

REQUEST FOR ADDITIONAL INFORMATION 257-1613 REVISION 0

3/3/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 04.03 - Nuclear Design

Application Section: MUAP-07021-P – "US-APWR Incore Power Distribution Evaluation Methodology"

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

04.03-20

Page 2 – How many incore fission detectors are available for concurrent measurements of the flux. How many will be used during a concurrent measurement? This question is asked to satisfy GDC10 requirements.

04.03-21

Page 3 – Specify the planes that define each quadrant of Figure 2-2. This question is asked to satisfy GDC10 requirements.

04.03-22

Page 3 – Clarify the statement that the thimbles are "distributed nearly uniformly in the core" and that the distribution in each quadrant is nearly identical. This question is asked to satisfy GDC10 requirements.

04.03-23

Page 3 – Reference to figure 2-2 on page 5 - Provide the basis for choosing the thimble locations. This question is asked to satisfy GDC10 requirements.

04.03-24

Page 6 – Paragraph 1. It is stated that "The same methodology used in the conventional PWRs, ..." Describe the statement "conventional PWRs". This question is asked to satisfy GDC10 requirements.

04.03-25

Page 6 – Paragraph 1. Justify the statement, "The same methodology used in the conventional PWR, therefore, can be applied to the US-APWR". This question is asked to satisfy GDC10 requirements.

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04.03-26

Page 6 – 3.1 MD Data Processing. – Specify dimensions and quantity of axial locations. Is the voltage measured in the center of the equally spaced axial locations, or is a continuous voltage measured and then averaged? This question is asked to satisfy GDC10 requirements.

04.03-27

Page 6, Equation 3-1. Provide units for all terms in equation 3-1. This question is asked to satisfy GDC10 requirements.

04.03-28

Page 6, bottom – It is stated that “Normally, several detectors are used for flux mapping”. State how many detectors are normally used, and provide a range (from minimum to maximum) for the number of detectors that can be used. This question is asked to satisfy GDC10 requirements.

04.03-29

Page 6, bottom – It is stated that “To correct the difference of sensitivity between detectors, each detector is routed separately in a common calibration thimble at least once.” – Provide the number of times a detector is routed through a calibration thimble and the criteria that is used to require further routing through a calibration thimble. This question is asked to satisfy GDC10 requirements.

04.03-30

Page 7, Equation (3-2) – The equation uses a reaction rate from a “reference detector”, but the “reference detector” is not defined. Provide definition of the “reference detector”. This question is asked to satisfy GDC10 requirements.

04.03-31

Page 7, Source Deck – Provide the axial zone length used in the 3D core model. This question is asked to satisfy GDC10 requirements.

04.03-32

Page 9, bottom – Define the term, “engineering heat flux hot channel factor” used in this page. This question is asked to satisfy GDC10 requirements.

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04.03-33

Page 10, top - Has the "INCORE" code (Reference 1) been approved for use by NRC? This question is asked to satisfy GDC10 requirements.

04.03-34

Page 10; Specify all the modifications to the INCORE code that were made in creating the INCORE-M code. This question is asked to satisfy GDC10 requirements.

04.03-35

Page 10 and Page 32; Provide a copy of Reference 1. This question is asked to satisfy GDC10 requirements.

04.03-36

Page 10 – 4.2 Input data – Provide the nodalization that is used in the specification of the input data. This question is asked to satisfy GDC10 requirements.

04.03-37

Page 14, Figure 4-3, "Example of INCORE-M Output (Radial Power Distribution)." Provide sample data from one of the perturbed cases used in Appendix A, and/or any case other than the 0.0 percent differences case. This question is asked to satisfy GDC10 requirements.

04.03-38

Page 18 – This uncertainty analysis relies on Reference 2. Provide Reference 2. Is Reference 2 approved by the NRC. This question is asked to satisfy GDC10 requirements.

04.03-39

Page 18 – 2nd paragraph – Provide reference for the US-APWR instrumental uncertainty analysis. This question is asked to satisfy GDC10 requirements.

04.03-40

Page 19 – Provide units for all terms in equation (5-1) and (5-2). This question is asked to satisfy GDC10 requirements.

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04.03-41

All pages - Provide an alphabetical list of all symbols used in this report along with units of the symbols. This question is asked to satisfy GDC10 requirements.

04.03-42

Page 21 to 24 – Provide extrapolation uncertainty scale to the US-APWR. This question is asked to satisfy GDC10 requirements.

04.03-43

Page 33, 2nd paragraph – Provide justification for the source of data used for the uncertainties on power peaking factors. This question is asked to satisfy GDC10 requirements.

04.03-44

Page 34, bottom – Provide information on the perturbations steps used during misalignment of the control rods. This is asked to satisfy GDC10 requirements.

04.03-45

Page 33 - Does the simulated data for the US-APWR represent a more conservative case than measured data for a PWR? Specify which of the perturbation types, A, B, C, and D, represent a more conservative estimate than actual PWR data. This question is asked to satisfy GDC10 requirements.