

REQUEST FOR ADDITIONAL INFORMATION 761-5804 REVISION 3

5/25/2011

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)

19-524

Structural failure or large deformation of the reactor internal structure (fuel assembly and control rod drive system) could prevent insertion of the control rods during or after an earthquake. In Table 19.1-54 of the DCD the HCLPF for the fuel assembly (reactor internals and core assembly) was assumed to be 0.5g without justification. To address this concern, staff requested the applicant to substantiate the HCLPF value of 0.5g for the fuel assembly.

In response, the applicant stated that the stress analysis for the fuel assembly is not complete. Further, the applicant stated that the HCLPF capacity of the fuel assembly and the combined reactor support arrangement will be at least 0.5g PGA since the system will be designed to meet the conservative requirements of the ASME code and tested to IEEE standard. The applicant also stated that updated fuel assembly fragility results will be included in an amendment to the PRA report MUAP-07030(R2) within one year after the issuance of the stress analysis report.

As the amendment to the PRA report has not been submitted, staff requests the applicant to provide the technical basis for estimating the HCLPF value of the fuel assembly and include this basis in DCD Section 19.1.5.

19-525

The standard design applicant is the supplier of some of the essential instrumentation and control equipment and should address this issue in the development of HCLPFs for use in the PRA based SMA. The COL applicant will be responsible for the qualification testing of most other electrical and I&C equipment and a COL action item should be added to the DCD that the COL applicant will address the application of a load factor in specifications for equipment to be qualified by testing to assure that the target HCLPF of 1.67 times the SSE is met.

Staff expects the applicant to address seismic qualification of Category I equipment to assure at least a 1.67 factor margin above the SSE (ref ISG-20). MHI has proposed developing load factors on SSE ISRS to arrive at the required response spectra (RRS). The October 9, 2009 letter response stated that these factors had not yet been defined but are being evaluated by component type and by method of qualification. As of yet, MHI has not submitted a response to the staff question. Staff notes that the test response spectra must be chosen so as to demonstrate that no more than one percent rate of failure would be expected when the plant is subjected to the applicable seismic margin ground motion. This is consistent with ISG-20, and clarifies how the COL

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licensee may confirm that prototype testing has demonstrated adequate seismic margin on a plant- and site- specific basis.

To address this issue, staff requests the applicant to include a COL action item in the DCD on how a COL licensee will seismically qualify equipment to assure at least a 1.67 factor margin above the SSE.

19-526

DCD, Chapter 19, should contain a COL action item requiring the COL applicant to identify plant-specific vulnerabilities and confirm the basis of the SMA. If the plant-level HCLPF is less than the target value, the applicant should perform a full convolution of sequence fragility for all sequences with a potential to lead to core damage to demonstrate that the seismic risk is acceptably low for the licensed plant. ISG-20 provides guidance on this process in Section 5.2, "Position on Updating DC PRA-Based Seismic Margin Analysis by COL Applicants."

DCD, Chapter 19, should also contain a COL action item requiring COL licensees to verify the plant SSC capacity to demonstrate the plant- and sequence-level HCLPF capacity is consistent with the FSAR. COL licensees should perform the verification based on the as-designed, as-built configuration of the plant. The plant walkdown process described in EPRI NP-6041 (Ref 13) can be used for the capacity verifications. COL licensees should complete the verification activities before initial loading of fuel to confirm that the as-designed and as-built plant level HCLPF capacity is at the level of 1.67 times the site GMRS PGA, or the values reviewed and approved for the licensee. The COL licensee should document the verification findings and make the documentation available for inspection. After completion of the as-built verification of seismic fragility target values for applicable seismic SSCs, the FSAR must be updated to reflect the as-built values. Further guidance is detailed in ISG-20, Section 5.3, "Verifications after Issuance of the COL."