February 18, 2010

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 NO.409 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Head:

By letter dated August 24, 2005, GE Hitachi Nuclear Energy submitted an application for final design approval and standard design certification of the economic simplified boiling water reactor (ESBWR) standard plant design pursuant to 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 the safety of the proposed design.

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.

If you have any questions or comments concerning this matter, you may contact me at 301-415-2375 or leslie.perkins@nrc.gov, or you may contact Amy Cubbage at 301-415-2875 or amy.cubbage@nrc.gov.

Sincerely,

/RA/

Leslie Perkins, Project Manager
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-010

Enclosure:
1. Request for Additional Information

cc: See next page

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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.

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Docket No. 52-010

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1. Request for Additional Information
cc: See next page
Distribution: See next page
ADAMS ACCESSION NO. ML100480884 NRO-002

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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO.409 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION DATED FEBRUARY 18, 2010

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Requests for Additional Information (RAIs)
ESBWR Design Control Document (DCD), Revision 6

RAI Number	Reviewer	Question Summary	Full Text
10.2-18 S03	Tatum J	Turbine Generator	The June 7, 2007, response to RAI 10.2-18, S01, described the diversity that is provided by the primary and emergency overspeed trip systems for the ESBWR turbine. The response indicated that diversity is provided by the design and implementation of the primary and emergency overspeed protection controllers. Because the ESBWR design does not provide the same level of diversity as that called for by SRP Section 10.2 (i.e., one electrical and one mechanical overspeed trip device), it tends to be more subject to common cause and common mode failures than designs that include a mechanical overspeed trip device. Therefore, the following additional information is needed in order for the staff to determine if this deviation from the guidance in SRP Section 10.2 is acceptable: A. In accordance with 10 CFR 52.47(a)(9), Tier 2 Table 1.9-10 needs to be revised to indicate that a mechanical trip device is not used to provide overspeed protection for the ESBWR turbine and appropriate justification for this deviation needs to be included in Tier 2 Section 10.2. The discussion in the DCD should be sufficient for the staff to find that the level of protection provided by the overspeed protection system for the ESBWR turbine is at least equivalent to the level of protection that would be provided by the diverse design called for by SRP Section 10.2. The following items are pertinent to the staff's evaluation in this regard and should be addressed in this RAI response and reflected in the DCD as appropriate: 1) The description of the turbine overspeed protection system (including air and hydraulic systems/interfaces) need to clearly indicate what parts are shared. For example, shared air and hydraulic dump lines and components such as dump valves need to be described in the DCD.

RAI Number	Reviewer	Question Summary	Full Text
			2) A summary description of the results of a reliability comparison of the two types of overspeed trip systems (or other analysis) that establishes the basis for concluding that the proposed design is at least equivalent to those that include a diverse mechanical overspeed trip device. 3) Factors and assumptions that are important for the analysis referred to in (2) to be valid should be described and COL action items should be established as appropriate to ensure that these considerations are properly implemented and maintained. For example, the amount of time that either the primary or emergency overspeed trip system can be out of service for maintenance is an important factor. Assumptions that periodic inspections, maintenance, testing, and corrective actions will be properly implemented in accordance with GEH and other vendor recommendations in order to ensure reliable performance is another important factor. 4) Common mode and common cause failure considerations that could prevent the overspeed trip systems from functioning properly and are pertinent to the design should be addressed. For example, the performance of solenoid valves, steam isolation valves, hydraulic systems and air systems have historically been problematic in this regard. Also, the potential for flow restrictions to occur in hydraulic or air system dump lines is of concern (especially in those cases where redundant flow paths are not provided) and need to be addressed. Design and programmatic measures that provide assurance that these common mode and common cause failures are not likely to occur should be described and means to ensure proper implementation by COL applicants should be established as appropriate. **[Note that the proposed DCD markup on the top of Page 10.2-8 needs to include provisions for the extraction non-return valves, and the**

RAI Number	Reviewer	Question Summary	Full Text
			"augmented inspection program" referred to on Page 10.2-10 needs to be explained (e.g., where is this augmented inspection program specified, the turbine missile probability analysis does not include specific inspection and test requirements for the extraction non-return valves.)] • The use of certain materials that are not subject to corrosion, conditioning equipment, desiccants, filters and design standards are examples of design considerations that may be pertinent for addressing common mode and common cause failures. • Implementation of periodic inspections, maintenance, testing, and corrective actions are examples of programmatic controls that may be applicable for assuring that common mode and common cause failures are prevented from occurring. For example, measures that assure the reliable performance of components and the quality of hydraulic and air systems are pertinent in this regard. 5. Failure of extraction non-return valves to function will tend to increase the probability of turbine overspeed and this is an important consideration in the turbine missile probability analysis that must be completed by COL applicants. Therefore, provisions need to be established and included in the DCD to ensure that COL applicants will properly model the failure of extraction non-return valves in the turbine missile probability analysis accordingly. B. In addition to the explanations and clarifications called for in (a), the staff found that some of the information that pertains to the overspeed trip system for the ESBWR turbine is confusing or incomplete and needs to be clarified. Unless otherwise indicated, the following items pertain to the description in Tier 2 Section 10.2:

RAI Number	Reviewer	Question Summary	Full Text
			1) The description of what valves are actuated by the primary and emergency trip systems seems to indicate in some places that only the turbine stop and intermediate stop valves are actuated and in other places the description indicates that all steam admission valves, including extraction non-return valves, are actuated. 2) With respect to the extraction non-return valves: the types of valves used, where they are located, locations where two valves are needed to address single failure considerations, and provisions to ensure the capability of the extraction non-return valves and associated air system to perform their isolation function (periodic inspection, test, maintenance and corrective actions) are not adequately described. 3) There is no explanation for how valve closure times and seat leakage are confirmed and maintained over time for the turbine steam isolation valves, including the extraction non-return valves. 4) No provisions were found (either in the DCD or in GEH recommendations provided in the Turbine Missile Generation Probability Analysis) that ensure that the local turbine overspeed trip device is periodically tested and maintained. 5) While the description indicates that a “voting” process is used by the primary overspeed trip system to establish a consensus value, there is no explanation as to how the process works to ensure that an erroneously low value from one speed sensor does not adversely impact the consensus value. 6) The bases for the times shown in Figures 10.2-1, 10.2-2, and 10.2-3 are not explained **[the distinction between Figures 10.2-2 and 10.2-3 has not been adequately addressed in the proposed DCD markup]**; and T_v is not defined on Figure 10.2-3.

RAI Number	Reviewer	Question Summary	Full Text
			7) The basis for three control valves being able to handle 85 percent steam flow as indicated in Section 10.2.1.2 has not been explained. 8) The response to RAI 10.2-18 indicates that the normal speed control and primary turbine overspeed trip systems share the same turbine speed sensors and speed signals, and that these sensors are separate and redundant to those used by the emergency turbine overspeed trip system. The Tier 2 description needs to be clarified to reflect this information. **[Note that the proposed DCD markup is still confusing in that it only refers to the normal speed control system and does not explain that the primary turbine overspeed trip system uses the speed sensors for the normal speed control system]** 9) Tier 2 Test 14.2.8.2.20 refers to Technical Specification (TS) requirements for the applicable acceptance criteria, but TS requirements do not exist for the turbine steam admission and extraction non-return valves. Therefore, clarification is needed to properly specify the acceptance criteria that apply. 10) Tier 2 Test 14.2.8.2.27 specifies in the acceptance criteria that turbine speed shall not exceed design limits. This is misleading and incomplete in that this test should also confirm proper performance of the turbine overspeed protection system (both the primary and emergency turbine trip systems). Therefore, to be clear, the last sentence of the Criteria Section should be revised to state: "Plant systems and equipment, including the turbine overspeed protection system and associated components, shall perform in accordance with the appropriate design and testing specifications."

RAI Number	Reviewer	Question Summary	Full Text
			11) Tier 1 Section 2.11.4 needs to be revised to include other structures, systems, and components important to safety consistent with the response to RAI 10.2-18, S02. 12) An ITAAC is needed to verify the layout/locations of turbine stop, control, intermediate stop, intercept, and extraction non-return valves.

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