

REQUEST FOR ADDITIONAL INFORMATION 366-2740 REVISION 1

5/14/2009

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 Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects)
(CIB1)

06.02.02-45

The MUAP-08013-P report provides the downstream path debris load. The assumed post-LOCA fluid constituents are based on 100% latent debris bypass, 50% fiber bypass, and 5% reflective metal insulation (RMI) bypass, which the report states is more conservative than that assumed for the in-vessel evaluation. Provide the basis for the assumed constituents and amounts. Also, the constituents are assumed to have a characteristic size, but it is expected that the constituents will have a size distribution over a range that includes the smallest size up to the largest size that can pass through the strainer openings. Provide the basis for the assumed characteristic sizes for the debris constituents.

06.02.02-46

The MUAP-08013-P report provides a methodology for evaluating plugging and wear of ex-vessel downstream components for the US-APWR design, but it is not directly referenced for the purpose of providing such methods in the FSAR. The proposed evaluation methodology should be provided in Chapter 6 of the FSAR in a manner such that it is clear that it must be used for evaluating these effects for components in the downstream paths that have not yet been designed or selected. Provide a reference to the report in Chapter 6 of the FSAR or otherwise provide the proposed methodology and criteria in the FSAR for evaluation of ex-vessel downstream effects.

06.02.02-47

The MUAP-08013-P report provides a list of necessary "confirmation items" that need to be considered in the design, procurement, and installation/layout of the ECCS and CSS components. These items include necessary evaluations of component wear that will need to be completed after specific components are identified, but do not address needed evaluations of component plugging. The report states that verification that the system components will meet needed specifications is considered part of the COL items in FSAR Section 17.4.9. However, the above referenced COL items address the need to develop and implement reliability assurance programs, but do not address the specific need to perform detailed evaluations of ex-vessel downstream components for plugging and wear. Therefore, COL items need to be provided in Chapter 6 that specifically require COL applicants to perform the necessary evaluations of plant-specific

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components for plugging and wear. Provide COL items in Chapter 6 that address the necessary evaluation of plant-specific components.

06.02.02-48

The MUAP-08013-P report provides an assessment of the debris settling in the downstream components based on the assumed system flow rates following a design-basis LOCA compared to the maximum settling velocities. The applicant needs to provide additional information to allow the staff to review the effects of ECCS and CSS fluid flow velocities which could be less than the minimum value required to prevent settling of suspended debris in the downstream flow path. For flow velocities less than the required minimum value (e.g. during system flow initiation or realignment), there is a concern that significant debris settlement could occur that would restrict necessary system cooling flow. For flow velocities less than the required minimum value (e.g. during system flow initiation or realignment), please address whether significant debris settlement could occur causing a restriction of the necessary system core cooling flow.

06.02.02-49

Provide an evaluation of the potential effects of the settlement or precipitation of boric acid and other chemicals causing blockage of the downstream ex-vessel flow path. In addition to the flow path leading to the reactor vessel, address the effects of entrained debris, boric acid, and other chemicals in carryover liquid exiting the core that could settle or precipitate in the flow path downstream of the reactor vessel (i.e., the flow path from the vessel back to the break location.)

06.02.02-50

Provide an evaluation of the effects of the possible collection of non-condensable gases in high points in the ECCS and CSS flow paths, including gases which may be entrained or evolve out of solution in the recirculation water, chemicals that become gaseous, and gases which may form as a result of chemical reactions. Gases in sufficient quantities that collect and are trapped at high points could cause unacceptable pressure losses and restriction of system cooling flows.

06.02.02-51

The MUAP-08013-P report states that the potential for CSS spray nozzle plugging by debris is low. However, the performance of the spray nozzles in accomplishing their necessary safety functions may be affected by changes to the CSS fluid physical or chemical properties, even though the flow rate through the nozzles is not restricted. Provide an evaluation of the effects of entrained debris, chemicals, and gases on the performance of the CSS spray nozzles, especially regarding their effects on spray droplet size distribution for containment pressure suppression and removal of fission products from the containment atmosphere. Provide test data or other empirical evidence as a basis for evaluating the effects on the spray characteristics.