**REQUEST FOR ADDITIONAL INFORMATION NO. 141-1735 REVISION 1**

1/9/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 12.02 - Radiation Sources
Application Section: 12.02 - Radiaton Sources

QUESTIONS for Health Physics Branch (CHPB)

12.02-5

10 CFR 20.1101(b), 1201and 1202 require licensees to control internal and external occupational exposure, and to ensure that engineering controls are used to keep occupational doses ALARA. 10 CFR 50 GDC 61 requires licensees to ensure that there is adequate shielding for routine activities in the area of the equipment. The guidance contained in Regulatory Guide 8.8 notes that to provide a basis for design, the quantity and isotopic composition of the radioactive material contained, in the station equipment should be estimated and that fission product source terms should be estimated using 0.25% fuel cladding defects. The guidance contained in Regulatory Guide 1.206 section C.I.12.2.1 notes that the applicant is to provide the models, parameters and bases used to calculate source magnitudes, including isotopic composition and the bases for all values. The data provided for the SFP, Irradiated Incore Detectors, and Irradiated Incore Detector cables in Section 12.2 appears to be insufficient or consistent enough to accurately describe the source term associated with these components.

**Question 1:**

The use of a Co-60 only source term for the SFP noted in the APWR DCD Section 12.2.1.1.5 is not consistent with the APWR DCD Section 12.2.1.1 notes that the source term for design bases is operation with 1% cladding defects. DCD Section 12.2.1.1.5, regarding SFP activity states “Fission products in the reactor coolant are negligible today due to technological improvements in nuclear fuel integrity resulting in a reduced fuel defect fraction”. However, DCD Tables 12.2-5 “Pressurizer Liquid Phase Source Strength” and Table 12.2-14 “Chemical and Volume Control System Radiation Sources Letdown Heat Exchanger Source Strength”, assume design bases cladding defects. The gamma ray source strengths for 1, 1.5 and 2 MeV reported for fluid streams addressed in DCD Tables 12.2-5 and 12.2-14, are not conservative with respect to the use of a Co-60 only source term.

In accordance with RG 1.206, if Co-60 is the only isotope used to calculate the source SFP source term during refueling, then please revised chapter 12 to included justification for the discrepancy between the stated fuel cladding defect design bases and the assumption that fission products in the reactor coolant system would be negligible. Otherwise, please revise chapter 12 to provide information that describes the bases, methods, parameters, assumptions, and resultant dose rates from the SFP fluid.

12.02-6

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**Question 2:**

The APWR DCD Section 12.2.1.2.5 notes that maximum gamma ray source strengths for the SFP, Irradiated Incore Detectors, and Irradiated Incore Detector cables are tabulated in DCD Tables 12.2-55, 12.2-54, 12.2-55 and 12.2-56. These tables only provide source strength data in (MeV/cm3/sec) or (MeV/watt-sec). DCD Section 12.2.1.1 notes that the design basis for the shielding source terms for the fission products for full-power operation is cladding defects in the fuel rods producing 1% of the core thermal power. There does not appear to be sufficient information regarding the models, assumptions and parameters provided in chapter 12 to justify the values presented in DCD Tables 12.2-55, 12.2-54, 12.2-55 and 12.2-56. Some of the information that may be needed to calculate the source strengths and isotopic concentrations includes, but is not limited to:

- isotopic composition models and parameters, such as assumed
- exposure duration for components inserted into the core,
- alloy composition for incore detectors,
- isotopic concentrations for the spent fuel pool water,
- the assumed leakage fraction from spent fuel bundles with defective cladding,
- the initial activity of the water used to flood up the Refueling Cavity,
- the assumed dilution ratio of the RCS activity as a result of the cool down and depressurization process and
- the fractional mixing between the Spent Fuel Pool and the Refueling Cavity during refueling.

In accordance with RG-8.8 and 1.206, please revise DCD chapter 12.2 to provide the information regarding the models, assumptions and parameters needed to generate the data presented in Tables 12.2-55, 12.2-54, 12.2-55 and 12.2-56.