

REQUEST FOR ADDITIONAL INFORMATION 740-5719 REVISION 2

4/26/2011

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 06.02.02 - Containment Heat Removal Systems

Application Section: 6.2.2

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

06.02.02-64

On April 7th, 2011, the staff performed an audit of 4CS-UAP-20070029 Rev1, "Hold-up Water volume calculation sheet during LOCA" describing the calculation of hold-up water volume following a loss of coolant accident to be used in determining the NPSH available for safety related pumps that draw suction from the RWSP.

Describe how this calculation was conservative for the NPSH evaluation. Include the following considerations.

- a. The NaTB baskets and associated drain piping were not discussed in the hold-up volume calculation.
It appears that they should be as they are designed to collect spray water and then deliver flow to the RWSP.
- b. Appropriate reference and justification should be provided for the applied methodology and selected input values used in the hold-up water calculation to demonstrate how the hold-up amount is conservative from a NPSH perspective. The following areas require additional information:
 - o Containment spray water droplets – Amount of water is a function of flow volume, fall height, and fall time. Method used for evaluating the fall time did not consider atmospheric resistance. This method under-predicts the fall time and therefore the spray water hold-up in the atmosphere. In addition, the flowrate and fall height values selected were not referenced to a document nor was a description provided that explained why the selected values were conservative for calculating hold-up amounts. Please explain how the treatment of spray water droplets in your calculation will provide conservative results.
 - o Condensate water on containment surfaces – Equation listed for film condensation correlation used to calculate film thickness could not be readily verified (reference in Japanese) and was not found in standard textbooks on heat and mass transfer. Appropriate reference and justification should be provided for the applied methodology and selected input values. Film thickness will be a function of the surface height. Justify estimated vertical surface area and corresponding heights used in the calculations.

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- o Vapor in the containment atmosphere – No basis provided for vapor amount assumed in the hold-up analysis. Please provide the reference and basis for the atmospheric conditions used to calculate the vapor amount.
 - o Water retained on the floors – Reference and basis was not provided for selected equation (method of evaluation) or input values used to evaluate dynamic retention on containment floor (result was 6" water height above floor). No evaluation was provided for assessing the dynamic retention on upper floors in containment (assumed 2" height above floor). Please provide the reference and basis and for calculating the dynamic water retention heights to include method and input values.
- c. Describe how the volume of water in the reactor system and the volume of water re-injected into the reactor system from the safety injection system is evaluated.
- d. Provide a proposed ITAAC for inspection of the as built containment. The purpose of the inspection is to confirm that all potential water retention locations have been identified and the amount of water retention has been conservatively estimated for each potential location.
- e. Provide a correlation to permit converting RWSP water volume (gallons) to RWSP water level (feet).