HITACHI

GE Hitachi Nuclear Energy

James C. Kinsey
Vice President, ESBWR Licensing

PO Box 780 M/C A-55
Wilmington, NC 28402-0780
USA

T 910 675 5057
F 910 362 5057
jim.kinsey@ge.com

MFN 07-660

Docket No. 52-010

December 14, 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. 111 Related to ESBWR Design Certification Application – Auxiliary Systems- RAI Numbers 9.1-42 S01 and 9.1-44**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC letter dated October 15, 2007 (Reference 1). The original response to RAI 9.1-42 sumitted via Reference 2 in response to Reference 3. GEH response to RAI Numbers 9.1-42 S01 and 9.1-44 are addressed in Enclosure 1.

If you have any questions or require additional information, please contact me.

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

D068
NRO

References:

1. MFN 07-556, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, Senior Vice President, Regulatory Affairs, *Request For Additional Information Letter No. 111 Related To ESBWR Design Certification Application*, dated October 15, 2007
2. MFN 07-341, Letter from James C. Kinsey to US Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 100 – Auxiliary Systems – RAI Numbers 9.1-41 and 9.1-42,* dated June 18, 2007
3. MFN 07-327, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, General Manager, Regulatory Affairs, *Request For Additional Information Letter No. 100 Related To ESBWR Design Certification Application*, dated May 30, 2007

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 111 Related to ESBWR Design Certification Application – Auxiliary Systems– RAI Numbers 9.1-42 S01 and 9.1-44

cc:	AE Cubbage	USNRC (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	eDRF	0000-0076-8153, Revision 2

Enclosure 1

MFN 07-660

Response to Portion of NRC Request for Additional Information Letter No. 111 Related to ESBWR Design Certification Application

Auxiliary Systems

RAI Numbers 9.1-42 S01 and 9.1-44

Enclosure 1

On the last page of this transmittal is a table of references. These references correspond to a series of GEH proprietary calculations/analyses that are available for NRC audit.

For historical purposes, the original text and GHNEA response to RAI 9.1-42 is included.

NRC RAI 9.1-42:

There are inconsistencies in DCD Tier 2, Rev. 3, Section 9.3.1 as to the classification of the make up portion of the fuel and auxiliary pool cooling system (FAPCS). DCD Tier 2, Rev. 3, Section 9.3.1 states that this portion of the system is safety-related but Chapter 19 states that it is RTNSS. If it is RTNSS, update DCD Tier 2, Rev. 3, Section 9.3.1. In addition, explicitly describe the RTNSS treatment of FAPCS in DCD Tier 2, Rev. 3, Section 9.3.1. Based on previous RAIs, the applicant has explicitly described RTNSS treatment of cooling water systems (I.e., plant service water) in Section 9.2 of Rev. 3 of the DCD.

GHNEA Response:

The Chapter 19 discussion of the FAPCS is in agreement with Subsection 9.1.3 with the exception of the last sentence in Subsection 19A.3.1.2. GHNEA assumes this is the inconsistency to which this RAI refers.

The FAPCS interfaces with the Fire Protection System (i.e. the diesel-driven makeup pump system) in several locations. The FAPCS pipe is safety-related in some locations and RTNSS in others.

The interfaces used to provide emergency makeup from the Fire Protection System (FPS) to the spent fuel pool and the IC/PCC pools are safety-related.

There is another interface between the FAPCS and the FPS on the piping used for low pressure coolant injection. This piping is classified RTNSS. Subsection 19A.3.1.2 is to be modified to make this clarification. Subsection 9.1.3 is to be revised to better clarify what is RTNSS vs. safety-related.

DCD Impact:

DCD Tier 2 is to be modified in Revision 4 as shown in the attached markup of Subsection 19A.1.1.2 and Subsection 9.1.3.2.

NRC RAI 9.1-42 S01:

The RAI response indicates that some portions of the fuel and auxiliary pools cooling system (FAPCS) are safety-related and some are RTNSS. The response does not clearly specify what portions of the FAPCS are safety-related. Provide a schematic identifying safety-related and RTNSS portions of the system. Include this figure in the DCD Tier 2, Section 9.1. Also, for the safety-related portions identify the safety function.

GEH Response:

See Reference 1 for a schematic showing the differences between RTNSS and safety-related piping and components.

As described by Tier 2, Table 9.1-3, the following portions of the FAPCS are safety-related:

1. Containment Isolation Valves – Provide containment isolation
2. Emergency Makeup Water Flow Paths – Provide makeup water for safety-related cooling
3. Piping interface with RWCU/SDC – Low pressure coolant injection is a RTNSS function, but it includes an interface with safety-related piping. Therefore two isolation valves are provided for a class break between RTNSS and safety-related piping.
4. GDCS Interconnecting Pipes – Provides a flow path from pool B/C to pools A and D for FAPCS makeup water.
5. Level Instrumentation (SFP & IC/PCC Pools) – Monitors pool inventory to ensure there is a sufficient quantity of water to provide 72 hours of safety-related cooling.

DCD Tier 2, Subsection 9.1.3.2 describes items that are safety-related and RTNSS. More detail will be added to clarify what components are needed for the functions of low pressure coolant injection (LPCI) and suppression pool cooling (SPC). With these changes, there is sufficient detail to determine the piping and components classifications. It is unnecessary to include the markup of the schematic in the DCD as it is contained in Table 9.1-1.

DCD Impact:

DCD Tier 2, Subsection 9.1.3 Revision 5, will be revised as shown in the attached markup.

Enclosure 1

NRC RAI 9.1-44:

DCD Tier 2 Revision 4, Section 9.1.3.2 states,

"During a loss of the FAPCS cooling trains, the cooling to the Spent Fuel Pool and IC/PCC pools is accomplished by allowing the water to heat and boil. Sufficient pool capacity exists for pool boiling to continue for at least 72 hours post-accident, at which point post accident makeup water can be provided through safety-related connections to the Fire Protection system (FPS) or another onsite or offsite water source."

However, the DCD does not identify the inventory of the water in the spent fuel pool or the amount of inventory that might be lost in 72 hours. Provide an analysis to demonstrate that the volume provided by the spent fuel pool is sufficient to provide cooling and shielding without makeup for 72 hours.

GEH Response:

See Reference 2 for a detailed analysis of the most limiting spent fuel pool boil-off scenario.

After 72 hours, the pool elevation is approximately 5.5 m, which is sufficient to keep the active fuel covered. During such an event, plant personnel would not be allowed in close proximity to the SFP (pool makeup is achieved from outside the fuel building), therefore maintaining a safe shielding depth is not required.

DCD Impact:

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

Enclosure 1

GEH Proprietary Calculations/Analyses:

Ref #	Title	eDRF Section
1)	FAPCS – Component Classifications	0000-0076-8153 R0
2)	Spent Fuel Pool Boil-off	0000-0038-9392 R3

containment isolation valves needed for post-accident recovery modes, which do not receive an isolation signal.

The FAPCS is a nonsafety-related system with the exception of piping and components required for:

- Containment isolation;
- Refilling of the IC/PCC pools and the Spent Fuel Pool with post-accident water supplies from the Fire Protection System or another onsite or offsite source.
- The high-pressure interface with the Reactor Water Cleanup/Shutdown Cooling system used for low pressure coolant injection.

The piping and components needed for the following functions are classified as RTNSS:

- Suppression pool cooling
- Low pressure coolant injection

This includes the suction line from the suppression pool, all of the piping and components in the cooling and cleaning trains, and the discharge lines to the suppression pool and the LPCI interface up to the safety-related isolation valves.

The FAPCS piping and components that are required to support safety-related and/or accident recovery function have Quality Group B or C and Seismic I classification (Table 9.1-3). A Seismic I classification is required for all safety-related functions listed above. A Seismic II classification is sufficient for the remaining nonsafety-related piping and components that support accident recovery functions. This classification satisfies the requirements of SRP 9.1.3 Section I.1.

Detailed System Description

The FAPCS is provided with two cooling and cleanup (C/C) trains with 100% capacity during normal operation. Each FAPCS train is physically separated and has one pump, one heat exchanger and one water treatment unit consisting of a prefilter and a demineralizer.

A manifold of four motor operated valves is attached to each end of the FAPCS C/C trains [refer to Figure 9.1-1]. These manifolds are used to connect the FAPCS C/C train with one of the two pairs of suction and discharge piping loops to establish the desired flow path during FAPCS operation. One loop is used for the fuel pools and auxiliary pools, and the other loop for the GDCS pools and suppression pool and for injecting water to drywell spray sparger and reactor vessel via the RWCU/SDC System and feedwater pipes.

The use of manifolds with proper valve alignment and separate suction-discharge piping loops 1) allows operating of one train independent of the other train to permit on-line maintenance or dual mode operation using separate trains if necessary, 2) prevents inadvertent draining of the pool and minimizes mixing of contaminated water in the Spent Fuel Pool with cleaner water in other pools.

Each water treatment unit is equipped with a prefilter, a demineralizer and a post strainer. A bypass line is provided to permit bypass of the water treatment unit, when necessary. To protect demineralizer resin, the water treatment units are bypassed automatically on a high temperature

containment isolation valves needed for post-accident recovery modes, which do not receive an isolation signal.

The FAPCS is a nonsafety-related system with the exception of piping and components required for:

- Containment isolation;
- Refilling of the IC/PCC pools and the Spent Fuel Pool with post-accident water supplies from the Fire Protection System or another onsite or offsite source.
- The high-pressure interface with the Reactor Water Cleanup/Shutdown Cooling system used for low pressure coolant injection.

The piping and components needed for the following functions are classified as RTNSS:

- Suppression pool cooling
- Low pressure coolant injection

This includes the suction line from the suppression pool, all of the piping and components in the cooling and cleaning trains, and the discharge lines to the suppression pool and the LPCI interface up to the safety-related isolation valves.

The FAPCS piping and components that are required to support safety-related and/or accident recovery function have Quality Group B or C and Seismic I classification (Table 9.1-3). A Seismic I classification is required for all safety-related functions listed above. A Seismic II classification is sufficient for the remaining nonsafety-related piping and components that support accident recovery functions. This classification satisfies the requirements of SRP 9.1.3 Section I.1.

Detailed System Description

The FAPCS is provided with two cooling and cleanup (C/C) trains with 100% capacity during normal operation. Each FAPCS train is physically separated and has one pump, one heat exchanger and one water treatment unit consisting of a prefilter and a demineralizer.

A manifold of four motor operated valves is attached to each end of the FAPCS C/C trains [refer to Figure 9.1-1]. These manifolds are used to connect the FAPCS C/C train with one of the two pairs of suction and discharge piping loops to establish the desired flow path during FAPCS operation. One loop is used for the fuel pools and auxiliary pools, and the other loop for the GDCS pools and suppression pool and for injecting water to drywell spray sparger and reactor vessel via the RWCU/SDC System and feedwater pipes.

The use of manifolds with proper valve alignment and separate suction-discharge piping loops 1) allows operating of one train independent of the other train to permit on-line maintenance or dual mode operation using separate trains if necessary, 2) prevents inadvertent draining of the pool and minimizes mixing of contaminated water in the Spent Fuel Pool with cleaner water in other pools.

Each water treatment unit is equipped with a prefilter, a demineralizer and a post strainer. A bypass line is provided to permit bypass of the water treatment unit, when necessary. To protect demineralizer resin, the water treatment units are bypassed automatically on a high temperature