reactor system to a heat sink under both normal operating and accident conditions.

Correct the apparent discrepancy between the discussion in DCD Tier 2 Section 10.4.9.2.2 Item A (b) and Figure 10.4.9-1 with regard to the normal position of the EFWS suction valves. If the suction valves are normally closed, demonstrate how the EFWS can operate in a timely manner to provide heat removal given that local operator action would be required to open the valves prior to establishing injection flow from the EFWS. Include this information in the DCD and provide a markup in your response.

ANSWER:

DCD will be revised as it should be normally "open".

Impact on DCD

The second paragraph of (b) of A. Operation During Normal Plant Operation in DCD 10.4.9.2.2 System Operation will be revised as follows.

The manual valves in the suction line flow paths from the EFW pits to the M/D and T/D EFW pumps are normally opened~~closed~~.

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

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APPLICATION SECTION:	**10.4.9**
DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-6

The DCD does not appear to describe methods used to protect the purity and cleanliness of the EFW pit inventory.

Per 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.

Describe methods used to protect the purity and cleanliness of the EFW pit inventory. If filtration is required, explain how it will be ensured that clogging of filters would not impact EFWS availability. Include this information in the DCD and provide a markup in your response.

ANSWER:

Emergency Feedwater Pits are completely closed structures and no foreign materials intrusion is anticipated. Interior surfaces of the pit are lined with stainless steel plate. The EFW pit is filled with clean demineralized water and should remain clean. No filtration is deemed necessary.

Sampling of the EFW pits is performed at each 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.

Impact on DCD

Following will be added at the end of the DCD Revision 1, Section 10.4.9.2, "Sampling of the EFW pits is performed at each 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."

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

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DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-7

In accordance with DCD Tier 2 Figure 10.4.9-1 and DCD Tier 2, Chapter 16, p. B 3.3.2-24, the demineralized water storage tank (DWST) provides a direct backup source for EFWS. If the water level of EFW pit reached low-low level, operators are given alarm in main control room. Then the EFW pumps will be stopped or the water source will be switched to the DWST manually to maintain sufficient EFW flow.

In accordance with SRP 10.4.9 Section III, Item 3, the EFWS design should have features to meet the generic recommendations of NUREG-0611 and NUREG-0635. Generic Short Term Recommendation No. 4 (GS-4) recommends emergency procedures be available for transferring to alternate sources of EFW supply.

DCD Tier 2 Section 13.5.3 states that the COL Applicant is to describe the program for developing and implementing emergency operating procedures. However, the staff could not find a specific commitment that the COL Applicant would develop emergency procedures that specifically address the switchover of water to the DWST. Demonstrate how it will be assured that emergency procedures will be developed for switchover of water to the DWST. Include this information in the DCD and provide a markup in your response.

ANSWER:

There is already the following statement in the second paragraph of D. Emergency feedwater pits in DCD 10.4.9.2.1 Description of Major Components; "The demineralized water storage tank provides a backup source for EFWS. Due to a sufficient volume of water in the EFW pits, this backup supply is not required to be safety-related. The manual valves from the demineralized water storage tank to the EFW pumps are normally closed.", however, a description regarding the switchover procedures will be added to the statement. As for the commitment to the description of the switchover procedure in the operation manual, because there is the commitment in COL 13.5(6) to develop the emergency operating procedures, it is considered sufficient.

Impact on DCD

The second paragraph of DCD 10.4.9.2.1 Description of Major Components, D. Emergency feedwater pits will be revised as shown below:

The makeup line routed from the demineralized water storage tank to the EFW pit is used for initial water fill of the EFW pits and to provide makeup water to maintain the water level in the EFW pits during normal plant operation. The demineralized water storage tank provides a backup source for

EFWS. Due to a sufficient volume of water in the EFW pits for safe shutdown of keeping the plant at hot standby for 8 hours and performing plant cooldown to RHR entry condition for 6 hours after accident or transient, this backup supply is not required to be safety-related. The manual valves from the demineralized water storage tank to the EFW pumps are normally closed. If the water level of both EFW pits reaches low-low water level after an accident or transient without stabilizing at MODE 4 condition, the manual isolation valve will be opened by an operator. Before opening the isolation valve, the operator verify that the storage tank has adequate water level to keep sufficient NPSH of the EFW pumps.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-8

The staff could not find in the DCD a statement regarding the amount of time that the turbine-driven EFWS pump trains could supply flow to the plant in the absence of all ac power.

In accordance with SRP 10.4.9 Section III, Item 3, the EFWS design should have features to meet the generic recommendations of NUREG-0611 and NUREG-0635. Generic Short Term Recommendation No. 5 (GS-5) 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.

Demonstrate how the EFWS design meets Generic Short Term Recommendation No. 5 (GS-5) listed in NUREG-0611 and NUREG-0635. Considerations related to extended turbine-driven pump operation without ac power include, for example, the continued availability of instrumentation and control (I&C) and pump room cooling. Include this information in the DCD and provide a markup in your response.

ANSWER:

Including the valve to supply steam for driving the turbine-driven EFW pump, all the equipment that require power source among the equipment which are required to drive the pumps, are fed power from Class 1E batteries. The charging to the Class 1E batteries stops during the SBO, however, Class 1E batteries have the capacity which allows the power feeding for 2 hours to each equipment, therefore, the turbine-driven EFW pumps can be driven for at least 2 hours.
On the other hand, the design temperature of the turbine-driven EFW pump and the equipment that are related to driving it, is 175 deg F, and because the room temperature continues to rise when the turbine-driven EFW pump continues to be operated because the cooling of the emergency feedwater pump (turbine-driven) area stops during the SBO, within 1 hour after the SBO, the room is cooled and the integrity of the pump is ensured by starting the operation of 1 unit of the emergency feedwater pump (turbine-driven) area air handling unit using 1 unit of the AAC-GTG. The room temperature does not reach 175 deg F within 1hour of the SBO, before the operation of the unit.
From the above reasons, as is described in the generic recommendations of NUREG-0611 and NUREG-0635 Generic Short Term Recommendation No. 5 (GS-5), at least 2 hour feedwater from at least one train of the EFWS can be performed during the SBO.
In addition, after the starting of the operation of the AAC-GTG, the charging to the Class 1E batteries are 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 DCD

DCD 10.4.9.2.2 System Operation B. Operation during Plant Transients and Accidents (f) Station Balckout (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. From the above, 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.

2/20/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 160-1848 REVISION 0**
SRP SECTION:	**10.4.9 AUXILIARY FEEDWATER SYSTEM (PWR)**
APPLICATION SECTION:	**10.4.9**
DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-9

The staff could not find a specific commitment that the COL Applicant would develop procedures and Technical Specification requirements that specifically require confirmation of the availability of an EFW flow path that has been previously taken out of service to perform periodic testing or maintenance, including independent verification by a second operator.

In accordance with SRP 10.4.9 Section III, Item 3, the EFWS design should have features to meet the generic recommendations of NUREG-0611 and NUREG-0635. Generic Short Term Recommendation No. 6 (GS-6) recommends confirmation of availability of an EFW flow path that has been taken out of service to perform periodic testing or maintenance, including Technical Specification requirements and procedures that require an operator to verify proper alignment of the flow path. The procedures should include an independent check by a second operator to verify the flow path alignment.

Provide the procedure that demonstrates how the EFWS design meets Generic Short Term Recommendation No. 6 (GS-6) listed in NUREG-0611 and NUREG-0635. Include this information in the DCD and provide a markup in your response.

ANSWER:

In accordance with the recommendation No. 6 (GS-6), the specific operating manual that requires an operator to determine that the EFWS valves are properly aligned and a second operator to independently verify the valves are properly aligned is being provided. This procedure is included in COL 13.5(5).

Impact on DCD

The sentence which identifies the verification of the alignment will be added after the last sentence of the last paragraph of DCD 10.4.9.2.3 Testing and Inspection Requirements in page 10.4-87 as shown below:

<u>After finishing the periodic testing of EFW pumps, an operator determines that the EFWS valves are properly aligned and a second operator independently verifies that the valves are properly aligned</u>.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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APPLICATION SECTION:	**10.4.9**
DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-10

It does not appear that the DCD has demonstrated that the low level alarm setpoint on the EFW pits allows at least 20 minutes for operator action, assuming the largest capacity EFW pump is operating.

In accordance with SRP 10.4.9 Section III, Item 3, the EFWS design should have features to meet the generic recommendations of NUREG-0611 and NUREG-0635. In the additional short-term recommendation "Primary EFW Water Source Low Level Alarm," the pit low level alarm setpoint should allow at least 20 minutes for operator action, assuming the largest capacity EFW pump is operating.

Demonstrate how the EFWS design meets the additional short-term recommendation "Primary EFW Water Source Low Level Alarm" listed in NUREG-0611 and NUREG-0635 with regard to time available for operator action. Include this information in the DCD and provide a markup in your response.

ANSWER:

For each EFW pit, at least 186,200 gallons of water is ensured between the below normal level and the low water level (pump stop water level). If it is tried to empty out one EFW pit in 20 minutes using a total of 2 units of the pumps, which are M/D and T/D EFW pumps that are connected to one unit of EFW pit, about 4,650 gpm of pump flow rate would become necessary. Such a large flow rate would not flow even if the steam generator is at the atmospheric pressure condition. From the above reasons, the pit low level alarm setpoint is able to allow at least 20 minutes for operator action.

Impact on DCD

DCD 10.4.9.2.1 Description of Major Components D. Emergency feedwater pits will be revised as follows.

Two 50% EFW pits are provided. 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 deep. 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.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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SRP SECTION:	**10.4.9 AUXILIARY FEEDWATER SYSTEM (PWR)**
APPLICATION SECTION:	**10.4.9**
DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-11

The staff could not find a commitment regarding an endurance test for the EFWS pumps.

In accordance with SRP 10.4.9 Section III, Item 3, the EFWS design should have features to meet the generic recommendations of NUREG-0611 and NUREG-0635. In the additional short-term recommendation "EFW Pump Endurance Test," it is requested that a 72-hour endurance test be performed on all EFWS pumps. Following the 72-hour pump run, the pumps should be shut down and cooled down and then restarted for one hour. In accordance with SRP 10.4.9 Section III, Item 3, a 48-hour test is acceptable rather than the 72-hour test.

Demonstrate how the EFWS design meets the additional short-term recommendation "EFW Pump Endurance Test" listed in NUREG-0611 and NUREG-0635. Include this information in the DCD and provide a markup in your response.

ANSWER:

The description regarding required 48-hour endurance test with additional one hour test after cooldown is going to be added to the related DCD section.

Impact on DCD

DCD 10.4.9.2.3 Testing and Inspection Requirement will be revised as shown below:

The EFW pumps are hydrostatically tested by the pump vendor in accordance with American Society of Mechanical Engineers (ASME) Section III (Reference 10.4-8), Class 3. Prior to initial plant start-up, the entire EFWS is hydrostatically tested after the installation is complete in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section III (Reference 10.4-8), Class 3. Chapter 14, Initial Test Program, describes testing to verify component installation and initial operation including a pump endurance test in accordance with the additional short-term recommendation "EFW Pump Endurance Test" in the generic recommendations of "NUREG-0611 and NUREG-0635" and the testing of transfer between normal and emergency buses, as well as integrated system testing.

The sentence as shown below will be added to DCD 14.2.12.1.24 Motor-Driven Emergency Feedwater System Preoperational Test, A. Objectives:

5. To verify endurance of the motor-driven emergency feedwater pump.

The sentence as shown below will be added to DCD 14.2.12.1.24 Motor-Driven Emergency Feedwater System Preoperational Test, D. Acceptance Criteria:

3. 48-hour endurance test is performed on motor-driven emergency feedwater pumps. Following the 48-hour pump run, the pumps are shut down and cooled down and then restarted for one hour. After that the soundness of the pumps is confirmed.

The sentence as shown below will be added to DCD 14.2.12.1.25 Turbine-Driven Emergency Feedwater System Preoperational Test, A. Objectives:

2. To verify endurance of the turbine-driven emergency feedwater pump.

The sentence as shown below will be added to DCD 14.2.12.1.25 Turbine-Driven Emergency Feedwater System Preoperational Test, D. Acceptance Criteria:

2. 48-hour endurance test is performed on turbine-driven emergency feedwater pumps. Following the 48-hour pump run, the pumps are shut down and cooled down and then restarted for one hour. After that the soundness of the pumps is confirmed.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 10.04.09-12

As indicated in DCD Tier 2 Figures 1.2-9, 1.2-10, 9A-8, and 9A-9, each EFW pit is located in the Reactor Building within its own cubicle. However, these figures do not indicate doorways or other means of entry to these cubicles to facilitate inspections of the pits.

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

Explain how EFW pit inspections will be accomplished in accordance with the requirements of GDC 45. Include this information in the DCD and provide a markup in your response.

ANSWER:

The program for in-service testing and inspection of the EFW pit liner is the responsibility of the COL applicant. DCD Subsection 3.8.4.7 requires the COL applicant to address monitoring of seismic category I structures in accordance with the requirements of NUMARC 93-01 and 10 CFR 50.65.

Interior surfaces of the EFW pit are lined with stainless steel plate. All structural components inside the pit are of stainless steel construction. An access hatch for inspection of the pit interior is located above 100% water level. No equipment is located inside the pit. Inspection of the integrity of the liner, verifying its presence, absence of significant corrosion, etc., will be conducted upon completion of construction/installation. Complete inspections will be conducted in accordance with the ISI program with the pit drained. EFW pits are completely enclosed structures and no foreign materials intrusion is anticipated. Build-up of debris or corrosion products is not expected. Accordingly, no additional inspection program detailing is deemed necessary.

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.

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DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-13

The DCD does not appear to confirm that the testing of the EFWS will include transfer between normal and emergency buses.

In accordance with GDC 46 and SRP 10.4.9 Section IV, Item 9, testing of the EFWS should include transfer between normal and emergency buses.

Demonstrate how the EFWS is tested with regard to transfer between normal and emergency buses. Include this information in the DCD and provide a markup in your response.

ANSWER:

DCD 14.2.12.1.45 Class 1E Bus Load Sequence Preoperational Test includes transfer between normal and emergency buses.

Impact on DCD

DCD 10.4.9.2.3 Testing and Inspection Requirement will be revised as shown below:

The EFW pumps are hydrostatically tested by the pump vendor in accordance with American Society of Mechanical Engineers (ASME) Section III (Reference 10.4-8), Class 3. Prior to initial plant start-up, the entire EFWS is hydrostatically tested after the installation is complete in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section III (Reference 10.4-8), Class 3. Chapter 14, Initial Test Program, describes testing to verify component installation and initial operation <u>including an pump endurance test in accordance with the additional short-term recommendation "EFW Pump Endurance Test" in the generic recommendations of "NUREG-0611 and NUREG-0635" and the testing of transfer between normal and emergency buses</u>, as well as integrated system testing.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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SRP SECTION:	**10.4.9 AUXILIARY FEEDWATER SYSTEM (PWR)**
APPLICATION SECTION:	**10.4.9**
DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-14

The US-APWR has design provisions that detect and mitigate steam binding of the EFWS pumps due to back-leakage from the SGs to the EFWS. Steam leakage from the SGs to the EFWS pumps during standby conditions is prevented by a series arrangement of two check valves in each pump train, as shown in DCD Tier 2 Figure 10.4.9-1. The applicant states in Tier 2, Section 10.4.9.3, that temperature monitoring is performed in the EFW discharge lines as a means to detect back leakage.

The EFW system design for recognizing the effects of steam binding of EFW pumps is consistent with guidance in Generic Safety Issue (GSI)-93, "Steam Binding of Auxiliary Feedwater Pumps," and associated Generic Letter 88-03, "Resolution of Generic Safety Issue 93." Generic Letter 88-03 specifically recommends that procedures be in place for recognizing steam binding and for restoring the EFWS to operable status if steam binding is detected. However, the staff could not find any information in the DCD to ensure that the COL applicant develops operating and maintenance procedures to address steam binding issues.

Provide the operating and maintenance procedures that address EFWS steam binding issues. Include this information in the DCD and provide a markup in your response.

ANSWER:

In the case leakage from the EFW check valve is detected, restoration is performed by the following procedure.

1. Isolate the relevant line using the EFW isolation valve (EFS-MOV-019), EFW pump outlet hand-operated isolation valve (EFS-VLV-013) and EFW pump discharge cross-connect line isolation valve (EFS-MOV-014).
2. After draining the isolated range, perform the maintenance of the check valve.
3. After performing the water filling of the isolated range, complete the restoration verifying that there is no temperature rise at the temperature gauge in the upstream of the EFW check valve.

Also, in the case 1 train is isolated for the restoration, the condition of the EFWS should be shifted to T-spec 3.7.5 CONDITION B. In this case, it is necessary to complete the restoration within the completion time of 72 hours. In the case restoration cannot be performed within 72 hours, the condition of the EFWS must be shifted to CONDITION C and plant operation condition shall be shifted to MODE 3 within 6 hours, then, it must be shifted to MODE 4 within further 18 hours.

Impact on DCD

DCD 10.4.9.3 Safety Evaluation of 8th paragraph will be revised as following:

The EFWS is designed to reduce the probability of steam binding. When a back leakage from an EFW check valve occurs, high temperature water from the main feedwater line ~~reaches into EFW pump casing and into suction line. S~~will retain around the check valve, and then steam voids may be formed due to the back leakage, which may become the cause of water hammer. When the leakage continues the voids reaches into EFW-pump casing and into suction line and therefore, steam binding may occur which would make the EFW pump inoperable. To avoid water hammer and steam binding to the EFW pump, monitoring of the EFW discharge line temperature upstream of the EFW check valves provides detection of back leakage, which requires prompt corrective action. Furthermore, by installing the EFW pump at the elevation sufficiently lower than the check valve, the steam voids are prevented from reaching to the EFW pump even when there is the leakage. These are especially important during OLM because the pump discharge tie line is opened and the possibility of all EFW becoming inoperable increases. In the case leakage from the EFW check valve is detected, restoration is performed by the following procedure.

4. Isolate the relevant line using the EFW isolation valve (EFS-MOV-019), EFW pump outlet hand-operated isolation valve (EFS-VLV-013) and EFW pump discharge cross-connect line isolation valve (EFS-MOV-014).
5. After draining the isolated range, perform the maintenance of the check valve.
6. After performing the water filling of the isolated range, complete the restoration verifying that there is no temperature rise at the temperature gauge in the upstream of the EFW check valve.

Also, in the case 1 train is isolated for the restoration, the condition of the EFWS should be shifted to T-spec 3.7.5 CONDITION B. In this case, it is necessary to complete the restoration within the completion time of 72 hours. In the case restoration cannot be performed within 72 hours, the condition of the EFWS must be shifted to CONDITION C and plant operation condition shall be shifted to MODE 3 within 6 hours, then, it must be shifted to MODE 4 within further 18 hours.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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APPLICATION SECTION:	**10.4.9**
DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-15

The staff reviewed design provisions that have been incorporated to provide minimum flow for EFWS pump cooling. Minimum flow check valves for each EFWS pump are depicted in DCD Tier 2 Figure 10.4.9-1. The pump minimum flow recirculation lines discharge recirculation water back into the EFW pits.

There does not appear to be a discussion in DCD about pump minimum flow requirements addressed in NRC IE Bulletin IEB 88-04, "Potential Safety-Related Pump Loss." This bulletin discusses, in part, pump minimum flow requirements as they relate not only to pump cooling due to fluid temperature rise, but also to hydraulic instability due to insufficient minimum flow, resulting in pump cavitation and potential damage of the impeller. This bulletin recommends that the limitations associated with these hydraulic phenomena be considered when specifying minimum flow capacity.

Demonstrate how the EFWS design meets the pump minimum flow requirements listed in NRC IE Bulletin IEB 88-04, "Potential Safety-Related Pump Loss." Include this information in the DCD and provide a markup in your response.

ANSWER:

The flow rate for the minimum flow of the EFW pump is determined adequately considering the hydraulic phenomena by the pump vendor.
The EFW pumps in the US-APWR share the minimum flow lines among the two units A and B, and among the two units C and D. The case there is the possibility that either one of the pumps which share the minimum flow line becomes the dead-head, is the case that the flow rate of the feedwater to the steam generator is reduced by throttling the EFW flow rate control valve (EFS-MOV-017), when the water level of the steam generator is restored sufficiently after feedwater to the steam generator is performed by the EFW pumps which are automatically started at the time of an accident or a transient phenomenon. The minimum flow line of each EFW pump is designed so that they have the capacity which ensures the minimum flow rate that is required from the pump vendor. In addition, at the condition the feedwater to the steam generator like this is not necessary so much, as either one EFW pump is stopped, minimum flow line would not be shared.
From the above reasons, in the US-APWR, the requirements in NRC IE Bulletin IEB 88-04 "Potential Safety-Related Pump Loss" regarding the flow rate of the minimum flow of the EFW pump are satisfied.

Impact on DCD

DCD 10.4.9.2.1 Description of Major Components, A. Emergency feedwater pumps 4th pragraph will be revised as shown below:

A mini flow line from the EFW pump discharge line to the EFW pit with a normally open valve and an orifice is provided to maintain minimum recirculation flow required for pump protection. The minimum flow line ensures a minimum recirculation flow for pump cooling whenever the pumps are running. Among 2 units of A and B and among 2 units of C and D, the minimum flow line is shared. Following the requirements in NRC IE Bulletin IEB 88-04, the minimum flow line is given sufficient capacity so that either of the pumps which share a minimum flow line does not become dead-head. A separate full flow line with a normally closed valve and an orifice allows pump testing during normal plant operation at the pump design flow rate without injection to the SGs. Both the mini flow line and full flow line are routed to the EFW pit by a common header.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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APPLICATION SECTION:	**10.4.9**
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QUESTION NO.: 10.04.09-16

The DCD does not appear to include testing of the EFW pits with regard to water chemistry and water quality.

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.

Add a surveillance requirement to the Technical Specifications that ensures that the EFW pit water chemistry and quality is appropriately maintained. Include this information in the DCD and provide a markup in your response.

ANSWER:

From the reasons below, 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 described.

- Technical Specifications of the US-APWR is developed based on the NUREG-1431 STS. Therefore, the surveillance of the water chemistry regarding the EFW pits which is not described in the STS is not described.
- 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 RCS, and regarding the water chemistry, it expects nothing..
- The maximum design temperature of the EFW pit is as low as 105 deg F, and it is not the condition the SCC occurs, therefore, there is no problem with the soundness of the EFW pit itself, too.

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.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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QUESTION NO.: 10.04.09-17

As described in DCD Tier 2 Section 10.4.9.2.1, Item D "Emergency Feedwater Pits," the EFW pits are connected by a tie line with two normally closed manual valves. If these valves are not maintained closed, it might be possible for a fault in one pit (e.g., a leak) to drain inventory from the remaining pit. However, a surveillance requirement for maintaining the EFW pit cross tie valves in the closed position is not provided.

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.

Add a surveillance requirement to the Technical Specifications that ensures the EFW pit cross connect valves are normally maintained in the closed position. Include this information in the DCD and provide a markup in your response.

ANSWER:

Because of the following reasons as shown below, US-APWR T-spec 3.7.6 Emergency Feedwater Pit (EFW Pit) does not include a surveillance requirement that ensures the EFW pit cross connect valves are normally maintained in the closed position.

- The SR 3.7.6.1 requires the ensuring of the water inventory of the EFW pit. Should there be any leakage from the pit, it can be checked by this surveillance.

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.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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QUESTION NO.: 10.04.09-18

Section 2.7.1.11.1 of the Tier 1 DCD indicates that the EFWS is designed to remove decay heat and sensible heat during various transient and accident conditions, including main steam line break (MSLB) and steam generator tube rupture (SGTR). The EFWS should be designed to limit the maximum amount of feedwater that can be discharged following a MSLB to prevent excessive SG feedwater flow and pump runout.
Furthermore, the EFWS should be designed to limit the maximum amount of feedwater that can be discharged into a failed steam generator so that steam generator overfill is prevented. However, the staff could not find an ITAAC entry or DCD Tier 1 discussion that specifically addresses limitations on maximum flowrates. Limitations on maximum EFW flow rates are, however, discussed in DCD Tier 2 Sections 10.4.9.2 and 10.4.9.2.1.

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

Demonstrate how it will be assured that limitations on maximum flowrates will be addressed as part of the ITAAC process, consistent with SRP 14.3, Appendix C, Item II.B.i. Include this information in the DCD and provide a markup in your response.

ANSWER:

In DCD Tier 1 Table 2.7.1.11-5, the description regarding the maximum operating flow rate of the EFW pump will be added. The maximum operating flow rate of the EFW pump is evaluated based on the following assumption.

- The assumption of the condition that while the OLM of 1 unit of EFW pump is performed by opening all the EFW pump discharge cross-tie line isolation valves, single failure of another EFW pump occurs, that is, the condition water is fed from 2 units of EFW pumps to 4 units of the steam generators. The EFW pump flow rate under this condition is the maximum.

- The assumption that one unit among the 4 units of steam generators is depressurized to the atmospheric pressure. Furthermore, it is assumed that the emergency feedwater to the depressurized steam generator is not isolated automatically.

For the piping flow resistance used for the evaluation the test is performed that water is fed from each pump to the steam generators under the condition the EFWS is separated into 4 trains, that is, the condition all the EFW pump discharge cross-tie line isolation valves are closed, and this testing of each EFW pump will determine system flow vs. SG pressure of each train. And then analysis will be performed to convert the test results to the design conditions that the two as-built EFWS trains deliver 800 gpm to their SGs against SG pressures up to the set pressure of the first stage of main steam safety valve plus 3 percent. 800 gpm is the feedwater flow rate to the steam generators from 2 units of the pumps, which excludes the minimum flow flow rate.

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 control valves limit maximum flow to each SG 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 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.

2/20/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 160-1848 REVISION 0**
SRP SECTION:	**10.4.9 AUXILIARY FEEDWATER SYSTEM (PWR)**
APPLICATION SECTION:	**10.4.9**
DATE OF RAI ISSUE:	**1/21/2009**

QUESTION NO.: 10.04.09-19

Section 2.7.1.11.1 of the Tier 1 DCD describes flow recirculation lines from each EFW pump that permit testing of each EFW pump at full flow. Figure 2.7.1.11-1 of the Tier 1 DCD displays flow recirculation lines that are connected to pump discharge paths.

General Design Criteria (GDC) 46 requires that the EFW system be designed to permit functional testing. This testing assures the integrity and operability of the EFW system and its components necessary for the removal of reactor core decay heat and reactor coolant system (RCS) sensible heat through the steam generators following transient conditions or postulated accidents. SRP 14.3, Appendix C, Item I.A.xiv states that normally, all design commitments in Tier 1 should be verified by a specific inspections, tests, analyses, and acceptance criteria (ITAAC) entry, unless there are specific reasons why this is not necessary. SRP 14.3, Appendix C, Item II.B.iv states that online test features should be verified by ITAAC. However, the staff could not locate supporting information that specifically demonstrates how the capability of EFW pump flow test features will be verified through the ITAAC process (e.g., functional flow tests).

Demonstrate how it will be assured that EFWS online test features will be addressed as part of the ITAAC process, consistent with SRP 14.3, Appendix C, Item I.A.xiv and SRP 14.3, Appendix C, Item II.B.iv. Include this information in the DCD and provide a markup in your response.

ANSWER:

In DCD Tier 1 Table 2.7.1.11-5, the description will be added regarding the recirculation line for checking the capacity of the EFW pump by online test.

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 control valves limit maximum flow to each SG 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 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.

2/20/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 160-1848 REVISION 0**
SRP SECTION:	**10.4.9 AUXILIARY FEEDWATER SYSTEM (PWR)**
APPLICATION SECTION:	**10.4.9**
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QUESTION NO.: 10.04.09-20

Figure 2.7.1.11-1 of the Tier 1 DCD illustrates the arrangement of EFW components by means of a flow diagram. A more detailed version of the EFW configuration is provided in the Figures 10.4.9-1 and 10.4.9-2 of the Tier 2 DCD. The set of additional details provided in Figures 10.4.9-1 and 10.4.9-2 of the Tier 2 DCD includes various check valves. By comparison, Figure 2.7.1.11-1 of the Tier 1 DCD does not include any check valves. It appears that at least some of the check valves shown in Figures 10.4.9-1 and 10.4.9-2 of the Tier 2 DCD have a safety related function (e.g., some check valves would prevent flow diversion of water through an inactive pump). Also, EFWS check valves are not explicitly identified in the ITAAC shown in Table 2.7.1.11-5 of the Tier 1 DCD.

SRP 14.3, Appendix C, Item I.B.ix states that Tier 1 figures for safety-related systems should include most of the valves on the DCD Tier 2 P&ID except for items, such as fill, drain, test tees, and maintenance isolation valves. The scope of valves to be included on the figures are those motor-operated valves (MOVs), power-operated valves (POVs), and check valves with a safety related active function. Also, SRP 14.3, Appendix C, Item II.B.i states that, typically, the system ITAAC specify functional tests or tests and analyses, to verify the direct safety functions for the various system operating modes.

Demonstrate how it will be assured that EFWS check valves will be addressed as part of the ITAAC process, consistent with SRP 14.3, Appendix C, Item II.B.i. Include this information in the DCD and provide a markup in your response, including updates to Tier 1 flow diagrams to explicitly show EFWS check valves that have a safety function.

ANSWER:

The check valves with active safety-related function will be added to Table 2.7.1.11-1, Table 2.7.1.11-2, ITAAC shown in Table 2.7.1.11-5 and Figure 2.7.1.11-2 of the Tier 1 DCD.
In ITAAC shown in Table 2.7.1.11-5, the testing of the check valves which cannot be practically established includes alternative inspection method (i.e. through disassembly) of the valves. Therefore, ITAAC item 9.a.iii describes that "Tests" of the as-built check valves will be performed for the operation of the valves.

Impact on DCD

The Tier 1 DCD, Figure 2.7.1.11-1, Sheet 3 of 3 will be revised as shown below:

Table 2.7.1.11-1 Emergency Feedwater System Location of Equipment and Piping (Sheet 3 of 3)

System and Components	Location
A-EFW pit discharge check valve	Reactor Building
B-EFW pit discharge check valve	Reactor Building
A-emergency feedwater pump (turbine-driven) discharge check valve	Reactor Building
B-emergency feedwater pump (motor-driven) discharge check valve	Reactor Building
C-emergency feedwater pump (motor-driven) discharge check valve	Reactor Building
D-emergency feedwater pump (turbine-driven) discharge check valve	Reactor Building
A-emergency feedwater pump (turbine-driven) minimum flow line check valve	Reactor Building
B-emergency feedwater pump (motor-driven) minimum flow line check valve	Reactor Building
C-emergency feedwater pump (motor-driven) minimum flow line check valve	Reactor Building
D-emergency feedwater pump (turbine-driven) minimum flow line check valve	Reactor Building
A-emergency feedwater check valve (between EFW control valve and EFW isolation valve)	Reactor Building
B-emergency feedwater check valve (between EFW control valve and EFW isolation valve)	Reactor Building
C-emergency feedwater check valve (between EFW control valve and EFW isolation valve)	Reactor Building
D-emergency feedwater check valve (between EFW control valve and EFW isolation valve)	Reactor Building
A-EFW pump turbine steam inlet line from A-main steam line check valve	Reactor Building
A-EFW pump turbine steam inlet line from B-main steam line check valve	Reactor Building
D-EFW pump turbine steam inlet line from C-main steam line check valve	Reactor Building
D-EFW pump turbine steam inlet line from D-main steam line check valve	Reactor Building
A-EFW pump turbine steam inlet drain line check valve	Reactor Building
D-EFW pump turbine steam inlet drain line check valve	Reactor Building

The Tier 1 DCD, Figure 2.7.1.11-2, Sheet 5 of 9 through Sheet 9 of 9 will be revised as shown below:

Table 2.7.1.11-2 Emergency Feedwater System Equipment Characteristics (Sheet 5 of 9)

System Name	Tag No.	ASME Code Section III Class	Seismic Category I	Remotely Operated Valve	Class 1E/Qual. For Harsh Envir.	Active Safety Function	Loss of Motive Power Position
A-EFW pit discharge check valve	EFS-VLV-008A	3	Yes	No	-	Transfer Open Transfer Closed	-
B-EFW pit discharge check valve	EFS-VLV-008B	3	Yes	No	-	Transfer Open Transfer Closed	-
A-emergency feedwater pump (turbine-driven) discharge check valve	EFS-VLV-012A	3	Yes	No	-	Transfer Open Transfer Closed	-
B-emergency feedwater pump (motor-driven) discharge check valve	EFS-VLV-012B	3	Yes	No	-	Transfer Open Transfer Closed	-
C-emergency feedwater pump (motor-driven) discharge check valve	EFS-VLV-012C	3	Yes	No	-	Transfer Open Transfer Closed	-
D-emergency feedwater pump (turbine-driven) discharge check valve	EFS-VLV-012D	3	Yes	No	-	Transfer Open Transfer Closed	-

Table 2.7.1.11-2 Emergency Feedwater System Equipment Characteristics (Sheet 6 of 9)

System Name	Tag No.	ASME Code Section III Class	Seismic Category I	Remotely Operated Valve	Class 1E/Qual. For Harsh Envir.	Active Safety Function	Loss of Motive Power Position
A-emergency feedwater pump (turbine-driven) minimum flow line check valve	EFS-VLV-020A	3	Yes	No	-	Transfer Open Transfer Closed	-
B-emergency feedwater pump (motor-driven) minimum flow line check valve	EFS-VLV-020B	3	Yes	No	-	Transfer Open Transfer Closed	-
C-emergency feedwater pump (motor-driven) minimum flow line check valve	EFS-VLV-020C	3	Yes	No	-	Transfer Open Transfer Closed	-
D-emergency feedwater pump (turbine-driven) minimum flow line check valve	EFS-VLV-020D	3	Yes	No	-	Transfer Open Transfer Closed	-

Table 2.7.1.11-2 Emergency Feedwater System Equipment Characteristics (Sheet 7 of 9)

System Name	Tag No.	ASME Code Section III Class	Seismic Category I	Remotely Operated Valve	Class 1E/Qual. For Harsh Envir.	Active Safety Function	Loss of Motive Power Position
A-emergency feedwater check valve (between EFW control valve and EFW isolation valve)	EFS-VLV-018A	3	Yes	No	-	Transfer Open Transfer Closed	-
B-emergency feedwater check valve (between EFW control valve and EFW isolation valve)	EFS-VLV-018B	3	Yes	No	-	Transfer Open Transfer Closed	-
C-emergency feedwater check valve (between EFW control valve and EFW isolation valve)	EFS-VLV-018C	3	Yes	No	-	Transfer Open Transfer Closed	-
D-emergency feedwater check valve (between EFW control valve and EFW isolation valve)	EFS-VLV-018D	3	Yes	No	-	Transfer Open Transfer Closed	-

Table 2.7.1.11-2 Emergency Feedwater System Equipment Characteristics (Sheet 8 of 9)

System Name	Tag No.	ASME Code Section III Class	Seismic Category I	Remotely Operated Valve	Class 1E/Qual. For Harsh Envir.	Active Safety Function	Loss of Motive Power Position
A-EFW pump turbine steam inlet line from A-main steam line check valve	EFS-VLV-102A	3	Yes	No	-	Transfer Open Transfer Closed	-
A-EFW pump turbine steam inlet line from B-main steam line check valve	EFS-VLV-102B	3	Yes	No	-	Transfer Open Transfer Closed	-
D-EFW pump turbine steam inlet line from C-main steam line check valve	EFS-VLV-102C	3	Yes	No	-	Transfer Open Transfer Closed	-
D-EFW pump turbine steam inlet line from D-main steam line check valve	EFS-VLV-102D	3	Yes	No	-	Transfer Open Transfer Closed	-

Table 2.7.1.11-2 Emergency Feedwater System Equipment Characteristics (Sheet 9 of 9)

System Name	Tag No.	ASME Code Section III Class	Seismic Category I	Remotely Operated Valve	Class 1E/Qual. For Harsh Envir.	Active Safety Function	Loss of Motive Power Position
A-EFW pump turbine steam inlet drain line check valve	EFS-VLV-109A	3	Yes	No	-	Transfer Open Transfer Closed	-
D-EFW pump turbine steam inlet drain line check valve	EFS-VLV-109D	3	Yes	No	-	Transfer Open Transfer Closed	-

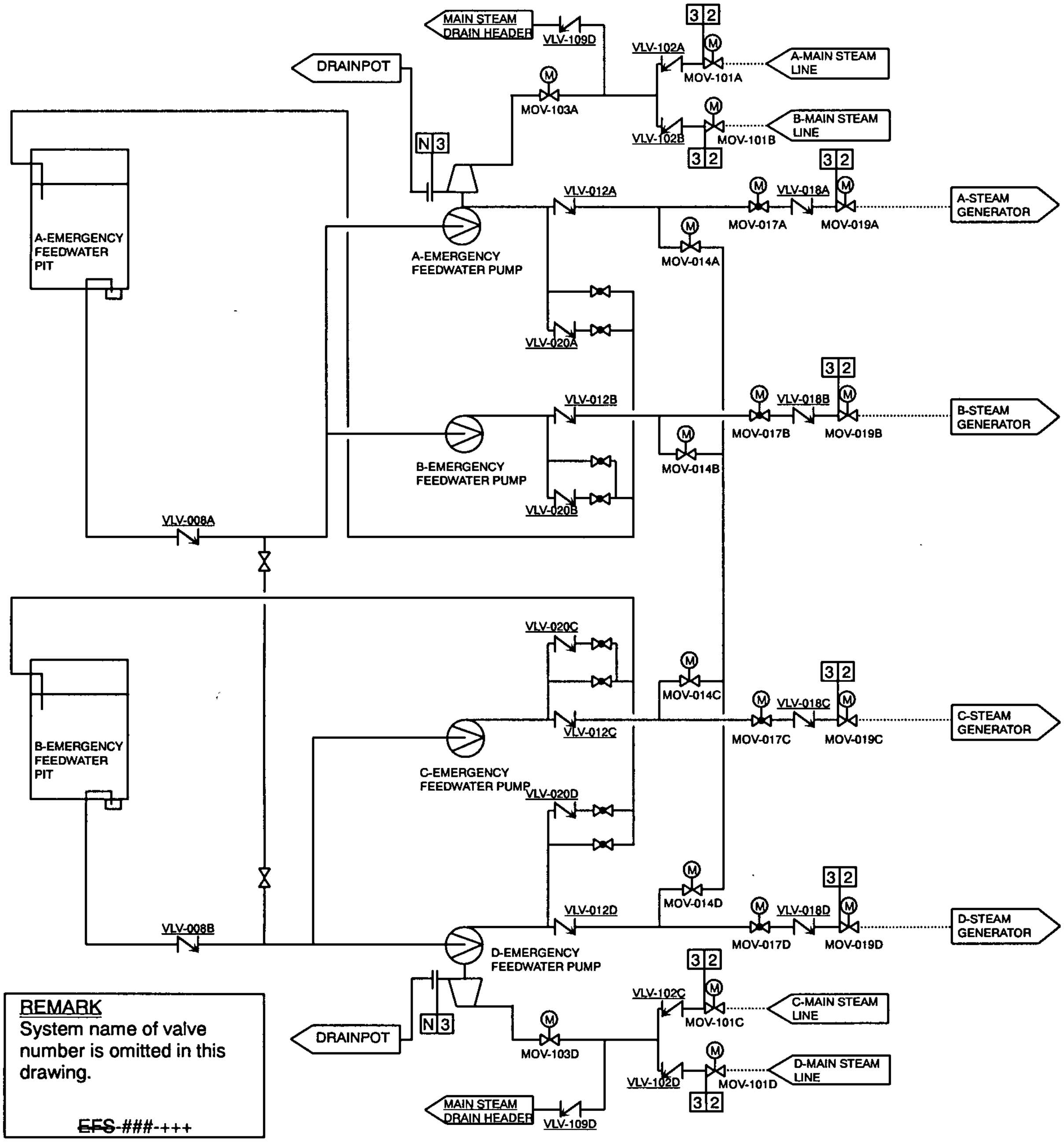
Note: Dash (-) indicates not applicable

The Tier 1 DCD, Figure 2.7.1.11-5, Sheet 4 of 5 will be revised as shown below:

Table 2.7.1.11-5 Emergency Feedwater System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 4 of 5)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8.a Controls exist in the MCR to open and close the remotely operated valves identified in Table 2.7.1.11-2.	8.a Tests will be performed on the as-built remotely operated valves listed in Table 2.7.1.11-2 using controls in the MCR.	8.a Controls in the MCR operate to open and close the as-built remotely operated valves listed in Table 2.7.1.11-2.
8.b The valves identified in Table 2.7.1.11-2 as having reactor protection system (RPS) control perform an active safety function after receiving a signal from RPS.	8.b.i Tests will be performed on the as-built remotely operated valves listed in Table 2.7.1.11-2 using simulated signals.	8.b The as-built remotely-operated valves identified in Table 2.7.1.11-2 perform the active function identified in the table after receiving a signal.
	8.b.ii Tests will be performed to demonstrate that remotely operated as-built EFW control valves and EFW isolation valves close within the required response time under preoperational condition.	8.c These as-built valves close within the following times after receipt of an actuation signal. The as-built EFW control valves close within 20 seconds. The as-built EFW isolation valves close within 20 seconds.
9.a The motor-operated and check valves, identified in Table 2.7.1.11-2 to perform an active safety-related, function to change position as indicated in the table.	9.a.i Tests or type tests of motor-operated valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i Each motor-operated valves change position as indicated in Table 2.7.1.11-2 under design conditions.
	9.a.ii Tests of the as-built motor-operated valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	9.a.ii Each as-built valves change position as indicated in Table 2.7.1.11-2 under pre-operational test conditions.
	9.a.iii Tests of the as-built check valves will be performed for the operation of the valves.	9.a.iii Each as-built check valves indicated in Table 2.7.1.11-2 perform their functions indicated in Table 2.7.1.11-2.
9.b After loss of motive power, the remotely operated valves, identified in Table 2.7.1.11-2, assume the indicated loss of motive power position.	9.b. Tests of the as-built valves will be performed under the conditions of loss of motive power.	9.b Upon loss of motive power, each as-built remotely operated valves identified in Table 2.7.1.11-2 assumes the indicated loss of motive power position.

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.

2/20/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 160-1848 REVISION 0**
SRP SECTION:	**10.4.9 AUXILIARY FEEDWATER SYSTEM (PWR)**
APPLICATION SECTION:	**10.4.9**
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QUESTION NO.: 10.04.09-21

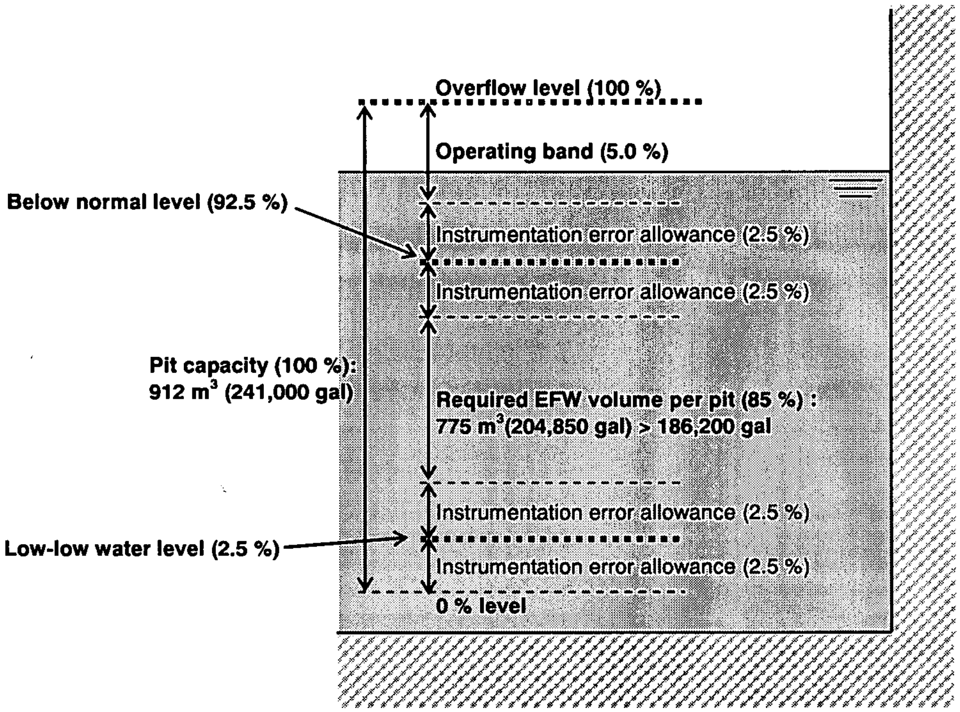
There is a Technical Specification surveillance requirement (SR) for the EFW pits, namely that the pit level be maintained at or above 204,850 gallons (SR 3.7.6.1). Also, DCD Tier 2 Section 10.4.9.3 states that the useable volume per pit is 204,850 gallons.
However, the Acceptance Criteria for ITAAC 13 as shown in DCD Tier 1 Table 2.7.1.11- 5 states that the water volume of each pit must be greater than or equal to 186,200 gallons. Thus, it appears that ITAAC 13 is not consistent with SR 3.7.6.1 and DCD Tier 2 Section 10.4.9.3.

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 and DCD Tier 2 Section 10.4.9.3. Include this information in the DCD and provide a markup in your response.

ANSWER:

186,200 gallons described in ITAAC 13 in DCD Tier 1 Table 2.7.1.11-5 is the amount of water per 1 pit of the sum total of the volume of water required for removing the decay heat during the 14 hours, which is the total of 8 hours of plant hot standby and the following 6 hours of RCS cooling to MODE 4 by steam generators (225,900 gallons), the volume of water required to remove the sensible heat during 6 hours of the RCS cooling (62,300 gallons), the volume of water required to restore the steam generator water level during the 14 hours (52,400 gallons) and the volume of water required to remove the heat input from the RCP during the 14 hours (31,800 gallons). On the other hand, the EFW pit is designed such that it is able to ensure 204,850 gallons which takes 10 % margin to 186,200 gallons into account, even when 2.5 % of instrumentation error allowance and 5.0 % of operating band are taken into consideration.
In ITAAC 13 of DCD Tier 1 Table 2.7.1.11-5, it is described to ensure the required value 186,200 gallons itself, however, in the actual inspection, as is shown in the figure below, if it is confirmed that the EFW pit water level is greater or equal to 92.5 % which is the below normal level, even if instrumentation error allowance is taken into account, it can be confirmed that the volume of water which has margin to 186,200 gallons (204,850 gallons) is ensured.
Likewise, in SR 3.7.6.1, by confirming that the water level of the EFW pit is greater or equal to 92.5 % which is the below normal level, it is confirmed that the volume of water 204,850 gallon is ensured.
That is the explanation about the 186,200 gal and 204,850 gal. In DCD Tier 2 10.4.9.3 Safety Evaluation, the comparative account of these numbers is described, however, as there are misleading descriptions on present showing, it will be revised.



Impact on DCD

DCD 10.4.9.3 Safety Evaluation 3rd paragraph will be revised as shown below:

The EFWS, with two Seismic Category I EFW pits, provides a means of pumping sufficient feedwater to remove the core decay heat following a loss of main feedwater event as well as to cool down the RCS to a temperature of 350°F at which point the RHRS can operate. A minimum of 186,200 gallons of water in each of the EFW pits is sufficient to supply the required water volume to SGs under all conditions. The basis for 186,200 gallons of water in each of the EFW pits is as follows:

Decay heat during hot standby (8 Hours) and cooldown (6 Hours)	: 225,900 gallon
Sensible heat to be removed from hot standby condition to start of residual heat removal	: 62,300 gallon
RCP heat input removal (one pump operation for 14 hours)	: 31,800 gallon
SG water level restore volume (from hot standby to cooldown condition)	: 52,400 gallon
Total required EFW volume	: 372,400 gallon
Required EFW volume per pit	: 186,200 gallon
Total ~~usable~~required EFW volume with 10 % margin	: 409,700 gallon
~~Usable~~Total required EFW volume with 10 % margin per pit	: 204,850 gallon

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

2/20/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

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The DCD does not appear to include testing of the EFW pits with regard to water chemistry and water quality.

In accordance with SRP 14.2, the applicant should verify the performance capabilities of 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 PRA (SRP 14.2 Acceptance Criteria Item II.5.viii).

Demonstrate how it will be assured that water chemistry and water quality associated with the EFW pit inventory will be tested, consistent with the SRP 14.2 Acceptance Criteria. Include this information in the DCD and provide a markup in your response.

ANSWER:

If there is anything which may adversely affect the integrity of the EFW pit, it would be the SCC, however, the maximum design temperature of the EFW pit is 105 deg F, and at the low temperature like that, SCC does not occur, therefore, there is no influence to the performance capabilities of EFW pits. Therefore, regarding the water chemistry of the EFW, oxygen concentration or chloride concentration,etc. will not be controlled, and the sampling of the turbidity only will be performed at each periodic inspection and it will be confirmed to be less or equal to 1 ppm.

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.