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Subject: **Response to Portion of NRC Request for Additional Information Letters No. 68 and 79 – Isolation Condenser System - RAI Numbers 6.2-101, 6.2-119, and 6.2-121**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 and 2 letters.

If you have any questions about the information provided here, please let me know.

Sincerely,

Kathy Sedney for

David H. Hinds
Manager, ESBWR

D068

Reference:

1. MFN 06-379, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 68 Related to ESBWR Design Certification Application*, October 10, 2006

2. 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

Enclosure:

1. MFN 06-474 – Response to Portion of NRC Request for Additional Information Letters No. 68 and 79 – Related to ESBWR Design Certification Application – Isolation Condenser System – RAI Numbers 6.2-101, 6.2-119, and 6.2-121

cc: AE Cubbage USNRC (with enclosures)
GB Stramback GE/San Jose (with enclosures)
eDRFs 0000-0047-9382 and 0000-0047-9656, Rev. 3

Enclosure 1

MFN 06-474

Response to Portion of NRC Request for

Additional Information Letters No. 68 and 79

Related to ESBWR Design Certification Application

Isolation Condenser System

RAI Numbers 6.2-101, 6.2-119, and 6.2-121

NRC RAI 6.2-101:

Provide design details for valves connecting the Isolation Condenser (IC)/Passive Containment Cooling (PCC) expansion pools with Dryer/Separator Pool and Reactor Well to provide 72 hours of passive containment cooling capability.

(A) Provide the flow areas connecting each of the pool compartments;

(B) Explain operator and/or automatic actions that are required to open the valves in pool #17, in order to refill the pools #1 thru #16 shown in Figure 6.2-74, IC/PCC Pools Configuration, in MFN-06-215 dated July 12, 2006 (response to RAI 6.2-74).

(C) Will power be available from the batteries at the time the valves are needed to open. Will the valves open at 72 hours even if the level in the level in the PCC pool has not dropped below the 29.6 meter elevation?

(D) Regarding Figure 6.2-74, IC/PCC Pools Configuration, (MFN-06-215); there appears to be one flow path (through a single valve) connecting pool #17 to one half of the upper pools and another flow path through one valve connecting to the other half of the upper pools. It would appear a single valve failure could be postulated in which refill of half the upper pool would not occur and result in continued long-term boil-down of three PCCS heat exchangers. Therefore, the ESBWR DCD Rev1 limiting sequence for determining peak containment pressure, that is a FWLB w/1 SRV failure may not produce the highest peak containment pressure. If Figure 6.2-74 is correct, a revised TRACG FWLB bounding analysis with failure of one of these refill lines should be pursued. If it is not correct, Figure 6.2-47 in MFN-06-215 should be revised and resumbitted, and the IC P&ID submitted in MFN-06-107 dated May 12, 2006, should be revised to show the correct number of valves connecting the pools.

(E) Revise DCD Tier 2 to include design details for the IC/PCC pools including the number of valves connecting the IC/PCCS expansion pools with Dryer/Separator Pool and Reactor Well to provide 72 hours of passive containment cooling capability, the automatic and/or operator actions necessary to open the valves, and the instrumentation and setpoints that will signal these actions. Revise DCD Tier 2, Figure 6.2-2, to show the correct number of valves connecting the pools.

GE Response:

A. The Reactor Well is connected to the Dryer/Separator Pool through a large opening during normal operation. There are two valves in parallel on either side of the Dryer/Separator pool that connect to the associated IC/PCC expansion pool. The value of the flow area between the Dryer/Separator pool and each of the two IC/PCC expansion pools will be determined in the detail design phase.

B. The two parallel valves in the Dryer/Separator pool (pool #17) to each of the two IC/PCC expansion pools open automatically on a low IC/PCC expansion pool water level signal from the associated IC/PCC expansion pool during a LOCA event.

C. Two batteries per division of power operate for 72 hours. If power is available after 72 hours, the valves will open when makeup water is required. If power is not available to open the valves, the Fire Protection System (FPS) can supply the necessary makeup water to the IC/PCC expansion pools. Therefore, makeup water to the IC/PCC expansion pools is always available. See DCD Tier 2 Subsection 9.5.1 for further information regarding the FPS.

   The water in the IC/PCC expansion pools provides makeup water to the IC and PCC pools. The two parallel valves that connect the Dryer/Separator pool to each of the two IC/PCC expansion pools only open on a low water level signal from the associated IC/PCC expansion pool. Therefore the IC/PCC expansion pools, and associated IC and PCC pools, will not automatically receive additional water until the water level drops to the low water level setpoint.

D. There are two valves in parallel (for redundancy) on either side of the Dryer/Separator Pool to the associated IC/PCC expansion pool. DCD Tier 2, Figure 6.2-2, will be revised to show the two valves. The RAI 6.2-74 figure is just a diagrammatic representation of the passage between pools.

E. DCD Tier 2, Table 3.9-8, In-Service Testing, identifies the four valves between the Dryer/Separator pool and the two IC/PCC expansion pools in Section B32, Isolation Condenser System Valves, as No. F104, Dryer/Separator Storage Pool valve. The passage between Reactor Well and Dryer/Separator pool will be kept open during normal operation and therefore will stay open during a LOCA event. The two parallel valves in the Dryer/Separator pool to each of the two IC/PCC expansion pools open automatically on a low IC/PCC expansion pool water level signal from the associated IC/PCC expansion pool. The low water level setpoint will be determined during the detail design phase. DCD Tier 2, Figure 6.2-2, will be revised to show the two valves on either side of the Dryer/Separator pool.

DCD Impact:

DCD Tier 2, Figure 6.2-2, IC/PCC Pool Configuration, will be revised to include two valves on either side of the Dryer/Separator Pool.

NRC RAI 6.2-119:

DCD Tier 2, Revision 1, Section 6.2.4.3.1.1, "Influent Lines," under the heading "Isolation Condenser Condensate and Venting Lines," describes the isolation provisions for these lines and the isolation condenser purge line.

(A) In this Section and in the tables of CIVs (Tables 6.2-23 through 6.2-30), there are discussions as to how the isolation provisions meet the intent of the "guidelines" of GDC 55 and GDC 56. It is not sufficient to meet the "intent" of the regulations; the ESBWR design must comply with the requirements of the regulations. The designs for these lines do not comply with the explicit requirements of GDC 55 and 56, which are that such lines require a CIV inside containment and another outside containment. As discussed in more detail in RAI 6.2-102, SRP 6.2.4, Rev. 2, RG 1.141, and national standard ANS-56.2/ANSI N271-1976 provide guidance on the implementation of the statements in GDC 55 and 56 which allow other isolation provisions if it can be demonstrated that the containment isolation provisions for a specific class of lines are acceptable on some other defined basis.

Revise the DCD to discuss the conformance (or lack thereof) of the subject lines to the requirements of the GDC and the guidelines of the cited guidance documents.

Further, in all the many other instances where DCD Tier 2, Revision 1, Section 6.2.4 and the CIV tables (Tables 6.2-16 through 6.2-42 and 6.2-47) make similar statements, revise them in like manner.

(B) This DCD Section states, in part:

...the IC System outside the containment consists of a closed loop... which is a "passive" substitute for an open "active" valve outside the containment. This closed-loop substitute for an open isolation valve outside the containment ***implicitly provides greater safety****. The combination of an* ***already isolated*** *loop outside the containment plus the two series automatic isolation valves inside the containment... [emphasis added]*

The staff disagrees with the highlighted words. A closed loop outside containment is not necessarily better or safer than a CIV. The standard of the GDC and the approved guidance documents is to have a CIV; a closed loop outside containment is sometimes allowed as an adequate, not superior, substitute for a CIV. Further, such a loop may be described as already closed, but not as "already isolated." This distinction is important in Technical Specifications, where one acceptable response to an inoperable CIV is to isolate the affected containment penetration. The presence of a closed loop attached to the affected penetration is not sufficient to consider the penetration to be isolated; some other barrier (e.g., valve, blind flange) must be closed to isolate the penetration.

Revise the DCD in light of the issues discussed above.

GE Response:

(A) The Isolation Condenser System (ICS) does meet the criterion as a closed loop system outside containment. The ICS meets the requirements of ANS 56.2 (as stated in the RAI)

Section 3.6.7 which states that "If a closed system outside containment is used as one of the two containment isolation barriers for an engineering safety feature related system, the closed system shall:" and a list of requirements follow. The ICS meets all requirements listed. In addition to one barrier outside containment, there are 2 Containment Isolation Valves (CIV) inside containment. Effectively, the ICS has 3 barriers (1 outside and 2 inside containment) and goes beyond the requirements in GDC 55 and 56. Having an additional CIV outside containment would be an over design of the system. No change made to the DCD.

(B) Verbiage will be changed to support RAI Part B comments in the next revision of the DCD. See DCD Impact below for markup.

DCD Impact:

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

DCD Tier 2, Section 6.2.4.3.1.1 will be revised as noted in the attached markup.

Isolation Condenser Condensate and Venting Lines

"In addition, the IC System outside the containment consists of a closed loop designed to ASME Code Section III, Class 2, Quality Group B, Seismic Category I, which is a "passive" substitute for an open "active" valve outside the containment. The combination of a **closed** loop outside the containment plus the two series automatic isolation valves inside the containment comply with the **requirements** of isolation functions of US NRC Code of Federal Regulations 10 CFR 50, Appendix A, Criteria 55 and 56."

DCD Tier 2, Tables 6.2-23, 25, 27 and 29, first asterisk, will be revised as noted in the attached markup.

"* With respect to meeting the **requirements** of US NRC 10CFR 50, Appendix A, General Design Criteria 55, the closed loop safety-related IC loop outside the containment is a "passive" substitute for an open "active" valve outside the containment. The combination of a **closed** loop outside the containment plus the two series automatic isolation valves inside the containment comply with the **requirements** of the isolation guidelines of 10 CFR50, App.A, Criterion 55 and 56."

DCD Tier 2, Tables 6.2-24, 26, 28 and 30, first asterisk, will be revised as noted in the attached markup.

"* The piping and valve arrangement for these lines meet the **requirements** of 10CFR50, App. A, GDC 55 because there are two normally closed valves in series in the line that leads from the suppression chamber back to the closed IC loop outside the containment."

NRC RAI 6.2-121:

DCD Tier 2, Revision 1, Section 6.2.4.3.1.2, "Effluent Lines," under the heading "Isolation Condenser Steam Supply Lines," makes two notable statements:

1. *Two isolation gate-valves are located in the containment where they are protected from outside environmental conditions, which may be caused by a failure outside the containment.*
2. *...the IC System outside the containment consists of a closed loop... which is a "passive" substitute for an open "active" valve outside the containment. This closed-loop substitute for an open isolation valve outside the* ***containment implicitly provides greater safety****. The combination of an* ***already isolated*** *loop outside the containment plus the series automatic isolation valves inside the containment comply with the intent of... [emphasis added]*

Statement 1. If the only justification for having both CIVs inside containment is that they are thus protected from outside environmental conditions, it is inadequate. SRP 6.2.4, Rev. 2,RG 1.141, and national standard ANS-56.2/ANSI N271-1976 provide guidance on acceptable justifications for deviations from the explicit requirements of GDC 55 and 56.

Statement 2. See RAI 6.2-119

Revise the two statements in light of the issues presented.

GE Response:

Statement 1. As stated in the response to RAI 6.2-119, the ICS has 3 isolation barriers, one outside containment as a closed loop system per ANS 56.2 Section 3.6.7, and two CIVs inside containment. Therefore, the 2 CIVs are protected from outside environmental conditions.

Statement 2: See GE's Response to RAI 6.2-119 for markup of DCD Tier 2 Subsection 6.2.4.3.1.1.

DCD Impact:

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