REQUEST FOR ADDITIONAL INFORMATION 871-6121 REVISION 0

11/15/2011

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)

19-560

Follow-up to Question 19-522:

In RAI 752-5614, Question 19-522, the staff asked MHI the following:

1. Given the potential for build-up of large hydrogen concentration inside RWSP, please examine potential changes in the design, operation, and/or implementation of accident management strategies to circumvent the potential for build-up of high combustible gas concentrations inside the RWSP compartment.
2. Please use the Level-2 PRA to demonstrate compliance with NRC's deterministic and probabilistic guidelines as applicable to combustible gas control.
3. Please discuss any potential accident management procedures that are considered for detection and mitigation of hydrogen build-up inside the RWSP.

In response to the second question, MHI presented the results of a sensitivity analysis that show that the NRC's LRF guideline of 10^{-6}/ry was not exceeded regardless of the failure fraction assigned to detonation for scenarios where the igniters would not be functional. This shows that the LRF guidelines are met, but does not address the probabilistic and deterministic containment performance guidelines outlined in Section III.D of SECY-90-016 and Section I.J of SECY-93-087. Specifically, it needs to be shown that the conditional containment failure probability (CCFP) is less than about 0.1, and that the containment can maintain its role as a reliable leak-tight barrier against all credible challenge for a 24 hour period following core damage. Following this period, the containment should continue to provide a barrier against the uncontrolled release of fission products.

With respect to the first question, MHI states that design options to prevent buildup of hydrogen buildup in the RWSP will be answered in the response to RAI 803-5891, regarding the combustible gas control system design (Chapter 6 of the FSAR). In the draft response to RAI 803-5891, Question 06.02.05-44, four Class 1E Emergency Gas Turbine Generators are mentioned. In addition, there are two Alternate AC (AAC) Gas Turbine Generators (GTG) to ensure onsite AC power. From looking at Revision 3 of the PRA, it is not clear whether or not failure of these two alternate AC gas turbine generators was considered as part of Plant Damage State (PDS) 5E. In any case, in Revision 3 of the PRA, 15% of the LRF for internal events at power included scenarios where the igniters do not function. Also, PDS 5E accounts for half of these scenarios. Based on this information, it appears that scenarios involving significant hydrogen buildup in the RWSP are credible, and that hydrogen detonation is a credible challenge for the first 24 hours after core damage.

The draft response to RAI 803-5891, Question 06.02.05-44, also withdraws the previous proposal in response to RAI 627-4926, Question 19-449, to apply the firewater system for preventing hydrogen buildup inside the RWSP during specific severe accident scenarios during station blackout (SBO). In addition, the applicant provides a markup of DCD Revision 3, Subsection 19.2.3.3.2 text that deletes the statement on the application of firewater system for RWSP flooding. Thus, there does not appear to be a response to the third question about potential accident management procedures that are considered for detection and mitigation of hydrogen build-up inside the RWSP.

Please explain in detail how the probabilistic and deterministic containment performance goals will be met for all credible severe accident scenarios (and especially for those scenarios in PDS 5E) for the first 24 hours after core damage. Also, explain how the containment can remain a barrier against an uncontrolled release of fission products after 24 hours. Finally, please explain how the Alternate AC Combustion Gas Turbines are modeled in the Level 2 PRA.