REQUEST FOR ADDITIONAL INFORMATION 593-4565 REVISION 1

6/8/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 07-21 Branch Technical Position - Guidance on Digital Computer Real-Time Performance
Application Section: Chapter 7

QUESTIONS for Instrumentation, Controls and Electrical Engineering 1 (AP1000/EPR Projects) (ICE1)

07-21 Branch Technical Position-1

Clearly identify the performance requirements for the US-APWR safety Instrumentation and Control (I&C) system.

10 CFR 52.47 states in part, that the information submitted for a design certification must include performance requirements and design information sufficiently detailed to permit the preparation of acceptance and inspection requirements by the NRC, and procurement specifications and construction and installation specifications by an applicant. It appears within Technical Report MUAP-09021, "US-APWR Response Time of Safety I&C System," the values within Section 3.4 should be changed to state “basis” for the time response requirements, not "assumptions". This should include how each of the following factors was determined, what estimates were made, and what facts ensure that these are the bounding requirements.

1. The values identified in Tables 4.0-1 and 4.0-2 as T1 through T4, and T1, T2, respectively. Clearly explain estimates madeand how they are deterministic. Provide justification that shows that the allocations can be reasonably expected to be satisfied by the plant design. Section 3.4 states "The response time allocated to the individual components (i.e., response time of sensor, digital controller) are based on MHI experience of digital I&C system in Japanese PWR plant" is not acceptable.
2. Using the Figure 4.4-1 and Figure 4.4-2, of MUAP-09005, MELTAC Topical Report, show the calculation of the maximum, and minimum, response time which is equal to **each** of the digital controller times, T2, by safety function presented in MUAP-09021.

   a) Identify each of the values, t1 through t10, in Figure 4.4-1 for the MELTAC Fundamental Cycle and how this can vary for each of the safety functions.

   b) Identify the differences between the typical MELTAC hardware configuration in Figure 4.4-2 and that used to determine each of the response time calculations.

07-21 Branch Technical Position-2

With regards to response time guidance of BTP 7-21, a basis should be provided for systems, particularly, that have not been implemented and tested on a full scale basis. In Technical Report MUAP-09021, "Time Response of Safety I&C System," the basis should include, but not be limited to,

1. A description of the effects of adding sensors, divisions, communication links, controller, computer nodes, or actuation devices required to scale the system to full scale or that which was previously built.
2. A description of the cycle which demonstrates that the watch-dog timer is correctly implemented. The description of the WDT cycle time in MUAP-09021 is not that identified in MUAP-09005 nor that identified as typical in BTP 7-21.
3. The time required for the application modules does not exceed the allotted time given in the architecture timing budget, and diagnostics and other support modules will not cause the allotted time to be exceeded.

10 CFR 52.47 states in part, that the information submitted for a design certification must include performance requirements and design information sufficiently detailed to permit the preparation of acceptance and inspection requirements by the NRC, and procurement specifications and construction and installation specifications by an applicant. MHI is requested to provide a basis for systems that have not been implemented and tested on a full scale basis.

07-21 Branch Technical Position-3

Regarding Technical Report MUAP-09021, "US-APWR Response Time of Safety I&C System," in each application where T2 is described, MHI is to identify, in the document, how the response time analysis accounts for all types of missed digital communication messages and specifically what those are and how they will not affect the time response performance allocation. (Example: Failed data integrity test, corrupted, late, etc.)

10 CFR 52.47 states in part, that the information submitted for a design certification must include performance requirements and design information sufficiently detailed to permit the preparation of acceptance and inspection requirements by the NRC, and procurement specifications and construction and installation specifications by an applicant.

07-21 Branch Technical Position-4

In Technical Report MUAP-09021, "US-APWR Response Time of Safety I&C System," MHI is to correct the list of variables in Table 4.0-1 or the list of variables in Table 7.2-3 of the DCD so that they are specifically consistent.

Table 7.2-3 of the DCD provides a list of reactor trip variables, ranges, accuracies, response times, and setpoints. Similarly, Table 4.0-1 in MUAP-09021 provides a list of reactor trip variables and their response times. However, the list of variables in Table 4.0-1 in the MUAP-09021 do not agree with the list of variables in Table 7.2-3 of the DCD. Also, Table 4.0-1 in Technical Report MUAP-09021 includes the ECCS signal, which is not listed in Table 7.2-3. On the other hand, Table 7.2-3 includes high source

range and high intermediate range neutron signal, and high positive and high negative rate of change of the power range flux signal. None of these signals are listed in Table 4.0-1 of Technical Report MUAP-09021. In the response to the RAI, MHI is to explain why these were different and which table will be revised**.**

07-21 Branch Technical Position-5

MHI should correct the tables and discuss why Table 4.0-2 of Technical Report MUAP-09021, "Response Time of Safety I&C System," and Table 7.3-4 in the DCD do not contain the same set of ESF actuation signals.

Table 7.3-4 of the US-APWR DCD provides a list of the ESF actuation variables, ranges, accuracies, response times, and setpoints. Similarly, Table 4.0-2 of the MUAP-09021 provides a list of the response time of ESF actuation signals. However, Table 4.0-2 of Technical Report MUAP-09021 and Table 7.3-4 in the DCD do not contain the same set of ESF actuation signals. Included in this issue is why the two tables are different with regard to the number of ESF functions listed. In particular, Technical Report MUAP-09021 lists five (5) ESF actuation functions, while Table 7.3-4 lists ten (10) ESF functions. For those ESF functions that are listed in both tables, some variables listed in Table 7.3-4 in the DCD are missing in Table 4.0-2 of Technical Report MUAP-09021. An example is the *High Main Steam Line Pressure Negative Rate signal* for the ESF function of *Main Steam Line Isolation*.