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August 15, 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: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 233 RELATED TO
ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Brown:

By letter dated August 24, 2005, GE Hitachi Nuclear Energy (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.

Pursuant to 10 CFR 2.390, we have determined that the enclosed RAIs contain proprietary information. We have prepared a non-proprietary version of the RAIs (Enclosure 1) that does not contain proprietary information. The proprietary information is indicated in brackets and underlined in Enclosure 2. We will delay placing this document in the public document room for a period of ten (10) working days from the date of this letter to provide you with the opportunity to comment on the proprietary aspects only. If you believe that any additional information in the enclosure is proprietary, please identify such information line by line and define the basis pursuant to the criteria of 10 CFR 2.390 before the public release date.

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R. Brown

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If you have any questions or comments concerning this matter, you may contact me at (301) 415-2890 Andrea.Johnson@nrc.gov or you may contact Thomas Kevern at (301) 415-0224 or Thomas.Kevern@nrc.gov.

Sincerely,

/RA R. Foster for:/

Andrea Johnson, 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 w/encl: See next page

R. Brown

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Andrea Johnson, 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 (Non-Proprietary)
2. Request for Additional Information (Proprietary)

cc: See next page (w/o enclosure 2)

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OFFICE	PM:NGE1	PM:NGE1
NAME	AJohnson	EOesterle
DATE	08/14/08	08/15/08

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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 233 RELATED TO
ESBWR DESIGN CERTIFICATION APPLICATION DATED AUGUST 15, 2008

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**Supplemental Requests for Additional Information (RAI)
ESBWR Design Control Document (DCD) Revision 5**

RAI Number	Reviewer	RAI Summary	RAI Full Text
11.3-13	Dvir A	A review of Chapter 11.3.2 DCD Tier 2, Revision 5, indicates inconsistency in Offgas equipment design criteria and code requirements. There is also inconsistency in equipment description.	<p>(a). A review of DCD Tier 2, Revision 5, Table 11.3-2., Offgas System Major Equipment Items, indicates the following:</p> <p>The Preheater tube side design temperature is 575 °F, but the shell side design is 450 °F. The applicant needs to clarify what safety considerations were taken in the event of tube failure when 575 °F gas leaks into the shell side. Also, the applicant needs to clarify pressure safety considerations in the event of tube failure where tube side design is 1250 PSIG and shell side design is 350 PSIG.</p> <p>(b). There is TEMA C code requirement for the Cooler-condenser but not for the Preheater and Catalyst (both are S&T Heat Ex.). Why?</p> <p>(c). A review of DCD Tier 2, Revision 5, Figure 11.3-1., Offgas System flow diagram shows Preheater- Recombiner – Cooler as one assembly. This is rather confusing since per DCD 11.3.2.2 the Recombiner assembly includes Preheater, Catalyst and Condenser sections. The applicant needs to clarify this and be consistent with the text and flow diagram.</p> <p>(d). The same flow diagram, Figure 11.3-1, shows eight (8) charcoal beds and two (2) guard beds. Table 11.3-2 calls for 10 vessels “filled with activated charcoal”. The applicant needs to clarify and be consistent with the flow diagram.</p> <p>(e). A review of DCD Tier 2, Revision 5, Chapter 11.3.2.5.4, Drying, does not make it clear what type of dryers will be used (refrigerant dryers or desiccant dryers?). The applicant needs to provide more detail as under this section.</p>

RAI Number	Reviewer	RAI Summary	RAI Full Text
			<p>(f). DCD Tier 2, Revision 5, Figure 11.3-1., Offgas System, has a note “Material per requirements of Reg. Guide 1.143.</p> <p>Table 1 of this guide is very specific as to material type and grade required for pressure retaining parts (i.e., 304 SS or 316SS, SA 36, or 516 Gr. 70 CS, etc.). DCD Tier 2, Revision 5, Table 11.3-2 is very general as to the materials description. The applicant needs to provide more detail on materials used in this system.</p>
11.0-1	Dehmel J	<p>A review of DCD Tier 2, Revision 5, revealed a number of inconsistencies in the citations of regulatory references, internally inconsistent citations of DCD tables, incorrect conversions from SI to conventional radiological units, and incomplete listing of radiological sampling points.</p>	<p>A review of DCD Tier 2, Revision 5, revealed a number of inconsistencies in the citations of regulatory references, internally inconsistent citations of DCD tables, incorrect conversions from SI to conventional radiological units, and incomplete listing of radiological sampling points. Specifically, the applicant is requested to review and resolve the following items:</p> <ul style="list-style-type: none"> a. Regarding incomplete and improper citations of references, is it not clear as whether a reference applies to the design bases, design features, regulatory analysis, or is part of a COLA information item? Specific examples include: <ul style="list-style-type: none"> (i) DCD Sect. 11.2 – Listed references are not cited in the text, e.g., ref. 11.2-8. The reference list includes improper regulatory citations, e.g., ref. 11.2-2; (ii) DCD Sect. 11.3 – Section makes an improper reference to a Section 12.2 table, Table 12.2-18b (wrong) vs 12.2-17 (correct). Listed references are not cited in the text, e.g., ref. 11.3-10. The reference list includes improper regulatory citations, e.g., ref. 11.3-1; and (iii) DCD Sect. 11.4 - Figure 11.4-4 is included but not cited in the text. Listed references are not cited in the text, e.g., ref. 11.4-5. The reference list includes improper regulatory citations, e.g., ref. 11.4-8. b. DCD Sect. 11.5 – Three instances of wrong conversions between MBq/m³ and uCi/m³ were noted: (i) Table 11.5-2 radiation monitor dynamic detection ranges: Turbine Building Normal Ventilation Air HVAC; and Turbine Building Combined Ventilation Exhaust; and (ii) Table 11.5-9, the Liquid Radwaste Discharge Monitor detection range is in error between MBq/m³ and uCi/m³. Given that the

RAI Number	Reviewer	RAI Summary	RAI Full Text
			<p>detection range is assigned to comply with RG 1.97 and Part 20 limits, the staff cannot resolve such inconsistency via independent means.</p> <p>c. DCD Sect. 11.5 – Sect. 11.5.3.2.13 (Stack Monitoring) refers to DCD Sect. 7.5.3 for compliance with RG 1.97 and TMI Action Plan Items for the plant stacks. However, Sect. 7.5.3 still refers to the "Plant Stack." Given this design change, Sect. 7.5.3 should refer to the new stack design, as the RB/FB, TB, and RWB stacks, as the DCD should not describe two different designs gaseous effluent release points and radiation monitoring systems in complying with Appendix B to Part 20, Appendix I to Part 50, and GDC 60 and 64.</p> <p>d. A review of DCD Tier 2, Revision 5, Section 9.2.6.2 indicates that DCD Table 11.5-5 does not include a system line item identifying sampling provisions for condensate water that might be present in the condensate storage tank basin and discharged to the storm drain. The basin's design includes a sump with provisions to pump water out of the basin to the LWMS or to release it to the storm drain in the event of a spill. Accordingly, a new system line item should be added to Table 11.5-5 in describing sampling provisions and criteria allowing the release of condensate water to the storm drain.</p>
12.2-15 S03	Dehmel J	A review of MFN 06-305 S02 and DCD Tier 2, Revision 5, DCD Table 12.2-19b indicates that the results were not adjusted for the ratio of the plant rated capacity factor (0.92/0.8).	A review of MFN 06-305 S02 and DCD Tier 2, Revision 5, DCD Table 12.2-19b indicates that the annual liquid effluent source term was not adjusted for the ratio of the plant rated capacity factor (0.92/0.8). The applicant is requested to either revise the liquid source term and doses by a ratio of 1.15, or introduce a properly qualified footnote in DCD Tier 2, Tables 12.2-19a and 12.2-20a (bases of source term and dose calculations) explaining the departure from the plant's rated design and significance of impact on dose results.

12.2-09 S05	Dehmel J	A review of MFN 06-305 S02, MFN 08-222, and DCD Tier 2, Revision 5, DCD Tables 12.2-16 and 12.2-18b indicates that the description of assumptions and dose results are inconsistent.	<p>A review of MFN 06-305 S02, MFN 08-222, and DCD Tier 2, Revision 5, DCD Tables 12.2-16 and 12.2-18b indicates that the description of assumptions and dose results are inconsistent. Specifically:</p> <p>(a). A review of DCD Tier 2, Revision 5, DCD Table 12.2-16 indicates that the description of the source terms and equilibrium for a set of 7 nuclides needs to be qualified as to the assumptions used for their stated equilibrium. The nuclides are Sr/Y-90, Zr/Nb-95, Ru-103/Rh-103m, Ru/Rh-106, Mo-99/Tc-99m, Ba/La-140, and Ce/Pr-144 and they should be qualified in estimating the source terms for the Rx/FB, RWB and TB. While the staff generally concurs with MFN 08-222, the applicant is requested to introduce a properly qualified footnote in DCD Table 12.2-16, or text update in Appendix 12B to DCD Section 12.2.2. Note that the staff's SER discussions and analysis of the source terms and doses will be based on an assumed 100 percent equilibrium for these radionuclides.</p> <p>(b). A review of DCD Tier 2, Revision 5, DCD Table 12.2-18b does not include the dose due to plume exposure for the infant. The concern is one of omission of the pathway and consistency with the results for all other age groups listed in this table. The staff finds the proposed deletion of the plume dose to all age groups (adult, teen and child) rather than adding it to the infant an unacceptable solution, given that this is an Appendix I compliance issue. A review of Appendix I, Sections II.B.1 and II.B.2 indicates that the dose objective clearly addresses external radiation exposures to the total body associated with all gaseous effluents. RG 1.109, Table 1 in deriving doses to the total body, refers to Eq. 8 and 10 for the methodology. For ground or mixed mode stack releases, Eq. 10 is applicable as it defines total body dose due to immersion in gaseous effluents, which represents plume exposure. The applicant is requested to revise the dose results for the infant in DCD Tier 2, Table 12.2-18b by adding to it the contribution from plume exposure and not subtract plume dose contributions from all other age groups.</p>
2.0-2	Harvey B	Errors in DCD Tier 2 Table 2.0-1	1. Revise Footnote 11 to DCD Tier 2 Table 2.0-1 to state that If a selected site has a χ/Q value that exceeds the ESBWR reference site value, the COL applicant will address how the radiological consequences associated with the controlling design basis accident continue to meet the dose reference values provided in

			<p>10 CFR 52.79(a)(1)(vi) (instead of 10 CFR 50.34(a)) using site-specific χ/Q values. 10 CFR Part 52, not 10 CFR Part 50, applies to COL applicants.</p> <p>2. Delete the sentence “COL applicant to determine basic speed of extreme wind for use in design of non safety-related structures that are not included as part of the ESBWR Standard Plant design” from COL information Item 2.0-7-A in DCD Tier 2 Table 2.0-2. The review of the design basis for non safety-related structures that are not included as part of the ESBWR standard plant design is beyond the scope of the COL FSAR.</p> <p>3. Delete the sentence “COL applicant to confirm or reanalyze in accordance with SRP 2.3.1.” from COL information Item 2.0-7-A in DCD Tier 2 Table 2.0-2. This sentence is redundant to the first sentence in the same COL information item which states the COL applicant is to supply site-specific information in accordance with SRP 2.3.1.</p> <p>4. Delete the phrase “and compared to dose values given in Chapter 15” from COL information Item 2.0-10-A listed in DCD Tier 2 Table 2.0-2. This COL information item asks the COL applicant to compare site meteorological dispersion values to dose values in Chapter 15. The comparison of dispersion values with dose values makes no sense.</p> <p>5. Revise COL information item 2.0-10-A in DCD Tier 2 Table 2.0-2 to state that the COL applicant will supply site-specific information in accordance with the SRP 2.3.4 to show that the site meteorological dispersion values as calculated in accordance with RG 1.145 and 1.194 result in doses less than stipulated in 10 CFR 52.79(a)(1)(vi) (instead of 10 CFR 50.34(a)). 10 CFR Part 52, not 10 CFR Part 50, applies to COL applicants.</p>
2.3-9 S2	Harvey B	Control Room χ/Q values	<p>1. Justify why the control room χ/Q values used to model LOCA releases from the main condenser (as shown in DCD Tier 2, Table 15.4-5a) assume the Turbine Building remains intact; that is, justify why the turbine building height (49.4 m) and width (111.6 m) as shown in DCD Tier 2, Table 2A-3 are used to determine the diffuse source initial lateral and vertical plume spread parameters for LOCA releases from the main condenser.</p>

			<p>The ESBWR LOCA is initiated by a seismic event. The main steam lines, main steam drain lines, and condensers are designed to meet the Safe Shutdown Earthquake (SSE) criteria whereas the Turbine Building is not designed to meet SSE criteria. [[</p> <p style="text-align: center;">]]</p> <p>2. Justify why the reactor building and fuel building diffuse area source models are used to evaluate the fuel handling accident.</p> <p>ESBWR Technical Specification 3.6.3.1 does not require the reactor building to be operational during Mode 6 (refueling) and the response to RAI 2.3-9 S01 item d(iii) states that [[</p> <p style="text-align: center;">]] the reactor building and fuel building diffuse area source models should not be used to evaluate the fuel handling accident. COL Information Item 2A.2-2.A states that any door on the east sides of the reactor building and fuel building must be administratively controlled prior to and during the movement of irradiated fuel bundles such that these doors are promptly closed under conditions indicative of a fuel handling accident. However, Footnote 3 to Section 5.3 of Appendix B to RG 1.183 states that radiological analyses should generally not credit for such manual isolation of the containment (e.g., ESBWR reactor building and fuel building).</p> <p>Because the fuel building and reactor building ventilation systems discharge to the reactor building/fuel building ventilation stack, the applicant should also discuss why this stack is not considered to be a potential release pathway for the fuel handling accident.</p>
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			<p>3. Revise Technical Specification 3.6.3.1 to include administrative controls to close the doors on the east side of the reactor building and fuel building within 30 minutes under conditions indicative of a fuel handling accident. Section 5.3 of Appendix B to RG 1.183 states that if the containment (e.g., ESBWR reactor building or fuel building) is open during fuel handling operations, the technical specifications allowing such operations should include administrative controls to close the open penetrations within 30 minutes. Such administrative controls will generally require that a dedicated individual be present, with necessary equipment available, to restore containment closure should a fuel handling accident occur.</p>
2.3-10S3	Harvey B	Release pathway for three ventilation stacks	<p>Update the DCD to include release pathway information (e.g., stack height above grade and relationship to adjacent buildings; release point shape and inside dimensions; effluent temperature, flow rate, and exit velocity) for each of the three ventilation stacks. Also verify that all three ventilation stacks are uncapped and vertically oriented.</p> <p>This information will be required by COL applicants in generating site-specific long term atmospheric dispersion site characteristics.</p>

DC GE - ESBWR Mailing List

(Revised 08/06/08)

cc:

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

Mr. Ray Ganthner
Senior Vice President
AREVA, NP, Inc. 3315
Old Forest Road
P.O. Box 10935
Lynchburg, VA 24506-0935

DC GE - ESBWR Mailing List

Email

aec@nrc.gov (Amy Cubbage)
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)
cberger@energetics.com (Carl Berger)
charles.bagnal@ge.com
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)
GEH-NRC@hse.gsi.gov.uk (Geoff Grint)
george.honma@ge.com (George Honma)
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)
jeff.waal@ge.com (Jeff Waal)
jgutierrez@morganlewis.com (Jay M. Gutierrez)
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.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)

DC GE - ESBWR Mailing List

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)
lee.dougherty@ge.com
lou.lanese@ge.com (Lou Lanese)
Marc.Brooks@dhs.gov (Marc Brooks)
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)
mike_moran@fpl.com (Mike Moran)
MSF@nei.org (Marvin Fertel)
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)
rick.kingston@ge.com (Rick Kingston)
RJB@NEI.org (Russell Bell)
RKTemple@cpsenergy.com (R.K. Temple)
Robert.Peters@ge.com (Robert Peters)
roberta.swain@ge.com (Roberta Swain)
Russell.Wells@Areva.com (Russell Wells)
sandra.sloan@areva.com (Sandra Sloan)
SauerB@BV.com (Robert C. Sauer)
sfrantz@morganlewis.com (Stephen P. Frantz)
steven.hucik@ge.com (Steven Hucik)
tdurkin@energetics.com (Tim Durkin)
tom.childress@ge.com
tom.miller@hq.doe.gov (Tom Miller)
trsmith@winston.com (Tyson Smith)
Vanessa.quinn@dhs.gov (Vanessa Quinn)
VictorB@bv.com (Bill Victor)
Wanda.K.Marshall@dom.com (Wanda K. Marshall)
wayne.cutright@ge.com (Wayne Cutright)
wayne.marquino@ge.com (Wayne Marquino)
whorin@winston.com (W. Horin)