

REQUEST FOR ADDITIONAL INFORMATION NO. 147-1850 REVISION 1

1/9/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 12.03-12.04 - Radiation Protection Design Features

Application Section: 12.03

QUESTIONS for Health Physics Branch (CHPB)

12.03-12.04-3

10 CFR 20.1101(b), 1201 and 1202 require licensees to control internal and external occupational exposure, and to ensure that engineering controls are used to keep occupational doses ALARA. In 10 CFR 20 the definition for ALARA includes guidance to make every reasonable effort to maintain exposures below regulatory limits, taking into account the state of technology. Regulatory Guide 1.206 section C.I.12.3.1 "Facility Design Features" notes that the Applicant should identify features that reduce the potential for exposure by minimizing the time in the area, reducing source build up, providing remote operation, reduce activation product generation. Regulatory Guide 8.8 Position C2e, notes that the applicant should provide design features that reduce the potential for exposure by selection of materials to reduce activation product formation, finishing of the material surfaces to minimize erosion, facilitate decontamination and reduce deposition. EPRI TR-103296 Rev-1 "Cobalt Reduction Guidelines" and EPRI TR-1003390 "Radiation Field Control Manual" note that Co-60 is the primary long term source of radiation fields in power plants.

APWR DCD Section 12.1.2.1 notes that the use of low cobalt material and provision of features to prevent buildup of radioactive material are effective methods of reducing personnel exposure. Industry standard documents, like EPRI report TR-1003390 "Radiation Field Control Manual" note that preconditioning of surfaces by means like electro-polishing can reduce dose rates from some Steam Generator Primary Side components by about 50%. Another example offered by TR-1003390 noted that the use of low cobalt impurity material, such as Alloy 690 tubing in Steam Generators could reduce dose rates associated with Co-60, by 30%, and provides as an example that tubing should have an average cobalt content of less than 150 ppm and a maximum value should be specified for any one heat. Another example of a dose reducing initiative, was that using Stabilized Chromium pre-coating of components reduces long term dose rates from these components by factors of 2 to 6 over just electro-polishing alone. These methods of material specification and pre-conditioning are known, proven, cost effective and documented dose reduction techniques. DCD Section 12.3.1.1.1.1.D "Nuclear Steam Supply System Equipment – SGs", fails to note any of these aspects as part of the design bases for the equipment.

In accordance with 10 CFR 20.1101(b), RG 8.8 and RG 1.206, please revise chapter 12.3 to include the information that describes the design specifications for the material selection and finishing methods employed for the purpose of ALARA, or revise chapter 12.3 to provide your justification for not specifying known and proven exposure reduction

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methods and materials as part of the design features discussed in section 12.3.1.1.1.1.D.

12.03-12.04-4

10 CFR 20.1101(b), 1201 and 1202 require licensees to control internal and external occupational exposure, and to ensure that engineering controls are used to keep occupational doses ALARA. In 10 CFR 20 the definition for ALARA includes guidance to make every reasonable effort to maintain exposures below regulatory limits, taking into account the state of technology. Regulatory Guide 1.206 section C.I.12.3.1 "Facility Design Features" notes that the Applicant should identify features that reduce the potential for exposure by minimizing the time in the area, reducing source build up, providing remote operation, reduce activation product generation. Regulatory Guide 8.8 Position C2e, notes that the applicant should provide design features that reduce the potential for exposure by selection of materials to reduce activation product formation, finishing of the material surfaces to minimize erosion, facilitate decontamination and reduce deposition. EPRI TR-103296 Rev-1 "Cobalt Reduction Guidelines" and EPRI TR-1003390 "Radiation Field Control Manual" note that Co-60 is the primary long term source of radiation fields in power plants.

APWR DCD Section 12.1.2.1 notes that the use of low cobalt material and provision of features to prevent buildup of radioactive material are effective methods of reducing personnel exposure. Industry standard documents, like EPRI report TR-1003390 "Radiation Field Control Manual" note that Cobalt impurity levels in materials used to construct the Reactor Coolant System should be limited. As an example, this report notes that the use of low cobalt impurity materials in reactor vessel and internals construction, could significantly reduce long term plant dose rates. As examples, the report notes that the Cobalt impurity in stainless steels should be less than 500 ppm, and Inconel alloys should have a Cobalt content of less than 200 ppm. The Cobalt content of nickel plate used to fabricate in-core components should be less than 50 ppm and braze material should be less than 500 ppm. These are known, proven and documented dose reduction techniques. DCD Section 12.3.1.1 "Plant Design Features for As Low As Reasonably Achievable" fails to note any of these material purity aspects as part of the design bases for the equipment.

In accordance with 10 CFR 20.1101(b), RG 8.8 and RG 1.206, please revise chapter 12.3 to include the information that describes the design specifications for the material selection employed for the purpose of ALARA or revise chapter 12.3 to provide justification for not specifying known and proven exposure reduction materials as part of the design features.

12.03-12.04-5

10 CFR 20.1101(b), 1201 and 1202 require licensees to control internal and external occupational exposure, and to ensure that engineering controls are used to keep occupational doses ALARA. In 10 CFR 20 the definition for ALARA includes guidance to make every reasonable effort to maintain exposures below regulatory limits, taking into

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account the state of technology. Regulatory Guide 1.206 section C.I.12.3.1 "Facility Design Features" notes that the Applicant should identify features that reduce the potential for exposure by minimizing the time in the area, reducing source build up, providing remote operation, reduce activation product generation. Regulatory Guide 8.8 Position C2e, notes that the applicant should provide design features that reduce the potential for exposure by selection of materials to reduce activation product formation, finishing of the material surfaces to minimize erosion, facilitate decontamination and reduce deposition. EPRI TR-103296 Rev-1 "Cobalt Reduction Guidelines" and EPRI TR-1003390 "Radiation Field Control Manual" note that Co-60 is the primary long term source of radiation fields in power plants.

APWR DCD Section 12.1.2.1 notes that the use of low cobalt material and provision of features to prevent buildup of radioactive material are effective methods of reducing personnel exposure. Industry standard documents, like EPRI report TR-1003390 "Radiation Field Control Manual" note that identifying the type of component, the cobalt content, the duty cycle and resultant Cobalt introduction rate helps to identify valves that require Cobalt Hard Facing (HF) material based on service conditions. The report notes that limiting the use of Cobalt HF materials to only those applications where service conditions warrant the use of these materials results in lower cobalt introduction rates and lower long-term plant dose rates. Documented industry Operating Experience demonstrates that application of these techniques during the design phase is more effective than retroactively implementing these criteria. These are known, proven and documented dose reduction techniques. DCD Section 12.3.1.1 "Plant Design Features for As Low As Reasonably Achievable" fails to note any of these material purity aspects as part of the design bases for the equipment.

In accordance with 10 CFR 20.1101(b), RG 8.8 and RG 1.206, please revise chapter 12.3.1.1 to include the information that describes the design specifications and the models describing the bases for determining the material selection of valves connected to the Reactor Coolant System, employed for the purpose of ALARA or revise chapter 12.3 to provide justification for not specifying known and proven exposure reduction methods and materials as part of the design features.