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

MFN 06-492

Docket No. 52-010

December 1, 2006

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. 66 Related to ESBWR Design Certification Application – DCD Chapter 4 and GNF Topical Reports – RAI Numbers 4.2-11 and 4.2-12**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 letter.

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

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If you have any questions about the information provided here, please let me know.

Sincerely,

David H. Hinds
Manager, ESBWR

Reference:

1. MFN 06-377, Letter from U. S. Nuclear Regulatory Commission to Mr. David H. Hinds, *Request for Additional Information Letter No. 66 Related to ESBWR Design Certification Application,* October 10, 2006

Enclosures:

1. MFN 06-492 - Response to Portion of NRC Request for Additional Information Letter No. 66 Related to ESBWR Design Certification Application – DCD Chapter 4 and GNF Topical Reports – RAI Numbers 4.2-11 and 4.2-12 – Contains GNF Proprietary Information
2. MFN 06-492 - Response to Portion of NRC Request for Additional Information Letter No. 66 Related to ESBWR Design Certification Application – DCD Chapter 4 and GNF Topical Reports – RAI Numbers 4.2-11 and 4.2-12 – Non Proprietary Version
3. Affidavit – Jens G. M. Andersen – dated December 1, 2006

cc: AE Cubbage USNRC (with enclosures)
AA Lingenfelter GNF/Wilmington (w/o enclosures)
GB Stramback GE/San Jose (with enclosures)
eDRFs 0061-3988 for 4.2-11
0060-1287 for 4.2-12

Enclosure 2

MFN 06-492

Response to Portion of NRC Request for

Additional Information Letter No. 66

Related to ESBWR Design Certification Application

Chapter 4 and GNF Topical Reports

RAI Numbers 4.2-11 and 4.2-12

Non-Proprietary Version

NRC RAI 4.2-11:

DCD Tier 1, Rev. 1, Section 2.9 under principal design criteria states, "The material of the control rod will be compatible with the reactor environment". In recent years, the phenomena shadow corrosion has been identified. This phenomena is partly due to the interaction between the zircaloy channels and stainless steel control blades. Discuss the implementation of this principle design criteria with respect to shadow corrosion.

GE Response:

This principal design criterion covers only the materials selection for the control blade. The main requirements regarding compatibility of the control blade material with the reactor environment are that the absorber tube material must be resistant to stress corrosion cracking (SCC) and deformation induced by B_4C swelling. Resistance to SCC and B_4C swelling insures the mechanical integrity and operational capability of the control blades through life. [[

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Shadow corrosion is a phenomenon that affects the channel in some situations and is considered in the evaluation of channel-control blade interference (see response to RAI 4.8-9). In such situations, shadow corrosion induces channel bow toward the control blades as a result of greater hydrogen uptake on the channel sides facing the blade relative to the channel sides away from the blade. Shadow corrosion-induced bow is a relatively new phenomenon and the industry is still working to understand it mechanistically. Several materials are known to cause shadow corrosion on Zircaloy, including stainless steel and Inconel. At this time, there is insufficient understanding to tailor the specifications of the control blade materials to reduce the propensity for shadow corrosion. [[

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DCD Impact

No DCD changes will be made in response to this RAI.

NRC RAI 4.2-12:

Describe what factors in the determination of the maximum linear heat generation rate limit that ensure the value is conservative based on uncertainties in the plant nuclear instrumentation and calibration as well as uncertainties and biases in the bundle peaking factors and uncertainties and biases in the 3D MONICORE PANAC11 computational engine? Justify any credit taken for adaption or relative improvement in LPRM instrument accuracy based on gamma thermometer calibration, as compared to TIP calibration.

GE Response:

To reasonably ensure the maximum linear heat generation rate limit (MLHGR) is conservative, a [[ ]] power uncertainty is included in the determination of the MLHGR value to explicitly account for monitoring uncertainties. These monitoring uncertainties include uncertainties in the plant nuclear instrumentation and calibration as well as uncertainties and biases in the bundle peaking factors and uncertainties and biases in the 3D Simulator computational engine. NEDC-33242P (reference 4.2-5 of the DCD Tier 2 Chapter 4) will be modified (see the actual modification at the bottom of this response) to clarify the use of this [[ ]] power uncertainty design basis MLHGR value. It is not the intent to either take credit or penalize the ESBWR adaption or relative improvement in LPRM instrument accuracy based on ESBWR nuclear instrumentation calibration, as compared to TIP calibration, but to simply account for it. The following paragraph discusses the application of this [[ ]] power uncertainty design basis MLHGR value for the ESBWR.

For conventional BWRs, Appendix A Section II.5 of NEDC-32694P-A shows that this MLHGR power uncertainty can be divided into the following components: Nodal Power Uncertainty and Pin Power Peaking Uncertainty, defined as:

[[

σ_{MC} σ_{GR}

]]

Because the nuclear instrumentation, core design, and core monitoring systems for the ESBWR are sufficiently similar to the conventional BWR, the above equations are applicable to the ESBWR. The individual uncertainty components for the $\sigma_{pinpeaking}$ value are not expected to be different between the ESBWR and conventional BWRs, because the core monitoring system and fuel design are similar. Hence the $\sigma_{pinpeaking}$ value of [[ ]] from Appendix A Section II.5 of NEDC-32694P-A can be applied to the ESBWR. Table 7A-4 of DCD Tier 2 Chapter 7 shows a σ_{nodal} value of [[ ]] for a 9 GT thermocouples per string system based on gamma scans. For a 7 GT thermocouples per string system, Table 7A-6 of DCD Tier 2 Chapter 7 shows an increase in nodal uncertainty of [[ ]] relative to 9 GT. To ensure the uncertainty is bounding, the [[ ]] σ_U component from Section 3.2 of NEDC-32694P-A is applied to account for LPRM updates and instrument failure. Therefore, for a 7 GT thermocouples per string system the σ_{nodal} value is [[ ]].

Hence for a 7 GT thermocouples per string system, the σ_{LHGR} value is [[ ]]. Therefore, a [[ ]] power uncertainty design basis MLHGR value for the ESBWR is adequate.

Addition of new sentence to Chapter 4 of LTR NEDC-33242P after 1st sentence of the 3rd paragraph that ends with the phrase "throughout the fuel rod lifetime":

> *In addition, a* [[ ]] *power uncertainty is included in the analyses to explicitly account for monitoring uncertainties.*

LTR Impact

NEDC-33242P, Chapter 4 will be revised as described above.

DCD Impact

No DCD changes will be made in response to this RAI.

ENCLOSURE 3

MFN 06-492

Affidavit

Affidavit

I, Jens G. M. Andersen, state as follows:

(1) I am Consulting Engineer, Thermal Hydraulic Methods, 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 GE letter MFN 06-492, David H. Hinds to U. S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 66 Related to ESBWR Design Certification Application – DCD Chapter 4 and GNF Topical Reports - RAI Numbers 4.2-11and 4.2-12* dated December 1, 2006. The proprietary information in Enclosure 1, *MFN 06-492 Response to Portion of NRC Request for Additional Information Letter No. 66 Related to ESBWR Design Certification Application – DCD Chapter 4 and GNF Topical Reports - RAI Numbers 4.2-11 and 4.2-12,* is delineated by double underlined dark red font text and is enclosed inside double square brackets. Figures and large equation objects are identified with double square brackets before and after the object. 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, of potential commercial value 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 the 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. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in (6) and (7) following. 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.

(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, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, 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 fuel design and licensing methodology 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 or its licensor.

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 at Wilmington, North Carolina this 1st day of December 2006.

Jens G. M. Andersen
Global Nuclear Fuels – Americas, LLC