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

February 12, 2008

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 153 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.

Based on a teleconference on RAI 18.11-36 on January 24, 2008, where GEH requested a change to the scope of the NRC review, the staff is forwarding the reopened or revised Section 18.11 RAIs consistent with the new review scope. Enclosed RAIs 18.11-7S01, 18.11-19 S01, 18.11-23 S01, 18.11-24 S01, 18.11-26 S01, and 18.11-29 S01 supersede the versions sent in RAI letter 125, dated December 14, 2007.

RAI 18.5-31, transmitted in RAI Letter 113, dated October 16, 2007, has been withdrawn. RAI 18.5.-31 has been superseded by RAI 14.3-211, transmitted in RAI Letter 126, dated December 20, 2007.

If you have any questions or comments concerning this matter, you may contact me at 301-415-6256 or djg3@nrc.gov or you may contact Amy Cubbage at 301-415-2875 or aec@nrc.gov.

Sincerely,

/RA/

Dennis Galvin, 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

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

February 12, 2008

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 153 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.

Based on a teleconference on RAI 18.11-36 on January 24, 2008, where GEH requested a change to the scope of the NRC review, the staff is forwarding the reopened or revised Section 18.11 RAIs consistent with the new review scope. Enclosed RAIs 18.11-7S01, 18.11-19 S01, 18.11-23 S01, 18.11-24 S01, 18.11-26 S01, and 18.11-29 S01 supersede the versions sent in RAI letter 125, dated December 14, 2007.

RAI 18.5-31, transmitted in RAI Letter 113, dated October 16, 2007, has been withdrawn. RAI 18.5.-31 has been superseded by RAI 14.3-211, transmitted in RAI Letter 126, dated December 20, 2007.

If you have any questions or comments concerning this matter, you may contact me at 301-415-6256 or djg3@nrc.gov or you may contact Amy Cubbage at 301-415-2875 or aec@nrc.gov.

Sincerely,
/RA/

Dennis Galvin, 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

ACCESSION NO.: ML080370628 NRO-002

OFFICE	PM:NGE1	PM:NGE1	BC:NGE1
NAME	DGalvin	ACubbage-via email	MShuaibi
DATE	02/07/08	02/11/08	02/12/08

OFFICIAL RECORD COPY

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 153 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION DATED FEBRUARY 12, 2008

Distribution:
PUBLIC
Hard Copy
NGE1 R/F
DGalvin, NRO
ACubbage, NRO

E-Mail:
RidsNroDnrlNge1
RidsNroDnrlNge2
RidsAcrsAcnwMailCenter
RidsOgcMailCenter
MJunge NRO
JBongarra
NRORidsNRODcipColp

Requests for Additional Information (RAIs):
ESBWR Design Control Document (DCD) Revision 4, Chapter 18

RAI Number	Reviewer	Question Summary	Full Text
18.4-26 Supplement 1 (MFN 07-408, July 24, 2007)	J. Bongarra	Describe the PFRA Work Instruction in NEDO-33219	In response to RAI 18.4-26, GEH responded as follows: Detailed guidance for the conduct of the Plant Functional Requirements Analysis (PFRA) is contained in the PFRA Work Instruction that has been drafted to implement NEDO-33219, Revision 1. The work instruction requires that the information specified in NUREG-0711, Section 4, Criterion 4 be determined and documented for each high level function. This data for each high level function will be an integral part of the PFRA structure, and as such will be validated and summarized along with the PFRA data structure. A draft copy of the PFRA Work Instruction will be available for review during the on-site audit scheduled for July 25, 2007. Please include this description of the PFRA work instruction in the implementation plan, NEDO-33219.
18.11-3 Supplement 1 (NEDO-33276 Rev. 1, March 29, 2007; MFN 06-446, November 22, 2006; MFN 07-334, June 27, 2007)	J. Bongarra	Operational conditions sampling: Sampling Dimensions	NEDO-33276, Rev. 1 provides a high-level summary of the sampling dimensions in Section 4.1.4.1. Items 1 through 3 in the section largely restate the review criteria for sampling dimensions in NUREG-0711 (Section 11.4.1.2). The staff cannot perform an implementation plan review when the plan simply restates the staff's review criteria. The plan should identify the operational conditions to be used for V&V and the process by which the sampling dimensions were used to identify them. The staff can then use the NUREG-0711 criteria in NUREG-0711 to review the acceptability of the operational conditions that have been identified.

RAI Number	Reviewer	Question Summary	Full Text
18.11-4 Supplement 1 (NEDO-33276 Rev. 1, March 29, 2007; MFN 06-446, November 22, 2006; MFN 07-334, June 27, 2007)	J. Bongarra	Operational Conditions Sampling: Scenario Identification	NEDO-33276, Rev. 1 provides a high-level summary of the scenario identification in Section 4.1.4.2. The section largely restates the review criteria for scenario identification in NUREG-0711 (Section 11.4.1.3). The staff cannot perform an implementation plan review when the plan simply restates the staff's review criteria. The plan should identify scenarios to be used and how the selected operational conditions were developed into scenarios. The plan should also identify how bias was avoided in the development of scenarios. The staff can then use the criteria in NUREG-0711 to review the acceptability of the scenarios that have been identified.
18.11-7 Supplement 1 (NEDO-33276 Rev. 1, March 29, 2007; MFN 06-446, November 22, 2006; MFN 07-334, June 27, 2007)	J. Bongarra	Task Support Verification: Criteria Identification	In the original RAI, the staff requested clarification as to what criteria were to be used in task support verification. GEH's response referred to their response to RAI 18.11-5. However, the RAI 18.11-5 response addresses the criteria for selecting tasks rather than the requested clarification of the criteria to be used to evaluate the Human-Systems Interfaces (HSIs) that support tasks. Please clarify the criteria to be used in task support verification.
18.11-19 Supplement 1 (NEDO-33276 Rev. 1, March 29, 2007; MFN 06-446, November 22, 2006; MFN 07-334, June 27, 2007)	J. Bongarra	Validation Testbeds: Validation Simulator and Simulation of remote actions	This follow-up RAI on testbeds has two parts: 1. Regarding the testbed to be used for integrated system validation, Section 3.4 of NEDO-33276 states that integrated system validation is performed using dynamic HSI prototypes and high-fidelity simulators. Section 4.3.4 describes a variety of test beds that are to be used to address the different objectives of the validation program. Three of the main simulation facilities to be used in this program are the GEH Test System, Baseline Simulator (BS), and the Full Scope Simulator (FSS), described in Sections 4.3.5.2, 4.3.5.3, and 4.3.5.4, respectively. These simulators provide incremental levels of fidelity, and the BS and FSS models are ANSI/ANS-3.5 compatible. While ANSI/ANS 3.5 compatibility provides an acceptable basis for an integrated system validation testbed as described in NUREG-0711, the BS does not provide the full control

RAI Number	Reviewer	Question Summary	Full Text
			room HSI. Thus, based on the staff's validation testbed criteria in NUREG-0711, Section 11.4.3.2.2, only the FSS is suitable for implementing integrated system validation. While the other simulators can provide valuable information to GE during their test and evaluation program, the final validation addressed in NUREG-0711 should be performed using the FSS. GEH should clarify the role of the FSS in the final validation. In addition, in response to RAI 18.10-1 GEH submitted the Attachment to MFN 07-625 in which simulation capabilities are defined, including a Part Task Simulator, Full-Scope Simulator, and Site Specific Training Simulator. The BS is not included in this response. Please describe how these descriptions correspond to those provided in NEDO-33276 and provide any changes to descriptions in NEDO-33276 that may be necessary to reconcile the two documents. 2. Regarding the simulation of remote actions, Section 4.3.4.1 indicates that actions at local system control stations are evaluated using drawings or mockup panels, but no information as to what evaluations are performed or how the actions will be analyzed. This statement is in the HFE Design Verification section rather than an integrated system validation section. Beyond this statement, no information about the treatment of local actions is provided. Please identify what remote actions are needed for the scenarios to be used in validation testing and provide information as to how these actions will be modeled and evaluated for validation.

RAI Number	Reviewer	Question Summary	Full Text
18.11-22 Supplement 1 (NEDO-33276 Rev. 1, March 29, 2007; MFN 06-446, November 22, 2006; MFN 07-334, June 27, 2007)	J. Bongarra	Scenario Definition	In RAI 18.11-4, the staff asked how the selected operational conditions were developed into scenarios. This RAI addresses the detailed definition of the scenarios so they can be run on the validation testbed. GEH's response to the original RAI indicated that specific scenario details are not included in the implementation plan as they will be developed as a part of the ESBWR design process. While in the context of a programmatic review, the staff agreed that this level of detail would be premature at this point in the process, GEH should provide this information if the staff is to conduct an Implementation Plan level review. The descriptions should provide sufficient detail so they can be reviewed using the criteria in NURGE-0711, Section 11.4.3.2.4.
18.11-23 Supplement 1 (NEDO-33276 Rev. 1, March 29, 2007; MFN 06-446, November 22, 2006; MFN 07-334, June 27, 2007)	J. Bongarra	Performance Measurement: Measurement Characteristics	In the original RAI, the staff requested information on measurement characteristics. GEH's response to the RAI indicated that the level of detail in the implementation plan was not intended to discuss measurement characteristics. GEH should provide this information on applicable measurement characteristics, such as reliability and validity, for all performance measures identified in response to RAI 18.11-24 so the staff is able to conduct an Implementation Plan level review (consistent with NUREG-0711, Section 11.4.3.2.5.1).
18.11-24 Supplement 1 (NEDO-33276 Rev. 1, March 29, 2007; MFN 06-446, November 22, 2006; MFN 07-334, June 27, 2007)	J. Bongarra	Performance Measurement: Performance Measurement Selection	In the original RAI, the staff requested information on the selection of performance measures. For the staff to perform an implementation plan review, GEH should identify the hierarchal set of performance measures (including plant/system level performance, operator task performance, situation awareness, operator workload, and anthropometric/physiological factors) that will be used in validation tests. The response should provide a clear picture of the range of measures to be used (consistent with NUREG-0711, Section 11.4.3.2.5.2). GEH's response to this RAI should consider the specific issues identified in the original RAI in RAI Letter 74.

RAI Number	Reviewer	Question Summary	Full Text
			GEH should also consider questions on specific performance measures based on the RAI response in MFN 06-446, dated November 11, 2006: • Operator task measures: The response addresses how operator tasks for validation will be selected. Please address how performance on selected tasks will be measured. • Situation awareness: The response discusses how situation awareness will be measured. The Situation Awareness Control Room Inventory (SACRI) method is discussed in NEDO-33276, Rev 1 but not in the RAI response. Please discuss the performance measures that will be used with the SACRI method. • Operator Workload: The response indicates that workload rating scales will be used and will be integrated by converting the ratings into a "fraction of the time involved over the simulated event." How will such a conversion be performed?
18.11-26 Supplement 1 (NEDO-33276 Rev. 1, March 29, 2007; MFN 06-446, November 22, 2006; MFN 07-334, June 27, 2007)	J. Bongarra	Performance Measurement: Performance Criteria	In the original RAI, the staff requested information on specific acceptance criteria for performance measures. For the staff to perform an implementation plan review, GEH should identify the criteria to be used for performance measures (consistent with NUREG-0711, Section 11.4.3.2.5.3). The specific criteria that are used for decisions as to whether the design is validated or not should be specified and distinguished from those being used to better understand the results. In addition, GEH should identify the basis for the criteria established. Note that the question of acceptance criteria is related to the discussion in RAI 18.11-29.

RAI Number	Reviewer	Question Summary	Full Text
18.11-27 Supplement 1 (NEDO-33276 Rev. 1, March 29, 2007; MFN 06-446, November 22, 2006; MFN 07-334, June 27, 2007)	J. Bongarra	Test Design	In the original RAI the staff requested the detailed test design methodology. In NEDO-33276, Rev. 1, GEH added a new section 4.4.9 to present a high level description of test design. However, GEH should provide the detailed information requested if the staff is to conduct an Implementation Plan level review. Please provide descriptions of the following aspect of test design (consistent with NUREG-0711, Section 11.4.3.2.6): • presentation of scenarios to crews • test procedures • training of test conductors • training of test participants • pilot studies.
18.11-29 Supplement 1 (NEDO-33276 Rev. 1, March 29, 2007; MFN 06-446, November 22, 2006; MFN 07-334, June 27, 2007)	J. Bongarra	Data analysis and Interpretation	To support the staff's review of the implementation plan, please describe (consistent with NUREG-0711, Section 11.4.3.2.7): • what methods will be used to analyze data and to assess performance criteria • how HEDs will be identified • how consistency across different measures will be evaluated • how data analysis will be verified for correctness NEDO-33276, Rev. 1, Section 4.4.8, contains high-level information about data analysis. Please clarify the following information in Section 4.4.8: The methods for analyzing the simulation results will draw from experience in EPRI OER program as summarized in EPRI NP-6560L, which provides estimates of the median response time and the standard deviation associated with different types of cue response as measures of consistency between crews and individuals. Acceptability of the MMIS clarity is that standard deviation falls within the ranges of responses demonstrated in existing plant simulations for multiple crews. For larger deviations between crews an examination of the MMIS for improvement is documented in an HED.

RAI Number	Reviewer	Question Summary	Full Text
			This does not seem to be an appropriate means of analyzing validation data. Assuming there will sufficient data to generate reliable statistics; the analysis is based on response variability and a comparison of that variability to the range of responses demonstrated in existing plant simulations. The approach seems to focus on variability alone, and not the acceptability of performance, e.g., are required tasks performed within an acceptable time for plant safety. It would seem the approach to analyzing data should focus on whether observed integrated system performance (as defined by the set of performance measures selected for use in validation) is acceptable (as defined by the acceptance criteria for each of the performance measures). Please provide an explanation of the approach to data analysis in light of the staff's concern. Note that the question of acceptance criteria is related to the discussion in RAI 18.11-26.

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)
art.alford@ge.com (Art Alford)
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)
dennis.chin@ge.com (Dennis Chin)
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)
jeff.waal@ge.com (Jeff Waal)
jgutierrez@morganlewis.com (Jay M. Gutierrez)
jim.kinsey@ge.com (James Kinsey)
jim.riccio@wdc.greenpeace.org (James Riccio)
jim.rogers@ge.com (Jim Rogers)
JJNesrsta@cpsenergy.com (James J. Nesrsta)
joel.Friday@ge.com (Joel Friday)
John.O'Neill@pillsburylaw.com (John O'Neill)
john.sorensen@ge.com (John Sorensen)
Joseph_Hegner@dom.com (Joseph Hegner)
junichi_uchiyama@mnes-us.com (Junichi Uchiyama)
kathy.sedney@ge.com (Kathy Sedney)
kathy.warnock@ge.com (Kathy Warnock)
kenneth.ainger@exeloncorp.com (Kenneth Ainger)
kimberly.milchuck@ge.com (Kimberly Milchuck)
KSutton@morganlewis.com (Kathryn M. Sutton)

kurt.schaefer@ge.com (Kurt Schaefer)
kwaugh@impact-net.org (Kenneth O. Waugh)
laura.bello@ge.com (Laura Bello)
lou.lanese@ge.com (Lou Lanese)
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)
randy.newton@ge.com (Randy Newton)
RJB@NEI.org (Russell Bell)
RKTemple@cpsenergy.com (R.K. Temple)
roberta.swain@ge.com (Roberta Swain)
sandra.sloan@areva.com (Sandra Sloan)
SauerB@BV.com (Robert C. Sauer)
sfrantz@morganlewis.com (Stephen P. Frantz)
sharon.lyons@ge.com (Sharon Lyons)
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)
Wanda.K.Marshall@dom.com
waraksre@westinghouse.com (Rosemarie E. Waraks)
wayne.marquino@ge.com (Wayne Marquino)
whorin@winston.com (W. Horin)