

April 20, 2015

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 5  
RELATED TO CHAPTERS 6, 7, and 19 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](mailto:adrian.muniz@nrc.gov).

Sincerely,

**/RA – J. Umana for/**

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

Docket No.: 052-45

eRAI Tracking Nos. 7658, 7797, and 7826

Enclosure: Request for Additional Information

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 5 RELATED  
TO CHAPTERS 6, 7, and 19 FOR GE-HITACHI NUCLEAR ENERGY  
ADVANCED BOILING-WATER REACTOR DESIGN CERTIFICATION RULE  
RENEWAL APPLICATION

Dear Mr. Head:

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/RA – J. Umana for/  
Adrian Muñoz, Project Manager  
Licensing Branch 3  
Division of New Reactor Licensing  
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Docket No.: 052-45  
eRAI Tracking Nos. 7658, 7797, and 7826  
Enclosure: Request for Additional Information

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**ADAMS Accession No.: ML15110A122**

**NRO-002**

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

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Letter to Jerald G. Head from Adrian Muñiz dated April 20, 2015

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NUMBER 5 RELATED  
TO CHAPTERS 6, 7, and 19 FOR GE-HITACHI NUCLEAR ENERGY  
ADVANCED BOILING-WATER REACTOR DESIGN CERTIFICATION RULE  
RENEWAL APPLICATION

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**Request for Additional Information 5**  
**Application Title: GEH ABWR DC Renewal**  
**Operating Company: GEH**  
**Docket No. 52-045**

**Review Section: 07 - Instrumentation and Controls - Overview of Review Process**

**QUESTION 07-1**

10 CFR 52.59(a) requires, in pertinent part, a finding of compliance with the regulations in effect at the time of original certification in order to issue a renewed design certification. As required by the regulations in effect at the time the ABWR DC was originally issued, the ABWR DC application must contain [t]he technical information which is required of applicants for construction permits and operating licenses by 10 CFR part 20, part 50 and its appendices, and parts 73 and 100, and which is technically relevant to the design and not site-specific." 10 CFR 52.47(a)(1)(i) (1997). In 1997, operating license Final Safety Analysis Reports (FSARs) were required to comply with 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 28, "Reactivity limits," (1997) which states, in part, "[t]he reactivity control systems shall be designed with appropriate limits on the potential amount and rate of reactivity increase to assure that the effects of postulated reactivity accidents can neither (1) result in damage to the reactor coolant pressure boundary greater than limited local yielding nor (2) sufficiently disturb the core, its support structures or other reactor pressure vessel internals to impair significantly the capability to cool the core." The NRC interprets this requirement to mean that the control rod patterns for reactor startup are to be evaluated and designed with appropriate limits to prevent large reactivity worth steps.

ABWR DCD FSAR Tier 2, Section 7.7.1.2.1(5)(b)(iii), Revision 5, states, "Groups 1-4 may only be withdrawn before groups 5 –10 are in the full-in position." If the ganged withdrawal sequence is performed as described in the FSAR section cited above, the ganged control rod sequence steps could create a potentially unsafe operating condition through inappropriate limits on the amount and rate of reactivity increase. These actions could unnecessarily challenge the reactor protection systems, and could potentially cause neutron flux levels and energy releases sufficient to disturb the core, its support structures or other reactor pressure vessel internals to impair significantly the capability to cool the core. Generally in a boiling water reactor (BWR), groups 1-4 control rods are withdrawn in significant portions of the rod travel length with each sequence step when the reactor core is far from critical and only if groups 5-10 are in the full-in position. This will not be the case if groups 5-10 are not full-in when groups 1-4 are withdrawn. Reactivity rod worth of the rods in groups 1-4 would very likely be significantly higher than when groups 5-10 are still full-in, making it more difficult for the reactor operator to control the approach to criticality and increasing the potential of challenging safety systems unnecessarily. Therefore, the ganged withdrawal sequence, as described in ABWR DCD, Tier 2, Section 7.7.1.2.1(5)(b)(iii), does not appear to comply with GDC 28 and, as currently written, appears to be contrary to generally accepted BWR operating practices. The staff notes that the language in Section 7.7.1.2.1(5)(b)(iii) may have been the result of an inadvertent error.

Therefore, in accordance with 10 CFR 52.59 (2014), 10 CFR 52.47(a)(1)(i) (1997), and 10 CFR Part 50, Appendix A, GDC 28 (1997):

1. Correct the ganged withdrawal sequence description in Section 7.7.1.2.1(5)(b)(iii) or provide a technical basis and further explanation as to why this section, as currently written, is correct and accurate.

**Request for Additional Information 5**  
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**Operating Company: GEH**  
**Docket No. 52-045**  
**Review Section: 06.02.01 - Containment Functional Design**

**QUESTION 06.02.01-1**

10 CFR 52.57(a) requires that an application for design certification renewal contain all information necessary to bring up to date the information and data contained in the previous application. The NRC staff views this requirement as including the correction of known errors.

In a letter, dated March 31, 2014, GE Hitachi Nuclear Energy (GEH) provided the U.S. Nuclear Regulatory Commission a "10 CFR Part 21.21(a)(2) 60-Day Interim Report Notification: Containment Loads Potentially Exceed Limits with High Suppression Pool Water Level in the ABWR Design" (ML14090A068) Attachment 1 to this letter states the following:

Nature of the defect or failure to comply and the safety hazard which is created or could be created by such defect or failure to comply:

ABWR hydrodynamic loads have been calculated with the Suppression Pool water level defined at the Technical Specification Suppression Pool High Water Level (HWL). The Suppression Pool level during the postulated LOCA vessel blowdown may be greater than the Suppression Pool HWL during the pertinent timeframe for hydrodynamic loads because vessel coolant inventory is transferred into the suppression pool during blowdown. Additionally, certain containment structures previously thought uncovered may be submerged with the higher Suppression Pool water level. Increased hydrodynamic loads may correspondingly increase the totals in the design load combinations for which containment structures are designed to withstand.

In a letter, dated August 29, 2014, GEH informed the NRC that "[t]he GEH assessment has concluded that the predicted increase in the suppression pool water level above the value used for defining the ABWR loads and applied in the structural analysis will not result in the creation of a Substantial Safety Hazard nor will it lead to exceeding a Technical Specification Safety Limit for the US ABWR Certified Design." (ML14241A306)

This may have implications for the GEH ABWR Design Certification (DC) renewal application. To aid the NRC staff, please determine the effect on this error on the GEH ABWR DC renewal application:

- a) Describe the impact of the error on loads on suppression pool wall boundaries, the access tunnel, and structures submerged in the suppression pool in term of loads from pool swell, condensation oscillation, chugging, and safety relief valve discharge.
- b) Identify any DCD changes, if needed.
- c) If any documents are being changed, identify them and state when they will be available for staff audit, if needed.

**Request for Additional Information 5**  
**Application Title: GEH ABWR DC Renewal**  
**Operating Company: GEH**  
**Docket No. 52-045**

**Review Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation**

**QUESTIONS:**

**19-6**

In Section 19G.2, "Scope of Assessment" of the GEH ABWR DCD Tier 2, revision 5, the applicant indicates that the spent fuel pool is not perforated. However, the applicant did not describe whether an assessment was performed to ensure no leakage through the spent fuel liner below the required minimum water level of the pool.

Therefore, the applicant is requested to state that an assessment was performed to ensure no leakage through the spent fuel liner below the required minimum water level of the pool.

**19-7**

In Section 19G.4.1, "Primary Containment" of the GEH ABWR DCD Tier 2, revision 5, the applicant concludes in the assessment that a strike upon the primary containment would not result in the perforation of the primary containment, and would not cause direct damage to the systems within the primary containment or expose them to jet fuel. However, the applicant did not describe whether the primary containment ultimate pressure capability is also maintained.

Therefore, the applicant is requested to address whether the primary containment can also maintain the ultimate pressure capability.

**19-8**

In Section 19G.4.2, "Site Arrangement and Plant Structural Design" of the GEH ABWR DCD Tier 2, revision 5, the applicant describes in Item (3) that the key design features for the reactor well shield plugs for protecting the drywell head from secondary impacts are identified in Section 3H.1.4, "Structural Design Criteria." Please provide the correct section addressing the key design features for the reactor well shield plugs for protecting the drywell head from secondary impacts.

**19-9**

In Section 19G.4.2, "Site Arrangement and Plant Structure Design," of the GEH ABWR DCD Tier 2, revision 5, the applicant describes in Items (6) and (7) that the key design features that protect the east and west walls of the Control Buildings by the location and design of the Service Building and Control Building Annex structures from the impact of a large commercial aircraft were described in Section 3H.6, "Summary of the Key Structural Design Features" and figures 1.2-20 through 1.2-22. However, the applicant did not provide any discussions of the design features in Section 3H.6 that the east and west walls of the Control Buildings are protected from the impact of a large commercial aircraft.

Therefore, the applicant is requested to provide the design features in Section 3H.6 that protect the east and west walls of the Control Buildings from the impact of a large commercial aircraft.