REQUEST FOR ADDITIONAL INFORMATION NO. 178-1930 REVISION 1

2/3/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation
Application Section: 19.1.5.1

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

19-292

DCD FSAR Section 3.2.1.3, describes the classification of the Safety Power Source Buildings (PS/B east and west)as seismic Category I. Further, Table 19.1-51 of the DCD lists the High Confidence of Low Probability of Failure (HCLPF) for the PS/B as 0.5g and indicates that it is an assumed value whereas, HCLPFs for the other Category I structures included in the design certification are stated to be derived per the fragility methodology of EPRI TR-103959, "Methodology for Developing Seismic Fragilities", Reference 19.1-36.

Given that Safety Power Source Buildings are designated as Category I with design details shown in DCD Chapter 3, Figures 3J-3 and 3J-4, the staff requests the applicant to provide a specific fragility derivation for the Safety Power Source Buildings (PS/B).

19-293

DCD FSAR Section 19.1.5.1, Table 19.1-51 provides specific fragilities (i.e., HCLPFs) for the Reactor Building (R/B), Pre-stressed Concrete Containment Vessel (PCCV) and Interior Containment Structure. The applicant states that the methodology used for developing these specific seismic fragilities is contained in EPRI TR-103959 (Reference 19.1-36). The HCLPFs listed in Table 19.1-51 for these structures are significantly greater than the 1.67 times the safe shutdown earthquake (SSE) target in SECY 93-087 and are also significantly greater than the generic fragilities assigned to other similar structures or equipment.

To address this concern, the staff requests the applicant to provide a summary of assumptions (e.g., failure modes, capacity and response factors, and associated uncertainties) used to develop HCLPFs for the Reactor Building (R/B), PCCV and Interior Containment Structure.

19-294

DCD FSAR Section 19.1.5.1, Table 19-1-51, lists the HCLPFs for USAPWR Structures, Systems and Components (SSCs). Most HCLPF values in this table were derived using the approach referenced in EPRI Utility Requirements Document (URD), Reference 19.1-35. The URD uses local (i.e., actual equipment location) spectral acceleration capacities which are derived from generic equipment

ruggedness spectra (GERS) and from generic estimates of capacity based on experience in past seismic probabilistic risk assessments (SPRAs). The fragility and corresponding HCLPF relative to ground motion PGA can vary considerably depending upon the foundation condition, structural stiffness, location of the equipment and details of the structural modeling and structural response analysis. As such, the location of the equipment relative to the ground motion input must be known.

To verify that the HCLPFs, based on generic capacities and generic structural amplifications, are reasonable and achievable for design certification of the US-APWR, the staff requests the applicant to provide equipment locations for the equipment included in the PRA based SMA listed in Table 19.1-51 for the equipment located in the R/B, PCCV, containment internal structure and the PS/B.

19-295

DCD FSAR Section 19.1.5.1, Table 19-1-51, lists the HCLPFs for the reactor coolant system (RCS). The table indicates that the HCLPFs for the reactor coolant system (RCS) components are generic and are not design specific. The RCS HCLPFs are derived from the EPRI Utility Requirements Document (Reference 19.1-35) and range from 0.62g to 0.67g. In the past, Large Break LOCA loading was combined with earthquake loading and governed the loads on component nozzles and RCS supports. Double ended guillotine break of the main coolant loop (MCL) piping and branch lines greater than 6 inches in diameter can now be eliminated by successfully performing a leak before break analysis. Due to the smaller size of the seismic induced LOCA, lower HCLPFs for RCS components and supports may result.

To address this concern, the staff requests the applicant to describe the methodology for developing the HCLPFs for the RCS components and supports and to describe how LOCA size was taken into consideration.

19-296

DCD Section 19.1.5.1, Table 19-1-51, lists the HCLPFs for the fuel assembly (reactor internals and core assembly). The HCLPF for the fuel assembly was assumed to be 0.5g (PGA) with no basis provided.

Given the safety significance of the fuel assembly, the staff requests the applicant to substantiate the HCLPF value of 0.5g.

19-297

DCD FSAR Section 3.10.2.1, “Seismic Qualification of Instrumentation and Electrical Equipment”, describes meeting the minimum requirements of IEEE 344 (Reference 3.10-6) for seismic qualification by testing or by type testing. However, IEEE 344 does not explicitly address how equipment testing will address the requirements set forth in SECY-93-087 (i.e., HCLPF target of 1.67 times the SSE).

To address this concern, the staff requests the applicant to demonstrate how seismic qualification by testing or by type testing will satisfy the SECY-093-087 requirement of 1.67 times SSE.

19-298

In DCD FSAR Section 19.1.5.1.2, which discusses SMA insights (insight 5), the applicant states that the HCLPFs for electrical equipment and sensors/transmitters to trip the reactor are above 0.67g to justify not including the analysis of the failure of the reactor trip system when power is available during a seismic event. Table 19.1-51 lists the HCLPF for the equipment use in the SMA analysis along with the basis. Sensors and transmitters are not listed in this table, therefore no basis is provided for the value used in this section.

To address this concern, the staff requests the applicant to provide basis for the assumption that the HCLPFs for electrical equipment and sensors/transmitters to trip the reactor are above 0.67g.

19-299

DCD FSAR Section 19.3.3 lists the resolution of COL Action Items relating to Chapter 19. COL Action Item 19.3(5) states that when the design activity progresses and specific design data become available, SSC fragilities are updated during the COLA phase to reflect design data. However, the COL Action Item does not define the point in the COLA phase the item will be addressed and does not provide any guidance to the COL applicant/holder on the methodology to be used for updating SSC fragilities.

To address this concern, the staff request the applicant to define when in the COLA phase COL Action Item 19.3(5) will be addressed and provide guidance or details on how the SSC fragilities will be updated.