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Subject: Submittal of Portion of Response to NRC Request for Additional Information (RAI) Letter 252 - Related to ESBWR Design Certification Application - Chapter 14.3 - RAI Numbers 14.3-421, 14.3-422, and 14.3-423

The purpose of this letter is to submit the response to Nuclear Regulatory Commission (NRC) Request Additional Information (RAI) numbers 14.3-421, 14.3-422, and 14.3-423.

The responses to RAIs 14.3-421, 14.3-422, 14.3-423 are provided in Enclosure 1 based on the request in NRC Letter 252 (Reference 1).

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

Sincerely,

Richard E. Kingston
Vice President, ESBWR Licensing

DOB8
NRO

Reference:

1. MFN 08-722 – Letter from Nuclear Regulatory Commission to Robert E. Brown (GEH) "*Request for Additional Information Letter No. 252 Related to ESBWR Design Certification Application*", dated September 16, 2008

Enclosure:

1. MFN 08-897 – Response to Portion of NRC Request for Additional Information Letter No. 252 Related to ESBWR Design Certification Application - DCD Tier 1 - RAI Numbers 14.3-421, 14.3-422, and 14.3-423

cc: AE Cabbage USNRC (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
DH Hinds GEH/Wilmington (with enclosure)
RM Wachowiak GEH/Wilmington (with enclosure)
eDRF 0000-0094-0150

Enclosure 1

MFN 08-942

Response to Portion of NRC Request for

Additional Information Letter No. 252

Related to ESBWR Design Certification Application

DCD Tier 1

RAI Numbers

14.3-421, 14.3-422, and 14.3-423

NRC RAI 14.3-421

Please explain why, on Page 3.3-1, of Tier 1 of DCD Rev. 5, Sections discussing "applicable facilities, HSIs, procedures, training," etc., were removed from the Design Description. Please also explain why the paragraph for minimum inventory was inserted as it was; is it meant to be a "Program Goal?" Is it an "HFE design goal?" The paragraph appears simply to have been inserted with an ambiguous relationship to the previous and subsequent material on Page 3.3-1 and 3.3-2.

GEH Response

The Design Descriptions in Tier 1 come from Tier 2. They provide a description for the design for which Design Commitments are written. These paragraphs were deleted because they are not pertinent to the Design Commitments or adding to the Tier 1 Design Description. The HFE Tier 1 Design Commitments (implementation plans) are tracked in Table 3.3-1 "ITAAC For Human Factors Engineering"**.

Since the additional paragraphs were deleted the "Program Goals" header is no longer needed and has been deleted.

The paragraph on Minimum Inventory will be addressed in a subsequent response in RAI 18.8-47.

** Table 3.3-1 will become Table 3.3-2 due to RAI 14.3-436.

DCD Impact

DCD Tier #1, Section 3.3 will be revised in revision 6 as noted in the attached markup.

NRC RAI 14.3-422

Page 3.3-2, of Tier 1 of DCD Rev. 5, lists 11 items, beginning with "operating experience review" and ending with (on Page 3.3-3) , "the strategy for the Human Performance Monitoring process ..." Please explain how this list relates to the previous and subsequent paragraphs.

GEH Response

These are eleven elements of the HFE process (NUREG-0711, "Human Factors Engineering Program Review Model"), and they reflect the Design Commitments (NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants"; Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria") identified in Table 3.3-1 "ITAAC For Human Factors Engineering"**. A header has been added for clarity.

** Table 3.3-1 will become Table 3.3-2 due to RAI 14.3-436

DCD Impact

DCD Tier #1, Section 3.3 will be revised in revision 6 as noted in the attached markup.

NRC RAI 14.3-423

Page 3.3-3 of Tier 1 of the DCD Rev. 5: please clarify the meaning of, "... details of the HFE design will not be completed before the NRC issuance of a design certification." Specifically, what is meant by "details of the HFE design?" Are the details those items identified in certification the acceptance criteria column of Table 3.3-1, e.g., "The scope of the OER" is a "detail" that will not be completed before design certification?

GEH Response

The paragraph will be deleted. The paragraph was originally added to clarify design acceptance criteria (DAC). DAC is extensively discussed in Chapter 14.

The DAC for HFE elements is the results summary reports (RSR) as discussed in NUREG-0711, "Human Factors Engineering Program Review Model" and tracked via ITAAC (Table 3.3-1, "ITAAC For Human Factors Engineering***"). For clarity and completeness, each RSR will contain a definition of the scope of the HFE element being addressed.

** Table 3.3-1 will become Table 3.3-2 due to RAI 14.3-436.

DCD Impact

DCD Tier #1, Section 3.3 will be revised in revision 6 as noted in the attached markup.

MFN 08-942

Markups for

RAI Numbers

14.3-421, 14.3-422, and 14.3-423

DCD Tier 1

DCD Revision 6

3.3 HUMAN FACTORS ENGINEERING

*** 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.**

3.3 HUMAN FACTORS ENGINEERING

Design Description

The Human Factors Engineering (HFE) design process represents a comprehensive, synergistic, iterative design approach for the development of human-centered control and information infrastructure for the ESBWR.

HFE Program Goals—The general objectives of the program can be stated in “human-centered” terms, which, as the HFE program develops, is refined and used as a basis for HFE planning, test and evaluation activities. HFE design goals include ensuring that:

- Personnel tasks can be accomplished within time and performance criteria;
- Human-System Interfaces (HSIs), procedures, staffing/qualifications, training and management and organizational variables support a high degree of operating crew situation awareness;
- Allocation of functions accommodates human capabilities and limitations;
- Operator vigilance is maintained;
- Acceptable operator workload is met;
- Operator interfaces contribute to an error free environment; and
- Error detection and recovery capabilities are provided.

A minimum inventory of HSI comprising the human system interfaces (i.e., alarms, controls, and displays) needed to implement the plant’s emergency operating procedures, bring the plant to a safe condition, and to carry out those human actions shown to be important from the probabilistic risk assessment is established and verified in the HFE program.

The elements of the ESBWR HFE Program Management are provided in the plan entitled “Man-Machine Interface System and Human Factors Engineering Implementation Plan (MMIS and HFE Implementation Plan). In the plan the following are described:

- HFE goals/objectives
- A technical program to accomplish the objectives
- The system to track HFE issues
- The HFE design team
- Management and organizational structure for the technical program.

The proposed methodologies for the conducts of the HFE activities are described in separate implementation plans. The results and outcomes of the activities are summarized in individual results summary reports.

The MMIS and HFE Implementation Plan and supporting HFE activity implementation plans are submitted for NRC staff review in the pre-design project phase. The results summary reports address the ESBWR safety-related systems described in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1~~their associated safety-related functions defined in the Task Analysis.~~ The results summary reports are available for the NRC

staff review, and are included in the list of items for Inspections, Tests, Analyses, and Acceptance Criteria.

The following are the HFE elements and their associated implementation plans:

- (1) Operating Experience Review (OER) is performed in accordance with the ESBWR HFE Operating Experience Review Implementation Plan. The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1.
- (2) Functional Requirements Analysis (FRA) is performed in accordance with the ESBWR HFE Functional Requirements Analysis Implementation Plan and Allocation of Functions (AOF) is performed in accordance with the ESBWR HFE Allocation of Functions Implementation Plan. The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1.
- (3) Task Analysis is performed in accordance with the ESBWR HFE Task Analysis Implementation Plan. The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1.
- (4) Staffing and Qualifications (S&Q) is performed in accordance with the ESBWR HFE Staffing and Qualifications Implementation Plan. The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1.
- (5) Human Reliability Analysis (HRA) is performed in accordance with the ESBWR HFE Human Reliability Analysis Implementation Plan. The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1.
- (6) Human System Interface (HSI) Design is performed in accordance with the ESBWR HFE Human System Interface Design Implementation Plan. The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1.
- (7) Procedure Development is performed in accordance with the ESBWR HFE Procedure Development Implementation Plan. The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1.
- (8) Training Development is performed in accordance with the ESBWR HFE Training Development Implementation Plan. The inspections, tests, analyses, and acceptance

criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1.

- (9) Human Factors Verification and Validation (HF V&V) is performed in accordance with the ESBWR HFE Verification and Validation Implementation Plan. The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1.
- (10) Design Implementation is performed in accordance with the ESBWR HFE Design Implementation Plan. The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1.
- (11) The strategy for the Human Performance Monitoring (HPM) process is developed in accordance with the ESBWR HFE Human Performance Monitoring Implementation Plan. The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1.

Inspections, Tests, Analyses and Acceptance Criteria

~~Because the HSI technology is continually advancing, details of the HFE design will not be complete before the NRC issuance of a design certification. Therefore the portions needed to complete the acceptance criteria of the certification review are marked as {{Design Acceptance Criteria}}.~~

The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems described in Table 2.2.10-1 and the nonsafety-related functions requiring regulatory treatment described in Table 3.3-1~~their associated safety-related functions.~~ Table 3.3-1-2 provides a definition of the inspections, test and/or analyses, together with associated acceptance criteria for Human Factors Engineering.