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MFN 07-491

Docket No. 52-010

September 10, 2007

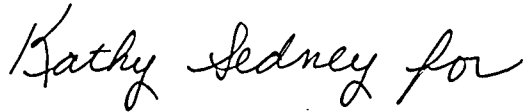
U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555-0001

Subject: **Response to Portion of NRC Request for Additional Information  
Letter No. 98 Related to ESBWR Design Certification Application –  
Environmental Qualification – RAI Number 3.11-12**

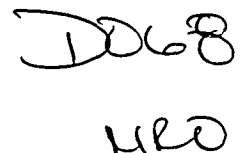
Enclosure 1 contains GEH's response to the subject NRC RAI transmitted via the  
Reference 1 letter.

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

Sincerely,

Handwritten signature of Kathy Sedney in cursive script.

James C. Kinsey  
Project Manager, ESBWR Licensing

Handwritten initials "DD68" and "MKD" in cursive script.

Reference:

1. MFN 07-317, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 98 Related to ESBWR Design Certification Application*, May 29, 2007

Enclosure:

1. MFN 07-491 – Response to Portion of NRC Request for Additional Information Letter No. 98 Related to ESBWR Design Certification Application – Environmental Qualification – RAI Number 3.11-12

cc: AE Cubbage USNRC (with enclosures)  
DH Hinds GEH (with enclosures)  
RE Brown GEH (w/o enclosures)  
GB Stramback GEH (with enclosures)  
eDRF 0000-0073-3773

**Enclosure 1**

**MFN 07-491**

**Response to Portion of NRC Request for  
Additional Information Letter No. 98  
Related to ESBWR Design Certification Application  
Environmental Qualification  
RAI Number 3.11-12**

### **NRC RAI 3.11-12**

*Provide details regarding qualification methods to qualify electronic equipment for gamma dose <104 rads.*

*Full Text: In DCD Tier 2, Rev 3, Appendix 3H, Table 3H-6, the applicant stated that electronic equipment is qualified for gamma dose < 104 rads. The NRC staff's position as discussed in SRP 3.11, Revision 3, is that a mild radiation environment for electronic equipment is a total integrated dose less than 103 rads. Provide details regarding qualification methods to qualify electronic equipment for gamma dose <104 rads.*

### **GEH Response**

NUREG-0800 SRP 3.11 acceptance Criteria 12 states: The staff's definition of what constitutes a mild radiation environment for electronic components, such as semiconductors or electronic components containing organic material, differs from that for other equipment. The staff's position, as stated in NUREG-1503, "Final SER ABWR, Chapter 3, Design of Structures, Components, Equipment, and Systems," and NUREG-1793, "Final SER AP1000, Chapter 3, Design of Structures, Components, Equipment, and Systems," is that a mild radiation environment for electronic equipment is a total integrated dose less than 10 Gy (1E3 rad), and a mild radiation environment for other equipment is less than 100 Gy (1E4 rad).

GEH will be utilizing the following: a mild radiation environment for electronic equipment is a total integrated dose less than 10 Gy (1E3 rad), and a mild radiation environment for other equipment is less than 100 Gy (1E4 rad).

Therefore, the qualification method for electronics exposed to a total integrated dose less than 10 Gy (1E3 rad) will be by analysis. The qualification method for electronics exposed to a total integrated dose of 10 Gy (1E3 rad), or higher will be by test.

Subsection 3.11.1 and Appendix 3H will be changed as follows.

### **DCD Impact**

DCD 26A6642AW Rev. 03  
Changes to Chapter 3.11.4

## **3.11.4 Estimated Chemical and Radiation Environment**

### **Chemical Environment**

Equipment in the lower portions of the containment is potentially subject to submergence. The chemical composition and resulting pH to which safety-related equipment is exposed during normal operation and design basis accident conditions is reported in Appendix 3H.

Sampling stations are provided for periodic analysis of reactor water, refueling and fuel storage pool water, and suppression pool water to assure compliance with operational limits of the plant technical specifications.

### **Radiation Environment**

Safety-related systems and components are designed to perform their safety-related function when exposed to the normal operational radiation levels and accident radiation levels.

The normal operational exposure is based on the radiation sources provided in Chapter 12.

The radiation sources associated with the Design Basis Accident (DBA) and developed in accordance with NUREG-1465 are used. Dose rates and integrated doses of neutron, gamma and beta radiation that are associated with normal plant operation and the DBA condition for various plant compartments are presented in Appendix 3H; these parameters are presented in terms of time-based profiles where applicable.

The gamma and beta doses in Appendix 3H are bounding values based on generic design considerations, and are to be revised and/or verified based upon the specific equipment considerations (exact design, specific location, materials of construction and leakage characteristics).

The equipment qualification, radiation qualification method for electronic equipment for a qualification requirement greater than or equal to 1E3 Rad will be test.

The equipment qualification, radiation qualification method for electronic equipment for a qualification requirement less than 1E3 Rad, a Mild Environment, will be to specify the radiation environmental requirement in the specifications and require a certificate of conformance from the vendor.

The equipment qualification, radiation qualification method for non-electronic equipment for a qualification requirement greater than or equal to 1E4 Rad will be test, analysis or test and analysis.

The equipment qualification, radiation qualification method for non-electronic equipment for a qualification requirement less than 1E4 Rad, a Mild Environment, will be to specify the radiation environmental requirement in the specifications and require a certificate of conformance from the vendor.

**Add to Appendix 3H the following table, 3H-13:**

Table 3H-13

TYPICAL MILD ENVIRONMENT PARAMETER LIMITS

Parameter	Limits	Notes
Temperature	50°C (122°F) 63°C (145°F)	Normal Abnormal
Pressure	Atmospheric	Nominal
Humidity	30 – 65% ≤ 95%	Typical Abnormal
Radiation	<1E4 Rads Gamma <1E3 Rads Gamma	Electronics
Chemistry	None	
Submergence	None	