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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application - RAI Numbers 7.1-136 and 7.7-14**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) responses to RAI Numbers 7.1-136 and 7.7-14 from the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC letter dated November 6, 2008. Enclosure 2 contains the DCD markup pages associated with the response to RAI 7.7-14.

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box.

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

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

Reference:

1. MFN 08-625, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 263 Related To ESBWR Design Certification Application*, dated November 6, 2008

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application - RAI Numbers 7.1-136 and 7.7-14

2. Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application - DCD Markups for RAI Number 7.7-14

cc:

AE Cubbage	USNRC (with enclosures)
RE Brown	GEH/Wilmington (with enclosures)
DH Hinds	GEH/Wilmington (with enclosures)
eDRF Section:	0000- 0096-4738 (RAI 7.1-136)
	0000- 0096-1615 (RAI 7.7-14)

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Enclosure 1

Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application

RAI Numbers 7.1-136 and 7.7-14

NRC RAI 7.1-136

DCD Tier 2 Section 7.1.2.4 specifies that Q-DCIS conforms to several regulatory guides (RGs) and industry standards. However, the use of RGs and industry standards to implement the IEEE Std 603 design criteria is not discussed with limited exceptions (Criteria 5.4 and 5.8) in DCD section 7.1.6.6. Occasionally, the use of RG 1.53 and IEEE Std 379 is discussed with IEEE Std 603 Criterion 5.1, but this is not done consistently. Since design acceptance criteria are being used to demonstrate conformance to IEEE Std 603, the staff needs to understand the methods or processes that GEH will use to implement IEEE Std 603. Please describe the methods, such as RGs and industry standards, which will be used to implement IEEE Std 603 in DCD section 7.1.6.6.

GEH Response

GEH agrees, however, this question addresses sections that will be revised in response to NRC RAIs 14.3-265 S01, 7.1-99, and 7.1-100.

For example, NRC RAI 14.3-265 S01, Item C, states: "*DCD Tier 2 does not provide clear information on the applicability and design basis information for IEEE 603 Criteria*."

The revision to DCD Tier 2, Subsection 7.1.6.6.1, which is provided in response to NRC RAI 14.3-265 S01 in support of changes being made to Table 7.1-2 and in response to NRC RAI 7.1-99, Item F, and RAI 7.1-100, Item D will address this request. Based on the DCD markups provided with the responses (refer to MFN 09-089) to RAIs 14.3-265 S01, 7.1-99, and 7.1-100, no DCD changes will be made in response to the RAI.

DCD Impact

No changes to the DCD will be made in response to RAI 7.1-136 as stated above.

NRC RAI 7.7-14

ESBWR DCD Tier 2, Chapter 7, Revision 5, added conformance to 10 CFR Part 50.55a(a)(1) for the non-safety control systems of Section 7.7. However, neither DCD Tier 2, Table 7.1-1 nor DCD Tier 2, Section 7.7 indicate conformance to GDC 1. SRP Table 7.1 and SRP Section 7.7 state that GDC 1 is applicable to control systems. Indicate conformance to GDC 1 in DCD Tier 2, Table 7.1-1 and in the appropriate subsections of DCD Tier, Chapter 7.7, or provide a justification for why GDC 1 is not applicable to the control systems in DCD Tier 2, Section 7.7.

GEH Response

GEH agrees with the NRC request to indicate applicability of GDC 1 to nonsafety-related control systems described in DCD Tier 2, Table 7.1-1 and the appropriate subsections with control systems where GDC 1 is applicable.

DCD Tier 2, Table 7.1-1 and Subsections 7.4.3.3.2 (RWCU/SDC), 7.5.4.3.2 (ARMS), 7.7.2.3.2 (RC&IS), 7.7.3.3.2 (FWCS), 7.7.4.3.2 (PAS), 7.7.5.3.2 (SB&PC), 7.7.6.3.2 (NMS Nonsafety-related subsystems), and 7.7.7.3.2 (CIS) will be updated in DCD Revision 6 to show that GDC 1 is applicable to these control systems.

DCD Impact

DCD Tier 2, Subsections 7.4.3.3.2 (RWCU/SDC), 7.5.4.3.2 (ARMS), 7.7.2.3.2 (RC&IS), 7.7.3.3.2 (FWCS), 7.7.4.3.2 (PAS), 7.7.5.3.2 (SB&PC), 7.7.6.3.2 (NMS Nonsafety-related subsystems), and 7.7.7.3.2 (CIS) will be updated in DCD Revision 6 as shown in the enclosed markups.

DCD Tier 2, Table 7.1-1 will be updated in DCD Revision 6 to reflect that GDC 1 is applicable to all control systems described in Table 7.1-1. This table is provided in the DCD markups associated with RAI 7.1-99 (refer to MFN 09-089).

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Enclosure 2

Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application

DCD Markups for RAI Number 7.7-14

7.4.3.3.2 General Design Criteria

GDC 1, 2, 4, 13, 19, and 24:

- Conformance: The RWCU/SDC system is nonsafety-related, but is designed to conform to these GDC.

7.4.3.3.3 Regulatory Guides

RG 1.151, Instrument Sensing Lines:

- Conformance: RG 1.151 is applicable to safety-related sensing lines. However, sections of endorsed standard ANSI/ISA-S67.02.01 on design practices for tubing, vents, and drains also apply to nonsafety-related instrumentation.

RG 1.180, Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related I&C Systems:

- Conformance: The RWCU/SDC system design conforms to RG 1.180.

RG 1.204, Guidelines for Lightning Protection of Nuclear Power Plants:

- Conformance: The RWCU/SDC system design conforms to RG 1.204.

7.4.3.3.4 Branch Technical Positions

BTP HICB-16, Guidance on Level of Detail Required for Design Certification Applications Under 10 CFR Part 52:

- Conformance: The level of detail provided for the RWCU/SDC system design conforms to BTP HICB-16.

7.4.3.4 Testing and Inspection Requirements

The RWCU/SDC system instruments are calibrated and tested during the preoperational testing program to confirm the instrumentation is correctly installed and functions as designed. In addition, calibration and surveillance testing of the containment isolation devices is performed at regular intervals ~~(IEEE Std. 603, Section 5.7 and 6.5)~~. To the maximum extent possible, instrumentation requiring regular calibration, testing, and maintenance is mounted on accessible panels or racks located outside high radiation areas.

7.4.3.5 Instrumentation and Control Requirements

Operation of the RWCU/SDC system is from the MCR. The main I&C available to the MCR operator includes:

- Manual and automatic flow controllers for system, demineralizer, and overboarding flow;
- Flow indications for system, demineralizer, and overboarding flow;

10 CFR 52.47(a)(1)(iv), Resolution of Unresolved and Generic Safety Issues:

- Conformance: Resolution of unresolved and generic safety issues is discussed in Section 1.11.

10 CFR 52.47(a)(1)(vi), ITAAC in Design Certification Applications:

- Conformance: ITAAC are provided for the I&C systems and equipment in Tier 1.

10 CFR 52.47(a)(1)(vii), Interface Requirements:

- Conformance: There are no interface requirements for this section.

7.5.4.3.2 General Design Criteria

GDC 1, 2, 4, 13, 19, 24, and 64:

- Conformance: The ARMS design complies with these GDC.

7.5.4.3.3 Regulatory Guides

RG 1.97 - Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants:

- Conformance: The ARMS area radiation level instrumentation conforms to RG 1.97.

RG 1.180, Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems:

- Conformance: The ARMS design conforms to RG 1.180.

RG 1.204, Guidelines for Lightning Protection of Nuclear Power Plants:

- Conformance: The ARMS design conforms to RG 1.204.

7.5.4.3.4 Branch Technical Positions

BTP HICB-10, Guidance on Application of Regulatory Guide 1.97:

- Conformance: The ARMS design conforms to BTP HICB-10.

BTP HICB-16, Guidance on the Level of Detail Required for Design Certification Applications Under 10 CFR Part 52:

- Conformance: The level of detail provided for the ARMS complies with BTP HICB-16.

7.5.4.3.5 Three Mile Island Action Plan Requirements

In accordance with SRP 7.5 and with Table 7.1-1, 10 CFR 50.34(f)(2)(xvii) [II.F.1], 10 CFR 50.34(f)(2)(xix) [II.F.3], and 10 CFR 50.34(f)(2)(xxvii)[III.D.3.3] apply to the ARMS. The ARMS design complies with these requirements, as indicated above. TMI action plan requirements are addressed generically in Appendix 1A.

- Conformance: ITAAC are provided for the I&C equipment in Tier 1.

10 CFR 52.47(a)(1)(vii), Interface Requirements:

- Conformance: There are no interface requirements for this section.

7.7.2.3.2 General Design Criteria

GDC 1, 13, 19, 24, 28 and 29:

- Conformance: The RC&IS complies with these GDC.

7.7.2.3.3 Regulatory Guides

RG 1.180, Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in safety-related Instrumentation and Control Systems

- Conformance: The RC&IS design conforms to RG 1.180.

RG 1.204, Guidelines for Lightning Protection of Nuclear Power Plants:

- Conformance: The RC&IS design conforms to RG 1.204.

7.7.2.3.4 Branch Technical Positions

BTP HICB-16, Guidance on Level of Detail Required for Design Certification Applications Under 10 CFR Part 52:

- Conformance: The level of detail provided for the RC&IS design conforms to BTP HICB-16.

7.7.2.4 Testing and Inspection Requirements

The RC&IS equipment is designed with consideration for online testing capabilities. The system can be maintained on line while repairs or replacement of hardware take place without causing any abnormal upset condition. The single-channel bypass capabilities support having continued RC&IS operation while repair or maintenance work is being performed on the dual-channel portion of the RC&IS equipment.

7.7.2.5 Instrumentation and Control Requirements

The CRD system is the RC&IS main direct interface to gather control rod position information and FMCRD status information and execute control rod movement commands. The FMCRD-related instrumentation that provides direct input to the RC&IS is addressed as part of the CRD system in Subsection 4.6.1. The primary output of the RC&IS to accomplish the RC&IS related rod movement functions is the 3-phase AC power to the FMCRD motors, associated AC power to the MBBs, and the holding brakes of the CRD system.

to reduced FW temperature. Although no credit is taken for the function in a safety analysis, the FW temperature control system also mitigates inadvertent FW temperature changes in either direction by manipulating its control valves to maintain the setpoint temperature. The temperature difference between FW lines A and B is monitored and alarmed if it exceeds the allowable value.

A total failure of the triple redundant FW temperature control system such that the outputs all fail downscale (or upscale), and the heating steam valves close (or open), or the bypass valves close (or open) is highly unlikely. No single failure or operator error of the FW temperature control system results in more than a 55.6°C (100°F) decrease in the final FW temperature. The design meets the requirements for the condensate and FW system specification in Subsection 10.4.7.1.

Table 7.1-1 identifies the FWCS and the associated codes and standards applied, in accordance with the SRP. This subsection addresses I&C systems conformance to regulatory requirements, guidelines, and industry standards.

7.7.3.3.1 Code of Federal Regulations

10 CFR 50.55a(a)(1), Quality Standards for Systems Important to Safety:

- Conformance: The FWCS design conforms to these requirements.

10 CFR 50.62, Requirements for reduction of risk from ATWS events for light-water-cooled nuclear power plants:

- Conformance: The ATWS mitigation functions are designed in accordance with the requirements of 10 CFR 50.62.

10 CFR 52.47(a)(1)(iv), Resolution of Unresolved and Generic Safety Issues:

- Conformance: Unresolved and generic safety issues are discussed in Section 1.11.

10 CFR 52.47(a)(1)(vi), ITAAC in Design Certification Applications:

- Conformance: ITAAC are provided for the I&C equipment in Tier 1.

10 CFR 52.47(a)(1)(vii), Interface Requirements:

- Conformance: There are no interface requirements for this section.

7.7.3.3.2 General Design Criteria

GDC 1, 13, 19, and 24:

- Conformance: The FWCS design complies with these GDC.

7.7.3.3.3 Regulatory Guides

RG 1.151, Instrument Sensing Lines:

Table 7.1-1 identifies the PAS and the associated codes and standards applied, in accordance with the SRP. This subsection addresses I&C systems conformance to regulatory requirements, guidelines, and industry standards.

7.7.4.3.1 Code of Federal Regulations

10 CFR 50.55a(a)(1), Quality Standards for Systems Important to Safety:

- Conformance: The PAS design conforms to these requirements.

10 CFR 52.47(a)(1)(iv), Resolution of Unresolved and Generic Safety Issues:

- Conformance: Resolution of unresolved and generic safety issues for I&C is discussed in Section 1.11.

10 CFR 52.47(a)(1)(vi), ITAAC in Design Certification Applications:

- Conformance: ITAAC are provided for the I&C equipment in Tier 1.

10 CFR 52.47(a)(1)(vii), Interface Requirements:

- Conformance: There are no interface requirements for this section.

7.7.4.3.2 General Design Criteria

GDC 1, 13, 19, and 24:

- Conformance: The PAS design complies with these GDC.

7.7.4.3.3 Regulatory Guides

RG 1.180 – Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in safety-related Instrumentation and Control Systems

- Conformance: The PAS design conforms to RG 1.180.

RG 1.204 – Guidelines for Lightning Protection of Nuclear Power Plants:

- Conformance: The PAS design conforms to RG 1.204.

7.7.4.3.4 Branch Technical Positions

BTP HICB-16, Guidance on Level of Detail Required for Design Certification Applications Under 10 CFR Part 52:

- Conformance: The level of detail provided for the PAS conforms to BTP HICB-16.

7.7.4.4 Testing and Inspection Requirements

The FTDC input and output communication interfaces function continuously during normal power operation. Abnormal functioning of these components can be detected during operation.

- During RPV heatup to rated pressure,
- While the turbine is brought up to speed and synchronized,
- During power operation when the reactor steam generation rate exceeds the turbine steam flow rate requirements,
- During plant load rejection and turbine/generator trips, and
- During cooldown of the nuclear reactor.

7.7.5.3 Safety Evaluation

The SB&PC System is classified as a primary power generation system. It is not safety-related, and is not required to operate during or after any DBAs. The system is required to operate in the normal plant environment and is required for the power production cycle. The SB&PC System equipment is located in both the MCR area of the CB and the turbine building (TB); and each SB&PC System component is subject to the environment of the applicable area. The SB&PC System FTDC panel and its components are designed to retain structural integrity during and after DBEs so that safety-related equipment in its area are able to perform their safety functions.

Table 7.1-1 identifies the nonsafety-related SB&PC System and the associated codes and standards applied, in accordance with the SRP. This subsection addresses I&C systems conformance to regulatory requirements, guidelines, and industry standards.

7.7.5.3.1 Code of Federal Regulations

10 CFR 50.55a(a)(1), Quality Standards for Systems Important to Safety:

- Conformance: The SB&PC design conforms to these requirements.

10 CFR 52.47(a)(1)(iv), Resolution of Unresolved and Generic Safety Issues:

- Conformance: The SB&PC System is nonsafety-related and conforms in that there are no unresolved issues for the SB&PC System. Resolution of unresolved and generic safety issues is discussed in Section 1.11.

10 CFR 52.47(a)(1)(vi), ITAAC in Design Certification Applications:

- Conformance: Inspection, test, analyses, and acceptance criteria of the SB&PC System FTDC are identified in Tier 1.

10 CFR 52.47(a)(1)(vii), Interface Requirements:

- Conformance: There are no interface requirements for this section.

7.7.5.3.2 General Design Criteria

GDC 1, 13, 19, and 24:

- Conformance: The SB&PC System design conforms to these GDC.

7.7.6.2.2.4 Environmental Considerations

The MRBM is located in the MCR. It is physically and electrically isolated from the safety-related NMS subsystems. All interfaces with the safety-related NMS subsystems are through fiber optic isolators.

7.7.6.3 Safety Evaluation

Table 7.1-1 identifies the nonsafety-related control systems and the associated codes and standards applied, in accordance with the SRP. This subsection addresses I&C systems conformance to regulatory requirements, guidelines, and industry standards.

7.7.6.3.1 Code of Federal Regulations

10 CFR 50.55a(a)(1), Quality Standards for Systems Important to Safety:

- Conformance: The AFIP and MRBM subsystem designs conform to these requirements.

10 CFR 52.47(a)(1)(iv), Resolution of Unresolved and Generic Safety Issues:

- Conformance: Unresolved and generic safety issues are discussed in Section 1.11.

10 CFR 52.47(a)(1)(vi), ITAAC in Design Certification Applications:

- Conformance: ITAAC are provided for the I&C equipment in Tier 1.

10 CFR 52.47(a)(1)(vii), Interface Requirements:

- Conformance: There are no interface requirements for this section.

7.7.6.3.2 General Design Criteria

GDC 1, 13, 19, 24, and 28:

- Conformance: The AFIP and MRBM subsystem designs comply with these GDC.

7.7.6.3.3 Regulatory Guides

RG 1.180, Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in safety-related Instrumentation and Control Systems:

- Conformance: The AFIP and MRBM subsystem designs conform to RG 1.180.

RG 1.204, Guidelines for Lightning Protection of Nuclear Power Plants:

- Conformance: The AFIP and MRBM subsystem designs conform to RG 1.204.

7.7.6.3.4 Branch Technical Positions

BTP HICB-16, Guidance on Level of Detail Required for Design Certification Applications Under 10 CFR Part 52:

7.7.7.3.2 General Design Criteria

GDC 1, 13, 19, and 24:

- Conformance: The CIS design conforms to these GDC. I&C are provided to operate the system and monitor process variables during startup, normal, and abnormal reactor operation. The CIS is operable from the MCR.

7.7.7.3.3 Regulatory Guides

RG 1.151, Instrument Sensing Lines:

- Conformance" The CIS instrument lines penetrating containment comply with the guidance of RG 1.151. Sensing lines are Seismic Category I Quality Group B and are provided with redundant isolation valves that can be isolated locally or remote manually from the MCR.

RG 1.180, Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in safety-related Instrumentation and Control Systems:

- Conformance: The CIS system design conforms to RG 1.180.

RG 1.204, Guidelines for Lightning Protection of Nuclear Power Plants:

- Conformance: The CIS system design conforms to RG 1.204.

7.7.7.3.4 Branch Technical Positions

Only BTP HICB-16, Guidance on the Level of Detail Required for Design Certification Applications Under 10 CFR Part 52, is applicable to the nonsafety-related CIS. The level of detail provided in this subsection conforms to BTP HICB-16.

7.7.7.4 Testing and Inspection Requirements

The CIS testing and inspection requirements are discussed in Subsection 9.4.9.

7.7.7.5 Instrumentation and Control Requirements

7.7.7.5.1 Logic and Interlocks

The CIS operation is manually or automatically activated from the MCR by aligning corresponding valves through remote manual control switches. During the inerting mode, a temperature controller accomplishes automatic control of the steam supply once the steam-heated nitrogen vaporizer has been activated. A temperature sensor at the outlet of the steam-heated vaporizer provides input to the temperature controller that then regulates the amount of steam. Low nitrogen temperature in the steam vaporizer outlet causes an alarm and a low-low temperature condition shuts off the main inerting line. The auxiliary steam supply is manually terminated. When the required inert containment pressure is reached, the CIS drywell pressure switch provides a signal to isolate the nitrogen supply shutoff valve.