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Subject: Response to Portion of NRC Request for Additional
Information Letter No. 134 - Related to ESBWR Design
Certification Application – RAI Number 14.2-96

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 the Reference 1 NRC letter. GEH response to RAI Number 14.2-96 is addressed in Enclosures 1 and 2.

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box. The marked-up pages may contain unverified changes in addition to the verified changes resulting from this RAI response. Other changes shown in the markups may not be fully developed and approved for inclusion in DCD Revision 5.

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

Sincerely,

R. E. Brown for

James C. Kinsey
Vice President, ESBWR Licensing

*DC68
HRO*

Reference:

1. MFN 08-033, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 134 Related to the ESBWR Design Certification Application*, dated January 14, 2008

Enclosures:

1. MFN 08-230 – Response to Portion of NRC Request for Additional Information Letter No. 134 - Related to ESBWR Design Certification Application – RAI Number 14.2-96
2. MFN 08-230 – Response to Portion of NRC Request for Additional Information Letter No. 134 - Related to ESBWR Design Certification Application – DCD Markups from the Response to RAI Number 14.2-96

cc: AE Cabbage USNRC (with enclosure)
GB Stramback GEH/San Jose (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
DH Hinds GEH/Wilmington (with enclosure)
eDRF 0000-0080-5819

Enclosure 1

MFN 08-230

Response to NRC Request for

Additional Information Letter No. 134

Related to ESBWR Design Certification Application

RAI Number 14.2-96

NRC RAI 14.2-96

DCD Tier 2, Revision 4, Section 14.2.8.2.1 reveals incomplete descriptions of the scope of filter performance associated with radiochemical measurements.

DCD Tier 2, Revision 4, Section 14.2.8.2.1 reveals incomplete descriptions of the scope of filter performance associated with radiochemical measurements. Specifically, Section 14.2.8.2.1 does not include charcoal media and should clarify that filters include "HEPA" filters used for the purpose of controlling airborne radioactive effluent discharges. In addition, the description should include filters and strainers and reverse osmosis sub-processing system used to process liquid effluents. Accordingly, revise DCD Tier 2, Section 14.2.8.2.1 (Description) to include HEPA filters, charcoal media, filters and strainers, and reverse osmosis subsystems in the discussion about performance.

GEH Response

A review of the test described in Subsection 14.2.8.2.1 against the requested changes has been performed. The current "Purpose" description only discusses chemistry and radiochemistry of the reactor coolant. We agree this needs to be extended to include gaseous process streams so that we can make assessments of fuel performance. This is specifically to determine if there is any evidence of fuel leakage of fission product radioisotopes into the coolant.

The purpose of testing described in Subsection 14.2.8.2.1 is primarily for the chemistry and radiochemistry of the reactor coolant. Therefore, testing is concentrated on the operation of the Condensate Purification System (CPS) filters and demineralizers to provide high quality Condensate and Feedwater and the Reactor Water Cleanup (RWCU) system to maintain reactor coolant quality. The test purpose is not to determine the efficiency of charcoal media nor of HEPA filters in either liquid or gaseous process streams. Testing of charcoal absorbers or High Efficiency Particulate Air (HEPA) filters is done periodically by methods described in the plant's Technical Specification. Therefore it is not appropriate to add the requested details about charcoal filters or HEPA filters into Subsection 14.2.8.2.1.

The ESBWR Liquid Radwaste System will utilize a reverse osmosis process as well as activated carbon filters to treat both low and high conductivity fluids. The testing of these devices is not to be covered in Subsection 14.2.8.2.1. However they are tested in Subsection 14.2.8.1.62 Liquid and Solid Radwaste Systems Preoperational Test and the system's performance verified in the startup phase by Subsection 14.2.8.2.32 Liquid Radwaste System Performance Test. We do agree that addition of carbon filters and reverse osmosis water treatment units into Subsection 14.2.8.1.62 would be appropriate.

DCD Impact

Subsection 14.2.8.1.62 “Liquid and Solid Radwaste Systems Preoperational Test” will be modified with the addition of carbon filter and reverse osmosis water treatment units to the description of items to be tested

Subsection 14.2.8.2.1 “Chemical and Radiochemical Measurements Test” will be modified to include discussion of gaseous process streams.

Markups of these changes are shown in Enclosure 2. The specific changes based on this RAI response are shaded in gray.

Enclosure 2

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**Response to Portion of NRC Request for
Additional Information Letter No. 134**

Related to ESBWR Design Certification Application

DCD Markups from the Response to RAI Number 14.2-96

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box. The marked-up pages may contain unverified changes in addition to the verified changes resulting from this RAI response. Other changes shown in the markups may not be fully developed and approved for inclusion in DCD Revision 5.

General Test Methods and Acceptance Criteria

Performance shall be observed and recorded during a series of tests, as recommended by the manufacturer, to demonstrate the following:

- Proper calibration and response of seismic instrumentation, including verification of alarm and initiation setpoints;
- Proper operation of internal calibration or test features; and
- Proper operation of recording and playback devices.

14.2.8.1.62 Liquid and Solid Radwaste Systems Preoperational Tests***Purpose***

The objective of this test is to verify the proper operation of the various equipment and processes, which make up the liquid and solid radwaste systems.

Prerequisites

The construction tests have been successfully completed and the SCG has reviewed the test procedure(s) and approved the initiation of testing. There shall be access to appropriate laboratory facilities and an acceptable effluent discharge path shall be established. Additionally, an adequate supply of demineralized water, the electrical power, and other required interfacing systems shall be available, as needed, to support the specified testing.

General Test Methods and Acceptance Criteria

The testing described below includes that of equipment and processes for the handling, treating, storing, and preparation for the disposal or discharge of liquid and solid radwaste.

The liquid and solid radwaste systems performance shall be observed and recorded during a series of individual component and integrated system tests to demonstrate to the extent practical for the following:

- Proper operation of equipment controls and logic, including prohibit and permissive interlocks;
- Proper operation of equipment protective features and automatic isolation functions, including those for ventilation systems and liquid effluent pathways;
- Proper functioning of instrumentation and alarms used to monitor system operation and status;
- Acceptable system and component flow paths and flow rates, including pump capacities and tank volumes;
- Proper operation of system pumps, valves, and motors under expected operating conditions;
- Proper operation of phase separators;
- Proper operation of concentrating and packaging functions, including verification of the absence of free liquids in packaged waste;

- Proper operation of mechanical and activated carbon filters, reverse osmosis water treatment units, and demineralizer units and their associated support facilities; and
- Proper functioning of drains and sumps, including those dedicated for handling of specific agents such as detergents.

14.2.8.1.63 Isolation Condenser System Preoperational Test

Purpose

The objective of this test is to verify that the operation of the ICS loops, including valves, logic and instrumentation is as specified.

Prerequisites

The construction tests have been successfully completed and the SCG has reviewed the test procedure and approved the initiation of testing. High-pressure nitrogen must be available to operate the spring-loaded condensate return valves, and nitrogen operated pneumatic rotary motor isolation valves. Electrical power is also required to operate valves and controls.

General Test Methods and Acceptance Criteria

Performance shall be observed and recorded during a series of individual component and integrated system tests to demonstrate the following:

- Proper calibration of instrumentation;
- Proper operation of instrumentation and equipment in appropriate design combinations of logic and instrument channel trip;
- Proper functioning of instrumentation and alarms used to monitor system operation and availability;
- Proper operation of system valves, including timing;
- Verification that the steam flow paths from the IC/PCCS pools to the atmosphere are unobstructed;
- Verification that IC steam and condensate-return piping flow passages are unobstructed;
- Proper operation of IC/PCCS pool level control;
- Verification that the IC Pool subcompartment valves are locked open;
- Proper isolation of IC containment isolation valves upon receipt of simulated isolation signals; and
- Acceptability of instrument channel response times, as measured from each applicable process variable input signal to the applicable process actuator confirmation signal.

14.2.8.1.64 Passive Containment Cooling System Preoperational Test

Purpose

The objective of this test is to verify the operation of Passive Containment Cooling Systems (PCCS) is as specified.

14.2.8.2.1 Chemical and Radiochemical Measurements Test

Purpose

The objective of this test is to secure information on the chemistry and radiochemistry of the reactor coolant and gaseous process streams while verifying that ~~the~~ sampling equipment, procedures and analytic techniques are adequate to supply the data required to demonstrate ~~that~~ the chemistry of all parts of the entire reactor system meet specifications and process requirements.

Prerequisites

The preoperational tests have been completed and plant management has reviewed the test procedures and approved the initiation of testing. For each scheduled testing iteration, the plant shall be in the appropriate operational configuration with prerequisite testing completed. Instrumentation has been checked or calibrated as appropriate.

Description

Specific objectives of the test program include evaluation of fuel performance, evaluations of demineralizer operations by direct and indirect methods, measurements of filter performance, confirmation of condenser integrity, demonstration of proper steam separator-dryer operation, and evaluation and calibration of certain process instrumentation (including that used to monitor reactor water conductivity). Data for these purposes is secured from a variety of sources such as plant operating records, regular routine coolant analysis, radiochemical measurements of specific nuclides, and special chemical tests.

Prior to fuel loading, a complete set of chemical and radiochemical samples is taken to ensure that sample stations are functioning properly, if not demonstrated during the preoperational testing, and to determine initial concentrations. Subsequent to fuel loading, during reactor heatup, and at each major power level change, samples are taken and measurements made to determine the chemical and radiochemical quality of reactor water and incoming feedwater, amount of radiolytic gas in the steam, gaseous activities leaving the air ejectors, decay times in the offgas lines, and performance of filters and demineralizers in both the CPS and RWCU systems.

Calibrations are made of monitors in effluent release paths, waste handling systems, and process lines. Proper functioning of such monitors is verified, as appropriate, including via comparison with independent laboratory or other analyses. In particular, the proper operation of failed fuel detection functions of the main steamline and offgas pretreatment process radiation monitors is verified. In this regard, sufficient data is taken to assure proper setting of, or to make needed adjustments to, the alarm and trip settings of the applicable instrumentation.

Criteria

Chemical factors defined in the Fuel Warranty Operating Limits must be maintained within the limits specified.

The activity of gaseous and liquid effluents must conform to license limitations conditions and NRC effluent concentration limits in 10 CFR 20 Appendix B Table 2.

Water quality must be known at all times and shall remain within the guidelines of the water quality specifications and the requirements of the Fuel Warranty document.