

REQUEST FOR ADDITIONAL INFORMATION 424-3281 REVISION 0

7/27/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 14.03.06 - Electrical Systems - Inspections, Tests, Analyses, and Acceptance Criteria
Application Section: SRP 14.03.06

QUESTIONS for Electrical Engineering Branch (EEB)

14.03.06-15

In RAI 32-738, Question 14.03.-1 the staff requested MHI to provide COL applicant (COLA) interface requirements in the US-APWR DCD for site-specific ITAACs for the switchyard and offsite power systems that are needed for operation and safe shutdown of the plant. The ITAACs should include provisions to verify by inspection and/or test the direct connections 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. In this RAI, the staff listed ten offsite power system items (a through j) that require ITAACs in accordance with the guidelines of RG 1.206, C111.7.2.

MHI in its response to the staff RAI stated that it will add an interface requirement in Tier 1, Section 3.0, for the specified items for the verification of the as-built system by the COL applicant. Further MHI stated that some of the items listed in the staff RAI are addressed in Section 8.2 (4) and (5) of the US-APWR, DCD Rev 1. The staff has examined Section 8.2 (4) and (5) of the US-APWR, DCD Rev 1 and finds that the description provided in Section 8.2 (4) and (5) of Revision 1 of the DCD does not adequately answer the staff's concern on the site-specific ITAACs.

The staff and MHI discussed the site-specific ITAACs listed in the staff RAI 32-738, Question 14.03.-1 (items a through j) during the teleconference held on March 23, 2009. During these discussions, MHI agreed with the staff that it will provide interface requirements in the upcoming revisions of the US-APWR DCD (Rev 2) for the COL applicant to develop site-specific ITAACs for the switchyard and offsite power systems as listed below.

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

An ITAAC is required to verify the as-built electrical system conforms to the configuration cited in (a) above and can perform its intended safety function. MHI agreed to add an inspection of the as-built design as a COL interface requirement in the DCD Tier 1, Revision 2.

- 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.

REQUEST FOR ADDITIONAL INFORMATION 424-3281 REVISION 0

MHI agreed to add an analysis of the as-built design as a COL interface requirement in DCD Tier 1, Revision 2.

- 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 agreed to add an analysis of the as-built design as a COL interface requirement in DCD Tier 1, Revision 2.

- 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 agreed to add an analysis of the as-built design as a COL interface requirement in DCD Tier 1, Revision 2.

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

MHI agreed to add an analysis and inspection of the as-built design as a COL interface requirement in DCD Tier 1, Revision 2.

- f. The appropriate lightning protection and grounding features for the system and components of the offsite circuits from the TN to the safety buses.

MHI agreed to add an inspection of the as-built design as COL interface requirement in DCD Tier 1 Revision 2 that appropriate lightning protection and grounding features for the system and components are provided.

- g. Instrumentation, controls and alarms used for monitoring switchyard equipment status.

Appropriate instrumentation and alarms are required for monitoring switchyard equipment and their status in order for the plant operators to assess whether the offsite power system is available or not, or has adequate voltage and frequency. MHI agreed to add an inspection of the as-built design as COL interface requirement in DCD Tier 1 Revision 2 to assure that appropriate instrumentation, controls and alarms are available to NPP operators for monitoring switchyard equipment and its 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).

MHI agreed to add an inspection of the as-built design as COL interface requirement in DCD Tier 1 Revision 2 to ensure that the offsite power system is constructed and installed in accordance with the approved designed and the installed system can perform its intended safety function.

REQUEST FOR ADDITIONAL INFORMATION 424-3281 REVISION 0

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

In order for plant operators to assess whether the offsite power system has adequate voltage, capacity and stability (one contingency operation), switchyard interface agreement and protocols between the nuclear power plant (NPP) and the TN system operator are required in accordance with the guidance given in GL 2006-2. MHI agreed to add an inspection of switchyard agreement and protocols between the NPP and TN Operator as a COL interface requirement in DCD Tier 1 Revision 2 for ensuring reliable offsite power is available to the NPP.

- 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 agreed to add an analysis of the as-built design as a COL interface requirement in DCD Tier 1, Revision 2 for the transient stability analysis.

The staff requests that MHI docket its response confirming the above actions to resolve this RAI question.

14.03.06-16

In RAI 32-738, Question 14.03.-2 the staff requested MHI to 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. Also, the staff questioned MHI on the COL interface requirements with respect to GDC 17 for 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.

During the teleconference held on March 23, 2009, MHI agreed that it will revise Section 8.2 (3) in the upcoming revisions of the DCD (Rev 2) to include COLA interface requirements for grounding and lightning protection. Also, MHI agreed that it will revise Section 8.2 (11) in the upcoming revisions of the DCD (Rev 2) to include COLA interface requirements for Stability study analysis in accordance with GDC requirements to address the loss of the unit, or the largest unit, or largest load, or the most critical transmission line including voltage operating range, for maintaining transient stability.

The staff requests that MHI docket its response confirming the above actions to resolve this RAI question.

REQUEST FOR ADDITIONAL INFORMATION 424-3281 REVISION 0

14.03.06-17

In RAI 32-738, Question 14.03-4 the staff requested MHI to 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 as listed under item 9 in Table 2.6.1-3.

During the teleconference held on March 23, 2009, MHI agreed that it will describe the tests required for assessing condition of system components and acceptance criteria in Table 2.6.1-3 for the onsite electric power system in upcoming Revision 2 of the DCD.

The staff requests that MHI docket its response confirming the above actions to resolve this RAI question.

14.03.06-18

In RAI 32-738, Question 14.03.-5 the staff requested MHI to revise Table 2.6.1-1 of the US-APWR DCD to include ac distribution equipment listed in RG 1.206, Appendix A, (pages C.11.1-A-19 - C.11.1-A-22).

During the teleconference held on March 23, 2009, MHI agreed that it will include ITAACs for items listed below in the Table 2.6.1-1 of Revision 2 of the US-APWR DCD.

1. Lightning protection to verify that lightning protection is provided, installed and tested to perform its intended function;
2. Breaker coordination and medium voltage cables susceptible to moisture and electrical issues that are identified via functional inspections, generic letters, circulars, RISs, NRC bulletins and Ins;
3. Tiebreakers in the 480 volt systems and vital instrument buses to assure their design and operational features;
4. Post fire safe shutdown circuit analysis and supporting breaker coordination and a testing program for the protective devices credited in the safe shutdown circuit analysis; and
5. Harmonics introduced by non-linear loads and their potential effects on class 1E equipment.

The staff requests that MHI docket its response confirming the above actions to resolve this RAI question.