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MFN 07-303

Docket No. 52-010

May 30, 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. 67 Related to ESBWR Design Certification Application – Mechanical Systems and Components – RAI Numbers 3.9-166, 3.9-167, 3.9-169 and 3.9-170.**

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
Project Manager, ESBWR Licensing

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HRO

References:
1. MFN 06-378, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 67 Related to the ESBWR Design Certification Application*, October 10, 2006

Enclosure:
1. MFN 07-303, Response to Portion of NRC Request for Additional Information Letter No. 67 Related to ESBWR Design Certification Application – Mechanical Systems and Components – RAI Numbers 3.9-166, 3.9-167, 3.9-169 and 3.9-170.

cc: AE Cubbage USNRC (with enclosures)
GB Stramback GE/San Jose (with enclosures)
BE Brown GE/ Wilmington (with enclosures)
eDRF 00067-8304

Enclosure 1

MFN 07-303

Response to Portion of NRC Request for

Additional Information Letter No. 67

Related to ESBWR Design Certification Application

Mechanical Systems and Components

RAI Numbers 3.9-166, 3.9-167, 3.9-169 and 3.9-170

NRC RAI 3.9-166

Verify that all sections of containment penetration piping which may be isolated with trapped liquid are protected from thermally-induced pressurization by a pressure relief device. Verify that these devices are included in the IST program. Identify those sections of isolated piping which are protected from excessive pressurization by other methods and describe the methods. Verify that the resulting thermally-induced pressurization and resulting differential pressure loads on isolation valves do not exceed that for which the valves are qualified.

GE Response

The current level of detail to which the design of piping and piping penetrations for primary containment does not permit the verifications requested. The unit inservice testing (IST) program is identified as a COL holder responsibility in DCD Tier 2 Subsection 3.9.9.3, which will include the relief valves within the scope of the IST program boundary determined from the plant process and instrument diagrams and piping isometric drawings. All penetration piping and isolation valves are designed to the requirements of the ASME Code, Section III, Class 2, and the ASME Code requires a design report for each piping system as identified under DCD Tier 2 Subsection 3.9.3. These design reports include an evaluation for overpressure protection for design base pressurization events.

Containment isolation functional design is covered in DCD Tier 2 Subsection 6.2.4, although there is not a specific discussion regarding consideration for potential penetration piping pressurization events. The actual choice of protection method for penetration piping overpressure protection must be evaluated on a case-by-case basis. Relief valves may not be a preferred method since this involves additional component maintenance and testing and creates an additional leakage pathway for each affected penetration. Several valve types characteristically provide penetration pressure self-relieving capability. These include penetration piping with a check valve as the inboard isolation valve, penetration piping with a globe valve where the penetration piping pressure can lift the disk off the seat to relieve inward, or penetrations isolated by spring-loaded ball valves oriented to relieve inward due to penetration piping pressurization. Also, penetrations with both valves outside containment do not have the potential to create an isolated volume of liquid within the penetration.

DCD Impact

DCD Tier 2, Subsection 6.2.4, will be revised as noted in the attached markup.

NRC RAI 3.9-167

Describe any non-containment isolation configurations where thermally induced pressurization may be possible, and describe how excessive pressurization is prevented and how isolation valves remain operable, as necessary. Verify that any pressure relief devices are included in the IST program.

GE Response

Individual system piping design is not presently developed sufficient to address what piping systems or portions of systems, if any, may be susceptible to thermally induced pressurization. Thus, it is also not possible to describe what actions have been taken to prevent excessive pressurization, or if any isolation valves are potentially affected and what mitigation actions have been implemented in the design to ensure operability.

Overpressure protection, whether due to internal or external cause, is a design responsibility under the piping design codes including ASME Code Section III and ASME/ANSI B31.1 Power Piping Code. Thermal loads on piping are a required consideration for the design of ASME Code, Section III, Class 1, 2 and 3 systems, and is noted under DCD Tier 2 Subsections 3.9.3.1 and 3.9.4. Design reports, which must address overpressure protection, are required per DCD Tier 2 Subsection 3.9.3. Owner responsibilities for review and acceptance are defined under the ASME Code and must be performed by the COL holder. The document collection, recording and filing of these reports are also administrative responsibilities of the COL holder, and the reports are to be made available for NRC review as stated under DCD Tier 2 Subsection 3.9.9.4.

The unit inservice testing (IST) program is identified as a COL holder responsibility in DCD Tier 2 Subsection 3.9.9.3, which will include the relief valves within the scope of the IST program boundary determined from the plant process and instrument diagrams and piping isometric drawings.

Thus, although detailed design information is not presently available to verify the overpressure protection requirements are satisfied, the DCD does include the appropriate requirements for the design to implement the necessary protection measures where applicable. The responsibilities assigned to the COL holder in the DCD, ensure that records for the as-built plant design will be available to confirm overpressure protection is adequate, and that the necessary relief valves are included in an IST program.

DCD Impact

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

NRC RAI 3.9-169

For all relief devices which perform a function of providing pressure relief to ensure the integrity of safety-related structures, systems, or components,verify that all valve discharge fluid dynamic loads have been included in the analysis of the upstream and downstream piping. Also, verify that the fluid dynamic loads imposed by the piping onto the relief devices do not exceed those for which the valve has been qualified to open and close, as required.

GE Response

Individual system piping design is not presently developed sufficient to address what piping systems or portions of systems include relief valves for overpressure protection. Thus, it is not possible to verify that dynamic loads due to relief valve actuation have been analyzed and incorporated into the design of piping supports. Nor is it possible to verify that relief valves have been procured to include the design fluid dynamic loads of the piping systems on which they are installed.

Overpressure protection, whether due to internal or external cause, is a design responsibility under the piping design codes including ASME Code Section III and ASME/ANSI B31.1 Power Piping Code. Dynamic pipe loading is one of the required considerations for the design of ASME Code, Section III, Class 1, 2 and 3 systems, and is noted under DCD Tier 2 Subsections 3.9.3.1 and 3.9.4. Design reports, which must address overpressure protection, are required per DCD Tier 2 Subsection 3.9.3. Owner responsibilities for review and acceptance are defined under the ASME Code and must be performed by the COL holder. The document collection, recording and filing of these reports are also administrative responsibilities of the COL holder, and the reports are to be made available for NRC review as stated under DCD Tier 2 Subsection 3.9.9.4.

Thus, although detailed design information is not presently available to verify the overpressure protection requirements are satisfied, the DCD does include the appropriate requirements for the design to implement the necessary protection measures where applicable. The responsibilities assigned to the COL holder in the DCD, ensure that records for the as-built plant design will be available to confirm overpressure protection is adequate. The design report records include, either directly or by reference (available under separate cover), the stress analyses, support calculations and other load evaluations performed for the design of the component system.

DCD Impact

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

NRC RAI 3.9-170

Provide a list of all safety-related relief devices credited with providing pressure relief in the plant safety analysis. For these devices, please provide the associated system design pressures, the device design set pressures and tolerances, and the certified relief capacities.

GE Response

Individual system piping design and equipment procurement is not presently developed sufficient to address what piping systems or portions of systems include relief valves for overpressure protection. Thus, it is not possible to provide a list of these devices, their design lift set pressures, the tolerances of procured devices, or their certified relief capacities.

Overpressure protection is a design responsibility under the piping design codes including ASME Code Section III and ASME/ANSI B31.1 Power Piping Code. Design reports, which must address overpressure protection, are required per DCD Tier 2 Subsection 3.9.3. Owner responsibilities for review and acceptance are defined under the ASME Code and must be performed by the COL holder. The document collection, recording and filing of these reports are also administrative responsibilities of the COL holder, and the reports are to be made available for NRC review as stated under DCD Tier 2 Subsection 3.9.9.4.

Design control, procurement document control, and unit design drawings control are areas of responsibility for quality assurance outlined in DCD Tier 2 Chapter 17. Quality control during the unit design phase, construction and transition into operation are included in this outline.

Thus, although detailed design information is not presently available to verify the overpressure protection requirements are satisfied, the DCD does include the appropriate requirements for the design to implement the necessary protection measures where applicable. The responsibilities assigned to the COL holder in the DCD, ensure that records for the as-built plant design will be available to confirm overpressure protection is adequate.

DCD Impact

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

6.2.4.1 Design Bases
Safety Design Bases

- Containment isolation valves provide the necessary isolation of the containment in the event of accidents or other conditions and prevent the unfiltered release of containment contents that cannot be permitted by 10 CFR 50.34(a)(1) limits. Leak-tightness of the valves shall be verified by Type C test.
- Capability for rapid closure or isolation of all pipes or ducts that penetrate the containment is performed by means or devices that provide a containment barrier to limit leakage within permissible limits;
- The design of isolation valves for lines penetrating the containment follows the requirements of General Design Criteria 54 through 57 to the greatest extent practicable consistent with safety and reliability. Exemptions from GDCs are listed in Table 1.9-6.
- Isolation valves for instrument lines that penetrate the DW/containment conform to the requirements of Regulatory Guide 1.11;
- Isolation valves, actuators and controls are protected against loss of their safety-related function from missiles and postulated effects of high and moderate energy line ruptures;
- Design of the containment isolation valves and associated piping and penetrations meets the requirements for Seismic Category I components;
- Containment isolation valves and associated piping and penetrations meet the requirements of the ASME Boiler and Pressure Vessel Code, Section III, Class 1, 2, or MC, in accordance with their quality group classification; ~~and~~
- The design of the control functions for automatic containment isolation valves ensures that resetting the isolation signal shall not result in the automatic reopening of containment isolation valves~~.~~**; and,**
- **Penetrations with trapped liquid volume between the isolation valves have adequate relief for thermally-induced pressurization.**

Design Requirements

The containment isolation function automatically closes fluid penetrations of fluid systems not required for emergency operation. Fluid penetrations supporting ESF systems have remote manual isolation valves that can be closed from the control room, if required.

The isolation criteria for the determination of the quantity and respective locations of isolation valves for a particular system conform to General Design Criteria 54, 55, 56, 57, and Regulatory Guide 1.11. Redundancy and physical separation are required in the electrical and mechanical design to ensure that no single failure in the containment isolation function prevents the system from performing its intended functions.

Protection of Containment Isolation Function components from missiles is considered in the design, as well as the integrity of the components to withstand seismic occurrences without loss of operability. For power-operated valves used in series, no single event can interrupt motive power to both closure devices. Pneumatic powered or equivalent containment isolation POVs are designed to fail to the closed position for containment isolation upon loss of the operator gas supply or electrical power.

The containment isolation function is designed to Seismic Category I. Safety and quality group classifications of equipment and systems are found in Table 3.2-1. Containment isolation valve functions are identified in Tables 6.2-16 through 6.2-42.

Penetration piping is evaluated for entrapped liquid subject to thermally-induced pressurization following isolation. The preferred pressure relief method is through a self-relieving penetration by selection and orientation of an inboard isolation valve that permits excess fluid to be released inward to the containment. Use of a separate relief valve to provide penetration piping overpressure protection is permissible on a case-by-case basis when no other isolation valve selection option is available.

The criteria for the design of the Leak Detection and Isolation System (LD&IS), which provides containment and reactor vessel isolation control, are listed in Subsection 7.1.2. The bases for assigning certain signals for containment isolation are listed and explained in Subsection 7.3.3.