**MITSUBISHI HEAVY INDUSTRIES, LTD.**
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TOKYO, JAPAN

March 10, 2009

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-09087

**Subject: MHI's Response to US-APWR DCD RAI No. 188-2007 REVISION 1**

**Reference:** 1) "Request for Additional Information No.188-2007 Revision 1, SRP Section: 11.03 – Gaseous Waste Management System, Application Section: 11.3" dates February 9, 2009.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Response to Request for Additional Information No. 188-2007 Revision 1."

Enclosed is the response to the RAI contained within Reference 1.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of the submittals. His contact information is below.

Sincerely,

Y. Ogata

Yoshiki Ogata
General Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosure:

1. Response to Request for Additional Information No. 188-2007 Revision 1

CC: J. A. Ciocco
C. K. Paulson

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Docket No. 52-021
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Enclosure 1

# UAP-HF-09087
# Docket Number 52-021

## Response to Request for Additional Information
## No. 188-2007 Revision 1

March 2009

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**03/10/2009**

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

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|---|---|
| **RAI NO.:** | **NO. SBPS 188-2007 REVISION 0** |
| **SRP SECTION:** | **11.03 – Gaseous Waste Management System** |
| **APPLICATION SECTION:** | **11.3** |
| **DATE OF RAI ISSUE:** | **2/9/2009** |

**QUESTION NO. : 11.03-1**

Regulatory Position 2.3 from RG 1.143 states that the portions of the gaseous radwaste treatment system that are intended to store or delay the release of gaseous radioactive waste, including portions of structures housing these systems, should be classified as described in Regulatory Position 5, "Classification of radwaste systems for design purposes," and designed in accordance with Regulatory Position 6, "Natural phenomena and man-induced hazards design for radwaste management systems and structures." A review of the DCD found a lack of discussion related to the guidance given in these regulatory positions. Provide additional information in the DCD to justify how the guidance in Regulatory Position 2.3, is met.

**ANSWER:**

In Section 11.3.1.7, the DCD states "The SSCs classifications for the GWMS are discussed in Section 3.2." According to Table 3.2-2 (Sheet 32 of 53) the GWMS components are all designed to the codes and standards of Class 6, which, as shown in Table 3.2-3, means that codes and standards meeting RG 1.143 are applied. Also, Table 3.2-2 (Sheet 32 of 53) shows that the seismic category of SSCs in the GWMS are classified based on RG 1.143. It is considered sufficient that Section 11.3 references Section 3.2 to show that the guidance in RG 1.143 is met.

**Impact on DCD**

There is no impact on the DCD.

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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**QUESTION NO. : 11.03-2**

The general design criteria specified in section 6.1.4 of Regulatory Guide 1.143 states, "The acceptability evaluation should be based on the requirements of the codes and standards given in Table 1, using the capacity criteria in Table 4." The "Inspection and Testing" codes from Table 11.3-11 of the DCD for Tanks (0-15 psig) and atmospheric tanks are API 620 and API 650, respectively. The "Inspection and Testing" codes from Table 1 of Regulatory Guide 1.143 for tanks (0-15psig) and atmospheric tanks are API 650 and API 620, respectively. Provide justification in the DCD why the "Inspection and Testing" codes for the tanks (0-15 psig) and atmospheric tanks components from Table 11.3-11 of the DCD, differ from the Table 1 "Inspection and Testing" codes given in Regulatory Guide 1.143.

**ANSWER:**

The information provided in Table 11.3-11 concerning the codes applied to the "Inspection and Testing" of both 0-15 psig tanks and atmospheric tanks is correct. DCD Table 11.3-11 refers to API 650 for atmospheric tanks and API 620 for tanks rated for pressures 0-15 psig, consistent with the scope and limitations of the current standards. API-650 is intended for atmospheric tanks. Although API 650 has special provisions to allow slightly higher internal pressures using its Appendix F, they are only applicable up to a pressure of 2.5 psig. Reference to API 650 for "Inspection and Testing" of the 0-15 psig tanks is inconsistent with the limitations of the standard.

A transposition error appears to have occurred during preparation of Revision 2 to Regulatory Guide 1.143. Revision 1, Table 1 has consistent references to the API standards for "Design and Construction" and "Inspection and Testing." This revision applies API 650 to atmospheric tanks and API 620 to tanks with rated pressures of 0-15 psig for both applications.

DCD Table 11.3-11 will not be changed at this time.

**Impact on DCD**

There is no impact on the DCD.

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

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**QUESTION NO. : 11.03-3**

SRP Section 11.3, SRP Acceptance Criteria 6 provides guidance on system design if the potential for explosive mixtures of hydrogen and oxygen exist. Section 11.3 of the DCD does not address this guidance. Provide additional information in the DCD to confirm compliance with SRP Section 11.3, SRP Acceptance Criteria 6. Also, DCD Table 11.3-3, "Equipment Malfunction Analysis (Sheet 2 of 2)," states "the main process equipment and piping are designed to contain a detonation." Specify in the DCD which components and piping are designed to withstand a hydrogen explosion.

**ANSWER:**

The hydrogen and oxygen analyzers are discussed in Sections 11.3.2.1.3 and 11.3.2.1.4. These components are designed to comply with SRP Section 11.3, including SRP Acceptance Criteria 6. These components analyze the process gas stream for potentially explosive concentration. The oxygen analyzer described in Section 11.3.2.1.3 is a dual analyzer, which conforms to the definition in SRP Acceptance Criteria 6.D. The analyzers are designed to alarm at 2%. As stated in Section 11.3.2.1.4, "The 2% limit is set administratively so that the operator has sufficient time to investigate the cause and take corrective action."

In accordance with SRP Acceptance Criteria 6.D, the design provides initial alarm at high concentration setpoint for operator action, and at the "high-high alarm" setting, automatic control features are initiated. At the "high-high alarm" setpoint, the sources of the gas to the charcoal beds are automatically isolated by valves in the closed position. These features will be added to Section 11.3.2.1.4.

Regarding the row in DCD Table 11.3-3 (Sheet 2 of 2), the statement, "the main process equipment and piping are designed to contain a detonation," is part of the alternate action for the hydrogen gas analyzer. The malfunction of the hydrogen analyzer is already considered for the row "oxygen / hydrogen analyzer skids; oxygen analyzer skid," (Table 11.3-3 Sheet 1 of 2) as the hydrogen analyzer is part of the oxygen / hydrogen analyzer skid. Therefore this separate row in Table 11.3-3 Sheet 2 of 2 is not necessary and will be removed.

**Impact on DCD**

In DCD Table 11.3-3 Sheet 2 of 2, remove the line for "Hydrogen gas analyzer."

At the end of Section 11.3.2.1.4 add the following paragraph:

"In the unlikely case that the oxygen concentration does reach 4%, automatic control features are initiated at this "high-high alarm" setting. When the high-high alarm occurs, the sources of the gas to the charcoal bed are isolated by closing the valves."

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

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**QUESTION NO. : 11.03-4**

SRP Section 11.3, SRP Acceptance Criteria 2 states: "The GWMS should be designed to meet the anticipated processing requirements of the plant. Adequate capacity should be provided to process gaseous wastes during periods when major processing equipment may be down for maintenance (single failures) and during periods of excessive waste generation. Systems that have adequate capacity to process the anticipated wastes and that are capable of operating within the design objectives during normal operation, including anticipated operational occurrences." In DCD Section 11.3.2.1.6 it is stated that "Four charcoal bed adsorbers are provided and arranged in two parallel trains. Each train has two charcoal bed adsorbers in series. During normal operation, both trains are in service. If one adsorber bed is saturated with moisture, the train is taken out of service for a short period until the charcoal is replaced and the train is returned back to service. With one train out of service, the system operates at half of its capacity for a short period until the out-of-service train is returned to service." Provide additional information in the DCD to justify how the US-APWR GWMS processing capacity is adequate to process the anticipated wastes when one train of charcoal adsorbers is out of service.

**ANSWER:**

The charcoal bed adsorbers are sized to have sufficient capacity to process the anticipated wastes based on a 1% failed fuel fraction (design basis) at full flow (1.2 SCFM). Two trains of charcoal bed absorbers are arranged in series (i.e. four charcoal bed adsorbers are arranged in series).

Two sets of charcoal bed absorbers allow operation with one single train when failed fuel fraction is low enough. When one train is not available, another single train is used to treat waste gases. As design basis failed fuel conditions is not expected to be part of normal operation, it is envisaged that the plant is operating under the realistic basis failed fuel fraction, noting that the gases generated under these conditions are significantly lower in concentration (based on design basis and realistic basis source terms presented in DCD Tables respectively 11.1-2 and 11.1-9).

Using these realistic basis conditions, it is analyzed that the nuclide activities from single train operation (with reduced decay time) are lower than the activities from the two-train operation for the bounding isotopes using the design basis source term. The effluent nuclide activities are also

monitored by the radiation instrument at the discharge side of the adsorbers. If the activity exceeds the discharge setpoint, the gas flow is diverted to the gas surge tank and is reprocessed through the charcoal beds. The discharge can be temporarily suspended until the radiation level is below the discharge setpoint or the out-of-service train is returned to service. It should also be noted that the full flow (1.2 SCFM) is a design maximum flow and is assumed to be continuous for design evaluation. Normal input gas flow is expected to be less and intermittent. Hence, the GWMS processing capacity is adequate to process the gaseous wastes under normal operating condition when one train of charcoal bed adsorbers is out of service.

**Impact on DCD**

The first paragraph in Section 11.3.2.1.6 will be revised to say the following:

"Four charcoal bed adsorbers are provided and arranged in two parallel trains. Each train has two charcoal bed adsorbers in series. During normal operation, both trains are in service and arranged in series. If one adsorber ~~bed~~ train is not available, i.e., saturated with moisture and/or requires maintenance, the train is taken out of service for a short period until the charcoal is replaced and the train is returned back to service. ~~With one train out of service, the system operates at half of its capacity for a short period until the out-of-service train is returned to service.~~ The effluent nuclide activities are also monitored by the radiation instrument at the discharge side of the adsorbers. If the activity exceeds the discharge setpoint, the gas flow is diverted to the gas surge tank and is reprocessed through the charcoal beds. The discharge can be temporarily suspended until the radiation level is below the discharge setpoint or until the out-of-service train is returned to service."

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.

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**QUESTION NO. : 11.03-5**

SRP Section 11.3, Acceptance Criteria 3 states "The design should include precautions to stop continuous leakage paths (i.e., to provide liquid seals downstream of rupture discs) and to prevent permanent loss of the liquid seals in the event of an explosion due to gaseous wastes produced during normal operation and anticipated operational occurrences." The DCD describes several design provisions of the GWMS to reduce or minimize explosive mixtures. However, the DCD does not describe any provisions for isolation of continuous gaseous leakage paths in the event that an explosion was to occur. Verify in the DCD that such provisions are included in the design of the GWMS.

**ANSWER:**

The GWMS does not use rupture disc. This design feature eliminates the need for seal water. In the event of loss of system pressures at the upstream and downstream of the charcoal beds, such as leakage, or an explosion, operator will close feed isolation valves remotely to shutdown the system for investigation from off-normal indication of pressure or gaseous flow.

**Impact on DCD**

There is no impact to the DCD.

**Impact on COLA**

There is no impact on the COLA.

**Impact on PRA**

There is no impact on the PRA.

This completes MHI's response to the NRC's question.