HITACHI

GE Hitachi Nuclear Energy

James C. Kinsey
Vice President, ESBWR Licensing

PO Box 780 M/C A-55
Wilmington, NC 28402-0780
USA

T 910 675 5057
F 910 362 5057

MFN 06-436 Supplement 2

Docket No. 52-010

December 10, 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. 79 Related to ESBWR Design Certification Application - Containment Systems - RAI Number 6.2-120 S01**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) response to the subject NRC RAI originally transmitted via the Reference 1 letter and supplemented by an NRC request for clarification in Reference 2.

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

Sincerely,

James C. Kinsey
Vice President, ESBWR Licensing

D068
NRO

References:

1. MFN 06-393, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application*, October 11, 2006
2. E-Mail from Shawn Williams, U.S. Nuclear Regulatory Commission, to George Wadkins, GE Hitachi Nuclear Energy, dated May 30, 2007 (ADAMS Accession Number ML071500023)

Enclosure:

1. MFN 06-436 Supplement 2 - Response to Portion of NRC Request for Additional Information Letter No. 79 - Related to ESBWR Design Certification Application - Containment Systems - RAI Number 6.2-120 S01

cc:	AE Cubbage	USNRC (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	GB Stramback	GEH/San Jose (with enclosures)
	RE Brown	GEH/Wilmington (with enclosures)
	eDRF	0000-0072-8507R1

Enclosure 1

MFN 06-436 Supplement 2

Response to Portion of NRC Request for

Additional Information Letter No. 79

Related to ESBWR Design Certification Application

Containment Systems

RAI Number 6.2-120 S01

NRC RAI 6.2-120:

DCD Section 6.2.4.3.1.2, "Effluent Lines," under the heading "Main Steam and Drain Lines," describes the power operated main steam isolation valves (MSIVs) as closing under either spring force or gas pressure. It states, in part:

The separate and independent action of either gas pressure or spring force is capable of closing an isolation valve.

Considering that virtually every BWR MSIV in the U.S. needs both gas pressure and spring force to close under accident conditions, verify that the quoted sentence is correct.

GEH Response:

Under normal plant operating and most accident conditions, either gas pressure or spring force is capable of closing each inboard and outboard Main Steam Isolation Valve (MSIV). However, in the event of an accident inside containment, the containment pressure may be much higher than during normal plant operation. Under these conditions, both gas pressure and spring force are needed to close the inboard MSIV. However, the outboard MSIV is capable of closing with either gas pressure or spring force because the accident pressure inside containment has no appreciable effect on the environmental pressure of the outboard MSIV. Text will be added to Section 6.2.4.3.1.2 under the heading "Main Steam and Drain Lines" to provide clarification.

DCD Impact:

DCD Tier 2, Section 6.2 will be revised as noted in the attached markup.

NRC RAI 6.2-120 S01:

RAI 6.2-120 noted that DCD, Tier 2, Revision 1, Section 6.2.4.3.1.2, "Effluent Lines," under the heading "Main Steam and Drain Lines," described the power-operated main steam isolation valves (MSIVs) as closing under either spring force or gas pressure. The staff questioned this statement, considering that virtually every BWR MSIV in the U.S. needs both gas pressure and spring force to close under accident conditions.

Supplemental Request:

The applicant provided an adequate response to this RAI, MFN 06-436, that explained the operation of the valves, which is like the MSIVs in other BWRs. The response included a proposed DCD, Revision 3, Section 6.2.4.3.1.2, which, if it had been incorporated into the DCD, would have resolved this issue.

However, the proposed revision was not incorporated in the DCD, Revision 3, Section 6.2.4.3.1.2. The version in Revision 3 contains even less information than it did in Revision 1, which causes this RAI to remain unresolved. On another note, the RAI response and current DCD version refers to DCD, Section 5.4.5, for further information, but that section does not seem to address this particular issue.

Please revise the DCD to include the appropriate information as presented in the proposed DCD Revision 3 and revisit the need to reference Section 5.4.5.

GEH Response:

The markup provided with the original response, but not incorporated into DCD Tier 2, Revision 3, included the following:

> "Under normal plant operating and most accident conditions, the separate and independent action of either gas pressure or spring force is capable of closing each MSIV. However, if there is a main steamline break **between the inboard MSIV and the containment wall**, both gas pressure and spring force are needed to close the inboard MSIV. Either gas pressure or spring force is needed to close the outboard MSIV under all accident conditions."

The postulate contained in this markup, the assumption of a break between an inboard main steam isolation valve (MSIV) and its penetration, is invalid and this portion of the original response is hereby withdrawn. The reason is that the break assumption stated in the markup text conflicts with DCD Tier 2, Subsection 3.6.2.1.1. Under the heading "Piping in Containment Penetration Areas" DCD Tier 2 states:

> "No pipe breaks or cracks are postulated in those portions of piping from the containment wall penetration to and including the inboard or outboard isolation valves which meet the following requirements in addition to the requirement of the ASME Code, Section III, Subarticle NE-1120:
>
> - The following design stress and fatigue limits are not exceeded:
>
>   **For ASME Code, Section III, Class 1 Piping**
>
>   - The maximum stress range between any two load sets (including the zero load set) does not exceed 2.4 S_m, and is calculated by Equation (10) in NB-3653, ASME Code, Section III. If the calculated maximum stress range of Equation (10) exceeds 2.4 S_m, the stress ranges calculated by both Equation (12) and Equation (13) in paragraph NB-3653 shall meet the limit of 2.4 S_m.
>   - The cumulative usage factor is less than 0.1."

Also, DCD Tier 2, Subsection 5.4.5, is the correct location for information regarding the design requirements and functional evaluation of the MSIVs, including addressing all relevant forces to which the actuation mechanism must respond during normal or abnormal operating conditions. Therefore, an alternative is proposed to revise DCD Tier 2, Subsection 5.4.5 instead of revising DCD Tier 2, Subsection 6.2.4.3.1.2.

DCD Impact:

DCD Tier 2, Subsection 5.4.5.2, Detailed System Description, first three paragraphs, will be revised as shown in the attached markup.

5.4.5 Main Steamline Isolation System

5.4.5.2 System Description

Detailed System Description

[DCD Tier 2, Subsection 5.4.5.2, Detailed System Description, first three paragraphs]

Figure 5.4-2 shows an MSIV schematically, and the MSIV characteristics are presented in Table 5.4-1. The MSIV shown is ~~are~~ a Y-~~pattern~~ globe stop valve~~s,~~ ~~in~~ for welded-in installation. Valves are installed in the main steam lines in flow-over-seat direction, so that normal steam flow tends to close the valve and increased inlet pressure tends to hold the valve closed. The Y-globe provides an internal main flow path that ~~pattern~~ streamlines the inlet and outlet ~~valve~~ passages to the extent practical, ~~thereby~~ to ~~minimizing~~ minimize the pressure-drop and help~~ing~~ to prevent debris accumulation ~~of debris~~on the conical seating surface.

The ~~main disk or~~ Y-globe poppet subassembly is attached at the lower end of the stem. The bottom end of the valve stem serves as the pilot disk, which opens and closes a small pressure-balancing hole in the poppet. When the hole is open, it acts as a pilot valve for the main poppet to relieve differential pressure ~~forces on~~ across the poppet to permit the valve to be opened. The permissible valve pressure differential for opening is limited by the lifting capacity of the actuator cylinder.

Y-globe stop valve stem travel is sufficient to place the wide-open poppet into the bonnet so that the lower end of the poppet remains out of the steam flow stream. The upper end of the stem backseats inside the bonnet for structural rigidity and to assist leakage sealing. The valve stem penetrates the bonnet flange through a packing gland that uses a replaceable single-stack packing to control the leak rate through the bonnet~~replaceable packing. With some packing designs, a leak-off connection may be provided~~. The ESBWR design does not permit the use of packing gland leak-offs in the MSIV design. The Y-globe stop valve single-stack packing gland design provides the greatest degree of leak control achievable without excessive packing drag on the stem. Packing load is controlled administratively as a part of MSIV maintenance.

Y-globe stop valve design uses a low-pressure pneumatic cylinder-&-piston actuator. The valve is opened by pneumatic pressure applied under the actuator piston. The opening stroke also compresses (charges) helical springs, mounted around guide shafts that also function as a yoke structure to support the pneumatic actuator subassembly. The Y-globe stop valve is closed when by two control pilot valves acting together release the under-piston pressure. In most operating conditions, the pneumatic pressure is then applied over the actuator piston, or the compressed spring force acts downward on the stem, closing the MSIV. Under certain event postulates, specific to in-containment LOCAs and the inboard MSIVs, the drywell pressure acting against the actuator lower chamber exhaust port offsets part of the pneumatic closure force. In this condition, the spring force is required in combination with the pneumatic force to assure valve closure. ~~The valve is opened by pneumatic pressure, and closed by pneumatic pressure or compressed springs. Helical springs around the spring guide shafts apply force in the direction of valve closure.~~