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MFN 06-308
Supplement 18

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Subject: Response to Portion of NRC Request for Additional Information Letter No. 185 Related to ESBWR Design Certification Application - - Classification of Structures Systems and Components (Nuclear Boiler System) -- RAI Number 3.2-19 S04

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) partial response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) received from the NRC via Reference 1 (RAI 3.2-19 S04).

Enclosure 1 contains the GEH response to NRC RAI 3.2-19 S04 that was received from the NRC on April 25, 2008, via MFN 08-434 (NRC Letter 185) (Reference 1). The original RAI and previous supplements from the NRC and GEH responses are listed in References 2 through 9.

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

Sincerely,

Richard E. Kingston

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Vice President, ESBWR Licensing

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NRO

References:

1. MFN 08-434 from Chandu Patel, Senior Project Manager, ESBWR/ABWR Projects Branch 1, Division of New Reactor Licensing, Office of New Reactors, to Robert E. Brown, *Request for Additional Information Letter No. 185 Related to ESBWR Design Certification Application*, dated April 25, 2008

2. MFN 06-308 Supplement 15 from Jim Kinsey to the U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter Number 148 Related to ESBWR Design Certification Application -- Classification of Structures, Systems and Components (Nuclear Boiler System) -- RAI Number 3.2-19 S03*, dated March 17, 2008

3. MFN 08-158 from Leslie Perkins, Project Manager, ESBWR/ABWR Projects Branch 2, Division of New Reactor Licensing, Office of New Reactors, to Robert E. Brown, *Request for Additional Information Letter No. 148 Related to ESBWR Design Certification Application*, dated February 19, 2008.

4. MFN 06-308, Supplement 12, from James C. Kinsey to the U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information to ESBWR Design Certification Application – Classification of structures, systems, and components*, RAI Number 3.2-19 S02, dated January 23, 2008.

5. E-mail from Chandu Patel, U.S. Nuclear Regulatory Commission to GEH, (RAI 3.2-19 S02), comment on response to RAI 3.2-19, Supplement 1 (MFN 06-308 Supplement 1), dated June 13, 2007.

6. MFN 06-308 Supplement 1 from James C. Kinsey to the U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 51 Related to ESBWR Design Certification Application – RWCU System – RAI Number 3.2-19 S01*, dated March 22, 2007.

7. E-mail from Jim Gaslevic, U.S. Nuclear Regulatory Commission to GEH, (RAI 3.2-19 S01), comment on response to RAI 3.2-19 main steam line valves and classifications, dated November 20, 2006.

8. MFN 06-308 from James C. Kinsey to the U.S. Nuclear Regulatory Commission, *Response to NRC Request for Additional Information Letter*

No. 51 Related to ESBWR Design Certification Application - Classification of Structures, Systems and Components - RAI Numbers 3.2-1 through 3.2-62, dated September 8, 2006.

9. MFN 06-277 from Lawrence Rossbach, Project Manager, ESBWR/ABWR Projects Branch, Division of New Reactor Licensing, Office of Nuclear Reactor Regulation, to David H. Hinds, *Request for Additional Information Letter No. 51 Related to ESBWR Design Certification Application [RAI concerning the classification of structures, systems, and components as described in Section 3.2 of the ESBWR design control document]*, dated August 8, 2006.

Enclosure:

1 Response to Portion of NRC Request for Additional Information Letter No. 185 Related to ESBWR Design Certification Application -- Classification of Structures Systems and Components (Nuclear Boiler System) -- RAI Number 3.2-19 S04

cc:	AE Cubbage	USNRC (with enclosures)
	RE Brown	GEH/Wilmington (with enclosures)
	GB Stramback	GEH/San Jose (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	eDRF	0000-0086-4521 (RAI 3.2-19 S04)

Enclosure 1

MFN 06-308, Supplement 18

Response to Portion of NRC Request for

Additional Information Letter No. 185

Related to ESBWR Design Certification Application

Nuclear Boiler System

RAI Numbers 3.2-19 S04

For historical purposes, the original text of RAI 3.2-19 and the GE responses are included. The attachments (if any) are not included from the original response to avoid confusion.

NRC RAI 3.2-19

In Table 3.2-1, Component B21, Item 13, the piping and valves (including supports) for main steam drains beyond the outermost MSIV and downstream of the second isolation valve is designated Quality Group D. However, consistent with SRP 3.2.2 and RG 1.26 guidance, this second drain isolation valve must also be a normally closed valve to define an acceptable transition from the upstream Quality Group B piping to the downstream Quality Group D piping. Please verify that the described second valve is a normally closed valve. Also, this item is designated Seismic Category II, which requires seismic analysis methods which are described in Section 3.7 of the DCD. However, Section 15.4.4.5.2.3 of the DCD refers to earthquake experience data as a basis for seismic structural capability of the main steam lines and drains. Please verify that this item will be analyzed according to methods described in Section 3.7, and revise Section 15.4.4.5.2.3 accordingly.

GE Response

The second isolation valve in the main steam drains beyond the outermost MSIV is a normally closed valve. GE confirms that B21 Item 13 in Table 3.2-1 will be analyzed according to the methods that are described in DCD Section 3.7. The statement in Section 15.4.4.5.2.3 that refers to earthquake experience data is not intended to be the only basis for seismic structural capability of main steam lines and drains. Please refer to the following statement in Section 15.4.4.5.2.3 that confirms that in the case of the ESBWR a dynamic analysis is performed to provide the basis for seismic structural capability of these lines:

"In the case of the ESBWR, further margin for survival can be expected, because the ESBWR lines are designed through dynamic analysis to survive such events, whereas in the case of the actual experience database, the lines shown to survive were designed to lesser standards to meet only normally expected loads."

DCD Impact

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

NRC RAI 3.2-19 S01

Email from Jim Gaslevic on 11/20/06

Table 3.2-1 shows that the MSIV drains beyond the outermost MSIV is designated as Quality Group D. The response to RAI 3.2-19 indicates that the second isolation valve in the main steam drains beyond the MSIV is a normally closed valve and GE confirms that B21 item 13 in Table 3.2-1 will be analyzed according to the methods that are described in DCD Section 3.7. Since Figure 3.2-1 shows there is an open orifice in this line that bypasses the closed valve, please confirm that the offsite radiation dose caused by a failure in this Safety Class D piping will not exceed the acceptance criteria of .5 rem identified in RG 1.26. Otherwise this line should be classified as Quality group C to be consistent with RG 1.26.

GE Response

There is a second normally closed valve that is in series with and upstream of the orifice in the bypass line. This valve is not reflected in the simplified schematic in DCD Figure 3.2-1, but does appear on the detailed Nuclear Boiler System P&ID. This second normally closed valve has the same classification as the normally closed valve referenced in the RAI. Therefore, no re-classification of the bypass line with the orifice is needed.

DCD Impact

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

NRC RAI 3.2-19 S02

Comment on response to RAI 3.2-19 S01 (MFN 06-308, Supplement 1):

GE's response to RAI 3.2-19 S01 identified that there is a second normally closed valve that is in series with and upstream of the orifice in the bypass line that is not reflected in the simplified schematic in DCD Figure 3.2-1, but does appear on the detailed Nuclear Boiler System P&ID. This normally closed valve is important to the classification and should be shown on the simplified diagram. The applicant is requested to submit a revised DCD Figure 3.2-1 to show this normally closed valve in the main steam drains.

GEH Response

This RAI was received by GEH prior to the submittal of DCD Tier 2, Revision 4. Therefore, the response to this RAI is based upon the current DCD, Revision 4.

Figure 3.2-1, which is a schematic diagram of the Power Conversion System, was revised, in DCD Tier 2, Rev. 4, to accurately depict the correct valve and piping relationships.

In addition, Items 12, 13 and 18 for System B21 in Table 3.2-1 were revised in DCD Tier 2, Rev. 4, to define the correct classifications for the steam drains.

DCD Impact

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

NRC RAI 3.2-19 S03

DCD Tier 2, Revision 4, submitted a revised Figure 3.2-1 to depict the correct valve and piping relationships. Although this figure does not show the second normally closed valve in the main steam (MS) drains stated in the response to RAI 3.2-19 S01, two normally open isolation valves in the MS drains are shown that could be used for isolating a downstream MS drain break. The boundary from safety-related to non-safety related is normally a closed valve, second automatically closed valve or second remotely operated valve. Provided the normally open isolation valves are remotely operated, this classification boundary is acceptable. Please confirm that the isolation valves are remotely operated or otherwise explain the basis for the classification boundary.

GEH Response

All valves shown on DCD Tier 2 Figure 3.2-1 that are part of Quality Group A have automatic isolation. The isolation signals for these valves are indicated, respectively, in DCD Tier 2 Tables 6.2-16 through 6.2-20. Valves located immediately upstream of steam line drains orifices shown on Figure 3.2-1 in Quality Groups B1 and B2 are normally open and designed to fail open in order to maintain a drainage path in the event of a loss of power to any of the three valves.

There is a line (drawn vertically) on Figure 3.2-1 under Quality Group B1, which directly cross-connects the main steam lines (all four) to the main steam lines drain line with an isolation valve shown as normally open. An open valve in this location would result in an abnormal bypass of main steam to the condenser. GEH has determined that this valve should be represented properly as normally closed, consistent with the design, and will make this correction in the next DCD revision.

DCD Impact

DCD Tier 2, Figure 3.2-1 will be revised as noted in the attached markup.

NRC RAI 3.2-19 S04

NRC Summary:

Provide clarifications for the boundary from safety-related QG B to non-safety related QG D.

NRC Full Text:

The applicant's response to RAI 3.2-19 S03 identified that the isolation valves immediately upstream of the steam line drains orifices shown on Figure 3.2-1 in Quality Groups B1 and B2 are normally open and are designed to fail open in order to maintain a drainage path in the event of loss of power to any of the three valves.

The proposed revision to Figure 3.2-1 shows another valve in a line that connects the main steam line with the main steam drain line that is now shown as normally closed. However, this normally closed valve is not in series with the main steam drain line.

Since the main steam drain line through the orifices represents a normally open flow path to the main condenser, it is not clear that the QG D and seismic Category II line downstream of the orifices and normally open, fail open valves is classified correctly. The boundary from safety-related QG B to nonsafety related QG D is normally a closed valve, second automatically closed valve or second remotely operated valve.

The applicant is requested to explain the basis for the classification boundary at the restraints considering the normally open, fail open valves. For example, if the orifice is sized to preclude excessive dose levels resulting from a failure of the downstream piping, or if operator action is credited, clarify this in the response.

GEH Response

The main steamlines (MSL) drains piping from each connection above the respective main steam isolation valve (MSIV) are isolated, as shown on DCD Tier 2, Rev. 5, Figure 3.2-1, by Quality Group A isolation valves. The inboard MSIV above-seat drains are combined into a single drain line with two isolation valves at the containment penetration. The four outboard MSIV above-seat drains have individual steamline drain connection isolation valves, shown as a single isolation valve schematically in Figure 3.2-1. These six isolation drains valves respond to automatic closure signals as listed in DCD Tier 2, Rev. 5, Tables 6.2-16 through 6.2-20.

The line that had previously been shown, in DCD Tier 2 Revision 4, with a normally-open valve that is noted in the second paragraph of the RAI supplemental inquiry, refers to the cross-connecting piping from the MSLs to the drains header downstream of the inboard MSIV above-seat drains pipe penetration isolation valve. This line is now

shown, in DCD Tier 2 Revision 5, with a normally-closed valve because this is a pressure equalizing header to permit steam bypass around the closed MSIVs, and is not part of the normal drains function.

The piping downstream of the isolation valves, for the three MSL drains stages that have bypass line orifices, use automatically closing and fail-open valves so that the drain path is maintained upon a loss of power. The automatic closure is used to shutoff the drain flow once reactor power has reached 40 percent of nuclear boiler rated power to stop excess steam diversion directly to the condenser. There is also a fourth set of drains in the main turbine steam supply piping, which is described in DCD Tier 2 Section 10.3 but not shown on Figure 10.3-1. These drains have a similar drains isolation valve arrangement with automatically closed/fail-open valves.

These MSL drains are evaluated for radiological release as part of the alternate source term release pathway described in LTR-NEDE-33279P (MFN 06-205 S02). The evaluation is in compliance with NRC Regulatory Guide 1.183, Alternative Radiological Source Terms For Evaluating Design Basis Accidents At Nuclear Power Reactors. The orifice opening area for the drains bypass lines is sized as assumed for the pathway analysis described in the LTR. Thus, the bypass line orifices are designed to preclude excessive dose levels and are demonstrated to meet this requirement by the analysis submitted with the LTR. The design of the MSL drains bypass line shutoff valves is, therefore, consistent with the requirements for MSL drains isolation as evaluated for the ESBWR.

DCD Impact

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

No changes to the subject LTR will be made in response to this RAI.