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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 136 Related to ESBWR Design Certification Application – TMSS and Feedwater Systems - RAI Number 10.4-15.**

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

Should you have any questions about the information provided here, please contact me.

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

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References:

1. MFN 08-026, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 136 Related to the ESBWR Design Certification Application,* January 11, 2008.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 136 Related to ESBWR Design Certification Application – TMSS and Feedwater Systems - RAI Number 10.4-15.

cc:	AE Cubbage	USNRC (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	DH Hinds	GEH/Wilmington (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	eDRF	0000-0080-6136 R1

Enclosure 1

MFN 08-127

Response to Portion of NRC Request for

Additional Information Letter No. 136

Related to ESBWR Design Certification Application

TMSS & Feedwater Systems

RAI Number 10.4-15

NRC RAI 10.4-15

Standard Review Plan (SRP) Section 10.4.6 (April 1996) states that the Condensate Cleanup System should be designed to maintain reactor water purity within the guidelines of Regulatory Guide (RG) 1.56. However, the latest version of the SRP states that the system should be designed to maintain reactor water purity within the guidelines provided in the latest version in the Electric Power Research Institute (EPRI) report series, "BWR Water Chemistry Guidelines," in addition to removing any reference to RG 1.56. Please clearly state whether the RWCU follows the EPRI BWR Water Chemistry Guidelines.

GEH Response

GEH understands that the "RWCU" in the last sentence is meant to be Condensate Purification System (CPS).

The ESBWR Water Quality Specification is written to concur with guidelines in EPRI's *BWRVIP-130: BWR Vessel and Internals Project BWR Water Chemistry Guidelines* (BWRVIP-130). Therefore, the Condensate Purification System will be designed to enable unit operation within the guidelines of BWRVIP-130. The subject statement in DCD 10.4.6.3 will be changed to state "The Condensate Purification System is designed to enable unit operation within the guidelines of EPRI's *BWRVIP-130: BWR Vessel and Internals Project BWR Water Chemistry Guidelines*."

A review of DCD Revision 4, Subsection 9.3.2, shows a claim of conformance to Regulatory Guide 1.56, but it does not show a specific reference to BWRVIP-130. The statement, "The Process Sampling System is designed to enable unit operation within the guidelines of EPRI's *BWRVIP-130: BWR Vessel and Internals Project BWR Water Chemistry Guidelines,* will be added to Subsection 9.3.2.1, *Design Bases,* under the Power Generation Design Bases Subsection, and a reference to BWR Water Chemistry Guidelines will be added to Subsection 9.3.2.7, *References.*

Table 1.9-22 cites the 2000 edition of EPRI's BWR Water Chemistry Guidelines (TR-103515 R2). DCD Subsection 5.2.3.2.2, BWR Chemistry of Reactor Coolant, is written to be in accordance with the 2004 edition (TR-1008192). The citation of TR-103515 will be replaced with TR-1008192.

DCD Impact

DCD Tier 2, Subsections 10.4.6 and 9.3.2 and Table 1.9-22 will be revised in Revision 5 as noted on the attached markup pages.

To support automation, the CPS is designed to be operated with a constant number of on line demineralizers and filters from 25 to 100% power or to automatically sequence the filters and demineralizers as necessary to support any power level from 25 to 100%.

Through normal condensate makeup and reject, the condensate storage tank water inventory is processed through the CPS. Tank water quality is maintained as required for condensate makeup to the cycle and miscellaneous condensate supply services.

The condensate purification and related support system wastes are processed by the radwaste system, as described within Chapter 11.

10.4.6.3 Evaluation

The CPS does not perform, ensure or support any safety-related function.

The CPS removes condensate system corrosion products and impurities resulting from condenser tube leakage in addition to some radioactive material, activated corrosion products and fission products that are carried-over from the reactor. The concentration of such radioactive material in the CPS requires shielding (see Chapter 12). Wastes from the condensate purification system are collected in controlled areas and sent to the radwaste system for treatment and/or disposal. Chapter 11 describes the activity level and removal of radioactive material from the condensate system.

Chemistry threshold limits and administrative actions are established to mitigate chemistry excursions in the condensate system. The COL Applicant will provide threshold values and recommended operator actions for chemistry excursions in the condensate system (COL 10.4-1-A).

~~The CPS complies with Regulatory Guide 1.56.~~The Condensate Purification System is designed to enable unit operation within the guidelines of EPRI's "BWRVIP-130: BWR Vessel and Internals Project BWR Water Chemistry Guidelines."

The CPS and related support facilities are located in nonsafety-related buildings. Potential CPS equipment or piping failures do not adversely affect safety-related equipment or structures.

10.4.6.4 Tests and Inspections

Preoperational tests are performed on the CPS to ensure operability, reliability, and integrity of the system. Each filter and demineralizer vessel can be isolated during normal plant operation to permit testing and maintenance.

10.4.6.5 Instrumentation Applications

Conductivity elements are provided for the system influent and for each demineralizer vessel effluent and monitored at the local control panel or in the main control room. System influent conductivity elements detect condenser leakage and demineralizer effluent conductivity elements provide indication of resin exhaustion. The demineralizer effluent conductivity elements also monitor the quality of the condensate that is recycled through a standby vessel before it is returned to service. Differential pressure is monitored across each filter vessel, demineralizer vessel and discharge resin strainer to detect blockage of flow. The flow through each demineralizer is monitored and used as control input to assure even distribution of condensate

9.3 PROCESS AUXILIARIES

9.3.1 Compressed Air Systems

Compressed air systems include the Instrument Air System (IAS), the Service Air System (SAS), the Containment Inerting System (CIS) and the High Pressure Nitrogen Supply System (HPNSS). The IAS is discussed in Subsection 9.3.6; the SAS is discussed in Subsection 9.3.7. The Containment Inerting System is described in Subsection 6.2.5.2 and the HPNSS is described in Subsection 9.3.8. The CIS and the HPNSS provide nitrogen gas for instruments and valve operators within the inerted containment. Compressed air operated components having safety-related or Regulatory Treatment of Non-Safety Systems (RTNSS) required functions, either have safety-related accumulators or are fail-safe and do not rely on any of the compressed air systems to perform these functions.

9.3.2 Process Sampling System

9.3.2.1 Design Bases

Safety (10 CFR 50.2) Design Bases

The Process Sampling System (PSS) does not perform or ensure any safety-related function. Therefore, this system has no safety-related design basis. The post-accident monitoring program uses sample point parameters and key sample locations as described in this Subsection and Subsections 7.5.1 and 7.5.2. This subsection addresses applicable requirements of General Design Criteria relative to PSS as discussed in Standard Review Plan Section 9.3.2.II.

PSS is in conformance with the relevant requirements and criteria stipulated in the codes and standards identified below:

- 10 CFR 20 & 20.1101(b);
- 10 CFR 50, Appendix A, GDC 1, 2, 13, 14, 26, 41, 60, 63, and 64;
- 10 CFR 50.34(f)(2)(viii) and 50.34(2)(xxvi);
- Regulatory Guides (RG) 1.21, 1.26, 1.29, 1.33, 1.56, 1.97, and 8.8;
- NUREG-0737, Item II.B.3; ~~and~~
- ANSI/HPS N13.1~~.~~;and
- EPRI BWRVIP-130: BWR Vessel and Internals Project BWR Water Chemistry Guidelines.

Power Generation Design Bases

The Process Sampling System (PSS) collects representative liquid and gaseous samples for analysis and provides the analytical information required to monitor plant and equipment performance and changes to operating parameters.

The PSS is designed to function during all plant operational modes under individual system requirements. Design guidelines related to PSS capabilities, the attainment of representative samples, and safety are described in the following paragraphs and in Table 9.3-1.

9.3.2.6 COL Information

9.3.2-1-A Post-Accident Sampling Program

The COL applicant shall develop a post-accident sampling program to monitor, as a minimum, the parameters delineated in Table 9.3-1 and SRP 9.3.2.

9.3.2.7 References

9.3.2-1 NUREG 0800, Standard Review Plan, Section 9.3.2.II, "Process and Post-Accident Sampling Systems."

9.3.2-2 Regulatory Guide 1.21, "Measuring and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants."

9.3.2-3 Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants."

9.3.2-4 Regulatory Guide 1.29, "Seismic Design Classification."

9.3.2-5 Regulatory Guide 1.33, "Quality Assurance Program Requirements."

9.3.2-6 Regulatory Guide 1.56, "Maintenance of Water Purity in Boiling Water Reactors."

9.3.2-7 Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident."

9.3.2-8 Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable."

9.3.2-9 ANSI/HPS N13.1, "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities."

9.3.2-10 ASME B31.1, Power Piping.

9.3.2-11 EPRI TR-1008192, "BWRVIP-130: BWR Vessel and Internals Project BWR Water Chemistry Guidelines."

9.3.3 Equipment and Floor Drain System

The Equipment and Floor Drain System (EFDS) consists of the Clean (nonradioactive) Drain Subsystem and the following five potentially contaminated subsystems:

- Low Conductivity Waste (LCW) Drain Subsystem;
- High Conductivity Waste (HCW) Drain Subsystem;
- Detergent Drain Subsystem;
- Chemical Waste Drain Subsystem; and
- Reactor Component Cooling Water System (RCCWS) Drain Subsystem.

These five subsystems collect liquid drainage from various plant areas and transfer them to the radwaste system.

Table 1.9-22

Industrial Codes and Standards[2] Applicable to ESBWR

Code or Standard Number	Year	Title
NSAC-202L	1999	Recommendations for an Effective Flow-Accelerated Corrosion Program, Revision 2
TR-100082	1991	Standardization of Cumulative Absolute Velocity
TR-1008192	2004	BWRVIP-130: BWR Vessel and Internals Project BWR Water Chemistry Guidelines
TR-102323	2004	Guidelines for Electromagnetic Interference Testing on Power Plants, Rev. 3
~~TR-103515-R2~~	~~2000~~	~~BWR Water Chemistry Guidelines~~
TR-106439	1996	Guidelines on Evaluation and Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Applications
URD	1997	Advanced Light Water Reactor Utility Requirements Document, Volume III, Revision 6, May 1997 and Volume II, Chapter 1 Appendix A, PRA Key Assumptions and Groundrules", Revision 6, December 1993.
Electronic Components Assemblies Materials Association (ECA)		
310-D-92	1992	Cabinets, Racks, Panels, and Associated Equipment
405-72	1972 (R 1979)	Recommended Test Methods for Flutter Measurement of Instrumentation Magnetic Tape Recorder/Reproducers
Electronic Industries Alliance (EIA)		
EIA-RS-160-51	1951	Sound Systems (Also under CEA)
TIA-204-D-89	1989	Minimum Standard for Land Mobile Communications, FM or PM Receivers, 25-866 MHz
220-B-88	1988	Minimum Standards for Land Mobile Communications Continuous Tone-Controlled Squelch Systems (CTCSS)
276-A-80	1980	Dynamic Loudspeakers Acceptance Testing (Also under CEA)
278-B-76	1976	Mounting Dimensions for Loudspeakers (Also under CEA)
299-A-68	1968 (R 1975)	Loudspeakers, Dynamic, Magnetic Structures and Impedance (Also under CEA)
310-D-92	1992	Racks, Panels, and Associated Equipment (Also under ECA)
TIA-316-C-90	1990	Minimum Standards for Portable/Personal Radio Transmitters, Receivers, and Transmitter/Receiver Combinations, Land Mobile Communications FM or PM Equipment, 25-1000 MHz
374-A-02	2002	Land Mobile Signaling Standard (Also under TIA)
405-72	1972 (R 1979)	Flutter Measurement for Instrumentation Magnetic Tape Recorders/Reproducers (Also under CEA)
422-B	1994 (R 2000)	Electrical Characteristics of Balanced Voltage Digital Interface Circuits (Also under TIA as TIA/EIA-422-B-94)