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December 4, 2013

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

Attention: Mr. Perry Buckberg

Docket No. 52-021
MHI Ref: UAP-HF-13277

Subject: MHI's Response to US-APWR DCD RAI No. 1058-7277 (SRP 16)

References: 1) "Request for Additional Information No. 1058-7277, SRP Section: 16 – Technical Specifications, Application Section: 16," dated November 12, 2013, ML13316B099.

With this letter, Mitsubishi Heavy Industries, Ltd. (MHI) transmits to the U.S. Nuclear Regulatory Commission (NRC) a document entitled "Response to US-APWR DCD RAI No. 1058-7277 (SRP 16)."

Enclosed is the response to the question contained within Reference 1.

Please contact to Mr. Joseph Tapia, General Manager of Licensing Department, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of this submittal. His contact information is provided below.

Sincerely,

Yoshiki Ogata,
Executive Vice President
Mitsubishi Nuclear Energy Systems, Inc.
On behalf of Mitsubishi Heavy Industries, Ltd.

Enclosure:

1. Response to US-APWR DCD RAI No. 1058-7277 (SRP 16)

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NRO

CC: P. Buckberg
J. Tapia

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Enclosure 1

UAP-HF-13277
Docket No. 52-021

Response to US-APWR DCD RAI No. 1058-7277 (SRP 16)

December 2013

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

12/4/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No.52-021

RAI NO.:	**NO. 1058-7277**
SRP SECTION:	**16 – Technical Specifications**
APPLICATION SECTION:	**16**
DATE OF RAI ISSUE:	**11/12/2013**

QUESTION NO. : 16-305

Upon review of Revision 4 of the U.S. APWR DCD, Chapter 16, "Technical Specifications (TS)," the following items were developed to address TS changes based on the response to RAI 628, Question 19.01-8, which were found to be incomplete by the staff. The applicant is requested to address the following items to allow satisfactory closure of the original RAI:

1. Add TS provisions for the "Low-Pressure Letdown Isolation" function at the end of TS Section 3.3 to support other changes in LCO 3.4.8 and LCO 3.9.6.

2. Page B 3.4.8-5: In the discussion of Action B.1, clarify the phrase "... reflects the importance of maintaining the availability of three paths for heat removal ..." The Letdown Isolation function is to prevent further loss of RCS inventory not to support a loss of decay heat removal capability

3. Page B 3.4.8-9: In the discussion of SR 3.4.8.3, clarify the phrase "... means confirmation of OPERABILITY of Instrumentation and its control (Setpoints, Channel Checks, Channel Calibrations) and valve." TS Section 3.3 does not contain any provision for this "Low-Pressure Letdown Isolation" function.

4. Page B 3.9.6-4: In the discussion of Action B.1, clarify the phrase "... reflects the importance of maintaining the availability of three paths for heat removal ..." The Letdown Isolation function is to prevent further loss of RCS inventory not to support a loss of decay heat removal capability.

5. Page B 3.9.6-6: In the discussion of SR 3.9.6.3,clarify the phrase "... means confirmation of OPERABILITY of Instrumentation and its control (Setpoints, Channel Checks, Channel Calibrations) ..." TS Section 3.3 does not contain any provision for this "Low-Pressure Letdown Isolation" function.

ANSWER:

1. TS provisions for the "Low-Pressure Letdown Isolation" I&C equipment function will be added in LCO 3.4.8 and LCO 3.9.6 as described in the response to items 3 and 5 below.

2. Low Pressure Letdown Isolation function is provided to maintain RCS inventory and to prevent the loss of the residual heat removal pumps due to overdraining from main coolant pipe, and therefore is considered risk-significant in the PRA. The TS Bases description for TS LCO 3.4.8, Action B.1 and 3.9.6, Action B.1 will be corrected in order to clarify the purpose.

3. MHI intended to include the TS controls of I&C equipment for low pressure letdown isolation valve, such as CHANNEL CHECK into SR 3.4.8.3. However, since the requirement is not clear for I&C equipment in this SR, MHI will separate out the testing of this I&C equipment into new SRs for I&C equipment as SR 3.4.8.10, SR 3.4.8.11 and SR 3.4.8.12.

4. Refer to the answer for item 2.

5. MHI intended to include the TS controls of I&C equipment for low pressure letdown isolation valve, such as CHANNEL CHECK into SR 3.9.6.3. However, since the requirement is not clear for I&C equipment in this SR, MHI will separate out the testing of this I&C equipment into SRs for I&C equipment as SR 3.9.6.9, SR 3.9.6.10 and SR 3.9.6.11.

Impact on DCD

DCD Chapter 16, LCOs 3.4.8 and 3.9.6, as their associated Bases, will be revised as shown in the Attachment-1.

Impact on R-COLA

There are impacts on the R-COLA to incorporate the DCD changes.

Impact on PRA

There is no impact on the PRA.

Impact on Topical/Technical Report

There is no impact on Topical and Technical Reports.

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY	
SR 3.4.8.8	Verify the correct breaker alignment and indicated power is available to the required SI pump.	[7 days OR In accordance with the Surveillance Frequency Control Program]	
SR 3.4.8.9	Verify that one SI pump is capable of supplying developed head at the test flow point greater than or equal to the required developed head following a manual start.	In accordance with the Inservice Testing Program	
SR 3.4.8.10	Perform CHANNEL CHECK of the required reactor coolant system loop water level.	[12 hours OR In accordance with the Surveillance Frequency Control Program]	DCD_16-305
SR 3.4.8.11	Perform MIC consistent with Specification 5.5.21, Setpoint Control Program (SCP).	[24 months OR In accordance with the Surveillance Frequency Control Program]	DCD_16-305
SR 3.4.8.12	Perform CHANNEL CALIBRATION of the required reactor coolant system loop water level.	[24 months OR In accordance with the Surveillance Frequency Control Program]	DCD_16-305

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.9.6.5	Verify the RWSP borated water volume (including water available in the refueling cavity) is ≥ 79,920 ft^3 (597,800 gallons).	[7 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.9.6.6	Verify that the RWSP boron concentration is ≥ 4000 ppm and ≤ 4200 ppm.	[7 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.9.6.7	Verify the correct breaker alignment and indicated power is available to the required SI pump.	[7 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.9.6.8	Verify that one SI pump is capable of supplying developed head at the test flow point greater than or equal to the required developed head following a manual start.	In accordance with the Inservice Testing Program
SR 3.9.6.9	Perform CHANNEL CHECK of the required reactor coolant system loop water level.	[12 hours OR In accordance with the Surveillance Frequency Control Program]

DCD_16-305

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY	
SR 3.9.6.10	Perform MIC consistent with Specification 5.5.21, Setpoint Control Program (SCP).	[24 months OR In accordance with the Surveillance Frequency Control Program]	DCD_16-305
SR 3.9.6.11	Perform CHANNEL CALIBRATION of the required reactor coolant system loop water level.	[24 months OR In accordance with the Surveillance Frequency Control Program]	DCD_16-305

ACTIONS

A.1

If one required RHR loop is inoperable, redundancy for RHR is lost. Action must be initiated to restore a third loop to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of three paths for heat removal.

B.1

If one low-pressure letdown isolation valve is inoperable, the automatic isolation function to prevent loss of RCS inventory is lost. Action must be initiated to restore the valve to OPERABLE status. The immediate Completion Time reflects the importance of maintaining ~~the availability of three paths for heat removal~~RCS inventory and preventing the potential loss of RHR as a decay heat removal method. DCD_16-305

C.1 and C.2

If less than two required loops are OPERABLE or less than two required loops in operation, except during conditions permitted by Note 1, all operations involving introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be suspended and action must be initiated immediately to restore two RHR loops to OPERABLE status and operation. The required margin to criticality must not be reduced in this type of operation. Suspending the introduction of coolant into the RCS of coolant with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. The immediate Completion Time reflects the importance of maintaining operation for heat removal. The action to restore must continue until two loops are restored to OPERABLE status and operation.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.8.3

SR 3.4.8.3 requires a complete cycle of each low-pressure letdown isolation valve. This requirements mean confirmation of OPERABILITY of ~~Instrumentation and its control (Setpoints, Channel Checks, Channel Calibrations) and~~the valve, and include TADOT of Actuation Output. DCD_16-305
Operating a low-pressure letdown isolation valve through one complete cycle ensures that the low-pressure letdown isolation valve can be ~~automatically~~ actuated to mitigate the effects from loss of RCS inventory. DCD_16-305
[The Frequency of 24 months is based on engineering judgment, taking into consideration the conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle length. This equipment is not at risk of imminent damage as it is designed to remain functional and in good condition while in operation, thus significant degradation due to a longer surveillance interval should not be of major concern. The design reliability is, therefore, maintained by taking these considerations into account based on sound engineering judgment. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.4.8.4

Verification that unborated water sources are isolated from the RCS when operating with RHR loops in service and no RCPs running ensures that an inadvertent boron dilution cannot occur under plant conditions that do not provide adequate boron mixing. [The Freguency of 7 days is reasonable considering the location of some of the valves and the fact that once secured closed the valves cannot be inadvertently repositioned. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

This SR is modified by a Note that state that the SR is not required to be performed if any RCP is in operation.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.8.8

Verification that the breaker alignment is correct and indicated power is available to the required SI pump ensures that the pump motor will be available to drive the pump upon manual start. [The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.4.8.9

Periodic surveillance testing of an SI pump to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by the ASME Code. This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the plant PRA for a drain-down event in Mode 5 with a partially filled RCS. SRs are specified in the Inservice Testing Program of the ASME Code. The ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

SR 3.4.8.10 DCD_16-305

SR 3.4.8.10 requires the performance of a CHANNEL CHECK of the required reactor coolant system loop water level in the same manner as SR 3.3.1.1.

[The Surveillance Frequency of 12 hours is based on operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the LCO required channels.

A CHANNEL CHECK may be conducted manually or automatically. For the US-APWR an automated CHANNEL CHECK is normally conducted continuously, which satisfies the 12 hour Surveillance Frequency requirement. Where the CHANNEL CHECK is conducted automatically, an alarm shall be generated when the agreement criteria is not met. If the automated CHANNEL CHECK function is unavailable, a manual CHANNEL CHECK shall be conducted at the minimum 12 hour Surveillance Frequency.

BASES

SURVEILLANCE REQUIREMENTS (continued)

OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.] DCD_16-305

SR 3.4.8.11

SR 3.4.8.11 is the performance of a MIC for the low pressure letdown isolation instrumentation in the same manner as SR 3.3.1.6.

[The Frequency of 24 months is based on engineering judgment, taking into consideration the conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle length. This equipment is not at risk of imminent damage as it is designed to remain functional and in good condition while in operation, thus significant degradation due to a longer surveillance interval should not be of major concern. The design reliability is, therefore, maintained by taking these considerations into account based on sound engineering judgment. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.4.8.12

SR 3.4.8.12 requires the performance of a CHANNEL CALIBRATION for each of the required reactor coolant system loop water level instrumentation channel in the same manner as SR 3.3.1.8.

[The Frequency of 24 months is based on engineering judgment, taking into consideration the conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle length. This equipment is not at risk of imminent damage as it is designed to remain functional and in good condition while in operation, thus significant degradation due to a longer surveillance interval should not be of major concern. The design reliability is, therefore, maintained by taking these considerations into account based on sound engineering judgment. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

REFERENCES None.

BASES

ACTIONS

A.1 and A.2

If less than the required number of RHR loops are OPERABLE, action shall be immediately initiated and continued until the RHR loop is restored to OPERABLE status and to operation or until ≥ 23 ft of water level is established above the reactor vessel flange. When the water level is ≥ 23 ft above the reactor vessel flange, the Applicability changes to that of LCO 3.9.5, and only one RHR loop is required to be OPERABLE and in operation. An immediate Completion Time is necessary for an operator to initiate corrective actions.

B.1

If one low-pressure letdown isolation valve is inoperable, the automatic isolation function to prevent loss of RCS inventory is lost. Action must be initiated to restore the valve to OPERABLE status. The immediate Completion Time reflects the importance of maintaining ~~the availability of three paths for heat removal~~RCS inventory and preventing the potential loss of RHR as a decay heat removal method. DCD_16-305

C.1

If no RHR loop is in operation, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that what would be required in the RCS for minimum refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation.

C.2

If no RHR loop is in operation, actions shall be initiated immediately, and continued, to restore two RHR loop to operation. Since the unit is in Conditions A and B concurrently, the restoration of three OPERABLE RHR loops and at least two operating RHR loop should be accomplished expeditiously..

SURVEILLANCE REQUIREMENTS

SR 3.9.6.1

This Surveillance demonstrates that two RHR loops are in operation and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. In addition, during operation of the RHR loops with the water level in the vicinity of the reactor vessel nozzles, the CS/RHR pump suction requirements must be met. [The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator for monitoring the RHR System in the control room. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.9.6.2

Verification that the required pump is OPERABLE ensures that an additional RCS or CS/RHR pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the required pump. [The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.9.6.3

SR 3.9.6.3 requires a complete cycle of each low-pressure letdown isolation valve. This requirements mean confirmation of OPERABILITY of ~~Instrumentation and its control (Setpoints, Channel Checks, Channel Calibrations) and~~the valve, and include TADOT of Actuation Output. DCD_16-305
Operating a low-pressure letdown isolation valve through one complete cycle ensures that the low-pressure letdown isolation valve can be ~~automatically~~ actuated to mitigate the effects from loss of RCS inventory. [The Frequency of 24 months is based on engineering judgment, taking into consideration the conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle length. This equipment is not at risk of imminent damage as it is designed to remain functional and in good condition while in operation, thus significant degradation due to a longer surveillance interval should not be of major concern. The design reliability is, therefore, maintained by taking these considerations into account based on sound engineering judgment. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.] DCD_16-305

SURVEILLANCE REQUIREMENTS (continued)

SR 3.9.6.7

Verification that the breaker alignment is correct and indicated power is available to the required SI pump ensures that the pump motor will be available to drive the pump upon manual start. [The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.9.6.8

Periodic surveillance testing of an SI pump to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by the ASME Code. This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the plant PRA for a drain-down event in Mode 6 with <23 ft. SRs are specified in the Inservice Testing Program of the ASME Code. The ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

SR 3.9.6.9 DCD_16-305

SR 3.9.6.9 requires the performance of a CHANNEL CHECK of the required reactor coolant system loop water level in the same manner as SR 3.3.1.1.

[The Surveillance Frequency of 12 hours is based on operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the LCO required channels.

A CHANNEL CHECK may be conducted manually or automatically. For the US-APWR an automated CHANNEL CHECK is normally conducted continuously, which satisfies the 12 hour Surveillance Frequency requirement. Where the CHANNEL CHECK is conducted automatically, an alarm shall be generated when the agreement criteria is not met. If the automated CHANNEL CHECK function is unavailable, a manual CHANNEL CHECK shall be conducted at the minimum 12 hour Surveillance Frequency.

BASES

SURVEILLANCE REQUIREMENTS (continued)

OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.] DCD_16-305

SR 3.9.6.10

SR 3.9.6.10 is the performance of a MIC for the low pressure letdown isolation instrumentation in the same manner as SR 3.3.1.6.

[The Frequency of 24 months is based on engineering judgment, taking into consideration the conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle length. This equipment is not at risk of imminent damage as it is designed to remain functional and in good condition while in operation, thus significant degradation due to a longer surveillance interval should not be of major concern. The design reliability is, therefore, maintained by taking these considerations into account based on sound engineering judgment. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.9.6.11

SR 3.9.6.11 requires the performance of a CHANNEL CALIBRATION for each of the required reactor coolant system loop water level instrumentation channel in the same manner as SR 3.3.1.8.

[The Frequency of 24 months is based on engineering judgment, taking into consideration the conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle length. This equipment is not at risk of imminent damage as it is designed to remain functional and in good condition while in operation, thus significant degradation due to a longer surveillance interval should not be of major concern. The design reliability is, therefore, maintained by taking these considerations into account based on sound engineering judgment. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

REFERENCES 1. Subsection 5.4.7