ArevaEPRDCPEm Resource

From: RYAN Tom (AREVA) [Tom.Ryan@areva.com]
Sent: Friday, March 21, 2014 1:31 PM
To: Hearn, Peter
Cc: Wunder, George; HOTTLE Nathan (AREVA); GUCWA Len (EXTERNAL AREVA); UYEDA Graydon (AREVA); SEALS Jeff (AREVA); RANSOM Jim (AREVA); LEIGHLITER John (AREVA); WILLIFORD Dennis (AREVA); RYAN Tom (AREVA); ROMINE Judy (AREVA); DELANO Karen (AREVA); WILLS Tiffany (AREVA); BALLARD Bob (AREVA); KOWALSKI David (AREVA); MUSGRAVE Jennifer (AREVA)
Subject: Advanced Response to US EPR DC FINAL RAI 610_CIB_7261, Chapter 10, Balance of Plant, Question 10.04.08-9
Attachments: RAI 610 Q 10.04.08-9 Advanced Response US EPR DC.pdf

Pete,

To support a final response date of May 29, 2014, an Advanced Response for RAI No. 610, Question 10.04.08-9 is provided in the attached file, "RAI 610 Q 10.04.08-9 Advanced Response US EPR DC.pdf."

To keep our commitment to send a final response to these questions by the final response date, we need to receive all NRC staff feedback and comments no later than April 28, 2014.

Please let me know if NRC staff has any questions or if this response can be sent as final.

Sincerely,

Tom Ryan
Manager, US EPR DCD
Regulatory Affairs
AREVA
7207 IBM Drive - CLT2B
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From: GUCWA Len (External AREVA INC)
Sent: Friday, March 14, 2014 6:00 PM
To: peter.hearn@nrc.gov
Cc: Wunder, George (George.Wunder@nrc.gov); HOTTLE Nathan (EP/PE); GUCWA Len (External AREVA INC); UYEDA Graydon (EP/PE); SEALS Jeff (EP/PE); RANSOM Jim (RS/NB); LEIGHLITER John (RS/NB); WILLIFORD Dennis (RS/NB); RYAN Tom (RS/NB); ROMINE Judy (RS/NB); DELANO Karen (RS/NB); WILLS Tiffany (CORP/IND); BALLARD Bob (EP/PE); KOWALSKI David (RS/NB); MUSGRAVE Jennifer (CORP/IND)
Subject: Advanced Response: US EPR DC FINAL RAI 610, Chapter 10, Balance of Plant

Pete,

To support a final response date of May 15, 2014, an Advanced Response for RAI No. 610, Questions 10.04.08-5 through 10.04.08-8 and 10.04.08-10 are provided in the attached file, "RAI 610 Advanced Response US EPR DC.pdf."

To keep our commitment to send a final response to these questions by the final response date, we need to receive all NRC staff feedback and comments no later than **April 14, 2014**.

AREVA requires additional time to address Question 10.04.08-9. The new schedule for this question is provided below. The schedule for the remaining questions is unchanged.

Question #	Advanced Response Date	NRC Comment Request Date	Final Response Date
RAI 610 — 10.04.08-5	March 14, 2014	April 14, 2014	May 15, 2014
RAI 610 — 10.04.08-6	March 14, 2014	April 14, 2014	May 15, 2014
RAI 610 — 10.04.08-7	March 14, 2014	April 14, 2014	May 15, 2014
RAI 610 — 10.04.08-8	March 14, 2014	April 14, 2014	May 15, 2014
RAI 610 — 10.04.08-9	**March 27, 2014**	**April 28, 2014**	**May 29, 2014**
RAI 610 — 10.04.08-10	March 14, 2014	April 14, 2014	May 15, 2014

Please let me know if NRC staff has any questions or if this response can be sent as final.

Sincerely,

Len Gucwa, P.E.
404-673-2739 cell

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 4844

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Advanced Response to

Request for Additional Information No. 610, Question 10.04.08-9

11/06/2013
U.S. EPR Standard Design Certification
AREVA Inc.
Docket No. 52-020
SRP Section: 10.04.08 - Steam Generator Blowdown System
SRSB Branch

Question 10.04.08-9:

Discuss your plans to ensure that the SGBS information in FSAR Rev. 5, Tier 1, Section 2.8.7, is consistent with the corresponding information in Tier 2, Section 10.4.8. For example, safety-related steam generator blowdown isolation based on high main steam activity and a partial cooldown signal is listed in Tier 1, Section 2.8.7, Items 1.0 and 4.4, but this isolation function is not discussed in Tier 2, Section 10.4.8, Subsection 10.4.8.2.2, in the description of the blowdown isolation valves. Similarly, Tier 1, Section 2.8.7, Item 4.4 states that the SGBS is isolated on high temperature downstream of the blowdown coolers, but this does not appear to be in Tier 2, Section 10.4.8.

Response to Question 10.04.08-9:

The list of safety-related functions performed by the steam generator blowdown system (SGBS) provided in U.S. EPR FSAR Tier 1, Section 2.8.7, Item 1.0 will be revised for consistency with U.S. EPR FSAR Tier 2, Section 10.4.8.1. The non-safety-related functions for the SGBS will be removed from U.S. EPR FSAR Tier 1, Section 2.8.7, Item 1.0 for consistency with U.S. EPR FSAR Tier 2, Section 10.4.8.1. These functions are listed in U.S. EPR FSAR Tier 1, Section 2.8.7, Item 4.4.

U.S. EPR FSAR Tier 1, Section 2.8.7, Item 4.4 will be revised to include additional isolation functions identified in Tier 2, Section 10.4.8.

U.S. EPR FSAR Tier 2, Section 10.4.8.3 identifies the SGBS functions that provide isolation. Blowdown isolation based on high main steam activity with a partial cooldown signal is listed in U.S. EPR FSAR Tier 2, Section 10.4.8.3.3. This information is consistent with information provided in U.S. EPR FSAR Tier 1, Section 2.8.7, Item 4.4. The list of isolation functions indicated in the description of the SG blowdown isolation valves in U.S. EPR FSAR Tier 2, Section 10.4.8.2.2 was incomplete, and it will be deleted to avoid misinterpretation because the functions are included in U.S. EPR FSAR Tier 2, Section 10.4.8.3.

U.S. EPR FSAR Tier 1, Figure 2.8.7-1—Steam Generator Blowdown System Functional Arrangement and U.S. EPR FSAR Tier 2, Section 10.4.8.3.2 will be revised and U.S. EPR FSAR Tier 1, Section 2.8.7, ITAAC Item 4.5 will be added to clarify that the blowdown demineralizer isolation valve (30GDA10AA013) closes upon receipt of a high temperature signal downstream of the demineralizer. U.S. EPR FSAR Tier 2, Section 10.4.8.3.2 states that this valve is automatically closed if the temperature of the blowdown water downstream of the second stage blowdown cooler reaches 131°F. The flash tank is then prevented from draining to the condenser, causing an increase in flash tank water level. The blowdown operation is stopped by the automatic closure of the SG blowdown adjusting valves or SG blowdown isolation valves on high water level.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.8.7, Items 1.0 and 4.4, Table 2.8.7-3—Steam Generator Blowdown System ITAAC, Item 4.4, and Figure 2.8.7-1—Steam Generator Blowdown System Functional Arrangement will be revised as described in the response and indicated on the enclosed markup.

New ITAAC Item 4.5 will be added to U.S. EPR FSAR Tier 1, Section 2.8.7 and Table 2.8.7-3–Steam Generator Blowdown System ITAAC as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 2, Sections 10.4.8.2.2 and 10.4.8.3.2 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

2.8.7 Steam Generator Blowdown System

Design Description

1.0 System Description

The steam generator blowdown system (SGBS) is a non-safety-related system with safety-related portions. It assists in maintaining the chemical characteristics of the secondary water within permissible limits. The SGBS is safety related from its connections to the steam generators to the outer containment isolation valves, including the SG transfer lines. The remaining portion of the blowdown system downstream of the outer containment isolation valves is non-safety-related.

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The SGBS provides the following safety-related functions:

- Containment isolation.
- SG blowdown isolation~~, including isolation of the SG transfer lines (emergency feedwater (EFW) actuation signal, or high main steam activity signal with a partial cooldown signal, or high SG level signal with a partial cooldown signal)~~.
- Interconnection of steam generators.

~~The SGBS provides the following non-safety-related functions:~~

- ~~SG blowdown isolation on high radioactivity signal from radiation monitors (R-46, R-47, R-48, R-49) with a partial cooldown signal.~~
- ~~SG blowdown isolation on a high temperature downstream of the blowdown coolers.~~

2.0 Arrangement

2.1 The functional arrangement of the SGBS is as described in the Design Description of Section 2.8.7, Tables 2.8.7-1— SGBS Equipment Mechanical Design and 2.8.7-2— SGBS Equipment I&C and Electrical Design, and as shown on Figure 2.8.7-1—SGBS Functional Arrangement.

2.2 Deleted.

3.0 Mechanical Design Features

3.1 Valves listed in Table 2.8.7-1 will be functionally designed and qualified such that each valve is capable of performing its intended function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions up to and including design basis accident conditions.

3.2 Equipment identified as RW-IIc in Table 2.8.7-1 can withstand design basis loads listed in Regulatory Guide 1.143 without a loss of structural integrity.

3.3 Equipment identified as Seismic Category I in Table 2.8.7-1 can withstand seismic design basis loads without a loss of safety function(s).

3.4 ASME Code Class 2 piping systems are designed in accordance with ASME Code Section III requirements.

3.5 As-built ASME Code Class 2 components listed in Table 2.8.7-1 are reconciled with the design requirements.

3.6 Pressure-boundary welds in ASME Code Class 2 components listed in Table 2.8.7-1 meet ASME Code Section III non-destructive examination requirements.

3.7 ASME Code Class 2 components listed in Table 2.8.7-1 retain their pressure-boundary integrity at their design pressure.

3.8 ASME Code Class 2 components listed in Table 2.8.7-1 are fabricated, installed, and inspected in accordance with ASME Code Section III requirements.

3.9 Deleted.

3.10 Deleted.

3.11 Deleted.

3.12 Deleted.

3.13 Deleted.

4.0 I&C Design Features, Displays, and Controls

4.1 Displays listed in Table 2.8.7-2 are indicated on the PICS operator workstations in the MCR and the RSS.

4.2 Controls on the PICS operator workstations in the MCR and the RSS perform the function listed in Table 2.8.7-2.

4.3 Equipment listed as being controlled by a priority and actuator control system (PACS) module in Table 2.8.7-2 responds to the state requested and provides drive monitoring signals back to the PACS module. The PACS module will protect the equipment by terminating the output command upon the equipment reaching the requested state.

4.4 Upon receipt of the following signals, the SGBS blowdown isolation valves listed in Table 2.8.7-2 close for the affected SG:

- EFW actuation signal.
- High main steam activity signal from radiation monitors with a partial cooldown signal.
- High SG water level signal with a partial cooldown signal.

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- High blowdown radioactivity signal from radiation monitors ~~(R-46, R-47, R-48, R-49)~~ with a partial cooldown signal.
- ~~High temperature signal downstream of the blowdown coolers.~~
- Containment isolation actuation signal.
- Main steam isolation signal with low SG pressure or high SG pressure drop.

4.5 The blowdown demineralizer isolation valve closes upon receipt of a high temperature signal downstream of the demineralizer.

5.0 Electrical Power Design Features

5.1 Equipment designated as Class 1E in Table 2.8.7-2 are powered from the Class 1E division as listed in Table 2.8.7-2 in a normal or alternate feed condition.

5.2 Deleted.

6.0 Environmental Qualifications

6.1 Equipment designated as harsh environment in Table 2.8.7-2 can perform the function listed in Table 2.8.7-1 under normal environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions.

7.0 Equipment and System Performance

7.1 Class 1E valves listed in Table 2.8.7-2 will function to change position as listed in Table 2.8.7-1 under normal operating conditions.

7.2 Deleted.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8.7-3 lists the SGBS ITAAC.

Table 2.8.7-3—Steam Generator Blowdown System ITAAC
Sheet 5 of 7

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.4	Upon receipt of the following signals, the SGBS isolation valves listed in Table 2.8.7-2 close for the affected SG: • EFW actuation signal. • High main steam activity signal from radiation monitors with a partial cooldown signal. • High SG water level signal with a partial cooldown signal. • High blowdown radioactivity signal from radiation monitors ~~(R-46, R-47, R-48, R-49)~~ with a partial cooldown signal. • Containment isolation actuation signal. • Main steam isolation signal with low SG pressure or high SG pressure drop. • ~~High temperature signal downstream of the blowdown coolers.~~	A test will be performed to verify that upon receipt of the following signals, the SGBS isolation valves close for the affected SG: • EFW actuation signal. • High main steam activity signal from radiation monitors with a partial cooldown signal. • High SG water level signal with a partial cooldown signal. • High blowdown radioactivity signal from radiation monitors ~~(R-46, R-47, R-48, R-49)~~ with a partial cooldown signal. • Containment isolation actuation signal. • Main steam isolation signal with low SG pressure or high SG pressure drop. • ~~High temperature signal downstream of the blowdown coolers.~~	Upon receipt of the following signals, the SGBS isolation valves listed in Table 2.8.7-2 close for the affected SG: • EFW actuation signal. • High main steam activity signal from radiation monitors with a partial cooldown signal. • High SG water level signal with a partial cooldown signal. • High blowdown radioactivity signal from radiation monitors ~~(R-46, R-47, R-48, R-49)~~ with a partial cooldown signal. • Containment isolation actuation signal. • Main steam isolation signal with low SG pressure or high SG pressure drop. • ~~High temperature signal downstream of the blowdown coolers.~~
4.5	The blowdown demineralizer isolation valve closes upon receipt of a high temperature signal downstream of the demineralizer.	A test will be performed to verify that the blowdown demineralizer isolation valve closes upon receipt of a high temperature signal downstream of the demineralizer.	The blowdown demineralizer isolation valve closes upon receipt of a high temperature signal downstream of the demineralizer.

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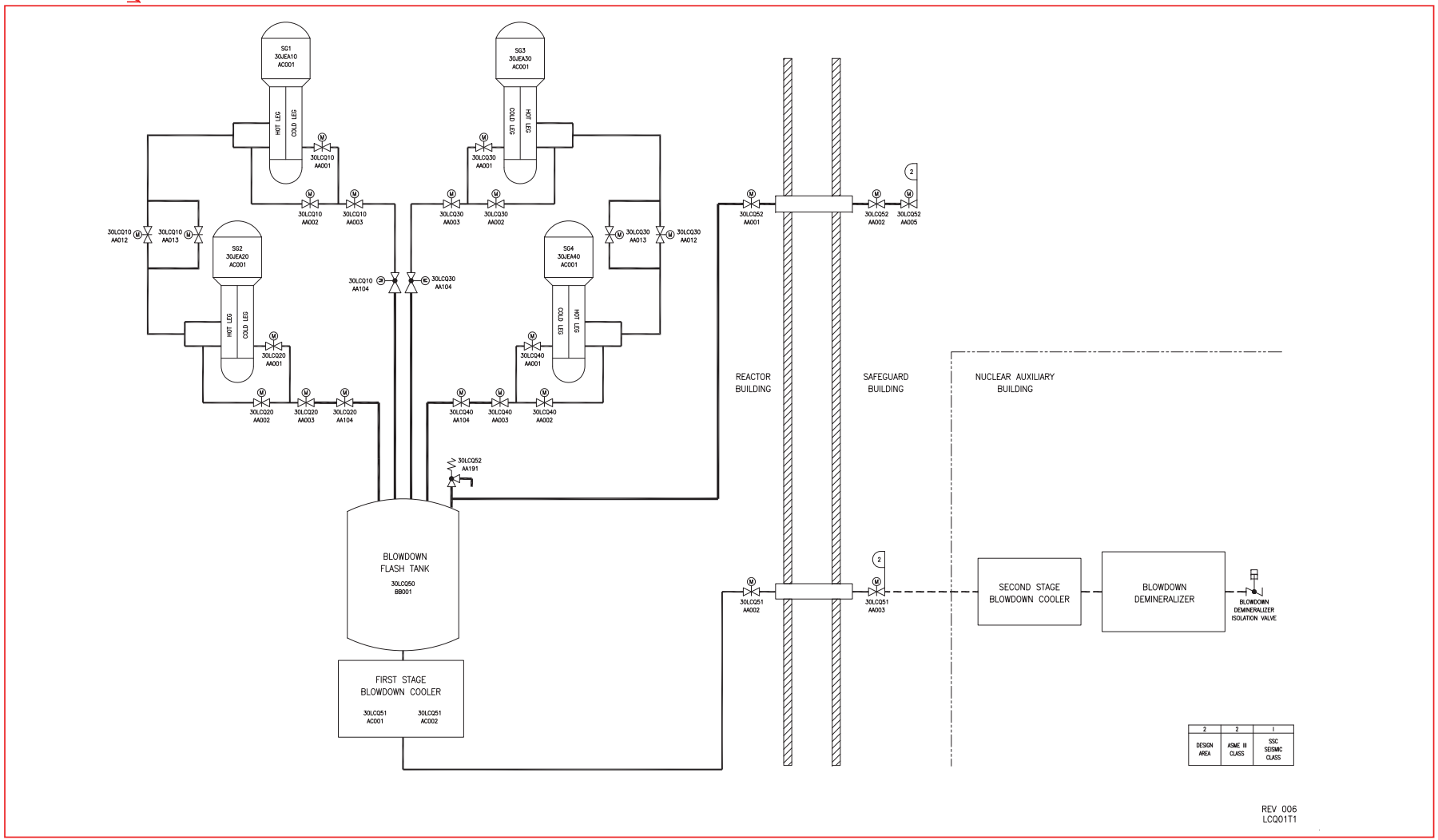
Figure 2.8.7-1—Steam Generator Blowdown System Functional Arrangement



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10.4.8.2.2 Component Description

Table 3.2.2-1 provides the seismic design and other design classifications for components in the SGBS. Section 3.2 describes how the guidance of RG 1.26 and RG 1.29 is implemented for the U.S. EPR.

SG Blowdown Isolation Valves

There are safety-related, electric motor operated, blowdown isolation valves on the hot and cold leg blowdown lines of each SG and a safety-related, electric motor operated, redundant valve on the common blowdown line from each SG. The common blowdown line isolation valves have a diverse power supply from the upstream hot and cold leg blowdown isolation valves. Closing the blowdown isolation valves prevents loss of SG secondary inventory.

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Process controls are provided to automatically isolate if the flash tank water level or pressure exceeds allowable limits, if the flash tank safety relief valve opens, or if the blowdown flow rate from a SG exceeds allowable limits.

SG Transfer Lines

The SG transfer lines are used to depressurize a stagnant SG during an SGTR plus LOOP event. These transfer lines are intended to transfer the content of the affected (i.e., stagnant) SG to the unaffected SG. These transfer lines link SGs 1 to 2 and SGs 3 to 4. For redundancy, each transfer line is equipped with two isolation valves, which are in parallel with each other.

Blowdown Flow Rate Adjusting Valves

The blowdown flow rate adjusting valves are designed to discharge the required SG blowdown flow to the flash tank.

Blowdown Flash Tank

Internal volume is sufficient to control the flash tank pressure and level within a narrow range. Nozzles are welded into the vertical shell, top and bottom. Four of the nozzles on top of the tank are for the SG blowdown inlet. The flashed steam is removed from a separate nozzle on the top head. The liquid drains from a nozzle on the lower head. There is an impurity pipe trap on the bottom of the flash tank. The tank is protected against overpressure by the flash tank safety relief valve, in conformance with the ASME Boiler and Pressure Vessel (BPV) Code, Section III-NC (Reference 1).

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blowdown is reduced or stopped by closing the SG blowdown flow rate adjusting valves and/or SG blowdown isolation valves. Valves are closed automatically upon reaching a setpoint water level to prevent the water hammer that could occur inside the flash tank if the water level were to reach the flash tank inlet nozzles.

The isolation valve downstream of the demineralizer is automatically closed to protect the SG blowdown demineralizer resin if the temperature of the blowdown water downstream of the second stage blowdown coolers reaches 131°F. The temperature limit could be exceeded if the main condensate flow or component cooling water flow (or both) is too low; or if the main condensate temperature or component cooling water temperature (or both) is too high; or if the flash tank pressure is too high. When the blowdown demineralizer isolation valve closes, the flash tank water level increases and the blowdown operation is stopped by the automatic closure of the SG blowdown adjusting valves or SG blowdown isolation valves.

In special cases, the entire SG blowdown demineralizing system can be bypassed around to the main condenser, or the blowdown can also be bypassed to the liquid waste storage system instead of to the main condenser. The blowdown can be manually discharged to the liquid waste management system if radioactivity is detected in the blowdown. Radiation monitors are designed to isolate SGBS on high blowdown activity coupled with a partial cooldown signal; only the SGBS of the affected steam generator will be automatically isolated (See Section 11.5.4.3 and Table 11.5-1).

10.4.8.3.3 Accident Conditions

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The blowdown isolation valves isolate on a containment isolation signal or emergency feedwater (EFW) actuation signal, or mainsteam isolation signal with low SG pressure or high SG pressure drop. For steam generator tube rupture, radiation monitors are designed to isolate SGBS on main steam high activity coupled with a partial cooldown signal or high steam generator water level above the narrow range with a partial cooldown; only the SGBS of the affected steam generator will be automatically isolated (See Section 11.5.4.1 and Table 11.5-1).

10.4.8.4 Safety Evaluation

The design of the SGBS satisfies GDC 1 as it relates to system components being designed, fabricated, erected, and tested for quality standards.

- The safety-related portion of the SGBS is designed and fabricated to codes consistent with the quality group classification in accordance with RG 1.26 and the seismic category in accordance with RG 1.29. The design of the SGBS is Seismic Category I and Quality Group B from its connection to the SG inside primary containment up to and including the isolation valves outside