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MFN 06-486
Supplement 2

Docket No. 52-010

June 11, 2007

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. 79 Related to ESBWR Design Certification Application – Reliability Assurance Program – RAI Number 17.4-15 S02**

Enclosure 1 contains GHNEA's response to the subject NRC RAI transmitted via e-mail on May 15, 2007. GHNEA's previous responses were provided in the Reference 1 and 2 letters.

If you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,

Kathy Sedney for

James C. Kinsey
Project Manager, ESBWR Licensing

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NRO

Reference:

1. MFN 06-486, Letter from David Hinds to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application – Reliability Assurance Program – RAI Numbers 17.4-13 through 17.4-16,* November 22, 2006
2. MFN 06-486, Supplement 1, Letter from James C. Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application – Reliability Assurance Program – RAI Numbers 17.4-15 S01 and 17.4-16 S01,* May 11, 2007

Enclosure:

1. MFN 06-486, Supplement 2 – Response to Portion of NRC Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application – Reliability Assurance Program – RAI Number 17.4-15 S02

cc:	AE Cubbage	USNRC (with enclosures)
	DH Hinds	GHNEA (with enclosures)
	RE Brown	GHNEA (w/o enclosures)
	eDRF	0000-0068-2413

Enclosure 1

MFN 06-486, Supplement 2

Response to Portion of NRC Request for

Additional Information Letter No. 79

Related to ESBWR Design Certification Application

Reliability Assurance Program

RAI Number 17.4-15 S02

Original Responses previously submitted under MFN 06-486 and MFN 06-486, Supplement 1 are included without DCD updates to provide historical continuity during review.

NRC RAI 17.4-15

The staff determined that a COL applicant referencing the ESBWR should reference the guidance documents used to implement its O-RAP in DCD Tier 2, Section 17.4.9, "Operational Reliability Assurance Activities." For the Maintenance Rule element of the O-RAP, these documents include RG 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants, "which endorses NUMARC 93-01, "Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." In addition, if still effective at the time of the COL application, RG 1.182, "Assessing and Managing the Risk Before Maintenance at Nuclear Power Plants," which endorsed the revised NUMARC 93-01, Section 11,"Assessment of Risk Resulting from the Performance of Maintenance Activities, "should be referenced. This information should also be added to DCD Tier 2,Section 17.4.14, 'References."

GE Response:

RG 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," NUMARC 93-01, "Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," RG 1.182, "Assessing and Managing the Risk Before Maintenance at Nuclear Power Plants," the revised NUMARC 93-01, Section 11, "Assessment of Risk Resulting from the Performance of Maintenance Activities, "will be referenced in DCD Tier 2, Section 17.4.9.

DCD Impact

DCD Tier 2, Section 17.4 will be revised in Revision 3 as noted in the response to RAI 17.4-15.

NRC RAI 17.4-15 S01

The list of Maintenance Rule guidance documents in Section 17.4 of the ESBWR DCD, Tier 2, should include the February 22, 2000, revision to Section 11 of NUMARC 93-01. NUMARC 93-01 should also be listed as a reference in DCD Section 17.4.14.

GE Response

DCD Tier 2 Section 17.4 will be revised, as shown in the attachment, to include the February 22, 2000, revision to Section 11 of NUMARC 93-01. NUMARC 93-01 is listed as a reference in DCD Section 17.4.14.

NRC RAI 17.4-15, S02

Comments on GE's response supplemental response to 17.4-15 (MFN-06-486 Supp. 1 dated May 11, 2007):

1. List the February 22, 2000, revision to Section 11 of NUMARC 93-01 as a separate document in the list of Maintenance Rule reference documents in Subsection 17.4.9.

2. Remove the word "including" in the 17.4.9 reference list because the version of 93-01 (rev 2) currently endorsed by RG 1.160 (rev.2) does not include the revised Section 11 (separately endorsed by RG 1.182).

3. List the February 22, 2000, revision to Section 11 of NUMARC 93-01 as a separate document in the list of references Subsection 17.4.14.

GHNEA Response

Subsection 17.4.9 has been revised to list the February 22, 2000 revision to Section 11 of NUMARC 93-01 as a separate document in the list of Maintenance Rule reference documents. This revision removes the word "including" in the 17.4.9 reference list because the version of 93-01 (rev 2) currently endorsed by RG 1.160 (rev.2) does not include the revised Section 11 (separately endorsed by RG 1.182). Also, the February 22, 2000, revision to Section 11 of NUMARC 93-01 is listed as a separate document in the list of references Subsection 17.4.14.

DCD Impact

DCD Tier 2, Section 17.4 will be revised in Revision 4 as noted above.

17.4.7 Design Considerations

The reliability of risk-significant SSCs, which are identified by the PRA and other sources, are evaluated at the detailed design stage by appropriate design reviews and reliability analyses. The procedure for design change control defines the process for evaluating design changes in engineering controlled documents to ensure that the total effect is considered before a change is approved, and the affected documents are identified and changed accordingly.

A design reliability assessment is a process in which the design engineer builds quality and reliability into the SSC, while ensuring that the basis for SSC design is properly modeled in the PRA. Due to the preliminary nature of the PRA model during the design phase, the model relies on generic information, bounding assumptions, or design requirements as a basis for model development. This design assessment can be performed for changes that occur during the plant design phase, as well as during normal plant operations. It is a systematic method to evaluate the proposed design details with respect to PRA insights. The assessment considers reliability concepts, such as redundancy, diversity, human factors, spatial interactions, external events, etc., to enhance the system design, and considers PRA insights and assumptions. If the assessment reveals that the proposed design could conflict with results and insights calculated in the PRA, or could cause significant unavailability of a safety function, then a design change is pursued.

Proposed design changes are processed by the design change control procedure, which requires PRA review. If a design change affects the PRA model, then the PRA is revised in accordance with the PRA update process described in the PRA procedure.

17.4.8 Defining Failure Modes

The determination of dominant failure modes of risk-significant SSCs includes historical information, analytical models and existing requirements. Many BWR systems and components have compiled a significant historical record, so an evaluation of that record is performed. For those SSCs for which there is not an adequate historical basis to identify critical failure modes, an analytical approach is necessary.

Inputs may include PRA importance analysis, root cause analysis, failure modes and effects analysis, and review of operating experience. In addition, equipment performance information, including vendor manuals, ASME Section XI, technical specifications, Regulatory Treatment of Non-Safety Systems (RTNSS), and other regulatory requirements are reviewed to identify important safety functions.

The design engineer analyzes this information to identify dominant failure modes, such as single failures, latent failures not detected by routine monitoring, common cause failures, or failures that could cascade into more significant safety functional failures.

17.4.9 Operational Reliability Assurance Activities

Once the dominant failure modes are determined for risk-significant SSCs, an assessment is performed to identify operational reliability assurance activities that assure acceptable performance during plant life. Such activities may consist of periodic surveillance inspections or tests, monitoring of SSC performance, and/or periodic preventive maintenance. Some SSCs may require a combination of activities to assure that their performance is consistent with that assumed in the PRA.

Operational reliability assurance activities will be implemented through the COL holder's maintenance and surveillance programs, quality assurance program, and Maintenance Rule program. The COL holder shall integrate the objectives of D-RAP into the Quality Assurance Progam developed to implement 10 CFR 50, Appendix B. Subsection 17.4.13 lists specific COL Information Items pertaining to operational reliability assurance activities. Guidance documents used to implement these activities include: Reg Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," (Reference 17.4-3) NUMARC 93-01, "Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," ~~including the February 22, 2000 Revision to Section 11 of NUMARC 93-11~~ (Reference 17.4-5), the February 22, 2000 Revision to Section 11 of NUMARC 93-01 (Reference 17.4-6) and, if still effective at the time of the COL application, RG 1.182, "Assessing and Managing the Risk Before Maintenance at Nuclear Power Plants." (Reference 17.4-4)

Periodic testing of SSCs may include startup of standby systems, surveillance testing of instrument circuits to assure that they respond to appropriate signals, and inspection of SSCs (such as tanks and pipes) to show that they are available to perform as designed. Performance monitoring, including condition monitoring, can consist of measurement of output (such as pump flow rate or heat exchanger temperatures), measurement of magnitude of an important variable (such as vibration or temperature), and testing for abnormal conditions (such as oil degradation or local hot spots).

Periodic preventive maintenance is an activity performed at regular intervals to preclude problems that could occur before the next preventive maintenance (PM) interval. This could be regular oil changes, replacement of seals and gaskets, or refurbishment of equipment subject to wear or age related degradation.

Planned maintenance activities will be integrated with the regular operating plans so that they do not disrupt normal operation. Maintenance that is performed more frequently than refueling outages must be planned so as to not disrupt operation or be likely to cause reactor scram, engineered safety feature actuation or AOOs. Maintenance planned for performance during refueling outages must be conducted in such a way that it has little or no effect on plant safety, outage length or other maintenance work.

Reliability monitoring information is collected from sources such as Technical Specification surveillance test data and industry operating data, if applicable. Similar reliability data is collected for RTNSS SSCs, which are within the scope of the D-RAP. Reliability estimates are also developed from basic event fault trees for risk-significant (that is, high-safety-significant) systems and components modeled in ESBWR PRA.

17.4.10 Owner/Operator's Reliability Assurance Program

Operational reliability assurance activities are implemented by the ESBWR owner/operator, and uses the information provided by GE. Elements include:

- **Problem Prioritization:** Identification for each of the risk-significant SSCs of the importance of that item as a contributor to its system unavailability and assignment of priorities to problems that are detected with such equipment.

Note: The Expert Panel, in accordance with common industry practice and guidance in NUMARC 93-01, develops the final list of risk significant SSCs from various inputs, including the PRA risk importance calculations and industry operating experience. It is necessary for the Expert Panel to include all SSCs that are in the scope of the RAP to be included in the high-safety-significant (HSS) category of SSCs within the scope of the Maintenance Rule. However, risk importance calculations, plant specifics and other factors may change the risk significance of certain SSCs in the operational RAP that were previously determined to be risk-significant within the bounds of the D-RAP. Therefore, exceptions between the D-RAP and operational RAP risk significance may exist, and should be evaluated and justified by the Expert Panel.

- Reliability Database - Historical data on equipment performance as available. The compilation and reduction of this data provides the plant with source of component reliability information. Data used in PRA fault-tree analyses may also be a viable initial source.

- Surveillance and Testing - Establishes the level of performance or condition being maintained for SSCs within the scope of the RAP and identifies declining trends in between surveillances prior to performance or condition degrading to unacceptable levels undetected (or failure) to the extent possible.

- Maintenance Plan - This plan describes the nature and frequency of maintenance activities to be performed on plant equipment. The plan includes the selected SSCs identified in the D-RAP.

17.4.14 References

17.4-1 GE Energy Nuclear, "Reliability Assurance Program Plan", NEDO-33289, October 2006.

17.4-2 US Nuclear Regulatory Commission, "Policy and Technical Issues Associated With the Regulatory Treatment of Non-Safety Systems (RTNSS) in Passive Plant Designs (SECY-94-084)", SECY-95-132, May 1995.

17.4-3 US Nuclear Regulatory Commission, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Reg Guide 1.160, March 1997.

17.4-4 US Nuclear Regulatory Commission, "Assessing and Managing the Risk Before Maintenance at Nuclear Power Plants," Reg Guide 1.182, May 2000.

17.4-5 NEI, "Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," NUMARC 93-01 April 1996.

17.4-6 NEI, "Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Revision to Section 11 of NUMARC 93-01 February 22, 2000.