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MFN 08-086, Supplement 54

Docket No. 52-010

July 10, 2008

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: **Response to Portion of NRC Request for Additional Information Letters No. 174, 189 and 199 Related to ESBWR Design Certification Application RAI Numbers 14.3-217 S01, 14.3-251 S01, 14.3-367 S01 and 14.3-371 S01**

The purpose of this letter is to submit the GE-Hitachi Nuclear Energy LLC (GEH) Response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC letters dated April 23, 2008 (Reference 1), May 6, 2008 (Reference 2) and May 15, 2008 (Reference 3). The original RAIs and responses were transmitted in References 4 through 8.

Enclosure 1 contains the GEH response to RAI Numbers 14.3-217 S01, 14.3-251 S01, 14.3-367 S01 and 14.3-371 S01.

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

Sincerely,

Charles W. Boyd
for

Richard E. Kingston
Vice President, ESBWR Licensing

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NRO

References:

1. MFN 08-435, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 174 Related To ESBWR Design Certification Application*, April 23, 2008.

2. MFN 08-482, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 199 Related To ESBWR Design Certification Application*, May 15, 2008.

3. MFN 08-461, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 189 Related To ESBWR Design Certification Application*, May 6, 2008.

4. MFN 07-718, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 126 Related To ESBWR Design Certification Application*, December 20, 2007.

5. MFN 08-086, Supplement 8. *Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application RAI Numbers 14.3-216, 14.3-217, 14.3-219, and 14.3-227.* March 5, 2008.

6. MFN 08-086, Supplement 5. *Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application, 14.3-168, 14.3-179, 14.3-237,14.3-251,14.3-259, 14.3-285,14.3-287,14.3-288, 14.3-289, 14.3-306, 14.3-313, 14.3-347 and 14.3-388.* February 28, 2008.

7. MFN 08-086, Supplement 19. *Response to Portion of NRC Request for additional Information Letter No. 126 Related to ESBWR Design Certification Application, RAI Numbers 14.3-155, 14.3-156,14.3-158,14.3-161,14.3-239, 14.3-267, 14.3-365, 14.3-366, 14.3-367 and 14.3-369.* March 28, 2008.

8. MFN 08-086, Supplement 17. Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application ESBWR RAI Numbers 14.3-157, 14.3-159, 14.3-248, 14.3-322, 14.3-358, 14.3-359, 14.3-360, 14.3-371 and 14.3-372. March 26, 2008.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letters No. 174, 189 and 199 Related to ESBWR Design Certification Application RAI Numbers 14.3-217 S01 (Letter 174), 14.3-251 S01 (Letter 174), 14.3-367 S01 (Letter 199) and 14.3-371 S01 (Letter 189)

cc:

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GB Stramback	GEH/San Jose (with enclosure)
RE Brown	GEH/Wilmington (with enclosure)
DH Hinds	GEH/Wilmington (with enclosure)
eDRF	0000-0087-7780

Enclosure 1

MFN 08-086, Supplement 54

Response to Portion of NRC Request for Additional Information Letters No. 174, 189 and 199 Related to ESBWR Design Certification Application

RAI Numbers 14.3-217 S01 (Letter 174), 14.3-251 S01 (Letter 174), 14.3-367 S01 (Letter 199) and 14.3-371 S01 (Letter 189)

NRC RAI 14.3-217 (original)

NRC Summary: Fresh air supply to Control Room Habitability Area (CRHA)

NRC Full Text:

DCD Tier 1, Table 2.16.2-6, Item 5 identifies an ITAAC to ensure that the EFUs would maintain the Control Room Habitability Area (CRHA) at a positive pressure greater than 31 Pa (0.125 inch H2O gauge) with respect to the adjacent areas, while supplying the required 424 CFM outdoor air flow.

(A) DCD Tier 1, Section 2.16.2, Figure 2.16.2-4 does not show any air exhaust path out of the CRHA. Please describe how the 424 CFM supply would be balanced with a 424 CFM release from the CRHA.

(B) DCD Tier 2, Table 9.4-1 does not provide information regarding any maximum CRHA pressurization that would not be exceeded while maintaining the fresh air supply of 424 CFM.

Please provide the information.

(C) Please provide an ITAAC to ensure that the fresh air supply will not be reduced below the required 424 CFM due to the CRHA pressurization exceeding the minimum required 31 Pa?

GEH Response (original response)

(A) RAI 9.4-29 questioned the exhaust air path required to maintain flow of fresh air. DCD Tier 2 Figure 6.4-1 and Figure 9.4-1 were revised to illustrate the controlled leakage path design feature. DCD Tier 1, Figure 2.16.2-4, was also revised based on this RAI to denote the controlled leakage path design feature. The GEH response to RAI 9.4-29 (MFN 07-687, December 21, 2007) describes the controlled leak path from the CRHA envelope that maintains the required minimum positive pressure and the minimum flow rate.

(B) The maximum CRHA pressure that would be achieved while maintaining the minimum required fresh air supply of 424 CFM is determined during detailed design based on the final EFU fan performance curve. A shutoff head of approximately 4 inches water gauge (wg) would be the maximum pressure expected. All CRHA pressure boundary components will be designed for a pressure greater than the maximum developed fan pressure.

(C) Response to RAI 9.4-29 revised DCD Tier 2, Section 9.4.1.2, to describe the EFU function to maintain minimum airflow in conjunction with a control leak path while maintaining a minimum positive pressure in the CRHA. This design function will be verified as an ITAAC to ensure that the fresh air supply will not be reduced below the

required 424 CFM while the CRHA pressurization is maintained above the minimum required 31 Pa.

DCD Impact

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

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

(C) DCD Tier 1, ITAAC Table 2.16.2-6, Emergency Filter Units, Item 12 will be added in Revision 5, as reflected in the attached markup, and will include the design function for the EFU to maintain minimum air flow in conjunction with a control leak path while maintaining a minimum positive pressure in the CRHA.

NRC RAI 14.3-217 S01

Question Summary: Controlled leakage design features meet the minimum fresh air supply and CRHA pressurization design features meet the minimum fresh air supply and CRHA pressurization

Full Text:

In the response to RAI 14.3-217, GEH stated that DCD Tier 2 Figures 6.4-1, 9.4-1, and DCD Tier 1 Figure 2.16.2-4 had been revised to illustrate the controlled air leakage path from the Control Room Habitability Area (CRHA) envelope. The controlled leakage is needed to maintain the required minimum positive pressure and the minimum fresh air flow rate in the CRHA. However, an arrow marked on the figures to denote the leakage location provides no information regarding its control design features for balancing the fresh air supply and discharge while maintaining pressure. Please describe your control leakage design features.

Specifically, please provide details to assure that the flow from the EFU system will always be 424 CFM or greater, while maintaining a positive pressure in the CRHA greater than or equal to 1/8 inch w.g. Consider in your response the control of the air leakage path being based on (1) CRHA pressure and; (2) the loading of EFU filters or other flow resistances which could cause reduction in EFU fan flow rate. The essential control features should be based upon the EFU flow measurement and CRHA pressure. This information should be incorporated into the DCD.

GEH Response

Tier 1 Section 2.16.2.3 and Table 2.16.2-6 and Tier 2 Section 6.4.5 and Table 6.4-1 were changed in DCD Revision 5 to incorporate the requested change.

DCD Impact

No further change to DCD Revision 5 will be required as a result of this response.

NRC RAI 14.3-251 (original)

NRC Summary:

Table 2.2.3-1, Feedwater Control Modes description is not sufficient NRC Full Text: Use information in Table 2.2.3-3, to describe the functional arrangement in Table 2.2.3-1 for FWCS Controls.

GEH Response (original response)

The functional arrangement of the FWCS as credited in the Chapter 15 Safety Analyses is that the controller exists and is highly reliable because it is a triple redundant digital controller. Tables 2.2.3-2 and 2.2.3-3 define the specific functions and controls that the equipment defined in Table 2.2.3-1 must perform. See ITAAC Design Commitments 2 and 3.

DCD Impact

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

NRC RAI 14.3-251 S01

In the original RAI, the staff requested information from Table 2.2.3-3, "WCS Controls", which lists the various control modes for the feedwater control system (FWCS); manual, automatic (single and three element) etc., should be used in Table 2.2.3-1, "Feedwater Control Modes". Currently, the only information in the "Feedwater Control Modes" table is "FWCS is a triple-redundant, fault tolerant digital controller (FTDC)." This table's content, description, or both, should be revised to provide a consistent design commitment.

The design commitment, which is a functional arrangement, must be clear, concise and recognizable information that will be provided in the inspection and test report(s) document(s) presented for review. Per Regulatory Guide 1.206, a functional arrangement is defined as (for a system) "the physical arrangement of systems and components to provide the service for which the system is intended and that is described in the ITAAC design description and as shown in the figures." Figure 2.2.3-1 provides a simple diagram for the FCS logic but is not referenced by the functional arrangement or the design commitment. The acceptance criteria can also be derived from further Tier 2 material. From the FWCS Tier 2 description in Section 7.7.3.2.1 of the DCD, it does not stipulate what attribute is "triple redundant" but it does state "including power supplies and input/output signals." Tier 2 goes on to state the FTDC "consists of three parallel processing channels, each containing hardware and software for execution of the control algorithm." Therefore, the staff is also requesting if the intent is to maintain the existing topic in the functional arrangement then it should stipulate the attributes which are to be triple redundant, in terms of components, features or functions, with Figure 2.2.3-1 revised and referenced, accordingly.

GEH RESPONSE

Note: The GEH response to RAI 14.3-252 (MFN 08-086 Supp 43, dated May 9, 2008) addresses the issue raised by RAI 14.3-251S01. RAI 14.3-252 and the GEH response to RAI 14.3-252 as follows:

NRC RAI 14.3-252

NRC Summary: If necessary, add a control parameter for three channel redundancy

NRC Full Text:

If the redundant nature of the FWCS is being taken credit for in any analysis, then an adequate description of the type of redundancy (parts of, such as processor only, or MFN 08-086 Supplement 54 Page 2 of 2 Enclosure 1 *complete three channel design etc.) and a specific ITAAC should be created to confirm with loss of one, and two, channels FWCS output is maintained.*

GEH Response

The FWCS is equipped with two triple-redundant, fault-tolerant digital controllers (FTDC) including power supplies. Each FTDC (one level controller and one temperature controller) consists of three parallel processing controllers, each controller containing the hardware and software for execution of the control algorithms. Failure of any two temperature controllers, or failure of any two level controllers will cause a loss of FWCS output. A specific ITAAC has been created to confirm that with loss of one controller, FWCS output is maintained. The loss of any two FWCS controllers is not a design commitment and additional ITAAC is not required.

As a result of the RAI 14.3-252 response DCD Rev 5 Section 2.2.3, Feedwater Control System included a new Functional Requirement (S2.2.3 (5) and a new ITAAC (T2.2.3-4, Item 5) which declared the FWCS Controllers to be fault tolerant. The response to 14.3-252 adequately addresses the concern raised in RAI 14.3-251S01.

DCD IMPACT

No changes to DCD Rev 5 are required.

NRC RAI 14.3-367

NRC Summary: Hydrostatic testing for FAPCS

NRC Full Text:

For ITAAC Table 2.6.2-2, Item 4, the DC refers to piping and components, however the ITA and AC refer only to components. The staff requests that the applicant ensure consistency among the associated DC, ITA, and AC (i.e., modify ITA and AC to include piping). In addition, the staff requests clarification of "a hydrostatic or pressure test" phrase used in the ITA. The staff discerns no need for a distinction when ASME Code Section III requirements are applied. Likewise, use of the term "pressure test" in the AC should be clarified or modified to be consistent with the ITA.

GEH Response

GEH Agrees. DCD Tier 1 Table 2.6.2-2, Item 4 will be revised as follows:

a) Change the ITA from "A hydrostatic or pressure test..." to "A pressure test..."
RAI 14.3-390 (See MFN 08-086, Supplement 3, dated February 15, 2008) has modified the ITA and AC to include piping.

DCD Impact

DCD Tier 1, Table 2.6.2-2 will be revised as noted in the attached markup.

NRC RAI 14.3-367 S01

Question Summary: Hydrostatic testing for FAPC

Full Text:

The staff requested clarification of "a hydrostatic or pressure test" phrase used in the ITA. However, in response GEH to used the term 'pressure test' instead of the more acceptable term 'hydrostatic test' which is the preferred test of the ASME code. GEH should modify the ITA and AC to use the term 'hydrostatic test'.

GEH Response

Tier 1 Table 2.6.2-2, AC #4 and ITA #4 were changed in DCD Revision 5 to state that hydrostatic testing will be performed.

DCD Impact

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

NRC RAI 14.3-371 (original)

NRC Summary:

Pressure boundary integrity for LWMS NRC Full Text:
For ITAAC Table 2.10.1-2 Item 2: The staff requests that the applicant revise the AC report to (1) identify the components omitted from the test including the reason why the component was omitted from testing, and (2) document the reason the component was omitted from hydrostatic testing (e.g, the test would damage or interfere with a system component) and whether an alternative test (alternative to hydrostatic testing) was conducted to verify pressure boundary integrity. Otherwise, some components will be excluded from verification that they retain pressure boundary integrity.

GEH Response (original response)

DCD Tier 1 Table 2.10.1-2 will be revised to clarify that the LWMS piping systems will be hydrostatically pressure tested in conformance to the requirements in the API or ASME Code per Regulatory Guide 1.143, Revision 2. The ITAAC meets the recommendations of RG 1.143 Section 4.4 which states:

Piping systems should be hydrostatically tested in their entirety except (1) at atmospheric tanks where no isolation valves exist, (2) when such testing would damage equipment, and (3) when such testing could seriously interfere with other system or component testing. For (2) and (3), pneumatic testing should be performed. Pressure testing should be performed on as large a portion of the in-place systems as practicable. Testing of piping systems should be performed in accordance with applicable ASME or ANSI codes listed in Table 1.

An assessment of any components that might be omitted from the hydrostatic test would be made when developing the test procedure for hydrotesting the system since the determination of appropriate alternate testing could only be made based on the specific system design configuration. Pneumatic or manufacturer type testing would be examples of alternative testing that could be used to demonstrate system leak integrity.

DCD Impact

DCD Tier 1 Table 2.10.1-2 will be revised as noted in the attached markup.

NRC RAI 14.3-371 S01

Question Summary: ITAAC Table 2.10.1-2, Item 2

Full Text:

It is assumed that GEH intends to deal only with the piping in this ITA therefore - GEH's proposed revisions are not quite acceptable as written. The way the ITA has been revised it may be interpreted to mean they intend to use the B31.3 testing procedure for all the API and BPVC code units as well as the piping. If the ITA and AC were revised as shown below, they would be acceptable.

ITA "A hydrostatic test in accordance with ASME/ANSI B31.3 will be conducted on the LWMS piping systems, except (1) at atmospheric tanks where no isolation valves exist, (2) when such testing would damage equipment, and (3) when such testing could seriously interfere with other systems or components required to be hydrostatically tested by the API or ASME codes and standards per Regulatory Guide 1.143, Revision 2."

AC "The reports document that the results of the hydrostatic test of the LWMS piping systems in accordance with ASME/ANSI B31.3 conform with the requirements in the ASME Code per Regulatory Guide 1.143, Revision 2 indicate no unacceptable pressure boundary leakage."

GEH Response

Tier #1 Table 2.10.1-2, ITA #2 and AC #2 were changed in DCD Revision 5 in response to this RAI.

DCD Impact

No further change to DCD Revision 5 will be required as a result of this response.