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Proprietary Notice

This letter forwards proprietary information in accordance with 10CFR2.390. Upon the removal of Enclosure 3, the balance of this letter may be considered non-proprietary.

MFN 08-086 Supplement 46

Docket No. 52-010

May 15, 2008

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application, RAI Numbers 14.3-171, 14.3-211, 14.3-271, and 14.3-389

The purpose of this letter is to submit the GE Hitachi Nuclear (GEH) response to the U. S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC Letter dated December 20, 2007 (Reference 1). The GEH response to RAI Numbers 14.3-171, 14.3-211, 14.3-271, and 14.3-389 is addressed in Enclosures 1, 2, 3, 4, and 5.

Enclosure 1 contains the GEH response to the subject RAIs.

Enclosure 2 contains DCD markups for inclusion in DCD Revision 5. All changes shown in Enclosure 2 are related to the subject RAIs.

Enclosure 3 contains GEH proprietary information as defined by 10 CFR 2.390. GEH customarily maintains this information in confidence and withholds it from public disclosure. A non-proprietary version is provided in Enclosure 4.

The affidavit contained in Enclosure 5 identifies that the information contained in Enclosure 3 has been handled and classified as proprietary to GEH. GEH hereby requests that the information of Enclosure 3 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17.

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MFO

Verified changes associated with a part of the RAI 14.3-271 response are identified in the enclosed LTR markup by enclosing the text within a black box. The marked-up pages may contain unverified changes in addition to the verified changes resulting from these RAI responses. Other changes shown in the markup(s) may not be fully developed and approved for inclusion in the LTR Revision.

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

Sincerely,

A handwritten signature in black ink that reads "James C. Kinsey". The signature is written in a cursive style with a large, looping initial "J".

James C. Kinsey
Vice President, ESBWR Licensing

Reference:

1. MFN 07-718, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 126 Related To ESBWR Design Certification Application*, dated December 20, 2007.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application, RAI Numbers 14.3-171, 14.3-211, 14.3-271, and 14.3-389
2. Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application, RAI Numbers 14.3-171, 14.3-211, 14.3-271, and 14.3-389 – DCD MARKUPS
3. Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application, RAI Numbers 14.3-171, 14.3-211, 14.3-271, and 14.3-389 – GEH PROPRIETARY INFORMATION
4. Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application, RAI Numbers 14.3-171, 14.3-211, 14.3-271, and 14.3-389 – NON-PROPRIETARY VERSION
5. Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application, RAI Numbers 14.3-171, 14.3-211, 14.3-271, and 14.3-389 – AFFIDAVIT

cc: AE Cabbage USNRC (with enclosure)
GB Stramback GEH/San Jose (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
DH Hinds GEH/Wilmington (with enclosure)
eDRF 0000-0082-2151 (RAI 14.3-171, 14.3-271, 14.3-389)
0000-0082-4372 (RAI 14.3-211)

MFN 08-086, Supplement 46

Enclosure 1

**Response to Portion of NRC Request for Additional
Information Letter No. 126 related to ESBWR Design
Certification Application, RAI Numbers 14.3-171, 14.3-211,
14.3-271, and 14.3-389**

NRC RAI 14.3-171

NRC Summary:

Editorial comment

NRC Full Text:

3.3 Human Factor Engineering is in DAC process, the ITAAC table should be labeled {DAC}.

GEH Response

GEH will revise the ITAAC table with the label {{Design Acceptance Criteria}} for the design-related elements under the Design Acceptance Criteria process. These include:

- Operating Experience Review
- Functional Requirements Analysis
- Allocation of Functions
- Task Analysis

And the design-related portions of the following HFE components:

- Staffing and Qualifications
- Human Reliability Analysis
- Human System Interface Design
- Procedures Development
- Training Development

The remaining ITAAC will be considered construction ITAAC.

DCD Impact

DCD Tier 1, Section 3.3 will be revised as noted in the attached markup (Enclosure 2).

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

NRC RAI 14.3-211

NRC Summary:

Correct Design Commitment of DCD Tier 1, Table 3.3-1

NRC Full Text:

ITAAC Table 3.3-1 contains 11 items, one for each element of NUREG-0711 and the corresponding ESBWR element implementation plan. However, the Design Commitment column for each element refers to the overall MMIS and HFE Implementation Plan rather than the specific pertinent elements implementation plan. Please update the 11 Design Descriptions to refer to the applicable implementation plans.

GEH Response

GEH will revise the Design Commitment column in ITAAC Table 3.3-1 in the DCD Tier 1 Rev 5 as shown in the attached Section 3.3 markup to reference the respective implementation plans.

DCD Impact

DCD Tier 1, Section 3.3 will be revised as noted in the attached markup (Enclosure 2).

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

NRC RAI 14.3-271

NRC Summary:

Clarify ITAAC for HFE

NRC Full Text:

Update ITAAC Columns 2 and 3 - Tier 1 Table 3.3-1 Column 2 (Inspections, Tests, Analyses) and Column 3 (Acceptance Criteria) should be revised for each Design Commitment to ensure that they accurately reflect the methodology described in the final versions of the implementation plans following revisions to address the staff's RAIs identified in Chapter 18 of the SER.

In addition, please review all of the items in the acceptance criteria column to ensure that the text is complete. For example Table 3.3-1 item 1, the Acceptance criteria states:

Summary reports document that:

- a. The OER team members and backgrounds.*
- b. The scope of the OER.*
- c. The sources of the operating experience reviewed and documented results.*
- d. The Process for issue analysis, tracking and review."*

This is not complete and does not provide an acceptable acceptance criterion.

GEH Response

ITAAC Table 3.3-1 will be revised in DCD Rev 5 to reference the respective implementation plans that have been updated to address the RAIs identified in Chapter 18 of the SER. The language in the Table will be revised to incorporate the staff's guidance on acceptable acceptance criterion. The items in Table 3.3-1 concerning the team members and background will be removed and addressed in a new GEH proprietary Table 3.1.4-1 added to revision 4 of the MMIS and HFE Implementation Plan as attached.

GEH will revise the current acceptance criteria to include the following acceptance criteria statement:

A result summary report(s) exists and concludes that the "specific pertinent element" was conducted in accordance with the implementation plan and contains:

Key output items from the activity's implementation plan will be listed after the statement.

DCD Impact

DCD Tier 1, Section 3.3 will be revised as noted in the attached markup (Enclosure 2).

LTR NEDO/NEDE-33217P, Rev 3, will be revised to add Table 3.1.4-1 as noted in the attached markup (Enclosure 3).

NRC RAI 14.3-389

NRC Summary:

MMIS/HFE Implementation Plan

NRC Full Text:

For ITAAC Table 3.3-1, Item 1, the staff requests that the applicant clarify in the DC that the activities will be performed in accordance with the OER Implementation Plan.

GEH Response

Design Descriptions in ITAAC Table 3.3-1 will be revised in the DCD Tier 1 Rev 5 to reference the applicable implementation plans.

DCD Impact

DCD Tier 1, Section 3.3 will be revised as noted in the attached markup (Enclosure 2).

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

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Enclosure 2

**Response to Portion of NRC Request for Additional
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14.3-271, and 14.3-389**

DCD MARKUPS

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.

~~*Applicable Facilities*—The HFE program addresses the Main Control Room (MCR), Remote Shutdown System (RSS), Technical Support Center (TSC), Emergency Operations Facility (EOF), and Local Control Stations (LCSs) with a safety related function or as defined by task analysis.~~

~~*Applicable HSIs, Procedures and Training*—The applicable HSIs, procedures, and training included in the HFE program include operations, accident management, maintenance, test, inspection and surveillance interfaces (including procedures) for those systems that have safety significance. This includes monitoring the designs being presented by ESBWR suppliers, to ensure that supplier design are consistent with the HFE requirements of the ESBWR HFE Program. 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.~~

~~*Applicable Plant Personnel*—Plant personnel, both licensed and unlicensed, addressed by the HFE program include licensed control room operators as defined in 10 CFR Part 55 and the categories of personnel defined by 10 CFR 50.120. In addition any other plant personnel who perform tasks that are directly related to plant safety, are addressed in the HFE program.~~

~~Man Machine Interface System (MMIS) employs digital technology to implement the majority of the monitoring, control, and protection functions for the ESBWR.~~

~~Standardization of hardware and software, and modularity of design will be used to simplify maintenance and provide protection against obsolescence.~~

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 activities of the HFE technical program described in the MMIS and HFE Implementation Plan are:~~

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 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.

- (1) Operating Experience Review (OER) is performed in accordance with the ESBWR HFE Operating Experience Review Implementation Plan.
- (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.

Allocation of Functions

~~(4)~~(3) Task Analysis is performed in accordance with the ESBWR HFE Task Analysis Implementation Plan.

~~(5)~~(4) Staffing and Qualifications (S&Q) is performed in accordance with the ESBWR HFE Staffing and Qualifications Implementation Plan.

~~(6)~~(5) Human Reliability Analysis (HRA) is performed in accordance with the ESBWR HFE Human Reliability Analysis Implementation Plan.

~~(7)~~(6) Human System Interface (HSI) Design is performed in accordance with the ESBWR HFE Human System Interface Design Implementation Plan.

~~(8)~~(7) Procedure Development is performed in accordance with the ESBWR HFE Procedure Development Implementation Plan.

~~(9)~~(8) Training Development is performed in accordance with the ESBWR HFE Training Development Implementation Plan.

~~(10)(9)~~ Human Factors Verification and Validation (HF V&V) is performed in accordance with the ESBWR HFE Verification and Validation Implementation Plan.

~~(11)(10)~~ Design Implementation is performed in accordance with the ESBWR HFE Design Implementation Plan.

~~(12)(11)~~ The strategy for the Human Performance Monitoring (HPM) process is developed in accordance with the ESBWR HFE Human Performance Monitoring Implementation Plan.
Human Performance Monitoring

~~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 result summary reports contain the main sources of information, are available for the NRC staff review, and are included in the list of items for Inspections, Tests, Analyses, and Acceptance Criteria.~~

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 their associated safety-related functions. Table 3.3-1 provides a definition of the inspections, test and/or analyses, together with associated acceptance criteria for Human Factors Engineering.

**Table 3.3-1
ITAAC For Human Factors Engineering**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| <p>1. Operating Experience Review (OER) is performed in accordance with the <u>MMIS and HFEESBWR HFE Operating Experience Review -Implementation Plan and its requirements.</u></p> | <p>OER activity is conducted and a results summary report is completed describing the personnel and methodology employed in the conduct of the activity and summarizing the OER outcomes and results. An inspection is performed on the OER results summary report(s). <u>}}Design Acceptance Criteria}}</u></p> | <p>Summary report(s) document <u>A results summary report(s) exists that concludes that the OER activity was conducted in accordance with the implementation plan and contains:</u></p> <ul style="list-style-type: none"> a. The OER team members and backgrounds. • <u>b. The scope of the OER.</u> • <u>e. The list of sources of operating experience reviewed and summary of documented results.</u> • <u>List of risk-important Human Actions and their resolutions from predecessor plants.</u> • d. A description of t<u>The process for issue analysis, tracking, and review.</u> <p><u>}}Design Acceptance Criteria}}</u> <u>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 their associated safety-related functions.</u></p> |

Table 3.3-1

ITAAC For Human Factors Engineering

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| <p>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 MMIS and HFE ESBWR HFE Allocation of Functions Implementation Plan, and its requirements</p> | <p>FRA and AOF activities are conducted and a results summary report is completed describing the personnel and methodology employed in the conduct of the activities and summarizing the FRA and AOF outcomes and results. An inspection is performed on the FRA and AOF results summary report(s). Design Acceptance Criteria</p> | <p>Summary report(s) document that: A results summary report(s) exists that concludes that the FRA and AOF activities were conducted in accordance with the implementation plans and contains:</p> <ul style="list-style-type: none"> • a. The FRA and AOF team members and backgrounds. Scope of the FRA. • b. Plant safety functional requirements. Functional hierarchy for plant safety functions including the identification of Critical Safety Functions. • Plant systems and configurations that support safety functions. • Definition of high-level plant functions, their support needs, and monitoring parameters. • Scope of AOF. • e. Safety function allocations. <p>Design Acceptance Criteria</p> <p>The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR</p> |

**Table 3.3-1
ITAAC For Human Factors Engineering**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|--|---|--|
| | | <p>safety-related systems as defined in <u>Table 2.2.10-1 and their associated safety-related functions.</u></p> <p>d. The methodology and implementation of the FRA and AOF activities concluding that the activities were performed in accordance with implementation plans.</p> |
| <p>3. Task Analysis is performed in accordance with the MMIS and HFEESBWR HFE Task Analysis Implementation Plan and its requirements.</p> | <p>Task Analysis activity is conducted and a results summary report is completed describing the personnel and methodology employed in the conduct of the activity and summarizing the Task Analysis outcomes and results. An inspection is performed on the Task Analysis results summary report(s). <u>}}Design Acceptance Criteria}}</u></p> | <p>Summary report(s) document that: <u>A results summary report(s) exists that concludes that the Task Analysis activity was conducted in accordance with the implementation plan and contains:</u></p> <ul style="list-style-type: none"> a. The Task Analysis team members and backgrounds. • <u>b. The scope of the Task Analysis.</u> • <u>e. A list of High level Task descriptions.</u> • <u>A description of the process for documenting and retaining task analysis results.</u> • <u>d. Examples of Detailed task descriptionsanalysis results.</u> • <u>List of minimum inventory of alarms, displays and controls.</u> |

**Table 3.3-1
ITAAC For Human Factors Engineering**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|--|---|---|
| | | <p>e.—The methodology and implementation of the Task Analysis concluding that the activity was performed in accordance with implementation plans. Design Acceptance Criteria</p> <p>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 their associated safety-related functions.</p> |
| <p>4. Staffing and Qualifications (S&Q) is performed in accordance with the MMIS and HFE ESBWR HFE Staffing and Qualifications Implementation Plan and its requirements.</p> | <p>i. An inspection is performed on the S&Q results summary report(s). Design Acceptance Criteria Staffing and Qualifications activity is conducted and a results summary report is completed describing the personnel and methodology employed in the conduct of the activity and summarizing the Staffing and Qualifications outcomes and results.</p> | <p>i. A results summary report(s) exists that concludes that the S&Q design activity was conducted in accordance with the implementation plan and contains: Summary report(s) document that:</p> <ul style="list-style-type: none"> a.— The S&Q team members and backgrounds. • b.The scope of the S&Q activity. • A summary of design requirements and inputs to the S&Q. <p>Design Acceptance Criteria</p> <p>The inspections, tests, analyses, and</p> |

**Table 3.3-1
ITAAC For Human Factors Engineering**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|-------------------|--|---|
| | | <p><u>acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and their associated safety-related functions.</u></p> |
| | <p><u>ii. An inspection is performed on the final S&Q results summary report(s).</u></p> | <p><u>ii. A final results summary report(s) exists that concludes that the S&Q process was conducted in accordance with the implementation plan and contains:</u></p> <ul style="list-style-type: none"> <u>• e-Final staffing levels and qualifications.</u> <u>• d-The basis for the S&Q concluding that issues and concerns raised in other HFE activities are addressed.</u> <p><u>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 their associated safety-related functions.</u></p> <p><u>e. The methodology and implementation of the S&Q activity concluding that the activity was performed in accordance with implementation plans.</u></p> |

**Table 3.3-1
ITAAC For Human Factors Engineering**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|--|---|--|
| <p>5. Human Reliability Analysis (HRA) is performed in accordance with the MMIS and HFE ESBWR HFE Human Reliability Analysis Implementation Plan and its requirements.</p> | <p>i. <u>An inspection is performed on the HRA results summary report(s).</u> Design Acceptance Criteria</p> <p>HRA activity is conducted and a results summary report is completed describing the personnel and methodology employed in the conduct of the activity and summarizing the HRA outcomes and results.</p> | <p>i. <u>A results summary report(s) exists that concludes that the HRA design was conducted in accordance with the implementation plan and contains:</u> Summary report(s) document that:</p> <ul style="list-style-type: none"> a. <u>The HRA team members and backgrounds.</u> • <u>b: The scope of the HRA.</u> • <u>e: A list of Risk-important human actions and how these are addressed input to in the Human Factors design process activities.</u> <p>Design Acceptance Criteria</p> <p><u>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 their associated safety-related functions.</u></p> <p>d. <u>The methodology and implementation of the HRA activity concluding that the activity was performed in accordance with</u></p> |

**Table 3.3-1
ITAAC For Human Factors Engineering**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| | | <u>implementation plans.</u> |
| | ii. <u>An inspection is performed on the final HRA results summary report(s).</u> | ii. <u>A final results summary report(s) exists that concludes that the HRA process was conducted in accordance with the implementation plan and contains:</u> <ul style="list-style-type: none"> • <u>A reconciled list of risk-important human actions input to Human Factors activities.</u> • <u>A summary of how risk-important human actions are addressed in the Human Factors activities.</u> • <u>A summary of how measures taken in the design keep risk-important actions below the risk important threshold.</u> • <u>Results of the validation of the HRA assumptions concluding that HRA assumptions are valid.</u> <u>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 their associated safety-related functions.</u> |
| 6. Human System Interface (HSI) Design is | i. <u>An inspection is performed on the</u> | i. <u>A results summary report(s) exists that</u> |

Table 3.3-1

ITAAC For Human Factors Engineering

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|--|---|---|
| <p>performed in accordance with the MMIS and HFEESBWR HFE Human System Interface Design Implementation Plan and its requirements.</p> | <p><u>HSI Design results summary report(s).</u></p> <p><u>}}</u>Design Acceptance Criteria}}<u>}}</u></p> <p>HSI Design activity is conducted and a results summary report is completed describing the personnel and methodology employed in the conduct of the activity and summarizing the HSI Design outcomes and results.</p> | <p><u>concludes that the HSI Design specification was conducted in accordance with the implementation plan and contains:</u>Summary report(s) document that:</p> <ul style="list-style-type: none"> • <u>a.</u>The <u>scope of the HSI Design team members and backgrounds.</u> • <u>A description of the concept of operations for HSI Design.</u> • <u>b.</u>A <u>list of HFE standards and guideline documents used in the activity.</u> • <u>e.</u>Descriptions of the <u>Style Guide and design specifications for HSI design.</u> • <u>d.</u>A <u>list of instruments comprising the minimum inventory of HSI and that complies with RG 1.97 and supporting analysis.</u> • <u>A description of the functional requirement specification for HSIs.</u> <p><u>}}</u>Design Acceptance Criteria}}<u>}}</u></p> <p><u>The inspections, tests, analyses, and acceptance criteria for the Human Factors</u></p> |

Table 3.3-1

ITAAC For Human Factors Engineering

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|-------------------|------------------------------|---|
| | | <p><u>Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and their associated safety-related functions.</u></p> <p>e.—The methods used for the evaluation and verification of the HSI.</p> <p>f.—The methodology and implementation of the HSI Design activity concluding that the activity was performed in accordance with the implementation plans.</p> |

Table 3.3-1
ITAAC For Human Factors Engineering

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|--|--|--|
| | <p>ii. <u>An inspection is performed on the final HSI Design results summary report(s).</u></p> | <p>ii. <u>A final results summary report(s) exists that concludes that the HSI Design process was conducted in accordance with the implementation plan and contains:</u></p> <ul style="list-style-type: none"> • <u>A summary of the methods used for the evaluation and verification of the HSI.</u> • <u>A description of the final inventory of HSI including alarms, information displays, and controls.</u> <p><u>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 their associated safety-related functions.</u></p> |
| <p>7. Procedure Development is performed in accordance with the MMIS and HFEESBWR HFE Procedure Development Implementation Plan and its requirements.</p> | <p>i. <u>An inspection is performed on the Procedure Development results summary report(s).</u></p> <p>Procedure Development activity is conducted and a results summary report is completed describing the personnel</p> <p><u>Design Acceptance Criteria</u></p> | <p>i. <u>A results summary report(s) exists that concludes that the Procedure Development design was conducted in accordance with the implementation plan and contains:</u>Summary report(s) document that:</p> <ul style="list-style-type: none"> • <u>The scope of the procedures</u> |

Table 3.3-1
ITAAC For Human Factors Engineering

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|--------------------------|--|--|
| | <p>and methodology employed in the conduct of the activity and summarizing the Procedure Development outcomes and results.</p> <p>Plant procedures (and supporting development material) are available for inspection.</p> | <p><u>development process.</u></p> <ul style="list-style-type: none"> • <u>A list of writer's guides for procedure development.</u> • <u>A summary of design requirements and inputs to procedure development.</u> <p><u>Design Acceptance Criteria</u></p> <p><u>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 their associated safety-related functions.</u></p> <ul style="list-style-type: none"> a. Effective plant procedures derived from ESBWR EPGs are approved. b. The Procedure Development team members and backgrounds. e. The scope of the procedures development process. d. Final procedures and procedure support equipment. e. Technical basis for severe accident management. f. The methodology and implementation of the procedures development activity |

**Table 3.3-1
ITAAC For Human Factors Engineering**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|-------------------|---|--|
| | | concluding that the activity was performed in accordance with implementation plans. |
| | ii. <u>An inspection is performed on the final Procedure Development results summary report(s).</u> | ii. <u>A final results summary report(s) exists that concludes that the Procedure Development process was conducted in accordance with the implementation plan and contains:</u> <ul style="list-style-type: none"> • <u>A description of the plant procedures derived from ESBWR EPGs.</u> • <u>A list of procedures and procedure support equipment developed.</u> • <u>A description of how procedures are utilized, including operator access and use of hard copy and computer based procedures.</u> • <u>Technical basis for severe accident management.</u> • <u>A description of procedure storage and laydown areas for hardcopy procedure use.</u> • <u>A description of the framework utilized for procedure maintenance and control of updates.</u> <u>The inspections, tests, analyses, and</u> |

Table 3.3-1
ITAAC For Human Factors Engineering

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|--|
| | | <p><u>acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and their associated safety-related functions.</u></p> |
| <p>8. Training Development is performed in accordance with the MMIS and HFEESBWR HFE Training Development Implementation Plan and its requirements..</p> | <p>i. <u>An inspection is performed on the Training Development results summary report(s).</u> Design Acceptance Criteria Training Development activity is conducted and a results summary report is completed describing the personnel and methodology employed in the conduct of the activity and summarizing the Training Development outcomes and results.</p> | <p>i. <u>A results summary report(s) exists that concludes that the Training Development design was conducted in accordance with the implementation plan and contains:</u>Summary report(s) document that:</p> <ul style="list-style-type: none"> a. The Training Development team members and backgrounds. • <u>b.</u>The purpose and scope of the Training Development. • <u>e.</u>The roles of organizations involved and the facilities and resources needed to satisfy the needs of the training. • <u>A summary of design requirements and inputs to Training Development.</u> <p>Design Acceptance Criteria <u>The inspections, tests, analyses, and acceptance criteria for the Human Factors Engineering process address the ESBWR</u></p> |

**Table 3.3-1
ITAAC For Human Factors Engineering**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|-------------------|---|--|
| | | <p><u>safety-related systems as defined in Table 2.2.10-1 and their associated safety-related functions.</u></p> <ul style="list-style-type: none"> d. The organization and content of the Training Program. e. The learning objectives. f. The methods for evaluating the effectiveness of the training program and trainee mastery of training. g. The methods for verifying the accuracy and completeness of training course materials. h. Procedures for refining and updating the content and conduct of training. i. The plan for periodic retraining of personnel. j. The methodology and implementation of the Training Development activity concluding that the activity was performed in accordance with implementation plans. |
| | <p><u>ii. An inspection is performed on the final Training Development results summary report(s).</u></p> | <p><u>ii. A final results summary report(s) exists that concludes that the Training Development process was conducted in</u></p> |

**Table 3.3-1
ITAAC For Human Factors Engineering**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|--|--|---|
| | | <p><u>accordance with the implementation plan and contains:</u></p> <ul style="list-style-type: none"> • <u>A description of the organization and content of the Training Program.</u> • <u>A description of the process for developing learning objectives.</u> • <u>A description of the methods for verifying the accuracy and completeness of training course materials, concluding that the training course materials are accurate and complete.</u> • <u>A description of the process for refining and updating the content and conduct of training.</u> • <u>A description of the plan for periodic retraining of personnel.</u> <p><u>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 their associated safety-related functions.</u></p> |
| <p>9. Human Factors Verification and</p> | <p><u>An inspection is performed on the HF</u></p> | <p><u>A results summary report(s) exists that</u></p> |

Table 3.3-1

ITAAC For Human Factors Engineering

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|--|
| <p>Validation (HF V&V) is performed in accordance with the <u>MMIS and HFEESBWR HFE Human Factors Verification and Validation Implementation Plan and its requirements.</u></p> | <p><u>V&V results summary report(s).</u> HF V&V activity is conducted and a results summary report is completed describing the personnel and methodology employed in the conduct of the activity and summarizing the HF V&V outcomes and results.</p> | <p><u>concludes that the HF V&V activity was conducted in accordance with the implementation plan and contains:</u> <u>Summary report(s) document that:</u></p> <ul style="list-style-type: none"> a. The HF V&V team members and backgrounds. • <u>b. The scope of the HF V&V.</u> • <u>Major conclusions and their basis.</u> • <u>A description of the process for documenting and retaining the detailed HF V&V results.</u> • <u>A summary of the following activities:</u> <ul style="list-style-type: none"> - <u>Operational conditions used for the HF V&V.</u> - <u>HSI inventory and characterization.</u> - <u>HSI task support verification.</u> - <u>HFE design verification.</u> - <u>Integrated system validation.</u> - <u>Human Engineering Discrepancy resolution.</u> <p><u>The inspections, tests, analyses, and</u></p> |

**Table 3.3-1
ITAAC For Human Factors Engineering**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|--|---|--|
| | | <p><u>acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and their associated safety-related functions.</u></p> <p>e. Sample of operational conditions used for the V&V.</p> <p>d. HSI Inventory and characterization.</p> <p>e. HSI Task Support Verification.</p> <p>f. HFE Design Verification.</p> <p>g. Integrated System Validation.</p> <p>h. The methodology and implementation for the HF V&V activity concluding that the activity was performed in accordance with implementation plans.</p> |
| <p>10. Design Implementation is performed in accordance with the MMIS and HFEESBWR HFE Design Implementation Plan and its requirements.</p> | <p><u>An inspection is performed on the Design Implementation results summary report(s).</u>Design Implementation activity is conducted and a results summary report is completed describing the personnel and methodology employed in the conduct of the activity and summarizing the Design Implementation</p> | <p><u>A results summary report(s) exists that concludes that the Design Implementation activity was conducted in accordance with the implementation plan and contains:</u></p> <ul style="list-style-type: none"> <u>• The results of the final (as-built) HSI Verification concluding that the “As-Built” HSIs and their design characteristics correspond to the HSI</u> |

Table 3.3-1
ITAAC For Human Factors Engineering

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|--------------------------|-------------------------------------|---|
| | <p>outcomes and results.</p> | <p><u>Requirements and that Human Engineering Discrepancies (if any) resulting from non-conformance are resolved.</u></p> <ul style="list-style-type: none"> • <u>The results of the confirmation of the “As-Built” procedures and training design implementation concluding that Human Engineering Discrepancies resulting from adapted sections (if any) are resolved.</u> • <u>The results of the verification of HFE design not performed in the HF V&V concluding that items in the verification list meet verification criteria and Human Engineering Discrepancies (if any) resulting from non-conformance are resolved.</u> • <u>A description of the resolution to Human Engineering Discrepancies and Open issues in the issue tracking system (HFEITS).</u> • <u>A summary of turnover of remaining Human Engineering Discrepancies/HFEITS issues.</u> <p><u>The inspections, tests, analyses, and</u></p> |

**Table 3.3-1
ITAAC For Human Factors Engineering**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|--|---|--|
| | | <p><u>acceptance criteria for the Human Factors Engineering process address the ESBWR safety-related systems as defined in Table 2.2.10-1 and their associated safety-related functions.</u></p> <p>Summary report(s) document that:</p> <ul style="list-style-type: none"> a. The Design Implementation team members and backgrounds. b. The HSI Verification (As-built). c. The Procedures and Training Confirmation (As-Built). d. The evaluation of aspects of the design not addressed in the HF V&V. e. Resolution of HEDs and Open issues concluding that all HFE-related issues in the issue tracking system (HFEITS) are corrected or justified. f. The methodology and implementation for the Design Implementation activity concluding that the activity was performed in accordance with implementation plans. |
| <p>11. <u>The strategy for the Human Performance Monitoring (HPM) process is performed developed in accordance with the MMIS</u></p> | <p><u>An inspection is performed on the HPM results summary report(s).</u> <u>HPM activity is initiated and a results</u></p> | <p><u>A results summary report(s) exists that concludes that the HPM strategy was developed in accordance with the</u></p> |

**Table 3.3-1
ITAAC For Human Factors Engineering**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| <p>and HFEESBWR HFE Human Performance Monitoring Implementation Plan and its requirements.</p> | <p>summary report is completed describing the personnel and methodology employed in the conduct of the activity and summarizing the HPM strategy, initial outcomes and results.</p> | <p><u>implementation plan and contains:</u></p> <ul style="list-style-type: none"> • <u>A description of the HPM strategy including the scope, structure, and provisions for specific cause determination, trending of performance degradation and failures, and corrective actions.</u> • <u>A description of the database to track activities and corrective actions.</u> <p><u>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 their associated safety-related functions.</u></p> <p>Summary report(s) document that:</p> <ol style="list-style-type: none"> a. <u>The HPM team members and backgrounds.</u> b. <u>The HPM strategy including the scope, structure, and provisions for specific cause determination, trending of performance degradation and failures, and corrective actions.</u> |

ESBWR

Table 3.3-1
ITAAC For Human Factors Engineering

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|--------------------------|-------------------------------------|--|
| | | e. The methodology and implementation of the HPM activity concluding that the activity was performed in accordance with implementation plans. |

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Enclosure 4

**Response to Portion of NRC Request for Additional
Information Letter No. 126 related to ESBWR Design
Certification Application, RAI Numbers 14.3-171, 14.3-
211, 14.3-271, and 14.3-389**

NON-PROPRIETARY VERSION

- Update the integrated schedule to show that project tasks are completely and accurately reflected.
- Assignment of project resources and skill sets to support the project needs.
- Preparation of project progress reports.
- Project risk management assessment.
- Project budgeting.
- Engineering procurement and/or fabrication.
- Communication with COL applicant and vendors.

(7) Team Composition for Project Activities

Table 3.1.4-1 provides the team composition for the project activities described in implementation plans in Subsection 2.3.1. The table provides the needed areas of team expertise for the performance of the activity.

3.1.4.2 MANAGEMENT PROCESS AND PROCEDURES

General Process Procedures - The project team executes its responsibilities through the processes established in ESBWR Project Policies and Procedures (P&Ps), Engineering Operating Procedures (EOPs), and the Engineering Service Instructions (ESIs) that implement the GEH Nuclear Energy Nuclear QA plans described in NP-2010 COL Demonstration Project Quality Assurance Plan [(2.1.1(1))].

The GEH internal procedures address:

- Assigning activities to individual team members.
- Governing the internal management of the team.
- Making management decisions.
- Making design decisions.
- Governing equipment design changes.
- Design team review of products.

The MMIS and HFE Implementation plan and its subordinate implementation plans are controlled documents under configuration control in accordance with the ~~GEEN QA Plan~~ GEH Project QA Plan [2.1.1(1)]. When improvements or deficiencies are identified, a Corrective Action Request (CAR) is issued to document the condition. The CAR tracks activity and ensures corrective and preventive actions are implemented. The CAR also ensures the actions are effective in either eliminating the deficiency or improving the affected plans.

A change or revision to this document and its subordinate plans prior to certification approval is established in accordance with the ~~GEEN QA Plan~~ GEH Project QA Plan [2.1.1(1)] and applicable ESBWR Project and Procedures. To make a change or revision to this document and the subordinate plans ~~described in section 4~~ listed in Subsection 2.3.1 after certification approval, the changes must in accordance with Processes for Changes and Departures to Tier 2 Information within the applicable appendix for the ESBWR to 10CFR 52.

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MFN 08-086, Supplement 46

Enclosure 5

**Response to Portion of NRC Request for Additional
Information Letter No. 126 related to ESBWR Design
Certification Application, RAI Numbers 14.3-171, 14.3-211,
14.3-271, and 14.3-389**

AFFIDAVIT

General Electric Company

AFFIDAVIT

I, **David H. Hinds**, state as follows:

- (1) I am General Manager, New Units Engineering, GE Hitachi Nuclear Energy ("GEH") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.
- (2) The information sought to be withheld is contained in Enclosure 3 of GEH's letter, MFN 08-086, Supplement 46, Mr. James C. Kinsey to U.S. Nuclear Regulatory Commission, entitled *Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application – RAI Numbers 14.3-171, 14.3-211, 14.3-271, and 14.3-389*, dated May 15, 2008. The proprietary information in Enclosure 3, *Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application – RAI Numbers 14.3-171, 14.3-211, 14.3-271, and 14.3-389 – GEH Proprietary Information*, is delineated by a [[dotted underline inside double square brackets⁽³⁾]]. Figures and large equation objects are identified with double square brackets before and after the object. In each case, the superscript notation ⁽³⁾ refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.
- (3) In making this application for withholding of proprietary information of which it is the owner, GEH relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.790(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).
- (4) Some examples of categories of information which fit into the definition of proprietary information are:
 - a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;
 - b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;
 - c. Information which reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;

- d. Information that discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a., and (4)b, above.

- (5) To address 10 CFR 2.390 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements, which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.
- (6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which was licensed to GEH. Access to such documents within GEH is limited on a "need to know" basis.
- (7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary information. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.
- (8) The information identified in paragraph (2), above, is classified as proprietary because it contains details of GEH's MMIS and HFE Implementation Plan. The development of the team composition for the project activities described in the implementation plans required a significant effort and extensive experience on the part of GEH. This is information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.
- (9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply

the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 15th day of May 2008.

for  *05/15/2008*
David H. Hinds
GE Hitachi Nuclear Energy