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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 62 – Auxiliary Systems – RAI Numbers 9.2-7, 9.2-10 and 9.2-12**

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

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

Sincerely,

/Kathy Sedney for

James C. Kinsey
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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. 69 Related to the ESBWR Design Certification Application*, September 29, 2006

Enclosures:

1. MFN 07-039– Response to Portion of NRC Request for Additional Information Letter No. 62 – Auxiliary Systems – RAI Numbers 9.2-7, 9.2-10 and 9.2-12

cc:

AE Cubbage	USNRC (with enclosure)
GB Stramback	GE/San Jose (with enclosure)
BE Brown	GE/Wilmington (with enclosure)
eDRF	0063-4699 for RAIs 9.2-7, 9.2-10 and 9.2-12

Enclosure 1

MFN 07-039

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 9.2-7, 9.2-10, and 9.2-12

NRC RAI 9.2-7:

Table 1.9-9 of the DCD, Tier 2, Rev 1, indicates that General Design Criteria (GDC) 44 is not applicable to PSWS and RCCWS because they are non-safety-related. GDC 44 applies to cooling water systems that transfer heat to an ultimate heat sink under normal operating conditions as well as during cooldown, shutdown, and accident conditions. These two systems are important to safety even though they are not safety-related; therefore GDC 44 applies to them. And if GDC 44 applies, so does GDCs 45 and 46. Demonstrate how these systems satisfy GDCs 44, 45, and 46.

GE Response:

GDC 44, 45, and 46 are based on plants with active, safety-related heat removal systems that discharge to an ultimate heat sink (UHS), such as a large body of water or a cooling tower.

DCD Tier 2 Subsection 3.1.4.15 provides the ESBWR Standard Plant evaluation for GDC 44. The ESBWR ultimate heat sink is the IC/PCC pool. In the event of a design basis accident, heat is transferred to the IC/PCC pool(s) through the Passive Containment Cooling System (PCCS). The water in the IC/PCC pool(s) is allowed to boil and the resulting steam is vented to the environment. The PCCS has no active components and requires no electrical motive power or control and instrumentation functions to perform its safety-related function of transferring heat to the ultimate heat sink. Therefore, no credible single failure can prevent the PCCS from performing its safety-related function. The requirements of Criterion 44 for heat transfer to the ultimate heat sink are met.

DCD Tier 2 Subsection 3.1.4.16 provides the ESBWR Standard Plant evaluation for GDC 45. The IC/PCC pool is located outside containment and is accessible for periodic inspections. During outages, the IC/PCC pool compartments can be drained to permit inspection of the condensers. PCCS piping inside containment can be inspected during outages (see the evaluation of Criterion 39). The features of the PCCS meet the requirements of Criterion 45.

DCD Tier 2 Subsection 3.1.4.17 provides the ESBWR Standard Plant evaluation for GDC 46. Redundancy and isolation are provided to allow periodic pressure testing of the PCCS. As discussed in the evaluation of Criterion 44 (DCD Tier 2 Subsection 3.1.4.15), the PCCS contains no active components; therefore, functional testing is not necessary. The periodic inspections described in the response to Criterion 45 verify system integrity. The design of the PCCS meets the requirements of Criterion 46.

10 CFR 50 Appendix A states that structures, systems and components (SSC) important to safety are those items "*that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public.*" Uncontrolled release of radioactive material into the environment or (at least) adversely affecting a safety-

related function is the only type of event that could involve an "*undue risk to the health and safety of the public*". Therefore, for the ESBWR, there is no technical basis for the RCCWS or PSWS to be categorized as safety related.

Additional Discussion:

Historically, reactor component cooling and plant service water systems performed the safety-related functions of cooling safety-related equipment during normal, transient, and accident conditions.

Compliance with GDC 44 requires that a system be provided to transfer heat from safety-related SSCs, to an UHS, and that the system must be capable of operating under normal and accident conditions assuming a single failure and a loss of offsite power. The ESBWR RCCWS and PSWS provide cooling during normal conditions and are not required to perform safety functions to mitigate design basis accidents (refer to the response to RAI 3.2-45, MFN 06-308 dated September 8, 2006). RCCWS and PSWS are non-safety-related; however, within ESBWR, these systems are designed to perform accident recovery functions. The RCCWS is required to provide post 72-hour cooling for Chillers and DG's and the PSWS is required for cooling the RCCWS post 72-hour (Response to RAI 19.1.0-2 submitted via MFN 07-066 dated January 30, 2007). The RCCWS and PSWS are designed to be a robust and reliable system to maintain plant reliability for power operation by incorporating redundant cooling water trains, parallel arrangement of major equipment and system cross-connects to support plant reliability. The RCCWS and PSWS do not transfer heat from any safety-related SSC. They are designed to transfer heat to a plant heat sink under normal conditions assuming a single failure and a loss of offsite power. Both RCCWS and PSWS will fall under the Regulatory Treatment of Non-Safety Systems (RTNSS) to provide cooling post 72-hour and post-SSE. These systems will meet the RTNSS requirements to be specified in DCD Appendix 19A.

Although RCCWS and PSWS are non-safety related systems, the RCCWS and PSWS meet GDC 44 by providing cooling water systems that are capable of rejecting heat to a plant heat sink under all normal conditions and part of accident recovery. These functions can be performed assuming a single failure concurrent with a loss of offsite power using nonsafety-related diesel power and the ability to isolate components or piping automatically or manually by use of parallel trains, cross-connected piping and redundant components. Additionally, these systems will withstand post-accident environments and remain functional after an SSE.

Compliance with GDC 45 requires that the cooling water system be designed to permit appropriate periodic inspection of important components (e.g., heat exchangers and piping) to ensure integrity and capability of the system. Both the PSWS and RCCWS are designed for periodic inspection of components to ensure the capability and integrity of the system per DCD Subsections 9.2.1.4 and 9.2.2.4 respectively. Therefore, both the PSWS and RCCWS meet the requirements for GDC 45.

Compliance with GDC 46 requires that the cooling water system be designed to permit appropriate periodic pressure and functional testing to ensure the leak-tight integrity and operability of components, as well as the operability of the system as a whole, at conditions as close to the design basis as practical. For the PSWS, testing of pumps and system is performed to simulate all normal modes of operation to the greatest extent practical and transfer between normal and standby power source is included in the periodic tests (DCD Subsection 9.2.1.4). Additionally, flow elements and transmitters are used in the PSWS return headers to monitor PSWS flow in the MCR and can be used to assist in leak detection (DCD Subsection 9.2.1.5). In DCD Chapter 9, Subsection 9.2.2.4, it is stated that the RCCWS contains provisions for inspection of major equipment as well as indicators for vital parameters required for testing and inspection. Also, the RCCWS will provide head tank level instrumentation to assist in leakage detection from the system (DCD Subsection 9.2.2.5). Therefore, both the PSWS and RCCWS meet GDC 45 requirements.

DCD Impact:

Based on the above, Table 1.9-9 of the DCD, Tier 2, will remain unchanged. The PSWS and RCCWS meet GDC 44, 45, and 46 as reflected in DCD Tier 2, Revision 3, Subsections 9.2.1 and 9.2.2 and Table 3.2-1. ESBWR compliance with GDC 44, 45 and 46 is discussed further in DCD Subsections 3.1.4.15 through 3.1.4.17.

NRC RAI 9.2-10:

Identify all alarms, instruments, and controls for PSWS, such as valve position, pressure, and temperature indications, radiation monitors, cooling tower basin level indications, etc.

GE Response:

DCD Tier 2, Revision 3, Subsection 7.4.2 provides the PSWS control requirements for remote shutdown. Other instruments, controls, and alarms will be finalized during the detailed design phase. The following is to be a list of expected instruments, controls, and alarms.

Each PSWS pump is control interlocked with its associated pump discharge motor-operated control valve (MCV), such that start initiation of a PSWS pump causes its associated pump discharge MCV to open.

A standby PSWS pump starts automatically under the following conditions:

a. Detection of a low system pressure signal.
b. Operating pump trip signal.
c. Loss of electric power to an operating pump.

The PSWS pumps are equipped with self-cleaning strainers that operate automatically upon a high differential pressure signal across the strainers.

Failure of a pump discharge motor-operated valve to open, results in the trip of the corresponding pump.

An active failure of one of the electrical buses results in the trip of the corresponding pump. The redundant standby pump automatically starts from an unaffected electrical bus.

Abnormal operating conditions are annunciated in the MCR. The PSWS active component operating status and system design parameters (e.g. pump flow rates, temperatures, pressures, etc., and component inoperable status) are monitored and indicated in the MCR.

Instrumentation is provided in the PSWS to indicate the following in the MCR:

a. PSWS pump motor current, winding temperature and bearing temperature monitoring in the MCR.

b. PSWS pump discharge pressure and discharge flow transmitters for use in performance trending.

c. Each pump discharge strainer is equipped with a pressure differential transmitter to indicate a high-pressure drop in the MCR.

d. PSWS pump discharge header pressure transmitters, flow transmitter and temperature elements are supplied for use in overall system performance trending and comparison with pump discharge pressure for pump performance verification and for use in starting of the standby pump.

e. A temperature element and flow transmitter is placed in the return lines prior to the mechanical draft cooling towers.

f. A temperature element is placed on the inlet and outlet of the service water side of each RCCWS and TCCWS heat exchanger in order to monitor PSWS water temperature.

g. Motor-operated and air-operated valve position indication.

h. A pressure differential transmitter shall be placed across the service water side of each RCCWS and TCCWS heat exchanger to indicate the pressure drop across the heat exchangers.

i. A discharge flow transmitter shall be placed after each RCCWS and TCCWS heat exchanger.

j. Flow control valve position indication.

k. Level transmitters shall be placed in each side of the PSWS basin to monitor water level.

l. PSWS return header pressure transmitters, flow transmitter, and temperature elements shall be supplied for use in overall system performance monitoring.

Annunciation is provided in the MCR for the following conditions:

a. A high differential pressure across pump discharge strainers.

b. High and low PSWS supply pressure.

c. High and low PSWS pump discharge flow.

d. High RCCWS/TCCWS heat exchanger inlet temperature.

e. High and low RCCWS/TCCWS heat exchanger outlet temperature.

f. PSWS pump trip and electrical status alarms.

g. PSWS standby pump auto-start.

h. A significant difference between the supply and return header flow.

i. PSWS pump motor winding high temperature.

j. PSWS pump bearing high temperature.

k. PSWS basin low water level

l. A high differential pressure across the PSWS side of the RCCWS/TCCWS heat exchangers.

m. Failure to open/close a motor-operated or air-operated valve.

DCD Impact:

DCD Tier 2, Revision 3, Subsection 9.2.1 reflects the attached information which is the necessary instrumentation for the ESBWR Standard Plant.

NRC RAI 9.2-12:

How do the PSWS, RCCWS, Makeup Water System (MWS), Condensate Storage and Transfer System (CS&TS), Chilled Water System (CWS), and Turbine Component Cooling Water System (TCCWS) satisfy GDC 2? Acceptance is based on meeting the guidance of Regulatory Position C.2 of Regulatory Guide 1.29 for non-safety-related portions.

GE Response:

Regulatory Position C.2 of Regulatory Guide 1.29 states that those portions of SSCs of which continued function is not required but of which failure could reduce the functioning of any plant feature included in Regulatory Position C.1, items 1.a through 1.q, to an unacceptable safety level or could result in incapacitating injury to occupants of the control room should be designed and constructed so that the SSE would not cause such failure.

There is no Makeup Water System (MWS) and Condensate Storage and Transfer System (CS&TS) piping in the control room that would incapacitate control room personnel. MWS containment penetrations and isolation valves are designed as Seismic Category I, and those portions within Seismic Category I buildings are designed as Seismic Category II (see DCD Table 3.2-1 and Subsection 9.2.3.1). The CS&TS also has portions within Seismic Category I buildings that are designed as Seismic Category II (see attached markup of DCD Table 3.2-1 and Subsection 9.2.6.1). Failure of either MWS or CS&TS will not compromise any safety-related system or component nor does it prevent a safe shutdown (DCD Subsections 9.2.3.3 and 9.2.6.3 respectively). Therefore, the MWS and CS&TS satisfy the requirements of GDC 2 because the failure of the nonsafety-related portions of the system does not impact any safety-related structures and will not degrade a safety-related system to an unacceptable safety level.

The RCCWS, TCCWS, and PSWS do not have any piping in the control room, and it is not possible for them to result in an incapacitating injury to occupants of the control room. None of these cooling water systems perform any safety-related function or interface with any safety-related component (DCD Subsections 9.2.1.1, 9.2.2.1, and 9.2.8.1) and all piping is designated as Seismic Category NS (DCD Table 3.2-1).

However, RCCWS, TCCWS and PSWS will be categorized under the Regulatory Treatment of Non-Safety Systems (RTNSS) in order to provide cooling functions post-SSE. RCCWS will be required to provide cooling to the DG's and NI Chillers. TCCWS will be required to provide cooling to the BOP Chillers. While the PSWS will be required to provide heat removal to the RCCWS and TCCWS heat exchangers. These systems will be designed to seismic requirements to be specified in DCD Appendix 19A. Therefore, the RCCWS, TCCWS, and PSWS satisfy the requirements of GDC 2 because the failure of the nonsafety-related portions of the systems does not impact any safety-

related structures and will not degrade a safety-related system to an unacceptable safety level. RCCWS, TCCWS and PSWS meet the intent of Position C.1 of Reg. Guide 1.29 by providing post-accident recovery cooling functions (Response to RAI 19.1.0-2).

CWS containment penetrations and isolation valves are designed as Seismic Category I, CWS portions within Seismic Category I buildings are designed as Seismic Category II, and the rest of the system is designed as non-seismic category according to RG 1.29 (see Table 3.2-1 and Subsection 9.2.7.1). The CWS does have piping in the control room, but it is not possible for these components to result in an incapacitating injury to occupants of the control room because the CWS components are designed to remain functional during and following a SSE.

Additionally, nonsafety-related portions of the CWS will be categorized under the Regulatory Treatment of Non-Safety Systems (RTNSS) in order to provide cooling functions post-SSE (Response to RAI 19.1.0-2 submitted via MFN 07-066 dated January 30, 2007). CWS will be required to provide cooling to remove heat from HVAC loads in the Reactor, Fuel Handling, Electrical, Control and Turbine Buildings. The Chilled Water System will be designed to the seismic requirements to be specified in DCD Appendix 19A. Therefore, the CWS satisfies the requirements of GDC 2 because the failure of the nonsafety-related portions of the system does not impact any safety-related structures and will not degrade a safety-related system to an unacceptable safety level. These systems are robust and meet the seismic requirements to be specified in DCD Appendix 19A to provide post-accident recovery cooling functions.

DCD Impact:

DCD Tier 2, Revision 3, Table 3.2-1 Item P25, P30 and Subsection 9.2.6.1 reflect this information.

Based on the above explanations, the RCCWS, TCCWS, and PSWS satisfy the requirements of GDC 2 as it pertains to Position C.2 of Reg. Guide 1.29. The PSWS, RCCWS, and TCCWS also meet the intent of GDC 2 as it pertains to Position C.1 of Reg. Guide 1.29. DCD Tier 2, Revision 3, Subsections 9.2.1, 9.2.2, and 9.2.8 reflect this information for PSWS, RCCWS and TCCWS, respectively.

Also, the CS&TS and CWS meet GDC 2 and compliance to Regulatory Guide (RG) 1.29. The applicable sections of RG 1.29 include Position C.1 for safety-related portions and Position C.2 for nonsafety-related portions. DCD Tier 2, Revision 3, Subsections 9.2.6 and 9.2.7 for CS&TS and CWS reflect this information, respectively.