April 18, 2008

ORGANIZATION: GE Hitachi Nuclear Energy

PROJECT: Economic Simplified Boiling Water Reactor (ESBWR) Design Certification

SUBJECT: SUMMARY OF AUDIT FOR REVIEW OF GEH RADIOLOGICAL ACCIDENT ANALYSES USING RADIONUCLIDE TRANSPORT AND REMOVAL AND DOSE ESTIMATION (RADTRAD) CODE AND CHAPTER 15.4 REQUEST FOR ADDITIONAL INFORMATION (RAI) FEBRUARY 21 – 22, 2008

On February 21 and 22, 2008, the U.S. Nuclear Regulatory Commission (NRC) conducted an audit of GE-Hitachi Nuclear Energy (GEH) radiological accident analysis using RADTRAD code and Chapter 15.4 RAIs at the GEH office in Washington, DC. A list of attendees is provided in Enclosure 1, a summary of the meeting, including open items briefed during the audit closing, is provided in Enclosure 2.

During this audit, the NRC team and GEH independently ran dose calculations using RADTRAD code, version 3.0.10 to verify consistent dose results. Staff also discussed the status of associated RAIs. Additional requests for information were identified as a result of this audit. The additional information requests are summarized in Enclosure 2 and will be issued in RAI form on the ESBWR docket.

During continuing review of the ESBWR design certification, staff will be considering information gained during this audit and will communicate any additional issues or requests for information with the applicant on the ESBWR docket.

/RA/

Bruce M. Bavol, Project Manager
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-010

Enclosures:
As stated

cc w/encls: See next page

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Enclosures:
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DATE	04/17/2008	04/17/2008	04/18/2008	04/18/2008

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Table 1: Audit Participation Summary

Table 1 provides a comprehensive list of the audit participants from both NRC and GEH. Their attendance at either the entrance meeting or at the closing meeting has been noted.

Last Name	First Name	Affiliation	Entrance Meeting	Closing Meeting
BAVOL	BRUCE	NRC	X	X
BROADBENT	GREG	GEH	X	X
HART	MICHELLE	NRC	X	X
KIRSTEIN	ERIK	GEH	X	X
LEE	JAY	NRC	X	X
MARQUINO	WAYNE	GEH	X	X
WHITE	FROSTIE	GEH	X	X

Summary of Audit for Review of GEH Radiological Accident Analyses Using Radionuclide Transport and Removal and Dose Estimation (RADTRAD) Code and Chapter 15.4 Requests for Additional Information (RAIs) February 21 – 22, 2008

On February 21 and 22, 2008, the U.S. Nuclear Regulatory Commission (NRC) conducted an audit of GE-Hitachi Nuclear Energy (GEH) radiological accident analysis using RADTRAD code and Chapter 15.4 RAIs at the GEH office in Washington, D.C.

During this audit, the NRC team and GEH independently ran dose calculations using RADTRAD version 3.0.10 to verify consistent dose results. Staff also discussed the status of associated RAIs. Following is a summary of these discussions.

The staff indicated that RAI 15.3-25 S01 was resolved based upon the response submitted via MFN 07-017S02 on November 30, 2007.

Staff requested GEH to make the following changes globally in Revision 5 of the applicable chapters of the DCD:

Based upon the new rule (10 CFR 52.47) issued on August 28, 2007, GEH should replace references to 50.34 with new 52.47 throughout DCD Chapters 2, 6, 9, 11,12, and 15, to the same level of detail as the existing reference in forthcoming DCD Revision 5.

In Section 15.4.8, GEH should globally change “Instrument Line Break” in the DCD text, references, tables, and figures to “Small Line(s) Carrying Primary Coolant Outside of Containment.”

In Section 15.4.4, GEH will globally check and change the references made from SRP 15.0.1 (operating reactors) to SRP 15.0.3 (new reactors).

GEH should change Figure 15.4-1 to make it legible.

In Section 15.4.4.5.1.1, GEH should correct the DCD to reflect markups that changed based upon RAI submissions.

In Section 15.4.4.5.2, GEH should change “two pathways” to “three pathways” consistent with the ESBWR design.

GEH indicated that they will be using RADTRAD version 3.0.10 instead of 3.0.3 since version 3.0.10 offers improvements. Accordingly, GEH should update the “codes used table” in Chapter 15.

GEH should clearly identify in Section 15.4.4.2.2, which operator actions, if any, are necessary to mitigate the consequences of the accidents.

In DCD Tables 15.4-2 and 15.4-4 GEH should increase control room in-leakage and revise dose value to maximize operating flexibility and for Table 15.4-4, add Sievert values.

The following RAIs, which GEH has not responded to, were discussed at the Audit. Based on audit results, the NRC staff requested additional questions (below) be added to RAIs 15.4-3 S02, 15.4-4 S02, and 15.4-26 S01. These RAIs will be issued in RAI Letter 181.

RAI 15.4-3 S02 and 15.4-4 S02

a) For all design basis accident events where Control Room (CR) in-leakage value was assumed zero, GEH should increase the in-leakage to the value used in LOCA (12 cfm) and credit the Emergency Filtration Units (EFUs). This affects X/Q values for the unfiltered in-leakage path with the exception of the fuel handling accident (FHAs) which will have a higher X/Q value than LOCA, and will not credit the EFUs. GEH should re-calculate control room doses for all design basis accident events where Control Room (CR) in-leakage value was assumed to be zero.

b) For Feedwater Line Break (FWLB), GEH should add in-leakage to CR.

c) For Instrument Line Break (ILB), GEH should revise Table 15.4-17 to include release point consistent with the format of all other accident results and input parameter tables.

RAI 15.4-26 S01

For DCD Tier 2, Section 15.4.4.5.2.3, discuss how GEH converted to scfm. GEH should explain how they modeled the 50%/day RB leakage and 40% of building volume mixing. The Revision 4 Technical Specification (TS) basis is not consistent with the GEH dose analysis. GEH should revise TS bases and clarify in Chapter 15 what assumptions are made so TS bases can be written to be consistent with Chapter 15. These questions are also related to RAI 6.2-165.

In addition, the following RAIs and associated GEH responses were discussed at the Audit. Based on the audit, the staff requested that additional information be provided beyond the information requested in the previously transmitted RAIs. The following is a summary of the additional information requests to be issued in RAI Letter 181.

RAI 15.4-2 S02

GEH should update reference to Main Steam Line diameter changes (from 24 inch to 30 inch outside diameter) in DCD.

RAI 15.4-6 S01

a) GEH has proposed to use AS1 as a bounding case rather than AS2 and should provide justification. GEH should reference NUREG-1465 and revise the AS-1 discussion and dose consequences in the DCD.

b) DCD Tier 2, Section 15.4.4.5.2.1 should refer to the LTR NEDE-33279P Revision 1, Section 4.3.1.

c) For DCD Tier 2, Section 15.4.4.5.4, verify that LTR NEDE-33279P is consistent with the DCD.

RAI 15.4-7 S01

a) In DCD Tier 2, Table 15.4-5 B, GEH should add a footnote to explain the point after which no credit is taken for fission product removal (for AS-1, if limiting) and the basis for the cutoff.

b) In DCD Tier 2, Section 15.4.4.2.1, GEH should appropriately re-word this section based upon making AS-1 bounding.

RAI 15.4-8 S01

a) GEH should emphasize in DCD Tier 2, Section 15.4.3, that it has been demonstrated in DCD Tier 2, Section 6.3 Emergency Core Cooling (ECCS) that no fuel melting occurs in a LOCA. The dose evaluation in Section 15.4.4 will need to be re-worded to invoke assumed fuel melting.

b) In DCD Tier 2, Section 15.4.4, GEH should include words from 10 CFR 52.47 – "evaluate accidents that could result in the release of significant quantities of radioactive fission products."

c) In DCD Tier 2, Section 15.4.4.2.1, GEH should delete both paragraphs in their entirety and include additional verbiage for the AS-1 LOCA scenario.

RAI15.4-17 S01

a) In DCD Tier 2, Section 15.4.4.2.1, GEH should move the first two sentences to Section 15.4.3. In Table 15.4-5, add a footnote (or other method) to explain the point after which no credit is taken for fission product removal (for AS-1 if limiting) and the basis for the cutoff.

b) In DCD Tier 2, Section 15.4.4.2.1 appropriately re-word this section based upon making AS-1 bounding.

RAI 15.4-22 S01

a) In DCD Tier 2, Section 15.4.4.5.2.3, GEH should explain why the VTT report was not used in the analyses?

b) In DCD Tier 2, Section 15.4.4.5.1.1, reference 15.4-12, GEH should remove the reference to BWROG methodology, which is based on source term from TID-14844.

c) GEH should add a reference to fission product removal LTR NEDE-33279P for detailed analysis modeling.

d) In Table 4.3 of LTR NEDE-33279P, for the conversion of MSIV leakage to SCFM, what containment conditions (temperature) are used to convert? GEH should add a row to the table, such that both the RADTRAD volumetric flow rate, and flow rate at standard conditions (for TS) are provided in Chapter 15.

e) GEH should justify 20% air mixing in the condenser and an iodine removal rate of 99.5%. Include 20% air mixing in the condenser as an item to be verified in the ITAAC table.

RAI 15.4-24 S01

a) GEH should replace or supplement DCD Tier 2, Tables 15.4-4 a-d (MELCOR Seq. of Events) with descriptive text.

b) In DCD Tier 2, Section 15.4.4.2.1, appropriately re-word this section based upon making AS-1 bounding.

RAI 15.4-31 S01

a) GEH should revise this response to clarify that the two dose calculations are provided for in Fuel Building and Reactor Building accidents.

b) GEH should explain why different atmospheric dispersion factors (X/Q) are used for Fuel Handling Accident (FHA)?

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