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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 313 Related to ESBWR Design Certification Application - RAI Number 7.7-12 Supplement 1**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) response to Request for Additional Information (RAI) Number 7.7-12 Supplement 1 from the U.S. Nuclear Regulatory Commission (NRC) sent by NRC letter dated March 9, 2009. Enclosure 2 contains the DCD markup page associated with the response to RAI 7.7-12 Supplement 1.

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 09-178, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 313 Related To ESBWR Design Certification Application*, dated March 9, 2009

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 313 Related to ESBWR Design Certification Application - RAI Number 7.7-12 Supplement 1

2. Response to Portion of NRC Request for Additional Information Letter No. 313 Related to ESBWR Design Certification Application - DCD Markup for RAI Number 7.7-12 Supplement 1

cc:

AE Cubbage	USNRC (with enclosures)
JG Head	GEH/Wilmington (with enclosures)
DH Hinds	GEH/Wilmington (with enclosures)
eDRF Section:	0000-0100-3634 (RAI 7.7-12 Supplement 1)

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Enclosure 1

Response to Portion of NRC Request for Additional Information Letter No. 313 Related to ESBWR Design Certification Application

RAI Number 7.7-12 Supplement 1

NRC RAI 7.7-12 Supplement 1

In response to RAI 7.7-12 GEH proposed to revise several DCD Tier 2 Section 7.7 subsections to provide subsection locations in DCD Tier 2 Chapter 15 where various failure modes were considered for the non-safety systems in Section 7.7. In the proposed DCD Revision 6 for Subsection 7.7.4.3 the expected and abnormal transients and accident events analyzed involving potential failures of the PAS listed only DCD Chapter 15 subsections involved with control rod position errors (15.2.3.1, 15.2.3.2, 15.3.8, and 15.3.9) that potentially could result from a failure in PAS providing a bad output signal to RC&IS that might result in an control rod position error. DCD Revision 5 Section 7.7.4.2 states, "The output demand request signals from the PAS are sent to the RC&IS to position the control rods, to the SB&CS [Note: typo in DCD; should be "SB&PC"] for pressure setpoints, and to the TGCS for load following operation. DCD Subsection 7.7.5.3 was also revised to provide subsection locations in DCD Chapter 15 where SB&PC control failures were considered. If the PAS failure resulted in an error in the pressure setpoint signal sent to the SB&PC, then it would seem one or more references to analysis of SB&PC control failures from DCD Chapter 15 should have been included in the Subsection 7.7.4.3? Add the missing DCD Chapter 15 references to DCD Subsection 7.7.4.3 for SB&PC control failures caused by potential PAS failures or justify why there are no DCD Chapter 15 references under PAS for a potential error in signals to SB&PC.

GEH Response

GEH concurs. The safety evaluation subsection of DCD Tier 2 Section 7.7.4.3 will be revised to include additional references to Chapter 15 to account for erroneous signals from PAS to SB&PC and FWCS.

DCD Impact

DCD Tier 2, Section 7.7.4.3 will be revised in Revision 6 as indicated in the attachment to this RAI.

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Enclosure 2

Response to Portion of NRC Request for Additional Information Letter No. 313 Related to ESBWR Design Certification Application

DCD Markup for RAI Number 7.7-12 Supplement 1

appropriate algorithms for automated sequences of turbine and related auxiliary systems. The PAS presents the operator with a series of break point controls on the main control console nonsafety-related VDUs for a prescribed plant operation sequence.

When all the prerequisites are satisfied for a prescribed breakpoint in a control sequence, a permissive is requested and upon operator acceptance, the prescribed control sequence is initiated or continued. The PAS then initiates demand signals to various system controllers to carry out the predefined control functions. For non-automated operations that are required during normal startup or shutdown (such as a change of Reactor Mode Switch status), automatic prompts are provided. Automated operations continue after the prompted actions are completed manually. The functions associated with reactor power control are performed by the PAS.

For reactor power control, the PAS contains algorithms that can change reactor power by control rod motions. A prescribed control rod sequence is followed when manipulating control rods for reactor criticality, heatup, power changes, and automatic load following. For reactor power control by FW temperature change, the PAS can provide the FW temperature control setpoint to allow reactor power maneuvering without moving control rods. Each of these functions has its own algorithm to achieve its design objective. In combination, the two reactor power control methods are utilized to form a sequential step-by-step power maneuvering strategy for the control rod pattern/movement and FW temperature change. During automatic load following operation, the PAS interfaces with the TGCS to coordinate main turbine and reactor power changes for stable operation and performance.

The normal mode of operation of the PAS is automatic. If any system or component conditions are abnormal during execution of the prescribed sequences, the PAS automatically switches into the manual mode. With the PAS in the manual mode, any in-progress operation stops and alarms are activated in the MCR. Also with the PAS in manual mode, the operator can manipulate control rods through the normal controls. A failure of the PAS does not prevent manual control of reactor power, and does not prevent safe shutdown of the reactor.

The triple redundant FTDC and redundant system controllers perform the PAS control functional logic.

7.7.4.3 Safety Evaluation

The PAS does not perform or ensure any safety-related function. This system is designed so that functionalities of safety-related systems in the plant are not affected by it.

Chapter 15 examines the various failure mode considerations for this system. The expected and abnormal transients and accident events analyzed in subsections 15.2.3.1, 15.2.3.2, 15.3.8, and 15.3.9 envelope the failure modes associated with the PAS digital controls and the RC&IS digital controls. The expected and abnormal transients and accident events analyzed in Subsections 15.2.5.1, 15.3.3, 15.3.4, 15.3.5 and 15.3.6 envelope the failure modes associated with the PAS digital controls and the SB&PC digital controls. The expected and abnormal transients and accident events analyzed in Subsections 15.2.4.2, 15.3.1, and 15.3.2 envelope the failure modes associated with the PAS digital controls and the FWCS digital controls.