REQUEST FOR ADDITIONAL INFORMATION 419-3126 REVISION 0

7/6/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 08.04 - Station Blackout
Application Section: 8.4

QUESTIONS for Electrical Engineering Branch (EEB)

08.04-8

In RAI-08.04-001 the staff requested additional information on whether any two, or a defined set of any two out of 4 trains are required for safe shutdown of the plant for LOOP, and LOOP and LOCA occurring simultaneously. In response to staff RAI, MHI stated that each of the four-train's 6.9 kV safety-related loads is powered from its Class 1E bus that is supplied from its respective GTG. In addition to the 6.9 kV loads, MHI stated that there are also 480 volt loads associated with each 6.9 kV train. The 480 volt loads are grouped as A1 and D1 loads. The group A1 loads support trains A and B, and group D1 loads support trains C and D. The Al loads can be supplied power from either A or B 6.9 kV Class 1E buses. The transfer of power supply from 480 volt bus A to B, or from 480 Volt B to A Class 1E buses is accomplished by manual actions by opening a normally-closed breaker and by closing a normally-open breaker. A similar arrangement exists for the 480 Volt group D1 loads that are associated with 6.9 kV trains C and D.

MHI asserts that any two out of four trains can achieve a safety function with one train out of service and with a single failure on another train. Based on the arrangement of the 480 Volt A1 and D1 loads, the US-APWR design relies on manual actions to achieve a safe shutdown of the plant using any two out of four trains. Manuals actions can be credited for meeting the SBO rule but they are not credited for design basis events and accident. During the March 12, 2009 teleconference, MHI agreed to add detail description to the DCD in future revision (Rev 2) to explain the dependencies and manual actions required for the 480 Volts loads to support the basis for the number of trains needed for safe shut down of the plant for operational and design basis events.

The staff requests that MHI docket its response confirming the above actions to resolve RAI-08.04-001.

08.04-9

In RAI-08.04-003 the staff requested additional information and clarification on how US-APWR design met the guidance provided on SBO in the SECY 94-084 and SRP Section 8.4 for evolutionary designs. The guidance given in the SECY 94-084 recommends that the preferred method of demonstrating compliance with an SBO (10 CFR 50.63) for evolutionary designs is to have a full-capacity AAC power source of a diverse design that can power a larger complement of shutdown equipment to bring the plant to cold shutdown if needed. The description given in the US-APWR DCD (Rev 0 and Rev1) credits only one of the two AAC-GTGs to maintain the plant in hot shutdown condition

during an SBO event. During the teleconference with MHI held on March 12, 2009, the staff explored the use of the second AAC-GTG during an SBO. MHI explained that US-APWR can achieve the hot shut-down condition by using only one AAC-GTG and one train Class **1** E system. Also MHI stated that the second AAC-GTG can be used as an additional back-up source to power Class 1 E system loads to achieve and to keep the plant in cold shut down condition if required.

In the original RAI the staff asked MHI to address why the Residual Heat Removal Pump was not included in the SBO loads that are powered by the AAC GTG during an SBO event. MHI indicated that the loads shown in the DCD are the loads needed for hot shut down as a minimum requirement of US-APWR under SBO conditions. MHI indicated during the March 12, 2009, teleconference that when the plant is moved to cold shut down, two AAC-GTGs will be used to operate any two safety trains' loads including the Residual Heat Removal Pump for keeping the plant in safe condition. Further, MHI agreed to add detail description to the DCD in future revision (Rev 2) on the use of both AAC-GTGs for SBO purposes. MHI will also provide load list for both Hot and Cold Shutdown conditions of the plant for an SBO event in future revision (Rev 2) of the DCD.

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

08.04-10

By RAI-08.04-005, the staff asked MHI to describe how it met the Position C3.4 of RG 1.155 with regard to procedures and training to cope with station blackout. The staff requested MHI to include an interface requirement in US-APWR DCD for a COL applicant to develop and submit a summary of SBO coping procedures and training guidelines for staff review since the subject procedures are site-specific. In response to this RAI, MHI indicated the procedures and training are addressed as COL item in Chapter 13, 13.4(1) and 13.4(2) of the DCD. The staff notes that the Chapter 13, 13.4(1) and 13.4(2) of the DCD addresses Operational Programs and not the plant specific procedures and training described in Position C3.4 of RG 1.155. The applicant is requested to add a narrative in the Section 8.4 of the DCD with regard to meeting Position C3.4 of RG 1.155, and then referring the reader to the DCD chapter and section where such COL interface items are addressed. The alternative approach is to add an interface COL requirement in Chapter 8, Section 8.4 for procedures and training to cope with station blackout in accordance with the guidelines of Position C3.4 of RG 1.155.

During the March 12, 2009, teleconference, MHI agreed to add a narrative in the Section 8.4 of the upcoming revision (Rev 2) of the DCD with regard to Position C3.4 of RG 1.155 and an interface requirement for the COL applicant for meeting Position C3.4 of RG 1.155.

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

08.04-11

By RAI-08.04-006, the staff asked MHI to addresses quality assurance and specifications as described in Position C3.5 of RG 1.155 for SBO equipment. Also, the staff requested MHI to provide an interface requirement in the US-APWR DCD for a COL applicant that references the US-APWR design certification to address the position C.3.5 of RG I.155 regarding quality assurance and specifications for SBO equipment. MHI responded to the staff query on meeting position C.3.5 of RG I.155 by stating that quality assurance of AAC-GTG will be controlled in accordance with DCD Chapter 17 and related topical report PQD-HD-19005 Revision 1.

During the March 12, 2009, teleconference, MHI agreed to add a narrative in the Section 8.4 of the upcoming revision (Rev 2) of the DCD with regard to Position C3.5 of RG 1.155 and an interface requirement for the COL applicant for meeting Position C3.5 of RG 1.155.

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

08.04-12

By RAI-08.04-007, the staff asked MHI to provide additional information on the systems and equipment required for coping for 1 hour without ac power for the following:

a. The staff asked MHI to provide additional information on RCS inventory taking into consideration shrinkage, leakage from pump seals, and inventory loss from letdown or other normally open lines. MHI responded by stating that the RCS is not in shrinkage condition, because plant is operated with keeping the RCS temperature during SBO. The seal return line is closed, and leakage of pump will not occur. Also letdown line and any other lines are closed, any inventory loss does not occur during SBO condition.

   During the March 12, 2009, teleconference MHI stated that the wording “leakage of pump will not occur” stated in its response is not appropriate. It should be stated “leakage of pump will be limited”. There is small leakage through RCP No.2 seal which is expected to be approximately 0.2 gpm (40 litters) per hour under SBO condition.

   This leakage is very small compared to RCS inventory and no significant inventory loss will occur during SBO.

Based on MHI's revised statements on the issue of RCS inventory during the March 12, 2009
Teleconference, MHI is requested to provide the following information and clarification regarding the RCS
inventory and core coverage.

1) Provide detailed description of the reactor coolant pump (RCP) seal return system and explain how the

RCP seal leak flow at lower pressure could return to the reactor at higher pressure to avoid loss of reactor coolant inventory during a station blackout (SBO) event.

2) Perform an SBO coping analysis to demonstrate that reactor core will remain covered during the SBO time period assuming loss of coolant inventory by (a) steaming from the reactor through safety relief valves to carry out decay heat from the core, (b) assuming maximum RCS unidentified leakage defined in technical specifications, and (c) appropriate amount of RCP seal leakage (at 25 gpm per pump per NUMARC 87-00, 2.5.2) unless justified in item 1 above.