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Supplement 4

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 63 Related to ESBWR Design Certification Application - Technical Specifications - RAI Number 16.2-76 S01**

Enclosure 1 contains the subject supplemental RAI response resulting from a March 27, 2007 e-mail from the NRC. GE's original response was provided in the Reference 1 letter.

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

References:

1. MFN 07-022, Letter from Jim Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 63 Related to ESBWR Design Certification Application – Technical Specifications – RAI Numbers 16.2-23, 16.2-30, 16.2-45, 16.2-50, 16.2-54, 16.2-73, 16.2-74, 16.2-76, and 16.2-77*, January 19, 2007

Enclosures:

1. MFN 07-022, Supplement 4 - Response to Portion of NRC Request for Additional Information Letter No. 63 Related to ESBWR Design Certification Application - Technical Specifications - RAI Number 16.2-76 S01

cc:

AE Cubbage	USNRC (with enclosures)
DH Hinds	GEH (with enclosures)
RE Brown	GEH (w/o enclosures)
eDRF	0069-9553

Enclosure 1

MFN 07-022, Supplement 4

Response to Portion of NRC Request for

Additional Information Letter No. 63

Related to ESBWR Design Certification Application

- Technical Specifications -

RAI Number 16.2-76 S01

NRC RAI 16.2-76

DCD Tier 2, section 9.1.2.7, states that on a complete loss of the FAPCS active cooling capability and under the condition of maximum heat load, sufficient quantity of water is available in the Spent Fuel Pool above the top of active fuel (TAF) level to allow boiling for 72 hours and still have the TAF at least 3.0 m (10 ft) submerged under water. The water level necessary to provide this heat removal capacity constitutes an initial condition of a transient analysis for a loss of forced cooling. The loss of inventory presents a challenge to a fission product barrier in that water cooling is necessary to assure protection of the fuel cladding.

Describe how the water level necessary to satisfy this transient analysis is included in a Limiting Condition for Operation consistent with the requirements of 10 CFR 50.36(c)(2)(ii), Criterion 2.

GE Response

The complete loss of the Fuel and Auxiliary Pools Cooling System (FAPCS) is not currently analyzed as an Anticipated Operational Occurrence (AOO), Infrequent Event, or Design Basis Accident (DBA) in Revision 2 of the Design Control Document (DCD) Tier 2, Chapter 15. However, an analysis to ensure that the design features and assumptions necessary to maintain adequate cooling for this event is described in DCD Tier 2, Subsection 9.1.2.7, which states: "On a complete loss of the FAPCS active cooling capability and under the condition of maximum heat load, sufficient quantity of water is available in the Spent Fuel Pool above the top of active fuel (TAF) level to allow boiling for 72 hours and still have the TAF submerged under water." The water level assumed in this analysis is already bounded by the water level required in DCD Tier 2, Chapter 16, Technical Specification 3.7.5, which is included in the Technical Specifications as an initial condition for the fuel handling accident safety analyses described in DCD Tier 2, Section 15.1.4, "Fuel Handling Accident." However, since the complete loss of the FAPCS is not an analyzed AOO or DBA, the initial conditions assumed in the evaluation of that event do not meet Criterion 2 of 10 CFR 50.36(c)(2)(ii).

DCD Impact

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

NRC RAI 16.2-76, Supplement 1

The response to RAI 16.2-76 states that the complete loss of the Fuel and Auxiliary Pools Cooling System (FAPCS) is not currently analyzed as an Anticipated Operational Occurrence (AOO), Infrequent Event, or Design Basis Accident (DBA) in Revision 2 of the DCD Tier 2, Chapter 15. The response also states that, since the complete loss of the FAPCS is not an analyzed AOO or DBA, the initial conditions assumed in the evaluation of that event do not meet Criterion 2 of 10 CFR 50.36(c)(2)(ii). The spent fuel pool coolant inventory performs a passive safety function analogous to that of the Isolation Condenser (IC) pool, but with a more direct path for decay heat removal from the fuel. The loss of the FAPCS is an AOO in that the condition may result from a loss of offsite power and/or failure of non-safety related equipment. The location of the description of the occurrence in Chapter 9 as opposed to Chapter 15 is not a valid basis for determining the applicability of 10 CFR 50.36 (c)(2)(ii). The ESBWR is unlike the BWR-6 design considered for NUREG-1434 in that no redundant, safety related makeup water supply is provided. Instead, the pool inventory itself is credited in maintaining adequate cooling, like the AP-1000, which has TS LCOs 3.7.5 and 3.7.9 that together ensure an adequate coolant inventory for 72 hours without forced cooling.

Therefore, provide an analysis evaluating the anticipated occurrence of a loss of the FAPCS and a technical specification LCO for the initial condition required for spent fuel pool inventory to satisfy the analysis.

GEH Response

Regulatory Treatment of Non-Safety Systems (RTNSS) short-term availability controls will be included in an Availability Control Manual (ACM) as an Appendix to DCD, Tier 2, Chapter 19. These Availability Controls will include requirements for Spent Fuel Pool water level to provide assurance that sufficient heat removal capability is available during a loss of the Fuel and Auxiliary Pools Cooling System (FAPCS) trains. Additional Availability Controls will include requirements for the Fire Protection Water Supply System to provide emergency makeup to the SFP. The addition of the RTNSS Availability Controls for the Fire Protection Water Supply System emergency makeup to the SFP will ensure the availability a source of makeup to assure continued availability of adequate heat transfer assuming boiling in the SFP that is not dependent upon the presence of offsite power.

DCD Impact

Availability Controls for Spent Fuel Pool water level to provide assurance that sufficient heat removal capability is available during a loss of the Fuel and Auxiliary Pools Cooling System (FAPCS) trains and for the Fire Protection Water Supply System emergency makeup to the SFP will be included in an Appendix to DCD, Tier 2, Chapter 19, as shown below.

ACM 3.7 PLANT SYSTEMS

AC 3.7.3 Spent Fuel Pool (SFP) Water Level

ACLCO 3.7.3 The SFP water level shall be ≥ 8.5 m (27.9 ft) over the top of irradiated fuel assemblies seated in the spent fuel storage pool.

APPLICABILITY: When spent fuel assemblies are stored in the SFP.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. SFP water level not within limit.	A.1 Restore SFP water level to within limit.	24 hours
B. Required Action and associated Completion Time not met.	B.1 Enter ACLCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
ACSR 3.7.3.1	Verify SFP water level within limits.	31 days

ACM B 3.7 PLANT SYSTEMS

AC B 3.7.3 Spent Fuel Pool (SFP) Water Level

BASES

The SFP is designed to dissipate fuel decay heat through heat up and boiling of the pool water during a loss of the Fuel and Auxiliary Pools Cooling System (FAPCS) trains. Steam generated by boiling of the SFP is released to the atmosphere through a relief panel in the Fuel Building. Water inventory in the SFP is adequate to keep the fuel covered through 72 hours, thereby avoiding heat up of the fuel and the potential for fission product release.

Sufficient reserve capacity is maintained on-site to extend the safe shutdown state from 72 hours through 7 days. Post 72-hour inventory makeup is provided via safety-related connections to the Fire Protection System and to offsite water sources.

This function is a nonsafety-related function that satisfies the significance criteria for Regulatory Treatment of Non-Safety Systems, and therefore requires regulatory oversight. The short-term availability controls for this function, which are specified as Completion Times, are acceptable to ensure that the availability of this function is consistent with the functional unavailability in the ESBWR PRA. The surveillance requirements also provide an adequate level of support to ensure that component performance is consistent with the functional reliability in the ESBWR PRA.

ACM 3.7 PLANT SYSTEMS

AC 3.7.1 Emergency Makeup Water

ACLCO 3.7.1 The emergency makeup water Functions listed in Table AC 3.7.1-1 shall be AVAILABLE.

APPLICABILITY: According to Table AC 3.7.1-1.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Required diesel-driven firewater pump unavailable.	A.1	Restore required diesel-driven firewater pump to AVAILABLE status.	7 days
B. Firewater source total volume not within limit.	B.1	Restore firewater source total volume to within limit.	7 days
C. One or more emergency makeup water Function(s) unavailable.	C.1	---------- **- NOTE-** Separate Condition entry is allowed for each emergency makeup water Function. ---------- Restore emergency makeup water Function(s) to AVAILABLE status.	31 days
D. Required Action and associated Completion Time not met.	D.1	Enter ACLCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
ACSR 3.7.1.1	Verify firewater source total volume ≥ 3900 m^3 ($1.03x10^6$ gallons).	31 days
ACSR 3.7.1.2	Verify that each manual, power-operated, or automatic valve in the flow path that is not locked, sealed, or otherwise secured in its correct position is in the correct position or can be aligned to the correct position.	31 days
ACSR 3.7.1.3	Verify required diesel-driven firewater pump starts on a manual start signal and operates for ≥ 15 minutes.	92 days

Table AC 3.3.7-1 (page 1 of 1)
Emergency Makeup Water Sources

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS
1.	Isolation Condenser / Passive Containment Cooling (IC/PCC) Pools Makeup Water – Emergency Makeup	1,2
4.	Spent Fuel Pool (SFP) - Emergency Makeup Water	When spent fuel assemblies are stored in the SFP

ACM 3.7 PLANT SYSTEMS

AC 3.7.1 Emergency Makeup Water

The Fire Protection Water Supply System can function in a backup capacity to provide additional water during the post accident recovery period to provide makeup to the Isolation Condenser / Passive Containment Cooling (IC/PCC) pools to extend the safe shutdown state from 72 hours through 7 days. Post 72-hour inventory makeup is provided via safety-related connections to the Fire Protection System and to offsite water sources. The required volume from 72 hours through 7 days is approximately 3,900 m^3 (138,000 ft^3), and the maximum required delivery rate is approximately 46 m^3/hr (200 gpm) at 72 hours.

During a loss of the Fuel and Auxiliary Pools Cooling System (FAPCS) cooling trains, the cooling to the Spent Fuel Pool (SFP) is accomplished by allowing the water to heat and boil off. Sufficient pool capacity exists for pool boiling to continue for at least 72 hours post-accident, at which point emergency makeup water can be provided through safety-related connections to the Fire Protection System. The required volume from 72 hours through 7 days is approximately 1921 m^3 (67,840 ft^3).

In conjunction with the diesel-driven pump, the dedicated connections for FPS makeup include the Fire Protection Enclosure (FPE), the water supply, the suction pipe from the water supply to the pump, one of the supply pipes from the FPE to the Reactor Building, and the connections to the Fuel and Auxiliary Pools Cooling System (FAPCS). Water is pumped from the firewater storage tanks by the diesel-driven firewater pump in the FPE to the desired flow path. The two firewater storage tanks are required to contain a total volume of $\geq$ 3900 m^3 (1.03×10^6 gallons) of water to ensure a sufficient quantity of emergency makeup is available.

The emergency makeup water functions are nonsafety-related functions that satisfy the significance criteria for Regulatory Treatment of Non-Safety Systems, and therefore require regulatory oversight. The short-term availability controls for these functions, which are specified as Completion Times, are acceptable to ensure that the availability of these functions is consistent with the functional unavailability in the ESBWR PRA. The surveillance requirements also provide an adequate level of support to ensure that component performance is consistent with the functional reliability in the ESBWR PRA.