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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application - ESBWR Human Factors Engineering - RAI Numbers 18.4-1 S02, 18.4-7 S02, 18.7-9 S02, and 18.12-4 S01**

Enclosure 1 contains GEH's response to the subject NRC RAIs transmitted via the Reference 1 letter.

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

Sincerely,

Kathy Sedney for

James C. Kinsey
Vice President, ESBWR Licensing

D068

NRO

Reference:

1. MFN 07-460, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application, dated August 16*, 2007
2. MFN 07-334, Letter from GE to U.S. Nuclear Regulatory Commission, *Submittal of "ESBWR DCD Chapter 18, Human Factors Engineering - RAI to DCD Roadmap Document"*, dated June 27, 2007
3. MFN 06-400, Letter from GE to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 64 – Human Factors Engineering – RAI Numbers 18.4-1 through 18.4-25*, dated November 1, 2006
4. MFN 06-403, Letter from GE to U.S. Nuclear Regulatory Commission, Response to Portion of NRC Request for Additional Information Letter No. 64 – Human Factors Engineering – RAI Numbers 18.7-1 through 18.7-15, dated October 27, 2006
5. MFN 06-447, Letter from GE to U.S. Nuclear Regulatory Commission, Response to Portion of NRC Request for Additional Information Letter No. 74 Related to ESBWR Design Certification Application – ESBWR Human Factors Engineering NEDO-33278, Rev. 1, ESBWR HFE Design Implementation Plan – RAI Numbers 18.12-1 through 18.12-6, dated November 18, 2006

Enclosure:

1. Enclosure 1 - Response to NRC Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application NEDO-33219 Funtional Requirements Analysis NEDO-33267 Human Reliability Analysis NEDO-33278 Design Implementation, RAI Numbers 18.4-1 S02, 18.4-7 S02, 18.7-9 S02, 18.12-4 S01

cc: AE Cubbage USNRC (with enclosures)
RE Brown GEH/Wilmington (with enclosures)
GB Stramback GEH/San Jose (with enclosures)
eDRF 0000-0074-3489

Enclosure 1

MFN 07-499

Response to NRC Request for

Additional Information Letter No. 105

Related to ESBWR Design Certification Application

NEDO-33219 Funtional Requirements Analysis
NEDO-33267 Human Reliability Analysis
NEDO-33278 Design Implementation

RAI Numbers 18.4-1 S02, 18.4-7 S02, 18.7-9 S02, 18.12-4 S01

For historical purposes, the original text of RAIs 18.4-1, 18.4-7, 18.7-9, and 18.12-4 and any previous supplemental text and GE responses are included preceding each supplemental response. Any original attachments or DCD mark-ups are not included to prevent confusion.

NRC RAI 18.4-1

As described in the DCD, it is clear that the ESBWR design is mature and quite complete. However, the ESBWR functional requirements analysis (FRA) described in NEDO-33219, "System Functional Requirements Analysis Implementation Plan, "is not clear regarding how particular aspects of the analysis have been or will be performed for ESBWR, as follows:

a) Section 3, paragraph 3, notes that the ESBWR functional analysis begins at the System Level because it is an evolutionary design. This may be acceptable, but the higher-level plant goals, subgoals, critical functions, and plant performance requirements that are being adapted from ABWR should be documented as part of the ESBWR functional analysis. Any functions that are different also should be documented.

b) Section 3, paragraph 4, states that the top-level structure created in this section is only an example and that the top-level structure is included implicitly in the design basis of the ESBWR plant systems. Please provide a description of this top-level structure.

c) Sections 3.1.1 and 3.1.2 note that definitions of several aspects of ABWR are needed and then describe the development of safety related and availability subgoals. In the actual ESBWR functional analysis, will such subgoals be developed for ESBWR? Please explain.

d) Section 4.2, paragraph 3, states that the functional analysis for ESBWR can take advantage of predecessor ABWR designs and that depending on the ESBWR project schedule, systems analysis could also be based on functions defined in ABWRs. Does this mean that a functional analysis will not be performed for ESBWR? Please explain.

e) Section 4.2 uses as an example of the methodology the reactor water cleanup (RWCU) System for a BWR-6 plant. Please explain why a system from a BWR-6 was used rather than an ESBWR system or an ABWR system (the predecessor plant for ABWR).

f) Please discuss how the plan ensures that all high-level functions for ESBWR necessary for the achievement of safe operation are identified, and that all requirements of each high-level function are identified.

g) Similar language appears in NEDO-33220, "ESBWR Allocation of Functions [AOF] Implementation Plan." Section 1.2, Scope, states:

- *"The function allocation can follow the same allocation from proven previous designs when the interface and information is unchanged. Thus, in many cases the HFE work performed for the previous ABWR designs applies directly to the ESBWR."*
- *"Detailing the steps of the AOF process for both new systems and changes to existing systems."*
- *"The AOF will be developed as a delta process to the ABWR plant designs. The Baseline Review Record established as precursor to these activities will form the bases from which a gap analysis will document the level of application of the technologies described therein. The systems will undergo execution of the described AOF activities, either because they are new systems or the design and/or regulatory basis is sufficiently changed to warrant reevaluation/reengineering." Please provide clarification of the above areas, so that the actual planned implementation of functional requirements analysis and allocation can be properly understood.*

Specifically:
- *What ABWR analyses will be used as part of the ESBWR design certification? Provide documentation of the analyses.*
- *How will the gap analysis be performed? What criteria will be used to determine when a gap exists?*

GE Response

(a) The higher-level plant goals, subgoals, critical functions, and plant performance requirements that are being adapted from ABWR will be documented as part of the ESBWR Functional Requirements Analysis (FRA). In addition, any other functions that are different will also be documented.

(b) The methodology for developing the top level functional structure starting from the plant primary goals (PFL-1) is discussed in Sections 3.1 through 3.3. An illustration of the top down Task Analysis (TA) approach is being developed in response to RAIs 18.5, (See Addendum to RAIs 18.5). This illustration depicts the process to be used. This process will follow through the allocation of functions (FA) and into the Task Analysis (TA) where the system functional analysis methodology begins (Section 4.2). This will be clarified in the next revision of NEDO-33219 and NEDO-33220.

(c) Yes. The FRA will be performed for each ESBWR system and will identify the safety related and availability subgoals.

(d) No. As stated in 18.4-1 (c) above, the FRA will be performed for ESBWR systems. This paragraph is allowing us to use previously verified design inputs from ABWR and other BWR plants as a starting point for the ESBWR FRA.

(e) When this document was issued, the Lungmen FRA for the reactor water cleanup system was not available. The processes identified in Figures 7 thru 12 are the same for the BWR6 and the ABWR. An example featuring the ESBWR RWCU system will be provided in the next revision to NEDO-33219 and NEDO-33220.

(f) As stated in Section 3.1, second paragraph the "...safety related and non-safety related system functions and design information are defined in the ESBWR System Design Description(SDD). In addition to system functions, the SDD defines mandatory allocations of functions prescribed by regulatory requirements or design goals."

(g) See response to RAI 18.3-25 (b) previously submitted.

The GAP analysis will be performed using checklists contained in the BRR Plan:

"Table 2 - Identification of Equivalent Systems Between Predecessor and ESBWR for HFE Evaluation", and
"Table 3 – Identifying Differences Between Predecessor and ESBWR Systems"

DCD/ LTR Impact
LTRs NEDO-33219, Rev 0 and NEDO-33220, Rev 0 will be revised as noted above.
No DCD changes will be made in response to this RAI.

(The above RAI response taken from Reference 3)

Excerpt from Roadmap Document transmitted to NRC via MFN 07-334, Ref. 2

NRC RAI 18.4-1 S01

RAI NO	SEC	#	NRC Supplemental	DocName/Question	Resolved	Plan	Section	Resolution Description
18.4-1	4	1	N	LTR NEDO-33219	From GE response	33219		Plan rewritten to illustrate the change to a top-down analysis of plant and system functions (all figures replaced).
18.4-1 item g	4	1	Y	Planned implementation of Function Allocation	From GE response			The original RAI numbering submitted was revised. The new RAI number that this response refers to is 18.6-7. The BRR was a topic of the audit, and it was also discussed at the audit, that GE would not be relying on the predecessor FRA, AOL, and TA. The new top down approach effectively starts with a fresh analysis for both the plant level and system level approaches. This RAI should be resolved.

NRC RAI 18.4-1 S02

f) Please discuss how the plan, NEDQ-33219. "System Functional Requirements Analysis Implementation Plan", ensures that all high-level functions for ESBWR necessary for the achievement of safe operation are identified, and that all requirements of each high-level function are identified. This is not addressed directly In Rev. 1 to NEDO-33219. New response to RAI necessary.

GEH Response

NEDO 33219 describes the process for identifying high-level functions for achieving safe operation. High-level plant functions are developed from the Safety Sub Goals and the Generation and Availability Sub Goals. The sub goals are broken down to identify high-level plant functions, which support the plant sub goals of safety and availability. All high-level plant functions can be identified through the application of this method to the entire set of Safety and Availability Sub Goals. At the end of the process a complete set of high-level plant functions will be obtained. The requirements of the high level functions are identified at the Plant Process Function (Sub-Function) level where control and/or monitoring capability of the parameters that supports the high level functions are identified.

A new Section 4.1.3.2 Plant Sub Goal Identification will be added to the next Revision of NEDO 33219.

DCD/TR Impact

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

LTR NEDO-33219, Rev 1 will be revised as noted in the attached markups and Attachments A, B and C.

NRC RAI 18.4-7

Please provide clarification of the following aspects of NEDO-33219 methodology.

a) Section 5.2, last paragraph states, "[f]uture reviews of the important PRA sequences address beyond design basis events from the ESBWR DCD (Chapter 19) can challenge the operators to interact through the HSI [human system interface] in different ways with the plant."
Please clarify.

b) Section 5.3, last paragraph states, "[c]ritical functions can also include non-safety functions involving high asset value components, those that support plant availability, and capacity factor, and those requiring human resources that can become unavailable for other safety related tasks." Please clarify the portion discussing human resources that can be unavailable.

c) Section 7.1, p. 46, states, "[t]he following types of events should be included, consistent with analyses documented in Chapters 15 and 19 of the ESBWR DCD: "Please explain the purpose of this portion of the analysis and how these events will be used.

d) Figure 2 of NEDO-33219 is for a BWR-6 and not ESBWR and should be labeled as such for clarity.

e) Figure 16 shows flow in units of MPa. Please correct.

f) Table 3 lists Level 6 as Systems Subgoals (SFL-2) and Level 7 as Systems Critical Functions (SFL-3). However, the example provided in Figure A-4, lists SFL-2 as System Process and SFL-3 as System Processing Elements. Please explain the inconsistency.

GE Response

(a) As the ESBWR design progresses, future reviews of the important PRA sequences will address plant scenarios beyond those listed in the design basis events (ESBWR DCD Chapter 19) that have a probability of challenging the operators to interact with the plant through the HSI interfaces in different ways. This will be performed during operator training sessions on the simulator.

(b) During plant transients, operators are challenged with simultaneous/almost concurrent tasks which need to be addressed leaving them unavailable to perform secondary tasks. The Control Room staffing assignments, workload, and task coordination will be assessed in the Task Analysis (TA). Many transients start with an initiating event and quickly follow with other secondary events which must be dealt with. Following an incident, additional control room personnel normally report to the Senior Reactor Operator (SRO) on-shift to provide additional assistance.

(c) These events will be analyzed during the FRA and the TA process and then used by the HFE team to monitor operator interaction with the HSI equipment. They will be included in the overall operator training program to ensure operator proficiency.
(d) Figure 2 will be corrected by adding BWR-6 into Title line at the next revision of NEDO-33219.
(e) Figure 16 units for "Pumps discharge flow" will be corrected at the next revision of NEDO-33219."
(f) The titles in Table 3 for Levels 1, 2, 5, 6 and 7 will be changed, to be consistent with Figure A-4 and the titles of Sections 3.1, 4.2.1 through 4.2.3 as follows:
Level 1 Change "Plant General Goals" to "Plant Primary Goals"
Level 2 Change "Plant Subgoals" to "Plant Primary Subgoals"
Level 5 Change "System Goals" to "System Functions"
Level 6 Change "System Subgoals" to "System Process"
Level 7 Change "System Critical Functions" to "System Processing Elements"

To ensure clarity, the word "Plant" will be inserted in the last paragraph of Section 3 and in the headers of Sections 3.2 and 3.3. Also, the word "Purity" will be corrected to "Purify" in the Title line of Figure A-4. These changes will be made at the next revision of NEDO-33219.

DCD/LTR Impact
LTR NEDO-33219, Rev 0 will be revised as noted above.
No DCD changes will be made in response to this RAI.

(The above RAI response taken from Reference 3)

Excerpt from Roadmap Document transmitted to NRC via MFN 07-334, Ref. 2

NRC RAI 18.4-7 S01

RAI NO	SEC	#	NRC Supplemental	DocName/Question	Resolved	Plan	Section	Resolution Description
18.4-7	4	7	N	LTR NEDO-33219	From GE response	33219	Figure 1	Plan rewritten to illustrate the inter-relation with other plans (HRA, OER etc.) and the iterative nature of the Operational Analysis; specifically, the FRA. Reformatted the plan to align with a standard HFE implementation plan template.
18.4-7	4	7	Y	Clarify the details of the functional analysis methodology	From GE response	33220 33219	a. Fig2 c. 4.1 a. Fig 3 c. 1.2	The statements questioned in the RAI have been omitted and the inconsistencies removed in subsequent revisions, but the response is still valid. a. The PRA as an input to the process is included in numerous sections of the AOF (3.1.1.5, 3.1.1.6, 3.1.1.7, 4.1.2, and Fig 2) and the FRA (1.2, 3.3.3, 4.1.2, 4.2.2, Fig 3) b. Task analysis will address staff assignments, workload, and task coordination. c. Events list referred to in RAI is deleted, but top down plant analysis will address plant level safety functions which will encompass the events and the PRA will provide input as stated before for major events.

NRC RAI 18.4-7 S02

a) In the RAI response. GEH indicated that as the ESBWR design progresses, future reviews of the important PRA sequences will address plant scenarios beyond those listed In the design basis events (ESBWR DCD Chapter 19) that have a probability of challenging the operators to interact with the plant through the HSI interfaces in different ways. This will be performed during operator training sessions on the simulator.

Please include the RAI response in a future revision to NEDO-33219.

c) In the RAI response, GEH indicated that certain events will be analyzed during the FRA and the TA process and then used by the HFE team to monitor operator interaction with the HSI equipment. They will be included in the overall operator training program to ensure operator proficiency.

Please Include the RAI response In a future revision to NEDO-33219.

GEH Response

a) GEH's original response to the RAI, which was acceptable, was based on Rev. 0 of NEDO 33219, however Rev.1 of NEDO 33219 has revised the section to which the RAI applied and clarification of the original acceptable response is in order.

As the ESBWR design progresses, design PRA analysis and operating philosophy changes will be evaluated using the process described in this document. This iterative process will continue through operator training in the plant simulator and ultimately continue for the life of the plant.

The next revision of NEDO 33219 will revise the Section 4.1.3.5 Critical Safety Function Identification, and will include a method to obtain Critical Safety Functions, which includes event criteria from DCD Chapters 15 and 19.

c) GEH's original response to the RAI, which was acceptable, was based on Rev. 0 of NEDO 33219, however Rev.1 of NEDO 33219 has revised the section to which the RAI applied and clarification of the original acceptable response is in order. The PFRA process will identify all applicable events including Chapters 15 and 19 that apply. The majority of events are identified during the Plant Safety Sub Goal identification and also during the identification of Critical Safety Functions.

As the ESBWR design progresses, design PRA analysis and operating philosophy changes will be evaluated using the process described in this document. This iterative process will continue through operator training in the plant simulator and ultimately continue for the life of the plant.

The next Revision of NEDO 33219 will add a new Section 4.1.3.2 Plant Sub Goal Identification.

DCD/NEDO Impact

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

LTR NEDO-33219, Rev 1 will be revised as noted in the attached markups and Attachments A, B and C.

RAI Number 18.7-9
The ESBWR PRA, as submitted, includes both Level 1 and Level 2 analyses and both internal and external events analyses. Clarify why NEDO-33267 does not specifically commit to use all of these analyses in determining the risk important HAs.

GE Response
Because this is a first time application of PRA/HRA to support HFE during the design phase we identify possible methodologies that will match the top down approach in levels 1 and 2 internal and external events PRAs to the bottom up approach used in task analysis. This match up is expected to result in refinements to the proposed methods in NEDO-33267. The development of the importance listing will consider the inputs from levels 1 and 2 of the internal and external events PRA models. The next revision of NEDO-33267 will clarify commitments by making the following changes to the Section 1.2 bullets.

First bullet, new will reference the text provided in RAI 18.7-6 to address the multidisciplinary team:
"Using a multidisciplinary team as described in Section 3 to analyze human actions within the context of the PRA."

Second bullet, current 1st bullet modified:
"Developing a process for using PRA/HRA (e.g., level 1, level 2, internal and external events) to support the design of the ESBWR HSI. An initial working process is shown in Figure 2."

Third bullet, current 2nd bullet unchanged.

Fourth bullet, new:
"Clarifying the role of operators, through obtaining design information related to factors that affect human performance."

Fifth bullet, current 3rd bullet unchanged.

Sixth bullet, current 4th bullet modified to insert the word "probabilistic":
"Iterating with the probabilistic risk assessment, ..."
The final three bullets remain unchanged.

DCD/LTR Impact
LTR NEDO-33267, Rev 0 will be revised as described above.
No DCD changes will be made in response to this RAI.

(The above RAI response taken from Reference 4)

Excerpt from Roadmap Document transmitted to NRC via MFN 07-334, Ref. 2

NRC RAI 18.7-9 S01

RAI NO	SEC	#	NRC Supplemental	DocName/Question	Resolved	Plan	Section	Resolution Description
18.7-9	7	9	N	LTR NEDO-33267	From GE response	33267	1.2	Bullets Change per RAI
18.7-9	7	9	Y	Level 2 and External Events PRA	From GE response	33267	4.2	Committed to in 4.2 paragraph 6

NRC RAI 18.7-9 S02

The RAI response does not clearly commit to the use of both level 1 and level 2 analyses and both Internal and external events analysis to determine the risk important HAs. Please provide this commitment in NEDO-33267.

GEH Response

GEH clarifies its commitments to the use of both ESBWR PRA level 1 and level 2 analyses and both internal and external events analysis to determine the risk important HAs in the changes to NEDO-33267 listed in bold.
In section 1.2 Scope the following changes are made to the second paragraph.

The scope of this plan includes the following **commitments**:

Bullets 2 to 4 (add bullet 2)

- **Using both the ESBWR PRA level 1 and level 2 analyses and both internal and external events analysis to determine the risk important HAs. The approach for determining risk importance of human actions is described in section 3.2.1**.
- Developing a process for using PRA/HRA **results** (e.g., level 1, level 2, internal and external events) to support the design of the ESBWR HSI. An initial working process is shown in Figure 3.
- Identifying and selecting **risk-important actions for evaluation of the HSI design features on** the quantitative risk estimates.

Section 3.1, bullet 1-second paragraph

The PRA, **consisting of both level 1 and level 2 analyses and internal and external analysis,** includes ...

DCD Impact

No DCD changes will be made in response to this RAI.
LTR NEDO-33267, Rev 2 will be revised as described above.

NRC RAI 18.12-4

NEDO-33278, Section 1.3 identifies the COL as the lead and manager of this effort. However, in Section 4.1.3, it appears that GE may be conducting these evaluations. Please clarify the roles of the COL and GE in this process.

GE Response

Since this activity will occur after the COL submittal, it is considered the COL holder's lead. However, Section 4.1.3 refers to the members of the HFE team as the resources. Currently the HFE team does consist of GE and COL representatives, and COL membership will increase as time continues. At the Design Implementation, there will be both GE and COL membership, and the HFE Team will still be guided by the established processes and procedures outlined in the MMIS and HFE Implementation Plan. Either qualified COL holder or GE personnel on the HFE team may perform the roles of Task Leader, Responsible Engineer, etc.

DCD/LTR Impact

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

No changes to the subject LTR will be made in response to this RAI.

(The above RAI response taken from Reference 5)

NRC RAI 18.12-4 S01

(1) Section 1.2 of NEDO-33278 Rev-2 describes a somewhat different organization than was identified in the RAI response. It states that the verifications are the responsibility of the COLOG. Clarify the role of the COLOG and the COL license applicant.

(2) Section 1.2 of NED0-33278 Rev-2 indicates that the verifications described for the plan "apply to the initial COL plants associated with the ESBWR design effort." The staff's position is that "as-built" verifications are needed for every new plant construction. Please explain why only the initial plants will be verified.

GEH Response

(1) The role of the COL Owners Group (COLOG) was established after the writing of the NEDO-33278 Rev 1 and the response to the original RAI. The role of the COLOG is described in the MMIS and HFE Implementation Plan (NEDO-33217 Rev 3) sections 3.1.4, 3.1.4.2(15), and 3.1.4.2(16) with additional details in the Human Performance Monitoring Implementation Plan (NEDO-33277 Rev 2).
The COL license applicant has the responsibility to comply with the regulatory obligations of the design implementation activity, with the COLOG serving as the entity that facilitates and supports the performance of the activity.
The NEDO-33278 will be revised in the next revision to the document, as noted in the attached markups, to clarify that the COL applicant (with the support of the COLOG) is responsible for the design implementation of new plants constructed from the ESBWR standard design.
(2) The wording of the scope is not clear and NEDO-33278 will be revised in the next revision to the document, as noted in the attached markup, to clarify that the design implementation applies to all new plants constructed from the ESBWR standard design.

DCD Impact

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

LTR NEDO-33278, Rev 2 will be revised as noted in the attached markup.

ATTACHMENT A

NRC RAI 18.4-1 S02 (f) and RAI 18.4-7 S02 (c)

Add Section for Plant Sub Goal Identification insert after Section 4.1.3.1 and to be revised as follows:

4.1.3.2 Plant Sub Goal Identification

The Plant Goals is divided into two categories, a Plant Safety Goal (Limit Radionuclide Release) and a Plant Generation and Availability Goal (Operate economically and Protect economic operation).

The Plant Safety Sub Goals that support the Plant Safety Goal to limit radionuclide release are developed by reviewing 10 CFR50 Appendix A-General Design Criteria for Nuclear Power Plants (GDC), NEDO-33175-Classification of ESBWR Abnormal Events and Determination of their Safety Analysis Acceptance Criteria, DCD Chapter 6 Engineered Safety Features, DCD Chapter 15 Safety Analysis and DCD Chapter 19 Probabilistic Risk Assessment and Severe Accidents.

The Plant Generation and Availability Sub Goals are developed from the basic Steam Power Cycle as applied to the Nuclear Plant Process (NPP) and NPP energy transformations and also the startup, power operations, shutdown and refueling states required for plant operation are considered in the development of Availability and Generation Sub Goals.

ATTACHMENT B

NRC RAI 18.4-1 S02 (f)

Section 4.1.3.3 will be Renumbered Section 4.1.3.4 and revised as follows:

High-level functions for safe operation are developed from the Safety Sub Goals and Plant Generation and Availability Sub Goals. Plant Functions that support the Plant Sub Goals are developed and identified and Plant Process Functions (Sub Functions) that support the Plant Functions are developed and identified.

As stated previously, the Plant Goals is divided into two categories, a Plant Safety Goal (Limit Radionuclide Release) and a Plant Generation and Availability Goal (Operate economically and Protect economic operation). The two categories for plant Goals are broken down to obtain Plant Sub Goals and high-level Plant Functions (Safety and Availability).

The requirements of the high level function are identified at the Plant Process Function (Sub Function) level where control and or monitoring capability of the parameters that supports the high level function is identified.

ATTACHMENT C

NRC RAI 18.4-7 S02 (a)

Section 4.1.3.5 will be Renumbered Section 4.1.3.6 and revised as follows:

Identify any function that is a Critical Safety Function that supports the Plant Safety Sub Goals. A function will be considered a Critical Safety Function if it meets any of the following criteria:

A Function will be considered a Critical Safety Function, which if that function failed, would not allow achievement of safety system performance requirements.
OR
Which if that function failed, could pose a safety hazard to plant personnel or to the general public
OR
If that function prevents or mitigates any of the criteria in ESBWR DCD Chapter 15/Tier 2 Rev. 3, Tables 15.0-3,4,5,6. These Tables list the safety analysis acceptance criteria required for Normal Operation, including Anticipated Operational Occurrence (AOO) and AOO in Combination with an additional single active component failure or single operator error, Infrequent Events and Accidents.
OR
If the Plant Function prevents or mitigates the following DCD Chapter 19 Probabilistic Risk Assessment and Severe Accidents Acceptance Criteria for internal events:

- Reactivity Control-The acceptance criterion is to achieve sub-criticality and maintain the reactor in a sub-critical state.
- RPV Overpressure Protection-A pressure of 150 percent of the reactor coolant pressure boundary is defined as the acceptance criteria for the RPV overpressure protection.
- Core Cooling-A peak cladding temperature of 2200 F is defined as the criterion for establishing the adequacy of coolant inventory.
- Containment Heat Removal-The acceptance criterion for the containment cooling function is to maintain the pressure below the ultimate containment failure pressure, which is provided in Appendix 19C.

1 OVERVIEW

The Design Implementation Plan, NEDO-33278, addresses the final "as-built" implementation of the Human Factors Engineering (HFE) guidance into ESBWR standard plant design. The ESBWR overall HFE design process is depicted in Figure 1. The standard design includes standardized Human System Interfaces (HSIs), procedures, and training. The ESBWR Combined Operating License Owners Group (COLOG) is responsible for establishing and maintaining the standard plant design and good human factors practice.

COL applicant (with the support of the

Figure 2 depicts the design implementation process described in this plan. The COLOG is responsible for design implementation of new plants constructed using the ESBWR standard plant design. The implementing organizations execute their responsibilities under the plans described in the ESBWR Man-Machine Interface Systems and Human Factors Engineering Implementation Plan (MMIS and HFE Implementation Plan), NEDO-33217. The design implementation, startup, and operational duties of the COL applicants include aspects of these plans, which are transferred to the COL applicant under their license obligations to ensure the integrity of the HFE infrastructure is maintained throughout the life cycle of the plant.

The HFE aspects of the ESBWR standard plant including design of the HSIs, standard plant procedures, and standard plant training documentation, are verified and validated using the Full Scope Simulator (FSS) during the HFE Verification and Validation (HF V&V) process. The Design Implementation as described in this plan is performed to assure that the "as-built" HFE design conforms to the design that was used in the ESBWR standard plant V&V efforts.

1.1 Purpose

The purpose of this document is to:

1. Confirm that the final HSIs, procedures, and training (as-built) HFE design conforms to the ESBWR standard plant design resulting from the HFE design process and V&V activities. Any identified human engineering discrepancies (HEDs) are assessed and properly addressed.
2. Verify aspects of the design that may not have been evaluated previously in the V&V process. This includes any hardware/software, new or modified displays that were absent from the simulator-based integrated V&V process, and any physical or environment (e.g., noise, lighting, etc.) differences between those present at the V&V process and the "as-built" Main Control Room (MCR).
3. Verify resolution of remaining HEDs and open items from the Human Factors Engineering Issue Tracking System (HFEITS).
4. ~~Transfer design implementation responsibility to the COLOG.~~
4. Transfer responsibility for HFEITS to ~~COLOG~~.

the COL applicant (with the support of the COLOG)

1.2 Scope

The "as-built" confirmations, verifications, and validations described in this plan apply to the ~~initial~~ COL plants ~~associated with~~ constructed from the ESBWR design ~~effort~~. The COLOG is responsible for: standard

- Regulatory obligations of design implementation

COL applicant (with the support of the