REQUEST FOR ADDITIONAL INFORMATION NO. 155-1442 REVISION 0

1/14/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 09.01.01 - Criticality Safety of Fresh and Spent Fuel Storage and Handling
Application Section: 9.1.1

QUESTIONS for Reactor System, Nuclear Performance and Code Review (SRSB)

09.01.01-1

The US-APWR Tier 2 DCD, revision 1, chapter 9 references MUAP-07032-P (R0), *Criticality Analysis for US-APWR New and Spent Fuel Storage Racks* (reference 9.1.7-6 in Chapter 9 of the DCD, revision 1). This report, in turn, references ([8] in section 5.0) the MHI technical report MUAP-07020 (R0), *Validation of the MHI Criticality Safety Methodology*. This question and the following questions are asked against the MHI technical report MUAP-07020. Answers to these questions are needed to support the review of DCD section 9.1.1 in accordance with the SRP section 9.1.1.

[Page 5] How much zinc is to be replaced by copper? Copper has a much larger thermal absorption cross section than zinc, and a finite resonance integral while zinc has no entry under resonance integral. What is the magnitude of the effect of this substitution?

09.01.01-2

[Page 5] Why are the analyses in this report limited to ENDF/B-V? Other evaluations are either more modern, or include the nuclides of interest (i.e. zinc). Are there any plans to switch to the use of newer nuclear data libraries, or, at a minimum, quantitatively determine the effect for key selected configurations?

09.01.01-3

[Page 6] The USL is represented by the following formula (based on Reference 5):

USL = 1 - Δk + β - Δβ, where Δβ is the statistical uncertainty.

Why is Δβ only subtracted and not defined as an uncertainty interval (meaning ±Δβ)?

09.01.01-4

[Page 10] What is the definition of the "one sided tolerance factor U"?

09.01.01-5

All experiments described in section 5 refer to fresh LEU fuel. However, the spent fuel contains a significant amount of plutonium, which causes a decrease in the reactivity worth of control materials containing boron-10. What is the rationale for not including plutonium-containing experiments in the set of validating experiments? What assurance is there that the procedure described in the document produces a valid (or conservative) estimate of the uncertainty to ensure that the required level of sub-criticality is achieved for fuel containing plutonium (and other actinides)?

09.01.01-6

[Section 5] Are the poison loadings and plate thicknesses in the separator plate experiments considered for validation prototypic (or bounding) of those in the fuel racks and other configurations to which this methodology will be applied?

09.01.01-7

[Section 6] Provide details concerning the MCNP calculations including the number of batches, number of histories-per-batch, and whether the calculations were single runs or restarts to improve prediction of fundamental mode, etc. Are the calculated results symmetric when they should be? Provide two sample MCNP input decks. The first input deck should describe one of the validating experiments that includes a poisonous plate, and the second deck should describe a proposed storage rack design.

09.01.01-8

[Section 7] Why were poison loading and plate thickness not considered as "correlated parameters" for the separator plate configurations?