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TOKYO, JAPAN

April 7, 2010

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

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-10075

Subject: MHI's Response to US-APWR DCD RAI No. 526-4121 REVISION 2

Reference: 1) "Request for Additional Information 526-4121 Revision 2, SRP Section: 09.03.02 - Process and Post-Accident Sampling Systems, Application Section: 9.3.2" dates February 1, 2010.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Response to Request for Additional Information No. 526-4121 Revision 2."

Enclosed is the response to the RAI 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. Response to Request for Additional Information No. 526-4121 Revision 2

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

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Docket No. 52-021
MHI Ref: UAP-HF-10075

Enclosure 1

UAP-HF-10075
Docket Number 52-021

Response to Request for Additional Information
No. 526-4121 Revision 2

April 2010

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

4/7/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**526-4121 REVISION 2**
SRP SECTION:	**09.03.02 – Process and Post-Accident Sampling Systems**
APPLICATION SECTION:	**9.3.2**
DATE OF RAI ISSUE:	**02/01/2010**

QUESTION NO. : 09.03.02-13

Background

RAI 346-2641 Question No. 09.03.02-10, Item 4, requested that the applicant clarify whether proposed Technical Specification 5.5.2 was intended to fulfill the requirements of Item III.D.1.1 in NUREG-0737 and 10 CFR 50.34(f)(2)(xxvi), and if so, these criteria should be referenced in the technical specification.

In the applicant's response (Reference 1), it stated, "The Technical Specification 5.5.2 does not reference specific criteria. This format is in accordance with the Technical Specifications format as shown in NUREG-1431, "Standard Technical Specifications," Number 5.5.2 which does not include criteria in the Tech Spec."

However, it was evident to the staff that the applicant is using TS 5.5.2 to implement the recommended program of NUREG-0737, Item III.D.1.1. Therefore in RAI 461-3686, Rev. 1, Question No. 09.03.02-12, Item 5, the staff requested that the applicant describe how the appropriate requirements will be communicated to the COL holder to ensure they implement a leakage monitoring and reduction program including the systems identified in scope in Reference 1, and meeting the requirements of NUREG-0737 Item III.D.1.1. RAI 461-3686 Question No. 09.03.02-12, Item 5 further stated that the requirements communicated to the COL holder should include the acceptance criteria in terms of the limiting leak rate(s) for the in-scope systems, and what leakage level would be reportable to the NRC in accordance with NUREG-0737 Item II1.D.1.1 Position 1(a). RAI 461-3686 Question No. 09.03.02-12, Item 5 additionally indicated that the following would be methods acceptable to the staff:

a) Revise Technical Specification 5.5.2 to reflect the systems within scope of NUREG 0737 Item III.D.1.1, as provided to the staff in the response to RAI No. 346-2641 Revision 1, Question No. 09.03.02-10 (Reference 1); or

b) Revise the DCD to include a COL Information Item to ensure the COL holder implements a program meeting the requirements of NUREG-0737 Item III.D.1.1 for the systems identified as within the scope of the requirement in Reference 1.

In response (Reference 2) to Item 4 of RAI 461-3686 Question No. 09.03.02-12, the applicant agreed to revise TS 5.5.2 to reflect the systems within scope of NUREG- 0737 Item III.D.1.1, and provided a proposed markup of TS 5.5.2 showing the change. The applicant stated in response to

RAI 461-3686 Question No. 09.03.02-12 Item 5 that a COL information item to ensure that the COL Applicant develop programs is addressed in COL 13.4(1). The applicant further stated that therefore, it is not necessary to include an additional COL information item. The staff finds the applicant's response unacceptable because COL Item 13.4(1) only applies to those operational programs listed in SECY-05-0197. The NUREG-0737 Item III.D.1.1 Leakage Monitoring and Prevention Programs is not one of the programs considered by SECY-05-0197 to be an operational program. The staff recognizes that the COL applicant will have to develop programs and procedures to implement technical specification requirements. However, Technical Specification 5.5.2 does not contain a reference to the regulatory criteria, specifically NUREG-0737 III.D.1.1, needed to develop the program, nor does it provide any link to the limiting leak rate that is the basis for the leakage acceptance criterion.

(In response to Item 2 of RAI 461-3686 Question No. 09.03.02-12, the applicant indicated the total ESF system leakage rate of 17.6 lb/hr stated in DCD Table 15.4.8-3 is a conservative number based on the assumed leakage rate from a number of sources. It is implied that the actual system leakage acceptance criteria would be chosen to support maintaining the total ESF leakage rate under 17.6 lb/hr)

Requested Information

How will the regulatory basis (i.e., NUREG-0737 Item III.D.1.1 and/or 10 CFR 50.34 (f)(2)(xxvi)) for the program identified in TS 5.5.2 be communicated to the COL applicant, to ensure the COL develops a program with appropriate methods and acceptance criteria?

References

1. Letter from Yoshiki Ogata (MHI) to Mr. Jeffrey A. Ciocco dated June 8, 2009, Subject: MHI's Response to US-APWR DCD RAI No. 346-2641 REVISION 1, Docket No. 52-021 MHI Ref: UAP-HF-09296 (ADAMS Accession No. ML091620184)

2. Letter from Yoshiki Ogata (MHI) to Mr. Jeffrey A. Ciocco dated November 17, 2009, Subject: MHI's Response to US-APWR DCD RAI No. 461-3686 REVISION 1, Docket No. 52-021 MHI Ref: UAP-HF-09527 (ADAMS Accession No.ML093240141)

ANSWER:

DCD will be revised as shown in "Impact on DCD" section below to include a COL Information Item to ensure the COL holder implements a program meeting the requirements of NUREG-0737 Item III.D.1.1 for the systems identified in TS 5.5.2.

Impact on DCD

DCD Tier 2 Table 1.8-2 and Section 13.4.1 Combined License Information, add COL 13.4(2) to read as follows:

13.4(2) The COL Applicant is to develop a leakage monitoring and prevention program for the systems specified in TS 5.5.2. The leakage monitoring and prevention program will include the appropriate methods and acceptance criteria as defined in NUREG-0737 Item III.D.1.1 (Ref 13.4-2).

DCD Section 13.4.2 References, add Reference 13.4-2 to read as follows:

13.4-2 Clarification of TMI Action Plan Requirements, NUREG-0737, U.S. Nuclear Regulatory Commission, Washington, DC, November 1980.

Impact on COLA

The COLA shall be updated to address changes to the DCD for COL item 13.4(2).

Impact on PRA

There is no impact on the PRA

This completes MHI's response to the NRC's question.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

4/7/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**526-4121 REVISION 2**
SRP SECTION:	**09.03.02 – Process and Post-Accident Sampling Systems**
APPLICATION SECTION:	**9.3.2**
DATE OF RAI ISSUE:	**2/1/2010**

QUESTION NO. : 09.03.02-14

Background

In the response to Item 3 of RAI 461-3686 Question No. 09.03.02-12, the applicant indicated that "a few gallons" of ESF leakage can be detected by the leakage detection system, and that the leakage rate can be calculated based on the level change time intervals (the staff assumes this means the level change in the sump for the ESF room(s) in the Equipment and Floor Drainage System). The applicant also indicated an alarm sounds in the main control room allowing an operator to be dispatched to investigate the leak and take action as necessary, including opening a valve to drain the liquid to the sump. However, the applicant did not provide actual leakage detection sensitivity in gallons per minute (gpm) or gallons per hour (gph). The staff requires clarification of why it is not necessary to identify the actual leak rate sensitivity. Will a leak of any size be corrected?

It is also not clear whether the ESF leak rates could be characterized after an accident if there are highly radioactive fluids in the system, since operator action is required to open a valve to drain the liquid to the sump.

Requested Information

1. Provide the actual leakage rate sensitivity, in terms of gallons per minute or gallons per hour, of the leakage detection system for the ESF rooms, or explain why it is not necessary to specify the leakage rate sensitivity.

2. Can the ESF leakage rates be characterized in a post-accident situation using the leakage detection system described?

ANSWER:

1. The leak detection system used for the ESF rooms is shown in sketch 1 attached. The leak detection system includes a leak accumulation pit equipped with two level switches at different levels and a drain pipe. The accumulation pit is approximately 1 foot 8 inches wide by 1 foot 4 inches long by 6 inches deep, and has a liquid volume about 1.1 cubic feet. The leak detection system is located inside each ESF room. When liquid accumulates to a predetermined liquid level (approximately 1.5 inches from the pit bottom), the level switch will

initiate an alarm in the main control room and starts timing the leak. When liquid reaches to a predetermined liquid level of the second level switch (approximately 3 inches from the pit bottom), the level switch will initiate an alarm in the main control room. This signal allows determination of leakage rate based on the accumulation rate. Should liquid continue to accumulate, it will be trapped inside the tank cubicle and flooding inside the cubicles may occur. A separate level switch is mounted on the inside wall near the floor of the ESF room. This third level switch detecting liquid will initiate an alarm in the main control room. The level switches are accurate to approximately +/- ¼ inch liquid level measurement. This design approach enables the plant operators to determine and/or evaluate the extent of conditions and perform analysis before corrective actions are implemented.

The above approach detects the predetermined liquid levels and measures the accumulation rate, from which the actual leakage rate can be determined. The sensitivity of the leakage rate is correlated to the liquid volume between the setpoints of the level switches and the accumulation time. In this design the difference in height between the level switches is 1.5 inches, which represents about 7.9 liters.

2. The ESF leak detection system is designed (as mentioned in part 1 of this response) to detect leaks during normal and post-accident situation. However the design is not able to characterize the contamination levels associated with the leakages. Characterization of the liquid can be estimated based on operating data and analysis results, and confirmed by sampling and analysis.

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

This completes MHI's response to the NRC's question.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

4/7/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**526-4121 REVISION 2**
SRP SECTION:	**09.03.02 – Process and Post-Accident Sampling Systems**
APPLICATION SECTION:	**9.3.2**
DATE OF RAI ISSUE:	**2/1/2010**

QUESTION NO. : 09.03.02-15

Background

In the response to RAI 346-2641 Question 09.03.02-10 Item 2, the applicant stated, in part, "Also, the Chemical and Volume Control System (CVCS) does not perform an ECCS function and is not expected to contain radioactive material following an accident. The CVCS can be used following an accident, but this system is not operated when high containment radiation levels exist. The leak detection design provided for the system can appropriately detect the leakage when the system is used."

In the response to RAI 461-3686, Question 09.03.02-12 Item 4, the applicant clarified that the CVCS is included within the scope of the leakage monitoring and prevention program. However, the "leakage detection design" for the CVCS is not described in DCD Section 9.3.4. In addition, DCD Tier 2 Section 9.3.4.3 states "The CVCS does not provide an ECCS function. Therefore, the provision for a leakage detection and control program in accordance with 10 CFR 50.34 (f) (xxvi) does not apply."

Requested Information

1. Provide more detail on the leak detection system for the CVCS.

2. Since the response to RAI 461-3686, Question 09.03.02-12 Item 4 indicated that the CVCS is to be included in the scope of the leakage monitoring and prevention program, the staff requests the applicant remove the statement from the DCD that, "Therefore, the provision for a leakage detection and control program in accordance with 10 CFR 50.34 (f) (xxvi) does not apply."

ANSWER:

1. The leakage detection system design for the CVCS systems takes into consideration the possibilities of large leakage from the tanks in the CVCS. Failure of these tanks could flood the floor drain sump tank area if not carefully controlled. Hence the design uses level

switches inside a slightly sloped drain pipe with a normally closed valve at the down slope side (Refer to the attached sketch 2).

When liquid accumulates to a predetermined liquid level, the first level switch sensing element which is inserted into the pipe will initiate an alarm and starts timing the leak. A second level switch is installed upstream of the sloped drain pipe with sufficient volume for liquid accumulation. When liquid continues to accumulate to the next level, the second level switch will initiate an alarm in the main control room. This signal allows determination of leakage rate based on the accumulation rate of the liquid. Should leak continues to accumulate, the liquid will be trapped inside the tank cubicle and flooding inside the cubicles may occur, if no other corrective actions are implemented. This design approach enables the plant operators to determine and/or evaluate the extent of conditions and perform analysis before corrective actions are implemented.

The above approach detects the predetermined liquid levels and measures the accumulation rate, from which the actual leakage rate can be determined. The sensitivity of the leakage rate is correlated to the sensitivity of the level switch. It should also be noted the two level switches can also be served as redundant leak detection instruments.

2. The following statement in the DCD, "Therefore, the provision for a leakage detection and control program in accordance with 10 CFR 50.34 (f) (xxvi) does not apply." will be deleted.

Impact on DCD

DCD Section 9.3.4.3, sixth paragraph, delete the last sentence as follows:

The CVCS does not provide an ECCS function. ~~Therefore, the provision for a leakage detection and control program in accordance with 10 CFR 50.34 (f) (xxvi) does not apply.~~

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

This completes MHI's response to the NRC's question.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

4/7/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**526-4121 REVISION 2**
SRP SECTION:	**09.03.02 – Process and Post-Accident Sampling Systems**
APPLICATION SECTION:	**9.3.2**
DATE OF RAI ISSUE:	**2/1/2010**

QUESTION NO. : 09.03.02-16

Background

The response to RAI 346-2641 Question 09.03.02-10 Item 2 as supplemented by the response to RAI 461-3686 Question 09.03.02-12 Item 3 described the leak detection system for the ESF systems (including RHRS, HHIS, and CSS). However, it is not clear if there is a similar leak detection system for the PSS, CVCS, or GWMS.

Requested Information

Is a system provided for online leakage detection and measurement for the PSS, CVCS, and GWMS? If not, how are leakage rates during normal operation determined?

ANSWER:

A leak detection system for the CVCS is described in the response to RAI No. 526-4121 Revision 2, Question No. 09.03.02-15 (1).

The portions of the PSS that may contain primary coolant are provided with leak detection systems. A primary liquid sampling station is provided for sampling the following: RCS hot leg; pressurizer liquid space; RHR downstream of containment spray; CVCS downstream of the letdown heat exchanger; upstream and downstream of the CVCS mixed bed demineralizer; downstream of the CVCS cation bed demineralizer; and downstream of deborating demineralizer. This primary liquid sampling station is provided for sampling during normal operation. A sink is provided in this sampling station to collect samples. A leak detection system is provided underneath the sink to detect leakage, consisting of a level instrument. Upon detection of accumulation with this level instrument, the leak detection system will initiate an alarm signal for operator action. The post-accident sampling rack is provided to obtain the post-accident sample of the reactor coolant. A drip pan is located below the sampling panel to collect any leakages; and a leak rate detection instrument is provided below the drip pan to provide alarm signal and measure leak rate.

For the balance of the PSS, online leak rate detection system is considered not practical due to the spread of PSS piping. However, the COL Applicant is required to include in the plant overall leak detection program for initial leak-test of the PSS, periodic analysis of R/B sump, A/B sump, and PSS sample sink drains to detect and/or determine possible primary coolant leakage, locate

and measure leak rates; fix piping that leaks; and report leakage to NRC. The COL Applicant is also required to implement a program of preventive maintenance to reduce leakage; and perform integrated leak tests at intervals not to exceed each refueling cycle. These provisions satisfy NUREG 0737, Item III.D.1.1.

It should be noted that the PSS uses stainless steel tubing and flow restricting orifices to prevent reactor coolant loss; leakage outside the containment is collected in the sump tank, or collected in the sample sink and drained to the WHT for processing.

Online measurement of highly radioactive gaseous leak rate is also considered not practical. The COL Applicant is required to perform initial leak-tests and similar preventive and maintenance program for the GWMS. Testing of the GWMS should include helium leak detection or equivalent test methods.

It should be noted that the gaseous waste system is capable of detecting leaks by monitoring the system operating parameters for abnormalities. If a leak does exist, the system instrumentation would indicate changes in flow rates and pressures outside the normal operating range. Once identified through system instrumentation and controls, the operator can take appropriate action to isolate the leak.

Impact on DCD

There is no impact on the DCD

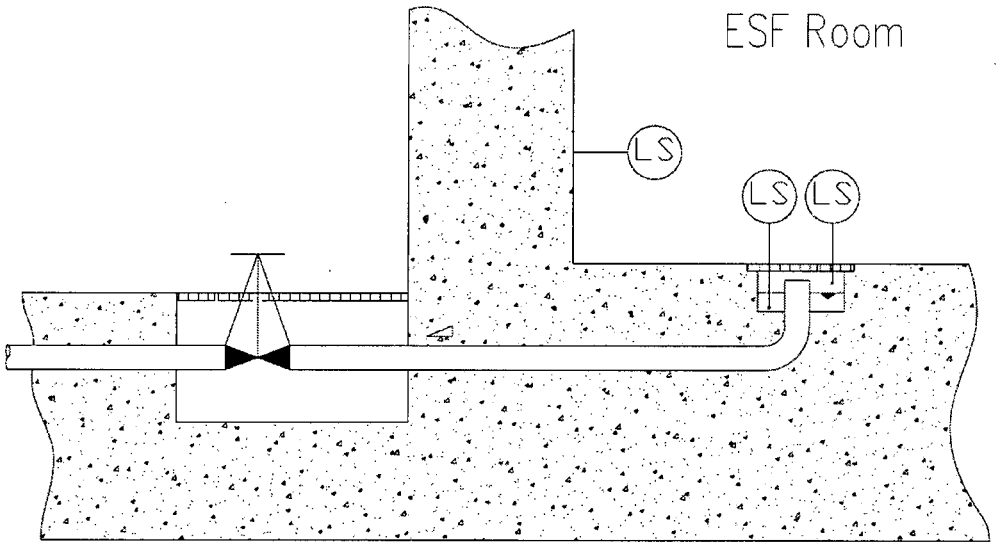
Impact on COLA

There is no impact on the COLA

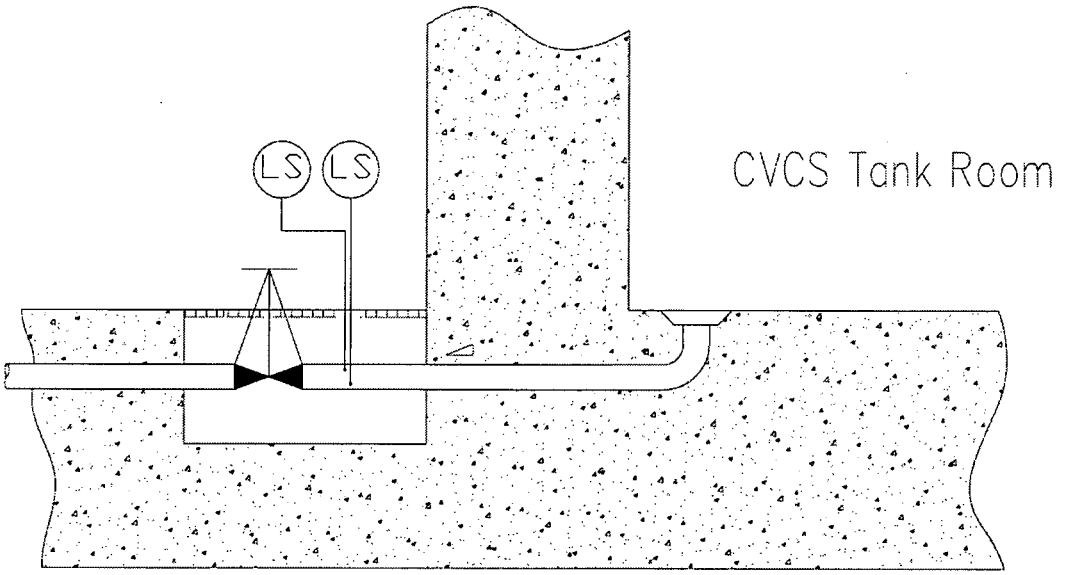
Impact on PRA

There is no impact on the PRA

This completes MHI's response to the NRC's question.



Sketch 1 – ESF Room Leak Detection System Schematic



Sketch 2 – CVCS Tank Room Leak Detection System Schematic