

# REQUEST FOR ADDITIONAL INFORMATION 646-5065 REVISION 0

10/7/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 03.09.02 - Dynamic Testing and Analysis of Systems Structures and Components  
Application Section: 3.9.2

QUESTIONS for Engineering Mechanics Branch 2 (ESBWR/ABWR Projects) (EMB2)

03.09.02-92

The applicant states in DCD Tier 2, Subsection 3.9.5.3.2 that some percentage of the main coolant flow is bypass flow, which is either for cooling metal or leakage between gaps. The bypass flows from gap leakages are as follows: small gap between the core-barrel outlet nozzle and RV outlet nozzle, neutron-reflector ring block inside surface and peripheral fuel assembly grids and nozzles, and neutron-reflector small gaps between the ring blocks. However, the applicant did not assess the liability of the core barrel flange to leakage flow-induced vibration.

In RAI 374-2446, Question # 03.09.05-25, the staff requested the applicant to discuss the liability of the core barrel flange to flow-induced vibration caused by the leakage (or bypass) flow between the outlet nozzle of the core barrel flange and the RV exit nozzle. Since the diameter of the core barrel flange is larger than that of the current 4-loop reactors, its shell modes have lower frequencies. In addition, the leakage flow rate is higher in the US-APWR than in the current 4-loop reactors. The applicant was also requested to provide evidence showing that the leakage flow between the outlet nozzle of the core barrel flange and the RV exit nozzle will not cause excessive vibration of the core barrel flange. Lastly, the applicant was requested to revise Section 3.9.5 of the DCD to include an assessment of the leakage flow effects on the core barrel flange.

In its response MHI stated the following:

There has been no reported evidence of nozzle gap by-pass flow being a major contributor to the core barrel vibration response through the experience of previous plants operation or testing. The bypass flow from the outlet nozzle gap between the Core Barrel / RV has little effect on the core barrel vibration because the flow rate and the flow contact area of the gap are much smaller than those of the downcomer as discussed in the response to RAI 206-1576 (QUESTION NO.: RAI 3.9.2-43) and Appendix-A of MUAP-07027-R1: "Comprehensive Vibration Assessment Program for US-APWR Reactor Internals".

The applicant argues that the US-APWR is not expected to experience leakage flow-induced vibration because such vibration has not been experienced by other in-service reactors. However, the in-service reactors are smaller in size, operating at lower flow rates, and experience smaller pressure drops than the US-APWR. This argument is therefore unacceptable, and the applicant is requested in this supplementary question to

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provide evidence or a basis for stating that leakage flow vibration is not a concern in the US-APWR.

### References:

MHI's Response to US-APWR DCD RAI No. 374-2446; MHI Ref: UAP-HF-09335; dated June 19, 2009; ML091751096.

MHI's Response to US-APWR DCD RAI No. 206-1576; MHI Ref: UAP-HF-09116; dated March 27, 2009; ML090910123.