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June 17, 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-09324

Subject: MHI's Responses to US-APWR DCD RAI No. 371-2617 Revision 0

References:
1) "Request for Additional Information No. 371-2617 Revision 0, SRP Section: 14.02 – Initial Plant Test Program – Design Certification and New License Applicants, Application Section: 14.2 Initial Test Program" dated May 20, 2009.
2) "MHI's Response to US-APWR DCD RAI No. 33", dated September 4, 2008 (MHI ref. UAP-HF-08165)
3) "MHI's Response to US-APWR DCD RAI No. 102-391 Revision 0", dated December 18, 2008 (MHI ref. UAP-HF-08287)
4) "MHI's Responses to US-APWR DCD RAI No. 243-2044 Revision 0" dated March 27, 2009 (MHI ref. UAP-HF-09130)

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. 371-2617 Revision 0".

Enclosed is the response to Question 14.02-117 that is contained within Reference 1. MHI supplements the previous responses provided by References 2, 3 and 4 with this response.

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.
Enclosures:

1. Response to Request for Additional Information No. 371-2617, Revision 0

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

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NRO

Contact Information

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Enclosure 1

UAP-HF-09324
Docket No. 52-021

Response to Request for Additional Information No. 371-2617
Revision 0

June 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/17/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 371-2617 REVISION 0**
SRP SECTION:	**14.02 – Initial Plant Test Program – Design Certification and New License Applicants**
APPLICATION SECTION:	**14.2**
DATE OF RAI ISSUE:	**5/20/2009**

QUESTION NO.: 14.02-117

DCD section 5.2.5 and MHI's response to RAI 14.02-101 both list the various subsystems that comprise the RCPB leak detection system. MHI's response to followup RAI 14.02-112 provides a draft test, 14.2.12.1.115, that addresses only two of these many subsystems. The other systems may be tested in other preoperational tests, but that is not clear. Please expand test 14.2.12.1.115 either to include testing of all subsystems or to cross reference the test abstracts where that testing is performed. Test 115 should, therefore, provide in one place clear documentation that all RCPB leakage detection subsystems are calibrated and tested, and should document the conversion factors and the results of the conversions from measured quantities to RCS leak rate for each subsystem. If certain subsystems only provide indication of a leak and not quantification this should be documented as well.

(BNL Followup to RAI 14.02-69, RAI 14.02-101 and RAI 14.02-112)

ANSWER:

MHI will revise preoperational test abstract 14.2.12.1.115 (initially provided as a draft per RAI-33 (Ref. 1) and revised per RAI-243 (Ref. 2)) to explicitly identify and verify the calibration and testing of all RCPB leakage detection subsystems.

Changes to Subsection 14.2.12.1.115 revise the responses to RAI-33 Question 14.02-69 (Ref. 1), and RAI-243 Question 14.02-112 (Ref. 2) regarding the text of new preoperational test 14.2.12.1.115, RCPB Leak Detection Systems.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1 as follows:

Note: Previous additions and revisions to Subsection 14.2.12.1.115 per references 1 and 2 are incorporated without change indicators in the following:

14.2.12.1.115 RCPB Leak Detection Systems Test

A. Objective
   1. To verify operability of RCPB leak detection systems and adjust the alarm setpoints.
   2. To demonstrate the function described in Subsection 5.2.5 with reference to RG 1.45.
   3. To determine quantitative conversion data from measured quantities that correspond to RCS leak rate.

Note: This test may be performed in conjunction with Subsection 14.2.12.1.80, "Liquid Waste Management System Preoperational Test."

B. Prerequisites
   1. Component testing and instrument calibration ~~has been~~is completed.
   2. Test instrumentation ~~has been~~ is available and calibrated.

C. Test Method
   1. Verify the calibration, ~~and~~ alarm setpoints and alarm functions ~~using simulated signals~~ to each channel of RCPB leak detection systems and associated systems used to determine RCS leakage identified below.
   ~~2. Verify alarm functions.~~

   Note: Instrument channel verification should be performed in conjunction with the associated tests identified below.

      a. Intersystem leakage, SG tube leakage and unidentified leakage detection design features:

Feature	Instrument	Associated Test
Containment sump level	Containment sump level instrument in Figure 11.2-1	14.2.12.1.115
Containment airborne particulate radioactivity	RMS-RE-40 in Figure11.5-1a and Subsection 11.5.2	14.2.12.1.78
Containment airborne gaseous radioactivity monitor	RMS-RE-41 in Figure11.5-1b and Subsection 11.5.2	14.2.12.1.78
Containment air cooler condensate standpipe level	Containment air cooler condensate standpipe level instrument in Figure 11.2-1	14.2.12.1.115
Steam generator blowdown water radiation monitor	RMS-RE-55 in Figure11.5-1d and Subsection 11.5.2	14.2.12.1.78
High sensitivity main steam line monitor	RMS-RE-65A, 65B, 66A, 66B, 67A, 67B, 68A, 68B in Figure11.5-1c and Subsection 11.5.2	14.2.12.1.78
Condenser vacuum pump exhaust line radiation monitor	RMS-RE-43A, 43B, 81A, 81B in Figure11.5-1i and Subsection 11.5.2	14.2.12.1.78

RHRS suction RTD	RHS-TE-605, 615, 625, 635 in Figure 5.4.7.2	14.2.12.1.22
SIS/accumulator injection line	SIS-LT-910, 911, 920, 921, 930, 931, 940, 941 in Figure 6.3-2	14.2.12.1.56
Safety Injection pumps discharge lines RTD	SIS-TE-984, 985, 986, 987 in Figure 6.3-2	14.2.12.1.56
SI Direct vessel Injection line RTD	SIS-TE-980, 981, 982, 983 in Figure 6.3-2	14.2.12.1.56
RHR Emergency letdown lines RTD	SIS-TE-988, 989 in Figure 6.3-2	14.2.12.1.22
Reactor head seal leakage RTD	RCS-TE-400 in Figure 5.1-2	14.2.12.1.8
CCW radiation monitors	RMS-RE-56A, 56B in Figure 11.5-1f	14.2.12.1.78
CCW surge tank level	NCS-LT-1200, 1201, 1210, 1211 in Figure 9.2.2-1	14.2.12.1.87
Containment humidity, temperature and pressure monitoring	Humidity instrument in subsection 5.2.4.2 and 5.2.5.6 CSS-TE-1990, 1991 in Figure 6.2.2-1 CSS-PT-960, 961, 962, 963, 964 in Figure 6.2.2-1	14.2.12.1.115 14.2.12.1.58
Charging flow rate	CVS-FT-138 in Figure 9.3.4-1	14.2.12.1.13
Liquid inventory balance	Related Instruments(See b below)	-

b. Design features for calculating leakage rate from RCS (liquid inventory balance):

Feature	Instrument	Associated Test
RCS pressure and temperature	RCS-PT-410, 420, 430, 440 RCS-TE-410, 415, 420, 425, 430, 435, 440, 445 in Figure 5.1-2	14.2.12.1.71
Pressurizer water level, pressure and temperature	RCS-LT-451, 452, 453, 454 RCS-PT-451, 452, 453, 454 RCS-TE-451, 452 in Figure 5.1.2	14.2.12.1.71, 14.2.12.1.2
Volume Control Tank water level, pressure and temperature	CVS-LT-120, 121 CVS-PT-122 CVS-TE-123 in Figure 9.3.4-1	14.2.12.1.71. 14.2.12.1.13
Letdown flow rate	CVS-FT-104 in Figure 9.3.4-1	14.2.12.1.14
Pressurizer relief tank	RCS-LT-560,RCS-PT-560 RCS-TE-560 in Figure 5.1-2	14.2.12.1.71 14.2.12.1.5
C/V reactor coolant drain tank water level, pressure and temperature	C/V reactor coolant drain tank water level, pressure and temperature instruments in Figure11.2-1	14.2.12.1.80
Primary makeup water flow	CVS-FT-223 in Figure9.3.4-1	14.2.12.1.16

RCP seal water flow	CVS-FT-150, 160, 170, 180 in Figure9.3.4-1 CVS-FT-154A, 154B, 164A, 164B, 174A, 174B, 184A, 184B, CVS-FT-158, 168, 178, 188 & CVS-LT-159, 169, 179, 189 in Figure9.3.4-1	14.2.12.1.71 14.2.12.1.13

2~~3~~. Verify the automatic functions.

3~~4~~. By addition of measured amounts of water to (1) the containment sump and (2) the containment air cooler condensate standpipe, quantify the conversion of each level indication to volume, determine the sensitivity of the leak detection capability and verify the leak rate alarm setpoints in the MCR.

NOTE: The results of this preoperational test shall be provided for development of the operating leakage conversion procedure as described in Subsection 5.2.5.8.

D. Acceptance Criteria

1. The RCPB Leak Detection systems operate as described in ~~Sections~~ Subsection 5.2.5.
2. The alarm setpoints are established.
3. Containment sump level indication is capable of detecting the leak rate specified in Subsection 5.2.5.4.1.1 and actuating an alarm in the MCR.
4. The Containment Air Cooler Condensate Flow Rate Monitoring System is capable of detecting the leak rate specified in Subsection 5.2.5.4.1.4 and actuating an alarm in the MCR.
5. The instrument channel calibrations and alarm functions to each channel of RCPB leak detection systems, as identified in item C.1 above, are verified.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

References

1) "MHI's Response to US-APWR DCD RAI No. 33", dated September 4, 2008 (MHI ref. UAP-HF-08165)

2) "MHI's Responses to US-APWR DCD RAI No. 243-2044 Revision 0" dated March 27, 2009 (MHI ref. UAP-HF-09130)

Attachment 1

US-APWR DCD Chapter 14 Mark-up

RESPONSE TO RAI No. 371-2617 Revision 0

B. Prerequisites

1. Required construction testing is completed.
2. Component testing and instrument calibration is completed.
3. Test instrumentation is available and calibrated.
4. Required support systems are available.

C. Test Method

1. Verify controls and functions in the normal and abnormal operating modes.
2. Verify status indications and alarms are functional.
3. Verify operating conditions of air handling unit.
4. Operate exhaust fans in battery room and verify operating condition.

D. Acceptance ~~Criterion~~Criteria

1. Turbine building area ventilation system (electric equipment area) operates as described in Subsection 9.4.4.
2. Indications and alarms operate as described in Subsection 9.4.4.
3. Battery Room Exhaust Fan operation maintains the hydrogen concentration below 2% by volume in the battery room per Subsection 9.4.4.1.2.

14.2.12.1.112 Reserved

14.2.12.1.113 Reserved

14.2.12.1.114 Reserved

14.2.12.1.115 RCPB Leak Detection Systems Preoperational Test

A. Objective

1. To verify operability of RCPB leak detection systems and adjust the alarm setpoints.
2. To demonstrate the function described in Subsection 5.2.5 with reference to RG 1.45.
3. To determine quantitative conversion data from measured quantities that correspond to RCS leak rate.

Note: This test may be performed in conjunction with subsection 14.2.12.1.80, "Liquid Waste Management System Preoperational Test."

B. Prerequisites

1. Component testing and instrument calibration is completed.

2. Test instrumentation is available and calibrated.

C. Test Method

1. Verify the calibration, alarm setpoints and alarm functions to each channel of RCPB leak detection systems and associated systems used to determine RCS leakage identified below.

Note: Instrument channel verification should be performed in conjunction with the associated tests identified below.

a. Intersystem leakage, SG tube leakage and unidentified leakage detection design features:

Feature	Instrument	Associated Test
Containment sump level	Containment sump level instrument in Figure 11.2-1	14.2.12.1.115
Containment airborne particulate radioactivity	RMS-RE-40 in Figure11.5-1a and Subsection 11.5.2	14.2.12.1.78
Containment airborne gaseous radioactivity monitor	RMS-RE-41 in Figure11.5-1b and Subsection 11.5.2	14.2.12.1.78
Containment air cooler condensate standpipe level	Containment air cooler condensate standpipe level instrument in Figure 11.2-1	14.2.12.1.115
Steam generator blowdown water radiation monitor	RMS-RE-55 in Figure11.5-1d and Subsection 11.5.2	14.2.12.1.78
High sensitivity main steam line monitor	RMS-RE-65A, 65B, 66A, 66B, 67A, 67B, 68A, 68B in Figure11.5-1c and Subsection 11.5.2	14.2.12.1.78
Condenser vacuum pump exhaust line radiation monitor	RMS-RE-43A, 43B, 81A, 81B in Figure11.5-1i and Subsection 11.5.2	14.2.12.1.78
RHRS suction RTD	RHS-TE-605, 615, 625, 635 in Figure 5.4.7.2	14.2.12.1.22
SIS/accumulator injection line	SIS-LT-910, 911, 920, 921, 930, 931, 940, 941 in Figure 6.3-2	14.2.12.1.56
Safety Injection pumps discharge lines RTD	SIS-TE-984, 985, 986, 987 in Figure 6.3-2	14.2.12.1.56
SI Direct vessel Injection line RTD	SIS-TE-980, 981, 982, 983 in Figure 6.3-2	14.2.12.1.56
RHR Emergency letdown lines RTD	SIS-TE-988, 989 in Figure 6.3-2	14.2.12.1.22

Feature	Instrument	Associated Test
Reactor head seal leakage RTD	RCS-TE-400 in Figure 5.1-2	14.2.12.1.8
CCW radiation monitors	RMS-RE-56A, 56B in Figure 11.5-1f	14.2.12.1.78
CCW surge tank level	NCS-LT-1200, 1201, 1210, 1211 in Figure 9.2.2-1	14.2.12.1.87
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Charging flow rate	CVS-FT-138 in Figure 9.3.4-1	14.2.12.1.13
Liquid inventory balance	Related Instruments(See b below)	-

b. Design features for calculating leakage rate from RCS (liquid inventory balance):

Feature	Instrument	Associated Test
RCS pressure and temperature	RCS-PT-410, 420, 430, 440 RCS-TE-410, 415, 420, 425, 430, 435, 440, 445 in Figure 5.1-2	14.2.12.1.71
Pressurizer water level, pressure and temperature	RCS-LT-451, 452, 453, 454 RCS-PT-451, 452, 453, 454 RCS-TE-451, 452 in Figure 5.1.2	14.2.12.1.71, 14.2.12.1.2
Volume Control Tank water level, pressure and temperature	CVS-LT-120, 121 CVS-PT-122 CVS-TE-123 in Figure 9.3.4-1	14.2.12.1.71. 14.2.12.1.13
Letdown flow rate	CVS-FT-104 in Figure 9.3.4-1	14.2.12.1.14
Pressurizer relief tank	RCS-LT-560,RCS-PT-560 RCS-TE-560 in Figure 5.1-2	14.2.12.1.71 14.2.12.1.5
C/V reactor coolant drain tank water level, pressure and temperature	C/V reactor coolant drain tank water level, pressure and temperature instruments in Figure11.2-1	14.2.12.1.80
Primary makeup water flow	CVS-FT-223 in Figure9.3.4-1	14.2.12.1.16
RCP seal water flow	CVS-FT-150, 160, 170, 180 in Figure9.3.4-1 CVS-FT-154A, 154B, 164A, 164B, 174A, 174B, 184A, 184B, CVS-FT-158, 168, 178, 188 & CVS-LT-159, 169, 179, 189 in Figure9.3.4-1	14.2.12.1.71 14.2.12.1.13

2. Verify the automatic functions.

3. By addition of measured amounts of water to (1) the containment sump and (2) the containment air cooler condensate standpipe, quantify the conversion of each level indication to volume, determine the sensitivity of the leak detection capability and verify the leak rate alarm setpoints in the MCR.

Note: The results of this preoperational test shall be provided for development of the operating leakage conversion procedure as described in Subsection 5.2.5.8.

D. Acceptance Criteria

1. The RCPB Leak Detection systems operate as described in Sections 5.2.5.

2. The alarm setpoints are established.

3. Containment sump level indication is capable of detecting the leak rate specified in Subsection 5.2.5.4.1.1 and actuating an alarm in the MCR.

4. The Containment Air Cooler Condensate Flow Rate Monitoring System is capable of detecting the leak rate specified in Subsection 5.2.5.4.1.4 and actuating an alarm in the MCR.

5. The instrument channel calibrations and alarm functions to each channel of RCPB leak detection systems, as identified in item C.1 above, are verified.

14.2.12.1.116 Equipment and Floor Drainage System Test

A. Objective

1. To demonstrate the correct routing of the drain lines.

2. To demonstrate the operation of the sump level instrumentation including alarms and indications.

Note: This test may be performed in conjunction with subsection 14.2.12.1.80, "Liquid Waste Management System Preoperational Test."

B. Prerequisites

1. Required construction testing is completed.

2. Test instrumentation is available and calibrated.

3. Required support systems are available.

4. Water is available for flow paths to be checked.

C. Test Method

1. The control circuitry and operation of system pumps and valves is verified.