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Proprietary Notice
This letter forwards proprietary information in accordance with 10CFR2.390. Upon the removal of Enclosure 1, the balance of this letter may be considered non-proprietary.

MFN 08-391

Docket No. 52-010

April 18, 2008

U.S. Nuclear Regulatory Commission

Document Control Desk
Washington, D.C. 20555-0001

Subject: **Response to Portion of NRC Request for Additional Information Letter No. 110 – Related to ESBWR Design Certification Application – RAI Number 4.8-7 Supplement 2**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by the Reference 1 NRC letter. GEH response to RAI Number 4.8-7 S02 is addressed in Enclosures 1, 2, 3 and 4.

Enclosure 1 contains GNF proprietary information as defined by 10 CFR 2.390. GNF customarily maintains this information in confidence and withholds it from public disclosure. A non-proprietary version is provided in Enclosure 2.

The affidavit contained in Enclosure 4 identifies that the information contained in Enclosure 1 has been handled and classified as proprietary to GNF. GEH hereby requests that the information of Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 10 CFR 9.17.

Verified DCD changes associated with this RAI response are identified in the Enclosure 3 DCD markups by enclosing the text within a black box. The marked-up pages may contain unverified changes in addition to the verified changes resulting from this RAI response. Other changes shown in the markups may not be fully developed and approved for inclusion in DCD Revision 5.

D068
NRO

If you have any questions or require additional information, please contact me.

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

Reference:

1. MFN 07-510, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 110 Related To ESBWR Design Certification Application*, dated September 19, 2007.

Enclosures:

1. MFN 08-391 – Response to Portion of NRC Request for Additional Information Letter No. 110 – Related to ESBWR Design Certification Application – RAI Number 4.8-7 S02 – GNF Proprietary Information
2. MFN 08-391 – Response to Portion of NRC Request for Additional Information Letter No. 110 – Related to ESBWR Design Certification Application – RAI Number 4.8-7 S02 – Non-Proprietary Version
3. MFN 08-391 – Response to Portion of NRC Request for Additional Information Letter No. 110 – Related to ESBWR Design Certification Application – DCD Markups from the Response to RAI Number 4.8-7 S02
4. MFN 08-391 – Response to Portion of NRC Request for Additional Information Letter No. 110 – Related to ESBWR Design Certification Application – RAI Number 4.8-7 S02 – Affidavit

cc: AE Cubbage USNRC (with enclosure)
GB Stramback GEH/San Jose (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
DH Hinds GEH/Wilmington (with enclosure)
eDRF 0000-0084-3454

Enclosure 2

MFN 08-391

Response to Portion of NRC Request for

Additional Information Letter No. 110

Related to ESBWR Design Certification Application

RAI Number 4.8-7 S02

Non-Proprietary Version

NRC RAI 4.8-7 S02

Flow-induced Vibration Testing

As discussed during the July 2007 GEH Control Blade and Fuel Assembly Design Audit, please capture plans to perform the Flow-induced Vibration Testing and submit the results. The GEH report should discuss ESBWR operating conditions and coolant quality relative to test conditions, steam acceleration effects, and disposition single-phase versus two-phase testing effects.

GEH Response

GNF has historically undertaken Flow Induced Vibration (FIV) testing for the introduction of new fuel designs. As in the past, GNF will conduct single phase FIV testing of a particular fuel bundle design that will be loaded into an ESBWR core as part of the fuel design program. Such a test will ensure that the design features of the selected fuel bundle design do not increase the potential for fretting wear and will specifically address any impacts that design features, including, but not limited to, short part length rods, spacers, Defender Debris Filter, and the lattice configuration may have on the overall vibration response. The method used to demonstrate the FIV acceptability of the selected fuel assembly will be to compare the vibration response of the ESBWR fuel bundle design with that from GNF bundle designs active in utility reactor cores at the time of testing, including GE14. Specifically, comparable existing bundle fuel rod responses will be measured at a number of locations, including locations of any new ESBWR fuel features. As in the GNF past practice for introducing new fuel designs, a new ESBWR fuel assembly will then be inserted in the test loop and comparable data and comparable locations will be evaluated at the same flow conditions using the same instrumentation. The primary instrumentation will be biaxial accelerometers that are mounted inside the fuel rods. As with previous GNF FIV tests, [[

]]. Data reduction will include peak acceleration and root mean square (RMS) displacement comparisons. [[

]] Response spectrums will be generated to assure that there are no significant differences in response between the ESBWR fuel assembly and the GNF fuel bundle designs active in the operating reactors at the time of testing. The results of the FIV tests are expected to show that there are no significant differences in the peak acceleration and RMS displacement response of the new ESBWR fuel and water rods compared to the performance of existing GNF fuel and water rods. At the conclusion of testing, a comprehensive test report will be created. This test report will be the basis for closure of a new ITAAC that will address the FIV testing for the first core load for each ESBWR (see below).

Single phase testing is considered necessary and sufficient to fully characterize new ESBWR fuel bundle FIV characteristics. "Fuel Rod Vibration in Two-Phase Flow" (NEDE-24389) describes extensive testing to determine effects of thermal-hydraulic parameters (temperature, flow and quality) on FIV results. [[

]] Dependence on quality is determined for both two-phase (adiabatic with two-phase inlet flow) and boiling (single-phase inlet flow with direct heating) tests at various mass fluxes. [[

]]

Acceleration levels an order of magnitude higher than recent experience would be considered unacceptable. Such unacceptable acceleration levels are described in "Fuel Water Rod FIV Tests" (NEDE-24254P).

DCD Impact

DCD Tier 1 Subsection 2.1.1 and Table 2.1.1-3 will be revised in Revision 5 as shown in the markup pages in Enclosure 3.

DCD Tier 2 Subsection 4.2.3.12 will be revised in Revision 5 as shown in the markup pages in Enclosure 3.

Enclosure 3

MFN 08-391

Response to Portion of NRC Request for

Additional Information Letter No. 110

Related to ESBWR Design Certification Application

DCD Markups from the Response to RAI Number 4.8-7 S02

(7) RPV surveillance specimens are provided from the forging material of the beltline region and the weld and heat affected zone of a weld typical of those adjacent to the beltline region. Brackets welded to the vessel cladding at the location of the calculated peak fluence are provided to hold the removable specimen holders and a neutron dosimeter in place.

(8) The RPV internal structures listed in Table 2.1.1-1 (chimney and partitions, chimney head and steam separators assembly, and steam dryer assembly) must meet the limited provisions of ASME Code Section III regarding certification that these components maintain structural integrity so as not to adversely affect RPV core support structure.

(9) The initial fuel to be loaded into the core will withstand flow-induced vibration and maintain fuel cladding integrity during operation.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.1.1-3 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria for the Reactor Pressure Vessel System.

Table 2.1.1-3

ITAAC For Reactor Pressure Vessel System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
~~7.~~8. The RPV internal structures listed in Table 2.1.1-1 (chimney and partitions, chimney head and steam separators assembly, and steam dryer assembly) must meet the limited provisions of ASME Code Section III regarding certification that these components maintain structural integrity so as not to adversely affect RPV core support structure.	Inspections will be conducted of the as-built internal structures as documented in the ASME Code design reports.	Report(s) documented that the RPV internal structures listed in Table 2.1.1-1 (chimney and partitions, chimney head and steam separators assembly, and steam dryer assembly) meet the limited provisions of ASME Code Section III, NG-1122 (c), regarding certification that these components maintain structural integrity so as not to adversely affect RPV core support structure.
~~7.~~9. The initial fuel to be loaded into the core will withstand flow-induced vibration and maintain fuel cladding integrity during operation.	Flow-Induced Vibration (FIV) testing will be performed on the fuel bundle design that will be loaded into the ESBWR initial core and on the reference GNF fuel design in reactor use during the time of the tests. Bundle and rod responses at various elevations between the ESBWR design and the GNF fuel design with the most similar design features will be compared.	A report exists that documents test results are acceptable. Acceptable criteria are that (from an FIV performance aspect) each location's average Root Mean Square (RMS) response does not exceed one order of magnitude greater than that of the reference bundle at each instrumented location.

4.2.3.11 Tie Plates

Adequacy of tie plate designs is demonstrated by detailed finite element analysis and/or mechanical testing for bounding fuel handling and seismic load conditions.

4.2.3.12 Spacers

Fuel spacer acceptability is proven by testing in accordance with NRC approved methods. The bounding load condition is seismic loading. Tests are conducted to demonstrate spacer fatigue capability and compliance with load limits and to demonstrate that a coolable geometry is maintained by showing minimal deformation at the combined load condition. Fretting wear is addressed by performing Flow-Induced Vibration (FIV) tests and evaluating the results relative to spacer designs that have demonstrated acceptable performance. Inspections, tests, analyses, and acceptance criteria (ITAAC) associated with the Flow-Induced Vibration (FIV) tests of ESBWR fuel assemblies are provided in Tier 1. Flow-Induced Vibration (FIV) testing will be performed on the fuel bundle design that will be loaded into the ESBWR initial core and on the reference GNF fuel design in reactor use during the time of the tests. In addition, both bundles will be fully instrumented at and near all design feature differences to capture any response differences exhibited by the ESBWR fuel design. Flow-induced vibration characteristics of the fuel design loaded into the ESBWR will be compared on a location-by-location basis to the reference GNF fuel design. Bundle and rod responses at various elevations between the ESBWR design and the GNF fuel design with the most similar design features will be compared to determine that ESBWR fuel design FIV response is adequate. ESBWR bundle performance will be considered acceptable from an FIV performance aspect when each location's average RMS response does not exceed one order of magnitude greater than that of the reference bundle at each instrumented location. The one order of magnitude limit acceptance criteria for the ITAAC has been used successfully for all GNF fuel introductions and has been verified via proven acceptable performance for all GNF fuel types since the introduction of GE9.

4.2.3.13 Channel

Channel adequacy relative to applicable design criteria is confirmed by performing the following evaluations:

- Calculation of elastic stress and deflection due to channel wall ΔP;
- Calculation of thermal stresses due to the various temperature gradients to which the channel is subjected during normal operation and handling;
- Calculations of fatigue and stress rupture that consider the combined effect of pressure-temperature cycling and hold time;
- Elastic-plastic and creep calculations of channel wall permanent deflection;
- Calculation of channel stress due to control rod contact; and
- Channel/lower tie plate differential thermal expansion analysis.

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Enclosure 4

Response to Portion of NRC Request for

Additional Information Letter No. 110

Related to ESBWR Design Certification Application

RAI Number 4.8-7 S02

Affidavit

Global Nuclear Fuel – Americas

AFFIDAVIT

I, Andrew A. Lingenfelter, state as follows:

(1) I am Vice President, Fuel Engineering, Global Nuclear Fuel – Americas, L.L.C. ("GNF-A"), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in enclosure 1 of GEH's letter, MFN 08-391, Mr. James C. Kinsey to U.S. Nuclear Energy Commission, entitled "*Response to Portion of NRC Request for Additional Information Letter No. 110 Related to ESBWR Design Certification Application – RAI Number 4.8-7 Supplement 2,*" dated April 18, 2008. The proprietary information in enclosure 1, which is entitled "*Response to Portion of NRC Request for Additional Information Letter No. 110 Related to ESBWR Design Certification Application – RAI Number 4.8-7 S02 – GNF Proprietary Information,*" is delineated by a [[dotted underline inside double square brackets.{3}]] Figures and large equation objects are identified with double square brackets before and after the object. In each case, the superscript notation {3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GNF-A relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GNF-A's competitors without license from GNF-A constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals aspects of past, present, or future GNF-A customer-funded development plans and programs, resulting in potential products to GNF-A;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. above.

(5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GNF-A, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GNF-A, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GNF-A. Access to such documents within GNF-A is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GNF-A are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2) is classified as proprietary because it contains details of GNF-A's fuel design and licensing methodology. The development of the methods used in these analyses, along with the testing, development and approval of the supporting methodology was achieved at a significant cost, on the order of several million dollars, to GNF-A or its licensor.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GNF-A's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GNF-A's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base

goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GNF-A.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GNF-A's competitive advantage will be lost if its competitors are able to use the results of the GNF-A experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GNF-A would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GNF-A of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 18th day of April 2008.

Andrew A. Lingenfelter
Vice President – Fuel Engineering
Global Nuclear Fuel – Americas, L.L.C.