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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 62 – Reactor Component Cooling Water and Plant Service Water Systems – RAI Numbers 9.2-6, -8, -9, -11 and 9.2-13**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 letter.

If you have any questions about the information provided here, please let me know.

Sincerely,

Kathy Sedney for

David H. Hinds
Manager, ESBWR

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Reference:

1. MFN 06-380, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 62 Related to ESBWR Design Certification Application*, September 29, 2006

Enclosure:

1. MFN 06-417 – Response to Portion of NRC Request for Additional Information Letter No. 62 – Reactor Component Cooling Water and Plant Service Water Systems – RAI Numbers 9.2-6, -8, -9, -10, -11, and 9.2-13

cc:	AE Cubbage	USNRC (with enclosures)
	GB Stramback	GE/San Jose (with enclosures)
	eDRF	0059-6864, Rev. 2

MFN 06-417

Enclosure 1

Response to a Portion of NRC Request for

Additional Information Letter No. 62

Related to ESBWR Design Certification Application

Reactor Component Cooling Water System
Plant Service Water System

RAI Numbers 9.2-6, -8, -9, -11 and 9.2-13

NRC RAI 9.2-6:

Include a non-proprietary version of the Plant Service Water System (PSWS) and Reactor Component Cooling Water System (RCCWS) drawings, with legends, in the Design Control Document (DCD) with sufficient detail to permit the preparation of acceptance and inspection requirements by the NRC and showing system function, major equipment, components, piping classes, instrumentation, and interface systems.

GE Response:

Non-proprietary/non-sensitive versions of these Process and Instrumentation Drawings (P&IDs) are not currently available. Because preparation of a non-proprietary/non-sensitive version would effectively result in blank sheets with only title blocks, we have not provided such drawings in this response. Copies of the PSWS and RCCWS P&IDs were previously supplied on December 15, 2005 via GE letter MFN 05-164. If these copies are not adequate or sufficiently detailed for the NRC to prepare acceptance and inspection requirements – presumably as part of the construction inspection program – then GE and the NRC can determine the best approach for providing the information needed to make such preparation.

No DCD changes will be made in response to this RAI.

NRC RAI 9.2-8:

Demonstrate the capability for detection, control, and isolation of PSWS leakage, including radioactive leakage into and out of the system and prevention of accidental releases to the environment. Describe allowable operational degradation (e.g., pump leakage) and the procedures to detect and correct these conditions when they become excessive.

GE Response:

The PSWS is designed to detect, control, and isolate non-radioactive leakage by monitoring system flow rate through the piping. Flow rate reductions would indicate possible system water losses or pump degradation. If any such losses adversely impact operation, then the flow loss portion of PSWS could be isolated, identified and repaired without immediately impacting plant operations.

Radioactive leakage into PSWS can only occur following three consecutive failures:

1. RCCWS can only become contaminated by the interface with either RWCU/SDC or FAPCS, which could occur only by cross-contamination through the heat exchangers associated with those systems;
2. The RCCWS is equipped with radiation detectors (Reference DCD Tier 2, Rev. 2, Subsection 11.5.3.2.8 and Table 11.5-5). If these detectors alarm, the applicable train and/or equipment is isolated. If these alarms fail, a third failure is required to contaminate PSWS; and
3. After these two foregoing failures have occurred, a leak from the RCCWS process water into the PSWS cooling water in the RCCWS heat exchangers would then have to occur.

This type of consecutive failure scenario is highly unlikely. However, the PSWS design includes provisions for obtaining a grab sample in the unlikely event that there is leakage. The COL holder will also provide provisions for sampling the cooling tower blowdown (Reference Table 11.5-5).

No additional DCD Tier 2 changes will be made in response to this RAI.

NRC RAI 9.2-9:

Describe the measures provided for precluding long-term corrosion and organic fouling that would degrade PSWS performance.

GE Response:

The type of water (e.g., fresh or sea water) and the results of a water quality analysis for a future plant referencing the design certification will determine the material selection for all piping and pump parts wetted by raw PSWS water.

Revision 2 to DCD Tier 2, Subsection 9.2.1.2 has been clarified by deleting the following: "Provision for anti-fouling treatment of the PSWS is provided," and replacing with: "Provisions to preclude long-term corrosion and fouling of PSWS are provided."

NRC RAI 9.2-11:

Discuss the potential for water hammer as well as operating and maintenance procedures for avoidance of water hammer in the PSWS and RCCWS.

GE Response:

The system is designed to minimize the potential for water hammer with features to mitigate water hammer should it occur. Specifically, water hammer is mitigated through the use of various system design and layout features, including:

- Minimize high points in the system
- Provide for venting at all high points
- Procedural requirements ensuring proper line filling prior to system operation and following maintenance operations will be addressed by the COL applicant.
- Valve actuation times that are slow enough to prevent water hammer.
- Use of check valves at pump discharge to prevent backflow into the pump.

DCD Subsections 9.2.1 and 9.2.2 will be revised in the next revision to state PSWS and RCCWS meets GDC 4 with respect to water hammer.

NRC RAI 9.2-13:

Describe design provisions to detect RCCWS leakage of radioactive or chemical contamination and the locations of radioactivity and conductivity monitors.

GE Response:

Intersystem leakage in to RCCWS is monitored through four methods. First, if the system intrusion is radioactive, the RCCWS monitors will detect the increase in radioactivity. The RCCWS has radiation monitoring in each cooling water train at the pump suction return line upstream of the cross-tie header (reference attached mark up of DCD Tier 2, Rev 2 Subsection 11.5.3.2.8). Second, the flow of RCCWS water is constantly monitored throughout the system to provide detection of leakage from or to RCCWS. Third, using the chemical contamination level to detect intersystem leakage would not be an effective method for systems cooled by RCCWS because the water quality is equal to or better than that of RCCWS, so even if there were an intrusion from one of these systems, it would not adversely affect the water quality of RCCWS. A conductivity monitor could detect PSWS inleakage, but any leakage into RCCWS would result in the surge tank level increasing, and an increase in surge tank level without the makeup line in use indicates that there is an intrusion to RCCWS and corrective actions need to be taken. Provisions are made for grab sampling capability to monitor for any potential chemical contamination. The locations of the grab samples will be determined based on actual plant system routing. Therefore, the minimal benefit from adding conductivity monitors is not warranted to detect intersystem leakage into RCCWS.

Revision 3 to DCD Tier 2 Subsection 11.5.3.2.8 will reflect the radiation monitor locations as noted on the attached markup.

The ranges of channel display are shown in Table 11.5-1 and Table 11.5-2. These ranges are selected to provide indication of isotopic effluent concentrations provided in 10 CFR 20. The subsystem provides data for reports of airborne releases of radioactive materials in accordance with Regulatory Guide 1.21.

Liquid Radwaste Discharge RMS

This subsystem continuously monitors the radioactivity in the liquid radwaste during its discharge to the environment and stops the discharge on detection of a high radiation level.

Liquid waste can be discharged from the sample tanks containing liquids that have been processed through one or more treatment systems such as filtration, and ion exchange. During the discharge, the liquid is extracted from the liquid radwaste discharge process pipe, passed through a liquid sample panel that contains a detection assembly for radiation monitoring, and returned to the process pipe. The detection assembly consists of a detector mounted in a shielded sample chamber equipped with a check source. A local radiation monitor analyzes and visually displays the measured gross radiation level.

The sample panel chamber can be drained and flushed to allow assessment of background buildup. Sample line flow is measured and indicated on the sample panel. A check source can be used to check operability of the channel.

The radiation monitor has trip circuits that are used to stop the discharge to the environment.

The range of channel display is shown in Table 11.5-1 and Table 11.5-2. The liquid radwaste discharge radiation monitor provides data for reports of liquid releases of radioactive materials in accordance with Regulatory Guide 1.21. This monitor is used to demonstrate compliance with the liquid effluent release concentration limits of 10 CFR 20.

Reactor Component Cooling Water Intersystem Leakage RMS

This subsystem consists of two channels. Each RCCW heat exchanger train has its own radiation monitor. Each channel monitors for intersystem radiation leakage into the respective RCCWS loop and, as such, addresses the guidelines of RG 1.45.

Each channel consists of a detector that is located upstream of the pump suction crosstie header. . Each channel provides individual channel trips on high radiation level and downscale/inoperative indication for annunciation in the MCR.

Each RCCW radiation sampler is provided with a remotely controlled radioactive check source.

The range of channel display is shown in Table 11.5-1 and Table 11.5-2.