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August 2, 2012

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-12193

Subject: **MHI's Response to US-APWR DCD RAI No. 883-6063 Revision 3 (SRP 09.04.01)**

Reference: 1) "Request for Additional Information No. 883-6063 Revision 3, SRP Section 09.04.01 – CONTROL ROOM AREA VENTILATION SYSTEM, Application Section: 9.4.1", dated January 3, 2012.

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. 883-6063 Revision 3."

Reference 1 contains four questions; Question 09.04.01-29, 30, 31, and 32. Enclosed is the response to Question 09.04.01-30. The response to the other three questions will be submitted separately as discussed with the NRC.

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

Sincerely,

Y. Ogata

Yoshiki Ogata,
Director- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosure:

1. Response to Request for Additional Information No. 883-6063 Revision 3

D081
NRO

CC: J. A. Ciocco
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Enclosure 1

UAP-HF-12193
Docket No. 52-021

Response to Request for Additional Information No. 883-6063
Revision 3

August 2012

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

08/02/2012

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**883-6063 REVISION 3**
SRP SECTION:	**09.04.01 - CONTROL ROOM AREA VENTILATION SYSTEM**
APPLICATION SECTION:	**9.4.1**
DATE OF RAI ISSUE:	**01/03/2012**

QUESTION NO.: 09.04.01-30

This is a follow-up to the RAI sequence: RAI No. 63, Question No. 09.04.01-18; RAI No. 327-2401, Question No. 09.04.01-6; RAI 475-3780, Question No. 09.04.01-14; & RAI No. 582-4456, Question 09.04.01-20.

This follow-up RAI is necessitated by changes created by DCD Revision 3 Tier 1 changes to Item 12 of ITAAC Table 2.6.5-1. The staff notes that Revision 3 of the US-APWR DCD Tier 1 deleted Item 12 from Table 2.6.5-1. This change creates a new Open Item from an Phase II SER NRC Confirmatory Item.

Please explain why deletion of Item 12 is acceptable.

ANSWER:

As discussed with NRC staff in public meetings on November 3, 2010 and January 20, 2011, MHI undertook a Tier 1 enhancement effort (with the results incorporated into DCD Rev 3) with the following objectives:

- Incorporate recent NRC guidance into existing ITAAC and Tier 1 design descriptions using engineering judgment and considering recent industry experience
- Facilitate the NRC's "Inspection Focus, Logic, and Practicality" review effort of ITAAC in the DCD review process
- Improve ITAAC to make them objective and unambiguous for effective closure
- Minimize potential for construction delays due to ITAAC closure

The NRC published RIS 2008-05 to express its concerns regarding Tier 1 and ITAAC content, wording, and level of detail. MHI volunteered to rewrite Tier 1 in its entirety, including ITAAC, to address RIS 2008-05 and to make Tier 1 closely meet regulatory requirements and conform to regulatory guidance. During the public meetings with the NRC staff, MHI stated that some ITAAC were added to Tier 1 as a result of this enhancement process and some ITAAC were deleted, while many others were re-written. Because some of these ITAAC changes significantly altered previously submitted RAI responses, MHI notified the NRC of these changes in a letter, "Revised Responses for US-APWR DCD RAI Nos. 132, 156, 195,242,255,318,372,424,582 and 616", UAP-HF-11175, dated June 7, 2011 (ML11159A136).

As part of the Tier 1 enhancement effort, the AAC power source ITAAC were reviewed against SRP Section 14.3 ITAAC selection criteria, DCD Section 14.3 ITAAC selection requirements, DCD Tier 2 Table 14.3-1d, "PRA and Severe Accident Analysis Key Design Features," Table 19.1-119,

"Key Insights and Assumptions" from the PRA and the RIS 2008-05. SRP Section 14.3 specifies that only the top-level information such as the principal performance characteristics and safety functions of the SSCs should be verified by ITAAC. The type of information and the level of detail in Tier 1 are based on a graded approach commensurate with the safety significance of the SSCs for the design.

The key design features and key insights and assumptions from DCD Tier 2 Table 14.3-1d and Table 19.1-119 are significant factors in the probability of core damage frequency and large release. Per DCD Section 14.3, key design insights for risk-significant SSCs should be verified in ITAAC. For example, 60 minutes power restoration via AAC is identified as a key design insight and this feature is verified in Tier 1 Table 2.6.5-1, ITAAC Item #6.

Thus the AAC power source is not a safety-related system but is included in Tier 1 because the PRA results consider it as risk significant. As a result of the Tier 1 improvement effort, two new ITAAC were added in DCD Rev 3 for the AAC power source to address key design insights that had not been included in DCD Rev 2:

- DCD Tier 1 Table 2.6.5-1, ITAAC Item #13: The two AAC power sources are each sized to meet the load requirements for SBO and LOOP conditions. The size of the AAC power source is different than the Class 1E EPSs.
- DCD Tier 1 Table 2.6.5-1, ITAAC Item #14: The two AAC power sources have a diverse starting mechanism from the Class 1E EPSs.

MHI notes that the AAC diversity description of DCD Tier 1 Table 2.6.5-1, ITAAC Item #13 is separated into a new ITAAC Item #15 as a result of an amended response to RAI No.894, 08.03.01-38 (UAP-HF-11404) after DCD Rev.3 submittal.

- DCD Tier 1 Table 2.6.5-1, ITAAC Item #15: The AAC power source design is different than the Class 1E EPS design.

Additionally, as part of the Tier 1 enhancement effort, one DCD Rev 2, AAC power source reliability ITAAC was deleted:

- DCD Tier 1 Table 2.6.5-1, ITAAC Item #12: The reliability of the AAC power sources meet or exceed 95 percent.

This ITAAC was deleted because, the 95% reliability criterion was not identified as a key design feature or key insight or assumption in the PRA in DCD Tier 2 Table 14.3-1d or Table 19.1-119, and because verification of this parameter did not meet SRP ITAAC selection criteria. SRP Section 14.3.6 specifies ITAAC verification of independence, capacity and capability of backup power systems, not reliability (new ITAAC Item #13 was added to address capacity).

As part of the DCD change to remove this ITAAC, the following prerequisite was added to pre-operational test (DCD Section 14.2) "14.2.12.1.46 - Alternate ac Power Sources for Station Black Out Preoperational Test":

- A report exists that demonstrates the reliability of the alternate ac power sources meets or exceeds 95% as determined in accordance with NSAC-108 (Reference 8.4-2) or equivalent methodology to meet the Criterion 5 of Section C.3.3.5, RG 1.155, based on historical data of the similar type of the ac alternate power sources.

However, as a result of subsequent discussions with the NRC, a 25 consecutive start preoperational test, without loading, will be performed for each AAC GTG, until there are sufficient U.S. plant operational/surveillance data for the AAC GTGs to demonstrate 95% or greater reliability, for the standard US-APWR, in accordance with NSAC-108 or equivalent methodology, to meet the requirements of Criterion 5 of Section 3.3.5, RG 1.155. This approach appropriately demonstrates consistency with the intent of RG 1.155 95% reliability criterion.

The preoperational test program will verify, prior to fuel load, that each AAC GTG was successfully started 25 consecutive times, or that the reliability meets or exceeds 95% in accordance with NSAC-108 or equivalent methodology, based upon U.S. plant operational/surveillance data, to meet the requirements of Criterion 5 of Section 3.3.5, RG 1.155.

In conclusion, removal of ITAAC Item #12, Table 2.6.5-1, from DCD, Rev 3 is justified because it is not a regulatory requirement and does not satisfy regulatory guidance for ITAAC selection. To clarify the methods by which reliability will be verified, MHI will revise DCD Subsections 8.4.2.2 and 14.2.12.1.46 to describe the 25 consecutive start preoperational testing.

Impact on DCD

DCD Subsections 8.4.2.2 and 14.2.12.1.46 will be revised as described in the answer above and as shown in the attached DCD markup.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on S-COLA

There is no impact on the S-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical / Topical Reports

There is no impact on the Technical / Topical Reports.

Each AAC GTG has sufficient capacity to operate the systems necessary for coping with an SBO event for the time required to bring and maintain the plant in safe shutdown condition. Two AAC GTGs are provided even though the provision of only one is adequate to meet the regulatory requirements. This meets the contingency of one AAC GTG not available. Single failure for the AAC GTGs need not be considered in accordance with Appendix B, RG 1.155 (Reference 8.3.1-21). Each AAC GTG has adequate fuel to operate the systems required for coping with an SBO for 8 hours. Therefore, the AAC GTGs meet Criterion 4 of Section C.3.3.5, RG 1.155 (Reference 8.3.1-21).

A 25 consecutive start preoperational test, without loading, will be performed for each AAC GTG, until there are sufficient U.S. plant operational/surveillance data for the AAC GTGs to demonstrate 95% or greater reliability, for the standard US-APWR, in accordance with NSAC-108 (Reference 8.4-2) or equivalent methodology, to meet the requirements of Criterion 5 of Section C.3.3.5, RG 1.155 (Reference 8.3.1-21). DCD_09.04.01-30

The AAC power system will be inspected and tested periodically based on manufacturer's recommendations and Reg 1.155 to demonstrate operability and reliability. The surveillance test interval does not exceed 3 months (Quarterly). During the quarterly test the AAC is started and brought to operating conditions. Additionally, during every refueling outage, the AAC generator is tested by performing a timed start and rated load capacity test. Following preoperational testing, ~~The reliability of~~ the AAC power system will be maintained to meet or exceed 95% reliability as determined in accordance with NSAC-108 (Reference 8.4-2) or equivalent methodology to meet Criterion 5 of Section C.3.3.5, RG 1.155 (Reference 8.3.1-21). Testing and maintenance of the AAC is evaluated under the reliability assurance program and the maintenance rule program. DCD_09.04.01-30

Procedures to cope with SBO are addressed in Section 13.5 and the training is addressed in Section 13.2. These include all operator actions necessary to cope with SBO for at least the duration in accordance with Subsection 8.4.2.1.1 and to restore normal long-term core cooling/decay heat removal once ac power is restored. This meets the requirement of Regulatory Position C.3.4 of RG 1.155.

The quality assurance of AAC GTG is controlled in accordance with DCD Chapter 17 and related topical report PQD-HD-19005 Revision 2 (Reference 8.4-3). This meets the requirements of Regulatory Position C.3.5 of RG 1.155.

8.4.3 Combined License Information

No additional information is required to be provided by a COL Applicant in connection with this section.

8.4.4 References

8.4-1 Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors, NUMARC 87-00, Revision. 1, August 1991.

8.4-2 Reliability of Emergency Diesel Generators at U.S Nuclear Power Plants, NSAC-108, September 1986.

1. The PSMS, the bus undervoltage relays, and the degraded voltage relays operate in accordance with design (see Subsection 8.3.1.1.3).

2. The loading intervals for supplying from Class 1E gas turbine generator are within the design limits.

3. Each train loads are sequenced on the bus by initiating of an ECCS actuation signal.

4. Each electrical division operates independently of other divisions.

5. All associated indications and alarms operate per design.

14.2.12.1.46 Alternate ac Power Sources for Station Black Out Preoperational Test

A. Objectives

1. Demonstrate the operability of each alternate ac power source breaker and associated interlocks.

2. Demonstrate the operation of air start and fuel systems.

3. Demonstrate alternate ac power source reliability by performing 25 consecutive starts with no failures on each alternate ac power source. DCD_09.04.01-30

4. Demonstrate the ability of the alternate ac power source to synchronize with the offsite power system.

5. Determine the fuel oil consumption of each alternate ac power source while operating under continuous rating load conditions.

6. Verify that, with the alternate ac power source operating in the test mode connected to its bus, an automatic start signal overrides the test mode by returning the alternate ac power source to standby operation.

B. Prerequisites

1. Required construction acceptance tests are completed.

2. Required electrical power supplies and control circuits are operational.

3. The alternate ac power source fuel oil system is available.

4. Adequate ventilation for the alternate ac power source area is available.

5. To omit Test C.4, documentation must exist that the reliability for each alternate ac power source meets or exceeds 95% in accordance with NSAC-108 (Reference 14.2-36) or equivalent methodology, based upon U.S. plant operational/surveillance data, to meet the requirements of Criterion 5 of Section DCD_09.04.01-30

C.3.3.5, RG 1.155 (Reference 14.2-37). ~~A report exists that demonstrates the reliability of the alternate ac power sources meets or exceeds 95% as determined in accordance with NSAC-108 (Reference 8.4-2) or equivalent methodology to meet the Criterion 5 of Section C.3.3.5, RG 1.155, based on historical data of the similar type of the ac alternate power sources.~~ DCD_09.04.01-30

C. Test Method

1. Fuel oil is transferred from the fuel oil storage tank to the fuel oil day tanks by means of the transfer pumps. Appropriate flow parameters are recorded.

2. The control logic of the alternate ac power source breaker, alternate ac power source start circuit, and support pumps and valves are verified.

3. The operability of the alternate ac power source starter is verified.

4. Twenty-five consecutive starts of each alternate ac power source, without loading, is verified. (This test can be omitted when Subsection 14.2.12.1.46, Prerequisite B.5 is met.) DCD_09.04.01-30

5. The alternate ac power source is started, voltage and frequency control demonstrated, phase rotation verified, and the backup generator synchronized to offsite power and loads.

6. During the testing, fuel oil consumption is monitored with the alternate ac power source operating at the continuous load rating.

7. With a simulated LOOP signal, the proper alternate ac power source trips is verified.

8. With the alternate ac power source connected to its bus, an automatic start signal causes it to return to standby operation.

9. Verify all associated indications and alarms during test sequences.

D. Acceptance Criteria

1. The controls, interlocks, and operation of the alternate ac power source breakers and support systems operate as designed (see Subsection 8.3.1.1.1).

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

3. Upon the receipt of automatic start signals, the alternate ac power sources operate as designed.

4. The alternate ac power source fuel oil consumption does not exceed the design requirements.

5. All associated indications and alarms operate per design.

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

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

14.2-29 US-APWR Test Program Description Technical Report, MUAP-08009, Revision 1, October, 2009

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.

14.2-32 Performance-Based Containment Leak-Test Program, Regulatory Guide 1.163, Rev. 0, U.S. Nuclear Regulatory Commission, Washington, DC September 1995

14.2-33 Industry Guideline for Implementing Performance-Based Option of 10 CFR 50 Appendix J, NEI 94-01, Rev. 0, Nuclear Energy Institute, July 1995

14.2-34 Containment System Leakage Testing Requirements, ANSI/ANS-56.8-1994, American National Standard Institute, January 1994

14.2-35 Pressurizer Surge Line Thermal Stratification, NRC Bulletin No. 88-11, U.S. Nuclear Regulatory Commission, Washington, DC, 1988 DCD_3.12-25

14.2-36 Reliability of Emergency Diesel Generators at U.S Nuclear Power Plants, NSAC-108, September 1986. DCD_09.04.01-30

14.2-37 Station Blackout, Regulatory Guide 1.155 Revision 0, August 1988. DCD_09.04.01-30