March 28, 2017

Mr. Jerald G. Head
Senior Vice President, Regulatory Affairs
GE Hitachi Nuclear Energy
3901 Castle Hayne Road MC A-18
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NUMBER 11 RELATED TO CHAPTER 6 FOR GE-HITACHI NUCLEAR ENERGY ADVANCED BOILING-WATER REACTOR DESIGN CERTIFICATION RULE RENEWAL APPLICATION

Dear Mr. Head:

By letter dated December 7, 2010, GE Hitachi Nuclear Energy submitted for approval an application to renew the Advanced Boiling-Water Reactor design certification rule pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52. The U.S. Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application to enable the staff to reach a conclusion on whether to grant the renewal application.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter. You are requested to respond within 30 days of the date of this letter.

If changes are needed to the design control document, the staff requests that the RAI response include the proposed wording changes. If you have any questions or comments concerning this matter, I can be reached at 301-415-4093 or by e-mail at adrian.muniz@nrc.gov.

Sincerely,

/RA/

Adrian Muñiz, Project Manager
Licensing Branch 3
Division of New Reactor Licensing
Office of New Reactors

Docket No.: 052-45

eRAI Tracking No. 8733

Enclosure: Request for Additional Information

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NUMBER 11 RELATED TO CHAPTER 6 FOR GE-HITACHI NUCLEAR ENERGY ADVANCED BOILING-WATER REACTOR DESIGN CERTIFICATION RULE RENEWAL APPLICATION DATED March 28, 2017

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ADAMS Accession No.: ML17087A290 **NRO-002**

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***Approval captured electronically in the electronic RAI system. **via e-mail**

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Request for Additional Information 11
Application Title: GEH ABWR DC Renewal
Operating Company: GEH
Docket No. 52-045
Review Section: 06.03 - Emergency Core Cooling System

QUESTION 06.03-3

In parts B.1, B.2, and B.3 of RAI 06.03-2, the staff requested that GE Hitachi Nuclear Energy (GEH) provide a description of the use of certain materials in the Advanced Boiling Water Reactor (ABWR) containment, how the design establishes limits on the quantities of those materials, and how the materials were evaluated for chemical effects. The staff requested this information in accordance with 10 CFR 52.59(a) (2014) as part of determining if the ABWR design complies with requirements in 10 CFR 50.46(b)(5)(1997) for emergency core cooling systems (ECCS). Chemical effects may increase strainer and reactor core clogging and form deposits on the fuel.

Follow-Up Question on the response to RAI 06.03-2, Parts B.1 and B.3

The staff requested the specific information in B.1 and B.3 of RAI 06.03-2 because the quantity of a material affects the amount of corrosion product it can generate in a given time period. Limiting the amount of materials contributing to corrosion products in the pool limits the amount of corrosion that can occur and the uncertainty in the chemical effects evaluation.

Based on the latest revision to GEH's RAI response to RAI 06.03-2 dated February 23, 2017 (ADAMS Accession number ML17055C593), it is not clear to the staff how chemical effects from all of the materials are addressed. Therefore, the staff requests the following information:

1. The response to B.1.b indicates that a large surface area of zinc (galvanized steel) could be exposed to the post-loss-of-coolant accident (LOCA) water and corrode, depending on the pH, temperature, and location of the galvanized steel. The response to B.1.b also states that this zinc will not make a significant contribution to corrosion products in the suppression pool. Provide the basis for disregarding galvanized steel corrosion and the potential for corresponding zinc chemical effects. Address how the location of the galvanized steel (i.e., communication with the suppression pool), the corrosion rate predicted for the pH and temperature conditions, the solubility of zinc under the expected pool conditions, the amount and type of zinc precipitate formed in the pool, etc. were considered.

2. The response to B.1.d states that carbon steel is not a material of concern because it is not used in containment. DCD Section 6.1.1.1.2 indicates uncoated carbon and low-alloy steel is used in Engineered Safety Features components, and that corrosion is expected. If the iron in these components is released into the post-LOCA pool, describe how it was evaluated for chemical effects and the basis for concluding it would not be a concern.

3. The response to B.1.e.i refers to the steel liner plate that isolates concrete from the post-LOCA fluid. If any of the coated carbon steel liner is within the zone of influence for the coating, describe how the potential chemical effects from the exposed carbon steel were evaluated.

Follow-up Question on the response to RAI 06.03-2, Part B.2

In B.2, the staff requested the ranges and timing of pH, pool temperature, and boron concentration following a LOCA. The response stated that:

1. The pH is maintained in the range 5.3 – 8.6
2. No boron is present because the Standby Liquid Control System will not be used in a LOCA.

The staff requested the pH and temperature ranges and transients because of the effect these parameters have on corrosion and precipitation, possibly leading to chemical effects at the strainer or in the reactor core. The staff requested the boron concentration range and transient because of the effect on pH and corrosion. The staff requested the transient behavior because corrosion and precipitation can depend on the sequence of conditions favoring corrosion and precipitation. The response described why boron would not be present but did not address transient behavior of pH or temperature. Therefore the staff requests the following information:

1. Describe how the pH during the post-LOCA period is maintained in the same range as during operation. (The response to Question B.2 suggests that the Suppression Pool Cleanup System (SPCU System) maintains the pH in the range 5.3-8.6. According to DCD Section 9.5.9, the SPCU function is terminated during a LOCA.)

2. Describe the transient temperature and pH behavior during the post-LOCA period and how it was determined.

3. How do these predictions of pH account for the potential generation of strong acids (e.g., nitric and hydrochloric) from radiolysis, and subsequent reduction of pH in the pool if it is unbuffered and the SPCU System is not in use.

4. If a combined license (COL) applicant proposed using the SLC System during a LOCA, the application would need to evaluate the impact on chemical effects, ECCS strainer head loss, and downstream effects. Describe how this possibility will be addressed, for example by proposing a COL item requiring the applicant to perform this evaluation and submit the results for NRC review.