

REQUEST FOR ADDITIONAL INFORMATION NO. 164-1925 REVISION 0

1/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 11.02 - Liquid Waste Management System

Application Section: 11.2

QUESTIONS for Health Physics Branch (CHPB)

11.02-1

Staff review of DCD Tier 2 (Rev 1), Section 11.2 indicates insufficient information is provided in regards to the stainless-steel liner design in cells/cubicles and housed tanks, equipment, and pumps of the LWMS for compliance with 10 CFR 20.1301; 10 CFR 20.1302; 10 CFR 20.1406; 10 CFR 20, Appendix B, Table 2, Column 2; 10 CFR 50.34a; 10 CFR 50.36a; 10 CFR 50, Appendix I; and 10 CFR 50, Appendix A, GDC 60 and GDC 61. Section 11.2.1.4 states, "cubicles where the radioactive liquid is stored are curbed and are lined up to a wall height equivalent to one full tank volume of liquid for that tank." The liner system of these cubicles is described to serve as a barrier to minimize contamination of the facility, environment, and groundwater. Further, Section 11.2.2.2.2 states, "cells/cubicles housing tanks that contain significant quantities of radioactive material are lined with stainless steel to a height sufficient to hold the tank contents in the event of tank failure." Although Tables 11.2-2 and 11.2-3 present some design information on tanks and sources having radioactive liquid waste inflow into the LWMS, the actual tanks, equipment, and pumps associated with stainless-steel liners are not identified. Please address the following items and revise the DCD to include this information.

1. Define "significant" quantities of radioactive materials for housing tanks in lined curbed cells/cubicles.
2. Identify all tanks used for storing and processing radioactive liquids that are housed in lined curbed cells/cubicles. Justify any tanks not housed in lined curbed cells cubicles.
3. Identify all equipment and pumps from Section 11.2.2.1 used for storing and processing radioactive liquids that are housed in lined curbed cells/cubicles. Justify any equipment and pumps not housed in lined curbed cells/cubicles.
4. Provide information on the design and radioactive material inventory of the boric acid tank described in Section 11.2.3.2 as a tank that contains a "large amount of radioactivity."

11.02-2

Staff review of DCD Tier 2 (Rev 1), Section 11.2 indicates insufficient information is provided in regards to conformance equipment codes and the preoperational test for

REQUEST FOR ADDITIONAL INFORMATION NO. 164-1925 REVISION 0

stainless-steel liners in cell/cubicles used for storing and processing radioactive liquids for compliance with 10 CFR 20.1301; 10 CFR 20.1302; 10 CFR 20.1406; 10 CFR 20, Appendix B, Table 2, Column 2; 10 CFR 50.34a; 10 CFR 50.36a; 10 CFR 50, Appendix I; 10 CFR 50, Appendix A, GDC 60 and GDC 61; and 10 CFR 52.47(b)(1). Section 11.2, Table 11.2-1 presents RG 1.143 equipment codes for LWMS components such as pressure vessels, tanks, pumps, piping and valves, flexible hoses and connections, filters, and ion exchange columns. However, codes for the design and construction, materials, welding, and inspection and testing of stainless-steel liners in cells/cubicles used to minimize contamination of the facility, environment, and groundwater are not provided. Additionally, the test for stainless-steel liners associated with the ITP as part of the initial plant start-up is not provided. Please address the following items and revise the DCD to include this information.

1. Provide the conformance equipment codes for stainless-steel liners in cells/cubicles, or justify their exclusion.
2. Provide the ITAAC to ensure that construction of stainless-steel liners in cells/cubicles is complete and acceptable, or justify their exclusion.

11.02-3

DCD Tier 2 (Rev 1), Section 11.2.1.6 discusses a provision for a mobile system or temporary equipment for liquid radioactive waste processing that may be installed in the auxiliary building at the discretion of facility operation. The mobile system or temporary equipment for liquid waste processing is not included in the LWMS which is designed with permanently installed equipment. Although COL item 11.2(1) for a mobile system or temporary equipment is presented in Section 11.2.4, there is no explicit statement in Section 11.2.1.6 to direct the COL applicant to take responsibility for this information item. Please include a statement for the COL applicant to address this information item in the discussion of Section 11.2.1.6. Also, please include a similar statement in the relevant section of the DCD for the COL applicant to address COL item 11.2(2) in Section 11.2.4.

11.02-4

DCD Tier 2 (Rev 1), Section 11.2, Table 11.2-14 presents some input design parameters and values used in the LADTAP II computer code and resulting individual annual population pathway doses (mrem/yr) from liquid radioactive effluents in Table 11.2-15. Staff review indicates insufficient information is provided to independently confirm the calculated individual annual population pathway doses for compliance with 10 CFR 20.1301; 10 CFR 20.1302; 10 CFR 50.34a; 10 CFR 50.36a; 10 CFR 50, Appendix I; and 10 CFR 50, Appendix A, GDC 60 and GDC 61. Please address the following items and revise the DCD to include this information.

REQUEST FOR ADDITIONAL INFORMATION NO. 164-1925 REVISION 0

1. Provide the basis for all design parameters and values used in the LADTAP II code calculation. Include value derivations and references (e.g., pointer to FSAR section or table, RG 1.109 table, etc.).
2. Provide the LADTAP II code input/output files used to calculate the liquid effluent doses in Table 11.2-15.

11.02-5

DCD Tier 2 (Rev 1), Section 11.2.1.2, first bulleted paragraph, please check the applicability of the pointer to Table 11.2-1 on RG 1.143 equipment codes to describe the capacity, redundancy, and flexibility attributes for LWMS design criteria.

11.02-6

Staff review of DCD Tier 2 (Rev 1), Sections 11.2.3.2 and 2.4.13, and MHI's response to RAI (Rev 0), Question 11.01-2 indicate insufficient information is provided in regards to the liquid radwaste tank failure analysis for compliance with 10 CFR 20, Appendix B, Table 2, Column 2; 10 CFR 20.1406; 10 CFR 50.34a; 10 CFR 50.36a; 10 CFR 50, Appendix A, GDC 60 and GDC 61; and 10 CFR 50, Appendix I. Pursuant to SRP Sections 11.2 and 2.4.13, and BTP 11-6, the staff requests this information to evaluate the basis and assumptions used in developing the source term, radionuclide distributions and concentrations to ensure that the highest potential radioactive material inventory associated with normal operation and anticipated operational occurrences is selected for liquid effluents processed by the LWMS, and to determine whether the failed tank and its components will result in the highest radionuclide concentrations at the nearest potable water supply located in an unrestricted area. Please address the following items and revise the DCD to include this information.

1. In response to the staff's question, MHI provided an evaluation to exclude Tc-99 from primary and secondary coolant concentrations based on: 1) core inventories of Tc-99 ($2.3E+3$ Ci), I-129 (5.6 Ci), and Cs-137 ($1.9E+5$ Ci) calculated by the ORIGEN code; 2) effluent concentration limits (ECLs) of Tc-99 ($6E-5$ mCi/ml) and Cs-137 ($1E-6$ mCi/ml) in 10 CFR 20, Appendix B, Table 2, Column 2; and 3) a dose consequence of Tc-99 in comparison to Cs-137 from radiological half-lives, core inventories, and ECLs assuming a 365 day travel time and no retarding effect due to radionuclide deposition.

The dose consequence analysis for liquid radwaste system failures must consider the most adverse contamination in groundwater (SRP 2.4.13) and the radionuclides selected for the source term and total inventory should include those that have the highest potential exposure consequences to users of water resources, including long-lived fission and activation products and environmentally mobile radionuclides (BTP 11-6).

Because Tc-99 and I-129 move readily with groundwater and Cs-137 movement is highly retarded due to interactions with soil and hydrological travel times to unrestricted areas are typically much longer than 1 year, please include the Tc-99

REQUEST FOR ADDITIONAL INFORMATION NO. 164-1925 REVISION 0

and I-129 concentrations in the tank failure analysis in Section 11.2.3.2, or justify their exclusion in an evaluation which considers the environmental (fate and transport) characteristics of Tc-99, I-129, and Cs-137.

2. In Section 11.2.3.2, fully describe the approach used to demonstrate that liquid radioactive effluents processed by the LWMS released into the surface or ground water from an assumed tank failure comply with the radionuclide concentrations in 10 CFR 20, Appendix B, Table 2, Column 2 (under the unity rule) and TEDE of 50 mrem/yr.
 - (a) Provide details of the calculations in developing the radioactive source term as radionuclide distributions and concentrations for the tank inventories. Provide the basis for all design parameters and values used. Include value derivations and references (e.g., pointer to applicable FSAR section or table, etc.).
 - (b) Provide the tank inventories evaluated and identify the tank selected to contain the highest inventory for the tank failure analysis.
 - (c) Provide the basis for Note 1 in Table 11.2-17 to exclude radionuclides with concentrations less than 1E-3 in fraction of the ECL from the total inventory of the failed tank.
 - (d) Discuss the equipment malfunction analysis in Table 11.2-18 (Sheets 1 and 2) not described in Section 11.2.
 - (e) Provide the basis for the assumed dilution of 4.4E+10 gallons of water.
 - (f) Describe any credit applied in the use of engineered design features for mitigating radiological consequences of the tank failure.
 - (g) Provide the resulting radionuclide concentrations at the receptor location.

11.02-7

DCD Tier 2 (Rev 1), Section 11.2, Tables 11.2-10 and 11.2-11 present calculated expected and maximum annual liquid radionuclide releases (Ci/yr) from some input design parameters and values in Tables 11.2-7 and 11.2-9 used in the PWR-GALE computer code. The resulting calculated annual liquid radionuclide releases are compared to 10 CFR 20 Appendix B liquid effluent concentration limits in Tables 11.2-12 and 11.2-13. Staff review indicates insufficient information is provided to independently confirm the calculated annual liquid radionuclide releases for compliance with 10 CFR 20.1302; 10 CFR 20, Appendix B, Table 2, Column 2; 10 CFR 50, Appendix I; 10 CFR 50.34a; and 10 CFR 50, Appendix A, GDC 60. Please address the following items and revise the DCD to include this information.

1. Provide the basis for all values and assumptions used in the PWR-GALE code calculation of expected and maximum annual liquid radioactive releases in Table 11.2-7. Include value derivations and references (e.g., pointer to applicable FSAR section, NUREG-0017, etc.).
2. Provide the PWR-GALE code input/output files used to calculate the expected and maximum annual liquid radionuclide releases in Tables 11.2-10 and 11.2-11.