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MFN 06-309
Supplement 7

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 54 – Auxiliary Systems– RAI Number 9.1-15 S01**

Enclosure 1 contains GEH's response to the subject NRC RAI transmitted via Reference 1 which is a supplemental request to the RAI transmitted via Reference 2. The original RAI response was transmitted via Reference 3.

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. E-mail dated May 3, 2007 from L. Quinones (NRC).
2. MFN 06-302, Letter from U.S. Nuclear Regulatory Commission to David H. Hinds, *Request for Additional Information Letter No. 54 Related to the ESBWR Design Certification Application*, August 23, 2006.
3. MFN 06-309 – Letter from GE to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 54 Related to ESBWR Design Certification Application – Auxiliary Systems,* September 8, 2006.

Enclosure:

1. MFN 06-309, Supplement 7- Response to Portion of NRC Request for Additional Information Letter No. 54 – RAI Number 9.1-15 S01.

cc:	AE Cubbage	USNRC (with enclosure)
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	LE Fennern	GEH/San Jose (with enclosure)
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Enclosure 1

MFN 06-309
Supplement 7

Response to Portion of NRC Request for Additional Information Letter No. 54 Related to ESBWR Design Certification Application

Auxiliary Systems

RAI Number 9.1-15 S01

For historical purposes, the original text of RAI 9.1-15 and the GE response is included.

NRC RAI 9.1-15:

DCD Tier 2, Section 9.1.2 states that the SFP is a reinforced concrete structure with a stainless steel liner. Operating experience indicates that damage to the liner from light load handling accidents, such as a fuel assembly drop, are credible and can allow leakage at high rates.

Consistent with the guidance of SRP Section 9.1.3, Revision 3,July 1981, Criterion III.1.f, describe how the makeup capacities and the time required to make associated hookups are consistent with expected leakage from structural damage that causes leakage through the liner.

GE Response:

SRP 9.1.3, Section III.1.f states:

"A seismic Category I makeup system and an appropriate backup method to add coolant to the spent fuel pool are provided. The backup system need not be a permanently installed system, nor Category I, but must take water from a Category I source. Engineering judgment and comparison with plants of similar design are used to determine that the makeup capacities and the time required to make associated hookups are consistent with heatup times or expected leakage from structural damage."

Reg. Guide 1.13, Section B.1 discusses acceptable solutions for avoiding structural damage resulting from load handling accidents:

"Possible solutions to this potential problem include (1) preventing, preferably by design rather than interlocks, heavy loads from being lifted over the pool; (2) using a highly reliable handling system designed to prevent dropping of heavy loads as a result of any single failure; or (3) designing the pool to withstand dropping of the load without significant leakage from the pool area in which fuel is stored."

The amount of leakage through the liner in the event of a load handling accident is limited by method 3. The SFP liner has been designed to the requirements contained in DCD Tier, Section 9.1.2.4 and as discussed in response to RAI 9.1-6. The ESBWR SFP liner is similar to existing plants such as ABWR. The liner is Seismic 1 and designed to the acceptance criteria of ASME Section III, Division 2, CC-3700.

In addition to the changes described in the response to RAI 9.1-6, the following sentence will be added to DCD section 9.1.2.4:

Pool liners will be evaluated to ensure structural integrity under fuel handling accidents.

DCD Impact:

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

E-mail dated May 3, 2007, from L. Quinones (NRC).

NRC RAI 9.1-15 S01:

The response is insufficient. Provide analyses demonstrating that the pool liner will retain its leak tight integrity after impact by a dropped fuel assembly, describe an alternative method of assuring an adequate pool inventory will be maintained following a fuel handling accident, or provide redundant safety-related makeup capability.

GEH Response:

Using previous analysis methodology as guide, an analysis of the pool liners was performed for the ESBWR. The resulting conclusion demonstrated that a liner thickness of 10.80 mm or greater is sufficient to resist damage from a dropped fuel bundle. This is well within the16 mm thickness of the liner.

DCD Impact:

DCD Tier #2, Subsection 9.1.2, is to be revised as noted in the attached markup.

9.1.2 Spent Fuel Storage

9.1.2.1 Design Bases

9.1.2.2 Nuclear Design

A full array in the loaded spent fuel rack is designed to be sub-critical by at least 5% $\Delta k/k$. Neutron-absorbing material, as an integral part of the design, is employed to assure that the calculated k_{eff}, including biases and uncertainties, does not exceed 0.95 under all normal and abnormal conditions.

Monte Carlo techniques are employed in the calculations performed to assure that k_{eff} does not exceed 0.95 under all normal and abnormal conditions.

The storage array is assumed to be infinite in all directions. No credit is taken for neutron leakage, therefore, the values reported as effective neutron multiplication factors are, in reality, infinite neutron multiplication factors.

The biases between the calculated results and experimental results, as well as the uncertainty involved in the calculations, are taken into account as part of the calculative procedure to assure that the specific k_{eff} limit is met.

9.1.2.3 Storage Design

The fuel storage racks provided in the Spent Fuel Pool in the Fuel Building provide for storage of irradiated fuel assemblies resulting from 10 calendar years of plant operation plus one full core off load. The fuel storage racks in the Reactor Building buffer pool deep pit can hold a minimum of 154 spent fuel assemblies.

9.1.2.4 Mechanical and Structural Design

The spent fuel storage racks in the Reactor Building buffer pool and in the Spent Fuel Pool in the Fuel Building contain storage space for fuel assemblies (with channels) or bundles (without channels). A standard dynamic analysis using the appropriate response spectra is performed to demonstrate compliance to design requirements. They are designed to withstand all credible static and seismic loadings. The racks are designed to protect the fuel assemblies and bundles from excessive physical damage which may cause the release of radioactive materials in excess of 10 CFR 20 and 10 CFR 100 requirements, under normal and abnormal conditions caused by impact from fuel assemblies, bundles or other equipment.

The Spent Fuel Pool and buffer pool are reinforced concrete structures with a stainless steel liner. Fuel storage racks and pool liner embedments are designed to meet Seismic Category I requirements. Pool liner and anchorage are designed to the same loads and load combinations as the pool concrete structure in accordance with Table 3.8-15, except that load factors for all cases are equal to 1.0, and the acceptance criteria follow ASME Section III, Division 2, CC-3700. Pool liners have been~~will be~~ evaluated to ensure structural integrity under fuel handling accidents. The bottoms of the pool gates are