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

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-08164

Subject: MHI's Response to US-APWR DCD RAI No. 32

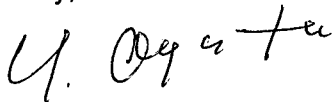
References: 1) "Request for Additional Information No. 32 Revision 0, SRP Section: 14.03 – Inspections, Tests, Analyses, and Acceptance Criteria, Application Section: 14.3.6," dated July 17, 2008.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Responses to Request for Additional Information No. 32 Revision 0".

Enclosure 1 provides the responses to the 5 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,

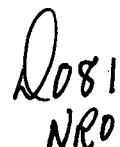


Yoshiaki Ogata,
General Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosures:

1. Responses to Request for Additional Information No. 32 Revision 0

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



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Docket No. 52-021
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Enclosure 1

UAP-HF-08164
Docket No. 52-021

Responses to Request for Additional Information No. 32 Rev. 0

August 2008

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

8/29/2008

**US-APWR Design Certification
Mitsubishi Heavy Industries
Docket No.52-021**

RAI NO.: NO.32 REVISION 0
SRP Section: 14.03-INSPECTIONS, TESTS, ANALYSES, AND
ACCEPTANCE CRITERIA
APPLICATION SECTION: 14.3.6
DATE OF RAI ISSUE: 7/17/2008

QUESTION NO. : 14.03-1

1. SRP 14.3-01& GDC 17: The staff notes that ITAAC Screening Summary Table 14.3.5 of the USAPWR Design Control Document (DCD) does not include a site-specific ITAAC entry for the transmission switchyard and offsite power system. RG 1.206, C.III.7.2, Site-Specific ITAAC, recommends that applicants develop ITAAC for the site-specific systems that are designed to meet the significant interface requirements of the standard certified design, that is, the site-specific systems that are needed for operation of the plant (e.g., offsite power). RG 1.206, C.II.1.2.6, ITAAC for Electrical Systems (SRP Section 14.3.6) states that applicants should develop ITAAC for the Offsite Power to verify by inspection and/or test the direct connection of offsite power sources to the class 1E divisions including the adequacy of voltage, capacity, independence/separation and stability of frequency of the offsite sources. Provide an interface requirement in the US-APWR DCD for the COL applicant to develop a Site-Specific ITAAC for the switchyard and offsite power system to address the following:
 - a. A minimum of two independent offsite transmission circuits from the transmission network (TN) to the safety buses with no intervening nonsafety buses (direct connection).
 - b. Voltage variations of the offsite TN during steady-state operation shall not cause voltage variations at the loads of more than plus or minus 10 percent of the loads' nominal ratings.
 - c. The normal steady state frequency of the offsite TN shall be within plus or minus 2 Hz of 60 Hz during recoverable periods of system instability
 - d. The capacity and capability of each circuit to power the required loads during steady state, transient, and postulated events and accident conditions. This should include proper operation and load carrying capability of breakers, switchgear buses, transformers, and cables.
 - e. The independence and separation of the offsite circuits and onsite class 1E electrical system and components.

- f. The appropriate lightning protection and grounding features for the system and components of the offsite circuits from the transmission network (TN) to the safety buses.
- g. Operation of instrumentation and control alarms used to monitor switchyard equipment status.
- h. The proper operation of the automatic fast transfer capability of the preferred power supply to the non-preferred power supply, i.e., from the reserve auxiliary transformer (RAT) to the unit auxiliary transformer (UAT).
- i. Switchyard interface agreement and protocols with the TN system operator/owner in accordance with the guidance given in GL 2006-2.
- j. Because of its importance to safety, provide ITAAC or interface requirements (such as transient stability analysis) for the offsite power system (switchyard) to assess minimizing the probability of losing electric power from any of the remaining supplies as a result of or coincident with, the loss of power generated by the nuclear unit, the loss of power from the TN, or the loss of the largest load.

ANSWER:

Some of the above items are COL items that are addressed in the COL application as described in the following discussion. MHI will add, as an interface requirement in Tier 1, Section 3.0, the specified items below for the verification of the as-built system by the COL applicant. It should be noted that several of these items are COL items that will be addressed in the COL application..

NRC Item a: A minimum of two independent offsite transmission circuits from the transmission network (TN) to the safety buses with no intervening nonsafety buses (direct connection).

MHI Response: COL items COL 8.2 (4), (5) address this item in Revision 1 of the DCD, Section 8.2. MHI will add an inspection of the as-built design as a COL interface requirement in the DCD Tier 1, Revision 2.

NRC Item b: Voltage variations of the offsite TN during steady-state operation shall not cause voltage variations at the loads of more than plus or minus 10 percent of the loads' nominal ratings.

MHI Response: COL item COL 8.2(11) addresses this item in Revision 1 of the DCD, Section 8.2. MHI will add an analysis of the as-built design as a COL interface requirement in DCD Tier 1, Revision 2.

NRC Item c: The normal steady state frequency of the offsite TN shall be within plus or minus 2 Hz of 60 Hz during recoverable periods of system instability

MHI Response: COL item COL 8.2(11) addresses this item in Revision 1 of the DCD, Section 8.2. MHI will add an analysis of the as-built design as a COL interface requirement in DCD Tier 1, Revision 2.

NRC Item d: The capacity and capability of each circuit to power the required loads during steady state, transient, and postulated events and accident conditions. This should include proper operation and load carrying capability of breakers, switchgear buses, transformers, and cables.

MHI Response: COL item COL 8.2(11) addresses this item in Revision 1 of the DCD, Section 8.2. MHI will add an inspection of the as-built design as a COL interface requirement in DCD Tier 1, Revision 2.

NRC Item e: The independence and separation of the offsite circuits and onsite class 1E electrical system and components.

MHI Response: COL items COL 8.2(3), (4), (5) address this item in Revision 1 of the DCD, Section 8.2. MHI will add an inspection of the as-built design as a COL interface requirement in DCD Tier 1, Revision 2.

NRC Item f: The appropriate lightning protection and grounding features for the system and components of the offsite circuits from the transmission network (TN) to the safety buses.

MHI Response: COL item COL 8.3(2) addresses this item in Revision 1 of the DCD, Section 8.3. MHI will add an inspection of the as-built design as COL interface requirement in DCD Tier 1 Revision 2.

NRC Item g: Operation of instrumentation and control alarms used to monitor switchyard equipment status.

MHI Response: COL items COL 8.2(3), (4), (5), and (7) address this item in Revision 1 of the DCD, Section 8.2. In accordance with the selection criteria for site-specific electrical systems ITAAC in Section 14.3 of Tier 2, MHI considers that this item is not a significant interface and therefore does not need to be addressed as an interface requirement in Tier 1.

NRC Item h: The proper operation of the automatic fast transfer capability of the preferred power supply to the non-preferred power supply, i.e., from the reserve auxiliary transformer (RAT) to the unit auxiliary transformer (UAT).

MHI Response: The automatic fast transfer of the onsite power system is carried out only under the condition of synchronization relay initiation. Onsite power systems do not affect the influence from different phases between the normal preferred power supply and the alternate preferred power supply.

NRC Item i: Switchyard interface agreement and protocols with the TN system operator/owner in accordance with the guidance given in GL 2006-2.

MHI Response: This requirement does not apply to the safety-related design of the plant and is not categorized as a significant interface. Therefore, this does not need to be addressed as an interface requirement in Tier 1.

NRC Item j: Because of its importance to safety, provide ITAAC or interface requirements (such as transient stability analysis) for the offsite power system (switchyard) to assess minimizing the probability of losing electric power from any of the remaining supplies as a result of or coincident with, the loss of power generated by the nuclear unit, the loss of power from the TN, or the loss of the largest load.

MHI Response: COL 8.2(11) addresses this item in Revision 1 of the DCD, Section 8.2.

Impact on DCD

MHI will add the following interface requirements for off-site power in Section 3.2, Revision 2 of the DCD, Tier 1 and Chapter 1, Table 1.8-1, Tier 2 of DCD, Revision 2

Offsite Power System

Offsite power system is site-specific. Two offsite power system circuits are physically independent and separated. Each offsite power system equipment circuit is sized in accordance with load conditions during steady state, transient, and postulated events and accident conditions. The independence and separation of the offsite circuits and onsite class 1E electrical system and components are achieved. The appropriate lightning protection and grounding features for the system and components of the offsite circuits from the transmission network (TN) to the safety buses are included in the design.

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

8/29/2008

**US-APWR Design Certification
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SRP Section: 14.03-INSPECTIONS, TESTS, ANALYSES, AND
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APPLICATION SECTION: 14.3.6
DATE OF RAI ISSUE: 7/17/2008

QUESTION NO. : 14.03-2

2. SRP 14.2-02: Provide interface requirements in the US-APWR DCD for the transmission switchyard and onsite power system in accordance with 10 CFR 52.79(b) under Tier 2 interface requirements. Specifically, "Plant Interfaces with the Remainder of Plant," of Tier 2 requires the COL applicant to address offsite AC requirements for steady-state load, inrush kVA for motors, nominal voltage, allowable voltage regulation, nominal allowable frequency fluctuation, maximum frequency decay rate, and limiting under-frequency value for the reactor coolant pump (RCP). It further requires the offsite transmission system analysis for loss of the unit or the largest unit, for voltage operating range, for maintaining transient stability, and for the RCP bus voltage to remain above the voltage required to maintain the flow assumed in Chapter 15 analyses following a turbine trip. Discuss how the ITAAC for electrical systems listed under US-APWR, Section 14.3.4.6 verify all requirements cited in 8.2 and 8.3 of US-APWR DCD Tier 2.
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ANSWER:

Using the selection criteria for site-specific electrical systems ITAAC in Section 14.3 of Tier 2, MHI considers that the items noted in NRC Question 14.03-2 are not significant interfaces. As such, these items are not addressed as interface requirements in Tier 1. Instead, the conformance and adjustment between the onsite power system and offsite power system can be resolved at the COL application stage. Revision 1 of the DCD, Chapter 8, addresses COL items that will resolve the following:

- COL 8.2(3) The COL applicant is to address plant switchyard includes layout, control system and characteristics of circuit breakers and buses.
- COL 8.2(4) The COL applicant is to provide detail description of normal preferred power.

- COL 8.2(5) The COL applicant is to provide detail description of alternate preferred power.
- COL 8.2(11) The COL applicant is to address stability and reliability study of the offsite power system. Stability study is to be addressed in accordance with BTP 8-3. A failure modes and effects analysis (FMEA) is to be provided.
- COL 8.3(1) The COL applicant is to provide transmission voltages. This includes also MT and RAT voltage ratings.
- COL 8.3(3) The COL applicant is to provide a short circuit analysis for the ac power system, since the system contribution is site specific.

Also, MHI has performed some analysis against the requirements of Chapter 15 for RCP power supply duration. This has been resolved in Revision 1 of the DCD in Chapter 8.

Impact on DCD

There is no impact on DCD.

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.

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QUESTION NO. : 14.03-3

3. GDC 2 & 10 CFR 50.49: Tables 2.6.1-1 and 2.6.2-1 of the US-APWR DCD shows electrical and seismic classification of major class 1E ac electrical power distribution equipment and dc power system equipment respectively. Under the third column of these tables, titled "Class 1E/Qual. For Harsh Environ," all ac and dc distribution equipment are listed as "Yes/No." It is not clear to the staff what is meant by "Yes/No," label. Correct these tables to indicate whether all of the equipment listed is qualified for seismic category 1 and for harsh environment.
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ANSWER:

Tables 2.6.1-1 and 2.6.2-1 reflect the electrical and seismic classifications of onsite ac and dc power systems. The "Yes/No" means that equipment is required as "Class 1E qualification", but is not required to function in a "harsh environment". If equipment is required to be "Class 1E" and function in a "harsh environment", it is described as "Yes/Yes". Note that safety-related equipment listed in Table 2.6.1-1 is located in Class 1 buildings and therefore will not be in a "harsh environment."

Impact on DCD

There is no impact on DCD.

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.

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QUESTION NO. : 14.03-4

4. GDC 17 & 18: Table 2.6.1-3 of the US-APWR DCD describes the ITAAC for the onsite electric power system. Under Column 1 of this table, item 9 addresses periodic inspection and testing to assess the system continuity, availability and condition of system components. However, under Column 2, no tests are listed or described for assessing the system continuity, availability and condition of system components. Provide a description of the applicable tests and acceptance criteria for the tests that will be conducted for the onsite electric power system to assess its continuity, availability and condition of system components.
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ANSWER:

GDC 18, "Inspection and testing of electric power systems" requires that Class 1E components and equipment be designed such that the continuity, availability and condition of the system components can be tested. For item 9, direct connection of offsite power sources to the Class 1E divisions will be verified by inspection. In addition, tests will be conducted on the as-built design by providing a test signal in only one Class 1E division at a time.

Impact on DCD

MHI will update Section 2.6, Table 2.6.1-3 in Revision 2 of the DCD, Tier 1, to specify the test method for Item 9.

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.

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QUESTION NO. : 14.03-5

5. RG 1.206: Appendix A to RG 1.206, (pages C.II.1-A-19 - C.II.1-A-22) lists ITAAC for ac distribution equipment in items A through P. Table 2.6.1-1 of the US-APWR DCD does not include some of the ac distribution equipment as required by the RG 1.206. Revise the Table 2.6.1-1 to include ITAAC for the following ac distribution equipment and system.
- a. Emergency onsite power sources (GTGs), including load sequencing and GTG support systems.
 - b. Alternate ac (AAC) Power sources for SBO and recovery of ac power following an SBO event.
 - c. Containment electrical penetration.
 - d. Lightning protection and grounding for both lightning and system grounding.
 - e. Safety-significant operating experience problems that have been identified via functional inspections, generic letters, circulars, RISs, NRC bulletins and INs. Some examples in the ac distribution systems are breaker coordination, short circuit protection, medium voltage cables susceptible to moisture (GL 2007-1), etc.
 - f. Design and operational features resulting from solutions identified to resolve GSIs, such as resolution of GI-48/49 and GL 91-11 which identified interlocks and LCOs of tie breakers and LCOs for class 1E vital instrument buses. Include ITAAC for tiebreakers in the 6.9 kV and 480 volt systems and vital instrument buses.
 - g. Post TMI requirements such as power to the power-operated relief valve, block valve, and pressurizer heaters.
 - h. Postfire safe shutdown circuit analysis and supporting breaker coordination including a testing program to for the protective devices credited in the safe shutdown circuit analysis.

- i. Sensing instrumentation and logic.
- j. Connection of non-class 1E loads on class 1E buses because of the potential degradation of class 1E sources and fire-induced cable damage. Provide ITAAC to verify independence between the class 1E sources and non-class loads.
- k. Harmonics introduced by non-linear loads (speed controllers and the like) and their potential effects on class 1E equipment.

ANSWER:

Appendix C.II.A-1 of RG 1.206 lists ITAAC for onsite electrical systems. Section 2.6 of Tier 1 describes the major electrical systems and components of the onsite power system that perform safety functions. The electrical systems described in Section 2.6 include:

Section 2.6.1	AC electric power system
Section 2.6.2	DC electric power system
Section 2.6.3	Instrumentation and control (I&C) power supply system
Section 2.6.4	Emergency power sources (NRC Item a))
Section 2.6.5	Alternate ac (AAC) power sources (NRC Item b)
Section 2.6.6	Plant lighting systems
Section 2.6.7	Grounding and lightning system (NRC Item d)
Section 2.6.8	Electrical penetration assemblies (NRC Item c)

The ITAAC for each of these systems is listed within each subsection. Electrical systems that are not part of the Class 1E system, but improve the reliability of the individual Class 1E divisions are also considered. These systems include non-Class 1E portions of the electrical system that power the balance of plant loads and are listed below. ITAAC for these systems and components is encompassed within the ITAAC for subsections 2.6.1 through 2.6.8. Section 14.3.4 of Tier 2 provides additional detail regarding how ITAAC were developed for electrical systems.

NRC Item e: Safety-significant operating experience problems that have been identified via functional inspections, Generic Letters, circulars, RISs, NRC Bulletins and Information Notices. Some examples in the ac distribution systems are breaker coordination, short circuit protection, medium voltage cables susceptible to moisture (GL 2007-1), etc.

MHI Response: Issues that resulted from safety-significant operating experience has been considered in the development of electrical system ITAAC. Where applicable, these issues are addressed in the ITAAC Tables, such as item 11.a in Table 2.6.1-3.

NRC Item f: Design and operational features resulting from solutions identified to resolve GSIs, such as resolution of GSI-48/49 and GL 91-11 which identified interlocks and LCOs of tie breakers and LCOs for class 1E vital instrument buses. Include ITAAC for tiebreakers in the 6.9 kV and 480 volt systems and vital instrument buses.

MHI Response: There are no tie-breakers/lines in the safety-related power systems of US-APWR design, and therefore; no ITAAC are provided for this item. LCO for Class 1E vital instrumental buses is described in section 3.8.9 of DCD Chapter 16.

NRC Item g: Post TMI requirements such as power to the power-operated relief valve, block valve, and pressurizer heaters.

MHI Response: Where applicable, post-TMI requirements are addressed in the ITAAC Tables, such as item 10 in Table 2.6.1-3.

NRC Item h: Postfire safe shutdown circuit analysis and supporting breaker coordination including a testing program for the protective devices credited in the safe shutdown circuit analysis.

MHI Response: Electrical equipment required for post-fire safe shutdown is addressed within the ITAAC Tables, such as item 9 in Table 2.6.1-3.

NRC Item i: Sensing instrumentation and logic.

MHI Response: Where applicable, sensing instrumentation and logic is addressed in the ITAAC Tables, such as item 6b in Table 2.6.1-3 and item 14a in Table 2.6.4-1.

NRC Item j: Connection of non-class 1E loads on class 1E buses because of the potential degradation of class 1E sources and fire-induced cable damage. Provide ITAAC to verify independence between the class 1E sources and non-class 1E loads.

MHI Response: Independence between the class 1E and non-class 1E loads for the electrical systems described in Section 2.6 are addressed in the ITAAC Tables, such as item 3 in Table 2.6.1-3.

NRC Item k: Harmonics introduced by non-linear loads (speed controllers and the like) and their potential effects on class 1E equipment.

MHI Response: The potential effect of harmonics on Class 1E equipment is addressed in the ITAAC Tables (e.g., item 10 in Table 2.6.1-3).

Impact on DCD

There is no impact on DCD.

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.