



**HITACHI**

**GE Hitachi Nuclear Energy**

James C. Kinsey  
Vice President, ESBWR Licensing

PO Box 780 M/C A-55  
Wilmington, NC 28402-0780  
USA

T 910 675 5057  
F 910 362 5057  
jim.kinsey@ge.com

MFN 07-179, Supplement 1

Docket No. 52-010

December 14, 2007

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

Subject: **Response to Portion of NRC Request for Additional Information  
Letter No. 93 Related to ESBWR Design Certification Application,  
Process Radiation Monitoring System ITAAC, RAI 14.3-139 S01**

Enclosure 1 contains GEH's response to the subject RAI transmitted via the Reference 1 letter.

If you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,

James C. Kinsey  
Vice President, ESBWR Licensing

*Dals  
MRO*

Reference:

1. MFN 07-106, Letter from U.S. Nuclear Regulatory Commission to David H. Hinds, *Request for Additional Information Letter No. 93 Related to ESBWR Design Certification Application*, January 31, 2007.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 93 Related to ESBWR Design Certification Application, Process Radiation Monitoring System ITAAC, RAI 14.3-139 S01

cc: AE Cabbage            USNRC (with enclosure)  
GB Stramback        GEH/San Jose (with enclosure)  
RE Brown            GEH/Wilmington (with enclosure)  
DH Hinds            GEH/Wilmington (with enclosure)  
eDRF                0000-0077-1455

**Enclosure 1**

**MFN 07-179, Supplement 1**

**Response to Portion of NRC Request for**

**Additional Information Letter No. 93**

**Related to ESBWR Design Certification Application**

**Process Radiation Monitoring System ITAAC**

**RAI Number 14.3-139 S01**

**NRC RAI 14.3-139 (original):**

*A review of DCD Tier 1, Rev. 2, Section 2.3.1 and Table 2.3.1-1 indicates that there are no ITAACs defining prerequisite system conditions in preparation to the conduct of necessary tests and inspections, and that they do not provide information about the types of tests and acceptance criteria that will be used to confirm that the Process Radiation Monitoring System (PRMS) will be built and will operate in accordance with all design commitments. As referred to in Table 2.3.1-1, the tests described in Section 2.3.1 are abbreviated functional descriptions of each PRMS subsystem and do not provide functional details on test objectives and requirements, and acceptance criteria that need to be used in complying with the intended purpose of ITAACs. Address the following as they relate to the PRMS used in monitoring and controlling radioactive liquid and gaseous process and effluent streams:*

*A. Describe prerequisite system conditions in preparation for the conduct of tests and inspections, including as-built post-construction inspections and pre-operational testing, including:*

*i. confirmation of the proper installation of the types and number of radiation detector channels, interface with valves and dampers requiring isolation or diversion of effluent/process streams, checks of electrical wiring, location of control and alarm panels (main and remote), process and effluent streams sampling systems, etc.*

*ii. cleaning, flushing, venting, filling, pressure testing, etc., following the installation of all mechanical components.*

*iii. conduct of post-construction functional tests and pre-operational system calibration tests (electronic and radioactive standards) in confirming the operation of each subsystem, detection sensitivity, dynamic operational ranges, etc.*

*B. Describe tests, test objectives and requirements, and acceptance criteria in complying with all associated ITAACs.*

*Accordingly, update the DCD as described above to include descriptions of post-construction and pre-operational testing, test objectives and requirements, and acceptance criteria*

**GEH Response:**

DCD Tier 2, Rev 3, Subsection 14.2.8.1.16 meets the intent on the level of details requested by this RAI. However, the finer design details are not within the scope of Tier 2, and thus, cannot be included in Tier 1.

DCD Tier 1, Subsection 2.3.1 was significantly updated in Rev. 3, and covers the top level items requested in the RAI. Within the scope applicable to a Tier 1 document, the Process Radiation Monitoring system design and ITAAC are complete. The additional details requested such as checks of electrical wiring, location of control alarm panels (main and remote), cleaning, flushing, venting, filling, etc. will be developed during the detailed design phase. Additionally, these types of details are highly subject to change, and thus, are not within the scope of the design certification information within Tier 1.

**DCD Impact:**

DCD Tier 1, Subsection 2.3.1 was adequately revised in DCD Revision 3. Therefore, no other change will be made with respect to this RAI.

**NRC RAI 14.2-139 S01:**

*In Revision 3 of the DCD, Tier 1, the applicant proposed responses to this RAI omit specific design commitments. Specifically, DCD Tier 1, Rev 3, Table 2.3.1-2 (line item 4 across the table) is inconsistent in describing design commitments and acceptance criteria as compared with the text of Tier 1 Section 2.3.1. In addition to confirming that the PRMS provides the required types of alarm functions, the design commitment and acceptance criteria fail to specify two specific operational functions for the applicable subsystems of the PRMS. The omitted design commitments; inspections, test, and analyses; and acceptance criteria in Tier 1 Table 2.3.1-2 are:*

*a. confirm that each subsystem properly isolates and/or terminates plant processes or effluent releases, and*

*b. confirm that each subsystem provides proper indications and responses to high radiation and downscale and inoperative conditions.*

*Accordingly, the applicant needs to revise line item 4 in Tier 1 Table 2.3.1-2 to include the above requirements as described in Tier 1 Section*

*2.3.1 so as to be consistent with DCD Tier 2 Sections 11.5 and 14.2.8.1.16.*

*The proposed text of DCD Chapter 14.2.8.1.16 (Rev. 3) was found to be acceptable.*

**GEH Response:**

- a. The isolation functions that are initiated by the PRMS are described in Tier 1 Subsection 2.3.1 and Tier 2 Section 11.5, mainly from the point of view of the I&C logic execution outcome. GEH agrees that one new entry will be added to provide a test commitment to ensure that appropriate isolation or termination requirements are met.

Tier 1 Subsection 2.3.1 and Table 2.3.1-2 will be changed to reflect that "Safety-related PRMS subsystems initiate preventive actions to isolate and/or terminate plant processes or effluent releases as described in Table 2.3.1-1." in Revision 5.

- b. This requirement is covered by Item 4.e of Table 2.3.1-2, which has been included in Revision 4 of Tier 1. No additional change is needed for this item.

**DCD Impact:**

DCD Tier 1 Subsection 2.3.1 and Table 2.3.1-2 will be revised as shown on the following Tier 1 markups.

ESBWR

26A6641AB Rev. 0405

Design Control Document/Tier 1

## **2.3 RADIATION MONITORING SYSTEMS**

The following subsections describe the major radiation monitoring systems for the ESBWR.

### **2.3.1 Process Radiation Monitoring System**

#### **Design Description**

The Process Radiation Monitoring System (PRMS) monitors and provides for indication of radioactivity levels in process and effluent gaseous and liquid streams, initiates protective actions, and activates alarms in the Main Control Room (MCR) on high radiation signals. Alarms are activated when a monitor becomes inoperative or goes upscale/downscale. The PRMS safety-related channel trip signals are provided as inputs to the Safety System Logic and Control (SSLC) for generation of protective action signals.

- (1) The functional arrangement of the PRMS is as described in the Design Description of this Subsection 2.3.1 and Figure 2.3.1-1 in conjunction with Table 2.3.1-1.
- (2)
  - a. The safety-related PRMS subsystems as identified in Table 2.3.1-1 are powered from uninterruptible safety-related power sources.
  - b. The safety-related PRMS subsystems identified in Table 2.3.1-1 have electrical divisional separation.
- (3) The safety-related process monitors listed in Table 2.3.1-1 are seismic Category I and can withstand seismic design basis loads without loss of safety function.
- (4) Safety-related PRMS subsystems provide the following:
  - a. Indications in MCR for radiation levels
  - b. Indications on SCUs for radiation levels
  - c. Alarms in MCR on radiation level exceeding setpoint
  - d. Indications on SCUs on radiation level exceeding setpoint
  - e. Alarms in MCR on upscale/downscale or inoperative conditions.
- (5) The nonsafety-related process monitors listed in Table 2.3.1-1 are provided.
- (6) Safety-related PRMS subsystems initiate preventive actions to isolate and/or terminate plant processes or effluent releases as described in Table 2.3.1-1.

Refer to Subsection 2.2.15 for "Instrumentation and Controls Compliance with IEEE Standard 603."

#### **Inspections, Tests, Analyses and Acceptance Criteria**

Table 2.3.1-2 provides a definition of the inspections, tests and/or analyses, together with the associated acceptance criteria for the PRMS. As appropriate, each of the ITAAC in Section 2.3.1 may be closed on a system-by-system basis throughout construction, in order that the PRMS subsystems may be placed in service.

26A6641AB Rev. 0405

ESBWR

Design Control Document/Tier 1

**Table 2.3.1-2**  
**ITAAC For The Process Radiation Monitoring System**

<b>Design Commitment</b>	<b>Inspections, Tests, Analyses</b>	<b>Acceptance Criteria</b>
<p>4. Safety-related PRMS subsystems provide the following:</p> <ul style="list-style-type: none"> <li>a. Indications in MCR for radiation levels</li> <li>b. Indications on SCUs for radiation levels</li> <li>c. Alarms in MCR on radiation level exceeding setpoint</li> <li>d. Indications on SCUs on radiation level exceeding setpoint</li> <li>e. Alarms in MCR on upscale/downscale or inoperative conditions.</li> </ul>	<p>Tests will be conducted by simulating a high radiation signal or portable gamma source that exceeds a setpoint value that is preset for the testing. Inspections will be conducted to confirm that the as-built indication and alarm requirements are met.</p>	<p>Test/inspection Reports exist and document that the as-built indication and alarm requirements are met.</p>
<p>5. The nonsafety-related process monitors listed in Table 2.3.1-1 are provided.</p>	<p>Inspection for the existence of the monitors will be performed.</p>	<p>Inspection reports document that the nonsafety-related monitors exist.</p>
<p>6. Safety-related PRMS subsystems initiate preventive actions to isolate and/or terminate plant processes or effluent releases as described in Table 2.3.1-1.</p>	<p>Tests will be conducted to confirm that the preventive actions are initiated and proper isolation and/or termination are secured on simulated high radiation levels. These tests will be performed in conjunction with each subsystem that contains the isolation boundaries.</p>	<p>Tests reports exist and document that the preventive actions requirements are met.</p>