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Subject: **Response to Portion of NRC Request for Additional Information
Letter No. 97 – Related to ESBWR Design Certification Application –
RAI Numbers 14.2-81 through 14.2-88**

Enclosure 1 contains GEH's response to the subject NRC RAIs transmitted via the Reference 1 letter.

If you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,



James C. Kinsey
Project Manager, ESBWR Licensing

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NRO

Reference:

1. MFN 07-292, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 97 Related to the ESBWR Design Certification Application*, May 10, 2007

Enclosures:

1. MFN 07-411 – Response to Portion of NRC Request for Additional Information Letter No. 97 – Related to ESBWR Design Certification Application – RAI Numbers 14.2-81 through 14.2-88
2. MFN 07-411 – Response to Portion of NRC Request for Additional Information Letter No. 97 – Related to ESBWR Design Certification Application – RAI Numbers 14.2-81 through 14.2-88 – DCD Tier 2 Markup Pages

cc: AE Cabbage USNRC (with enclosures)
DH Hinds GHNEA Wilmington (with enclosures)
BE Brown GHNEA Wilmington (with enclosures)
eDRF 0000-0070-2566 and 0000-0071-8164

Enclosure 1

MFN 07-411

Response to Portion of NRC Request for

Additional Information Letter No. 97

Related to ESBWR Design Certification Application

RAI Numbers 14.2-81 through 14.2-88

NRC RAI 14.2-81

Address how field engineering design changes will be documented and reflected in the conduct of field tests and test acceptance criteria.

A review of DCD Tier 2, Rev. 3, Section 14.2.1 indicates that the objectives of construction tests do not consider the possibility of field engineering changes to SSC and do not identify how such changes will be documented and reflected in the conduct of field tests and test acceptance criteria. Accordingly, update the DCD to include a description of the process that will be used to address how field engineering design changes to SSC will be documented and reflected in the conduct of initial tests to ensure that the plant will be built and will operate in accordance with the design certification and comply with NRC regulations.

GEH Response

The process of controlling and resolving problems encountered during plant testing phases is to be controlled by the quality process described in the Quality Assurance Program Document (QAPD) established by the COL applicant and maintained by the COL holder. Problems uncovered in testing will be tied to the QAPD through a link in the startup administration manual and will be added to the list of the items this manual will provide.

DCD Impact

A change is to be made in Tier 2 DCD by adding an additional bullet to the content requirements of the startup administration manual. Specifically this statement will read:

“Identifies the quality process to be used to control the resolution of test failures, deficiencies and oversights discovered in the ITP. This program will address the control of any plant modifications required to resolve these deficiencies.”

The statement will reside under the other six requirements shown for the startup administration manual. These requirements were located in subsection 14.2.9.1 but are being relocated to subsection 14.2.2.1 under the topic title - Startup Administration Manual.

DCD markup pages are shown in enclosure 2.

NRC RAI 14.2-82

Objectives of pre-operational tests do not consider operational programs and procedures. A review of DCD Tier 2, Rev. 3, Section 14.2.1 indicates that the objectives of pre-operational tests do not consider operational programs and procedures as prerequisites before fuel loading and do not identify when such programs need to be approved and in place. In the context of controlling and monitoring radioactive effluents, the programs include the Radiological Effluent Technical Specifications (RETS) or Standard Radiological Effluent Controls (SREC), Offsite Dose Calculation Manual

(ODCM), Process Control Program (PCP), and Radiological Environmental Monitoring Program (REMP). Accordingly, update the DCD to identify these program documents and state when such documents must be approved and operationally ready for the conduct of pre-operational tests for all associated systems as prerequisites before fuel loading.

GEH Response

In response to RAI 11.5-47, GEH prepared a revision to DCD Tier 2 to require the COL applicant to fully describe the listed operational programs. Furthermore, the COL information item in DCD Revision 3, Subsection 13.4.1 requires implementation milestones. RAI 11.5-47 and the response are provided below for clarity. COL applicant item 11.5.7.2 states the COL applicant will develop an ODCM that will include programs for monitoring and controlling the release of radioactive material to the environment.

For historical purposes, the original text of RAI 11.5-47 and the GEH responses are included. The attachments are not included from the original response to avoid confusion.

“NRC RAI 11.5-47

In DCD Rev. 3, Chapter 11, GE identified COL holder items encompassing Operational Program including: Offsite Dose Calculation Manual (ODCM), Process Control Program (PCP), Radiological Environmental Monitoring Program (REMP), radiological effluent technical specifications (RETS), and standard radiological effluent controls (SREC). In accordance with SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria," dated October 28, 2005, COL applicants should fully describe these operational programs in their COL application and should propose implementation milestones (license conditions) for staff review. Accordingly, revise the DCD to include COL applicant items rather than COL holder items for these operations programs.

GEH Response

GEH is globally changing the COL holder items to COL Applicant items in DCD Tier 2, Revision 4.

DCD Tier 2, Subsections 11.5.4.5, 11.5.4.6, 11.5.4.7, 11.5.4.8, and various paragraphs of Subsection 11.5.7 will be updated to show COL Applicant.”

DCD Impact

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

NRC RAI 14.2-83

DCD Section 14.2.8.1.15, scope of the preoperational test is incomplete. A review of DCD Tier 2, Rev. 3, Section 14.2.8.1.15 indicates that the scope of pre-operational tests is incomplete. In its description, the test only refers to plant water systems and does not identify plant systems designed to process and treat gaseous process and effluent streams. Accordingly, update the DCD to include in the scope of initial tests of systems that are designed to handle and treat liquid and gaseous process and effluent streams. Without this updated information, the staff cannot perform its evaluation and conclude, with reasonable assurance, that initial tests cover all systems and confirm that all design commitments have been fulfilled and that the plant will be built and will operate in accordance with the design certification.

GEH Response

DCD Subsection 14.2.8.1.15, Process Sampling System Preoperational Test, does not address liquid or gaseous waste processing. The preoperational tests for the systems designed to handle and treat liquid and gaseous process and effluent streams are described in the following subsections of the DCD.

14.2.8.1.40: Radioactive liquid drainage and transfer systems

14.2.8.1.48: Offgas system

14.2.8.1.62: Liquid and solid radwaste systems

DCD Impact

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

NRC RAI 14.2-84

DCD Section 14.2.8.1.16, purpose of pre-operational tests is incomplete. A review of DCD Tier 2, Rev. 3, Section 14.2.8.1.16 indicates that the purpose of pre-operational tests is incomplete. In its description, the test only refers to process steams, and does not include liquid and gaseous effluent streams. In addition, the listing of integrated subsystem tests fails to include a confirmation of the proper operation of remote control panels, including local audio visual alarms upon instrument trip responses and downscale or inoperative instrument conditions. Accordingly, update the DCD to include initial tests for liquid and gaseous effluent streams and update the scope of integrated subsystem tests to include the proper operation of all remote control panels.

GEH Response

DCD Subsection 14.2.8.1.16, Process Radiation Monitoring System Preoperational Test, does not address liquid or gaseous effluent streams. The preoperational tests for the systems designed to handle and treat liquid and gaseous process and effluent streams are described in the following subsections of the DCD.

- 14.2.8.1.40: Radioactive liquid drainage and transfer systems
- 14.2.8.1.48: Offgas system
- 14.2.8.1.62: Liquid and solid radwaste systems

These tests include demonstration of the proper operation of the equipment controls and logic and proper functioning of the instrumentation and alarms used to monitor system operation and status.

DCD Impact

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

NRC RAI 14.2-85

DCD Section 14.2.8.1.40, scope of pre-operational tests is incomplete. A review of DCD Tier 2, Rev. 3, Section 14.2.8.1.16 indicates that the scope of pre-operational tests is incomplete. In its description, the scope does not describe how the installation and operation of mobile waste processing systems will be integrated in the tests. Address the following as they relate to pre-operational tests for systems described in Sections 11.2 and 11.4 of the DCD:

- (A) Given that the processing of radioactive wastes relies on a combination of permanently installed plant systems and mobile waste treatment systems, the tests should consider operational interfaces between plant systems and mobile treatment systems and characteristics. Please discuss how these interfaces will be confirmed.*
- (B) Provide definitions of tests and acceptance criteria, as they relate to the interface with the LWMS in controlling and monitoring liquid effluent releases described in DCD Sections 11.2 and 11.4.*
- (C) Describe types and initial quantities of filtration and adsorbent media placed in components of permanently installed and mobile waste treatment systems described DCD Chapters 11.2 and 11.4.*
- (D) Describe the process that will be used to confirm that the performance characteristics of the selected filtration and adsorbent media used for waste treatment will meet or exceed radioactivity or radionuclide decontamination factors or removal efficiencies described in DCD Sections 11.4 and 11.2 in complying with Part 20 effluent concentration and dose limits and Part 50 Appendix I dose objectives. Accordingly, update the DCD to include the conduct of initial tests in confirming the proper installation and operation of mobile liquid waste treatment systems and overall performance in controlling releases of radioactive materials in liquid effluent streams, as stated in DCD Sections 11.2 and 11.4.*

GEH Response

(A) DCD Subsection 14.2.8.1.62 "Prerequisites", states, the construction tests have been successfully completed. Included in the construction tests are individual component tests. Interfaces between LWMS and mobile systems will be included in these tests. The mobile equipment is designed to the requirements of Regulatory Guide 1.143, which insures all mobile equipment has the same standard of design as the LWMS. As stated in the RAI, the solid and liquid radwaste process relies on both permanently installed plant systems and mobile waste treatment systems. The preoperational testing described in DCD Subsection 14.2.8.1.62 addresses both liquid and solid radwaste systems. Test requirements include:

- Acceptable system and component flow paths and flow rates, including pump capacities and tank volumes
- Proper operation of equipment controls and logic, including prohibit and permissive interlocks
- Proper functioning of instrumentation and alarms used to monitor system operation and status,

These tests could not be successfully completed if the plant systems and the mobile waste treatment systems were not interfacing as designed.

- (B) The mobile systems are designed in accordance with Regulatory Guide 1.143 and installation of the systems will follow quality assurance requirements to ensure that the installation follows the design requirements. Controlling and monitoring effluent release is described in Subsection 14.2.8.1.62 which states proper operation of equipment protective features and automatic isolation functions, including those for ventilation systems and liquid effluent pathways; and proper functioning of instrumentation and alarms used to monitor system operation and status is verified. GEH response to RAI 11.5-23, MFN 07-030, dated 4/10/07, revised DCD Subsection 11.5.7.2 to require the COL applicant to provide programmatic details, ODCM, for monitoring and controlling the release of radioactive material to the environment.
- (C) GEH response to RAI 11.2.3-1 Supplement No. 1, MFN 07-371, dated 7/13/07, changed DCD Table 11.2-3 to require filtration and adsorbent media meet or exceed the decontamination factors listed.
- (D) GEH response to RAI 11.2.3-1 Supplement No. 1, MFN 07-371, dated 7/13/07, changed DCD Table 11.2-3 to require filtration and adsorbent media meet or exceed the decontamination factors listed.

DCD Impact

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

NRC RAI 14.2-86

DCD Section 14.2.8.1.48, scope of pre-operational tests is incomplete. A review of DCD Tier 2, Rev. 3, Section 14.2.8.1.48 indicates that the scope of pre-operational tests is incomplete as they do not describe the process that will be used in confirming the proper selection and performance characteristics of the media to treat gaseous process, waste, and effluent streams. Address the following as they relate to the selection and installation of adsorbent media used to treat radioactive gaseous, process, waste, and effluent streams:

- (A) Describe the type and initial quantities of adsorbent media that will be placed in the guard and main charcoal beds described DCD Section 11.3.*
- (B) Describe the process that will be used to confirm that the performance characteristics of the selected adsorbent media will meet or exceed radioactivity or radionuclide decontamination factors, removal efficiencies, or holding times described in DCD Section 11.3 in complying with Part 20 effluent concentration and dose limits and Part 50, Appendix I dose objectives. Accordingly, update the DCD to include descriptions of initial tests addressing the proper installation of adsorbent media.*

GEH Response

DCD Subsection 11.3.2.1, "Adsorption" provides design criteria for the charcoal media such as vendor tests of charcoal for krypton and xenon adsorption. During the preoperational test phase a prerequisite to offgas testing is verification that the correct amount of charcoal has been loaded in the absorber beds and that the charcoal that is being used meets the requirements for charcoal described in DCD Subsection 11.3.2.1. Offgas performance can only be confirmed during startup testing when there are radionuclides in the waste stream. The startup test for the offgas system is described in DCD Subsection 14.2.8.2.29. Subsection 14.2.8.2.1 describes the samples taken to verify offgas performance.

- (A) The adsorbent media for the guard and charcoal beds is described in DCD Table 11.3-1. The charcoal mass is no less than 33,000 lbs for the guard beds and 490,000 lbs for the charcoal beds. The guard and charcoal beds are sized to process three times the source term without affecting delay time of the noble gases (30-minute), DCD Subsection 11.3.1.
- (B) DCD Subsection 14.2.8.2.29 describes the startup testing of the offgas system. The performance of the charcoal adsorbers is tested to verify that the radioactivity effluents meet the technical specification limits. COL applicant item 11.5.7.2 states the COL applicant will develop an ODCM that will include programs for monitoring and controlling the release of radioactive material to the environment.

DCD Impact

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

NRC RAI 14.2-87

DCD Section 14.2.8.1.62, scope of pre-operational tests is incomplete. A review of DCD Tier 2, Rev. 3, Section 14.2.8.1.62 indicates that the scope of pre-operational tests for the liquid and solid radioactive waste systems are incomplete. See applicable comments noted in RAI 14.2-85 above.

GEH Response

See GEH response to RAI 14.2-85.

DCD Impact

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

NRC RAI 14.2-88

DCD Section 14.2.8.2.1, prerequisites for startup tests is incomplete. A review of DCD Tier 2, Rev. 3, Section 14.2.8.2.1 indicates that the prerequisites for the startup tests is incomplete as they do not identify necessary operational programs and procedures providing the means perform radiological and radio-chemical measurements in assessing the performance of permanently installed plant systems and mobile waste treatment system used to control and monitor radioactive effluents. The relevant programs include the Radiological Effluent Technical Specifications (RETS) or Standard Radiological Effluent Controls (SREC), and the Offsite Dose Calculation Manual (ODCM). Accordingly, update the DCD to identify these program documents and state when such documents must be approved and operationally ready for the conduct of startup tests for all associated systems. The discussion noting that radioactivity levels in gaseous and liquid effluents must conform to license limitations, the discussion should more appropriately refer to license conditions instead and the requirements of 10 CFR Parts 20.1301 and 20.1302 in complying with dose limits for members of the public in unrestricted areas, Part 20, Appendix B, Table 2, effluent concentration limits, and 10 CFR Part 50, Appendix I dose objectives.

GEH Response

See GEH response to RAI 14.2-82.

DCD Impact

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

Enclosure 2

MFN 07-411

Response to Portion of NRC Request for

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Related to ESBWR Design Certification Application

RAI Numbers 14.2-81 through 14.2-88

DCD Markup Pages

Interrelationships and Interfaces

Effective coordination between the various site organizations involved in the test program is achieved through the SCG, which is composed of representatives of the plant owner/operator, GEEN, and others. The duties of the SCG are to review and approve project testing schedules and to effect timely changes to construction or testing in order to facilitate execution of the preoperational and initial startup test programs.

14.2.2 Startup Admin Manual/ Test Procedures/ Program/ Results/ Reports

14.2.2.1 Startup Administration Manual

A Startup Administration Manual is developed and made available to the NRC 60 days prior to the scheduled start of the Preoperational Test program. This manual:

- Describes the responsibilities of the organization that will carry out the test program, methods and plans for providing the necessary manpower, and a description of the staff responsibilities, authorities and personnel qualifications for conducting the ITP.
- Delineates the development, review and approval of test procedures per Appendix C of RG 1.68. These site approved test procedures are to be made available approximately 60 days before their intended use.
- Delineates utilization of reactor operating and testing experience in the development of the test procedures.
- Requires the development of plant operating and emergency procedures prior to fuel loading, and their application during the test program, consistent with section C.7 of RG 1.68.
- Defines requirements for the test program schedule consistent with section C.5 of RG 1.68 and the test sequence, consistent with sections 1 through 5 in Appendix A of RG 1.68.
- Defines requirements for the test methodology, prerequisites, initial conditions, acceptance criteria, and analysis techniques consistent with RG 1.68.
- Identifies the quality process to be used to control the resolution of test failures, deficiencies and oversights discovered in the ITP. This program will address the control of any plant modifications required to resolve these deficiencies.

Regulatory Guide 1.68 specifies criteria (see Regulatory Position C.1) for determining what structures, systems, components and design features are required to be tested during the power ascension test phase in accordance with the requirements therein. Testing of such structures, systems, components and design features is then subject to license conditions requiring NRC prior approval for major test changes.

14.2.2.2 Test Procedures

In general, testing during the ITP is conducted using detailed, step-by-step written procedures to control the conduct of each test. These specifically include safety precautions and limits as needed for the test to supplement those in the normal operating procedure. Such test procedures:

- Specify testing prerequisites,
- Describe desired initial conditions,
- Include appropriate methods to direct and control test performance (including the sequencing of testing),
- Specify acceptance criteria by which the test is to be evaluated, and
- Provide for or specify the format by which data or observations are to be recorded.

The procedures are developed and reviewed by personnel with appropriate technical backgrounds and experience. This includes the participation of principal design organizations (including GEEN) to establish test performance requirements and acceptance criteria. Specifically, GEEN provides the COL ~~licenseholder~~ with scoping documents (that is, plant preoperational and startup test specifications) containing testing objectives and acceptance criteria applicable to the plant design. Such documents shall also include, as appropriate, delineation of specific plant operational conditions at which tests are to be conducted, testing methodologies to be utilized, specific data to be collected, and acceptable data reduction techniques. Available information on operating and testing experiences of operating power reactors is factored into test procedures as appropriate. Test procedures are reviewed by the SCG and receive final approval by designated plant management personnel. Approved test procedures for satisfying the commitments of this chapter are made available approximately 60 days prior to their intended use for preoperational tests and 60 days prior to scheduled fuel loading for power ascension tests.

14.2.2.3 Conduct of Test Program

The startup group conducts the ITP in accordance with the startup administrative manual. This manual contains the administrative procedures and requirements that govern the activities of the startup group and their interface with other organizations. The startup administrative manual receives the same level of review and approval, as do other plant administrative procedures. It defines the specific format and content of preoperational and startup test procedures, as well as the review and approval process for both initial procedures and subsequent revisions or changes. The startup administrative manual also specifies the process for review and approval of test results and for resolution of failures to meet acceptance criteria and of other operational problems or design deficiencies noted. It describes the various phases of the ITP and establishes the requirements for progressing from one phase to the next, as well as those for moving beyond selected holdpoints or milestones within a given phase. It also describes the controls in place that assure the as-tested status of each system is known and that track modifications, including retest requirements, deemed necessary for systems undergoing or already having completed specified testing. Additionally, the startup administrative manual delineates the qualifications and responsibilities of the different positions within the startup group. The startup administrative

manual is intended to supplement normal plant administrative procedures by addressing those concerns that are unique to the startup program or that are best approached in a different manner. To avoid confusion, the startup program attempts to be consistent with normal plant procedure where practical. The plant staff typically performs their duties according to normal plant procedures. However, in areas of potential conflict with the goals of the startup program, the startup administrative manual or the individual test procedures address the required interface.

14.2.2.4 Review, Evaluation, and Approval of Test Results

Individual test results are evaluated and reviewed by members of the startup group. Test exceptions or acceptance criteria violations are communicated to the affected and responsible organizations who help resolve the issues by suggesting corrective actions, design modifications, and retests. GEEN and others outside the plant staff organization, as appropriate, have the opportunity to review the results for conformance to predications and expectations. Test results, including final resolutions, are then reviewed and approved by designated startup group supervisory personnel. Final approval is obtained from the SCG and the appropriate level of plant management as defined in the startup administrative manual. The SCG and the designated level of plant management also have responsibility for final review and approval of overall test phase results and of that for selected milestones or hold-points within the test phases.

14.2.2.5 Test Records

Initial test program results are compiled and maintained according to the startup manual, plant administrative procedures, and applicable regulatory requirements. Test records that demonstrate the adequacy of Safety-Related components, systems and structures shall be retained for the life of the plant. Retention periods for other test records are based on consideration of their usefulness in documenting initial plant performance characteristics.

14.2.3 Test Program's Conformance with Regulatory Guides

The development of the ITP uses NRC Regulatory Guides listed below (see compliance section 1.8):

- Regulatory Guide 1.68 — “Initial Test Programs for Water-Cooled Nuclear Power Plants;”
- Regulatory Guide 1.68.1 — “Preoperational and Initial Startup Testing of Feedwater and Condensate Systems for Boiling Water Reactor Power Plants;”
- Regulatory Guide 1.68.2 — “Initial Startup Test Program to Demonstrate Remote Shutdown Capability for Water-Cooled Nuclear Power Plants;”
- Regulatory Guide 1.68.3 — “Preoperational Testing of Instrument and Control Air Systems;”
- Regulatory Guide 1.20 — “Comprehensive Vibration Assessment Program for Reactor Internals During Preoperation and Initial Startup Testing;”
- Regulatory Guide 1.41 — “Preoperational Testing of Redundant Onsite Electric Power Systems to Verify Proper Load Group Assignments;”
- Regulatory Guide 1.56 — “Maintenance of Water Purity in Boiling Water Reactors;”