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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 100 – Related to ESBWR Design Certification Application – RAI Numbers 20.0-12 and 20.0-15**

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 regarding the information provided here, please contact me.

Sincerely,

Kathy Sedney for

James C. Kinsey
Project Manager, ESBWR Licensing

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NRO

Reference:

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

Enclosures:

1. MFN 07-380 – Response to Portion of NRC Request for Additional Information Letter No. 100 – Related to ESBWR Design Certification Application – Generic Issues - RAI Numbers 20.0-12 and 20.0-15

cc:	AE Cubbage	USNRC (with enclosures)
	DH Hinds	GEH Wilmington (with enclosures)
	RE Brown	GEH Wilmington (with enclosures)
	eDRF	0000-0069-1530/R1 and 0000-0070-1199/R1

Enclosure 1

MFN 07-380

Response to Portion of NRC Request for

Additional Information Letter No. 100

Related to ESBWR Design Certification Application

Generic Issues

RAI Numbers 20.0-12 and 20.0-15

NRC RAI 20.0-12

TMI Action Plan Item III.D.1.1

In DCD Tier 2, Revision 3, Table 1A-1, "TMI Action Plan Items," item III.D.1.1 concerns leakage control and detection in the design of systems outside containment that contain (or might contain) accident source term radioactive materials following an accident. The applicant's approach to addressing this item is fundamentally wrong.

The table cites two means for satisfying the requirements of 10 CFR 50.34(f)(2)(xxvi) and this item: 1) Appendix J testing; 2) Leak Detection and Isolation System (LD&IS).

1) Appendix J.

Containment leakage rate testing, required by Appendix J to 10 CFR Part 50, has little to do with this item. This item does not address leakage out of the containment; it has to do with radioactive material which has already been allowed to leave the containment and is now in pipes which are outside of the containment (such as parts of the residual heat removal system) which could potentially leak. Although containment isolation valves (CIVs) could perhaps be closed to terminate such leaks, the idea is to assure that the pipes and components outside containment are not leaking. To quote from 10 CFR 50.34(f)(2)(xxvi): The goal is to minimize potential exposures to workers and public, and to provide reasonable assurance that excessive leakage will not prevent the use of systems needed in an emergency.

Closing CIVs would often prevent the use of systems needed in an emergency.

NUREG-0737, "Clarification of TMI Action Plan Requirements," may be confusing. It calls for "...periodic integrated leak tests" of piping systems outside containment, at refueling outage frequency. These should not be confused with the containment integrated leakage rate tests of Appendix J, which are done at intervals of 4 years or more.

In summary, the Appendix J testing program has little bearing on this item and does not satisfy the requirements of 10 CFR 50.34(f)(2)(xxvi).

2) LD&IS.

In a similar fashion, the Leak Detection and Isolation System has limited bearing on this item. The LD&IS functions to detect and isolate leakage from the reactor coolant pressure boundary. To quote from DCD Tier 2, Revision 3, section 7.3.3:

The system is designed to automatically initiate the isolation of certain designated process lines that penetrate the containment to prevent release of radiological leakage from the reactor coolant pressure boundary. The initiation of the isolation functions results in the closure of the appropriate containment isolation valves.

Again, closing CIVs is not the point of item III.D.1.1. The point is to monitor and test system boundaries outside of containment to reduce or eliminate leakage from the systems.

Please re-address item III.D.1.1 in light of this discussion, with no reliance on Appendix J testing or the LD&IS.

GEH Response

GEH agrees the response to this TMI Action Plan item should be revised to address the concerns stated in this RAI for detecting and limiting system leakage during plant operation. This is accomplished by defining a program to reduce leakage to as-low-as-practical levels for all required post-accident systems outside the containment that could contain highly radioactive fluid. Such a program would consist of:

- Monitoring drain sumps to ascertain gross leakage occurring from systems included in this program.
- Inspecting miscellaneous components (e.g., vents, drains, valve packing, valve packing leakoffs, pump packing, pump gland seal leakoffs, etc.) for leakage during initial system startup as part of the system preoperational test, and reducing any detected leakage to as-low-as-practical levels. After fuel load these components are monitored as part of a surveillance test program.
- Performing indirect inspections or a suitable substitute in situations where it is not possible, practical or permissible (e.g., due to high radiation) to make direct inspections. Examples of indirect inspection techniques include inspecting floor areas for wetting and monitoring the associated equipment or floor drain sumps for excessive flow or fill rates.

Based on a review of the list of systems mentioned in the clarification section of NUREG-0737, Item III.D.1.1, the ESBWR systems outside containment performing those design functions are as follows:

- Fuel and Auxiliary Pools Cooling System (FAPCS)
- Containment Monitoring System (CMS)
- Isolation Condenser System (ICS)

The portion of ICS outside containment is submerged during normal operation. Consequently, it is not accessible to plant personnel under post-accident conditions or for routine surveillance during normal plant operation.

Affected Documents

DCD Tier 2, Table 1A-1 will be revised as noted in the attached markup for TMI Action Plan Item III.D.1.1 [10 CFR 50.34(f)(2)(xxvi)].

NRC RAI 20.0-15

In DCD Tier 2, Rev 3, Table 1A-1, TMI Item II.K.3.16, GE stated that: "The ESBWR also uses direct acting [safety relief valves] (SRVs)."

In the response to RAI 5.2-20 S01, MFN 06-178 Supplement 1, submitted in GE letter dated May 3, 2007, GE changed the position. In this response GE stated that: The pilot operated SRV configuration in some previously licensed BWRs that has proven to be less reliable than comparable plants with direct acting SRVs uses a configuration with steam pressure over the main disk isolating the valve outlet and a depressurize-to-open actuation method. These earlier domestic BWR pilot operated SRVs are mostly of a single manufacturer and product design series. Direct extension of the experience with this SRV design to currently offered design types, makes, and models of pilot operated SRVs is not appropriate. Lessons learned from the experience history with this SRV design are considered in the selection of overpressure protection valves for the ESBWR.

It seems that GE plans to use pilot operated in the ESBWR design. The statement in Table 1A is in conflict with the RAI response. Please revise the table so that there is consistency.

GEH Response

GEH is considering, but has not committed to, the use of pilot-operated SRVs for ESBWR. The statement in Table 1A-1, TMI Item II.K.3.16, will be revised to clarify that ESBWR will not use the specific pilot-operated SRV designs that experienced performance problems in earlier BWR plants.

Affected Documents

DCD Tier 2, Table 1A-1, will be revised as noted in the attached markup.

Table 1A-1

TMI Action Plan Items

Regulation	TMI Item	Description	ESBWR Resolution	Associated Tier 2 Location(s)
			Operations Facility are discussed in Section 13.3.	
10 CFR 50. 34(f)(2)(xxvi)	III.D.1.1	Provide for leakage control and detection in the design of systems outside containment that contain (or might contain) accident source term radioactive materials following an accident. Applicants shall submit a leakage control program, including an initial test program, a schedule for retesting these systems, and the actions to be taken for minimizing leakage from such systems. The goal is to minimize potential exposures to workers and public, and to provide reasonable assurance that excessive leakage will not prevent the use of systems needed in an emergency.	Leakage is reduced to as low-as-practical levels for all required post-accident systems outside the containment that could contain highly radioactive fluid using a program that consists of: • Monitoring drain sumps to ascertain gross leakage occurring from systems included in this program. • Inspecting miscellaneous components (e.g., vents, drains, valve packing, valve packing leakoffs, pump packing, pump gland seal leakoffs, etc.) for leakage during initial system startup as part of the system preoperational test, and reducing any detected leakage to as-low-as-practical levels. After fuel load these components are monitored as part of a surveillance test program. • Performing indirect inspections or a suitable substitute in situations where it is not possible, practical or permissible (e.g., due to high radiation) to make direct inspections. Examples of indirect	5.2.5, 6.2.6.3, ~~and~~ 7.3.3 and Chapter 16 Section 5.5.2

Table 1A-1

TMI Action Plan Items

Regulation	TMI Item	Description	ESBWR Resolution	Associated Tier 2 Location(s)
			inspection techniques include inspecting floor areas for wetting and monitoring the associated equipment or floor drain sumps for excessive flow or fill rates. The Leak Detection and Isolation System (LD&IS) includes detection and actuation capability for systems that could potentially carry radioactive material outside the containment. Containment integrated leakage rate (Type A tests), containment penetration leakage rates (Type B tests), and containment isolation valve leakage rates (Type C tests) that comply with Appendix J and General Design Criteria 52, 53, and 54 of Appendix A of 10 CFR 50. Type A, B, and C tests are performed prior to operations and periodically thereafter to assure that leakage rates through the containment and through systems or components that penetrate the containment do not exceed maximum allowable rates specified in the plant Technical Specifications (TS). There are 7 following ESBWR systems that perform the design functions mentioned in the clarification section of NUREG-0737,	

Table 1A-1

TMI Action Plan Items

Regulation	TMI Item	Description	ESBWR Resolution	Associated Tier 2 Location(s)
			Item III.D.1.1, and could contain radioactive material outside the primary containment boundary:~~.~~ ~~1) Passive Containment Cooling System (is considered part of the containment boundary)~~ ~~2~~1) Isolation Condenser System 2) Fuel and Auxiliary Pools Cooling System 3) Containment Monitoring System ~~3) Reactor Water Cleanup System/Shutdown Cooling~~ ~~4) Main Steam System~~ ~~5)Fuel and Auxiliary Pools Cooling System~~ ~~6)Containment Inerting System~~ ~~7)Equipment and Floor Drainage System (Lower Drywell Sumps)~~ The portion of ICS outside containment is submerged during normal operation. Consequently, it is not accessible to plant personnel under post-accident conditions or for routine surveillance during normal plant operation.	

Table 1A-1

TMI Action Plan Items

Regulation	TMI Item	Description	ESBWR Resolution	Associated Tier 2 Location(s)
10 CFR 50. 34(f)(1)(vi)	II.K.3.16	Perform a study to identify practical system modifications that would reduce challenges and failures of relief valves, without compromising the performance of the valves or other systems. (Applicable to BWR's only).	One of the key design criteria of the ESBWR is that SRVs should not need to open during any Anticipated Operational Occurrences (transients) or DBAs to protect against overpressure. SRVs are only expected to open in the event of an ATWS or beyond design basis events. This is achieved through the use of the Isolation Condenser System (ICS). General Electric and the BWR Owners' Group responded to this requirement for earlier BWR models. Based on a review of the existing operating information on the challenge rate of relief valves, they concluded that the BWR/6 product line had already achieved the "order of magnitude" level of reduction in SRV challenge rate. The principal reason for this reduction is that the BWR/6 uses direct acting SRVs, not the pilot-operated design used in some earlier BWRs. The ESBWR uses either direct acting SRVs or a modern pilot-operated SRV design that has been proven not to experience the performance problems observed in earlier BWRs.~~also uses direct acting SRVs.~~	5.2.2.