

January 14, 2008

Mr. Robert E. Brown
Senior Vice President, Regulatory Affairs
GE-Hitachi Nuclear Energy Americas, LLC
3901 Castle Hayne Road MC A-45
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 142 RELATED TO
ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Brown:

By letter dated August 24, 2005, GE-Hitachi Nuclear Energy Americas, LLC (GEH) 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 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.

To support the review schedule, you are requested to provide the requested additional information within 45 days of the date of this letter.

If you have any questions or comments concerning this matter, you may contact me at 301-415-3207 or saw8@nrc.gov or you may contact Amy Cabbage at 301-415-2875 or aec@nrc.gov.

Sincerely,

/RA/

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

Docket No. 52-010

Enclosure:
Request for Additional Information

cc: See next page

January 14, 2008

Mr. Robert E. Brown
Senior Vice President, Regulatory Affairs
GE-Hitachi Nuclear Energy Americas LLC
3901 Castle Hayne Road MC A-45
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 133 RELATED TO
ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Brown:

By letter dated August 24, 2005, GE-Hitachi Nuclear Energy Americas, LLC (GEH) 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 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.

To support the review schedule, you are requested to provide the requested additional information within 45 days of the date of this letter.

If you have any questions or comments concerning this matter, you may contact me at 301-415-3207 or saw8@nrc.gov or you may contact Amy Cabbage at 301-415-2875 or aec@nrc.gov.

Sincerely,
/RA/
Shawn Williams, Project Manager
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-010
Enclosure:
Request for Additional Information
cc: See next page
Distribution: See next page

ADAMS ACCESSION NO. ML080110250

OFFICE	PM:NGE1	LPM:NGE1	BC:NGE1
NAME	SWilliams	ACabbage	MShuaibi
DATE	1/11/08	1/14/08	1/14/08

OFFICIAL RECORD COPY

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 142 RELATED TO
ESBWR DESIGN CERTIFICATION APPLICATION DATED JANUARY 14, 2008

Distribution:

PUBLIC

Hard Copy

NGE1 R/F

SWilliams, NRO

ACubbage, NRO

E-Mail:

RidsNroDnrlNge1

RidsNroDnrlNge2

RidsAcrcAcnwMailCenter

RidsOgcMailCenter

RidsNroDsraSrsb

RidsNroDeCib2

RidsNroDserRsac

YCastillo-Diaz, NRO

JLee, NRO

**Requests for Additional Information (RAIs)
ESBWR Design Control Document (DCD), Revision 4**

RAI Number	Reviewer	Question Summary	Full Text
15.4-32	Diaz-Castillo Y	Calculation of HCl and HNO ₃	<p><u>MFN 06-205, Supplement 2, dated August 30, 2007:</u> Licensing Topical Report NEDE-33279P, "ESBWR Containment Fission Product Removal Evaluation Model," Page 4-3 states that the doses were conservatively increased by 10% for determining HCl for accident scenarios AS-2 and AS-3. Explain why this same assumption was not used for the total HNO₃ calculation. In addition, please discuss the reason(s) for using the 10% higher dose rate to determine the amount of HCl.</p>
15.4-33	Diaz-Castillo Y	Addition of a column for Reactor Pressure Vessel PV in Table E1 located in Part 3 of VTT-R-04413-06 report (12/06).	<p><u>MFN 07-466, dated August 24, 2007:</u> Research Report VTT-R-06771-07 (Part 3), Table E1 on Page 6, provides the different times at which the pH of the Gravity Driven Cooling System (GDCS) pool and the Lower Dry Well (LDW) become permanently less than seven (7) hours for the various cesium hydroxide (CsOH) fractions. Please provide similar hours calculations for the Reactor Pressure Vessel (RPV). In addition, please provide the time in number of days.</p>
15.4-34	Diaz-Castillo Y	Amount of CsOH formed in all three accident scenarios.	<p><u>MFN 07-466, dated August 24, 2007:</u> Research Report VTT-R-06771-07 (Part 3), Tables 9, 11, and 13 provide the total amount of CsOH formed during accident scenarios 1, 2, and 3, respectively. According to the tables, most of the CsOH is formed in the Wet Well (WW), while different quantities are formed in the other pools depending on the accident scenario. Please discuss why the majority of the CsOH is transported to the WW while in the other pools there is less or no CsOH.</p>
15.4-13, Supplement No. 1 (MFN 07-466, August 24, 2007)	Diaz-Castillo Y	Sensitivity analysis of pH to CsOH formation.	<p>In staff's request for additional information dated January 27, 2007 (ML0702303000), RAI 15.4-13, the staff asked the applicant to provide a sensitivity analysis of pH to CsOH formation (zero to 100 percent formation). However, sensitivity analyses were only provided for 100, 50, 25 and 10 percent formation. Please provide a sensitivity analysis for when there is 0 percent of CsOH formed inside containment for each of the three accident scenarios.</p>

Enclosure

RAI Number	Reviewer	Question Summary	Full Text
15.4-35	Diaz-Castillo Y	Basis for HNO ₃ in GDCS.	Research Report VTT-R-04413-06 (Part 2), Page 60, indicates that all of the HNO ₃ is assumed to be released into the Upper Drywell atmosphere for accident scenario 1, while Pages 63 and 68 of the same report indicate that 100% of all the HNO ₃ is assumed to form in the GDCS for accident scenarios 2 and 3. Please explain why your assumptions are different depending in the accident scenario. In addition, please clarify whether these assumptions are conservative.
15.4-36	Diaz-Castillo Y	Flow direction in accident scenarios 1 and 2.	<u>MFN 07-466, dated August 24, 2007:</u> Research Report VTT-R-06771-07 (Part 3), in the description of accident scenarios 1 and 2 on Pages 18 and 25, it states that the direction of mixing between the RPV and the LDW is changed at each time step between +0.1 Kg/s and -0.1 Kg/s. Please provide the basis for this value. In addition, please clarify if this is more conservative than assuming that there is no mixing between the RPV and the LDW.
15.4-37	Diaz-Castillo Y	Discrepancy between Figures 6 and 13.	<u>MFN 07-466, dated August 24, 2007:</u> Research Report VTT-R-06771-07 (Part 3), Figures 6, 13, and 20 show the distribution of elementary boron in the three accident scenarios, respectively. For accident scenarios 1 (AS-1) and 2 (AS-2), you stated that due to slow mixing during 2.5E+06 (about 30 days), about 10% and 6% of boron, respectively, is removed from the LDW and moved to the RPV. Please clarify this statement and describe the flow mechanisms more in detail. In addition, there seems to be a discrepancy between the amount of boron removed and its illustration in the figures. For example, for AS-1, the amount of boron moved to the RPV is 10%, which according to Figure 6 represents approximately 2500 moles, however, for AS-2; the amount of boron moved is 6%, which according to Figure 13 represents 7500 moles. Please clarify this discrepancy.
15.4-38	Diaz-Castillo Y	Dissimilarity between Figures 7 and 14.	<u>MFN 07-466, dated August 24, 2007:</u> Research Report VTT-R-06771-07 (Part 3), Figures 7 and 14, show the calculated pH in scenarios AS-1 and AS-2 for the different CsOH formation rates, respectively. For AS-2, during the early stages of the accident, there seems to be a rapid increase in pH followed by a decrease, then a small increase followed by a sudden decrease (not shown). Finally, the pH seems

RAI Number	Reviewer	Question Summary	Full Text
			to level off between 8 and 8.5. Please discuss the pH behavior in the RPV during the early stages (between 1000 and 10,000 seconds) of scenario AS-2. In addition, given that scenario AS-2 is similar to AS-1, and that the pH behavior is similar for all of the other pools in AS-1 and AS-2, please discuss why the pH behavior in the RPV during AS-2 is different from the pH behavior during AS-1.
15.4-39	Diaz-Castillo Y	Use of 100% CsOH formation rate.	<p><u>MFN 07-466, dated August 24, 2007:</u></p> <p>Research Report VTT-R-06771-07 (Part 3), Figures 7-10, 14-17, and 21-24, show the results of CsOH sensitivity calculations. It appears that there is only a relatively small difference, if any, in pH with varying CsOH formation rates. Given these results, please discuss if you still plan to assume in your calculations a formation rate of 100% CsOH. The staff still believes CsOH may also exist in the form of cesium compounds other than CsOH (i.e., cesium molybdate, cesium manganate). Use of a formation rate of less than 100% will provide conservatism to the calculation. If your plans are not to use a reduced CsOH formation rate, please discuss what other conservatisms are introduced in your pH calculation.</p>
15.4-40	Diaz-Castillo Y	pH sensitivity study to be used for dose calculations.	<p>GEH provided several pH calculations results in Parts 1, 2, and 3 of the associated VTT Reports. In Part 1 (October 2006), GEH provided pH calculation results for cases A (base case) through F with varying strong acid formation for scenario AS-1. In Part 2 (December 2006), GEH provided pH calculation results for the base case for scenarios AS-2 and AS-3. In Part 3 (August 2007), GEH provided pH calculation results and concentration tables for the base case for scenarios AS-1-A through AS-1-F. In addition, GEH provided pH calculation results along with some concentration tables for the CsOH sensitivity runs for scenarios AS-1-A, AS-2-A, and AS-3-A with HCl and HNO3 scaled formation rates. However, there appears to be some missing tables in Research Report VTT-R-06771-07 (Part 3):</p> <ol style="list-style-type: none"> 1. Concentration tables for cases AS-2-A and AS-3-A similar to Tables 4 through 7. 2. Concentration tables for cases AS-1, AS-2, and AS-3 for the sensitivity runs with CsOH masses equal to 50%, 25%, 10% and 0%, similar to

RAI Number	Reviewer	Question Summary	Full Text
			<p>the tables in Appendix 2 of your Part 3 report.</p> <p>It is not clear to the staff which of the sensitivity runs/cases you are planning to use as part of your containment fission product removal evaluation. Please identify which case you plan to use and provide the tables described above.</p>
15.4-41	Diaz-Castillo Y	pH bounding case.	<p><u>MFN 07-466, dated August 24, 2007:</u> Of all the pH scenarios reviewed, which is the bounding scenario and the most conservative and why?</p>

DC GE - ESBWR Mailing List

(Revised 1/3/08)

cc:

Ms. Michele Boyd
Legislative Director
Energy Program
Public Citizens Critical Mass Energy
and Environmental Program
215 Pennsylvania Avenue, SE
Washington, DC 20003

W. Craig Conklin, Director
Chemical and Nuclear Preparedness &
Protection Division (CNPPD)
Office of Infrastructure Protection
Department of Homeland Security
Washington, DC 20528

Mr. Marvin Fertel
Senior Vice President
and Chief Nuclear Officer
Nuclear Energy Institute
1776 I Street, NW
Suite 400
Washington, DC 20006-3708

Mr. Ray Ganthner
AREVA, Framatome ANP, Inc.
3315 Old Forest Road
P.O. Box 10935
Lynchburg, VA 24506-0935

Vanessa E. Quinn, Acting Director
Technological Hazards Division
National Preparedness Directorate
Federal Emergency Management Agency
500 C Street, NW
Washington, DC 20472

Email

APH@NEI.org (Adrian Heymer)
awc@nei.org (Anne W. Cottingham)
bennettS2@bv.com (Steve A. Bennett)
bevans@enercon.com (Bob Evans)
bob.brown@ge.com (Robert E. Brown)
BrinkmCB@westinghouse.com (Charles Brinkman)
chris.maslak@ge.com (Chris Maslak)
CumminWE@Westinghouse.com (Edward W. Cummins)
cwaltman@roe.com (C. Waltman)
dan1.williamson@ge.com (Dan Williamson)
david.hinds@ge.com (David Hinds)
david.lewis@pillsburylaw.com (David Lewis)
David.piepmeyer@ge.com (David Piepmeyer)
dlochbaum@UCSUSA.org (David Lochbaum)
don.lewis@ge.com (Don Lewis)
erg-xl@cox.net (Eddie R. Grant)
Eugene_Grecheck@dom.com (Eugene S. Grecheck)
frankq@hursttech.com (Frank Quinn)
Frostie.white@ge.com (Frostie White)
gcesare@enercon.com (Guy Cesare)
george.honma@ge.com (George Honma)
george.stramback@gene.ge.com (George Stramback)
george.wadkins@ge.com (George Wadkins)
GovePA@BV.com (Patrick Gove)
greshaja@westinghouse.com (James Gresham)
gzinke@entergy.com (George Alan Zinke)
hickste@earthlink.net (Thomas Hicks)
james.beard@gene.ge.com (James Beard)
jcurtiss@winston.com (Jim Curtiss)
jgutierrez@morganlewis.com (Jay M. Gutierrez)
jim.kinsey@ge.com (James Kinsey)
jim.riccio@wdc.greenpeace.org (James Riccio)
JJNesrsta@cpsenergy.com (James J. Nesrsta)
joel.Friday@ge.com (Joel Friday)
john.o'neil@pillsburylaw.com (John O'Neil)
john.sorensen@ge.com (John Sorensen)
Joseph.savage@ge.com (Joseph Savage)
Joseph_Hegner@dom.com (Joseph Hegner)
junichi_uchiyama@mnes-us.com (Junichi Uchiyama)
kathy.sedney@ge.com (Kathy Sedney)
kenneth.ainger@exeloncorp.com (Kenneth Ainger)
KSutton@morganlewis.com (Kathryn M. Sutton)
kurt.schaefer@ge.com (Kurt Schaefer)
kwaugh@impact-net.org (Kenneth O. Waugh)
lou.lanese@ge.com (Lou Lanese)

MaddenG@BV.com (George Madden)

DC GE - ESBWR Mailing List

- 3 -

Margaret.Bennet@dom.com (Margaret Bennet)
maria.webb@pillsburylaw.com (Maria Webb)
mark.beaumont@wsms.com (Mark Beaumont)
Marvin.Smith@dom.com (Marvin L. Smith)
matias.travieso-diaz@pillsburylaw.com (Matias Travieso-Diaz)
media@nei.org (Scott Peterson)
mgiles@entergy.com (M. Giles)
mike_moran@fpl.com (Mike Moran)
mwetterhahn@winston.com (M. Wetterhahn)
nirsnet@nirs.org (Michael Mariotte)
PAC2@nrc.gov (Peter Cochran)
pareez.golub@ge.com (Pareez Golub)
Pat.Woodfin@ge.com (Pat Woodfin)
patriciaL.campbell@ge.com (Patricia L. Campbell)
paul.gaukler@pillsburylaw.com (Paul Gaukler)
Paul@beyondnuclear.org (Paul Gunter)
peter.jordan@ge.com (Peter Jordan)
phinnen@entergy.com (Paul Hinnenkamp)
pshastings@duke-energy.com (Peter Hastings)
RJB@NEI.org (Russell Bell)
RKTemple@cpsenergy.com (R.K. Temple)
roberta.swain@ge.com (Roberta Swain)
ronald.hagen@eia.doe.gov (Ronald Hagen)
sandra.sloan@areva.com (Sandra Sloan)
SauerB@BV.com (Robert C. Sauer)
sfrantz@morganlewis.com (Stephen P. Frantz)
sharon.lyons@ge.com
steven.hucik@ge.com (Steven Hucik)
steven.stark@ge.com (Steven Stark)
tom.miller@hq.doe.gov (Tom Miller)
trsmith@winston.com (Tyson Smith)
VictorB@bv.com (Bill Victor)
waraksre@westinghouse.com (Rosemarie E. Waraks)
wayne.marquino@ge.com (Wayne Marquino)
whorin@winston.com (W. Horin)