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Subject: **Response to Portion of NRC Request for Additional Information Letter Nos. 100, 105 and 107 Related to ESBWR Design Certification Application – RAI Numbers 7.1-56, 7.1-59, 7.1-60, 7.2-1 S01, 7.3-2 S01, 7.8-5 S01, and 7.9-7 S01**

Enclosure 1 contains GEH's responses to the subject NRC RAIs.

The NRC transmitted RAI 7.2-1 S01 Supplement 1 via email from Lauren Quinones, dated June 26, 2007.

The NRC transmitted RAIs 7.1-56, 7.1-59 and 7.1-60 via Reference 1.

The NRC transmitted RAIs 7.3-2 Supplement 1 and 7.9-7 Supplement 1 via Reference 2.

The NRC transmitted RAI 7.8-5 Supplement 1 via Reference 3.

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

Sincerely,

Kathy Sedney for

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

References:

1. MFN 07-327, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 100 Related to ESBWR Design Certification Application,* May 30, 2007
2. MFN 07-460, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application,* August 16, 2007
3. MFN 07-492, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 107 Related to ESBWR Design Certification Application*, August 31, 2007

Enclosures:

1. MFN 07-560 -- Response to Portion of NRC Request for Additional Information Letter Nos. 100, 105 and 107 Related to ESBWR Design Certification Application – RAI Numbers 7.1-56, 7.1-59, 7.1-60, 7.2-1 S01, 7.3-2 S01, 7.8-5 S01, and 7.9-7 S01

cc: AE Cubbage USNRC (with enclosures)
RE Brown GEH/Wilmington (with enclosures)
GB Stramback GEH/San Jose (with enclosures)

eDRF:	RAI 7.1-56	0000-0070-3245
	RAI 7.1-59	0000-0070-3297
	RAI 7.1-60	0000-0075-2389
	RAI 7.2-1 S01	0000-0074-4828
	RAI 7.3-2 S01	0000-0074-9769
	RAI 7.8-5 S01	0000-0075-6500
	RAI 7.9-7 S01	0000-0075-8770

MFN 07-560

Enclosure 1

Response to Portion of NRC Request for Additional Information Letter Nos. 100, 105 and 107 Related to ESBWR Design Certification Application – RAI Numbers 7.1-56, 7.1-59, 7.1-60, 7.2-1 S01, 7.3-2 S01, 7.8-5 S01, and 7.9-7 S01

NRC RAI 7.1-56

DCD Tier 2, Rev. 3, Section 7.1.3.3, Q-DCIS Safety Evaluation, states; "It is the nonsafety-related gateway that translates the safety-related information into a format that N-DCIS can understand, will respond to interruptions and queries and will package the safety-related information into the necessary message packets to support specific N-DCIS components for monitoring, alarming and recording purposes." Describe where the safety to non-safety boundary is. Define what is meant by a nonsafety gateway. Include the safety status of all signals received and sent. A gateway is normally the device at the boundary between safety and non-safety related systems; this would require that device to be safety related. Rev. 2 of the DCD specifically stated that "The communication from safety-related systems and E-DCIS has their own gateways to transmit the data to NEDCIS."

GEH Response

Describe where the safety to non-safety boundary is.

The boundary between the safety-related distributed control and information system (Q-DCIS) and nonsafety-related DCIS (N-DCIS) is in the equipment that converts the safety-related electrical signal to light for use by the nonsafety-related system. This equipment is safety-related and located in safety-related cabinets.

The second paragraph of DCD Tier 2, Rev. 4, Section 7.1.3.3 (Q-DCIS Safety Evaluation) states, "The fiber optic communication module, which converts safety-related electrical signals to light on the sending side of the fiber optic cable, is physically located within and is powered by the division within which it is located. The fiber optic communication module is a qualified safety-related component." The fourth paragraph states "The IEEE Std. 603, Sections 5.6 and 6.3, isolation occurs in the safety-related fiber optic communication transmitter or receiver module where the electrical signal is first converted to light." IEEE Std. 603, Section 5.6 isolation is further described in Subsection 7.1.6.6.1.7.

Define what is meant by a nonsafety-related gateway.

Nonsafety-related gateways are electronic devices that translate digital communication protocols into other digital communication protocols (e.g. TCP/IP to UDP) and, when necessary, convert the physical communication medium from one network to the physical communication medium used in another network (e.g. electrical twisted pair network to a fiber optic network). Message content passes through the nonsafety-related gateways to the receiver with its content unchanged. The receiver, in combination with the sender's protocol and message content, may verify message validity and integrity through means such as checksums and parity checks.

DCD Tier 2, Rev. 4, Subsections 7.1.3.3 (Q-DCIS Safety Evaluation), 7.1.4 (N-DCIS General Description Summary), and 7.1.5 (N-DCIS Specifics) include information on the boundary and communication between the Q-DCIS and the N-DCIS and describe the nonsafety-related gateways as indicated in the following statements.

- The eighth paragraph in Subsection 7.1.3.3, states, "The nonsafety-related gateways, when required, handle the data interface, but do not provide isolation for communications between the Q-DCIS and the N-DCIS. They do this by packaging the data for the various N-DCIS functions, responding to the N-DCIS requests for information and monitoring communication link status."
- The fourth paragraph in Subsection 7.1.4 states that the "N-DCIS provides gateways/datalinks as necessary to allow vendor supplied or prepackaged ("foreign") control systems to be integrated into the DCIS."
- The fifth bullet item in the Subsection 7.1.4.8.1 bullet list indicates that the nonsafety-related gateways "translate and distribute data from the QDCIS to the N-DCIS."
- The fifth bullet item in Subsection 7.1.5.2.5 states, "N-DCIS gateways/datalinks provide the N-DCIS communication with the Q-DCIS, vendor supplied controllers, the secure communication with the TSC/EOF/ERDS, and other nonsafety-related packaged systems."
- The sixth paragraph in Subsection 7.1.5.2.6 states, "The electrical and data isolation functions are part of Q-DCIS, and the gateway functions (data conversion and packaging) are part of N-DCIS."

Include the safety status of all signals received and sent.

All signals arriving at a nonsafety-related gateway from the Q-DCIS have already been isolated via a safety-related communication interface within the Q-DCIS as described above and are, therefore, nonsafety-related. All signals whether sent or received via a nonsafety-related gateway are within the Nonsafety-related DCIS (N-DCIS) and are, therefore, nonsafety-related.

A gateway is normally the device at the boundary between safety-related and nonsafety-related systems; this would require that device to be safety-related.

Since the gateway is not the boundary between safety-related and nonsafety-related (as described above), it is not required to be classified as safety-related.

Rev. 2 of the DCD specifically stated that "The communication from safety-related systems and E-DCIS has their own gateways to transmit the data to NEDCIS."

The above quote is from DCD Tier 2, Rev. 2, Subsection 7.9.2.2.2 (Hardware Configuration). From Revision 2 to Revision 3 of the DCD, Section 7.1 was completely rewritten to enhance the description of the ESBWR DCIS. The existing description was combined with the communication information previously included in Section 7.9 to

provide a better picture of the integrated system. Communication from safety-related systems to nonsafety-related systems having their own gateways is now reflected in the sixth paragraph of Rev. 4, Subsection 7.1.3.3 (Q-DCIS Safety Evaluation) which states, "The gateways are specific to the communication link between the sending and receiving components. For example, the gateway between the SSLC/ESF and N-DCIS is different from the gateway between the RPS/NMS and the N-DCIS. The sending sources are different even though the receivers are the same."

The responses to RAI 7.1-33 and 7.9-3 (MFN 07-285) also addressed the use of gateways and communication/isolation between Q-DCIS and N-DCIS.

DCD Impact

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

NRC RAI 7.1-59

DCD Tier 2, Rev 3, Section 7.1.3.3, states "Check back, time synchronization or similar signals are sent from non-safety related components to safety-related components but only under the circumstances described below." Only the time signals are described below in that paragraph. Please explain what "check back" and "similar signals" mean in detail. During public meetings with staff on April 24 and 26, 2007, GE's presentation specifically said "Other than time of day, all non-safety inputs require the safety-related instrument to be placed in the INOP position and operator action to accept the data."

GEH Response

Only the time signals are described below in that paragraph. Please explain what "check back" and "similar signals" mean in detail.

A "checkback" signal is a signal sent between systems to indicate whether data was transmitted and received correctly. The term "similar signals" is too vague and will be removed. Following the description of time signals communication in DCD Subsection 7.1.3.3 is a description of the communication from nonsafety-related (N-DCIS) to safety-related (Q-DCIS) for the calibration of the APRM (Average Power Range Monitor) and LPRM (Local Power Range Monitor).

Calibration of the APRM and LPRM may involve a "checkback" signal between the safety-related NUMAC equipment and the nonsafety-related 3D MONICORE system to verify that the calibration data was transmitted and received correctly. This transmission/transfer of data can only take place while the safety-related equipment is in INOP and the data can then only be used if manually signaled to do so by the operator. Detail will be added to DCD Subsection 7.1.3.3 to further clarify what is meant by a "checkback" signal and how it might be used

Further detail on the communication of APRM/LPRM gain adjustment factors (from N-DCIS to Q-DCIS) can be found in Licensing Topical Report "Application of Nuclear Measurement Analysis and Control (NUMAC) for the ESBWR Reactor Trip System," NEDO-33288, March 2007 (MFN 07-160), Section 5.2.3.3.3, "Nonsafety-Related System to Safety-Related System Communications".

"Other than time of day, all non-safety inputs require the safety-related instrument to be placed in the INOP position and operator action to accept the data."

This statement is still true.

DCD Impact

DCD Tier 2, Subsection 7.1.3.3, "Q-DCIS Safety Evaluation," will be revised as indicated in the following mark-up in response to this RAI.

The safety-related systems are designed not to depend on nonsafety-related communication ~~for~~ to function~~;~~, therefore, loss of communication is never a safety issue. ~~More s~~Specifically, no process feedback signals are sent from the N-DCIS to the Q-DCIS~~nonsafety-related components to the safety-related components~~. The only signals ~~Check back, time synchronization, or similar signals are~~ sent from nonsafety-related components to safety-related components are those involved in time tagging and the transmission of data for calibration of the safety-related NMS and is ~~but~~ only possible under the strict circumstances described below.

Nonsafety-related ~~T~~time signals are sent to Q-DCIS communication interfaces through the gateways for use by the Q-DCIS to allow time tagging of data sent to the N-DCIS~~nonsafety-related components~~. These time signals are only used by the Q-DCIS ~~only~~ for VDU indication so that all displays ~~have~~ show the same time of day. The~~y~~ time signals sent from the N-DCIS to the Q-DCIS are never used to synchronize logic nor is the safety-related logic dependent in any way on the absence, presence, or correctness of the time signal.

The ~~single remaining~~ only other instance of nonsafety-related to safety-related communication involves the calibration of the APRM and LPRM. This transfer of data is similar to that of ~~As with the~~ retrofit Nuclear Measurement Analysis and Control (NUMAC) PRNM systems already licensed for some U.S. nuclear power plants, which is done~~, the data originate in 3D MONICORE, but the information exchange is~~ manually and is rigorously controlled. Before the NUMAC chassis can accept new calibration data, even if it has been continuously sent by 3D MONICORE, the operator must use a keylock switch to make the particular chassis inoperable (INOP). If the operator has not additionally put the corresponding division in bypass, the INOP is interpreted as an NMS trip. It is not physically possible to simultaneously put more than one division in bypass. ~~Both t~~Trips and bypasses are alarmed in the MCR.

After the chassis has been made INOP, the operator reviews the download received by the chassis to be calibrated. Additionally, the operator may determine~~s~~ that ~~the~~ a checkback signal interchange indicates that the NUMAC chassis correctly received the 3D MONICORE data. If a checkback signal is utilized, it is initiated by the NUMAC equipment and sent to 3D MONICORE. 3D MONICORE receives the checkback signal, verifies/validates that the information received by the NUMAC equipment is what was sent, and then sends a signal back to the NUMAC equipment confirming that the data was received accurately. There is no automatic/automated system response to a good or bad checkback signal. Only after the operator is satisfied that the calibration data are ~~reasonable~~accurate and correct (likely through manual verification of the data in addition to the use of a confirming electronic checkback signal) ~~does he~~ can the operator instruct

the NUMAC chassis that it is acceptable to use the downloaded data. Thise process is equivalent, but more convenient and accurate, to carrying the calibration data to the NUMAC chassis and inputting it by hand, a process~~,~~ which may ~~is still possible~~ be used. After the download is accepted by NUMAC, the operator uses the keylock switch to make the instrument operable (removing it from INOP) and then resets the bypass for the division.

NRC RAI 7.1-60

In DCD Tier 2, Rev 3, Section 7.9 was deleted. Per 10 CFR 50.34(h)(2), "Applications for light water cooled nuclear power plant construction permits, manufacturing licenses, and preliminary or final design approvals for standard plants docketed after May 17, 1982, shall include an evaluation of the facility against the SRP." The DCD should provide a cross reference from each section of SRP 7.9 to where, specifically, the information can be found in the DCD. Clarify where the information that was provided in DCD Tier 2, Rev 2, Section 7.9, is now located in DCD Rev. 3.

GEH Response

The SRP acceptance criteria for Section 7.9 are associated with SRP Appendix 7.1-B, 7.1-C, and 7.1-D. The table below contains the locations in the DCD Tier 2, Rev. 4, Section 7.1 where this information is located.

SRP 7.9 Acceptance Criteria Reference	Location in DCD Tier 2, Rev. 4
7.1-B (Conformance to IEEE 279)	Not Applicable. This only applies to permits issued prior to 1971
7.1-C (Conformance to IEEE 603)	7.1.6.6.1 and Table 7.1-2
7.1-D (Conformance to IEEE 7-4.3.2)	7.1.6.4 (RG 1.152), 7.1.6.6.1.28 and Table 7.1-1

Data Communications Systems that were discussed in Section 7.9 of DCD Tier 2, Rev. 2 are addressed in Section 7.1 of DCD Tier 2, Rev. 4. The communication information previously included in Section 7.9 was combined with the description in Section 7.1 to provide a better picture of the integrated system. The table below cross-references the location of information previously in DCD Tier 2, Rev. 2, Section 7.9 with its new location in DCD Tier 2, Section 7.1.

Location in DCD Tier 2, Rev. 2	Location in DCD Tier 2, Rev. 4
7.9.1.1.1	7.1.3.1.1
7.9.1.1.2	7.1.2.2 & 7.1.3.1.2
7.9.1.2	7.1.3.2
7.9.1.3	7.1.2.3 & 7.1.3.3
7.9.1.3.1	7.1.2.3 & 7.1.2.4
7.9.1.3.2	7.1.2.4 & 7.1.6.2
7.9.1.3.3	7.1.2.4 & 7.1.6.3
7.9.1.3.4	7.1.2.4 & 7.1.6.4
7.9.1.3.5	7.1.2.4 & 7.1.6.5
7.9.1.4	7.1.2.5 & 7.1.3.4
7.9.1.5	7.1.3.5
7.9.2.1.1	7.1.4.1 & 7.1.5.1.1
7.9.2.1.2	7.1.5.1.2 & 7.1.4.2
7.9.2.2	7.1.5.2 & 7.1.4
7.9.2.3	7.1.5.3 & 7.1.4.3
7.9.2.3.1.1	7.1.5.3.1
7.9.2.3.2	7.1.5.3.2
7.9.2.3.3	7.1.5.3.3
7.9.2.3.4	7.1.5.3.4
7.9.2.3.5	7.1.5.3.5
7.9.2.4	7.1.5.4 & 7.1.4.5
7.9.2.5	7.1.5.5
7.9.3	7.1.7
7.9.4	7.1.8
Figure 7.9-1	Figure 7.1-2

Figure 7.9-1 was removed, and a generic description of the ESBWR DCIS functional network diagram can be found in Figure 7.1-2.

To address the RAI 7.9-15 commitment, the following additional information is provided: The section, "Transient Recording and Analysis and Sequence of Events Recording," is currently found in DCD Tier 2, Rev. 4, Subsection 7.1.5.2.4.10, and discussion of the alarm management system is located in Subsection 7.1.5.2.4.3.

DCD Impact

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

For historical purposes, the original text of RAI 7.2-1 and the GE response are included.

RAI 7.2-1

In order for staff to confirm the ESBWR is in full compliance with IEEE Std. 7-4.3.2 requirements, please provide the ESBWR safety system design basis as outlined in IEEE Std. 7-4.3.2. (Note: The Reg. Guide 1.152, Rev. 2 which endorses IEEE Std. 7-4.3.2-2003 and includes requirements for cyber security is in the process of being issued. This latest version of RG 1.152 will be used in the review of ESBWR.) Demonstrate each requirement per the standard and beyond IEEE Std. 603 is met per the following items identified in IEEE Std. 7-4.3.2:

5.3 Quality - The following requirements are necessary in order to meet the quality criterion:
a. Software development including Software quality metrics
b. Software tools
c. Verification and validation
d. Independent V&V (IV&V) requirements
e. Software configuration management
f. Software project risk management

5.4 Equipment qualification - Equipment qualification testing shall be performed with the computer functioning with software and diagnostics that are representative of those used in the actual operation. This includes, as appropriate, exercising and monitoring the memory, the CPU, inputs and outputs, display functions, diagnostic, associated components, communication paths, and interfaces. Testing shall demonstrate that the design basis performance requirements have been met.

5.5 System Integrity - In addition to the requirements of IEEE Std. 603, the design for computer integrity, test and calibration and fault detection and self-diagnostics shall be addressed.

5.6 Independence - Data communication between safety channels or between safety and nonsafety systems shall not inhibit the performance of the safety function. Identify barrier requirements to provide adequate confidence that the nonsafety portions cannot interfere with performance of the safety portion of the software or firmware.

5.11 Identification - The following identification requirements specific to software systems shall be met; a) Firmware and software identification shall be used to assure the correct software is installed in the correct hardware component. b) Means included in the software such that the identification may be retrieved from the firmware using software maintenance tools. c) Physical identification requirements per IEEE 603-1998.

5.15 Reliability - In addition to requirements of IEEE 603- 1998, when reliability goals are identified, the proof of meeting the goals shall include software. (Note: As stated in RG 1.152 and SRP Chapter 7, the NRC staff does not endorse the concept of quantitative reliability goals as a sole means of meeting the requirements for reliability of safety systems. Quantitative reliability determination, using a combination of analysis, testing, and operating experience, can provide an added level of confidence in the reliable performance of safety I&C systems.)

GE Response

The ESBWR design basis addresses the requirements of IEEE Std. 7-4.2.3 as documented in section 7.1.2.2 of DCD Tier 2, Rev. 01. Specific criteria and guidelines stated in ANSI/IEEE-ANS-7-4.3.2, as endorsed by Regulatory Guide 1.152, are used as a basis for design procedures established for programmable digital equipment.

Software quality is addressed in Appendix 7B and in NEDO-33245, "Software Quality Assurance Plan".

Equipment qualification requirements that address computer equipment and software are discussed in Design Definition (Requirements) Phase of the Software Management Plan (NEDO-33226P). These design activities address the development of equipment design and configuration requirements in accordance with Reg. Guide 1.172, "Software Requirements Specifications for Digital Computer Software Used in Safety Systems of Nuclear Power Plants."

The remaining items are addressed in Subsection 7.1.2.3.3, "Safety System Criteria Per IEEE Std. 603", (IEEE Std. 603, "IEEE Standard Criteria for Safety Systems - Nuclear PWR"). Specific criteria related to software system (BTP HCIB-14) are also discussed in this section.

NRC RAI 7.2-1 S01

RAI 7.1-2, Supplement 1 (MFN-06-146, May 25, 2006) DCD, Tier 2, Rev. 3, Section 7.1.6.4 now provides a more abbreviated response. This section, as does the RAI response, references the software design process LTRs which are currently under revision to be submitted. Equipment qualification (EQ) requirements referenced in the response as part of the Software Management Plan do not include an EQ testing with the computer functioning. Provide description of compliance to IEEE std 7.4-3-2.

GEH Response

DCD Tier 2, Revision 4, Section 7.1.2.4 "Q-DCIS Regulatory Requirements Conformance Summary" states that Q-DCIS conforms with IEEE Std. 7-4.3.2. DCD Tier 2, Revision 4, Section 7.1.6.4 discusses conformance of the I&C equipment with Regulatory Guide 1.152 and IEEE Std. 7-4.3.2 sections specifically addressed in RG 1.152.

IEEE Std. 7-4.3.2 section 5.4.1 Computer system testing states "Computer system qualification testing (see 3.1.36) shall be performed with the computer functioning with software and diagnostics that are representative of those used in actual operation. All portions of the computer necessary to accomplish safety functions, or those portions, whose operation or failure could impair safety functions, shall be exercised during testing."

DCD Tier 2, Revision 4, Sections 7.1.6.6.1.5 and 3.11.2.2 added Regulatory Guide (RG) 1.209, "Guidelines for Environmental Qualification of Safety-Related Computer-based Instrumentation and Control Systems in Nuclear Power Plants," dated March 2007. RG 1.209 Regulatory Position C(2) provides that the qualification testing should be performed with the I&C system functioning, with software and diagnostics that are representative of those used in actual operation, while the system is subjected to the specified environmental service conditions, including abnormal operational occurrences. Testing should exercise all portions of the safety-related computer-based I&C systems necessary to accomplish the safety-related function or those portions whose operation or failure could impair the safety-related function.

Therefore, GEH has added EQ testing that is performed with safety related computers functioning and performing their safety related functions. EQ testing is also performed with those nonsafety-related portions functioning, whose operation or failure could impair safety functions.

DCD Impact

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

For historical purposes, the original text of RAI 7.3-2 and the GE response are included.

NRC RAI 7.3-2

Update DCD Section 7.3.

The staff finds that many design features described during the July 26 and 27 I&C meeting were not clearly documented in DCD, Tier 2, Revision 1, Section 7.3. A general update of DCD Section 7.3 is required. For example, ECCS/ESF Platform was never discussed in DCD. If a referenced platform will be implemented for the ESF function, it should be listed at DCD Section 7.3.6, "References." Figures 7.3.1A and 7.3.1B have not shown manual actuation which was discussed in DCD Section 7.3.1.1.2. The "joystick bypass switch" information, which was discussed in response to Staff RAI 7.2-3, should be documented in the DCD.

GE Response

DCD Section 7.3 has been updated for Revision 3, however an Engineered Safety Features Systems (ESF) platform has not been selected. A specific platform was presented in MFN 07-101 and a DCD Rev. 4 markup of DCD Section 7.3.7, "References," was provided. Note that the DCD Section 7.3.6, "References," was re-numbered to DCD Section 7.3.7 in Revision 3.

The manual actuation description in Section 7.3.1.1.2 (updated in Revision 2) is reflected in DCD, Tier 2, Revision 3. Figures 7.3-1A and 7.3-1B (also updated in Revision 2) are shown in DCD, Tier 2, Revision 3 to reflect N-2 and to reflect the DPS interaction. Figure 7.3-1C was also added in Revision 2. However, these figures are intended to be a general depiction of the actuation circuit, not a detailed depiction of the actuation logic and do not show the manual actuation logic. As part of the design process, Nuclear Boiler System (NBS) and Gravity Driven Cooling System (GDCS) system simplified logic diagrams have been developed. These logic diagrams show the manual actuation logic. These simplified logic diagrams were submitted under separate cover in MFN-07-001.

See DCD, Tier 2, Revision 3, Sections 7.2.1.2.4 and 7.2.1.14.2.2 and Figure 7.2-1 for the discussion of the RPS bypass switches. The discussion about the bypass switches in the response to RAI 7.2-3 is included in these sections.

DCD Impact:

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

NRC RAI 7.3-2 S01

The response to this question is not accurate. GE has selected "TRICONEX" as ECCS/ESF platform. DCD Section 7.3.7 should provide proper reference.

GEH Response

The reference to the TRICON application report, NEDE-33388P, "ESBWR I&C TRICON (SSLC/ESF) Platform Application," has been added to DCD Tier 2 in MFN 07-515, submitted 9/29/2007.

DCD Impact

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

For historical purposes, the original text of RAI 7.8-5 and the GE response are included.

NRC RAI 7.8-5

Topical report NEDO-33251, "ESBWR I&C Defense-In-Depth and Diversity Report," Appendix A has a Table that listed eight accident analyses subsections that may require further analysis to verify that the acceptance criteria (2.5 REM for AOOs and 25 REM for DBAs) can be met. Provide analysis of these events that require supporting analyses or confirmatory assessment.

GE Response

The confirmatory analyses to validate the assessment documented in NEDO-33251, "ESBWR I&C Defense-In-Depth and Diversity Report," will be included as an ITAAC in ESBWR DCD Tier 1, as part of the Revision 3 update.

DCD/LTR Impact

DCD Tier 1 will be revised in Revision 3 as described above.

NRC RAI 7.8-5 S01

In response to RAI 7.8-5, GEH stated that the confirmatory analyses to validate the assessment documented in NEDO-33251 will be included as an ITAAC in ESBWR DCD Tier 1, as part of the Revision 3 update. The staff has reviewed DCD Tier 1, Revision 3. There is no evidence that these confirmatory analyses were included in the Tier 1 documents as described above. Please markup the proposed Tier 1 documents to address these confirmatory analyses.

GEH Response

As committed to in the original response to RAI 7.8-5, ESBWR DCD Tier 1, Revision 3, provided an ITAAC for the confirmatory analyses required to validate the assumptions in LTR NEDO-33251, ESBWR I&C Diversity and Defense-In-Depth Report (reference ESBWR DCD Tier 1 Table 2.2.14-1, ITAAC No. 8).

In ESBWR DCD Tier 1 Revision 4, the ITAAC being discussed is now listed as ITAAC No. 8 in Table 2.2.14-4. This ITAAC was revised to be more comprehensive. The requirement to perform confirmatory analyses of events to validate the assumptions in LTR NEDO-33251 was replaced with the requirement to perform confirmatory analyses of events to validate the Diverse Protection System (DPS) design scope. Since the DPS

is the system designed to mitigate a protection system common cause software failure, the aforementioned ITAAC revision ensures that completion of the confirmatory analyses of the applicable design basis events in conjunction with a protection system common cause software failure, demonstrate that the DPS design scope is adequate to meet the radiation release guidelines discussed in BTP HICB-19.

DCD Impact

No DCD changes are required in response to this RAI.

For historical purposes, the original text of RAI 7.9-7 and the GE response are included.

NRC RAI 7.9-7

This communication exists from the 3D Monicore function of the NE-DCIS to the Power Range Neutron Monitoring (PRNM) function of the Neutron Monitoring System (NMS). Section 7.9.1.2 of the DCD, Tier 2, Revision 1, states that this data communication is a dedicated input to NMS and does not pass through the E-DCIS network. Please clarify and explain how separation between essential (E) and non-essential (NE) sections is met in light of the clarifications regarding classification of interconnected equipment noted in Regulatory Guide 1.152, Rev. 2, Part B. Regulatory Guide 1.152 in Part B references IEEE Std. 603-1991, paragraph 5.6.3.1, "Interconnect Equipment", which requires that equipment that is used for both safety and nonsafety functions shall be classified as part of the safety systems. The term equipment includes both software and hardware of digital systems.

GE Response

Section 7.9, "Data Communication System," was deleted in DCD Revision 3. Data Communications Systems that were discussed in Section 7.9 of DCD Tier 2, Revision 2 are addressed in Section 7.1 of DCD Tier 2, Revision 3. The term Essential Distributed Control and Information System (E-DCIS) has been replaced with the term Safety-related Distributed Control and Information System (Q-DCIS) throughout DCD Chapter 7 Revision 3. The term Non-Essential Distributed Control and Information System (NE-DCIS) has been replaced with the term Nonsafety-related Distributed Control and Information System (N-DCIS) throughout DCD Chapter 7 Revision 3.

Communication from the 3D Monicore function to NMS is described in Section 7.1.3.3 of the DCD Revision 3.

DCD/LTR Impact

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

NRC RAI 7.9-7 S01

The response, which merely slates that communication is described In Section 7.1.3.3, is unacceptable. The RAI references IEEE Std. 603-1991, paragraph 5.6.3.1. The referenced section in the DCD does not address this paragraph of the IEEE std. An analysis should be done for each section and subsection of IEEE Std. 603 to confirm conformance to the SRP as required by 10CFR34(h)(i)(2). Review by the staff of Section 7.1.3.3 with regards to lEEE paragraph 5.6.3.1 gives rise to the following major concern. This statement is provided: "A nonsafety-related gateway that translates the safety-related information Into a format that the N-DCIS can understand." Please note that subsection (1) of IEEE paragraph 5.6.3.1 states "Isolation devices used to effect a safety system boundary shall be classified as part of the safety system." The use of a nonsafety-related gateway does not appear to be in compliance with this requirement. This

should be explained in much more detail including a drawing or schematic of the Q-DCIS network. If that information is not available at this time please identify the specific future Design Certification submittal. ITAAC or COL item which will provide this level of detail.

GEH Response

The response is divided into two parts as shown.

(1) An analysis should be done for each section and subsection of IEEE Std. 603 to confirm conformance to the SRP as required by 10CFR34(h)(i)(2).

DAC ITAAC and ITAAC shown in DCD Tier 1, Rev. 4, Subsection 2.2.15, "Instrumentation and Control Compliance with IEEE Std. 603," will be used to demonstrate how the Safety-Related Distributed Control and Information System (Q-DCIS) complies with IEEE Std. 603-1991, including the Correction Sheet issued January 30, 1995.

(2) Review by the staff of Section 7.1.3.3 with regards to lEEE paragraph 5.6.3.1 gives rise to the following major concern. This statement is provided: "A nonsafety-related gateway that translates the safety-related information Into a format that the N-DCIS can understand." Please note that subsection (1) of IEEE paragraph 5.6.3.1 states "Isolation devices used to effect a safety system boundary shall be classified as part of the safety system." The use of a nonsafety-related gateway does not appear to be in compliance with this requirement. This should be explained in much more detail including a drawing or schematic of the Q-DCIS network. If that information is not available at this time please identify the specific future Design Certification submittal. ITAAC or COL item which will provide this level of detail.

The isolation device used as the safety-related system boundary is the safety-related fiber optic communication module where the electrical signal is first converted to light, not the nonsafety-related gateway, which is not required to be classified as part of the safety-related system. See the response to NRC RAI 7.1-56 for additional detail about the gateways.

DCD Impact

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