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Subject: **Response to Portion of NRC Request for Additional Information  
Letter No. 100 - Generic Issues - RAI Numbers 6.2-170 and 6.2-171**

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

If you have any questions or require additional information, please contact me.

Sincerely,



James C. Kinsey  
Project Manager, ESBWR Licensing



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Reference:

1. MFN 07-327, Letter from U.S. Nuclear Regulatory Commission to Robert Brown, *Request for Additional Information Letter No. 100 Related to ESBWR Design Certification Application*, May 30, 2007

Enclosure:

1. MFN 07-420 - Response to Portion of NRC Request for Additional Information Letter No. 100 - Related to ESBWR Design Certification Application - Generic Issues - RAI Numbers 6.2-170 and 6.2-171

cc: AE Cabbage USNRC (with enclosures)  
BE Brown GEH/Wilmington (with enclosures)  
GB Stramback GEH/San Jose (with enclosures)  
eDRF 0000-0069-0116

**Enclosure 1**

**MFN 07-420**

**Response to Portion of NRC Request for  
Additional Information Letter No. 100  
Related to ESBWR Design Certification Application  
Generic Issues  
RAI Numbers 6.2-170 and 6.2-171**

**NRC RAI 6.2-170:**

*DCD, Tier 2, Revision 3, Appendix 1C, Table 1C-1 states that Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions" evaluation is addressed DCD Chapters 6.2.1, 6.2.2 and 6.2.4. This GL addresses possible water hammer in drywell cooling systems.*

*Staff could not locate any discussion of water hammer in Section 6.2.1, 6.2.2 and 6.2.4. Please explain. Staff further notes that this issue is usually addressed in response to Section 9.2.2, "Reactor Auxiliary Cooling Water Systems," of NUREG-0800, "Standard Review Plan."*

**GEH Response:**

Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design Basis Accident Conditions," was issued to address the following issues of concern:

1. Cooling water systems serving the containment air coolers may be exposed to the hydrodynamic effects of water hammer during either a loss-of-coolant accident (LOCA) or a main steam line break (MSLB). These cooling water systems were not designed to withstand the hydrodynamic effects of water hammer and actions may be needed to satisfy system design and operability requirements.
2. Cooling water systems serving the containment air coolers may experience two-phase flow conditions during postulated LOCA and MSLB scenarios. The heat removal assumptions for design basis accident scenarios are based on single-phase flow conditions and actions may be needed to satisfy system design and operability requirements.
3. Thermally induced overpressurization of isolated water-filled piping sections in containment could jeopardize the ability of accident-mitigating systems to perform their safety functions and could lead to a breach of containment integrity through bypass leakage. Actions may be needed to satisfy system operability requirements.

For ESBWR, the cooling water system serving the containment (drywell) air coolers during normal operation is the Chilled Water System (CWS), which is described in DCD Tier 2, Revision 3, Subsection 9.2.7. Subsection 9.2.7.5 indicates that the CWS containment penetration line isolation valves automatically close on a LOCA signal to control the flow of water into and out of the containment. Further details on this CWS function are provided in DCD Tier 2, Revision 3, Subsection 6.2.4.3.2.1. Except for the containment isolation function, the CWS equipment is all nonsafety-related and is not required to function during the response to a design basis accident. It is assumed that the nonsafety-related Seismic Category II coolant boundary of the CWS or Drywell Cooling System heat exchanger may fail, opening to the containment atmosphere. Thus, the concerns of GL 96-06 have been taken into consideration in the design of CWS and do not adversely affect the ESBWR response to a design basis accident.

During design basis accident conditions, the design feature providing cooling of the containment air for ESBWR is the Passive Containment Cooling System (PCCS) condensers, which condense steam that has been released to the DW following a LOCA or MSLB to transfer the heat to the Isolation Condenser (IC)/Passive Containment Cooling (PCC) pools. The IC/PCC pools are

designed to boil in order to perform their heat removal function. DCD Tier 2, Revision 3, Subsection 6.2.1 discusses the role of the PCCS condensers in maintaining containment pressure and temperature within design limits during design basis accidents and provides information about the function of the PCCS. DCD Tier 2, Revision 3, Subsection 6.2.2 provides design details on the PCCS. The passive nature of the PCCS design prevents it from being subjected to water hammer effects or thermally-induced overpressurization.

Therefore, the references to Subsections 6.2.1, 6.2.2 and 6.2.4 in DCD Tier 2, Revision 3, Appendix 1C, Table 1C-1 are appropriate. DCD Tier 2, Table 1C-1 will be revised for GL 96-06 to include a short description of containment air cooling systems. The reference to DCD Tier 2, Subsection 6.2.4 for the CWS will be revised to refer to Subsections 6.2.4.3.2.1 and 9.2.7.5.

**DCD Impact:**

DCD Tier 2, Table 1C-1 will be revised as shown in the attached markup for GL 96-06 and GL 96-06s1.

**NRC RAI 6.2-171:**

*DCD, Tier 2, Revision 3, Chapter 1.11, Table 1.11-1 states that Task Action Plan Item (TAP) B-12, "Containment Cooling Requirements (Non-LOCA)," evaluation is addressed in DCD Sections 6.2.2, 7.3.2, 9.2.7 and 9.4.8. Staff could not locate where, in Section 6.2.2, this item is discussed.*

*If TAP B-12 is addressed in these sections, please revise these sections with a reference to TAP B-12, or if no reference to these specific sections is necessary to adequately address TAP B-12, then delete the reference to these sections in Table 1.11-1, TAP B-12.*

**GEH Response:**

Task Action Plan Item (TAP) Item B-12 in NUREG-0933, ", " begins by stating: "The rationale for normal and post-accident containment cooling will be reviewed to determine the adequacy of the design requirements imposed on the containment ventilation systems. By reviewing typical designs, the staff will develop a basic understanding of the consequences of a loss of normal containment cooling including the impact, if any, on the operability of safety systems and control systems."

DCD Tier 2, Revision 3, Subsections 6.2.2 and 7.3.2 have been referenced because they describe the design of the Passive Containment Cooling System (PCCS), which performs the safety-related containment cooling for ESBWR. DCD Tier 2, Revision 3, Subsections 9.2.7 and 9.4.8 have been referenced because they describe the design of the Chilled Water System (CWS) and Drywell Cooling System (DCS), respectively. The CWS and DCS perform containment air cooling during normal operation and are isolated on a loss-of-coolant accident (LOCA) signal.

A loss of normal containment cooling does not impact the operability of the safety-related PCCS to perform this function or the ability to place the ESBWR in a safe shutdown condition. The PCCS is a passive system that does not have instrumentation, control logic or power-actuated valves, and does not need or use electrical power for its operation.

DCD Tier 2, Table 1.11-1 will be updated to explain the basis for the references provided in Item B-12.

**DCD Impact:**

DCD Tier 2, Table 1.11-1 will be revised as shown in the attached markup for Item B-12.

**Table 1C-1**  
**Operating Experience Review Results Summary – Generic Letters**

No.	Issue Date	Title	Evaluation Result or Topic's Tier 2 Location(s)
96-03	1/31/96	NRC Generic Letter 96-03: Relocation of The Pressure Temperature Limit Curves And Low Temperature Overpressure Protection System Limits	Not Applicable. Is an administrative communication. Consistent with current Standard Technical Specifications (NUREG-1434, Rev. 3.1) Chapter 16 TS, Subsection 5.6.4
96-04	6/26/96	Boraflex Degradation in Spent Fuel Pool Storage Racks	Not Applicable. Is a procurement communication. The equipment specification for the racks at the time of the order will be consistent with the latest regulatory guidance. Subsection 9.1.2
96-05	9/18/96	Periodic Verification of Design-Basis Capability of Safety-Related Power-Operated Valves	Subsection 3.9.6.1
96-06	9/30/96	Assurance of Equipment Operability And Containment Integrity During Design-Basis Accident Conditions	PCCS provides containment air cooling during design basis accidents as described in Subsections 6.2.1 and 6.2.2, and is not subject to water hammer effects. The Chilled Water System provides cooling water to the Drywell Cooling System during normal operation, and is isolated on a LOCA signal as discussed in Subsections 9.2.7.5 and 6.2.4.3.2.1. Fluid-filled piping associated with containment penetrations that automatically isolate during DBAs is designed in accordance with ASME Code Section III to accommodate thermal transient loadings as described in Subsection 3.9.3.4 and Table 3.9-2.
96-06s1	11/13/97	NRC Generic Letter 96-06, Supplement 1: Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions	Subsections 6.2.1, 6.2.2 and 6.2.4.3.2.1 and 9.2.7.5.
97-04	10/7/97	NRC Generic Letter 97-04: Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps	Not applicable, the ESBWR does not use pumps for ECCS or safety-related containment cooling functions.
98-01	5/11/98	NRC Generic Letter No. 98-01: Year 2000 Readiness of Computer Systems at Nuclear Power Plants	Outdated concern

ESBWR

26A6642AD Rev. 04

Design Control Document/Tier 2

Table 1.11-1 (continued)

Action Plan Item/Issue Number	Description	Associated Tier 2 Location(s) and/or Technical Resolution
		<p>The containment and its internal structures are designed to withstand all S/P dynamic loads, due to LOCA and SRV actuation events in combination with those from the postulated seismic events. The load combinations are described and specified in Section 3.8.</p> <p>A complete description of and diagrammatic representation of these loads is provided in Appendix 3B.</p>
B-11	Subcompartment Standard Problems	(5)
B-12	Containment Cooling Requirements (Non-LOCA)	<p>(4) Subsections 6.2.2 and 7.3.2 describe the safety-related containment cooling system (PCCS). Subsections 9.2.7 and 9.4.8 describe the systems involved in normal containment cooling:</p> <p>A loss of normal containment cooling does not impact the operability of the safety-related PCCS to perform this function or the ability to place the ESBWR in a safe shutdown condition. The PCCS is a passive system that does not have instrumentation, control logic or power-actuated valves, and does not need or use electrical power for its operation.</p>
B-13	Marviken Test Data Evaluation	(5)
B-14	Study of Hydrogen Mixing Capability in Containment Post-LOCA	(6) Covered under Item A-48.
B-15	Contempt Computer Code Maintenance	(3)
B-16	Protection Against Postulated Piping Failures in Fluid Systems Outside Containment	(6) Issue incorporated into Item A-18.