



HITACHI

GE Hitachi Nuclear Energy

Richard E. Kingston
Vice President, ESBWR Licensing

PO Box 780
3901 Castle Hayne Road, M/C A-55
Wilmington, NC 28402
USA

T 910 675 5057
F 910 362 5057
Rick.Kingston@ge.com

MFN 08-086 Supplement 66

Docket No. 52-010

September 26, 2008

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. 215 Related to ESBWR Design Certification Application ESBWR RAI Numbers 14.3-345 S01 and 14.3-348 S01

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC letter dated June 23, 2008 (Reference 1).

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box. The marked-up pages may contain unverified changes in addition to the verified changes resulting from this RAI response. Other changes shown in the markup(s) may not be fully developed and approved for inclusion in the DCD.

Enclosure 1 contains the GEH response to each of the subject RAIs. Previous RAIs and responses were transmitted in References 2 through 4. The enclosed changes will be incorporated in an upcoming DCD Revision.

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

Sincerely,

Lee F. Dougherty for

Richard E. Kingston
Vice President, ESBWR Licensing

*DO68
NEW*

References:

1. MFN 08-550, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 215 Related To ESBWR Design Certification Application*, dated June 23, 2008.
2. MFN 07-718, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 126 Related To ESBWR Design Certification Application*, dated December 20, 2007.
3. MFN 08-086, Supplement 43 Response to Portion of NRC Request for Additional Information Letter No. 126, Related to ESBWR Design Certification Application, DCD Tier 1, RAI Numbers 14.3-252, 14.3-260, 14.3-265 and 14.3-345 dated May 9, 2008.
4. MFN 08-086, Supplement 40 Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application RAI Number 14.3-348, dated May 2, 2008.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 215 Related to ESBWR Design Certification Application DCD Tier 1 RAI Numbers 14.3-345 S01 and 14.3-348 S01

Enclosure 1, Attachment 1 DCD Tier 1, Revision 5 Markups

cc: AE Cabbage USNRC (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
eDRF Section 0000-0091-4396 RAI 14.3-345 S01
0000-0087-6167 RAI 14.3-348 S01

Enclosure 1

MFN 08-086, Supplement 66

**Response to Portion of NRC Request for
Additional Information Letter No. 215
Related to ESBWR Design Certification Application
DCD Tier 1
RAI Numbers 14.3-345 S01 and 14.3-348 S01**

***Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box. The marked-up pages may contain unverified changes in addition to the verified changes resulting from this RAI response. Other changes shown in the markup(s) may not be fully developed and approved for inclusion in DCD Revision 6.**

The GEH Response to RAI 14.3-345 is included here for ease of reference. Any DCD markup attachments for this RAI response have not been included.

NRC RAI 14.3-345(original)

For ITAAC Table 2.1.2-3 Item 6a, there is a reference to Table 2.1.2-2. However, the divisions that are the subject of ITAAC verification are not clearly identified in Table 2.1.2-2 (i.e., there is no clear correlation between Table 2.1.2-1 and the ITAAC in Section 2.13). The staff requests that the applicant provide a clear identification of the divisions in Table 2.1.2-2 to facilitate completion of the ITAAC per Section 2.13.

Also there are no clear criteria provided for physical separation as discussed in item 6b. and likewise no such criteria provided in the Section 2.2.15 ITAAC to which this is referred. The staff requests the applicant to provide suitable justification for this approach or provide the necessary criteria.

GEH Response (original)

DCD Tier 1, Section 2.1.2, and ITAAC Table 2.1.2-3, Items 6a & 6b will be revised as noted in the attached markup for clarity and appropriate cross references for the verification of the ITAAC. No reference to divisions will be provided in Table 2.1.2-2. Identification of the divisions will be established during detailed design.

DCD Impact (original)

DCD Tier 1, Section 2.1.2, and Table 2.1.2-3, Items 6a & 6b will be revised as noted in the attached markup to provide correct references to ITAAC verification in Table 2.2.15-2.

NRC RAI 14.3-345 S01

A.) *Item 6a) in Table 2.1.2-3, the Inspections, Tests, Analyses, (ITA) references Table 2.2.15-2, Items 21.a. and 21.b. The staff suggests the following changes in Items 21.a and 21.b in Table 2.2.15-2.*

It is suggested that the Design Commitment (DC) is revised as follows to clarify what it is meant by systems being supplied by power supplies in the same division: "The electrical safety-related components in the mechanical systems listed in Table 2.2.15-1 receive power from their respective, safety-related, divisional power supplies."

The basis for this change is that the systems in Table 2.2.15-1 probably are not exclusively one division but several or multiple divisions, and thus have more than one electric power division supplying power to portions of them. If the systems are composed of only a singular division and receive power from a power supply in that same division, then the clarification may not be necessary.

The modification to the ITA and Acceptance Criteria (AC) is to be in accordance with the intent of the response for RAI 14.3-379.

It is suggested that the ITA be revised in order for the inspections to be of the as-built installations not the one line diagrams: "Test(s) will be performed for the electrical components for the mechanical systems listed in Table 2.2.15-1 by providing a test signal in only one safety-related electrical division at a time."

The Item a for the AC is no longer required, the staff suggest that GEH modify Item b for the AC as shown below:

"Test report(s) exist(s) and conclude(s) the electrical components in a singular division for the mechanical systems listed in Table 2.2.15-1 receive(s) power from a safetyrelated power supply in the same division."

The DC, ITA, and AC for Item 21.b. could be written in the same manner as those for Item 21.a. above, if more than one division of non-electric power sources supplies those same mechanical systems.

B.) *For Table 2.1.2-3, Item 6b in Table 2.1.2-3 the ITA refers to Table 2.2.15-2, Items 5.a. and 5.b. The staff suggests the following changes in Items 5.a. and 5.b. of Table 2.2.15-2:*

For Item 5.a., the AC could be revised to state "Analysis report(s) exist(s) and conclude(s) that . . . "

For Item 5.b., the AC, could be revised to state "Report(s) exist(s) and conclude(s) that . . . "

C.) *For Table 2.1.2-3, Item 6b), the staff suggests the following revision be made to the DC so that both physical and electrical independence are established for the various portions of the Nuclear Boiler System (NBS) system: "Physical separation and electrical independence are provided between the redundant portions of the safety-related electrical equipment of the NBS system and other mechanical systems and between the*

safety-related electrical equipment of the NBS system and non-safety related equipment."

Each mechanical system being supplied power from several electrical divisions should be treated in the same manner as this for the NBS in determining whether the components of those systems are powered from the appropriate electrical division and be in accordance with the GEH response to RAI 14.3-379.

GEH Response

A.) GEH concurs that the Design Commitment, ITA, and AC for Table 2.2.15-2, Item 21.a should be revised in order to better clarify what is meant by systems being supplied by power supplies in the same division.

GEH concurs that Item 21.b is no longer necessary and will be deleted.

B.) GEH concurs and Table 2.2.15-2 Item 5.a and 5.b will be revised to add, "exist".

C.) Table 2.1.2-3 Item 6b was considered a "reference ITAAC" and has been deleted. These "reference ITAACs" have been removed from the ITAAC tables throughout as a result of the DCD consistency review.

DCD Impact

DCD Tier 2, Tables 2.1.2-3 and 2.2.15-2 have been revised as noted in the attached markups.

NRC RAI 501114.3-348 (original)

NRC Summary:

RCIS interfacing systems

NRC Full Text:

For ITAAC Table 2.2.1-6 Item 3, the ITA & AC are not consistent with the DC regarding interfacing systems. The staff requests that the applicant modify the ITA and AC to include a verification of the associated interfacing systems specified in Table 2.2.1-3. In addition, the AC should include verification of that the list of systems identified as interfaces in Table 2.2.1-3 is a complete list. The applicant should confirm that there are other ITAAC to verify the functional performance of the associated interfacing systems.

GEH RESPONSE (original)

DCD Tier 1, Rev. 4, ITMC Table 2.2.1-6 Item 3 will be revised to include a verification of the associated interfacing systems specified in Table 2.2.1-3.

DCD IMPACT (original)

DCD Tier 1, Rev. 4, Table 2.2.1-6 Item 3, will be revised as noted in the attached markup.

RAI 14.3-348 S01

NRC Summary:

RC&IS interfacing systems.

NRC Full Text:

GEH has made an attempt to meet the staff's request, but the staff suggests additional changes.

- A.) The DC should be revised as follows because in Table 2.2.1-3 it appears that there are initiators both from the rod control and information system (RC&IS) and the stated interfacing systems: "A RC&IS automatic function and its initiators including the initiators from interfacing systems are defined in Table 2.2.1-3."*
- B.) The ITA should have two parts per the GEH response, and the basis for the changes requested in the ITA is the same reason stated for the DC. It is suggested that the ITA be revised as stated below:*

ITA (Item a): "Inspections will be performed to verify that the as-built RC&IS system complies with the automatic function, and its initiators, including the initiators from interfacing systems defined in Table 2.2.1-3."

ITA (Item b): "Test(s) and type test(s) will be performed on the as built system using simulated signals to represent the initiators from the RC&IS and interfacing systems specified in Table 2.2.1-3."

- C.) *The AC should have two parts per the GEH response, and the basis for the changes requested in the AC is the same reason stated for the DC. It is suggested that the AC be revised as stated below:*

AC (Item a): "Report(s) document(s) and conclude(s) that the as-built RC&IS system complies/comply with the automatic function, and all of its initiators, from the RC&IS and interfacing systems as defined in Table 2.2.1-3."

AC (Item b): "Test and type test report(s) document(s) and conclude(s) the RC&IS system is capable of performing the functions defined in Table 2.2.1-3 using simulated signals to represent the initiators from the RC&IS and interfacing as-built systems specified in Table 2.2.1-3."

The applicant should state in their reply to this request that the list of interfacing systems is a complete list, and that all initiators from other interfacing systems have been accounted for in Table 2.2.1-3. This should not be in the ITAAC just in the applicant's reply.

- A.) Table 2.2.1-3, RC&IS Automatic Functions, Initiators, and Associated Interfacing Systems, lists the initiators (both internal and external to RC&IS), and describes the function associated with those initiators. The table also lists the associated systems that interface with RC&IS. This table presents a complete list of interfacing systems and accounts for all initiators from those interfacing systems.

There are three initiating signals internal to the RC&IS (denoted by the dash (-) in the interfacing system column). The remaining initiating signals listed in the table are external to the RC&IS. Regardless of which signal "initiates" the function, it is still the "initiator" and not the "interfacing system" that provides the signal to initiate the function. Item 4, Table 2.2.1-6, ITAAC for the Rod Control and Information System will be revised to delete "and associated interfacing systems".

- B.) Tests will not be performed on entire interfacing systems; only on the "initiators". The verbiage of the ITA and AC addressing only the "initiators" and not the "interfacing systems" is correct and further revision is unnecessary.

- C.) AC; see Item B.

The verbiage "type test" was removed from the ITA and AC as type test refers to a factory test and these type tests will not be performed on the "initiators".

DCD Impact

DCD Revision 5 Tier 1 will be modified as shown in the attached markup of Table 2.2.1-6.

Enclosure 1

Attachment 1

DCD Tier 1, Revision 5 Markups

Table 2.1.2-3	ITAAC for The Nuclear Boiler System
Table 2.2.15-2	ITAAC for IEEE Std. 603 Compliance Confirmation
Table 2.2.1-6	ITAAC for the Rod Control and Information System

**Table 2.1.2-3
ITAAC For The Nuclear Boiler System**

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
	iii) Inspection will be performed to verify that the as-installed <u>equipment, including components and piping, components and including anchorage</u> is bounded by the tested or analyzed conditions.	iii) A report exists and concludes that the loading on the as-installed <u>equipment, including components and piping, components</u> including associated anchorage falls within the design basis seismic load conditions used for type testing or analysis.
6a. Each of the NBS safety related equipment identified in Table 2.1.2-2 is powered from its respective safety-related divisional power supply. Deleted b. Separation is provided between NBS safety related electrical equipment, and between safety related electrical equipment and nonsafety related cable.	See Tier 1, Subsection 2.2.15 and Table 2.2.15-2, Items 21a & 21b. See Tier 1, Subsection 2.2.15 and Table 2.2.15-2, Items 5a & 5b.	See Tier 1, Subsection 2.2.15 and Table 2.2.15-2, Items 21a & 21b. See Tier 1, Subsection 2.2.15 and Table 2.2.15-2, Items 5a & 5b.
7. Deleted Each mechanical train of safety-related NBS equipment located in the <u>Reactor Building outside the drywell is physically separated from the other trains.</u>	<u>Inspections of the as-built NBS equipment trains will be performed.</u>	<u>Report(s) document that each mechanical train of NBS equipment located in the Reactor Building outside the drywell is physically separated so as not to preclude accomplishment of the intended safety function.</u>

Table 2.2.15-2

ITAAC For IEEE Std. 603 Compliance Confirmation

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>5. Criteria 5.6 and 6.3, Independence: For the Criteria 5.6 and 6.3 systems listed in Table 2.2.15-1, there is physical, electrical, and communications independence between redundant portions of a safety-related system, between safety-related systems and the effects of a DBE, and between safety-related systems and nonsafety-related systems, as identified in the applicable FMEA.</p>	<p>a. Block level FMEA will be performed to verify that the designs of the Criteria 5.6 and 6.3 systems listed in Table 2.2.15-1 have physical, electrical, and communications independence between redundant portions of a safety-related system, between safety-related systems and the effects of a DBE, and between safety-related systems and nonsafety-related equipment, as identified in the applicable FMEA. {{Design Acceptance Criteria}}</p> <p>b. Inspection(s) will be performed to demonstrate that the Criteria 5.6 and 6.3 systems listed in Table 2.2.15-1 have physical independence between redundant portions of a safety-related system, between safety-related systems and the effects of a DBE, and between safety-related systems and nonsafety-related equipment, as identified in the applicable FMEA. .</p>	<p>a. Analysis report(s) exist and conclude(s) that the designs of the Criteria 5.6 and 6.3 listed in Table 2.2.15-1 have physical, electrical, and communications independence between redundant portions of a safety-related system, between safety-related systems and the effects of a DBE, and between safety-related systems and nonsafety-related equipment, as identified in the applicable FMEA. {{Design Acceptance Criteria}}</p> <p>b. Inspection report(s) exist and conclude(s) that the Criteria 5.6 and 6.3 systems listed in Table 2.2.15-1 have physical independence between redundant portions of a safety-related system, between safety-related systems and the effects of a DBE, and between safety-related systems and nonsafety-related equipment, as identified in the applicable FMEA.</p>

**Table 2.2.1-6
ITAAC For Rod Control and Information System**

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. RC&IS functional arrangement is defined in Table 2.2.1-1.	Test(s) and inspection(s) of the as-built system will be performed.	Test and inspection report(s) document that the as-built system conforms with the functional arrangement defined in Table 2.2.1-1.
2. RC&IS is divided into major functional groups as defined in Table 2.2.1-2.	Test(s) and inspection(s) of the as-built system will be performed.	Test and inspection report(s) document that the as-built system is divided into major functional groups as defined in Table 2.2.1-2.
3. RC&IS automatic functions, and initiators, and associated interfacing systems are defined in Table 2.2.1-3.	Test(s) and type test(s) will be performed for the initiators on the as-built RC&IS using simulated signals to perform automatic functions listed in Table 2.2.1-3.	Test and type test report(s) document that the RC&IS is capable of performing the functions for the initiators as defined in Table 2.2.1-3.
4. RC&IS rod block functions and the permissive conditions under which the rod block is active are defined in Table 2.2.1-4.	Test(s) and type test(s) will be performed using simulated signals and manual actions to confirm that the rod withdrawal and insertion commands are blocked as defined in Table 2.2.1-4.	Test and type test report(s) document that the rod block functions defined in Table 2.2.1-4 are performed in response to simulated signals and manual actions.
5. RC&IS controls, interlocks, and bypasses are defined in Table 2.2.1-5.	Inspection(s), test(s) and type test(s) will be performed on the as-built system using simulated signals and manual actions.	Inspection, test and type test report(s) document that the system controls, interlocks, and bypasses exist, can be retrieved in the main control room, or are performed in response to simulated signals and manual actions as defined in Table 2.2.1-5.

Table 2.2.15-2

ITAAC For IEEE Std. 603 Compliance Confirmation

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>20. Criterion 6.8, Setpoint: For the Criterion 6.8 systems listed in Table 2.2.15-1, setpoints for safety-related functions are defined, determined and implemented based on a defined setpoint methodology.</p>	<p>Inspection(s), test(s), and/or analysis(es) for the Criterion 6.8 systems listed in Table 2.2.15-1 will be performed to verify that the setpoints for safety-related functions are defined, determined and implemented based on a defined setpoint methodology.</p>	<p>Inspection(s), test(s), or analysis(es) report(s) for the Criterion 6.8 systems listed in Table 2.2.15-1 <u>exist and</u> conclude(s) that the safety-related systems' setpoints for safety-related functions are defined, determined and implemented based on a defined setpoint methodology.</p>
<p>21. Criterion 8.1, Electrical Power</p> <p>Sources: The listed systems in Table 2.2.15-1 receive power from safety-related power supplies in the same division. <u>The electrical safety-related components in the mechanical systems listed in Table 2.2.15-1 receive power from their respective, safety-related, divisional power supplies.</u></p>	<p>a. Test(s) will be performed for the electrical components for the mechanical systems listed in Table 2.2.15-1 by providing a test signal in only one safety-related electrical division at a time. <u>Inspection(s) will be performed of the "current revision" of the electrical one-line diagrams for the listed systems in Table 2.2.15-1.</u> {{Design Acceptance Criteria}}</p> <p>b. Inspection(s) will be performed on the listed systems in table 2.2.15-1</p>	<p>a. Test(s) Inspection report(s) exist and conclude(s) that the "current revision" of the electrical components in a <u>singular division for the mechanical one-line diagrams show the listed systems listed in Table 2.2.15-1, receive power from a safety-related power supplies in the same division.</u> {{Design Acceptance Criteria}}</p> <p>b. Inspection report(s) <u>exist and</u> conclude(s) that the listed systems in Table 2.2.15-1, receive power from safety related power supplies in the same division.</p>