REQUEST FOR ADDITIONAL INFORMATION 783-5855 REVISION 0

7/25/2011

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

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

QUESTIONS for PRA and Severe Accidents Branch (SPRA)

19-546

The staff has reviewed the applicant's response to RAI 19.01-9. In Table 19.1-119, Key Insights and Assumptions, of the US-APWR DCD, Revision 3. It states, "nitrogen will not be injected in the SG tubes to speed draining in the US-APWR design. The SG will be filled with air during midloop." MHI stated that the pressurizer spray vent valve, which is 3/4 inch in diameter, provides a sufficient vent path during RCS draining such that the possibility of negative RCS pressure caused by the limited size of the RCS vent path during draindown does not restrict drainflow.
Given the information provided by MHI at the PRA public meeting in June 2011, the staff requests that the applicant provide: (1) the results of an NPSH calculation that demonstrate that the CS/RHR pumps have adequate NPSH given a vacuum in the pressurizer during draining to midloop conditions and (2) the results of a calculation that demonstrate that the anticipated RCS vacuum conditions do not impact the ability to remove the steam generator manways which is planned to occur before removal of three pressurizer safety valves.

19-547

Chapter 19 of the DCD, Revision 3, states: "The assumptions of success criteria specific to the LPSD PRA are as follows:

•When the RCS is at atmospheric pressure (i.e., POS 4-2 and POS 8-2), it is assumed that the gravity injection from SFP is effective. The gravity injection from SFP is established by opening the injection flow path from SFP to RCS cold legs, and the water supply path from the RWSP to SFP. The validity of this function is determined by engineering judgment based on the previous PRA studies.

•When the RCS is in mid-loop operation at the closed state (i.e., POS 4-1 and POS8-3), it is assumed that the reflux cooling with the SGs is effective. The validity of this function is determined by engineering judgment based on previous PRA studies."

The justification for gravity injection and reflux cooling should not be determined by engineering judgment based on previous PRA studies, since the feasibility of gravity injection and reflux cooling are based on specific RCS configurations that vary according to different reactor designs. Rather, the feasibility of reflux cooling and gravity injection must be based on APWR design specific analyses. The staff is requesting that the

applicant update the DCD and the PRA to describe the results of analyses that were performed to justify the feasibility of gravity injection and reflux cooling.

19-548

The staff has reviewed the applicant's response to RAI 9.01.04-21 regarding drain paths from the refueling cavity. The staff has also noted that RCS leakage detection or containment isolation of lines connected to the RCS are not required to be operable during Modes 6 according to TS, and failures of RCS level indication have occurred during Mode 6. The staff agrees that there would be considerable time to core boiling given a loss of the decay heat removal function with no inventory loss when the refueling cavity is flooded. However, the staff requests MHI to evaluate inadvertent losses of RCS inventory during POSs 5, 6, and 7 when fuel is in the vessel using generic operational data. These POSs were screened from evaluation in the shutdown PRA.