



GE Energy

David H. Hinds
Manager, ESBWR

PO Box 780 M/C L60
Wilmington, NC 28402-0780
USA

T 910 675 6363
F 910 362 6363
david.hinds@ge.com

MFN 06-470

Docket No. 52-010

November 21, 2006

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

Subject: **Response to Portion of NRC Request for Additional Information
Letter No. 74 – ESBWR Human Factors Engineering – NEDO-33277
Rev 1 ESBWR Human Performance Monitoring Implementation Plan
-RAI Numbers 18.13-1 through 18.13-5**

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

If you have any questions about the information provided here, please let me know.

Sincerely,

A handwritten signature in cursive script that reads "David H. Hinds for".

David H. Hinds
Manager, ESBWR

D068

Reference:

1. MFN 06-383, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 74 Related to ESBWR Design Certification Application*, October 11, 2006

Enclosures:

1. MFN 06-470 – Response to Portion of NRC Request for Additional Information Letter No. 74 Related to ESBWR Design Certification Application –ESBWR Human Factors Engineering – NEDO-33277 Rev 1 ESBWR Human Performance Monitoring Implementation Plan -RAI Numbers 18.13-1 through 18.13-5

cc: AE Cabbage USNRC (with enclosures)
GB Stramback GE/San Jose (with enclosures)
eDRF 0000-0061-0377

Enclosure 1

MFN 06-470

Response to Portion of NRC Request for

Additional Information Letter No. 74

Related to ESBWR Design Certification Application

Human Factors Engineering

NEDO-33277 Rev 1

ESBWR Human Performance Monitoring Implementation Plan

RAI Numbers 18.13-1 through 18.13-5

NRC RAI 18.13-1

- A. *NEDO-33277, Section 3.1.1 discusses converting "single incidents into measures." Are these incidents to be collected from the fleet of ESBWRs or just from one single plant?*
- B. *NEDO-33277, Section 3.1.2 mentions "precursor analysis." When is this analysis method used?*
- C. *NEDO-33277, Section 3.1.2 also mentions the use of risk importance measures. How are these to be used in this context?*
- D. *Please clarify how the third paragraph of NEDO-33277, Section 3.1.2 relates to HPM.*
- E. *NEDO-33277, Section 3.3 states that the "HFE design team assumes that the COL holder HPM process includes the following essentials." These essentials should be stated as required items for the COL holder in the Plan.*
- F. *The HPM Plan uses both "Full Scope Simulator (FSS)" and "Baseline Specific Simulator" (BSS)." The BSS is not defined. Is this the same as the BS described in Section 4.3.3.5.3 of the V&V Implementation Plan (NEDO-33278)? Also, Section 3.3.2, of NEDO-33277, Operating Phase Requirements, states that strategy elements are implemented through use of the BSS. Is the BSS still used during the operating phase? Wouldn't all operator training be done using the FSS?*
- G. *Section 4.2 of the HPM Plan states that the activities and results of the HPM Plan will be summarized in a result summary report. When will that report be issued? Is it a periodic report?*

GE Response

- A. The ESBWR HPM strategy uses operating, program and training data from the fleet of ESBWR units. The plan employs a centralized system to collect, evaluate, trend and disseminate information on precursor events. Each COL holder is committed to:
- Maintaining a safety conscience work environment,
 - Establishing a low threshold for reporting potential event precursors,
 - Training plant staff to identify, process and resolve potential event precursors,
 - Screening potential event precursors in a timeframe consistent with seriousness,
 - Trending potential event precursors,
 - Evaluating trends, and
 - Supporting and actively participating in the COLOG.

Event precursors from individual plants will be evaluated and trended. When an event precursor is validated as generically applicable to the ESBWR fleet, the COLOG will:

- Notify each COL holder of the concern and potential impacts,
- Determine the most effective means to mitigate issues,
- Commission GE to modify generic design, training, and staffing & qualification, as required, and
- Coordinate and validate cost-effective, time-efficient generic changes.

B. The HPM strategy anticipates the incorporation of precursor analysis during:

- Pre-operational plant simulation,
- Full-scope simulator training,
- Construction and testing,
- Initial start-up and low-power testing,
- ESBWR operating (including: abnormal, emergency and transient) phase, and
- Shutdown, refueling, and reactor restart.

C. The risk important measures prioritization scheme:

- Screens and trends operational occurrences,
- Ensures potential nuclear safety impact are systematically addressed,
- Evaluates issues to determine the scope and timeframe of corrective actions, and
- Provides sensitivity to the overall plant (ESBWR fleet) risk.

D. The ESBWR employs a real-time risk monitor (RTRM) that predicts the impact of emergent and planned changes to plant configuration. The RTRM allows the operator to make risk-informed decisions when removing or restoring equipment from service or changing plant configuration. The quantity, quality and context of plant risk information available to decision-makers is used to evaluate ESBWR training, procedures and operator performance.

E. The next revision of NEDO-33277 Section 3.3 replaces “The HFE design team assumes that the COL holder HPM process includes the following essentials:” with “Required elements of the COL holders’ (and/or COLOG’s) HPM program include:”

- F. The Baseline Specific Simulator (BSS) is different from the Baseline Simulator (BS) described in NEDO-33276 Section 4.3.3.5.3. To avoid future confusion, the BSS is now designated as the Representative Training Simulator (RTS). The BS is the predecessor to the Full Scope Simulator (FSS) and the RTS (formerly, BSS) is the successor to the FSS. The RTS (the ESBWR standard FSS configuration) is applied toward licensed operator training throughout the fleet during the operational phase. The purpose of the RTS is to ensure that operators are trained on a standardized FSS. And the data obtained from standard scenarios administered among COL holders provides statistically relevant human performance data, based on expected responses to specific initiating events.
- G. The state of HPM is published periodically (not less than bi-annually) as stated in Section 4.2 item number 2. The first of these reports will be published prior to initial criticality.

DCD/LTR Impact

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

LTR NEDO-33277, Rev. 1 will be revised as described above.

NRC RAI 18.13-2

The first bullet of Criterion 1 for the HPM element in NUREG-0711 states the performance monitoring strategy should provide reasonable assurance that the design can be effectively used by personnel, including within the control room and between the control room and local control stations and support centers. DCD Tier 2, Revision 1, Section 18.13.2, and the HPM Plan, address this item for the V&V portion of the design phase. However, they do not address it for the operational phase of the HPM program. Also, the Plan does not address human performance between the control room and the support centers at all. Please clarify.

GE Response

NEDO-33277 rev. 1 Section 1.2, "Scope", will state that the HPM strategy provides a reasonable assurance that the ability to interface among various HSI within each facility is maintained effectively throughout the ESBWR operational phase:

- Within the control room,
- At the remote shutdown panel,
- Among safety related local control stations (and as determined high-level task analyses), and
- Support centers (emergency Plan facilities).

Control room interaction with support centers is verified by V&V and monitored by the HPM strategy via E-plan drill and inspection inputs to the corrective action program.

DCD/LTR Impact

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

LTR NEDO-33277 Rev. 1, will be revised as described above.

NRC RAI 18.13-3

NEDO-33277 mentions risk screening of operational events for importance in Sections 1.2.2 and 3.3. Also, Section 3.1.2 mentions precursor analysis, importance measures, and advanced risk and reliability techniques. However, it is not clear just what the process will be for monitoring and screening for risk important changes in human performance. Please clarify.

GE Response

The process for monitoring and screening issues for risk importance is outlined in figure one and RAI 18.13-1 A, B & C responses. A screening checklist to determine risk importance will be developed within the COLOG charter (which is further discussed in RAI 18.13-5 response).

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.

NRC RAI 18.13-4

NEDO-33277, Section 3.3.1 of the plan mentions monitoring HAs commensurate with their safety importance during the pre-operational phase. However, the operational phase does not address this aspect of the HPM program. Please clarify.

GE Response

Pre-operational and operational human actions (HAs) are monitored per the HPM plan (see Figure 1).

NEDO-33277 Section 3.1.1 Item 4 will be split into two items as follows:

4. dynamic simulation of plant accident sequences, and
5. measurement and trending of operator performance and plant responses

to clarify the intent of the HPM plan to monitor HAs during the operational phase commensurate with safety importance.

DCD/LTR Impact

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

LTR NEDO-33277, Rev 1 Section 3.1.1 will be revised as described above.

NRC RAI 18.13-5

The operational phase of the HPM program is tied to the plant's periodic training program and the corrective action program, therefore certain aspects will be recurrent and timely. However, the description does not specifically address the timing of analyses and feedback of information to ensure that deviations in performance are identified and corrected in a routine and timely fashion. Clarify if this is not known now and is a COL responsibility to define.

GE Response

Issue resolution and timeliness related to ESBWR design and related ESBWR programs during the operational phase are defined by the COLOG charter. GE and COL applicants will draft the charter following COL submittal. Compliance with the COLOG charter ensures that GE, the COLOG, and individual COL holders remain in compliance with regulations such as 10 CFR 50 Appendix B.

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.