May 30, 2008

Mr. Robert E. Brown
Senior Vice President, Regulatory Affairs
GE Hitachi Nuclear Energy
3901 Castle Hayne Road MC A-50
Wilmington, NC 28401

SUBJECT: ECONOMIC SIMPLIFIED BOILING WATER REACTOR (ESBWR) CHAPTER 22 OPEN ITEMS

Dear Mr. Brown:

As you are aware, the U.S. Nuclear Regulatory Commission staff is preparing the safety evaluation report (SER) for the ESBWR design certification application submitted by GE Hitachi Nuclear Energy (GEH) on August 24, 2005. The staff has identified eight (8) open items for SER Chapter 22, "Regulatory Treatment of Non-Safety Systems," which is enclosed for your information. The staff is prepared to review your response to the open items (OI) and have conference calls and meetings with your staff, as appropriate, to resolve these OI to support issuance of the final SER.

Please provide a response date for any late or unscheduled open items discussed in the enclosure.

This OI letter is based on the staff's review of the ESBWR Design Certification Document (DCD) Revision 4, request for Additional Information (RAI) responses, and other submittals received to date. The staff will continue its review as additional RAI responses and other deliverables are submitted, including future DCD Revisions. The staff will inform cognizant GEH staff of any resulting changes to the status of Chapter 22. If you have any questions, please contact Thomas Kevern at (301) 415-0224 or Thomas.Kevern@nrc.gov or Rocky D. Foster at (301) 415-5787 or Rocky.Foster@nrc.gov.

Sincerely,

/RA B. Sosa for:/

Jeffrey Cruz, Chief
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 052-010

Enclosure:
As stated

cc w/encl: See next page

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ADAMS ACCESSION NO: ML081480235 NRO-002

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NAME	RFoster	SGreen	ACubbage	JCruz-B. Sosa for:
DATE	05/27/2008	05/27/2008	05/27/2008	05/30/2008

OFFICIAL RECORD COPY

Letter to Robert E. Brown from Rocky Foster Regarding Economic Simplified Boiling Water Reactor (ESBWR) Chapter 22 Open Items dated May 30, 2008

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ESBWR Design Certification Review
Chapter 22: "Regulatory Treatment of Non-Safety Systems"
Preliminary Open Items

RAI 22.5-5 S01, May 13, 2008, ML081270301

GEH's response to RAI 22.5-5 did not provide sufficient details to demonstrate that RTNSS systems have been adequately protected from flood-related effects associated with both natural phenomena and system and component failures.

Specifically, GEH indicated that for RTNSS systems located in Reactor Building (RB), Control Building (CB), Fuel Building (FB), Fire Pump Enclosure Building (FPE), Electrical Building (EB), Service Water Building (SF), and Turbine Building (TB), the design/installation of RTNSS equipment included protection from the effects of internal flooding. However, GEH did not provide description/discussion for the design/installation of the RTNSS equipment or discuss how this design/installation will protect RTNSS from the effects of internal flooding.

Similarly, for the plant service water (PSW) system located outdoors onsite (OO), GEH did not describe/discuss how the design/installation of RTNSS equipment will be protected from the effects of external flooding.

Provide a detailed description of the design/installation requirements for RTNSS SSCs and discuss how this design/installation will provide the protection for the RTNSS SSCs from the effects of internal flooding and/or external flooding.

Status: GEH has not committed to a response date.

RAI 22.5-6 S01, January 15, 2008, ML080090295

As stated by the applicant, structures that house Criteria B1 and B2 RTNSS systems are designed to the augmented standards of DCD, Section 19A.8.3.

With regard to IBC seismic provisions proposed by the applicant for the design of RTNSS SSCs meeting Criterion B2, the staff noticed that these seismic provisions utilize a 2500-year event as the "Maximum Considered Earthquake". This ground motion is then reduced by a factor of two thirds to produce the "design" ground motion. Such ground motion may have a return period varying from approximately 500 to 1,500 years, depending on the regional seismicity. The design seismic demands are further modified (generally reduced) in the design calculations to account for earthquake energy absorption through nonlinear behavior, i.e. component cracking and yielding. Structures classified as IBC Occupancy Category IV are designed as Seismic Use Group III and are expected to achieve the Immediate Occupancy performance level at the "design" level ground motion. Based on the *2003 NEHRP Recommended Provisions for Seismic Regulations of New Buildings and Other Structures* (FEMA 450, 2004), which forms the technical bases for the IBC seismic provisions, Immediate Occupancy is a performance level below an operational or a "functional" level. FEMA 450 further states that at the Immediate Occupancy level, damage to the structural systems is very slight and the structure remains safe to occupy; however, some repair is probably required before the structure can be restored to normal service. Equipment housed in such structures, on the other hand, is expected to experience more damage. In particular, utilities necessary for normal function of systems are

not expected to be available. Also, some equipment and systems may experience internal damage due to shaking of the structure. Ultimately, minor structural repairs are required; however, significant nonstructural repair and cleanup are probably required before normal function of the structure can be restored.

Based on the above, the staff believes that the IBC 2003 seismic provisions are not adequate to ensure that the post-72 hour systems, structures and components can withstand the effects of a safe-shutdown earthquake (SSE) without the loss of capability to perform their required functions. The staff requests the following:

1. Identify in the DCD all non-safety-related, non-seismic structures that house/support RTNSS systems meeting Criteria B1 and B2.

2. Provide the technical rationale to support GEH's assertion that IBC seismic provisions will achieve functional performance under an SSE level earthquake.

3. Given the lower hazard level and performance level of the IBC as compared to the SSE hazard level with a functional performance level, explain how GEH will ensure availability and reliability of RTNSS B2 systems and their surrounding/supporting structures.

In the event of an SSE, explain in the DCD how RTNSS B1 and B2 systems are protected against adverse interaction due to the failure of adjacent nonsafety related, non-seismic structural and non-structural components that are designed to the IBC seismic provisions.

Status: GEH responded to the NRC on April 28, 2008 in MFN 08-388. The response RAI is under staff review.

RAI 22.5-7 S01, January 15, 2008, ML080090295

Based on the staff's understanding of the IBC code, the augmented seismic design criteria, as delineated in GEH's response, will allow Criterion B2 RTNSS SSCs to achieve Immediate Occupancy performance level at two thirds SSE. In accordance with FEMA 450, this is a state of some level of damage (lower for the structure and higher for the equipment) at two-thirds SSE. This is not sufficient to provide reasonable assurance that Criterion B2 SSCs will function after an SSE event. The staff requests the following:

1. Provide a detailed explanation for GEH's assertion that an Immediate Occupancy performance level at two-thirds SSE will provide reasonable assurance that Criterion B2 SSCs will function after an SSE event.

2. If applicable, provide in the DCD GEH's specific modifications to the IBC provisions in order to improve the performance criteria for RTNSS Criterion B2 SSCs to functional performance level at an SSE event level.

Status: GEH responded to NRC on 4/29/2008 in MFN 08-388. The response RAI is under staff review.

RAI 22.5-9 S01, May 13, 2008, ML081270301

GEH's response to RAI 22.5-9 did not provide sufficient details about the design of RTNSS SSCs with respect to hurricanes. Additionally, the information provided in GEH's response to RAI 22.5-5 requires additional clarifications. The staff requests the following information to be provided in the DCD:

a. Identify the 3-second gust wind speed used in the design for the Category 5 hurricane.

b. Confirm that the procedures used for calculating and distributing the wind pressure and all the associated parameters that account for the physical and geometrical conditions of the structures are in accordance with the DCD Tier 2, Revision 4, Section 3.3.1. Otherwise, fully describe the alternative procedure used.

c. Confirm that the hurricane missile spectrum is consistent with the tornado missile spectrum identified in DCD Tier 2, Revision 4, Table 2.0-1. Otherwise, fully describe the alternative missile spectrum used.

d. Explain how the design of the Turbine Building for tornado winds without missiles will envelop the demands of a Category 5 hurricane wind with missiles. If hurricane missiles are assumed to penetrate the building, describe the protection provisions implemented to protect RTNSS systems from missile damage as stated in Table 19A-4.

Status: GEH has not committed to a response date.

RAI 22.5-21 S01, May 13, 2008, ML081270301

The staff considers GEH's response to RAI 22.5-21 in Letter No. MFN 08-336 incomplete because it did not address seismic design. The first sentence in DCD Tier 2, Revision 4, Section 19A.8.3 states that all systems that meet RTNSS Criterion B require augmented design standards. The following sentence excludes more than half of these systems based on their categorization as Regulatory Oversight "Support". Irrespective of the regulatory oversight level, the fundamental question here is: Are these systems required to function following an accident? And if so, what design standards are used to achieve that goal?

The staff requests the following information to be provided in the DCD:

1. Confirm that the augmented seismic design standards in DCD Section 19A.8.3 is applicable to all RTNSS systems and components that meet Criterion B including those designated as Regulatory Oversight "Support". Otherwise, describe the alternative seismic design criteria used and justify its adequacy.

2. Confirm that the augmented seismic design standards in DCD Section 19A.8.3 are applicable to the non-seismic structures that house and support all RTNSS systems and components that meet Criterion B including those designated as Regulatory Oversight "Support". Otherwise, describe the alternative seismic design criteria used and justify its adequacy.

This RAI should not be construed as an approval of the augmented design standard proposed by GEH. This issue is still under review in other RAIs

Status: GEH has not committed to a response date.

RAI 22.5-22, April 23, 2008, ML081070527

The following proposed availability controls (ACs) in DCD Revision 4 should state, in the ACLCO, the associated instrumentation functions, and the number of required divisions for each function. The AC Bases should explicitly state the minimum level of system degradation that corresponds to a function being unavailable (usually addressed by Condition A), and the number of divisions used to determine the test interval for each required division (or component) for AC surveillance requirements (ACSRs) (e.g., logic system functional test) that specify a Frequency of 24 months on a staggered test basis.

- AC 3.3.1 Alternate Rod Insertion (ARI)
- AC 3.3.2 Anticipated Transient Without Scram (ATWS)/Standby Liquid Control (SLC) System Actuation
- AC 3.3.3 Feedwater Runback (FWRB)
- AC 3.3.5 Automatic Depressurization System (ADS) Inhibit
- AC 3.5.1 Gravity-Driven Cooling System (GDCS) Deluge Function

Status: GEH has not committed to a response date.

RAI 22.5-23, April 23, 2008, ML081070527

Regarding DCD Revision 4

- AC 3.7.2 Fuel and Auxiliary Pools Cooling System (FAPCS) – Operating, and
- AC 3.7.3 FAPCS – Shutdown

a. Add an ACSR to demonstrate availability of FAPCS pumps.

b. Why is just one FAPCS train required to be available in ACLCO 3.7.2 when the focused PRA assumes two trains, and two trains are required in ACLCO 3.7.3?

c. For a total loss of the FAPCS function, why does AC 3.7.2 allow 7 [14?] days to restore function, instead of 24 hours as specified in AC 3.7.3?

Status: GEH has not committed to a response date.

RAI 22.5-24, 04/23/2008, ML081070527

Regarding DCD Revision 4

- AC 3.8.1 Standby Diesel Generators – Operating, and
- AC 3.8.2 Standby Diesel Generators - Shutdown

a. Why does ACLCO 3.8.1 require just one standby diesel generator, when the focused PRA assumes two, and two are required by ACLCO 3.8.2?

b. For a total loss of standby diesel generator availability, why does AC 3.8.1 allow 14 days to restore function, instead of 24 hours as specified in AC 3.8.2?

Status: GEH has not committed to a response date.

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