

REQUEST FOR ADDITIONAL INFORMATION NO. 142-1733 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 - Radiation Sources

QUESTIONS for Health Physics Branch (CHPB)

12.02-7

10 CFR 20.1101(b), 1201 and 1202 requires 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. Regulatory Guide 8.8 notes that the applicant should estimate the quantity and isotopic composition of the radioactive material to be contained, deposited, or accumulated in station equipment. 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.

Question 1:

The APWR DCD Section 9.3.4.2.5 "Boron Recycle Subsystem" notes that the concentration of the boric acid is gradually increased until it reaches 7,000 ppmB then the concentrate is transferred to the boric acid tank. Any process that increases the concentration of boric acid, will also increase the concentration of the activity remaining after the water passes through the Boric Acid Feed Demineralizer. 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. DCD Figure 12.3-1 "Radiation Zones for Normal Operation/Shutdown (Sheet 15 of 34) Auxiliary Building at Elevation -26'-4"" identifies the Boric Acid Storage Tanks as a Zone VIII (Maximum Dose Rate 100 R/h) area and the Boric Acid Transfer Pumps as a Zone VII (Maximum Dose Rate 10 R/h) area. DCD Section 12.2.1.1.3 "Sources for Full Power Operation" does not discuss the Boric Acid Storage Tanks as a source of radiation exposure.

In accordance with RG 1.206, please update chapter 12 to provide models, parameters and bases used to calculate the source magnitudes in the Boric Acid Storage Tanks and the Boric Acid Transfer Pumps. The information provided should reflect the expected affect on the source term contained in these components resulting from the operation of the Boric Acid Evaporator for an operating cycle with design basis cladding defects.

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12.02-8

10 CFR 20.1101(b), 1201 and 1202 requires 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. Regulatory Guide 8.8 notes that the applicant should estimate the quantity and isotopic composition of the radioactive material to be contained, deposited, or accumulated in station equipment. 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.

Question 2:

The APWR 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 while activation product activity is calculated independently of the fuel defect level. Some of the activity contained in the fluid processed by the Boric Acid Evaporator, will deposit on interior components, resulting in the Boric Acid Evaporator becoming a significant source of exposure during maintenance activities. DCD Figure 12.3-1 "Radiation Zones for Normal Operation/Shutdown (Sheet 17 of 34) Auxiliary Building at Elevation 3'-7" ", identifies the Boric Acid Evaporator as a Zone VIII (Maximum Dose Rate 100 R/h) area. Based on the information depicted in this figure, two pumps are located next to the evaporator. Section 12.2 does not contain any information regarding the estimated activity contained within the Boric Acid Evaporator package and pumps.

In accordance with 10 CFR 20.1101(b) and RG 1.206, please provide in chapter 12, information that describes the bases, methods and assumptions for the source term, and dose rates, associated with the Boric Acid Evaporator, involving operation under "realistic" conditions, and for operation with design basis cladding defects. The information provided is to be consistent with the radiation zone information also provided in chapter 12.

12.02-9

10 CFR 20.1101(b), 1201 and 1202 requires 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. Regulatory Guide 8.8 notes that the applicant should estimate the quantity and isotopic composition of the radioactive material to be contained, deposited, or accumulated in station equipment. 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.

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Question 3:

The APWR 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. The purpose of the Boric Acid Evaporator is to concentrate boric acid contained in this fluid. Due to deposition of some of this activity, the evaporator may become a significant source of exposure. Figure 12.3-1 depicts it as a Zone VIII (Maximum Dose Rate 100 R/h) area. Beta, gamma and airborne exposure may be significant for maintenance, waste handling and dewatering activities that involve removal of the sludge that collects in the bottom of the evaporator. Section 12.2 does not provide any information that describes the source terms applicable for the removal and processing of this material.

In accordance with 10 CFR 20 and RG 1.206, please provide in chapter 12, information that describes the bases, methods and assumptions for the source terms, expected dose rates and airborne concentrations and the accumulated TEDE exposure, associated with the removal handling and dewatering of the Boric Acid Evaporator bottoms. This data provided should include separate presentations for operation under "realistic" conditions, and for operation with design bases cladding defects.