

**REQUEST FOR ADDITIONAL INFORMATION 400-3032 REVISION 0**

6/18/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 11.05 - Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems

Application Section: 11.5

**QUESTIONS for Health Physics Branch (CHPB)**

11.05-12

In response to the Staff's question (RAI 249-1978, Question 11.05-5, item 1) MHI states,

"The Containment radiation gas monitor (RMS-RE-41) will be deleted from the TS leakage detection methods since this monitor (RMS-RE-41) does not have enough leakage detection capability assuming that no failed fuel exists. The Containment radiation particulate monitor (RMS-RE-40) will remain as a diverse detection method. The DCD Chapter 16 Technical Specification will be revised to delete this monitor's description (see also RAI 165, Question 1967)."

Information requested in the Staff's question supporting the Applicant's response on the minimum required sensitivity for the containment particulate radiation monitor (RMS-RE-40) necessary to satisfy the RCS leakage rate technical basis for detecting an increase of 1 gpm within 1 hour using a realistic primary coolant concentration was not provided.

In response to the Staff's question on the containment radiation particulate monitor MHI states,

"This range provides the capability to detect leakage of less than 0.5 gpm within one hour of detector response time. This conforms to the requirement to detect 1 gpm as stated in RG 1.45."

Information requested in the Staff's question (RAI 249-1978, Question 11.05-5, item 2) supporting the Applicant's response on the methodology to satisfy the technical basis for RCS leakage detection instrumentation using a realistic radioactive concentration in the RCS was not provided.

The Staff requests the Applicant to:

1. Submit a detailed evaluation which demonstrates that the containment particulate radiation monitor range provides the capability to detect leakage of "less than 0.5 gpm within one hour of detector response time" using a realistic radioactive concentration in the RCS, or describe the program and procedure that will be used to satisfy the RCS leakage rate technical basis and RG 1.45 (Rev 1). Revise the DCD to include this information and provide a markup in your response.

## REQUEST FOR ADDITIONAL INFORMATION 400-3032 REVISION 0

2. Update reference of RG 1.45 (Rev 0) to its current revision (Rev 1) in Table 1.9.1-1 of DCD Section 1.9, and DCD Sections 5.2.5.4.1.2 and 5.2.7, and provide a markup in your response.

### 11.05-13

In response to the Staff's question (RAI 249-1978, Question 11.05-6, item 1) it states,

"The ranges of these three types of radiation monitors described in DCD Tables 11.5-1 through 11.5-3, respectively, are sufficient to provide the capability to detect 30 gpd primary-to-secondary leakage. This conforms to the requirement of NEI 97-06 and EPRI Guidelines and no specific sensitivity requirement needs to be stated in DCD Tables 11.5-1 through 11.5-3."

Information requested in the Staff's question supporting the Applicant's response on the minimum required sensitivities for the steam generator blowdown water radiation monitor (RMS-RE-55), high sensitivity main steam line monitors (RMS-RE-65A, 65B, 66A, 66B, 67A, 67B, 68A, 68B), and condenser vacuum pump exhaust line radiation monitors (RMS-RE-43A, 43B) necessary to satisfy the primary-to-secondary leakage rate detection sensitivity technical basis was not provided.

In response to the Staff's question (RAI 249-1978, Question 11.05-6, item 2) MHI states,

"Primary-to-secondary leakage is verified by these radiation monitors and compared to leakage rates calculated by using other monitors to ensure the validity of these methods."

The response does not identify and discuss the "other monitors" used to calculate primary-to-secondary leakage rates.

Information requested in the Staff's question supporting the Applicant's response on the methodology to satisfy the technical basis for primary-to-secondary leakage detection instrumentation using a realistic radioactive concentration in the RCS was not provided.

The response to the Staff's question also states,

"The condenser vacuum pump exhaust line radiation monitors are the primary monitors used to estimate the primary-to-secondary leakage rate. The primary-to-secondary leakage rate can be estimated by comparing the fission gas activity, such as Xe-133, in the condenser exhaust gas to the fission gas activity in the reactor coolant system (RCS). When fission gas concentrations are low in the RCS, other isotopes such as Ar-41 can be used, taking into consideration the effect of their shorter half-lives."

This information on the condenser vacuum pump exhaust line radiation monitors as the "primary monitors" and how they are used to estimate primary-to-secondary leakage rate using fission gas activity in the RCS is absent in Section 11.5.2.4.2 of the DCD.

The Staff requests the Applicant to:

## REQUEST FOR ADDITIONAL INFORMATION 400-3032 REVISION 0

1. Submit a detailed evaluation which demonstrates that the ranges of the primary-to-secondary radiation monitors are sufficient to provide the capability to detect 30 gpd primary-to-secondary leakage using a realistic radioactive concentration in the RCS, or describe the program and procedure that will be used to satisfy the primary-to-secondary leakage rate technical basis, NEI 97-06 and EPRI Guidelines. Revise the DCD to include this information and provide a markup in your response.
2. Identify the “other monitors” described and discuss how they are used to calculate primary-to-secondary leakage rates to ensure the validity of these methods. Revise the DCD to include this information and provide a markup in your response.
3. Revise DCD Section 11.5.2.4.2 to include the information identifying use of the condenser vacuum pump exhaust line radiation monitors as primary monitors and how they are used to estimate primary-to-secondary leakage rate using fission gas activity in the RCS, and provide a markup in your response.
4. Identify the “other isotopes” described and discuss how these isotopes are used to estimate primary-to-secondary leakage rate in condenser exhaust gas when fission gas concentrations are low in the RCS given that Ar-41 composition in air is very small (<1%). Revise the DCD to include this information and provide a markup in your response.

### 11.05-14

In response to the Staff’s question (RAI 249-1978, Question 11.05-7) it states,

“The ranges of the radiation monitors described in DCD Tables 11.5-1 through 11.5-3 provide the capability to detect SG Tube leakage of an amount in conformance with NEI 97-06 and EPRI Guidelines. These three types of radiation monitors are identified in DCD Tier 1 in Table 2.7.6.6-1 and the ITAAC information is given in Table 2.7.6.6-2.”

The Staff reviewed Section 2.7.6.6, and Tables 2.7.6.6-1 and 2.7.6.6-2 in Tier 1 of the DCD, but was not able to find the ITAAC to address the sensitivity, response time, and alarm limit for the SG tube leak detection instruments.

The Staff requests the Applicant to:

1. Provide the ITAAC in Tier 1 of the DCD to address the sensitivity, response time, and alarm limit of the SG tube leak detection instruments. Revise the DCD to include this information and provide a markup in your response.

### 11.05-15

In response to the Staff’s question (RAI 249-1978, Question 11.05-8) it states,

## REQUEST FOR ADDITIONAL INFORMATION 400-3032 REVISION 0

“These monitors are the part of the Process and Effluent Radiological Monitoring System and their preoperational test is described in DCD Section 14.2.12.1.78 for operation.

The Staff reviewed Section 14.2.12.1.78 in Tier 2 of the DCD, but was not able to find the sensitivity, response time, and alarm limit of the SG tube leak detection instruments being included in the tests.

The Staff requests the Applicant to:

1. Provide the preoperational tests in Tier 2 of the DCD to demonstrate the sensitivity, response time, and alarm limit of the SG tube leak detection instruments. Revise the DCD to include this information and provide a markup in your response.

### 11.05-16

In response to the Staff's question (RAI 249-1978, Question 11.05-9) to describe design features of the main steam line radiation monitors in regards to environmental factors it states,

“The main steam line radiation monitor detectors and other instruments will be placed away from the main steam lines, detecting gamma ray from radioactive nuclides which come through the wall of the main steam line pipe and the room where the monitors will be placed is ventilated. The monitors will not be affected by high temperature and humidity of main steam.”

“The detectors will be shielded to minimize the effect of gamma radiation except from the steam line being monitored.”

“... detectors will be shielded to minimize ambient radiation effects.”

The Staff requests the Applicant to:

1. Revise the DCD to include this information and provide a markup in your response.

### 11.05-17

In response to the Staff's question (RAI 249-1978, Question 11.05-10, item 2) to require a check source (or justify its exclusion) for the four main steam line accident monitors it states,

“To verify the function of the main steam line accident monitors, we will use a radiation source which indicates lower than the low limit of the measurement range. The monitoring system measures the resulting signal with output for the operators, and verifies the function of the detector by detecting loss of signal. For associated electronics, the test signal generating system and electronics will be verified by that signal.”

## REQUEST FOR ADDITIONAL INFORMATION 400-3032 REVISION 0

In response to the Staff's question (RAI 249-1978, Question 11.05-10, item 4) to provide the isotope to calibrate (or justify its exclusion) the high sensitivity main steam line (N-16 ch) monitors it states,

“detectors which will be installed at the plant are examined by another isotope which emits lower energy gamma rays and associated with the response for N-16 by analysis or type test.”

The Staff requests the Applicant to:

1. Revise Table 11.5-1 to include the information on how the function of the main steam line accident monitors is verified and provide a markup in your response.
2. Describe how performance monitoring checks are performed and trended in accordance with Section 4.3.3 of EPRI TR-104788-R2 (2000). Revise the DCD to include this information and provide a markup in your response.
3. Address the potential energy response dependence for detectors that will be installed when using another isotope of lower energy to calibrate the N-16 channel.
4. Provide the isotope used to calibrate the high sensitivity main steam line (N-16 ch) monitors such as the reference source or other qualified source described in Section 4.3.2.4 of EPRI TR-104788-R2 (2000). Revise DCD Table 11.5-1 to include this information and provide a markup in your response.