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MFN 07-398

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 98 –Auxiliary Systems– RAI Numbers 9.3-37, 9.3-38, and 9.3-39**

Enclosure 1 contains GE'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,

Kathy Sedney for

James C. Kinsey
Project Manager, ESBWR Licensing

D068

NRO

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 the ESBWR Design Certification Application*, May 29, 2007.

Enclosure:

1. MFN 07-398 – Response to Portion of NRC Request for Additional Information Letter No. 98 – RAI Numbers 9.3-37, 9.3-38, and 9.3-39

cc:

AE Cubbage	USNRC (with enclosure)
BE Brown	GE/Wilmington (with enclosure)
LE Fennern	GE/San Jose (with enclosure)
GB Stramback	GE/San Jose (with enclosure)
eDRF:	0000-0070-1668
	0000-0070-1689
	0000-0070-0975

Enclosure 1

MFN 07-398

Response to Portion of NRC Request for Additional Information Letter No. 98 Related to ESBWR Design Certification

Auxiliary Systems

RAI Numbers 9.3-37, 9.3-38, and 9.3-39

NRC RAI 9.3-37:

In DCD, Tier 2, Rev. 3, Section 9.3.9.6, you stated that the COL Holder will perform the following COL Item:

1. Determine the Oxygen and Hydrogen demand requirements and supply system, if implemented.

However, in Section 9.3.10 you stated that the COL Applicant shall define site storage requirements for the Oxygen Injection System. Please clarify whether the above COL Item should be the responsibility of the COL Applicant or COL Holder and the basis for it. In addition, please clarify whether the decision to implement the Hydrogen Water Chemistry System is the responsibility of the COL Applicant or the COL Holder and why.

GEH Response:

The item in DCD, Tier 2, Revision 3, Subsection 9.3.9.6 is the responsibility of the COL Applicant. DCD, Tier 2, Revision 4 is to be revised to correct this. The basis for this is the COL Applicant makes the determination as whether to implement Hydrogen Water Chemistry or not. As stated in DCD Subsection 9.3.9, a Hydrogen Water Chemistry System is not part of the ESBWR Standard Plant design. Demand requirements for Oxygen and Hydrogen vary depending on whether or not the Applicant employs a Hydrogen Water Chemistry System and whether or not Noble Chemistry is implemented with it.

DCD Impact:

DCD, Tier 2, Rev. 4, Subsection 9.3.9.6 is to be revised as shown on the attached markup.

NRC RAI 9.3-38:

Clarify whether the means for storing and handling oxygen comply with EPRI Report NP-5283-SR-A, "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations." In addition, please clarify whether the decision to implement the Oxygen Injection System relies on the COL Applicant or the COL Holder and the basis for it.

GEH Response:

The Oxygen Injection System (OIS) is part of the ESBWR Standard Plant design and is not determined by the COL Applicant. The OIS is designed to add sufficient oxygen to the Condensate and Feedwater Systems to suppress corrosion and corrosion product release. Implementation of the Hydrogen Water Chemistry System changes the demand for oxygen and also the storage requirements. The COL Applicant defines the site storage requirements based on oxygen demand and Hydrogen Water Chemistry Requirements (if implemented). If the Hydrogen Water Chemistry system is implemented, the hydrogen and oxygen storage facilities will comply with the guidelines of EPRI Report NP-5283-SR-A.

DCD Impact:

None.

NRC RAI 9.3-39:

In Section 9.3.11.6 you stated that the COL Applicant/Holder shall perform the following items:

1. Determine if a Zinc Injection System is required based on site-specific water quality requirements.

2. Furnish necessary information on System Description, Test and Inspection when vendor information becomes available.

Please clearly state whether the COL Applicant or the COL Holder is responsible for providing the above information and the basis for it. In addition, please clarify whether the decision to implement the Zinc Injection System is the responsibility of the COL Applicant or the COL Holder and why.

GEH Response:

The purpose of the Zinc Injection System in existing BWR plants is to reduce radiation levels in the primary containment due to cobalt (CO-60) deposition primarily on the recirculation system piping. Since the ESBWR does not have recirculation piping and ESBWR material selection has reduced stellite (a principal source of cobalt) in the plant, the beneficial effects of implementing Zinc Injection at startup are limited. However, design features are provided for installation of a Zinc Injection System if operating conditions warrant it.

Therefore, the COL Applicant determines if ZIS is warranted based on plant configuration and material selection. Additionally, the Applicant is required to include the necessary information for system description, test and inspections if ZIS is implemented.

DCD Impact:

Revision 4 of DCD Tier 2, Subsection 9.3.11.6 is to be revised as shown in the attached markup.

9.3.9 Hydrogen Water Chemistry System

The ESBWR Standard Plant design includes the capability to connect a Hydrogen Water Chemistry System (HWCS), but the system itself is not part of the ESBWR Standard Plant design.

9.3.9.1 Design Bases

Safety (10 CFR 50.2) Design Bases

The HWCS is Nonsafety-Related. Therefore, the HWCS has no safety design basis. However, it is required to be safe and reliable, consistent with the requirements for using hydrogen gas.

Power Generation Design Basis

Provisions are made to permit installation of a system for adding hydrogen to the feedwater at the suction of the feedwater pumps. If experience shows it necessary, a hydrogen water injection system can be added later in plant life.

The HWCS utilizes the guidelines in EPRI report "BWR Hydrogen Water Chemistry Guidelines".

9.3.9.2 System Description

The HWCS, illustrated in Figure 9.3-5, is composed of hydrogen and oxygen supply systems to inject hydrogen in the feedwater and oxygen in the offgas and several monitoring systems to track the effectiveness of the HWCS. The hydrogen and oxygen demand requirements and supply systems are site dependent and shall be defined by the COL Applicant/Holder at the time of deployment, if implemented. The hydrogen supply system may be integrated with the generator hydrogen supply system (as described in Subsection 10.2.2.2.8).

9.3.9.3 Safety Evaluation

The HWCS is not safety-related, however, the HWCS is used, along with other measures, to reduce the likelihood of corrosion failures that would adversely affect plant availability. The means for storing and handling hydrogen utilize the guidelines in EPRI report "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations".

9.3.9.4 Inspection and Testing Requirements

The HWCS, if necessary, can be installed at the connection points provided. The COL Applicant/Holder shall provide the inspection and testing requirements at the time of deployment.

9.3.9.5 Instrumentation and Controls

The necessary instrumentation can be provided to control the injection of hydrogen and augment the injection of oxygen. Automatic control features in the HWCS minimize the need for operator attention and improve performance.

9.3.9.6 COL Information

COL ~~Holder~~Applicant will determine Oxygen and Hydrogen demand requirements and supply system, if HWC is implemented.

COL ~~Holder~~Applicant will furnish necessary information Test and Inspection when vendor information becomes available.

9.3.9.7 References

9.3.9-1 Electric Power Research Institute, "BWR Hydrogen Water Chemistry Guidelines," EPRI Report NP-4947-SR (see Table 1.9-22).

9.3.9-2 Electric Power Research Institute, "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations," EPRI Report NP-5283-SR-A (see Table 1.9-22).

9.3.11 Zinc Injection System

The ESBWR Standard Plant design includes the capability to connect a Zinc Injection System (ZIS), but the system itself is not part of the ESBWR Standard Plant design.

9.3.11.1 Design Bases

Safety (10 CFR 50.2) Design Bases

The ZIS does not perform any safety-related function. Therefore, the ZIS has no safety design basis.

Power Generation Design Bases

Provisions are made to permit installation of a system for adding a zinc solution to the feedwater. Piping connections for a bypass loop around the feedwater pumps and space for the zinc addition equipment are provided.

9.3.11.2 System Description

See Subsection 9.3.11.6.

9.3.11.3 Safety Evaluation

The Zinc Injection System is not safety-related, and does not affect the safety function of any other safety-related system.

9.3.11.4 Test and Inspections

The Zinc Injection System, if necessary, can be installed at the connection points provided. Zinc injection is not performed when the plant is in cold shutdown. See Subsection 9.3.11.6.

9.3.11.5 Instrumentation and Controls

Instrumentation can be provided to automatically stop the injection of zinc solution if feedwater flow stops. The zinc injection rate can be manually adjusted based on the zinc concentration in the reactor water.

9.3.11.6 COL Information

The COL Applicant shall determine if a Zinc Injection System is required to be implemented at startup based on plant configuration and material selection. If a Zinc Injection system is to be installed, the COL Applicant shall include necessary information on system description, test and inspection.

9.3.11.7 References

None.