RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

12/27/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 1050-7218 REVISION 3**
SRP SECTION:	**03.07.02 – Seismic System Analysis**
APPLICATION SECTION:	**3.7.2**
DATE OF RAI ISSUE:	**08/30/2013**

QUESTION NO. 03.07.02-227:

DCD Section 3.7.2.2 states that the member and element forces results obtained from the ACS SASSI analyses are enveloped and used for the development of seismic loads for design of structural members.

Staff review of the applicant's ANSYS dynamic analysis model, described in MUAP 10006 (R3), Part 2, finds that the reactor building basemat is discretized with only two layers of solid elements (ANSYS Solid45) for large areas. A similar approach is used for some parts of the CIS basemat. The staff notes that for the Solid45 element type, ANSYS recommends the use of at least 4 layers of solid elements for adequate moment prediction.

The ACS SASSI structural model is derived directly from the ANSYS dynamic analysis model, using solid elements comparable to ANSYS Solid45 elements. Based on this observation, the staff requests the applicant to confirm whether basemat member forces are derived directly from the ACS SASSI analysis model, and to provide technical justification for using less than 4 layers of solid elements for modeling of the basemat and other parts of the model where bending behavior appears to be important.

ANSWER:

The basemat member forces are not directly derived from ACS SASSI structural model. They are derived from analysis of a refined three-dimensional finite element (FE) model of the basemat. The seismic acceleration responses obtained from soil-structure interaction (SSI) analyses of ACS SASSI model are applied to the refined three-dimensional FE model as equivalent static loads to derive member forces. Design Control Document (DCD) Section 3.8.5.4.2 provides information regarding basemat structural design analysis. The refined three-dimensional FE model is presented on DCD Figures 3.8.5-5 through 3.8.5-10. As shown on the Figures, the basemat areas away from the prestressed concrete containment vessel (PCCV) are discretized vertically using six layers of solid elements. The area below the PCCV is divided into 12 layers in the vertical direction, and the portion modeled to simulate the reactor cavity is divided into 10 layers in the vertical direction. The

vertical layering of the solid elements in the refined three-dimensional FE model of the basemat is adequate for basemat bending moment prediction.

Impact on DCD

There is no impact on the DCD.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical Report

There is no impact on the Technical/Topical Report.

This completes MHI's response to the NRC's question.