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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-09527

Subject: MHI's Response to US-APWR DCD RAI No. 461-3686 REVISION 1

Reference: 1) "Request for Additional Information 461-3686 Revision 1, SRP Section: 09.03.02 - Process and Post-Accident Sampling Systems, Application Section: 9.3.2" dates October 6, 2009.

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. 461-3686 Revision 1."

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. 461-3686 Revision 1

CC: J. A. Ciocco
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NRO

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Docket No. 52-021
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Enclosure 1

UAP-HF-09527
Docket Number 52-021

Response to Request for Additional Information
No. 461-3686 Revision 1

November 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

11/17/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 461-3686 REVISION 1**
SRP SECTION:	**09.03.02 – Process and Post-Accident Sampling Systems**
APPLICATION SECTION:	**9.3.2**
DATE OF RAI ISSUE:	**10/6/2009**

QUESTION NO. : 09.03.02-12

Background

In RAI 09.03.02-10 (Reference 1), the staff requested additional information regarding the conformance of the US-APWR design to NUREG-0737 Item III.D.1.1 as required by 10 CFR 50.34(f)(2)(xxvi). Specifically, the applicant was requested to provide the following information:

1. List the systems considered to be in scope of the requirements of NUREG-0737 Item III.D.1.1 or 10 CFR 50.34(f)(2)(xxvi). If any systems expected to contain radioactive materials after an accident are excluded from the leakage detection program, justify the exclusion of these systems.

2. Describe the design provisions that facilitate minimization and detection of leakage for each of the systems considered to be in scope of item III.D.1.1 or 10 CFR 50.34(f)(2)(xxvi), if not already described in the DCD.

3. Discuss the need to include a COL information item in the DCD to ensure the COL holder develops a program for leakage monitoring and prevention to fulfill the requirements of NUREG-0737 Item III.D.1.1 and 10 CFR 50.34(f)(2)(xxvi).

4. Clarify whether proposed Technical Specification 5.5.2 intended to fulfill the requirements of Item III.D.1.1 and NUREG-0737 and 10 CFR 50.34(f)(2)(xxvi). If so, these criteria should be referenced in the technical specification.

5. In DCD Tier 1 and Tier 2, provide the initial test program information for leakage control and detection for all systems outside containment that contain (or might contain) accident source term radioactive materials following an accident.

In the discussion which follows, 10 CFR 50.34(f)(2)(xxvi) requires conformance to NUREG-0737 Item III.D.1.1. The requirements in NUREG-0737 are identified.

NUREG-0737 Item III.D.1.1 Position 1(b) requires applicants to measure actual leakage rates with the system in operation and report them to NRC. Also, certain accident analyses, such as the rod ejection accident, assume a particular ESF leakage rate (see US-APWR DCD Table 15.4.8-3). While the applicant did identify the initial test program information for leakage detection

in the ESF rooms in subsection 14.2.12.1.77 as requested in Item 5 above, the initial test requirement does not require the measurement of actual system leakage rates, or contain any acceptance criteria for system leakage rates.

NUREG-0737 Item III.D.1.1 Position 2 requires continuing leakage reduction by establishing a program of preventive maintenance to reduce leakage to as-low-as-practicable levels, The response to Item 2 states, in part, that the leakage detection system is included in the Equipment and Floor Drainage Systems described in Chapter 9, Subsection 9.3.3. Section 9.3.3.3 indicates that rooms housing ESF equipment have a wall-mounted level switch, as required, to warn of a flooded condition and a leak-detecting floor drain box with electrodes to provide indication in the main control room for the purpose of leakage source, and that a common alarm in the MCR provides audible indication of a leak. Also, Section 9.3.3.5, "Instrumentation Requirements", states, in part that level indication, in addition to the level-operated switch used for pump control, is provided for sumps in the containment to provide backup indication of the presence of large leaks and to provide information as to the source. However, it is not clear from the information in Section 9.3.3 how sensitive the leak detection systems are, or whether the systems provide the capability to determine the leakage rate. For a leakage detection system to facilitate minimization of the leakage rate, the detection system must be capable of detecting relatively small leaks and allow measurement of the leakage rate, so that prompt corrective maintenance can be performed as needed.

In response to Item 2, the applicant indicated that neither the Chemical and Volume Control System (CVCS) or the gaseous waste management system (GWMS) were expected to contain highly radioactive fluids following an accident, thus, were not included within the scope of the program. However, in operating plant designs, the sample system flow paths for post-accident sampling typically return to the volume control tank (CVCS system) for liquid samples and the gaseous waste system for gaseous systems. Further, during the long-term recovery period following an accident there will be a need for many of the functions performed by the CVCS and GWMS. Therefore, the staff requires additional technical justification for the exclusion of the CVCS and GWMS systems from the scope of the NUREG-0737 Item III.D.1.1 program. The technical justification needs to address whether the CVCS and GWMS be relied on during the long-term post accident recovery period. If these systems will not be used during the post-accident period, the staff requires an explanation of how the critical functions of these systems (make-up and let-down, boron control, chemical control) will be accomplished in the absence of these systems.

In response to Item 3, the applicant stated that a COL information item to ensure the COL holder develops a program for leakage monitoring and prevention is not considered necessary because the systems have the necessary features built into the design as listed above, and because additional information on the leakage monitoring and prevention program is covered in Chapter 16, Technical Specification 5.5.2, which the
COL holder must comply with.

In response to Item 4, the applicant indicated that Technical Specification 5.5.2 does not reference specific criteria because it is based on the NUREG-1431, "Standard Technical Specifications" format. However, the list of systems in Technical Specification 5.5.2 does not match those systems listed in response to Item 1.

The applicant is relying on Technical Specification 5.5.2 to ensure the COL holders implements a program to implement the NUREG-0737 Item III.D.1.1 requirements for a leakage monitoring and control program; however, the list of systems in the technical specification is not correct for the US-APWR. Acceptable methods to the staff to correct this discrepancy would be for the applicant to change the technical specification to reference the specific in-scope systems, or include a COL information item requiring the COL holder to implement a leakage monitoring and control program conforming to NUREG-0737 Item III.D.1.1 which lists the correct systems in scope of the

requirement, as well as the basic requirements of the program.

Requested Information

1) Describe how the initial test program item described in DCD Subsection 14.2.12.1.77 determines the initial system leakage rate.

2) Provide the acceptance criteria for the initial test program system leakage rates and the operational leakage rates. Describe the basis for these acceptance criteria. Discuss whether these acceptance criteria are related to ESF leakage limits included in DCD Chapter 15.

3) What is the sensitivity of the leakage detection system described in DCD Subsection 9.3.3 in terms of leakage rate is the system capable of determining leakage rate? If not, justify how the system design supports the goal of "continuing leak reduction" of NUREG-0737 Item III.D.1.1, Position 2.

4) The response to RAI 09.03.02-10 stated the CVCS and GWMS are not expected to contain radioactive material following an accident. Therefore, the staff requires additional technical justification for the exclusion of the CVCS and GWMS systems from the scope of the NUREG-0737 Item III.D.1.1 program. Specifically, will the CVCS and GWMS be relied on during the long-term post accident recovery period? If not, explain how the critical functions of these systems (make-up and let-down, boron control, chemical control) will be accomplished in the absence of these systems

5) 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 as in-scope in Reference 1, and meeting the requirements of NUREG-0737 Item III.D.1.1. 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 III.D.1.1 Position 1(a). 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 Revision1, 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.

References

1. Letter from Yoshiki Ogata (MHI) to Mr. Jeffery 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)

ANSWER:

1. Preoperational test 14.2.12.1.77 does not determine the initial system leak rate. This test verifies the calibration and functionality of the miscellaneous leakage detection system installed in each ESF equipment room, which are then used to determine and monitor the leak rate. The initial system leak rate within the ESF equipment rooms is measured during initial performance of the program identified in TS section 5.5.2, Primary Coolant

Sources Outside Containment, which is performed during Hot Functional testing as identified in Impact on DCD below.

2. The program for leakage monitoring and prevention identified in TS section 5.5.2 including the acceptance criteria for allowable leakage rates will be developed by COL Applicant. The total ESF system leakage rate of 17.6 lb/hr stated in DCD Table 15.4.8-3 is determined based on the assumed leakage which is double the leakage rate from sources that may contain high radioactive recirculation water (e.g. valve packing glands, pump shaft seals, flanged connections). The total ESF system leakage is in general well below this leakage rate.

3. The leakage detection design can be used to determine the leakage rate based on the rate of accumulation of liquid in the leakage detection system. A few gallons of ESF leakage can be detected and the leakage rates will be calculated based the level change time intervals. In addition, in the event that a leak is detected, an alarm sounds in the Main Control Room, an operator is dispatched to examine the area and the cause of the leak, open the valve to allow the leaked fluid to drain to the sump. When appropriate, the ESF system and room can be isolated for repair. The design is therefore supporting the goal of continuing leak reduction.

4. The response to RAI 09.03.02-10 does not intent that the CVCS and GWMS were excluded from the scope of the NUREG-0737 Item III.D.1.1 program. The response states that both the CVCS and GWMS can be used after an accident. Technical Specification 5.5.2 will be revised to include these systems.

5. Technical Specification 5.5.2 will be revised to reflect the systems within scope of NUREG-0737 Item III.D.1.1 as described in the response to item 4. A COL information item to ensure that the COL Applicant develop programs is addressed in COL 13.4(1). Therefore, it is not necessary to include an additional COL information item.

Impact on DCD

DCD Tier 2 Subsection 14.2.12.1.1, RCS Hot Functional Preoperational Test will be revised to add Item C.7 of Test Method. Changes to the DCD have been provided in Mitsubishi Heavy Industries, Ltd. letter to the NRC, "Transmittal of the Updated Chapter 14 of US-APWR DCD," dated October 28, 2009 (UAP-HF-09499).

The statement in the first paragraph of Section 5.5.2 in Chapter 16 will be revised to read;
"This program provides controls to minimize leakage from those portions of systems outside containment that could contain highly radioactive fluids during a serious transient or accident to levels as low as practicable. The systems include Containment Spray, Safety Injection, Chemical and Volume Control, **Gaseous Waste Management** and Sampling System. The program shall include the following:"

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.