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TOKYO, JAPAN

September 4, 2008

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-08165

Subject: MHI's Response to US-APWR DCD RAI No. 33

References: 1) "Request for Additional Information No. 33 Revision 0, SRP Section: 14.02 – Initial Plant Test Program – Design Certification and New License Applicants, Application Section: 14.2," dated July 21, 2008.

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. 33 Revision 0".

Enclosure 1 provides the response to the 61 questions that are 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. 33 Revision 0

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

D081
NRO

Contact Information

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Enclosure 1

UAP-HF-08165
Docket No. 52-021

Response to Request for Additional Information No. 33 Rev. 0

September 2008

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-25

RG 1.68, App. C.3, "Initial Criticality Procedures", cautions that "a critical rod position (boron concentration) should be predicted so that any anomalies may be noted and evaluated" prior to initial criticality. DCD Section 14.2.10.2 does not include this precaution in the list of conditions that need to exist prior to initial criticality. Please include this precaution in DCD Section 14.2.10.2.

(BNL RAI 14.2-9, Part C)

ANSWER:

MHI will revise Subsection 14.2.10.2 to include prediction of core conditions including rod position and boron concentration at criticality.

Impact on DCD

This revision impacts revision 1 of the DCD in the third paragraph of Subsection 14.2.10.2, on page 14.2-20, with the following addition:

- **Core conditions including rod position and boron concentration at criticality are predicted.**

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. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-26

RG 1.68, App. C.3, "Initial Criticality Procedures", cautions that "high-flux scram trips should be set at their lowest value (approximately 5% - 20%)" prior to initial criticality. DCD Section 14.2.10.2 does not include this precaution in the list of conditions that need to exist prior to initial criticality. Please include this precaution in DCD Section 14.2.10.2.

(BNL RAI 14.2-9, Part D)

ANSWER:

Subsection 14.2.10.2 describes general information regarding initial criticality; detailed requirements for initial criticality are provided in the initial criticality startup test abstract in Subsection 14.2.12.2.2.2. Subsection 14.2.10.2 includes the prerequisite condition "The protection and safety monitoring system and plant control and monitoring system are operable" as a general description. Details regarding high flux scram trips should be specified in the startup test abstract.

MHI will revise Subsection 14.2.12.2.2.2 to include setting of high flux scram trips as a prerequisite to initial criticality.

Impact on DCD

This revision impacts revision 1 of the DCD in item B, Prerequisites, of Subsection 14.2.12.2.2.2 on page 14.2-138 with the following addition:

8. **Hi-flux trip set points are established at the lowest value prior to initial criticality.**

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-27

RG 1.68, App. A.2.d, "Initial Fuel Loading and Precritical Tests," indicates that a "final test of the reactor coolant system to verify that system leak rates are within specified limits" should be conducted prior to initial criticality. DCD Section 14.2.10.2 does not include this prerequisite in the list of conditions that need to exist prior to initial criticality. Please include this prerequisite in DCD Section 14.2.10.2.

(BNL RAI 14.2-9, Part E)

ANSWER:

MHI will revise DCD Subsection 14.2.10.2 "Initial Criticality" to include the final leak test of the reactor coolant system prior to the initial fuel loading in accordance with RG 1.68, Appendix A item 2.d. Note that a detailed description about the RCS final leak test is provided in Subsection 14.2.12.2.1.10.

Impact on DCD

This revision impacts revision 1 of the DCD in the third paragraph of Subsection 14.2.10.2, on page 14.2-20, with the following addition:

- **RCS system leak rates are verified within the specified limits.**

Impact on COLA
There is no impact on the COLA.

Impact on PRA
There is no impact on the PRA.

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Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-28

RG 1.68, App. A.3, "Initial Criticality," states that "all systems required for startup or protection of the plant, including the reactor protection system and emergency shutdown system, should be operable and in a state of readiness." prior to initial criticality. DCD Section 14.2.10.2 does not include this prerequisite in the list of conditions that need to exist prior to initial criticality. Please include this prerequisite in DCD Section 14.2.10.2.

(BNL RAI 14.2-9, Part F)

ANSWER:

Subsection 14.2.10.2 describes general information, and detailed descriptions of initial criticality are described in 14.2.12.2.2.2.

MHI believes that the statement "The protection and safety monitoring system and plant control and monitoring system are operable" in Subsection 14.2.10.2 sufficiently describes conditions required for startup or protection of the plant.

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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Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-29

RG 1.68, App. A, includes verification of operation of the alarms for many systems. In the DCD, verification of the operation of alarms in different systems is not consistently addressed. In some system preoperational tests, verification of alarms and functional indications is included. However, such verification is not included in other test abstracts of the DCD. For example, CVCS Preoperational Tests described in Sections 14.2.12.1.12 to 14.2.12.1.14 do not include any tests relating to the verification of alarms in the system. However, water levels in the Volume Control Tank, Boric Acid Tank and the Holdup Tank have associated alarms. Please review all test abstracts in Section 14.2 to include provisions for verification of operation of alarms, as appropriate.

(BNL RAI 14.2-20)

ANSWER:

MHI has reviewed the preoperational test abstracts to ensure that testing of alarms are adequately addressed. As a result of this review, 24 preoperational test abstracts will be revised.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsections 14.2.12.1.5, 14.2.12.1.12, 14.2.12.1.13, 14.2.12.1.14, 14.2.12.1.16, 14.2.12.1.20, 14.2.12.1.22, 14.2.12.1.31, 14.2.12.1.32, 14.2.12.1.33, 14.2.12.1.37, 14.2.12.1.41, 14.2.12.1.45, 14.2.12.1.46, 14.2.12.1.47, 14.2.12.1.74, 14.2.12.1.75, 14.2.12.1.85, 14.2.12.1.86, 14.2.12.1.88, 14.2.12.1.89, 14.2.12.1.107, 14.2.12.1.109, and 14.2.12.1.111 as indicated below.

1). Revise 14.2.12.1.5 on page 14.2-34 as follows:

C. Test Method

4. Verify indications and alarms.

D. Acceptance Criteria

4. Indications and alarms operate as described in Subsection 5.4.11.4.

2). Revise 14.2.12.1.12 on page 14.2-40 as follows:

C. Test Method

4. Verify indications and alarms.

D. Acceptance Criteria

4. Indications and alarms operate as described in Subsection 9.3.4.5.

3). Revise 14.2.12.1.13 on pages 14.2-41 and 14.2-42 as follows:

C. Test Method

5. Verify indications and alarms.

D. Acceptance Criteria

6. Indications and alarms operate as described in Subsection 9.3.4.5.

4). Revise 14.2.12.1.14 on pages 14.2-42 and 14.2-43 as follows:

C. Test Method

5. Verify indications and alarms.

D. Acceptance Criteria

4. Indications and alarms operate as described in Subsection 9.3.4.5.

5). Revise 14.2.12.1.16 on page 14.2-44 as follows:

C. Test Method

3. Verify indications and alarms.

D. Acceptance Criteria

2. Indications and alarms operate as described in Subsections 9.2.6.5 and 9.3.4.5.5.6.

6). Revise 14.2.12.1.20 on page 14.2-48 as follows:

C. Test Method

3. Verify indications and alarms.

D. Acceptance Criteria

4. Indications and alarms operate as described in Subsection 7.8.1.1.2.

7). Revise 14.2.12.1.22 on page 14.2-51 as follows:

D. Acceptance Criteria

7. Indications and alarms operate as described in Subsection 5.4.7.2.5.

8). Revise 14.2.12.1.31 on page 14.2-58 as follows:

C. Test Method

3. Verify indications and alarms.

D. Acceptance **Criteria** ~~Criterion~~

2. Indications and alarms operate as described in Subsection 10.4.6

9). Revise 14.2.12.1.32 on pages 14.2-58 and 14.2-59 as follows:

C. Test Method

4. Verify indications and alarms.

D. Acceptance **Criteria** ~~Criterion~~

2. Indications and alarms operate as described in Subsection 10.4.2

10). Revise 14.2.12.1.33 on page 14.2-59 as follows:

C. Test Method

4. Verify indications and alarms.

D. Acceptance **Criteria** ~~Criterion~~

2. Indications and alarms operate as described in Subsection 10.4.5.

11) Revise 14.2.12.1.37 on page 14.2-62 as follows:

C. Test Method

4. Verify indications and alarms.

D. Acceptance **Criteria** ~~Criterion~~

2. Indications and alarms operate as designed.

12). Revise 14.2.12.1.41 on pages 14.2-65 and 14.2-66 as follows:

C. Test Method

5. **Verify indications and alarms.**

D. Acceptance **Criteria** ~~Criterion~~

2. **Indications and alarms operate as described in Subsections 8.3.1.1.2 and 8.3.1.1.6.**

13). Revise 14.2.12.1.45 on page 14.2-71 as follows:

C. Test Method

5. **Verify all associated indications and alarms during test sequences.**

D. Acceptance Criteria

5. **All associated indications and alarms operate per design.**

14). Revise 14.2.12.1.46 on page 14.2-72 as follows:

C. Test Method

8. **Verify all associated indications and alarms during test sequences.**

D. Acceptance Criteria

5. **All associated indications and alarms operate per design.**

15). Revise 14.2.12.1.47 on page 14.2-74 as follows:

C. Test Method

8. **Verify all associated indications and alarms.**

D. Acceptance Criteria

8. **Indications and alarms operate as described in Subsection 8.3.2.1.1.**

16). Revise 14.2.12.1.74 on page 14.2-95 as follows:

C. Test Method

3. **Verify indications and alarms.**

D. Acceptance Criteria

6. **Indications and alarms operate as designed.**

17) Revise 14.2.12.1.75 on page 14.2-96 as follows:

C. Test Method

4. **Alarms and indications are verified.**

D. Acceptance Criteria

3. Alarms, indications and trip signals operate as designed.

18) Revise 14.2.12.1.85 on pages 14.2-105 and 14.2-106 as follows:

C. Test Method

6. Alarms and indications are verified.

D. Acceptance Criteria

5. Alarms and indications perform as designed.

19). Revise 14.2.12.1.86 on page 14.2-106 as follows:

C. Test Method

3. Verify indications and alarms.

D. Acceptance Criteria

4. Indications and alarms operate as described in Subsection 9.1.4.5.

20). Revise 14.2.12.1.88 on page 14.2-108 as follows:

C. Test Method

4. Verify indications and alarms.

D. Acceptance **Criteria** ~~Criterion~~

2. Indications and alarms operate as described in Subsection 9.2.8.

21). Revise 14.2.12.1.89 on page 14.2-109 as follows:

C. Test Method

3. Verify indications and alarms.

D. Acceptance Criteria

4. Indications and alarms operate as described in Subsection 10.4.10.

22). Revise 14.2.12.1.107 on page 14.2-123 as follows:

C. Test Method

6. Verify indications and alarms.

D. Acceptance Criteria

3. Indications and alarms operate as described in Subsection 5.4.10.3.

23). Revise 14.2.12.1.109 on page 14.2-124 as follows:

C. Test Method

5. Verify indications and alarms.

D. Acceptance **Criteria** ~~Criterion~~

2. Indications and alarms operate as described in Subsection 9.2.6.

24) Revise 14.2.12.1.111 on page 14.2-126 as follows:

C. Test Method

2. Verify status indications **and alarms** are functional.

D. Acceptance **Criteria** ~~Criterion~~

2. Indications and alarms operate as described in Subsection 9.4.4.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 33 REVISION 0

SRP SECTION: 14.02 – Initial Plant Test Program – Design Certification and New License Applicants

APPLICATION SECTION: 14.2

DATE OF RAI ISSUE: 7/21/2008

QUESTION NO.: 14.02-30

RG 1.68, App. A, Section 1.h(10) calls for a preoperational test of the Ultimate Heat Sink. This test is in the startup test program for the US-APWR as test 14.2.12.2.4.21. Please provide justification for not testing the Ultimate Heat Sink during the preoperational phase, or revise Section 14.2 to include it.

(BNL RAI 14.2-21)

ANSWER:

MHI fully intends to perform preoperational testing of the UHS in accordance with RG 1.68 Appendix A section 1.h(10). However, design details related to the Ultimate Heat Sink are site-specific and there is insufficient design detail to prepare a preoperational test abstract in the DCD. This system is outside of the certified design described by the DCD. As stated in Subsection 14.2.12, the COL applicant is responsible for the testing outside the scope of the certified design in accordance with the test criteria described in Subsection 14.2.1. This is identified as COL item 14.2(10).

As stated in Subsection 9.2.5.2, "the COL Applicant will determine the type of UHS (e.g. cooling pond, cooling towers) based on specific site conditions and meteorological data. The COL Applicant will provide a detailed description and drawings of the UHS, including water inventory, temperature limits, heat rejection capabilities under limiting conditions, instrumentation, and alarms. The COL Applicant will determine the source of make-up water to the UHS inventory and the blowdown discharge location. The blowdown discharge is provided as a check point for monitoring and neutralizing chemistry of ESW discharges to the environment." This is identified as COL item 9.2(3).

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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US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-31

DCD Section 14.2.12.1.1 addresses the RCS Hot Functional Preoperational Test.

A. Prerequisites: Please add that all systems to be operated have completed cold functional testing. Add specifications for RCS and secondary water quality.

B. Please specify the actual temperatures at which the test will be performed. Specify the expected and maximum heatup and cooldown rates.

C. Also, Objective A.2 and Acceptance Criterion D.2 relate that this test is used to coordinate preoperational tests of other systems that require hot temperatures. Since this procedure is the coordinating mechanism, these other tests should be listed here.

D. Please add the following to the Test Method Section:

- Perform inspections for leakage.
- Demonstrate the capability to control the RCS under solid conditions (no pressurizer bubble) both cold and hot.
- Include temperature and pressure plateaus to be used.
- Include provisions to perform trial applications of plant operating procedures and to keep track of recommended changes.
- Provide for the hot ECCS testing of RG 1.79: C.1.a.(2) – SI Hot Flow test; C.1.c.(3) – Accumulator Hot Flow Test; C.2.b.(3) Valve operability at maximum expected temperatures.

(BNL RAI 14.2-22)

ANSWER:

A. MHI will revise the prerequisites to include prerequisites that all systems to be operated have completed cold functional testing and to add specifications for RCS and secondary water quality.

B. MHI will provide the actual temperatures at which the test will be performed and specify the maximum heatup and cooldown rates. The expected heatup and cooldown rate would be from about 30°F per hour to about 50°F per hour. However, MHI does not consider it necessary to include expected heatup and cooldown rates in DCD Subsection 14.2.12.1.1.

C. MHI will list the preoperational tests that are coordinated with the RCS hot functional test.

D. MHI will revise the Test Method Section to incorporate the above comment. Note that the first sentence of comment item D "Perform inspection for leakage" is tested in DCD Subsection 14.2.12.1.71, RCS Leak Rate Preoperational Test.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.1 on page 14.2-30 and Subsection 14.2.12.1.54 on pages 14.2-79 and 14.2-80.

1. Revise 14.2.12.1.1 as follows:

   (1) Add the following to item B., Prerequisites:

   8. Cold functional testing of all systems to be operated are complete.

   9. RCS and secondary water chemistry are kept in compliance with Table 9.3.4-1 and Table10.3.5-3.

   10. RCS temperature is maintained at 557°F.

   Note: The maximum heatup rate and cooldown rate of RCS are 100°F per hour.

   (2) Add the following to item C, Test Method:

   3. The capability to control the RCS under solid conditions (no pressurizer bubble) during both heatup and cooldown is demonstrated.

   4. The temperature and pressure plateaus are used.

   5. Provisions are in place to perform trial applications of plant operating procedures and to track recommended changes.

   6. This test is used to coordinate the following preoperational tests:

14.2.12.1.2	**Pressurizer Pressure and Water Level Control Preoperational Test**
14.2.12.1.3	**RCP Initial Operation Preoperational Test**

14.2.12.1.4	**Pressurizer Safety Depressurization Valve (SDV) Preoperational Test**
14.2.12.1.5	**Pressurizer Relief Tank Preoperational Test**
14.2.12.1.7	**Reactor Internals Vibration Test**
14.2.12.1.13	**CVCS Preoperational Test - Charging and Seal Water**
14.2.12.1.14	**CVCS Preoperational Test - Letdown**
14.2.12.1.15	**RCS Lithium Addition and Distribution Test**
14.2.12.1.19	**Resistance Temperature Detectors (RTDs)/Thermocouple Cross-Calibration Preoperational Test**
14.2.12.1.21	**Main Steam Supply System Preoperational Test**
14.2.12.1.22	**Residual Heat Removal System (RHRS) Preoperational Test**
14.2.12.1.23	**Main Steam Isolation Valve (MSIV), Main Feedwater Isolation Valve(MFIV) and Main Steam Check Valve Preoperational Test**
14.2.12.1.25	**Turbine-Driven Emergency Feedwater System Preoperational Test**
14.2.12.1.50	**Dynamic State Vibration Monitoring of Safety Related and High-Energy Piping**
14.2.12.1.51	**Steady State Vibration Monitoring of Safety Related and High-Energy Piping**
14.2.12.1.52	**Thermal Expansion Test**
14.2.12.1.54	**Safety Injection System(SIS) Preoperational Test**
14.2.12.1.56	**Safety Injection Check Valve Preoperational Test**
14.2.12.1.66	**Reactor Cavity Cooling System Preoperational Test**
14.2.12.1.69	**Containment Fan Cooler System Preoperational Test**
14.2.12.1.71	**RCS Leak Rate Preoperational Test**
14.2.12.1.72	**Loose Parts Monitoring System Preoperational Test**
14.2.12.1.76	**Remote Shutdown Preoperational Test**
14.2.12.1.83	**Steam Generator Blowdown System Preoperational Test**
14.2.12.1.84	**Sampling System Preoperational Test**
14.2.12.1.87	**Component Cooling Water System Preoperational Test**
14.2.12.1.107	**Pressurizer Heater and Spray Capability and Continuous SprayFlow Verification Test**

2. Revise Subsection 14.2.12.1.54 as follows:

   1) Add the following sentence to item A., Objectives:

      4. To verify flow test and valve operability for the SIS injection line at operating pressure and temperature conditions.

   2) Add the following to item C., Test Method:

      3. During hot operating conditions, small amounts of water are injected into the reactor coolant system by the SIS (in accordance with RG 1.79).

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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9/4/2008

US-APWR Design Certification

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Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-32

DCD Section 14.2.12.1.3, RCP Initial Operation Preoperational Test, refers to DCD Section 5.4.1 for RCP design specifications. The RCP is a complex pump with many subsystems that should be tested, and that are not listed in the test abstract.
Examples from Section 5.4.1 include:

- RCPs provide design flow rate to the reactor vessel (5.4.1.2)
- RCPs provide adequate flow rate during coastdown on a LOOP and there is adequate natural circulation to cool the core (5.4.1.2)
- Design seal injection rates are obtained (5.4.1.3.2)
- Thermal barrier HX provides adequate cooling on loss of seal injection (5.4.1.3.2)
- CCW cooling to bearings is adequate (5.4.1.3.2)
- Oil spillage protection system functions as designed (5.4.1.3.2)
- All instrumentation functions (e. g., RTDs, seal injection flow, CCW flow) (5.4.1.3.2)
- Anti-rotation device is functional (5.4.1.3.2)
- Motor air cooling and CCW are functional (5.4.1.3.2)
- RCP frame vibration is acceptable (5.4.1.3.2)
- CCW cooling is adequate on a loss of seal injection (5.4.1.3.3)
- Seal injection provides adequate cooling on loss of CCW (5.4.1.3.4)
- Seal leak-off values are acceptable (5.4.1.4.1 and 5.4.1.4.9)

Please revise DCD Subsection 14.2.12.1.3 to address the above RCP test requirements.

(BNL RAI 14.2-23)

ANSWER:

The RCP test attributes listed above are tested as described below. MHI will revise Subsection 14.2.12.1.3 to clarify certain test attributes.

a) The RCP design flow rate is tested in DCD Subsection 14.2.12.2.4.12, RCS Flow Measurement Test.

b) The RCP flow rate during coastdown on a LOOP is tested in DCD Subsection 14.2.12.2.1.13, RCS Flow Coastdown Test.

c) The design seal injection rates are tested in DCD Subsection 14.2.12.1.13, CVCS Preoperational Test - Charging and Seal Water.

d) The thermal barrier HX cooling on loss of seal injection is tested at the factory

e) The CCW cooling to bearings is tested in DCD Subsection 14.2.12.1.87, Component Cooling Water System Preoperational Test.

f) The oil spillage protection system functions is tested during component testing, included in item B.,Prerequisites, in DCD Subsection 14.2.12.1.3, RCP Initial Operational Test.

g) All instrumentation functions (e. g., RTDs, seal injection flow, CCW flow) are tested during component testing, included in item B.,Prerequisites, in DCD Subsection 14.2.12.1.3, RCP Initial Operational Test.

h) The anti-rotation device function is tested at the factory.

i) The motor air cooling and CCW are tested in DCD Subsection 14.2.12.1.87, Component Cooling Water System Preoperational Test.

j) The RCP frame vibration testing is tested during component testing, included in item B.,Prerequisites, in DCD Subsection 14.2.12.1.3, RCP Initial Operational Test.

k) The CCW cooling on a loss of seal injection is tested at the factory.

l) The seal leak-off values are tested during component testing, included in item B.,Prerequisites, in DCD Subsection 14.2.12.1.3, RCP Initial Operational Test, and tested at the factory.

Impact on DCD

This revision impacts revision 1 of the DCD in item B, Prerequisites, of Subsection 14.2.12.1.3, RCP Initial Operation Preoperational Test on page 14.2-32.

B. Prerequisites

1. Required construction testing ~~is~~ **including oil spillage protection system and the seal leakoff** is completed.

2. Component testing and instrument calibration ~~is~~ **including RCP frame vibration, RTD, seal injection flow and CCW flow** is completed.

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-33

DCD Section 14.2.12.1.5 describes the Pressurizer Relief Tank (PRT) test. DCD Sections 14.2.12.1.4 and 14.2.12.1.6 test the SDVs and RVs. The PRT test does not verify proper PRT operation upon relief valve or SDV operation, which is its main function. Please revise DCD Subsection 14.2.12.1.5 to verify proper PRT operation on relief valve or SDV operation.

(BNL RAI 14.2-24)

ANSWER:
MHI will revise DCD Subsection 14.2.12.1.5 to provide information on the abstract for testing the proper PRT operation.

Impact on DCD

This revision impacts Subsection 14.2.12.1.5 on pages 14.2-33 and 14.2-34.

Revise item A., Objectives, as follows:

4. **To demonstrate that the pressurizer relief tank is capable of receiving a steam discharge.**

Revise item C., Test Method, as follows:

5. **Verify the ability of the pressurizer relief tank to condense a steam discharge from the pressurizer. This test is performed in conjunction with Subsection 14.2.12.1.4, Pressurizer Safety Depressurization Valve (SDV) Preoperational Test.**

Revise item D., Acceptance Criteria, as follows:

5. The pressurizer relief tank functions per design.

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: **7/21/2008**

QUESTION NO.: 14.02-34

DCD Sections 14.2.12.1.4 and 14.2.12.1.6 test the SDVs and RVs respectively. Neither test abstract mentions clearly that both SDVs and all 4 RVs will be tested. Also, RG 1.68, App. A, Item 1.a(2)(d) calls for a check of the "pressure relief valves ... supports and restraints for discharge piping". This should be done after the valves have actuated and relieved. Please address the above test requirements in the referenced DCD test abstracts.

(BNL RAI 14.2-25)

ANSWER:

MHI will revise preoperational test abstracts 14.2.12.1.4 and 14.2.12.1.6 to indicate that both pressurizer safety depressurization valves (SDVs) and all 4 pressurizer safety valves are to be tested.

Impact on DCD

This revision impacts sections 14.2.12.1.4 on pages 14.2-32 and 14.2-33, and section 14.2.12.1.6 on pages 14.2-34 and 14.2-35.

Revise section 14.2.12.1.4 as follows (only affected steps are shown):

A. Objectives

1. To demonstrate operation and valve response times for ~~the~~ **both** pressurizer SDV**s**.

C. Test Method

1. **Each** SDV is operated and **the** response time is determined.

D. Acceptance Criteria

1. SDV operating time is within design specifications **for both SDVs**.

Revise section 14.2.12.1.6 as follows (only affected steps are shown):

A. Objectives

2. To verify the operability of ~~the~~ **all 4** pressurizer safety valves at approximately operating temperature and pressure.

C. Test Method

3. The operability of ~~the~~ **all 4** pressurizer safety valves is demonstrated at approximately operating temperature and pressure or using in-situ testing.

D. Acceptance Criteria

2. ~~The~~ **All four** pressurizer safety valves actuate at the required pressure (See Subsections 5.4.10 and Table 5.4.10-3).

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-35

DCD Section 14.2.12.1.7, Reactor Internals Vibration Test, refers to RG 1.20, "Comprehensive Vibration Assessment Program for Reactor Internals during Preoperational and Initial Startup Testing", in a footnote. DCD Table 1.9.1-1 commits to RG 1.20 with no exceptions. The test in DCD Section 14.2.12.1.7 should specifically reference and incorporate RG 1.20 for test methodology and acceptance criteria as appropriate. The DCD should also note that the RCOL will be designated and tested as a prototype per RG 1.20. Further, upon successful qualification of the RCOL as a valid prototype, the SCOL plants will be designated and tested as Non-Prototype Category I, per RG 1.20. Please revise DCD Section 14.2.12.1.7 to incorporate the above RG 1.20 guidance. Also, MHI needs to identify any COL Actions Item(s) as part of its response to this request for additional information.

(BNL RAI 14.2-26, Part A)

ANSWER:

In the DCD, the reactor internal vibration test is described in Subsection 3.9.2.4 as the part of the comprehensive vibration assessment program based on the RG 1.20.

In Subsection 3.9.2.4.1, the relations between the plant classifications and required vibration assessments based on RG 1.20 are described as below:

> "The first operational US-APWR reactor internals are classified as Prototype in accordance with RG 1.20 (Reference 3.9-21). Upon qualification of the first US-APWR as a Valid Prototype, subsequent plants will be classified as Non-Prototype category I based on the designation of Regulatory Guide 1.20. The first COL Applicant is to commit to implement a pre-operational vibration assessment program and to prepare the final report consistent with guidance of RG 1.20 for a prototype. Subsequent COL Applicant need only provide information in accordance with the applicable portion of position C.3 of RG 1.20 for Non-Prototype internals."

The methods including measurement locations and the acceptance criteria are described in Subsections 3.9.2.4.2 and 3.9.2.4.3.

Subsection 14.2.12.1.7 is the abstract as a part of the whole pre-operational test program. MHI will revise the 14.2.12.1.7 to add reference to Subsection 3.9.2.4 for details and to clarify the relationship with RG 1.20 for the base requirements.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.7 on pages 14.2-35 and 14.2-36.

In item C., Test Method, add the following note:

C. Test Method (1-3 is for first-plant-only testing)

NOTE: Reactor internal vibration tests are coordinated with the reactor internals comprehensive vibration assessment program described in Subsection 3.9.2.4 and consistent with the requirements of RG 1.20 (Reference 14.2-13).

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: **7/21/2008**

QUESTION NO.: 14.02-36

DCD Section 14.2.8.1.1 notes that the Reactor Internals Vibration Test is conducted only during the hot functional test, prior to fuel loading, because the vibration responses under normal operating conditions with core are predicted to be almost the same or slightly lower than those under hot functional tests without the core loaded. This does not seem to be in accordance with RG 1.20, although no exception is specifically cited. RG 1.20 clearly includes activities for post fuel load and during the power ascension phase. Please revise DCD Subsection 14.2.8.1 to address activities for post fuel load and during the power ascension phase consistent with RG 1.20 guidance.

(BNL RAI 14.2-26, Part B)

ANSWER:

Response to this question is addressed in MHI response to RAI-28 Question 14.02-19.
Also see response to RAI-33, Question14.02-35.

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: **7/21/2008**

QUESTION NO.: 14.02-37

RG 1.68, App. A section 1.a(3) calls for preoperational vibration tests of reactor internals and RCS components such as piping and rotating components. DCD Table 14A-1, Conformance Matrix of RG 1.68, Row 1.a(3) states that a vibration test of the RCS piping is not needed since vibration is low. The purpose of the test is to confirm that fact. Please provide additional information in the DCD to justify this exception to RG 1.68 or otherwise revise Section 14.2 accordingly.

(BNL RAI 14.2-26, Part C)

ANSWER:

MHI response to RAI-28, Question 14.02-19 states that MHI will revise Table 14A-1 row 1.a(3) to indicate that preoperational tests 14.2.12.1.7, Reactor Internals Vibration Test, and 14.2.12.1.51, Steady State Vibration Monitoring of Safety Related and High-Energy Piping, correspond to RG 1.68 Appendix A item 1.a (3). In addition, the statement regarding the inapplicability of Appendix A section 1.a(3) for RCS piping vibration testing will be deleted and preoperational test 14.2.12.1.51 will be revised to clarify performance of RCS piping vibration testing during hot functional testing.

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: **7/21/2008**

QUESTION NO.: 14.02-38

DCD section 14.2.12.1.9, Item B.4 on page 14.2-37 needs to be clarified. This may be a typographical error.

(BNL RAI 14.2-27)

ANSWER:

Revision 1 of the DCD corrected the typographical error identified in item B.4 of Subsection 14.2.12.1.9 on page 14.2-37 as follows:

4. Required support systems are available.~~2~~.
5. Required electrical power supplies and control circuits are operational.

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: **7/21/2008**

QUESTION NO.: 14.02-39

DCD Section 14.2.12.1.10, Acceptance Criteria D.1 on page 14.2-38 refers to section 7.7.1.3 of the DCD for proper generator phasing information, but none is provided. Please include this additional information in the DCD.

(BNL RAI 14.2-28)

ANSWER:

MHI will provide clarification of the acceptance criteria since Subsection 7.7.1.3 does not contain this criteria.

Impact on DCD

This revision impacts item D, Acceptance Criteria, of revision 1 of the DCD in Subsection 14.2.12.1.10 on page 14.2-38:

D. Acceptance Criteria

1. Generator phasing is proper for parallel **and synchronized** motor-generator set operation ~~(see Subsection 7.7.1.3)~~.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-40

DCD Section 14.2.12.1.12, Chemical and Volume Control System (CVCS) Preoperational Test – Boric Acid Blending does not include a test on the operation of heaters and heat tracing. RG 1.68 1.b. (2) Chemical Control System Tests includes verification of operation of heaters and heat tracing. As stated in Chapter 9.3.4.3 of the DCD, the CVCS is designed to ensure that the boric acid solution remains soluble. Heat tracing or a heated area with temperature alarms are provided for portions of the system which normally contain 4 wt. % of boric acid solution, to assure that boric acid solution temperature does not go below 65 °F. Please discuss the testing for the heaters and heat tracing and include in the DCD, as appropriate.

(BNL RAI 14.2-29)

ANSWER:

MHI will revise preoperational test abstract 14.2.12.1.12 to include testing of the heaters and heat tracing.

Impact on DCD

This revision impacts Subsection 14.2.12.1.12 on page 14.2-40 of the DCD as follows (only affected steps are shown):

A. Objectives

3. **To verify the operability of heat tracing or area heating for portions of the system which normally contain 4 wt. % of boric acid solution.**

C. Test Method

5. **Demonstrate the operability of heat tracing or area heating for portions of the system which normally contain 4 wt. % of boric acid solution.**

D. Acceptance Criteria

5. **Heat tracing or area heating for portions of the system which normally contain 4 wt. % of boric acid solution operate as described in Subsection 9.3.4.3.**

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-41

DCD Section 14.2.12.1.12, Chemical and Volume Control System (CVCS) Preoperational Test – Boric Acid Blending does not include a test demonstrating the correct failure mode on loss of power to system components. RG 1.68 1.b. (2) Chemical Control System Tests includes demonstration of correct failure mode on loss of power to system components. Table 9.3.1-1, Safety-Related Air Operated Valve, provides the loss of power position of the AOVs in the CVCS. Please discuss how the loss of power position of the CVCS components is being demonstrated and include appropriate tests in the DCD.

((BNL RAI 14.2-30)

ANSWER:

DCD Subsection 9.3.1.1.1 states that "the safety-related air-operated valves served by the IAS, shown in Table 9.3.1-1, do not require IAS to perform their safety-related function and these valves fail in the safe position on loss of instrument air pressure" and "in the event of a station blackout (SBO), the safety-related air-operated valves served by the IAS will fail in the safe position."

Preoperational test abstract 14.2.12.1.91, Instrument Air System Preoperational Test, includes verification of the appropriate response of air-operated valves during and following upset, faulted or emergency conditions, with the exception of safety-related containment isolation valves which are tested in section 14.2.12.1.62, Containment Local Leak Rate Preoperational Test. Preoperational test abstract 14.2.12.1.62 includes verification of the response of safety-related air-operated containment isolation valves on loss of instrument air.

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: **7/21/2008**

QUESTION NO.: 14.02-42

DCD Section 14.2.12.1.15, addresses the Lithium Addition and Distribution Test. Test method step C.3 is unclear as written, please clarify. There is only one acceptance criterion and it addresses uniform distribution of Lithium. Please add a criterion for proper operation of the Lithium Addition components/system into DCD Section 14.2.12.1.5.

(BNL RAI 14.2-31)

ANSWER:

MHI will revise Subsection 14.2.12.1.15 to clarify items B.5, C.1 and C.3, add C.4, and revise section D., Acceptance Criterion.

Impact on DCD

This revision affects revision 1 of the DCD in Subsection 14.2.12.1.15 on page 14.2-43 as follows:

Revise item C. as follows:

C. Test Method

NOTE: Boron addition is not required during hot functional testing.

1. Lithium (^{7}LiOH) is added in chemical mixing tank. The amount of lithium is in accordance with the primary water chemical concentration. **The increased lithium concentration will be approximately 1.0 ppm.** The lithium is charged into the RCS by the charging pump.

2. At several sampling points (e.g., RCS loops, pressurizer liquid, and demineralizer inlet), each lithium concentration is measured until the lithium concentration is almost equal at each sampling point.

3. The RCS volume without fuel assembles is estimated from the amount of lithium added and the resulting lithium concentration. **The quantity and concentration of injected lithium divided by increased concentration of lithium is used to estimate the RCS volume. This volume is reference data.**

4. **Following completion of hot functional testing, lithium is removed until it is approximately equal to the initial concentration (example: almost 0.5 ppm).**

Revise item D as follows:

D. Acceptance Criteria~~on~~

1. ~~The maximum deviation of lithium concentration measurements is within limits (0.05 ppm).~~ **The lithium concentrations from all sample points are within +/-0.05 ppm following analytical measurement with an accuracy of +/- 0.05 ppm or better.**

2. **Lithium mixing, charging to the RCS, and removal performs as described in Subsections 9.3.4.**

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: **7/21/2008**

QUESTION NO.: 14.02-43

DCD Section 14.2.12.1.16, PMWS Preoperational Test, Item B. Prerequisites does not include the availability of Demineralized Water Storage Tank (DWST) and Demineralized Water Transfer Pumps. DWST and the transfer pumps supply demineralized water to the Primary Makeup Water Tanks. To conduct the preoperational tests for the PMWS, DWST and the transfer pumps should be available. Please discuss and address the availability of DWST and demineralized water transfer pumps for the prerequisites for PMWS preoperational tests in DCD Subsection 14.2.12.1.16.

(BNL RAI 14.2-32)

ANSWER:

MHI concurs that the availability of the Demineralized Water Storage Tank (DWST) and Demineralized Water Transfer Pumps are prerequisites for performance of this test. These are support systems addressed in prerequisite item B.4. However, MHI will clarify the prerequisites in Subsection 14.2.12.1.16, Primary Makeup Water System (PMWS) Preoperational Test, to specifically include these items.

Impact on DCD

This revision impacts item B, Prerequisites, of Subsection 14.2.12.1.16 on page 14.2-44 of the DCD revision 1 as follows:

4. Required support systems are available**, including the Demineralized Water Storage Tank (DWST) and the Demineralized Water Transfer 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: **7/21/2008**

QUESTION NO.: 14.02-44

Section 14.2.12.1.17, Reactor Trip System and ESF System Response Time Test, presents the test method and acceptance criterion in terms of the total reactor trip system and total ESF system response times. RG 1.68 1.c guidance is to verify (by testing) the response time of each of the protection channels, including sensors. Please discuss and modify the DCD to address, as appropriate, the testing of the response time of each of the protection channels including sensors in the Reactor Trip and ESF systems.

(BNL RAI 14.2-33)

ANSWER:

MHI will address the testing of the response time of each of the protection channels including sensors in the Reactor Trip and ESF systems.

Allocations for sensor, signal conditioning, and actuation logic response times are obtained from (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) in place, onsite, or offsite (e.g., vendor) test measurements, or (3) utilizing vendor engineering specifications, as described SR 3.3.1.13 and SR 3.3.2.8 of DCD Chapter 16.

Impact on DCD

This revision impacts revision 1 of the DCD in item C, Test Method, of Subsection 14.2.12.1.17 on page 14.2-44 as follows:

C. Test Method

1. **The response times of each primary sensor associated with the reactor trip system and the ESF system will be obtained from either (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) in place, onsite, or offsite (e.g., vendor) test measurements, or (3) utilizing vendor engineering specifications, as described in section B 3.3.1 of DCD Chapter 16 for SR 3.3.1.13 and SR 3.3.2.8.**

2. ~~1.~~ Reactor trip signal and ESF actuation signals are applied at the process sensor output, and the time interval is measured until loss of stationary gripper coil voltage and until the ESF equipment is capable of performing its safety function.

3. ~~2.~~ Total reactor trip system and ESF system response time is computed by summing the results of the previous test method.

4. ~~3.~~ Individual components and valve response times are accomplished in the system preoperational test procedures.

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: **7/21/2008**

QUESTION NO.: 14.02-45

DCD 14.2.12.1.18: Reactor Trip System and ESF System Logic Preoperational Test calls for the use of an engineering tool for validating the software in the ESF and reactor trip systems. The acceptance criterion D.1 is that the results of this test method are "Good." Please include additional information in DCD Subsection 14.2.12.1.18 for determining the adequacy of the test results.

(BNL RAI 14.2-34)

ANSWER:

For the Protection and Safety Monitoring System (PSMS), a logic test is a check of the PSMS software memory integrity to ensure there is no change to the internal PSMS software that would impact its functional operation or the continuous self-test function. The software memory integrity test is described in Topical Report MUAP-07004 Section 4.4.1 and Topical Report MUAP-07005 Section 4.1.4.1.c.

The word "Good" means there is no change to the internal PSMS software that would impact its functional operation or the continuous self-test function.

MHI will include additional information in DCD Subsection 14.2.12.1.18 for determining the adequacy of the test results.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.18 on page 14.2-46 as follows:

D. Acceptance Criteria

1. The results of Test Method C.1 for the reactor trip system and the ESF system are completely

"Good", **which means there is no change to the internal PSMS software that would impact its functional operation or the continuous self-test function.**

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: **7/21/2008**

QUESTION NO.: 14.02-46

DCD 14.2.12.1.19: RTDs/TCs cross calibration test, refers to DCD Subsection 7.7.1.1 and BTP-HICB-13 for acceptance criterion D.1.; Subsection 7.7.1.1 does not provide any information regarding acceptability of the RTDs. The referenced Branch Technical Position (HICB-13) does not give specific tolerances as inferred by this acceptance criterion. Please revise Subsection 7.7.1.1 to provide information regarding acceptability of the RTDs.

Acceptance Criterion D.2 uses the terminology "approximately" to determine acceptable measurements. Please revise DCD Subsection 14.2.12.1.19 to be more specific regarding the acceptable tolerance.

(BNL RAI 14.2-35)

ANSWER:

This test is intended to collect baseline data for future comparison during operation.

The second sentence of acceptance criterion D.1 of Subsection 14.2.12.1.19 is intended to explain the first sentence. However, including this information in the acceptance criterion section is unclear. This information is more suitable in the test method section, C.3.

MHI will revise Subsection 14.2.12.1.19

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.19 on page 14.2-47 as follows:

C. Test Method

1. RTD resistance data is taken at specified temperatures during hot functional testing, and the RTD resistance versus temperature characteristics is verified.

2. Thermocouple data is taken at the same temperature points used for recording RTD data, and the thermocouple millivolt-versus-temperature characteristics is verified to be within design tolerances.

3. RTD deviation from RCS average temperature and isothermal corrections for individual thermocouples are determined from the recorded data. **NOTE: Any individual RTD reading that differs from the calculated average temperature by the specified amount determined using the methodology referenced in Section 7.1 (which conforms to Branch Technical Position 7-13) is not used for average temperature calculations (see Subsection 7.7.1.1)~~.~~ This methodology conforms to Branch Technical Position 7-13.**

4. After disconnecting special test instrumentation and reconnecting RTDs to normal plant terminations, temperature data are taken to verify that all temperature instruments are reading correctly and indicate approximately RCS average temperature, as a functional check.

D. Acceptance Criteria

1. Test data are recorded for future alignment purposes only, and specific acceptance criteria are not provided. ~~**However, any individual RTD reading that differs from the calculated average temperature by the specified amount determined using the methodology referenced in Section 7.1 (which conforms to Branch Technical Position HICB-13) are not used for average temperature calculations (see Subsection 7.7.1.1).**~~

~~2. All temperature instruments disconnected for measurement indicate approximately RCS average temperature when their RTDs are reconnected to normal plant terminations.~~

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: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-47

Section 14.2.12.1.21, Main Steam Supply System Preoperational Testing, discusses the testing for relief valves, turbine bypass valves, and main steam safety valves. The section of the DCD does not discuss the testing for the main steam relief valve block valve. Please include the testing for the main steam relief valve block valve in DCD Subsection 14.2.12.1.21.

(BNL RAI 14.2-36, Part A)

ANSWER:
MHI will revise Subsection 14.2.12.1.21, Main Steam Supply System Preoperational Test, to discuss the testing for each valves clearly.

Impact on DCD

This revision impacts Subsection 14.2.12.1.21 on pages 14.2-48 and 14.2-49.

Note: changes indicated below include changes from response to Question 14.02-48 below for continuity.

Revise Objectives, item A.1 as follows:

1. To demonstrate the operability of the ~~power-operated atmospheric relief~~ **main steam depressurization** valves~~, and motor-operated relief~~ **main steam relief** valves **and main steam relief valve block valves** with steam lines at normal operating temperature and pressure.

Revise Test Method, item C.4 as follows:

4. Demonstrate the operability of the ~~power-operated atmospheric relief~~ **main steam depressurization** valves, ~~and~~ the **main steam relief** ~~motor-operated relief~~ valves **and the main steam relief valve block valves** during hot functional testing.

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-48

Section 14.2.12.1.21, Main Steam Supply System Preoperational Testing, discusses the testing for relief valves, turbine bypass valves, and main steam safety valves. In this section, the terminology of power-operated atmospheric relief valve and motor-operated relief valve is used. However, in Section 10.3.2 of the DCD, these valves are referred to as main steam relief valve and main steam depressurization valve. Please use consistent terminology in both subsections of the DCD.

(BNL RAI 14.2-35, Part B)

ANSWER:

MHI will revise Subsection 14.2.12.1.21, Main Steam Supply System Preoperational Test, to correct the terminology for these relief valves.

Impact on DCD

This revision impacts Subsection 14.2.12.1.21 on pages 14.2-48 and 14.2-49.

Note: changes indicated below include changes from response to Question 14.02-47 above for continuity.

Revise Objectives, item A.1 as follows:

1. To demonstrate the operability of the ~~power-operated atmospheric relief~~ **main steam depressurization** valves~~, and motor-operated relief~~ **main steam relief** valves **and main steam relief valve block valves** with steam lines at normal operating temperature and pressure.

Revise Test Method, item C.4 as follows:

4. Demonstrate the operability of the ~~power-operated atmospheric relief~~ **main steam depressurization** valves, ~~and~~ the **main steam relief** ~~motor-operated relief~~ valves **and the main steam relief valve block valves** during hot functional 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: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-49

RG 1.68 App. A, Section 1.d(9) calls for preoperational testing of the Condensate Storage System. For item 1.d(9), DCD Table 14A-1 references Test abstracts 14.2.12.1.24 & .25 for the EFW System, but these do not address condensate storage, which is addressed in Subsection 14.2.12.1.109. Please correct DCD Table 14A-1.

(BNL RAI 14.2-37)

ANSWER:

Revision 1 of the DCD revised Table 14A-1 to indicate testing of the Condensate Storage System by preoperational test 14.2.12.1.109, and deleted reference to Subsection 14.2.12.1.24 and 14.2.12.1.25.

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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SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-50

The acceptance criterion for DCD 14.2.12.1.37 includes the instrument 120 V ac system, however that system is not described in DCD Subsection 8.3.1.1.1 as stated. Please clarify and provide appropriate acceptance criteria for the 120 V ac system in DCD Subsection 14.2.12.1.37.

(BNL RAI 14.2-38)

ANSWER:

MHI will revise the acceptance criterion for DCD Subsection 14.2.12.1.37 to refer to Subsection 8.3.1.1.7 for the non-Class 1E 120V AC I&C Power system.

Impact on DCD

This revision impacts revision 1 of the DCD in item D, Acceptance Criteria of Subsection 14.2.12.1.37 on page 14.2-62 as follows:

D. Acceptance Criterion

1. The 13.8 kV, 6.9 kV **and** 480 V~~, and instrument 120 V~~ ac systems (non-Class 1E) perform as described in Subsection 8.3.1.1.1~~.~~ **and the non-Class 1E 120V AC I&C power system performs as described in Subsection 8.3.1.1.7.**

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: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-51

DCD 14.2.12.1.41 includes a reference to Technical Specification (TS) SR 3.8.9.1. TS SR 3.8.8.1 (inverter voltage, frequency, and alignment) is also relevant to this test. Please include TS SR 3.8.8.1 as part of the acceptance criteria in DCD Subsection 14.2.12.1.41.

(BNL RAI 14.2-39)

ANSWER:

MHI will add reference to Technical Specification (TS) 3.8.8.1 to the acceptance criteria in DCD Subsection 14.2.12.1.41.

Impact on DCD

This revision impacts revision 1 of the DCD in item D, Acceptance Criterion, of Subsection 14.2.12.1.41 on page 14.2-66 as follows:

1. The 120 V, Class 1E, ac distribution panels perform as described in Subsections 8.3.1.1.2 and 8.3.1.1.6, and their operation is in conformance with the Chapter 16, Technical Specifications, **SR 3.8.8.1 and** SR 3.8.9.1.

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: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-52

DCD 14.2.12.1.44 describes the preoperational test for the Gas Turbine Generator. Included are objectives associated with the electrical, mechanical, and logic subsystems. However, not all of the objectives are reflected in the test methods and acceptance criteria as follows:

Objective A.6 is to verify that all generator trip signals are bypassed with a safety injection signal. However, test method C.7 calls for a simulated loss of offsite power to verify the emergency generator trips and bypasses but not a safety injection signal. Please provide additional information in DCD Subsection 14.2.12.1.44 to implement Objective A.6 of the test.

(BNL RAI 14.2-40, Part A)

ANSWER:

DCD Subsection 14.2.12.1.44, Class 1E Gas Turbine Generator Preoperational Test, was substantially revised in response to RAI-12, Question 14.02-3. The following revisions have been incorporated into revision 1 of the DCD.

Test Objective A.6 (renumbered A.11) states the following as revised:

> To verify that specified automatic Class 1E gas turbine generator trips are automatically bypassed with an emergency core cooling system (ECCS) actuation signal.

Test Method C.7 (renumbered C.12) states the following as revised:

> Demonstrate that the specified automatic trip signals for the Class 1E gas turbine generator are bypassed automatically as designed.

Acceptance Criteria item D.10 (added) states the following:

> On an ECCS actuation signal, specified automatic Class 1E gas turbine generator trips are automatically bypassed.

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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SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-53

DCD 14.2.12.1.44 describes the preoperational test for the Gas Turbine Generator. Included are objectives associated with the electrical, mechanical, and logic subsystems. However, not all of the objectives are reflected in the test methods and acceptance criteria as follows:

Objective A.2 is related, in part, to verifying the proper operation of the fuel oil storage and transfer system (FOS). Test methods C.1 and C.6 discuss this attribute, but there is no acceptance criterion that validates the safety functions for the FOS that are described in Section 9.5.4.1 of the DCD. Please revise DCD Subsection 14.2.12.1.44 to document the acceptance criterion that validates the safety functions for the FOS as described in Section 9.5.4.1 of the DCD.

(BNL RAI 14.2-40, Part B)

ANSWER:

The testable safety functions of the FOS, as described in Subsection 9.5.4.1, are as follows:

• Each GTG fuel oil storage tank provides 7 days storage of fuel oil. This allows power to be supplied to the safety-related loads for postulated accident conditions, assuming the loss of all offsite power sources and an additional amount for periodic testing of the onsite power sources. Each GTG also has an associated fuel oil day tank with a capacity to supply sufficient fuel oil for a period of one and half (1 ½) hours.

• The FOS contents are protected from the effects of low temperatures so that the fuel oil does not cloud.

Subsection 14.2.12.1.44, Acceptance Criteria item D.5, as amended by response to RAI-12 Question 14.02-3 and incorporated in revision 1 of the DCD, includes verification of fuel oil

consumption, which correlates to the fuel oil storage design capacity that satisfies the safety function:

5. The fuel oil consumption of each Class 1E gas turbine generator while operating under continuous rating load conditions does not exceed the design requirements.

MHI will revise DCD Subsection 14.2.12.1.44, Class 1E Gas Turbine Generator Preoperational Test, to further clarify Acceptance Criterion D.5 and add an acceptance criterion for the fuel oil storage and transfer system.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.44 on page 14.2-70.

Revise item D., Acceptance Criteria, or Subsection 14.2.12.1.44 as follows:

5. The fuel oil consumption of each Class 1E gas turbine generator while operating under continuous rating load conditions does not exceed the design requirements**, including fuel oil storage capacity as described in Subsection 9.5.4.1**.

13. The Fuel Oil System operates as described in Subsection 9.5.4.

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: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-54

DCD 14.2.12.1.44 describes the preoperational test for the Gas Turbine Generator. Included are objectives associated with the electrical, mechanical, and logic subsystems. However, not all of the objectives are reflected in the test methods and acceptance criteria as follows:

Table 1 in Regulatory Guide 1.9 lists tests that should be conducted during the preoperational test phase. These tests include a load rejection and hot restart. RG 1.9 is not referred to in DCD Subsection 14.2.12.1.44, nor are these tests identified as part of the test method. (Reg. Guide 1.9 is listed in DCD Section 8.3.1.2.2 and in Table 1.9.1-1 as being applicable and as being used for the gas turbine generators). Please provide additional information in DCD Subsection 14.2.12.1.44 to reference RG 1.9 and to incorporate the appropriate tests identified in the RG.

(BNL RAI 14.2-40, Part C)

ANSWER:

MHI response to RAI-12, Question 14.02-3 discussed the applicability (and exceptions) of RG 1.9 to the US-APWR Class 1E gas turbine generators and included revisions to Subsection 14.2.12.1.44 to specifically include all applicable recommended test requirements from RG 1.9.

DCD Subsection 14.2.12.1.44, Class 1E Gas Turbine Generator Preoperational Test, as revised in response to RAI-12, Question 14.02-3 and incorporated in revision 1 of the DCD includes load rejection and hot restart tests as follows:

C. Test Method

8. The largest single load and complete load are shed and no tripping on overspeed is verified.

10. Demonstrate functional capability at full load temperature conditions by verifying each Class 1E gas turbine generator starts upon receipt of a manual or auto-start signal, and the generator voltage and frequency are attained within the required time limits.

D. Acceptance Criteria

6. Upon the loss of the largest single load and complete loss of load, each Class 1E gas turbine generator continues to operate without exceeding the overspeed limit.

8. Each Class 1E gas turbine generator starts and attains required voltage and frequency within the required time limits at full load temperature.

Reference to RG 1.9 within preoperational test abstract 14.2.12.1.44 is not necessary since the applicable test requirements and methods have been incorporated into the test.

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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SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-55

Acceptance criterion D.2 of DCD Subsection 14.2.12.1.46 is not worded properly (probably a typographical error). Please revise the wording.

(BNL RAI 14.2-41)

ANSWER:

MHI has revised acceptance criterion item D.2 of DCD Subsection 14.2.12.1.46 to correct the typographical error as follows:

2. Each alternate ac power source ~~is~~ can be synchronized with offsite power.

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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SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-56

DCD Section 14.2.12.1.50, "Dynamic State Vibration Monitoring of Safety Related and High-Energy Piping", uses the phrases "specified transients" and "various plant transients". Please revise Subsection DCD Section 14.2.12.1.50 to include the list of specific transients that will be tested. In addition, please specify how the transients will be initiated.

(BNL RAI 14.2-42)

ANSWER:

The intention of Subsection 14.2.12.1.50 is to instrument and monitor safety-related and high energy piping during plant transients experienced during preoperational testing and in particular, hot functional testing. This test abstract is not intended to direct the performance of particular plant operations in order to collect data; all plant evolutions are directed by other preoperational tests.

MHI will revise Subsection 14.2.12.1.50 to specify the testing evolutions during which monitoring is to be performed, in order to assure that data is collected and evaluated for all pertinent preoperational test transients.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.50 on page 14.2-76 as follows. Revisions in response to RAI-33 Question 14.02-57 are included for clarity.

A. Objective

1. To demonstrate during ~~specified~~ transients that the system's monitored parts respond in accordance with design calculations.

C. Test Method

1. **The dynamic response of the specified safety-related and high-energy piping is recorded during both steady flow and flow-induced transients .** ~~Deflection measurements are recorded during various plant transients.~~

2. **Specified safety-related and high-energy piping are screened qualitatively for perceptible vibration by visual inspection during the transient events.**

3. **Dynamic response monitoring is performed in conjunction with preoperational test 14.2.12.1.24 and during hot functional testing per 14.2.12.1.1 and the tests coordinated by 14.2.12.1.1.**

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: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-57

DCD Sections 14.2.12.1.50 and 14.2.12.1.51 address dynamic and steady state vibration monitoring, respectively. These tests should be very similar yet the test methods are different. For example, Section 14.2.12.1.50 does not include visual inspections. Please revise DCD Subsections 14.2.12.1.50 and 14.2.12.1.51 accordingly or justify the difference in test methods.

(BNL RAI 14.2-43)

ANSWER:

Preoperational test 14.2.12.1.50 is performed during hot functional testing when access to piping is limited; therefore, this test relies upon installed temporary monitoring sensors at specified reference points. (e.g., vibration displacement).

MHI will clarify the test method in Subsection 14.2.12.1.50 and include visual inspections.

Impact on DCD

This revision impacts revision 1 of the DCD in item C, Test Method, of Subsection 14.2.12.1.50 as follows. Revisions in response to RAI-33 Question 14.02-56 are included for clarity.

C. Test Method

1. **The dynamic response of the specified safety-related and high-energy piping is recorded during both steady flow and flow-induced transients.** ~~Deflection measurements are recorded during various plant transients.~~

2. **Specified safety-related and high-energy piping are screened qualitatively for perceptible vibration by visual inspection during the transient events.**

3. **Dynamic response monitoring is performed in conjunction with preoperational test 14.2.12.1.24 and during hot functional testing per 14.2.12.1.1 and the tests coordinated by 14.2.12.1.1.**

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: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-58

DCD 14.2.12.1.53 has as an objective to demonstrate proper alignment and operation of ESF and other safety components with gas turbine maximum and minimum design voltages. The acceptance criteria require that the gas turbines function as designed and the ESF and other safety components actuate in the proper sequence and automatically align in the proper manner. There is no acceptance criterion identified to verify that all components operated properly under both maximum and minimum design voltages. Please revise DCD Subsection 14.2.12.1.53 to verify that all components operate properly under both maximum and minimum design voltages.

(BNL RAI 14.2-45)

ANSWER:

The intention of the test objectives in Subsection 14.2.12.1.53, Class 1E Gas Turbine Generator Sequence Preoperational Test – LOOP Sequence and LOOP Sequence with ECCS Actuation, is to comply with RG 1.9 and IEEE 387. While voltage and frequency vary with load, the intent is to demonstrate that Class 1E gas turbine generator loading sequences attain the required voltage and frequency within acceptable limits and time. Accordingly, MHI will revise test objectives to clarify this intent. Additionally, MHI will revise the acceptance criteria to clearly align with the test objectives.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.53 on pages 14.2-78 and 14.2-79 as follows:

A. Objectives

1. To demonstrate that the operation of the Class 1E gas turbine generators and the emergency loads supplied are in agreement with design assumptions.

2. To demonstrate proper automatic alignment and operation of ESF and other safety components using Class 1E gas turbine generators with **voltage and frequency within acceptable limits** ~~the maximum and minimum design voltage~~. (LOOP sequence)

3. To demonstrate that the starting of Class 1E gas turbine generator by an ECCS actuation signal.

4. To demonstrate proper automatic alignment and operation of ESF and other safety components upon an ECCS actuation signal using Class 1E gas turbine generators with **voltage and frequency within acceptable limits**~~the maximum and minimum design voltage~~. (LOOP sequence with ECCS actuation signal)

(NOTE) The ECCS actuation of the isolation valves and non-safety components and system valves in the SIS is verified in the ECCS Actuation and Containment Isolation Logic Preoperational Test (Subsection 14.2.12.1.55) and the Main Steam Isolation Valve (MSIV) and Main Feedwater Isolation Valve (MFIV) System Preoperational Test (Subsection 14.2.12.1.23).

D. Acceptance Criteria

~~1. The Class 1E gas turbine generators function as designed on a simulated LOOP including a simultaneous start of the redundant units, and safety bus loads are within the design limit.~~

~~2. Each Class 1E gas turbine generator starts and operates on standby in response to an ECCS actuation signal.~~

~~3. The ESF and other safety components actuate in the proper sequence and automatically align in the proper manner (Subsections 7.3 and 8.3.1 and Table 8.3.1-4).~~

1. **Operation of the Class 1E gas turbine generators and the emergency loads supplied are in agreement with design assumptions.**

2. **On a LOOP, proper automatic alignment and operation of ESF and other safety components using Class 1E gas turbine generators is demonstrated, with voltage and frequency within acceptable limits. (LOOP sequence)**

3. **The Class 1E gas turbine generators start on an ECCS actuation signal.**

4. **On an ECCS actuation signal coincident with a simulated LOOP, proper automatic alignment and operation of ESF and other safety components using Class 1E gas**

turbine generators is demonstrated, with voltage and frequency within acceptable limits. (LOOP sequence with ECCS actuation signal)

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: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-59

Part A: Test Method C.2 in DCD Subsection 14.2.12.1.56, "Safety Injection Check Valve Preoperational Test", presents the method for operability of accumulator discharge check valves. However, the test abstract does not specify testing of each of the 4 accumulator injection trains in accordance with RG 1.79, "Preoperational Testing of Emergency Core Cooling Systems for Pressurized Water Reactors". RG 1.79 states that: "Each accumulator injection train should be tested individually or simultaneously by opening the isolation valve and then slowly..." Please provide additional information in DCD Subsection 14.2.12.1.56 to document that each injection train will be tested in accordance with the guidance in RG 1.79 and that the operability of the check valves will be demonstrated.

Part B: Test Methods C.1 and C.2 in DCD Subsection 14.2.12.1.56 discuss the operation of the accumulator discharge check valves and injection line check valves. It is not clear how the test methods described verify the operation of the accumulator discharge check valves. Please revise DCD Subsection 14.2.12.1.56 to include a test method verifies the operation of the accumulator discharge check valves.

(BNL RAI 14.2-46)

ANSWER:

Part A: MHI will revise Subsection 14.2.12.1.56, Safety Injection Check Valve Preoperational Test, to document that each injection train will be tested in accordance with RG 1.79.

Part B: MHI will revise Subsection 14.2.12.1.56, Safety Injection Check Valve Preoperational Test, to describe how to verify the operability.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.56 on page 14.2-82.

Revise Item C, Test Method, as follows:

1. RCS pressure is reduced and safety injection pump flow is routed through the reactor vessel or hot leg and the correct accumulator discharge check valve and injection line check valve operation **to confirm delivery of the water** are verified.

2. Accumulator motor-operated isolation valves are opened and RCS pressure and temperature are reduced to the accumulator discharge conditions to verify the operability of ~~accumulator discharge valves~~ **each accumulator discharge check valve as indicated by a decrease in the fluid level of each accumulator.**

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: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-60

Test Method C.3 in DCD Subsection 14.2.1.57, Safety Injection Accumulator Test, describes the accumulator discharge valve operation under maximum differential pressure conditions. RG 1.79, Preoperational Testing of ECCS for PWRs, Section C.1.c (2), states that this capability should be demonstrated for both normal and emergency power conditions. Neither the test method nor the acceptance criteria discuss the operability demonstration for both the normal and emergency power conditions. Please provide additional information in DCD Subsection 14.2.1.57 to indicate how accumulator discharge valve operation is demonstrated for both normal and emergency power conditions.

(BNL RAI 14.2-47)

ANSWER:

MHI will revise Subsection 14.2.1.57, Safety Injection Accumulator Test, to address that accumulator discharge isolation valve operation is demonstrated for both normal and emergency power conditions.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.1.57 on page 14.2-83.

Revise item C, Test Method, as follows:

3. Each accumulator discharge valve is operated under maximum differential pressure conditions of normal accumulator precharge pressure and zero reactor coolant pressure **with normal and emergency power conditions.**

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: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-61

Acceptance criterion D.2 for the containment spray system preoperational test in DCD Subsection 14.2.12.1.58 states that CS/RHRS pumps and CS system performance are within design limits without a discussion or reference to the specific design limits. Please provide additional information in DCD Subsection 14.2.12.1.58 to document the pump and system characteristics being tested and the associated design limits that should be met.

(BNL RAI 14.2-48)

ANSWER:

MHI will revise Subsection 14.2.12.1.58 to add the references to clarify the pump and system characteristics.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.58 on page 14.2-84.

D. Acceptance Criteria

1. CS system components respond to normal control signals and to simulated CS actuation load, load shed, and load sequencing signals **as described in Subsection 6.2.2.2.**

2. CS/RHRS pumps and CS system performance characteristics are within design specifications **as described in Subsection 6.2.2.2.**

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-62

DCD Subsection 14.2.12.1.58, Containment Spray System Preoperational Test, does not specifically discuss testing of the proper operation of CS/RHR system interlocks. RG 1.79 C.2.d.(2) states that performance data should be recorded and the proper operation of interlocks and equipment protective devices in pump and valve controls are verified. The CSS containment isolation valves are interlocked and are allowed to open only if two in-series RHR hot leg suction isolation valves are closed. Please provide additional information in DCD Subsection 14.2.12.1.58 to identify the preoperational tests that record performance data and verify the interlocks for the CS and RHR systems.

(BNL RAI 14.2-49)

ANSWER:

MHI will revise Subsection 14.2.12.1.58, Containment Spray System Preoperational Test, to specifically address testing of the CS/RHR pump hot leg isolation valve open permissive interlocks as described in Subsection 7.6.1.1 and the CS/RHR valve open block interlocks as described in Subsection 7.6.1.2.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.58 on pages 14.2-84 and 14.2-85.

A. Objectives

6. To verify proper operation of the CS/RHR pump hot leg isolation valve open permissive interlocks and the CS/RHR valve open block interlocks.

C. Test Method

5. **The CS/RHR pump hot leg isolation valve open permissive interlocks described in Subsection 7.6.1.1 and the CS/RHR valve open block interlocks described in Subsection 7.6.1.2 are demonstrated.**

D. Acceptance Criteria

6. **The CS/RHR pump hot leg isolation valve open permissive interlocks perform as described in Subsection 7.6.1.1, and the CS/RHR valve open block interlocks perform as described in Subsection 7.6.1.2.**

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-63

DCD Subsection 14.2.12.1.58, Containment Spray System Preoperational Test, demonstrates the operation of the CS/RHRS pumps, CS system valves, and their associated control circuitry. The CS/RHR system can be manually initiated and operated from the remote shutdown console (RSC). In addition, containment pressure and temperature are also indicated both in the main control room (MCR) and RSC. However, no preoperational test was identified relating to the verification of operability of CS system from the RSC.

Please provide additional information in the DCD to discuss how the operability of the CS system from the RSC will be verified. If the test is included in DCD Subsection 14.2.12.1.76, Remote Shutdown Preoperational Test, then please include appropriate wording either in DCD Subsection 14.2.12.1.58 or in DCD Subsection 14.2.12.1.76.

(BNL RAI 14.2-50)

ANSWER:

RG 1.68.2 does not require verification of the operation of the CS system from the RSC; therefore, this is not specifically addressed in DCD Subsection 14.2.12.1.76, Remote Shutdown Preoperational Test.

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-64

RG 1.68, Appendix A, 1. h. (8), "Tanks and Other Sources of Water Used for ECCS", states that testing should include demonstration of proper operation of associated alarms, indicators, controls, heating and chilling systems, and valves.

DCD Subsection 14.2.12.1.59, "Refueling Water Storage System Preoperational Test", only addresses verification of control circuits and alarms. Further, the acceptance criterion in DCD Subsection 14.2.12.1.59 references DCD Subsection 6.3.2.2.4 for the refueling water storage pit (RWSP) system components controls. However, the RWSP system is also discussed in DCD Subsections 6.2.2.2.3 and 6.2.2.2.5, and the RWSP system instrumentation is briefly discussed in DCD Subsection 6.3.5.4.

Finally, DCD Subsections 6.2.2.2.3, 6.2.2.2.5 and 6.3.5.4 and Table 6.3-5 provide RWSP system specifications but do not provide any discussion of the alarms and their verifications.

Therefore, MHI needs to revise DCD Subsection 14.2.12.1.59 to: (1) include demonstration of proper operation of systems and equipment within the scope of this test abstract; and (2) verify the accuracy of the acceptance criteria accordingly.

(BNL RAI 14.2-51)

ANSWER:

MHI will revise Subsection 14.2.12.1.59, Refueling Water Storage System Preoperational Test, to clarify the intent of testing.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.59, Item D, Acceptance Criterion, on page 14.2- 85 as follows:

1. The RWSP system components controls, including ~~temperature controls and~~ alarms operate as designed (see Subsections 6.2.2.2.5, 6.3.2.2.4, and 6.3.5.4).

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-65

The acceptance criterion presented in DCD Subsection 14.2.12.1.60, "Essential Chilled Water System Preoperational Test", states that: "The essential chilled water system operates as described in Subsection 9.2.7."

However, DCD Subsection 9.2.7 does not describe the acceptance criteria for the ECCS system in terms of the system function during normal conditions, and following receipt of an ECCS actuation signal. Also, the system and pump performance characteristics need to be specified.

(BNL RAI 14.2-52)

ANSWER:

MHI will revise Subsection 14.2.12.1.60, Essential Chilled Water System Preoperational Test, to include testing of system flows, pump and chiller performance, and verification of system response on receipt of an ECCS actuation signal.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsections 9.2.7.2.1 on page 9.2-29 and 14.2.12.1.60 on page 14.2-86.

Revise the 6th paragraph of Subsection 9.2.7.2.1 as follows:

Upon receipt of an ECCS actuation signal, **the operating essential chillers and pumps continue to run and the standby essential chillers and pumps start** ~~all essential chillers and chilled water pumps are energized~~.

Revise item C, Test Method, of Subsection 14.2.12.1.60 with the following additions:

4. **Verify system flow rates, pressures, and performance of all pumps.**

5. **Verify that essential chillers supply 40° F chilled water to the HVAC systems cooling coils.**

6. **Verify that operating essential chillers and pumps continue to run and the standby essential chillers and pumps start upon receipt of an ECCS actuation signal.**

Revise item D, Acceptance Criterion, of Subsection 14.2.12.1.60 as follows:

D. Acceptance ~~Criterion~~ **Criteria**

1. The essential chilled water system operates as described in Subsection 9.2.7.

2. **Controls, alarms and status indications perform as described in Subsection 9.2.7.5.1.**

3. **System flow rates, pressures, and performance of all pumps are within design specifications.**

4. **Essential chillers supply 40° F chilled water to the HVAC systems cooling coils.**

5. **Operating essential chillers and pumps continue to run and the standby essential chillers and pumps start upon receipt of an ECCS actuation signal.**

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-66

DCD Subsection 14.2.12.1.61, Containment Structural Integrity Test (SIT), refers to DCD Subsection 3.8.1 as providing the acceptance criterion for containment structural response. However, DCD Subsection 3.8.1.7, "Testing and Inservice Inspection Requirements," notes that:

"Structural integrity testing of the PCCV is performed in accordance with Article CC-6000 of the ASME Code, Section III (Reference 3.8-2), RG 1.35 (Reference 3.8-5), and RG 1.35.1 (Reference 3.8-6). The testing meets the same criteria requirements for ILRT and Containment Leakage Testing as given in RG 1.206 Subsection C.I.6.2.6 (Reference 3.8-1)."

Additionally, RGs 1.35 and 1.35.1 are listed in Table 1.9.1-1 of the DCD, but are not listed in Table 14.2-2 of the DCD.

Therefore, MHI needs to: (1) revise DCD Subsection 14.2.12.1.61 to include the performance of the prestressed concrete containment vessel SIT in accordance with these RGs and ASME code requirements as documented in DCD Subsection 3.8.1.7; (2) add RGs 1.35 and 1.35.1 to Table 14.2-2 of the DCD; and (3) verify that the SIT meets the applicable guidance in RG 1.68, Appendix A, Item 1.i.

(BNL RAI 14.2-53)

ANSWER:

MHI will revise Subsection 14.2.12.1.61 to add reference to Subsection 3.8.1.3.1 for definition of the test method. Since Subsection 3.8.1.3.1 includes reference to the test methods and inspection criteria of ASME III Article CC-6000, RGs 1.35 and 1.35.1, this code and these RGs do not need to be explicitly referenced in Subsection 14.2.12.1.61.

Subsection 3.8.1.discusses the application of Section III of the ASME Code to the design, testing and inspection of the concrete containment vessel, consistent with RG 1.68 Appendix A Item

1.i.(1) footnote 14, which states that over-pressure structural tests should be conducted in accordance with Section III of the ASME Code.

Impact on DCD

This revision impacts revision 1 of the DCD in item C, Test Methods, of Subsection 14.1.2.12.1.61 on page 14.2-86 as follows:

1. The containment is pressurized to the test pressure of 78.2 psig as described in Subsection 3.8.1.3.1, **using the test methods described in Subsection 3.8.1.7**, and the deflection measurements, and concrete crack inspections are made to determine that the actual structural response is within the limits predicted by the design analyses.

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-67

Acceptance criterion D.1 of DCD Subsection 14.2.12.1.66, "Reactor Cavity Cooling System Preoperational Test." references DCD Subsection 9.4.6.

DCD Subsection 9.4.6.1.2.3 documents two temperature limits that serve as a design basis for the system.

Please revise DCD Subsection 14.2.12.1.66 to document the verification of the temperature limits in DCD Subsection 9.4.6.1.2.3 during hot functional testing.

(BNL RAI 14.2-55)

ANSWER:

MHI will revise the test method and acceptance criteria of preoperational test abstract 14.2.12.1.66 to include verification that temperature limits specified in DCD Subsection 9.4.6.1.2.3 are specifically addressed during hot functional testing.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.66 items C, Test Method and D, Acceptance Criteria, on pages 14.2-89 and 14.2-90 as follows:

Revise Subsection 14.2.12.1.66 item C, Test Method, with the following addition:

4. **During hot functional testing, monitor temperature between the reactor vessel support base plates and the concrete, and temperature of the primary shield wall.**

Revise Subsection 14.2.12.1.66 item D, Acceptance Criteria, with the following additions:

3. **During hot functional testing, the temperature between the reactor vessel support base plates and the concrete is maintained at or below 200° F.**

4. **During hot functional testing, the temperature of the primary shield wall is maintained at or below 150° F**

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-68

Acceptance criterion D.1 of DCD Subsection 14.2.12.1.69, "Containment Fan Cooler System Preoperational Test", references DCD Subsection 9.4.6.

DCD Subsection 9.4.6.1.2.1 documents two temperature limits that serve as a design basis for the system.

Please revise DCD Subsection 14.2.12.1.69 to document the verification of the temperature limits in DCD Subsection 9.4.6.1.2.1 during hot functional testing.

(BNL RAI 14.2-56)

ANSWER:

MHI will revise the test method and acceptance criteria of preoperational test abstract 14.2.12.1.69, Containment Fan Cooler System Preoperational Test, to include verification that temperature limits specified in DCD Subsection 9.4.6.1.2.1 are specifically addressed during hot functional testing.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.69 on page 14.2-91.

Add the following to 14.2.12.1.69 item C, Test Method:

4. **With the Containment Fan Cooler in operation, monitor containment air temperature during normal plant operation (three units in operation) and simulated LOOP conditions (two units in operation) during Hot Functional testing.**

Revise Subsection 14.2.12.1.69 item D as follows:

D. Acceptance **Criteria** ~~Criterion~~

2. **Containment air temperature remains below 120° F during normal plant operation (three units in operation) and below 150° F during simulated LOOP conditions (two units in operation) during Hot Functional testing.**

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-69

Acceptance criterion D.1 of DCD Subsection 14.2.12.1.71, "RCS Leak Rate Preoperational Test", references Technical Specification LCO 3.4.13. The RCPB leakage detection system is described in DCD Subsection 5.2.5.

Part A: DCD Subsection 5.2.5.1 notes, in part, that the RCPB leakage detection system is designed in accordance with RG 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems". RG 1.45 is listed in DCD Table 1.9.1-1, but is not listed in DCD Table 14.2-2. Please revise DCD Subsection 14.2.12.1.71 to reference RG 1.45, and add RG 1.45 to DCD Table 14.2-2.

Part B: DCD Subsection 14.2.12.1.71 only addresses 2 of the 4 RCS leakages in LCO 3.4.13 (items b and c). Please revise DCD Subsection 14.2.12.1.71 to add items a and d (no pressure boundary leakage and primary to secondary leakage less than 150 gpd) to the objectives, test method, and acceptance criteria sections of the test abstract.

Part C: The test method section of DCD Subsection 14.2.12.1.71 does not address all of the leakage detection methods in DCD sections 5.2.5.3 and 5.2.5.4. Please revise DCD Subsection 14.2.12.1.71 to add these additional leakage detection methods to the test abstract.

Part D: Neither DCD Subsection 5.2.5 nor DCD Subsection 14.2.12.1.71 identify quantitative methods for determining RCPB leakage rates for each of the several detection methods. The majority of these methods are qualitative. Please identify which leakage detection rates will be quantitative and which will be qualitative, and provide test step(s) in DCD Subsection 14.2.12.1.71 that will determine and correlate, as appropriate, the leakage results of the various methods.

(BNL RAI 14.2-57)

ANSWER:

Part A: MHI will revise DCD Table 14.2-2 to add R.G 1.45. MHI considers that Subsection 14.2.12.1.71, RCS leak Rate Preoperational Test, is conducted to assure that the amount of leakage from RCS is within the specified limit and RCPB is sound. Therefore, MHI will add RCPB leak detection systems test as a new preoperational test in Subsection 14.2.12.1.

Part B: MHI does not intend to address only items b and c of LCO 3.4.13 in DCD Subsection 14.2.12.1.71. MHI will revise the description in DCD Subsection 14.2.12.1.71, "A. Objective" and "C. Test Method" deleting the term "identified and unidentified" to avoid confusion.

Part C: MHI will revise the DCD to add RCPB leak detection systems test as a new preoperational test in Subsection 14.2.12.1 and address leakage detection methods in DCD sections 5.2.5.3 and 5.2.5.4.

Part D: Unidentified leakage detection methods described in Subsection 5.2.5.4.1.1 through 5.2.5.4.1.4 are quantitative. Also, changes in the reactor coolant inventory described in 5.2.5.4.2 item C also provides quantitative information of unidentified leakage and information obtained from system components such as C/V reactor coolant level indications provides quantitative information of identified leakage.
MHI will revise DCD Subsection 14.2.12.1.71 item C "Test Method" to add the description of additional detection methods that will be used to determine leakage results.

Impact on DCD

This revision impacts sections 14.2.12.1.71 on pages 14.2-92 and 14.2-93, Table 14.2-2 on page 14.2-165, and adds new Subsection14.2.12.1.[LATER], RCPB Leak Detection Systems.

Revise section 14.2.12.1.71 as follows (only affected descriptions are shown):

A. Objective
1. To determine during hot functional testing the ~~amount of identified and unidentified~~ leakage from the RCS and verify that the leakage is within allowable limits.

C. Test Method
The ~~identified and unidentified~~ RCS leakage rates are determined by monitoring the following parameters **in conjunction with quantitative leakage detection methods described in Subsection 5.2.5.4.1.1 through 5.2.5.4.1.4** over a specified period of time:

Revise Table 14.2-2 to add RG1.45 as follows.

20. RG 1.45, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage," Rev.1, May,2008

New Subsection14.2.12.1.[LATER] RCPB Leak Detection Systems is added as follows.

14.2.12.1.[LATER] RCPB Leak Detection Systems

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.**

B. **Prerequisites**

1. **Component testing and instrument calibration has been completed.**

2. **Test instrumentation has been available and calibrated.**

C. **Test Method**

1. **Verify the calibration and alarm setpoints using simulated signals to each channel of RCPB leak detection systems.**

2. **Verify alarm functions.**

3. **Verify the automatic functions.**

D. **Acceptance Criteria**

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

2. **The alarm setpoints are established.**

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-70

The objective of DCD Subsection 14.2.12.1.75 includes the demonstration of the nuclear instrumentation system to supply signals for operating the appropriate alarm and trip signals and indicating reactor power levels. The acceptance criteria for this test do not verify any nuclear instrumentation system output functions such as alarm, trip, or indication signals. Please revise DCD Subsection 14.2.12.1.75 to add acceptance criteria that verify any nuclear instrumentation system output functions such as alarm, trip, or indication signals.

(BNL RAI 14.2-58)

ANSWER:

MHI will revise DCD Subsection 14.2.12.1.75, Nuclear Instrumentation System Preoperational Test, to include acceptance criteria for nuclear instrumentation system output functions. See response to RAI-33, Question 14.2-29.

Impact on DCD

See response to RAI-33, Question 14.2-29.

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-71

DCD Subsection 14.2.12.1.79 addresses the HEPA Filter and Charcoal Absorber Preoperational Test for four in-plant HVAC systems and refers to DCD Subsection 9.4. This subsection and Tables 1.9.1-1 and 14.2-2 commit to RG 1.52, which specifies, in part, initial test requirements for the HVAC systems. One of the four HVAC systems is the technical support center (TSC) HVAC, and DCD Subsection 9.4.3.4.4 commits to RG 1.140 rather than RG 1.52 for the TSC. Section C.6 of each RG has guidance for testing, including "Initial in-place testing". Please revise DCD Subsection 14.2.12.1.79 to incorporate the test requirements of both RG 1.52 and RG 1.140, accordingly.

(BNL RAI 14.2-59)

ANSWER:

RG 1.52, *Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants*, provides guidance and criteria for implementing the NRC's regulations with regard to "engineered-safety-feature (ESF) atmosphere cleanup systems in light-water-cooled nuclear power plants. For the purposes of this guide, ESF atmosphere cleanup systems are those systems that are credited in the licensee's current design basis accident analysis, as described in the Safety Analysis Report (SAR)" (excerpted from Part A of RG 1.52).

The DCD states that
"Only safety-related systems are credited in the US-APWR safety analyses." in section 15.0.0.5.
"There are no safety design bases for the TSC HVAC system." in section 9.4.3.1.1.4.
"The TSC HVAC system ... does not serve any safety function. Therefore, it is not safety-related or seismic Category I qualified." in section 9.4.3.2.4.

Based upon the above, MHI concludes that RG 1.52 is not applicable to the TSC HVAC system. Therefore, testing of this system is performed in accordance with the recommendations in RG 1.140, *Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal*

Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants, consistent with Subsection 9.4.3.4.4.

Since the requirements of RG 1.52 and RG 1.140 are the same relative to in-place testing of HEPA filters and adsorber units, and to ensure consistent testing methods, MHI will revise Subsection 14.2.12.1.79 to refer to RG 1.52, RG 1.140, ASME N510 (Ref. 9.4.8-8) and ASME AG-1-1997 for test methods and acceptance criteria.

Impact on DCD

This revision impacts revision 1 of the DCD in Table 14.2-1 on page 14.2-25, Subsection 14.2.12.1.79 on page 14.2-99 and Subsection 14.2.14 on page 14.2-164 as described below:

Change "absorbers" to "adsorbers" in items A.1, B.5, and C.1 of Subsection 14.2.12.1.79, the title of Subsection 14.2.12.1.79 and in Table 14.2-1 in the title column for section 14.2.12.1.79.

Revise Subsection 14.2.12.1.79 item C, Test Method, as follows:

4. **Testing shall be performed in accordance with RG 1.52 (Reference 14.2-26), RG 1.140 (Reference 14.2-25), ASME N510 (Reference 14.2-20) and ASME AG-1-1997 (Reference 14.2-27).**

Revise Subsection 14.2.12.1.79 item D, Acceptance Criteria, as follows:

1. The HEPA filters and charcoal ~~absorbers~~**adsorbers perform and** operate in accordance with **RG 1.52 (Reference 14.2-26), RG 1.140 (Reference 14.2-25), ASME AG-1-1997 (Reference 14.2-27),** ASME N509 (Reference 14.2-19) and ASME N510 (Reference 14.2-20) as described in Section 9.4.

Revise Subsection 14.2.14, References, as follows:

14.2-26 <u>Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants</u>, Regulatory Guide 1.52, Rev. 3, U.S. Nuclear Regulatory Commission, Washington, DC June 2001

14.2-27 <u>Code on Nuclear Air and Gas Treatment</u>, ASME/ANSI AG-1-1997, American Society of Mechanical Engineers

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-72

DCD Subsection 14.2.12.1.80, "Liquid Waste Management System Preoperational Test", tests the capability of the LWMS as described in DCD Subsection 11.2. DCD Subsection 11.2.1.1 documents the design objectives of the LWMS.

However, DCD Subsection 14.2.12.1.80 does not seem to address the following design objectives of the LWMS documented in DCD Subsection 11.2.1.1: storage, sampling & analysis, treatment, recycle back to plant use, and release.

Please revise DCD Section 14.2.12.1.80 to address LWMS storage, sampling & analysis, treatment, recycle back to plant use, and release in the test abstract. Otherwise, please explain how these design objectives are being addressed by the test abstract.

(BNL RAI 14.2-60)

ANSWER:

MHI will revise DCD Subsection 14.2.12.1.80 to address the system operating performance, consistent with the design objectives of the LWMS documented in DCD Subsection 11.2.1.

Impact on DCD

This revision impacts Subsection 14.2.12.1.80 on page 14.2-101 with the following addition to item D, Acceptance Criteria:

5. The Liquid Waste Management System operates as described in Subsection 11.2.

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-73

DCD Subsection 14.2.12.1.81, "Gaseous Waste Management System Preoperational Test", tests the capability of the GWMS as described in DCD Subsection 11.3. DCD Subsection 11.3.1.1 documents the design objectives of the GWMS.

However, DCD Subsection 14.2.12.1.81 does not seem to address the following design objectives of the GWMS documented in DCD Subsection 11.3.1.1: storage, sampling & analysis, treatment, reuse, and release.

Please revise DCD Section 14.2.12.1.81 to address GWMS storage, sampling & analysis, treatment, reuse, and release in the test abstract. Otherwise, please explain how these design objectives are being addressed by the test abstract.

(BNL RAI 14.2-61)

ANSWER:

The design objectives in Subsection 11.3.1.1 are implemented in the system design, which is described in Subsection 11.3.2. Verification that the waste gas system operates as described in section 11.3.2 is included in Subsection 14.2.12.1.81.D acceptance criteria item 2:

"2. The waste gas compressors, waste gas dryer, and waste gas system are operable and their controls operate as described in Section 11.3."

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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Docket No. 52-021

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SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-74

DCD Subsection 14.2.12.1.82, "Solid Waste Management System Preoperational Test", tests the capability of the SWMS as described in DCD Subsection 11.4. DCD Subsection 11.4.1.1 documents the design objectives of the SWMS.

However, the test method has only one step, "Verify alarms and indications". DCD Subsection 14.2.12.1.82 does not seem to address the following design objectives of the SWMS documented in DCD Subsection 11.4.1.1: processing, de-watering, solidification, storage, sampling & analysis, and packaging.

Please revise DCD Section 14.2.12.1.82 to address SWMS processing, de-watering, solidification, storage, sampling & analysis, and packaging in the test abstract. Otherwise, please explain how these design objectives are being addressed by the test abstract.

(BNL RAI 14.2-62)

ANSWER:

MHI will revise the test methods described in section 14.2.12.1.82 to include demonstration of the operation of all subsystems included in the SWMS.

Impact on DCD

This revision impacts Subsection 14.2.12.1.82 on page 14.2-102.

Revise section 14.2.12.1.82.C, Test Method, as follows:

C. Test Method

1. Verify **manual and automatic system controls, interlocks,** alarms and indications.

2. **Demonstrate the ability of the SRSTs to receive spent resin from the LWMS, CVCS, SFPCS, SG blowdown system, and the condensate polisher ion exchange columns.**

3. **Demonstrate the ability of the SWMS to handle the following waste types, consistent with system operations described in Subsection 11.4.2: dry active waste, spent filter elements, spent resin, spent activated carbon, and oil and sludge.**

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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Docket No. 52-021

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SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-75

DCD Subsection 14.2.12.1.84, Sampling System Pre-op Test, tests the capability of the "sampling system", and refers to DCD Subsection 9.3.2. However, it is not fully clear which sampling systems are within the scope of the test. DCD Subsection 9.3.2 is titled "Process and Post-Accident Sampling Systems" and includes 6 sampling sub-systems, one of which is the SG Blowdown Sampling System, that has a separate test in DCD Subsection 14.2.12.1.83. Please revise DCD Subsections 14.2.12.1.83 and/or 14.2.12.1.84, accordingly, to clarify where and how these sampling systems are being tested.

(BNL RAI 14.2-63)

ANSWER:

Because the SG blowdown sampling subsystem operates in conjunction with the SG Blowdown system, MHI will revise the Objectives, the Prerequisites, Test Methods and Acceptance Criteria described in Subsection 14.2.12.1.83 to clarify where and how the SG Blowdown sampling system is being tested.

Impact on DCD

This revision impacts Subsection 14.2.12.1.83 on page 14.2-103.

Revise section 14.2.12.1.83 as follows (only revised items shown):

A. Objective

2. To demonstrate **the capability of the SG blowdown sampling system to collect blowdown liquid sample from each SG and** the operation of the ~~SGBDS sample monitoring system~~ **SG blowdown sampling system including monitors, system valve and control circuits.**

3. **To demonstrate of the performance of laboratory equipment**

B. Prerequisities

6. **The SGBDS to be sampled is at normal pressure and temperature.**

7. **The condenser or waste water system (WWS) or LWMS is available to receive discharge from the SG blowdown sampling system**

C. Test Method

6. **Verify the flow rate and temperature during SG blowdown liquid samples are taken from each SG.**

7. **Verify the operation of control circuit and operability of the SG blowdown sampling system**

8. **Verify the operation of laboratory equipment used to analyze or monitor SG blowdown water quality and radioactivity concentrations**

D. Acceptance Criteria

1. The SGBDS operates as described in Subsection 10.4.8 ~~and subsection 9.3.2.2,and Table9.3.2.5~~and Table 10.3.5-1

2. **The SG blowdown sampling system operates as described in Subsection 9.3.2.2 and Table 9.3.2-5**

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-76

Part A: DCD Subsection 14.2.12.1.86, "Fuel Handling System Preoperational Test," addresses the tests referred to in RG 1.68, Appendix. A, Section 1.m (4) and (5). RG 1.68, Appendix. A, Section 1.m (4) references NUREG-0554 and NUREG-0612 for these tests. DCD Subsection 14.2.12.1.86 references NUREG-0612 but does not reference NUREG-0554. RG 1.68, Appendix. A, Section 1.m also notes that: "full operational testing should be at 100% of rated load". Please revise DCD Subsection 14.2.12.1.86 to incorporate a reference to NUREG-0554 and to address the RG 1.68 guidance that full operational testing be conducted at 100% of rated load.

Part B: RG 1.68, Appendix. A, Section 1.m (2), calls for tests of refueling equipment, including hand tools and grapples. DCD Subsection 9.1.4.2.1 discusses various fuel handling tools, such as a new and a spent fuel assembly handling tool and a rod control cluster (RCC) handling tool. Please revise DCD Subsection 14.2.12.1.86 to address the various fuel handling tools discussed in DCD Subsection 9.1.4.2.1.

(BNL RAI 14.2-64)

ANSWER:

Part A: MHI will revise DCD Subsection 14.2.12.1.86 to include reference to NUREG-0554 as well as NUREG-0612 for the spent fuel cask handling crane. The spent fuel cask handling crane is designed as a single failure proof crane in accordance with NUREG-0554 as stated in Subsection 9.1.5.3, and is subject to heavy loads per the criteria of NUREG-0612. MHI will revise DCD Subsection 14.2.12.1.86 to clarify requirements for testing of the refueling machine, new fuel elevator, and fuel handling machine. MHI will revise DCD Subsection 14.2.12.1.86 to clarify that full operational testing be conducted at 100% of rated load.

Part B: MHI will revise DCD Subsection 14.2.12.1.86 to address the various fuel handling tools discussed in DCD Subsection 9.1.4.2.1.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.2.1.86 on page 14.2-106, and Subsection 14.2.14 on page 14.2-164.

Revise section 14.2.12.1.86.A, Objectives, as follows:

3. To perform static load testing at 125% of rated load and operational **(dynamic)** load testing ~~using the dummy fuel assembly~~ **at 100% of rated load on the refueling machine, new fuel elevator, fuel handling machine, and spent fuel cask handling crane.**

4. **To perform operational load testing using the dummy fuel assembly.**

Revise section 14.2.12.1.86.B, Prerequisites, as follows:

4. A dummy fuel assembly **and sufficient test weights are** available.

Revise section 14.2.12.1.86.C, Test Method, as follows:

1. The refueling machine, new fuel elevator, fuel handling machine, and spent fuel cask handling building crane are **static** load tested at 125% of rated load, followed by an inspection.

4. **The refueling machine, new fuel elevator, fuel handling machine, and spent fuel cask handling building crane are dynamically load tested at 100% of rated load, followed by an inspection.**

5. **Spent fuel cask handling crane testing for handling of heavy loads includes test requirements specified by NUREG-0554 (Reference 14.2-24) and NUREG-0612 (Reference 14.2-21) as applicable.**

6. **The use and operation of fuel handling tools identified in Subsection 9.1.4.2.1 are demonstrated.**

Revise section 14.2.12.1.1.86.D, Acceptance Criteria, as follows:

3. The refueling machine, new fuel elevator, **and** fuel handling machine ~~,and spent fuel cask handling crane~~ can lift 125% of rated load and satisfactorily pass an inspection, ~~including visual, liquid penetrant and magnetic particle examination as applicable, in accordance with "Control of Heavy Loads at Nuclear Power Plants,: NUREG-0612, (Reference 14.2-21)~~ and can transfer the dummy fuel assembly ~~between the transfer cart and the reactor vessel~~ **(Subsection 9.1.4). The spent fuel cask handling crane can lift 125% of rated load and satisfactorily pass an inspection, and can raise the new fuel shipping container from the receipt truck (the only potentially heavy load handling for new fuel receipt described in Subsection 9.1.4).**

5. **Refueling machine, new fuel elevator, and fuel handling machine testing demonstrates compliance with test requirements specified by ASME NOG-1 (Reference 14.2-30) and ASME B30.20-2006 (Reference 14.2-31) as applicable.**

6. **Spent fuel cask handling building crane testing demonstrates compliance with test requirements specified by NUREG-0554 (Reference 14.2-24), ASME NOG-1 (Reference 14.2-30) and NUREG-0612 (Reference 14.2-21) as applicable.**

7. **Fuel handling tools perform their intended design function as identified in Subsection 9.1.4.2.1.**

Revise subsection 14.2.14 as follows:

14.2-24 **Single Failure Proof Cranes for Nuclear Power Plants, NUREG-0554, Nuclear Regulatory Commission, Washington, DC May 1979**

14.2-30 **Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder), ASME NOG-1-2004, American Society of Mechanical Engineers.**

14.2-31 **Below-the-Hook Lifting Devices, ASME B30.20-2006, American Society of Mechanical Engineers.**

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-77

DCD Subsection 14.2.12.1.87, Component Cooling Water System Preoperational Test, provides the abstract for testing the CCW system. Two key functions of the system do not appear to be tested: (1) verification of the cooling capability of the heat exchangers; and (2) prevention of leakage of radioactive fluids into or out of the CCW system, and detection of leakage of radioactive material into the CCW system. Please revise DCD Subsection 14.2.12.1.87 to provide information on how the above two key functions of the CCW will be tested.

(BNL RAI 14.2-65)

ANSWER:

(1) MHI will revise DCD Subsection 14.2.12.1.87 to provide information on the abstract for testing the CCWS cooling capability.

(2) Testing of leakage prevention design features described in Subsections 9.2.2.3.1 and 9.2.2.3.2, consisting of alarms and interlocks, are included in the test methods and acceptance criteria in Subsection 14.2.12.1.87.

Note that the hydrostatic pressure test of individual components or subsystems is performed as the construction test to verify their pressure boundary integrity.

Testing of the radiation monitors for CCW leak detection (radiation monitors RMS-RE-56A and RMS-RE-56B) and associated interlock closure of the CCW surge tank vent valve is provided in Section 14.2.12.1.78, the preoperational test of process radiological monitoring.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.87 on page 14.2-107.

Revise item C., Test Method, as follows:

4. **The cooling ability of the CCW system is verified during RCS heatup and cooldown in conjunction with the RHRS during the hot functional test.**

Revise item D., Acceptance Criteria, as follows:

5. **CCW system performance characteristics are within design specifications.**

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: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-78

RG 1.68.3 provides guidance for preoperational testing of Instrument and Control Air Systems. DCD Subsections 14.2.12.1.91 and 14.2.12.1.92 provide the test abstracts for testing of the Instrument Air System and the Station Service Air System. However, neither of these reference RG 1.68.3 for the testing. Please revise DCD Subsections 14.2.12.1.91 and 14.2.12.1.92 to include a reference to RG 1.68.3 and any relevant test prerequisites, objectives, and/or acceptance criteria.

(BNL RAI 14.2-66, Part A)

ANSWER:

The recommendations of RG 1.68.3 are incorporated into preoperational test abstracts 14.2.12.1.91 and 14.2.12.1.92 and 14.2.12.1.62, as indicated in DCD Table 1.9.1-1, with exceptions noted for items C.7, C.8.b and C.11 as described below.

Reference to RG 1.68.3 within preoperational test abstracts 14.2.12.1.91 and 14.2.12.1.92 is not necessary since the applicable test requirements and methods have been incorporated into the test.

Reg. Guide Number	Title Status Corresponding Chapter/Section/Subsection	Status
1.68.3	Preoperational Testing of Instrument and Control Air Systems (Rev. 0, April 1982)	Conformance with exceptions. C.7, C.11: This criterion applies to instrument and control air systems important to safety. The US-APWR does not have an important to safety instrument and control air system. C.8.b: US-APWR does not perform the gradual reduction pressure test because the sudden air

pressure shutoff test verifies that the affected components respond properly.

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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SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-79

RG 1.68.3 provides guidance for preoperational testing of Instrument and Control Air Systems. Table 1.9.1-1 notes conformance to this RG with some exceptions. One exception is to item C.8.b of RG 1.68.3, which specifies a gradual loss of pressure test. The table does not provide a clear justification for this exception. Please add RG 1.68.3, item C.8.b test condition to DCD Subsections 14.2.12.1.91 and 14.2.12.1.92 or provide a clear justification for not performing the gradual loss of pressure test.

(BNL RAI 14.2-66, Part B)

ANSWER:

MHI considers that in the case of both gradual loss of pressure and sudden air pressure shutoff, the resulting response of components are the same. For instance, air-operated valves take defined positions for loss of air pressure. Fail-close valves takes close position, fail-open valve takes open position, and some 3 way valve, such as excess letdown line 3 way valve takes preferred position in both above cases. In addition, the safety related loads, which are shown in Table 9.3.1-1, take their Safety Position by opening or closing their attached solenoid valve automatically or manually and discharging air rapidly. Note that the safety positions of air-operated valves which MHI adopts are "fail-open," "fail-close," and "fail to preferred position" for 3 way valves. In other words, safety features can be tested by confirming their fail positions in the sudden air pressure shutoff test. Therefore, MHI considers that it is not necessary to perform the gradual loss of pressure test.

Impact on DCD

There is no impact on the DCD.

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.

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SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-80

DCD Subsection 14.2.12.1.98, Class 1E Electrical Room HVAC Preoperational Test, tests the air handling units. DCD Subsection 14.2.12.1.102, Non-Class 1E Electrical Room HVAC Preoperational Test, tests the air handling units. DCD Subsection 14.2.12.1.111, Turbine Building area Ventilation System (Electric Equipment Area) Preoperational Test, tests the fans. These three systems are also required to maintain H2 concentration of less than 2% in the battery rooms. Please revise the acceptance criteria of DCD Subsections 14.2.12.1.98, 14.2.12.1.102 and 14.2.12.1.111 to incorporate the requirement to maintain H2 concentration of less than 2% in the battery rooms.

(BNL RAI 14.2-67)

ANSWER:

MHI will revise the acceptance criteria of DCD Subsections 14.2.12.1.98, 14.2.12.1.102 and 14.2.12.1.111 to incorporate the requirement to maintain H2 concentration less than 2% in the battery rooms.

Impact on DCD

This revision impacts revision 1 of the DCD in item D., Acceptance Criteria (Criterion), of Subsections 14.2.12.1.98, 14.2.12.1.102 and 14.2.12.1.111, on pages 14.2-116, 14.2-119 and 14.2-126 respectively.

Revise item D., Acceptance Criteria, of Subsection 14.2.12.1.98 as follows:

4. **Battery Room Exhaust Fan operation maintains the hydrogen concentration below 2% by volume in the battery room per Subsection 9.4.5.1.1.2.**

Revise item D., Acceptance Criterion, of Subsection 14.2.12.1.102 as follows:

D. Acceptance **Criteria** ~~Criterion~~

2. **Battery Room Exhaust Fan operation maintains the hydrogen concentration below 2% by volume in the battery room per Subsection 9.4.3.1.2.2.**

Revise item D., Acceptance Criterion, of Subsection 14.2.12.1.111 as follows:

D. Acceptance **Criteria** ~~Criterion~~

2. **Battery Room Exhaust Fan operation maintains the hydrogen concentration below 2% by volume in the battery room per Subsection 9.4.4.1.2.**

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: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-81

DCD Subsection 14.2.12.1.100, Main Steam/Feedwater Piping Area HVAC Preoperational Test, tests the air handling units and refers to DCD Subsection 9.4.3, which in turn references Figure 9.4.3-3. This figure appears incorrect in that, although labeled as Main Steam/Feedwater HVAC, the drawing repeats the Electric Room HVAC shown in Figure 9.4.3-2. Please revise Figure 9.4.3-3 in DCD Subsection 9.4.3 to correctly depict the Main Steam/Feedwater HVAC.

(BNL RAI 14.2-68)

ANSWER:

MHI has revised Figure 9.4.3-3 in revision 1 of the DCD, Subsection 9.4.3, to show the Main Steam/Feedwater Piping Area HVAC system.

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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SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-82

DCD Subsection 14.2.12.1.101, MCR HVAC System Preoperational Test, tests the MCR HVAC System and MCR habitability. This System is described in DCD Subsection 9.4.1. Two important functions of the system in DCD Subsection 9.4.1 do not appear in the test abstract: proper automatic switching to the emergency pressurization mode and to the emergency isolation mode. These functions should be added to the test abstract. The test abstract should also include a requirement that the system design per DCD Subsection 9.4.1 will be verified. Additionally, DCD Subsection 9.4.1 and Tables 1.9.1-1 & 14.2-2 commit to RG 1.196 which specifies, among other items, testing guidance for the MCR envelope integrity. Please include a reference to 1.196 test guidance in this test abstract.

In summary, please revise DCD Subsection 14.2.12.1.101 to: (1) address proper automatic switching to the emergency pressurization mode and to the emergency isolation mode; (2) require that the system design as specified in DCD Subsection 9.4.1 will be verified, and (3) include relevant RG 1.196 test guidance.

(BNL RAI 14.2-69)

ANSWER:

RG 1.196 refers to RG 1.197 for performing a control room envelope integrated leak test. RG 1.197 in turn refers to ASTM E-741-00 as an acceptable test method. This integrated testing is included in Subsection 14.2.12.1.101 in item C.6. MHI will revise Subsection 14.2.12.1.101 to clarify the integrated control room envelope testing requirements and bases.

MHI will revise Subsection 14.2.12.1.101 to include testing of automatic switching to the emergency pressurization mode and to the emergency isolation mode, and verification that the system performs as described in Subsection 9.4.1 in all operating modes.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.101 on pages 14.2-118 and 14.2-119, Subsection 14.2.14 on page 14.2-164, and Table 14.2-2 on page 14.2-165.

Revise Subsection 14.2.12.1.101 as follows:

A. Objectives
   1. To demonstrate operation of the MCR HVAC system **in normal, isolation and emergency pressurization modes**.

   2. To verify that the system components perform their safety-related functions, including:

      a. Providing sufficient breathable quality air to the MCR

      b. Maintaining the MCR at positive pressure

   3. To perform integrated control room envelope leak testing.

C. Test Method

   1. Verify manual and automatic controls.

   2. Verify that alarms and indications are functional.

   3. Performance of the MCR HVAC and habitability systems are observed and recorded during component and integrated system testing.

   4. Verify design air flow.

   5. The ability of the emergency air supply to maintain the MCR at the proper positive pressure is demonstrated.

   6. ~~The ability of the emergency air supply to limit~~ ~~air~~**Air** inleakage to the MCR is verified in accordance with **RG 1.196 (Reference 14.2-28) and** ASTM E-741-00 (Reference 14.2-23).

   7. Demonstrate automatic switching to isolation mode upon the receipt of the initiation signal.

   8. Demonstrate automatic switching to pressurization mode upon the receipt of the MCR isolation signal.

   9. Demonstrate Smoke Purge Operation mode.

   10. Perform system and component testing in accordance with RG 1.52 (Reference 14.2-26),

   11. Testing of high-efficiency particulate air filters and charcoal adsorbers performed per Subsection 14.2.12.1.79 is coordinated with this test.

   12. Testing of prefilters, fans and fan motors, heaters, dampers, and ductwork is performed in accordance with RG 1.52 (Reference 14.2-26), and standards referenced by RG 1.52.

D. Acceptance Criteria

1. The AHUs ~~and~~, fans **and dampers** ~~operate on the proper signals~~**perform as described in Subsections 6.4.2 and 9.4.1.**

2. All **indications and** alarms ~~annunciate properly~~ **operate as described in Subsection 9.4.1.5.**

~~3. A positive pressure is maintained in the MCR with respect to the surrounding area, including during accident conditions, as specified in Section 6.4.~~ **The MCR HVAC system automatically switches to pressurization mode and establishes pressurization mode conditions upon the receipt of the MCR isolation signal in accordance with Subsections 6.4.2 and 9.4.1.2.2.1.**

4. The system maintains proper control room air quality.

5. The MCR tornado depressurization protection dampers operate as designed.

6. ~~The emergency air supply limits air inleakage to the MCR as specified in Subsection 6.4.~~**The ASTM E741 tests confirm total system leakage in the pressurization mode and air exchange rate in the pressurization mode in accordance with Subsection 6.4.2.3.**

7. **The MCR HVAC system automatically switches to isolation mode and establishes isolation mode conditions upon the receipt of the initiation signal in accordance with Subsections 6.4.2 and 9.4.1.2.2.2.**

Revise Subsection 14.2.14, References, as follows:

14.2-28 **<u>Control Room Habitability at Light-Water Nuclear Power Reactors</u>, Regulatory Guide 1.196, Rev. 1, U.S. Nuclear Regulatory Commission, Washington, DC January 2007**

Revise Table 14.2-2 as follows:

21 **Regulatory Guide 1.196, "Control Room Habitability at Light-Water Nuclear Power Reactors, Rev. 1, January 2007**

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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US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-83

DCD Section 14.2.12.1.103, Technical Support Center HVAC Preoperational Test, tests the TSC HVAC System and refers to DCD Section 9.4.3. Section 9.4.3.4.4 and Tables 1.9.1-1 and 14.2-2 include a commitment to conduct testing of the TSC HVAC System in accordance with RG 1.140. RG 1.140, Section C.6, includes guidance for testing, including "Initial In-place Testing." Please revise DCD Section 14.2.12.1.103 to include the relevant provisions of RG 1.140, Section C.6.

(BNL RAI 14.2-70)

ANSWER:

Testing of the TSC HVAC high-efficiency particulate air filters and charcoal adsorbers is performed per preoperational test abstract 14.2.12.1.79. MHI will revise DCD Section 14.2.12.1.103, Technical Support Center HVAC Preoperational Test, to (1) refer to Subsection 14.2.12.1.79 in order to ensure coordination of testing and (2) refer to RG 1.140 for additional testing requirements for fans and fan motors, heaters, dampers, and ductwork.

Impact on DCD

This revision impacts revision 1 of the DCD in item C., Test Method, of Subsection 14.2.12.1.103 on page 14.02-120 and Subsection 14.2.14 on page 14.02-164 as follows:

Revise Subsection 14.2.12.1.103 as follows:

C. Test Method

4. **Testing of high-efficiency particulate air filters and charcoal adsorbers performed per Subsection 14.2.12.1.79 is coordinated with this test.**

5. **Testing of prefilters, fans and fan motors, heaters, dampers, and ductwork is performed in accordance with RG 1.140 (Reference 14.2-25), and standards referenced by RG 1.140.**

Revise Subsection 14.2.14, References, as follows:

14.2-25 Design, Inspection and Testing Criteria for Normal Ventilation Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants, Regulatory Guide 1.140, Rev. 2, U.S. Nuclear Regulatory Commission, Washington, DC June 2001

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 33 REVISION 0

SRP SECTION: 14.02 – Initial Plant Test Program – Design Certification and New License Applicants

APPLICATION SECTION: 14.2

DATE OF RAI ISSUE: 7/21/2008

QUESTION NO.: 14.02-84

DCD Subsection 14.2.12.1.105, Vessel Servicing Preoperational Test, addresses the heavy lifting equipment described in DCD Subsection 9.1.5. RG 1.68, App. A, section 1.o (1) calls for tests of the associated refueling lifting equipment (e. g., slings). DCD Subsection 9.1.5 mentions slings, hooks, etc. These should be added to Test abstract 14.2.12.1.105. RG 1.68 section 1.o (3) calls for a demonstration of the operability of safety devices. DCD Subsection 9.1.5.5 describes safety devices in addition to the interlocks. These safety devices need to be included in the test abstract.

In summary, please revise DCD Section 14.2.12.1.105 to: (1) incorporate dynamic and static load testing of the lifting equipment identified in DCD Subsection 9.1.5, and (2) require a demonstration of the operability of the safety devices identified DCD Subsection 9.1.5.5.

(BNL RAI 14.2-71)

ANSWER:

MHI will revise Subsection 14.2.12.1.105, Vessel Servicing Preoperational Test, to incorporate dynamic and static load testing of the lifting equipment identified in DCD Subsection 9.1.5, and require a demonstration of the operability of the safety devices identified in DCD Subsection 9.1.5.5.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.105 on page 14.2-121. Note: References 14.2-24, NUREG-0554, and 14.2-30, ASME NOG-1, added in response to Question 76 above.

Revise item Subsection 14.2.12.1.105 as follows:

A. Objectives

1. To demonstrate operation of the ~~reactor vessel head and internals lifting rigs, and the~~ polar crane, including the control circuits, **limit devices, safety devices** and interlocks, **and the reactor vessel head and internals lifting rigs, associated equipment and accessories (e.g., slings and hooks, etc.)**.

2. To verify the polar crane and the reactor head and internals lifting rig**s, and associated equipment and accessories,** have completed static testing at 125% and operational testing **(dynamic load testing)** at 100% of rated load.

C. Test Method, as follows:

1. Verify control circuitry, **limit devices, safety devices, and interlocks** for the polar crane **as described in Subsection 9.1.5.5**.

2. ~~Verify~~ **Perform static load testing at 125% of rated load for** the polar crane, ~~and~~ reactor vessel head and internals lifting rigs, **and associated equipment and accessories,** ~~static and dynamic load testing~~ followed by ~~visual~~ **appropriate** inspection**s** ~~are completed~~.

3. **Perform operational (dynamic load) testing at 100% of rated load of the polar crane, reactor vessel head and internals lifting rigs, and associated equipment and accessories followed by appropriate inspections.**

4. **Testing and inspection includes testing and inspection requirements specified by NUREG-0554 (Reference 14.2-24), ASME NOG-1 (Reference 14.2-30), and NUREG-0612 (Reference 14.2-21) as applicable.**

D. Acceptance Criteria

1. The polar crane and its associated interlocks, **limit devices, safety devices** and control circuits perform as specified in Subsection 9.1.5.

2. The polar crane static testing at 125% of rated load ~~is completed~~ and operational **(dynamic load)** testing at 100% of rated load **is completed** and **the crane** satisfactorily passes ~~an~~ inspection**s**~~, including visual, liquid penetrant and magnetic particle examination as applicable,~~ in accordance with **NUREG-0554 (Reference 14.2-24), ASME NOG-1 (Reference 14.2-30), and** NUREG-0612, (Reference 14.2-21).

3. The reactor vessel head and internals lifting rigs **and associated equipment and accessories** satisfactorily pass an inspection~~, including visual, liquid penetrant and magnetic particle examination as applicable~~ **following static and operational (dynamic load) testing** in accordance with NUREG-0612~~,~~ (Reference 14.2-21) **and NUREG-0554 (Reference 14.2-24)**.

4. **Testing and inspection demonstrates compliance with testing and inspection requirements specified by NUREG-0554 (Reference 14.2-24), ASME NOG-1 (Reference 14.2-30) and NUREG-0612 (Reference 14.2-21) as applicable.**

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

9/4/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 33 REVISION 0**

SRP SECTION: **14.02 – Initial Plant Test Program – Design Certification and New License Applicants**

APPLICATION SECTION: **14.2**

DATE OF RAI ISSUE: **7/21/2008**

QUESTION NO.: 14.02-85

DCD Subsection 14.2.12.1.107, "Pressurizer Heater and Spray Capability and Continuous Spray Flow Verification Test", appears to duplicate, to some extent, DCD Subsection 14.2.12.1.2, "Pressurizer Pressure and Water Level Control Preoperational Test." In addition, Test Method C.5 of DCD Subsection 14.2.12.1.107 is not sufficiently detailed, and the reference in Acceptance Criterion D.2 to DCD Subsection 5.4.11.1 does not appear to be correct.

Please revise DCD Subsection 14.2.12.1.107 to: (1) clarify the distinction between DCD Subsections 14.2.12.1.107 and 14.2.12.1.2; (2) add additional detail to Test Method C.5 of DCD Subsection 14.2.12.1.107, and (3) correct or clarify the reference to DCD Section 5.4.11.1 in DCD Subsection 14.2.12.1.107, Acceptance Criterion D.2.

(BNL RAI 14.2-72)

ANSWER:

The preoperational test 14.2.12.1.2, Pressurizer Pressure and Water Level Control Preoperational Test, is intended to perform initial tuning of the pressurizer pressure and level controls and should be completed prior to performing preoperational test 14.2.12.1.107, Pressurizer Heater and Spray Capability and Continuous Spray Flow Verification Test.

MHI considers the level of detail contained in Test Method C.5 of DCD Subsection 14.2.12.1.107 to be sufficient and adequate to convey plant baseline data collection for the performance of the auxiliary pressurizer spray utilizing CVCS addition to the pressurizer spray line, as described in Subsection 5.4.10.3.4.

MHI will revise Subsection 14.2.12.1.107 to include completion of 14.2.12.1.2 as a prerequisite, and to correct the error in Acceptance Criterion D.2.

Impact on DCD

This revision impacts revision 1 of the DCD in Subsection 14.2.12.1.107 on pages 14.2-122 and 14.2-123.

Revise item B, Prerequisites, as follows:

4. **Preoperational test 14.2.12.1.2 is complete.**

Revise item D, Acceptance Criteria, as follows:

2. The pressurizer pressure response to the opening of the pressurizer spray valves and to the actuation of all pressurizer heaters is within the limits described in Subsection 5.4.10.**3**.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.