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Subject: **Submittal of Response to Portion of NRC Request for Additional Information Letter No. 310 Related to ESBWR Design Certification Application Chapter 18 - Human Factors Engineering - RAI Number 18.10-1 S03.**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) responses to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAIs) sent by NRC letter No. 310, dated February 26, 2009 (Reference 1).

RAI 18.10-1 S03 was requested by Reference 1, and was preceded by responses in References 2, 3, and 4 as requested by References 5, 6, and 7, respectively.

Enclosure 1 provides the GEH responses to the subject RAI as requested in Reference 1.

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

Sincerely,

Richard E. Kingston

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Vice President, ESBWR Licensing

References:

1. MFN 09-151 - Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 310 Related To ESBWR Design Certification Application, dated February 26, 2009*
2. MFN 07-625 - Response to Portion of NRC Request for Additional Information Letter No. 111 Related to E5BWR Design Certification Application - Human Factors Engineering - RAI Numbers 18.10-1 S02,18.10-2 S01, and 18.10-3, dated January 17, 2008
3. MFN 07-334 - Submittal of *"ESBWR DCD Chapter 18, Human Factors Engineering - RAI to DCD Roadmap Document*", dated June 27, 2007
4. MFN 06-445 - *Response to Portion of NRC Request for Additional Information Letter No. 74 – ESBWR Human Factors Engineering NEDO-33275, Rev. 0, ESBWR HFE Training Development Implementation Plan – RAI Numbers 18.10-1 and 18.10-2,* dated November 21, 2006
5. MFN 07-556 - Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 111 Related To ESBWR Design Certification Application*, dated October 15, 2007
6. Email from AE Cubbage to DL Lewis - *List of Chapter 18 RAIs for Roadmap Request*, dated 5/18/07
7. MFN 06-386 - Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request For Additional Information Letter No. 74 Related To ESBWR Design Certification Application*, dated October 11, 2006

Enclosures:

1. MFN 09-222 – Response to Portion of NRC Request for Additional Information Letter No. 310 Related to ESBWR Design Certification Application Human Factors Engineering - Response to NRC RAI 18.10-1 S03

cc: AE Cubbage USNRC (with enclosure)
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eDRF Section 0000-0099-9680

Enclosure 1

MFN 09-222

Response to Portion of NRC Request for

Additional Information Letter No. 310

Related to ESBWR Design Certification Application

Human Factors Engineering

RAI Numbers 18.10-1 S03

NRC RAI 18.10-1 S03

For RAI 18.10-1 S02, related to the Training Review Element, Organization of Training Review Criteria, Criterion 3 (NUREG-0711 Section 10.4.2) GEH provided acceptable additional information in the response, but did not incorporate the information into the DCD. However, when an RAI response contains direction on how work will be done, then that information needs to be included in the DCD (or a document incorporated by reference). In particular, the staff requests that GEH incorporate the detailed definitions of the training simulators on the last three pages of the attached markup to MFN 07-625 into an appropriate source document. One acceptable way to accomplish this expeditiously is to incorporate the information verbatim from the RAI response as an appendix in the Training implementation plan.

GEH Response

An appendix will be added to NEDO-33275, ESBWR HFE Training Development Implementation Plan, which incorporates the detailed simulator definitions requested. A sentence that provides reference to the new appendix will also be added for completeness. The content of the simulator definitions has been modified to remove specific details that were not needed to support the Training Review Element, Organization of Training Review Criteria, Criterion 3 (NUREG-0711 Section 10.4.2) and to provide consistency between the same simulator definitions stated in NED-33276, ESBWR Human Factors Engineering Verification and Validation Implementation Plan, Revision 2.

The following is a summary of the changes to the detailed simulator definitions from those provided in the RAI 18.10-1 S02 (MFN 07-625) response:

- Minor editorial changes for consistency of definitions between implementation plans
- Removal of reference to the exact or approximate number of plant systems included in the simulator platforms
- Removal of reference to the number and locations of simulator platforms

DCD Impact

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

LTR NEDO-33275, Rev 2 will be revised as noted in the attached markups.

Training implementation and evaluation is the responsibility of COL Applicants. GEH has the ability to support the COL Applicant's training program.

Training materials are developed and implemented using existing sources of information and design specific information from the ESBWR HFE design team. The role of the HFE design team is to provide input to the training program and, if requested, to conduct specific training modules. For example, the ESBWR design team supplies system descriptions, planned operator tasks, and the Emergency Procedure Guidelines (EPG's), which are integrated into specific training programs.

The Staffing and Qualifications implementation plan for the ESBWR establishes the required responsibilities, skill sets, and qualifications of plant personnel. The training development process establishes the organization and processes required to achieve and maintain the qualifications and certifications of plant personnel. Initial and re-qualification training are provided to establish and maintain proficiency in required job tasks.

Resources such as part-task, full-scope, and training simulators are used in the ESBWR HFE implementation process for both design verification and training. These facilities and resources include features of the HSI that are based on the inputs of the HFE team. Simulator definitions are provided in Appendix B.

3.1.4.2 Learning Objectives

The training program establishes learning objectives derived from the analyses of jobs, tasks, and operator responses. The learning objectives establish desired performance capabilities for personnel after completion of initial training.

The learning objectives include training needs identified in the following:

- Licensing basis - Final Safety Analysis Report, system descriptions, system operating manuals and operating procedures, facility license and license amendments, licensee event reports, and other documents identified by the ESBWR design team and the COL Applicants as being important to training
- Operating Experience Review – lessons learned from events and previous training deficiencies and operational problems. This information is maintained in the OER/BRR database and is used to improve overall training effectiveness and trainee mastery of the learning objectives.
- Functional requirements analysis and allocation of functions - functions are broken down into individual tasks and are allocated to the appropriate performance regimen (human, machine, "machine, human limited", etc.)
- Task Analysis - ESBWR tasks identified during task analysis that pose unusual demands, including new or different tasks and tasks requiring a high degree of coordination, high workload, or special skills
- Human Reliability Analysis - coordinating individual roles to reduce the likelihood and/or consequences of human error associated with risk-important HAs and the use of advanced technology in the ESBWR

APPENDIX B SIMULATOR DEFINITIONS

B.1 PART TASK SIMULATOR

B.1.1 Purpose

The Part Task Simulator (PTS) is a tool used by the Human Factors Engineering group for the development and testing of Human System Interface display screens, initial development and testing of the plant normal, abnormal, and emergency operating procedures, and the initial development of operations training material.

The PTS has the plant and system fidelity deemed necessary to allow for simulating normal plant operation, including plant heatup and startup, maneuvering at power, and plant shutdown and cooldown. Additionally, the PTS will simulate plant responses to design basis Abnormal Operational Occurrences (AOOs) and accidents.

On a case-by-case basis, for the systems modeled with the required fidelity, PTS can be shown to be high fidelity (in accordance with ANSI 3.5 and Reg Guide 1.149)

B.1.2 Properties

The simulation software for the PTS contains the simulation models resulting from the initial system design of the systems deemed necessary for the PTS, and generic or simplified models of the remainder of the plant systems.

The hardware for the PTS consists of enough table/desk space and Visual Display Units (VDUs) to simulate one console section of the preliminary ESBWR control room design and the required input devices and computers.

The PTS has an instructor station providing the required basic functions (establishing desired initial conditions, backtracking, snap-shot storage, and trending) as determined by the HFE group.

B.1.3 Scope

The PTS software contains the initial system design simulation models for the systems deemed necessary for normal plant operations and generic or simplified models as required for the remaining systems. The systems selected as necessary for the PTS include the normal BWR heat cycle and required auxiliaries, control and protection systems, and ECCS systems.

The PTS contains the initial Human System Interface for the plant systems and includes VDUs and input devices.

B.2 FULL SCOPE SIMULATOR

B.2.1 Purpose

The Full Scope Simulator (FSS) is a high fidelity (in accordance with ANSI 3.5 and Reg Guide 1.149) ESBWR simulation tool used by the Human Factors Engineering group for the validation of the control room design, the validation of plant normal, abnormal, and emergency operating procedures, and the validation of operations training material.

The FSS is able to perform normal, abnormal, and emergency plant operations, and is ANSI 3.5 certified. Those full scope simulators that are used for training are also Regulatory Guide 1.149 compliant.

B.2.2 Properties

The simulation software for the FSS contains the simulation models for the ESBWR plant systems included in the detailed system design along with generic or simplified models of the remainder of the plant systems.

The hardware for the FSS consists of a full-scale mockup of the ESBWR control room.

The FSS has an instructor station providing the full functionality required for ANSI 3.5 certified training simulators.

B.2.3 Scope

The FSS contains the simulation models for the ESBWR plant systems.

The FSS contains the ESBWR Human System Interface for the plant systems, including VDUs and input devices.

B.3 SITE SPECIFIC TRAINING SIMULATOR

B.3.1 Purpose

The site-specific training simulator provides a full scope simulation tool for conducting licensed operator training activities, completing control manipulations for operator license applicants, and conducting license operator operating tests.

In addition to the systems contained in the ESBWR design, the site-specific training simulator simulates site support systems and infrastructure necessary for the operation of the ESBWR. The site-specific training simulator is ANSI 3.5 certified and Reg Guide 1.149 compliant.

B.3.2 Properties

The simulation software for the site-specific training simulator provides the plant operational functionality and fidelity required by ANSI 3.5 certified and Reg Guide 1.149. The software for the systems simulates the detailed system design. The remaining systems are modeled either statically or using simplified models.

The hardware for the site-specific training simulator is developed using the same control room design, and the same materials and manufacturing techniques as the actual ESBWR control room hardware.

The Site Specific Training Simulator has an instructor station providing the full functionality required for ANSI 3.5 certified training simulators.

B.3.3 Scope

The site-specific training simulator is an ANSI 3.5 certified and Reg Guide 1.149 compliant full scope simulator for operator training and testing.

The site-specific training simulator contains consoles and panels with the same form, fit, and feel as the ESBWR main control room.