

September 25, 2006

Mr. David Hinds, Manager, ESBWR
General Electric Company
P.O. Box 780, M/C L60
Wilmington, NC 28402-0780

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 64 RELATED TO
ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Hinds:

By letter dated August 24, 2005, General Electric Company (GE) submitted an application for final design approval and standard design certification of the economic simplified boiling water reactor (ESBWR) standard plant design pursuant to 10 CFR Part 52. The Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed design.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter. This RAI concerns Human Factors Engineering, Chapter 18, of Tier 2 of the ESBWR design control document (DCD), Revision 1. The RAI questions were sent to you via electronic mail on July 14, 17, 18 and 29, 2006, and were discussed with your staff during a telecon on September 13, 2006. You agreed to respond to these RAI questions by October 20, 2006.

If you have any questions or comments concerning this matter, you may contact me at (301) 415-207 or lnq@nrc.gov, or Amy Cabbage at (301) 415-42875 or aec@nrc.gov.

Sincerely,

/RA/

Lauren Quiñones, Project Manager
ESBWR/ABWR Projects Branch
Division of New Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 52-0010

Enclosure: As stated

cc: See next page

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ACCESSION NO. ML062650093

OFFICE	NRBA/PM	NRBA/BC
NAME	LQuinones	JColaccino
DATE	09/22/2006	09/25/2006

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LRossbach

LQuinones

MBarillas

JGaslevic

JBongarra

JCai

NSalgado

higgins@bnl.gov

ohara@bnl.gov

Requests for Additional Information (RAIs)
ESBWR Design Control Document (DCD) Section 18.4
Functional Requirements Analysis and Function Allocation Plans

RAI Number	Reviewer	Question Summary	Full Text
18.4-1	Bongarra J	Clarify the overall role and scope of the analyses conducted for the ABWR	<p>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:</p> <ul style="list-style-type: none"> 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.

RAI Number	Reviewer	Question Summary	Full Text
			<p>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).</p> <p>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.</p> <p>g) Similar language appears in NEDO-33220, "ESBWR Allocation of Functions [AOF] Implementation Plan." Section 1.2, Scope, states:</p> <ul style="list-style-type: none"> • "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 herein. 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." <p>Please provide clarification of the above areas, so that the actual planned implementation of functional requirements analysis and allocation can be properly understood.</p>

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			<p>Specifically:</p> <ul style="list-style-type: none"> • 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?
18.4-2	Bongarra J	Provide status of reference documents	<p>a) NEDO-33219, Section 2.3, identifies Regulatory Requirements and Guidelines. NEDO-33219 lists NUREG-0700, 1986, which is outdated. The current version is Rev. 2, dated May 2002. Also, EPRI NP-3659, dated 1984, has been supplanted by several later EPRI documents. Please explain the rationale for referencing these older versions.</p> <p>b) NEDO-33220, Section 2.1, identifies reference documents for function allocation. NUREG-0700, Rev. 2 is listed. How is this document relevant to function allocation? The 1987 version of the Handbook of Human Factors is listed. There are later versions of this document, the latest being 2006. Please explain the rationale for referencing these older versions.</p>
18.4-3	Bongarra J	Include information on critical functions for primary containment in the plan	<p>Section 3.2 of NEDO-33219, p. 19 states that, "The ESBWR PFL-3 Critical Functions for the primary containment have been identified and they are the bases for EPGs [Emergency Procedure Guidelines]. These Critical Functions are identified in the EPGs and in the ESBWR DCD." This is one of several cases where this plan is lacking in ESBWR-specific information. The statement acknowledges that it is available. Please include information on critical functions for primary containment in the plan.</p>

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18.4-4	Bongarra J	Clarify statements on section 5.1 of NEDO-33219, regarding safety related plant critical functions	Section 5.1 of NEDO-33219, p. 39, when discussing the plant's safety related plant critical functions states that "[t]hese functions cover the accident conditions because if one of these functions was not achieved, the respective subgoal (and consequently the primary safety subgoal) will be not satisfied." This does not appear to be accurate, because if true it would imply that the ESBWR has inadequate defense-in-depth (when failure of one critical function results in unacceptable release of activity to the environment). Also, please clarify the part of the statement that says, "these functions cover the accident conditions." Clarify statements in Section 5.1 of NEDO-33219, p. 39 regarding safety related plant critical functions.
18.4-5	Bongarra J	Update or clarify safety goals	Figure 1 of NEDO-33219 presents a Block Diagram for the plant Safety Goals. The scope of the FRA in Section 1.3 is stated to include both probabilistic and deterministic evaluations. Based on this, two important aspects appear to be lacking from the goals in Figure 1, namely prevention of initiating events (as defined by the PRA) and any consideration of emergency planning activities. Please update or explain how these aspects are addressed.
18.4-6	Bongarra J	Clarify safety-related sub-goals for shutdown	Figure 2 of NEDO-33219 presents the availability-related subgoals including AG-4, Shutdown and Refueling. Is risk related to Shutdown and Refueling included in the safety-related goals as well? If so, where? If not, why not?

RAI Number	Reviewer	Question Summary	Full Text
18.4-7	Bongarra J	Clarify the details of the functional analysis methodology	<p>Please provide clarification of the following aspects of NEDO-33219 methodology.</p> <ul style="list-style-type: none"> 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.

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18.4-8	Bongarra J	Clarify how the methodology will be applied to ESBWR	<p>An implementation plan should provide step-by-step, specific guidance on how to perform the allocation of function analysis. The current document does not provide step-by-step procedures. Absence of specific procedural steps may make this document difficult for reviewers to understand the proposed methodology. While the document contains a fair amount of detail, it is not clear how will the methodology be applied for ESBWR. Perhaps a worked-out example, included in the plan, (or some other approach) is needed to illustrate the application of the methodology reflecting a slice of the methodology from top to bottom. Such an example does not need to reflect a complete analysis at any step. Clarify how the methodology will be applied to ESBWR.</p>
18.4-9	Bongarra J	Clarify if the methodology described is the actual approach that will be used to conduct that analyses	<p>The methodology is presented more as a recommended practice rather than as an approach to be used. The purpose of an Implementation Plan is to provide the methodology that will be used rather than what might be used. Please clarify if the methodology described is the actual approach that will be used to conduct that analyses.</p>
18.4-10	Bongarra J	Clarify how and where function allocation analysis considers integrated personnel responsibilities	<p>Among the key considerations in allocating functions are performance demands like time available and personnel workload. These types of considerations are appropriately identified in GE's methodology. However, the analysis begins at the system level rather than high-level functions which can include multiple systems or system operations. The consideration of operators' combined responsibilities, including those of monitoring and backing up automation, does not appear to be addressed until the function allocations are evaluated (as discussed in Section 4.3 of NEDO-33220).</p> <p>The function allocation analysis should consider the context in which functions will be performed. For example, a set of scenarios with which the analysis is performed. Scenarios provide operational context and a means to evaluate multiple</p>

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			<p>concurrent demands on personnel. It may also be difficult to evaluate functions in the absence of scenarios because the same function may be easily performed in one scenario but difficult in another.</p> <p>Clarify how and where function allocation analysis considers integrated personnel responsibilities.</p>
18.4-11	Bongarra J	Clarify the relationship between AOF and HFE	NEDO-33220 Section 1.4, states that HFE is not within the scope of AOF and that it is "a separate discipline." Please clarify this statement.
18.4-12	Bongarra J	Clarify the relationship between NEDO-33220 and NUREG-0711	<ul style="list-style-type: none"> • NEDO-33220 Section 3.2, states, "Specific guidelines from Section 4.4 of NUREG-0711r2 [2.3(4)] will be followed. The guidelines are paraphrased herein for clarification and convenience purposes" (P. 13). Eight guidelines follow this statement. However, the guidelines paraphrased are not from NUREG-0711, Rev 2. The guidelines appear to be from the original version of NUREG-0711 published in 1994. That guidance has been replaced by the guidance in Rev 2. • Guideline 6 states references a Figure 4.1 in NUREG-0711. However, the figure reference is incorrect and appears to be a reference to a figure in the 1994 version of NUREG-0711. • Page14 references Figure 1 of NEDO-33220. This figure is Figure 4.1 from NUREG-0711. <p>Clarify the relationship between NEDO- 33220 and NUREG-0711.</p>
18.4-13	Bongarra J	Clarify what are the evaluation tests referred to in NEDO-33220, Section 3.2.2.3	NEDO-33220 Section 3.2.2.3, states, "When the allocations pass the evaluation tests, the function allocation process is complete, and the results obtained (functions and tasks allocated to humans) should provide the inputs needed for task analysis." (p. 17). What are the evaluation tests referred to in this statement?

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18.4-14	Bongarra J	Provide results of research program regarding role of personnel and experience gained from subsequent ABWR deliveries for NRC review	NEDO-33220 Section 3.5.1, states, "General expected roles of the human, an initial allocation of functions, and an operator crew organization have been determined for the ESBWR in the DCD Chapter 18. These elements of the GE ESBWR design have evolved from a five year (1986-1991) research program which covered allocation of functions and validation testing (Chapter 18.4 of ABWR DCD] and subsequent ABWR deliveries." Please provide the results of this research program and experience gained from subsequent ABWR deliveries for NRC review.
18.4-15	Bongarra J	Clarify criteria for defining functions	NEDO-33220 Section 4.1.1 provides consideration for defining functions to be allocated. There is an un-numbered Table on page 26 where some information is provided. However, the table does not contain all the considerations listed on page 25, e.g., accuracy and frequency are listed in the considerations, but not on the table. Are there specific criteria for these considerations that the analyst uses, e.g., what is a moderate rate? Are worksheets or some other guidance available for the analysts? Please clarify.
18.4-16	Bongarra J	Clarify methodology for allocating functions	<p>NEDO-33220 Section 4.2 addresses the process for allocating functions.</p> <p>a) The decision guidelines on page 26 appear to be incomplete. The first bullet addresses allocation to multiple regions in Figure 9. Are decision guidelines needed for allocation to each region of the figure? Clarify second bullet decision guideline.</p> <p>b) This section contains many criteria for allocating functions. Most are stated at a very general level. Are there more specific criteria available for analysts to use as part of the decision making process?</p> <p>c) Figure 17 identified criteria for allocating a function to humans. One is "Objective of Function is Maintain ON/OFF control." Please clarify what this means.</p>

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			<p>d) On page 34 the following criterion is provided: "1. Automated Data Display. Examine each function and function segment and specify points where automated display will simplify the core performance requirements for detecting, monitoring, planning or executing." Clarify the meaning of this statement.</p> <p>e) Figure 21, the second diamond appears to be mislabeled. It should contain a title per the description on page 40.</p>
18.4-17	Bongarra J	Clarify inconsistencies between FRA and FA	Please confirm that the functional requirements analysis and function allocation (FA) will be kept current over the life cycle of design development and kept until plant decommissioning so that they can be used for analyses and modifications over the life of the plant. This is not clearly stated in either DCD Chapter 18 or NEDO-33219. Clarify inconsistencies between FRA and FA.
18.4-18	Bongarra J	Complete details regarding safety related sub-goals	Section 3.3.1 of NEDO-33219, Safety Related Subgoals Identification, states, "[t]o accomplish these objectives, the EPGs are intended to maintain the integrity of the barriers against fission products release. Top level objectives of EPGs will constitute the PFL-2 safety subgoals for the functional structure." It appears that some of the objectives of normal operations procedures would also be appropriate for safety subgoals at the PFL-2 level, since they also contribute to the Safety goal (PFL-1) Prevention of Activity release to environment. Also in Section 3.3.1 the first bullet under the PFL-2 subgoals is "Reactor Protection (fuel, coolant boundary, etc.)" The use of "etc." is not appropriate for a high level safety goal. Please complete this with all necessary detail.
18.4-19	Bongarra J	Provide changes from ABWR to ESBWR high level functions	Given the current stage of the ESBWR design, it is expected that GE should know now if there are any modifications to high-level functions between the ABWR and the ESBWR. However, this is not documented in NEDO-33219. The final report should provide this information and an explanation of the reasons for any changes that exist. Please provide a commitment in the plan to provide this information.

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18.4-20	Bongarra J	Clarify the organization of documentation	Figure 6 of NEDO-33220 provides an example of the content of an allocation of function document. However, this is only an example, the actual structure of the contents should be provided. Section 3.5.4, Organization of the Documentation, includes a discussion of the use of an electronic database, "if applicable." When would it be applicable?. Will this approach be used by the ESBWR design team?
18.4-21	Bongarra J	Clarify references regarding basis for allocation in section 5	Section 5 makes reference to Appendix A for the criteria that may be used as a decision basis. Why was this appendix not referenced in the function analysis section where the basis for allocation is presented? And why isn't the basis the analysis that results from the methodology in Section 4.2, Function Allocation?
18.4-22	Bongarra J	Clarify performance of top-down approach	For the functional requirements analysis, the verification of NUREG-0711, Element 4, Criterion 10 will be accomplished if the top-down approach in NEDO-33219 is followed. However, as noted in RAI 18.4-1, there is not a clear commitment to actual performance of the top-down method. Discuss whether 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.
18.4-23	Bongarra J	Clarify the verification of function assignments	<p>Verification of Function Assignment – NEDO-33220, Section 4.3, Evaluation of Function Allocation, addresses the verification of function assignment. The following clarifications to the methodology are requested:</p> <ol style="list-style-type: none"> 1. In Section 4.3.1 reference is made to Figure 20. Should this be Figure 21? Clarify reference. 2. On page 39, the makeup of the team is identified as including engineering and human factors. Will operations expertise be included as well? Page 40 indicates that a "chairperson" will resolve undecided cases. How will the chairperson be determined?

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			<p>3. What procedures will be followed to obtain, integrate, and resolve expert evaluations? What data forms will be experts use?</p> <p>4. Page 40 states that the following should be considered:</p> <ul style="list-style-type: none"> a. Psychological/physiological environment: shift length, job coherence, learning/performance requirements, and stress levels. b. Physical environment: heat, lighting, noise, glare, etc. c. Social structure: inter/intra-group characteristics, work team structure, and interpersonal interaction and support. d. Organizational policy and structure: channels of communication, supervisory structure, and operator autonomy/responsibility. <p>Similar detailed factors are evaluated in Phase 4 (page 44), e.g., "Can the organization be expected to provide personnel at the times and places required?"</p> <p>The methodology is being performed as part of a hypothetical allocation using a static process. How can these factors be evaluated until there is an operating plant with an established organization? For example, how can the team evaluate whether the organization be expected to provide personnel at the times and places required? Will the methodology provide guidelines that can be used by the experts to evaluate these factors.</p> <p>In general, these evaluations appear inconsistent with the stated purpose of the plan. "To describe a methodology for static function allocation" (p. 6). And the plan acknowledges the limitations of static allocation as not addressing the very factors that are evaluated:</p>

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			<p>Static function allocation does not account well for the dynamic (changing) nature of plant operations (e.g., due to component aging, plant modifications, and changes in the operating points) and human performance (e.g., due to procedures, training, cultural factors, attitude, boredom, fatigue, learning, adapting, etc.) (p. 5-6).</p> <p>5. Section 4.3.2.5, "Phase 5: Is Cognitive Support Adequate," and Section 4.3.6, "Phase 6: Is Job Satisfaction Optimum?" appear to require experts to evaluate important factors, but no guidance is provided as to how the evaluations can be made. Explain how can the experts evaluate this without a great deal of plant and control room design information. Is guidance going to be provided? Please provide examples of guidance to be used.</p> <p>6. Section 4.3.3 discusses tradeoff studies for deciding between different function allocations. Since the methodology has not produced alternatives, clarify the purpose of the tradeoff studies at the evaluation stage of the process. Why isn't the consideration of alternatives part of the function allocation process itself.</p> <p>7. Will dynamic evaluations be performed? Page 52 states "As necessary, the [control room design team] CRDT may elect to perform static and/or dynamic evaluation to verify the allocation of functions before the formal [verification and validation] V&V." When will dynamic evaluations be performed and where is the methodology described?</p>

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18.4-24	Bongarra J	DCD Tier 1, ITAAC	<p>The Inspection Test Analysis and Acceptance Criteria (ITAAC) for Functional Requirements Analysis is in DCD Tier 1, Table 3.3-1, Item 4. Item 4.a relates to developing an system functional requirements analysis (SFRA) plan, which has already been completed (NEDO-33219) and is being reviewed as part of design certification of the ESBWR. Therefore 7.a does not belong in the ITAAC. Item 7.b relates to the implementation of the SFRA Plan and is appropriate, but should be modified to follow the guidance in the Standard Review Plan (SRP) Section 14.3, Draft Revision 0, September 1996.</p> <p>Similarly, the ITAAC for Functional Allocation is in DCD Tier 1, Table 3.3-1, Item 5. Item 5.a relates to developing an FA plan, which has already been completed (NEDO-33220) and is being reviewed as part of design certification of the ESBWR. Therefore 5.a does not belong in the ITAAC. Item 5.b relates to the implementation of the SFRA Plan and is appropriate, but should be modified to follow the guidance in SRP 14.3.</p>

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18.4-25	Bongarra J	Clarify and update DCD Section 18.4	<p>Function allocation is addressed in Section 18.4.2.</p> <p>(a) Item (1) (e) states "[a]nalysees shall confirm that the personnel can perform tasks allocated to them while maintaining operator situation awareness, acceptable personnel workload, and personnel vigilance." The implementation plan does not clearly address this analysis. Please address.</p> <p>(b) Item (2)(b) (ii) states "[d]evelopment of alternative function allocations for use in the conduct of comparative evaluations. The implementation plan does not clearly address this analysis. Please address.</p> <p>(c) Item (2)(b) (v) states "[d]evelopment of test and analysis methods for evaluating function allocation alternatives." The implementation plan does not clearly address this analysis. Please clarify.</p>

Requests for Additional Information (RAIs)
ESBWR Design Control Document (DCD) Section 18.5 and NEDO-33221, ESBWR Task Analysis

RAI Number	Reviewer	Question Summary	Full Text
18.5-1	Bongarra J	Clarification of task analysis scope	<p>Clarify what will be included in the task analysis scope for ESBWR. The following statements make the ESBWR analysis scope unclear:</p> <ul style="list-style-type: none"> • “Preliminary, interim and results summary reports from the task analysis will be design input to the human reliability analysis (HRA) analysis and changes from the Reference ABWR identified to the systems engineering process.” (NEDO-33221, Section 1.3, Methodology, p. 11) • “In the case of the ESBWR design, which builds directly upon the ABWR, a considerable number of interactions between design features and human tasks have already been accomplished.” (NEDO-33221, Section 1.3, p. 11) • “For the functions and tasks, which have not already been analyzed in previous designs, a task analysis should be performed based on the information available. A process for screening out duplication of effort should consider the degree of change in the ESBWR processes, changes to the human system interface (HSI), changes to cognitive skills required for the task, and applicability of generic task analysis for normal operations, maintenance, testing and emergency responses. For new or significantly changed functions the specific Human Factor techniques selected to conduct the initial [high level Task Analysis] are.....” (NEDO-33221, Section 3.4.1, Task Analysis Methods, p. 19)

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			<p>If a screening process will be used to screen out tasks based on their similarity to the ABWR, then the criteria for such a screen process should be identified. If analyses performed for the ABWR are to be used for the ESBWR, then these analyses should be provided.</p>
18.5-2	Bongarra J	Clarify inconsistencies of scope statements across document	<p>NEDO-33221, Section 1.3, Methodology, Items 1, 3 and 4 includes a scope statement that is not completely consistent with Section 1.2, Scope. For example, analyses of local control stations (LCSs) is not included in Section 1.3, but is included in Section 1.2. Clarification is needed as to which scope statements are applicable to ESBWR or the statements should be revised for consistency.</p>
18.5-3	Bongarra J	Clarify inclusion of critical tasks in task analysis	<p>NEDO-33221, Section 3.7 defines "critical tasks." Section 1.3 and 3.7 imply, but do not clearly state that the identified critical tasks will be subject to a task analysis. Please confirm that all such tasks will be analyzed.</p>
18.5-4	Bongarra J	Clarify task independence	<p>On NEDO-33221, page 13, one of the characterizations of a task is that it be independent of other tasks. Please clarify what this means and how it impacts the selection of, or definition of, tasks to analyze.</p>
18.5-5	Bongarra J	Clarify task analysis methodology	<p>The methodology generally conforms to the basic elements of the review criterion:</p> <ul style="list-style-type: none"> • operational sequence diagrams are used as a linking technique • the methodology provides for the development of high-level task descriptions and more detailed task decompositions • the detailed task description should address the input, process, and output needed by and of personnel and the topics identified in the criterion

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			<p>While these basic elements are generally described, some clarification of the details is needed as is identified in the questions below.</p> <p>(A) Section 1.3. Methodology Background, states that "[t]his Task Analysis Implementation Plan recommends (emphasis added) methodology for performing task analysis during the design stage for human actions associated with the [main control room] MCR, [remote shutdown display] RSD, and other applicable [man machine interface systems] MMISs." Section 3.3 states that "[t]he actual human factor techniques and forms for data collection will be selected by the analysts." (p. 19). Many other such statements exist in the document that qualify the methodology as a recommended practice rather than a commitment. The purpose of an Implementation Plan review is to certify the methodology that will be used, rather than what might be used. Please clarify why the methodology described is a recommendation only and not the actual plan that will be used to conduct that analyses.</p> <p>(B) Figure 2, Task Analysis Implementation Process (p 86) needs clarification. Specific questions are:</p> <ul style="list-style-type: none"> • Section 3.4.1, Task Analysis Methods, list the use of four approaches to task analysis. However, Figure 2 (p 86) providing an integrated overview of the methods does not include all of the methods listed, specifically Narrative Task Descriptions and operating sequence diagrams (OSDs) are included, but Mission Scenarios and functional flow diagrams (FFDs) are not.

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			<ul style="list-style-type: none"> • Why is task analysis (TA) evaluation not shown? • Why do the reports listed not match those described in Section 3.9, Task Analysis Report? • What is the meaning of dashed vs. solid lines? • What is the meaning of the lines connecting the evaluation techniques at the bottom of the figure and the last three steps of the High-level task analysis? Explain why these particular steps (boxes) are connected? <p>(C) An implementation plan should provide step-by-step, specific guidance on how to perform task analysis. The current document contains much background and tutorial information, and little in the way of step-by-step procedures. Absence of these type of specific procedural steps will make this document difficult for users and the intended methodology may be incorrectly and inconsistently applied.</p> <p>(D) The document contains a detailed methodology with many steps and considerations. Provide a worked out example to illustrate the application of the methodology as it will be performed for ESBWR reflecting a slice of the methodology from top to bottom. Such an example does not need to reflect a complete analysis at any step.</p>

RAI Number	Reviewer	Question Summary	Full Text
18.5-6	Bongarra J	Provide additional clarification for the task analysis methodology, Section 2	<p>NEDO-33221, Section 2 has many references to additional documents. What role do these documents play in the plan? Many of the versions of the documents are old and have been replaced by newer, updated material. For example, the 1981 version of NUREG-0700 is referenced, while that document has undergone two extensive revision since then. MIL-STD-1472C is referenced, while that document has been revised three times since and is not in Revision F.</p> <p>Other documents are old and may contain outdated and potentially incorrect guidance. For example, EPRI-NP3701 on Computer-Generated Display System Guidelines was published in 1984. Technology and display development approaches have advanced so much since then that the guidance is not fully applicable to today's systems. These documents have been replaced by a new generation of guidance documents.</p> <p>It is also unclear how some of these documents relate to task analysis, such as EPRI-NP3701.</p>
18.5-7	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.3	Section 3.3, items 1 and 2 - Clarify that the data will come from the analyses conducted in accordance with the plans and not the plans themselves.

RAI Number	Reviewer	Question Summary	Full Text
18.5-8	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.4.1	<p>(A) Section 3.4.1, Task Analysis Methods, p. 19, discusses a process to screen out certain tasks from the analysis. Provide additional information about how an analyst will perform this screening and what criteria will be used to screen tasks out.</p> <p>(B) Section 3.4.1, Task Analysis Methods, identifies one approach to task analysis as "Task Descriptions (TDs)." Later the same technique is identified as a "Narrative Task Description" and in another place as a "Narrative Description." If all of these refer to the same analysis, please make the name of the analysis consistent throughout the document.</p>
18.5-9	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.5	The bullet list of steps presented in Section 3.5 refers to "Developing the basic statement of task performance requirements," while Figure 2 and Section 3.5.5 refer to developing the basic statement of task functions." Clarify inconsistency.

RAI Number	Reviewer	Question Summary	Full Text
18.5-10	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.5.1	Section 3.5.1, Converting Functions Into Tasks, states "[t]he aim of this step is to develop a high-level sequential description of the operations that must be carried out to fulfill the functions of a particular system (operational sequence)." (p. 23). The document also states "In order to develop the descriptions of the operating sequences, it is necessary to define scenarios that include all the operations that can be performed with the system" (p. 23). Thus it appears that the analysis begins at the system level rather than high-level functions which can include multiple systems or system operations. Clarify how and where tasks that involve operations across systems, e.g., startup and shutdown, are analyzed. Also, Section 3.5.6, Decomposition of Tasks into Individual Activities, states "Due to the nature of the initial system TAs, the system OSD for most systems, do not have links with other system OSDs. Only when a TA of the integrated systems and plant operator would an OSD define interaction across OSDs." (p. 34). When is TA of the integrated systems performed, since the methodology only appears to address system TAs.
18.5-11	Bongarra J	Provide additional clarification for the task analysis methodology, Sections 3.5.6 and 3.6.1	Section 3.5.6 Discusses the use of the Berlinger task taxonomy. In Section 3.6.1, Rasmussen's decision-making model is presented, then in the same section a simplified version of Rasmussen's model is offered. The data tables that the analysis will presumably use, e.g. Table A-1, do not seem to be derived from any of these specific models. What is the role of these different approaches and why are multiple models necessary?
18.5-12	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.6	Section 3.6, states "The detailed task descriptions will provide the principal results for direct use in identifying human engineering discrepancies." (p. 36). Explain the role of task descriptions in identifying Human Engineering Discrepancies (HED).

RAI Number	Reviewer	Question Summary	Full Text
18.5-13	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.5.6	Section 3.5.6, Decomposition of Tasks into Individual Activities. The bottom of p. 36, beginning with "The results..." to the end of the paragraph on p. 37, "... perform assigned tasks successfully" appears to restate activities already completed earlier in the high-level TA. Explain why these activities are performed again.
15.5-14	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.6.1	<p>(A) Section 3.6.1, Operator Decision-Making Model states "The plant-specific operational-task analysis is accomplished by superimposing the generic questions from the operator behavior model work onto the functional structure." (p. 40). Clarify the meaning of this statement and how the analyst will accomplish this activity.</p> <p>(B) Section 3.6.1, Operator Decision-Making Model, p. 40 references Figure 16. It appears that it should be Figure 14. Please clarify.</p>
18.5-15	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.6.2	<p>Section 3.6.2, states:</p> <p>"Assuming that the complete list of tasks is available at the end of this first part of the task analysis, there are three main steps in the performance of the task analysis:</p> <ul style="list-style-type: none"> • Table Top Analysis (TT) • Walk Through/Talk Through (WTTT) • Simulator Analysis (SA) <p>Of these, the first two should be regarded as mandatory in all Task Analysis, and when a simulator is available, the third should also be regarded as mandatory." (p. 42).</p> <p>Why are all steps considered mandatory for all analyses?</p>

RAI Number	Reviewer	Question Summary	Full Text
18.5-16	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.6.4	<p>(A) Section 3.6.4 states "Any required information not available from the display system must come from some other source such as training, experience, and/or procedures." (p. 45). Since required information should be available in the display system, please clarify the circumstances when it is not necessary.</p> <p>(B) Section 3.6.4 states "The process begins with the definition of the objectives of the computer-generated display system." (p. 45). Why is a task analysis, with the aim to identify task requirements, starting with objectives of the display system?</p> <p>(C) Section 3.6.4 references a Table A-2, yet no A-2 is provided</p>
18.5-17	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.6.9	Section 3.6.9 states "A multi-disciplinary technical staff is needed to conduct the task analysis. The disciplines and experience of the staff should include nuclear engineering, instrumentation and control engineering, and human factors engineering." (p. 55). Additional expertise is needed to conduct task analysis, including operations, maintenance, training, and procedure developers, where appropriate. Clarification of the statement is needed.

RAI Number	Reviewer	Question Summary	Full Text
18.5-18	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.6.10	<p>(A) Section 3.6.10, Workload Assessment, states that "[t]o assist in the task assessment and rating, the Table Data Form (Section 3.6.2) may be used." (p. 56). Explain how this form can be used for workload assessment.</p> <p>(B) Section 3.6.10, Workload Assessment, discusses graphical depictions of workload on p. 56. Provide an example of such a depiction.</p> <p>(C) Section 3.6.10, Workload Assessment, states that "[t]he time is associated with the timeline for each task element (first column of the Figures 13 through 15)." (p. 57). Should this reference be limited to Fig 13?</p> <p>(D) Section 3.6.10, Workload Assessment states that "It is usually acceptable to have very short periods of high workload. As a rule of thumb, for sustained tasks, workloads of between 50 percent and 75 percent can be considered acceptable." (p. 58). What is the technical basis for this statement? Also, if the analysis is limited to system level task analyses, how can the overall workload level be assessed, given that operators are often performing multiple tasks involving more than one system?</p> <p>(E) Section 3.6.10, Workload Assessment, states that "Workload differences measured by physiological means must be used to infer that performance breakdown would result or to infer how the operator would feel about the task.." (p. 62). Please clarify this statement.</p> <p>(F) Section 3.6.10, Workload Assessment, provides a discussion of many different approaches to workload measurement. Which approach will the ESBWR analysis use?</p>

RAI Number	Reviewer	Question Summary	Full Text
18.5-19	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.7	<p>Section 3.7, Methods for Identification of Critical Tasks - NUREG-0711, Task Analysis Criterion 1, 3rd bullet states "[human actions] that have been found to affect plant risk by means of PRA importance and sensitivity analyses should also be considered risk-important. Internal and external initiating events and actions affecting the PRA Level I and II analyses should be considered when identifying risk-important actions." Section 3.7 defines critical tasks and references Section 19.4 of the PRA. However, neither the scope or section 3.7 address all aspects of this criterion. Section 19.3 of PRA is titled Determination of Important structures systems and components (SSCs) for Level I and 19.4 is Determination of Important SSCs for Level II. Section 19.3 did sorts by Fussell-Vesely (FV) and risk achievement worth (RAW) and developed Tables 19.1 and 19.2. This section noted that there were several human error contributions, but they are not listed anywhere and they were apparently eliminated from these tables. Section 19.4 relates to the PRA level II analysis and discusses ADS and containment venting as important but actually only addresses the systems and components and does not clearly conclude that any HAs are risk- important or critical. There does not appear to be a list of risk important operator actions anywhere in the PRA. Please address the risk aspects of this criterion.</p>

RAI Number	Reviewer	Question Summary	Full Text
18.5-20	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.7	<p>Section 3.7, Methods for Identification of Critical Tasks (and the associated Figure 16), identify several ways that a task may be designated as a critical task. A few aspects of these definitions require clarification. The risk aspects were addressed by the previous RAI.</p> <ul style="list-style-type: none"> • the section refers to the GE ABWR ESBWR SSAR. Please clarify what is meant by this reference. • the section adds actions to "isolate the reactor and to inject " Please explain the basis for adding this action and why it was not identified by the PRA. • the section adds tasks involved in the achievement of a "critical function to safety." The section also mentions a "safety critical function." The ESBWR System Functional Requirements Analysis Implementation Plan" discusses " plant critical functions" and "systems critical functions," in Table 3 but not a "critical function to safety" or a "safety critical function." Neither one of these discussed in the PRA would seem to provide the HA or task that would serve as the "critical function to safety." Please explain from where the "critical functions to safety" are derived. • the section adds actions that relate to "a task with a great potential for human error." Please explain how these tasks will be determined.
18.5-21	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.7	Section 3.7, Methods for Identification of Critical Tasks, references Figure 18. The proper reference appears to be Figure 16.

RAI Number	Reviewer	Question Summary	Full Text
18.5-22	Bongarra J	Provide additional clarification for the task analysis methodology, Section 3.9	Section 3.9, Task Analysis Report, does not address the main outputs of task analysis: HSI requirements, procedure input, and training input. Where will these be documented?
18.5-23	Bongarra J	Provide additional clarification for the task analysis methodology, Section 4.1	Section 4.1, Objectives, states that "[t]he objective of evaluating the results of task analysis is to ensure that the task analysis defines the system design goals" (p. 564). This is not consistent with the purpose of task analysis, which is to define the requirements for task performance. Please clarify this statement.

RAI Number	Reviewer	Question Summary	Full Text
18.5-24	Bongarra J	Provide additional clarification for the task analysis methodology, Section 4	<p>Section 4, Methods for the Evaluation of the Task Analysis Results - In general, this whole section seems to focus on evaluation of the actual design and not the task analysis results themselves. The HSI design is the result of many inputs, of which task analysis is one. Evaluating the design in the ways described in this section does not, in itself, constitute an evaluation of the task analysis. For example, the following display characteristics, identified on pp. 66-67 of the plan, are identified as part of the evaluation:</p> <p>"1. Content density</p> <p>The design team may be able to evaluate content density by considering the following questions for each picture:</p> <ol style="list-style-type: none"> a. Does the picture appear congested? b. Is it difficult to locate needed information due to the large number of picture elements? c. Are there likely to be many elements competing for the user's attention? d. Does this picture require lines of demarcation or other symbols to separate elements from one another? e. Does scanning this picture for important information, require focusing on each individual element separately?" <p>These aspects of a display are more related to the use of human factors engineering (HFE) design guidelines than to the task analysis results.</p> <p>Please clarify the proposed approach.</p>

RAI Number	Reviewer	Question Summary	Full Text
18.5-25	Bongarra J	Provide additional clarification for the task analysis methodology, Appendix A	Appendix A, provides the data table to be used by analysts. The information section of this table does not match the information provided on Table 6 (p. 82). Please explain.
18.5-26	Bongarra J	Clarify the treatment of task integration	If the ESBWR task analysis focuses only on a selected subset of tasks (as discussed above in Criterion 1), e.g., those that are new or significantly changed, then how is the integration of all tasks into a specific job assessed?
18.5-27	Bongarra J	Explain how is minimum inventory identified	The topic of minimum inventory is not adequately addressed in NEDO-33221. In Section 1.2, Scope, a commitment to define a minimum inventory is made; however, it is not addressed in the detailed methodology. Additional information is needed as to how the minimum inventory will be identified and what criteria will be used in the selection process.

RAI Number	Reviewer	Question Summary	Full Text
18.5-28	Bongarra J	Explain how are requirements derived from data tables	<p>The methodology indicates that the results will be used as input to the design of HSIs, procedures, and training. Sufficient detail is provided for training applications in Section 5. However, while the detailed methodology discusses the analysis of specific information requirements, including detailed data tables, it is not clear how the requirements transmitted to HSI designers will be identified and communicated. For example, this topic is specifically addressed in Section 3.8, which states:</p> <p>"Requirements for alarms, displays, controls, and data processing are obtained from the Table Data Form described in Section 3.6.2. This table should be detailed enough to identify all these requirements. A complete set of requirements will be those defined in the ESBWR standard design features complemented with those derived from other matching areas identified in the Table Data Form." (p. 63).</p> <p>What is the role of the ESBWR standard features in HSI requirements identification? Which specific columns of the detailed data table, e.g., from Table A-1, constitute the HSI requirements? Where are alarm requirements identified?</p>
18.5-29	Bongarra J	Clarify the role of task analysis in procedure development	Explain the role of task analysis as input to procedure development and modification.
18.5-30	Bongarra J	Clarify how changes to implementation plan will be reflected in the DCD	Identify what changes will be made to DCD Tier 2, Section 18.5, Task Analysis, in response to the Task Analysis Implementation Plan and any revisions made on the basis of the RAIs.

RAI Number	Reviewer	Question Summary	Full Text
18.5-31	Bongarra J	Clarify how changes to implementation plan will be reflected in the DCD/Tier 1 Design Commitments and ITAAC	Identify what changes will be made to DCD/Tier 1 Design Commitments and ITAAC, specifically Commitment 4 addressing task analysis, in response to the Task Analysis Implementation Plan and any revisions made on the basis of the RAIs.
18.5-32	Bongarra J	Clarify document title of NEDO-33221	The title of NEDO-33221 should state that the document is an implementation plan. Please clarify document title.

Draft Requests for Additional Information (RAIs)
NEDO-33266, ESBWR Human Factors Engineering Staffing and Qualifications Plan

RAI Number	Reviewer	Question Summary	Full Text
18.6-1	Bongarra J	Clarify inconsistencies for staffing level between the DCD and the implementation plan	Some aspects of staffing are not consistent between NEDO-33266 and Chapter 18 of the Design Control Document (DCD). For example, Section 3.2 of NEDO-33266 contains Table 1, which specifies the initial baseline shift staffing and qualifications for the ESBWR and which meets 10 CFR 50.54 (I). This includes two senior reactor operators (SROs), two reactor operators (ROs) and two Auxiliary operators. Section 18.6.2 of the DCD also specifies ESBWR initial baseline staffing assumptions, but which is different from that in NEDO-33266. These documents should be made consistent.

18.6-2	Bongarra J	Clarify the scope of the staffing analysis	<p>(a) Section 1 of NEDO-33266 states that “.. tasks that indirectly support safety functions, but have no direct interface to the allocated safety functions may be screened from [human factors engineering] HFE review of the [human system interface] HSI.” Please clarify this statement, as it is not clear that this is an appropriate restriction in the scope.</p> <p>(b) Section 1 also states that “safety related tasks will be matched to the final baseline staff and qualifications developed.” However, the term “safety related” is not defined in Section 1.3 definitions, so that this sentence cannot be fully understood. Please clarify.</p> <p>(c) Section 1.2 of NEDO-33266 (and DCD TIER 1, ITAAC Table 3.3-1, item 7.a) states that the plant conditions for which staffing analyses will be performed are normal operations and transients. However, transients are not defined in the definitions list and accident or emergency conditions are not mentioned as being included in the staffing basis. Please confirm that accidents or emergencies will also be addressed.</p> <p>(d) Additionally, Note 3 of Table 2 of NEDO-33266 is not clear and seems as if it may be limiting the scope of the analyses; please explain Note 3.</p>
18.6-3	Bongarra J	Clarify the screening process	Section 4.3.2, subsection titled “Phase 4 Screening” is not clear. Please explain the purpose of Phase 4 and the methodology for accomplishing the screening.
18.6-4	Bongarra J	Clarify the screening criteria	Section 4.4.2 states that “... Table 2 provides example screening criteria for evaluating task interactions with the plant that have some type of safety role.” Table 2 actually gives results in the columns but the criteria for judging the column answers are not provided. Also in the staffing and qualification (S&Q) Column of Table 2, the difference between “Yes” and “Personnel Assigned” is not clear. Clarify the screening criteria.

18.6-5	Bongarra J	Clarify the “Standard Interface”	Section 4.4.2 states that “... In many cases it is expected that the design will use previously developed standard BWR design interfaces for typical power plant systems such as pumps and turbines used in the steam supply systems.” This is also indicated as “Standard Interface” in the HSI Column for many rows of Table 2. This does not appear appropriate in that standard BWR interfaces are quite old at this time and the ABWR is the predecessor plant for ESBWR, not the standard BWR. Also, the standard interfaces are most likely analogue, while the large majority of ESBWR will be digital and screen-based. Further, it is not clear why these should be exempted from the HSI design process. Please clarify these issues.
18.6-6	Bongarra J	Clarify the methodological details of NEDO-33266	<p>A few areas of NEDO-33266 require clarification:</p> <ul style="list-style-type: none"> (a) Section 4.5 refers to the “HFE HSI design process” in Figure 1. Shouldn’t this be the S&Q process? (b) Section 4.5.1 describes a demonstration of the adequacy of the recommended S&Q level in five separate specific bullets. Are these a part of the overall HFE verification and validation (V&V) program or will they be separately performed for Staffing? If part of V&V, they will be reviewed under that Element rather than here with Staffing. (c) In Figure 2, what is the purpose of the diamond asking “Is it a documented error?” Why does a “Yes” answer for this question lead to a conclusion that “Correction of HFE issue not necessary?” If the HFE issue degrades performance or increases the potential for error, then it seems as if it should be considered for correction. That is not the case in the Figure, as drawn.

18.6-7	Bongarra J	Clarify the ESBWR baseline starting point	<p>(a) Section 4.1 of NEDO-33266 states that “Based on an operating experience review that examined operational problems and strengths that resulted from staffing levels in ABWR reference systems the starting point for a baseline shift S&Qs is provided in Table 1.” This statement is an important assumption and starting point. Please provide the documents or analysis that reached this conclusion (or make it available for NRC review).</p> <p>(b) Section 4.1 of NEDO-33266 also states that "Where the ESBWR design features give rise to significant differences in plant systems from previous designs (i.e., described in the Baseline Review Records), reexamination of the S&Qs is performed." Please submit the table of contents Baseline Review Records and provide a schedule for when the Baseline Review Records will be available for audit.</p>
18.6-8	Bongarra J	Clarify the importance rankings and measures	<p>NEDO-33266 Section 4.3.2, probabilistic risk assessment (PRA)/human reliability assessment (HRA), states, “[t]hus, the effect of overall staffing levels on plant safety and reliability will be assessed via importance ranking and measures determined by the PRA/HRA model.” Please elaborate, as there is not enough information provided here to determine what will be done and how it will be accomplished.</p>
18.6-9	Bongarra J	Clarify the staffing for risk-important actions	<p>NEDO-33266 does not appear to address the ability of the staff to perform the PRA-identified risk important human actions or the effect of overall staffing levels and crew coordination on the risk-important human actions. Please discuss this aspect of staffing.</p>
18.6-10	Bongarra J	Update of S&Q ITAAC	<p>The Tier 1 ITAAC for Staffing and Qualification is in Table 3.3-1, Item 7. Item 7.a relates to developing an S&Q plan, which has already been completed and is being reviewed as part of design certification of the ESBWR. Therefore 7.a does not belong in the ITAAC. Item 7.b relates to the implementation of the S&Q Plan and is appropriate, but should be modified to follow the guidance on the Standard Review Plan (SRP) Section 14.3.</p>

Requests for Additional Information (RAIs)
NEDO-33267, ESBWR Human Factors Engineering (HFE) Human Reliability Analysis (HRA) Implementation Plan

RAI Number	Reviewer	Question Summary	Full Text
18.7.1	Bongarra J	Clarify purpose statement	The “Purpose” statement included in the HRA Plan states that the Plan describes “how information generated by HRA tools can be used to support the [human system interface] HSI HFE design goals.” The use of this verb implies that applicant does not necessarily need to use the information and that it’s merely provided for consideration. Neither the statement (nor the Plan) commit to using the information.
18.7.2	Bongarra J	Clarify origin of error taxonomy	Pages 12-15. What is the origin of the error taxonomy used (i.e., type A, B, C)?
18.7.3	Bongarra J	Update reference to NUREG-1792	Page 18. NUREG-1792 is available as of April, 2006. Please, reference current version.
18.7.4	Bongarra J	Clarify definition	Page 10, 1.3, “Definitions,” what is meant by, “IEEE Working Group?”
18.7.5	Bongarra J	Clarify reference	Page 20, reference 20. Is this a publically-available document?
18.7.6	Bongarra J	Clarify HRA analyst qualifications	Page 21, states that the “robustness of the HRA depends, in large part, on the analyst’s understanding...” How does GE’s HRA Plan ensure that the applicants (for design certification and COL) meet this objective, i.e., have qualified analysts?

RAI Number	Reviewer	Question Summary	Full Text
18.7-7	Bongarra J	Provide the initial list of risk important human actions	NEDO-33267 and DCD Tier 2, Chapter 18.7 state in several places that the PRA/HRA will provide a listing of potentially risk-important human interactions for use in several portions of the HFE program. The initial PRA/HRA for ESBWR has been completed and submitted to NRC along with Chapter 19 of the DCD. Therefore, sufficient information is available to develop the initial list of risk important actions using the methods discussed in this report. The PRA and DCD Chapter 19 provide very informative lists of risk important structures, systems and components (SSCs), however they note in several places that human actions are not included. It is not clear why human actions were excluded from these importance listings and are not in NEDO-33267. Please provide the initial list of risk important human actions.
18.7-8	Bongarra J	Provide the IMs and the criteria to be used for determining the risk important HAs	NEDO-33267, Section 4, states that, "These analyses will use a variety of importance measures and HRA sensitivity analyses assumptions to ensure that risk important actions are not overlooked." However, the particular importance measures to be used and the acceptance criteria (or cutoff values) for determining which human actions (HAs) are risk important, are not given in the report. It is noted that cutoff values, using the risk achievement worth (RAW) and Fussell-Vesely (FV) importance measures (IMs), are specified in DCD Tier 2, Section 19.5.2 for important SSCs. Please provide the IMs and the criteria to be used for determining the risk important HAs.
18.7-9	Bongarra J	Clarify why NEDO-33267 does not specifically commit to use all of the PRA analyses in determining the risk important HAs	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.
18.7-10	Bongarra J	Clarify methodology	Several areas of NEDO-33267 were not sufficiently clear:

RAI Number	Reviewer	Question Summary	Full Text
			<ul style="list-style-type: none"> • Section 1.1, Purpose, contains a paragraph and 5 bullets that address Regulatory Guide (RG) 1.174. Please clarify the relation of this to the HRA implementation plan. • Section 3, 2nd sentence, states "If such a PRA/HRA model is developed, ..." Since the model is already developed, clarify the use of the word "if" • Section 3, first bullet, states that the PRA/HRA will be performed early in the design process. It also discusses iterative nature of the PRA/HRA and how it will be updated as the design progresses. Please clarify where the Rev. 1 PRA submitted for ESBWR, is on this time line. • Section 4, HRA Methodology, on p. 23 & 24, discusses HRA aspects and approaches, but contains a combination of items that are: completed, will be done, may be done, and others that appear to be listed as "good approaches." The mix of various verbs is confusing. Please clarify your commitment to these various items. In addition, the discussion that begins on p.23 of the "several analysis components..." merely appears to list and describe these components but does not explicitly state that the GE HRA will include/address these components. Please clarify. • Page 27, please explain what are the "ranking tools." • Section 5.3.1, 5.3.2 and 5.3.3 list "assumptions" for aspects of the HRA. These activities should be characterized as commitments (or in some cases design goals of the HSI) rather than as assumptions.

RAI Number	Reviewer	Question Summary	Full Text
			<ul style="list-style-type: none"> • On page 31, the next to last paragraph is not clear. Should there be an "or" between "...accident sequences" and "become a direct cause of an initiating event?" • Page 33, paragraph that begins, "Example models for performing detailed estimation..." The Plan does not seem to provide the applicant with direction on how to select the model(s) to use for performing an HRA or HEP estimation. Please clarify/explain. • Page 37, Figure 1 does not show HRA as being an input to PRA. However, Figure 2 does and page 26, paragraph 2 states that HRA is input to the PRA. Please reconcile/correct. • Page 38, Figure 2. In the box titled, "HRA Update Evaluation," are arrows missing to show information flow? Please clarify. • Page 42. First paragraph begins with, "This paper illustrates..." Clarify what paper is being referenced.
18.7-11	Bongarra J	Clarify why the validation of important HRA assumptions are stated as "may be" and not as a commitment	Section 3 & 5.1 of NEDO-33267 state that "The HRA task will interact with the HFE verification and validation program to provide test scenarios and updating quantitative evaluations based on validation results." This does not provide enough detail to verify that HRA assumptions such as decision making and diagnosis strategies for dominant sequences will be validated by the verification and validation (V&V) program as discussed in NUREG-0711 Criterion 4. Section 4 of NEDO-33267, 2nd bullet on p. 23, provides more detail on this issue, but it is stated as "may be." Clarify why the validation of important HRA assumptions are stated as "may be" and not as a commitment.

RAI Number	Reviewer	Question Summary	Full Text
18.7-12	Bongarra J	Clarify why time is the most important performance shaping factor	Page 26. In the discussion of human error probabilities, the assumption for screening is that "time" is the most important performance shaping factor. Why? Is that always true?
18.7-13	Bongarra J	Clarify missing text	Page 29. It seems that there is text missing in second bullet at top of page. Please clarify.
18.7-14	Bongarra J	Clarify HRA Tier 1 information	The Tier 1 inspections tests analysis and acceptance criteria (ITAAC) for HRA is in Table 3.3-1, Item 8. Item 8.a relates to developing an HRA plan, which has already been completed and is being reviewed as part of design certification of the ESBWR. Therefore 7.a does not belong in the ITAAC. Item 7.b relates to the implementation of the HRA itself. This should be modified to be implementation of the HFE HRA Plan and should be constructed following the guidance on the Standard Review Plan (SRP) Section 14.3.
18.7-15	Bongarra J	Clarify items in section 18.7.3	The bullet items in Section 18.7.3 are characterized as "analysis components that increase the quality of the HRA." Clarify why these items are not described as they "will be" accomplished for ESBWR.

ESBWR Mailing List

cc:

Mr. David H. Hinds, Manager
ESBWR
P.O. Box 780, M/C L60
Wilmington, NC 28402-0780

Mr. George B. Stramback
Manager, Regulatory Services
GE Nuclear Energy
1989 Little Orchard Street, M/C 747
San Jose, CA 95125

Mr. David Lochbaum, Nuclear Safety
Engineer
Union of Concerned Scientists
1707 H Street, NW., Suite 600
Washington, DC 20006-3919

Mr. Paul Gunter
Nuclear Information & Resource Service
1424 16th Street, NW, Suite 404
Washington, DC 20036

Mr. James Riccio
Greenpeace
702 H Street, Suite 300
Washington, DC 20001

Mr. Adrian Heymer
Nuclear Energy Institute
Suite 400
1776 I Street, NW
Washington, DC 20006-3708

Mr. Paul Leventhal
Nuclear Control Institute
1000 Connecticut Avenue, NW
Suite 410
Washington, DC 20036

Mr. Ron Simard
6170 Masters Club Drive
Suwanne, GA 30024

Mr. Brendan Hoffman
Research Associate on Nuclear Energy
and Environmental Program
215 Pennsylvania Avenue, SE
Washington, DC 20003

Mr, Jay M. Gutierrez
Morgan, Lewis & Bockius, LLP
1111 Pennsylvania Avenue, NW
Washington, DC 20004

Mr. Glenn H. Archinoff
AECL Technologies
481 North Frederick Avenue
Suite 405
Gaithersburg, MD 20877

Mr. Gary Wright, Director
Division of Nuclear Facility Safety
Illinois Emergency Management Agency
1035 Outer Park Drive
Springfield, IL 62704

Mr. Charles Brinkman
Westinghouse Electric Co.
Washington Operations
12300 Twinbrook Pkwy., Suite 330
Rockville, MD 20852

Mr. Ronald P. Vijuk
Manager of Passive Plant Engineering
AP1000 Project
Westinghouse Electric Company
P. O. Box 355
Pittsburgh, PA 15230-0355

Mr. Ed Wallace, General Manager
Projects
PBMR Pty LTD
PO Box 9396
Centurion 0046
Republic of South Africa

Mr. Russell Bell
Nuclear Energy Institute
Suite 400
1776 I Street, NW
Washington, DC 20006-3708

Ms. Sandra Sloan
Areva NP, Inc.
3315 Old Forest Road
P.O. Box 10935
Lynchburg, VA 24506-0935

Mr. Robert E. Sweeney
IBEX ESI
4641 Montgomery Avenue
Suite 350
Bethesda, MD 20814

Mr. Eugene S. Grecheck
Vice President, Nuclear Support Services
Dominion Energy, Inc.
5000 Dominion Blvd.
Glen Allen, VA 23060

Mr. George A. Zinke
Manager, Project Management
Nuclear Business Development
Entergy Nuclear, M-ECH-683
1340 Echelon Parkway
Jackson, MS 39213

E-Mail:

tom.miller@hq.doe.gov or
tom.miller@nuclear.energy.gov
sfrantz@morganlewis.com
ksutton@morganlewis.com
jgutierrez@morganlewis.com
mwetterhahn@winston.com
whorin@winston.com
gcesare@enercon.com
jerald.holm@framatome-anp.com
erg-xl@cox.net
joseph_hegner@dom.com
mark.beaumont@wsms.com
steven.hucik@ge.com
patriciaL.campbell@ge.com
bob.brown@ge.com
david.hinds@ge.com
chris.maslak@ge.com
James1.Beard@ge.com
wayne.massie@ge.com
kathy.sedney@ge.com
mgiles@entergy.com
tansel.selekler@nuclear.energy.gov or
tansel.selekler@hq.doe.gov
Frostie.white@ge.com
David.piepmeyer@ge.com
george.stramback@gene.ge.com