



GE Energy

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.*

**James C. Kinsey**  
Project Manager, ESBWR Licensing

PO Box 780 M/C J-70  
Wilmington, NC 28402-0780  
USA

T 910 675 5057  
F 910 362 5057  
jim.kinsey@ge.com

MFN 07-046

Docket No. 52-010

January 26, 2007

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. 82 Related to ESBWR Design Certification Application –  
DCD Chapter 4 and GNF Topical Reports – RAI Numbers 4.9-1, 4.9-3  
and 4.9-4**

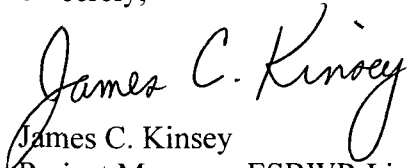
Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 letter.

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.

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

Sincerely,

  
James C. Kinsey  
Project Manager, ESBWR Licensing

Reference:

1. MFN 06-515, Letter from U. S. Nuclear Regulatory Commission to Mr. David H. Hinds, *Request for Additional Information Letter No. 82 Related to ESBWR Design Certification Application*, December 7, 2006

Enclosures:

1. MFN 07-046 - Response to Portion of NRC Request for Additional Information Letter No. 82 Related to ESBWR Design Certification Application – DCD Chapter 4 and GNF Topical Reports – RAI Numbers 4.9-1, 4.9-3 and 4.9-4 – GNF Proprietary Information
2. MFN 07-046 - Response to Portion of NRC Request for Additional Information Letter No. 82 Related to ESBWR Design Certification Application – DCD Chapter 4 and GNF Topical Reports – RAI Numbers 4.9-1, 4.9-3 and 4.9-4 – Non Proprietary Version
3. Affidavit – Jens G. M. Andersen – dated January 26, 2007

cc: AE Cabbage USNRC (with enclosures)  
AA Lingenfelter GNF/Wilmington (w/o enclosures)  
GB Stramback GE/San Jose (with enclosures)  
eDRFs 0063-2506

**Enclosure 2**

**MFN 07-046**

**Response to Portion of NRC Request for  
Additional Information Letter No. 82  
Related to ESBWR Design Certification Application**

**DCD Chapter 4 and GNF Topical Reports**

**RAI Numbers 4.9-1, 4.9-3, and 4.9-4**

**Non-Proprietary Version**

**NRC RAI 4.9-1:**

Section 2 of NEDE-33243P states that blade lifetime is defined as a 10 percent reduction in the cold worth of a quarter segment of the blade.

- a) Please discuss the overall reduction in total blade worth at the point where a quarter segment has been reduced by 10 percent.*
- b) Please discuss how the EOL reduction in blade worth is accounted for in safety analysis and shutdown margin calculations.*

**GE Response:**

- a) With the axial burnup resembling the nominal profile in Table 5-1 of NEDE-33243P and the [[ ]] quarter segment reaches 10% worth reduction, the total blade worth is approximately [[ ]] reduction from the un-depleted cold worth. Similarly, the EOL blade worth corresponding to the limiting axial profile is [[ ]] reduction from the un-depleted cold worth.
- b) The analysis of shutdown margin for reduced worth control blades has been well defined in the GNF technical design procedure. The impacts on cold shutdown margin and maximum subcritical banked withdrawal position shutdown margin, for operation with reduced worth control blades, are both addressed in the procedure. The procedure also provides guidance for checking the shutdown margin results against the appropriate acceptable criteria. For control blades operating within the nuclear lifetime limit, no additional safety analysis is required

**DCD Impacts:**

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

**NRC RAI 4.9-3:**

*Section 2 of NEDE-33243P describes the blade worth depletion methodology. Please discuss the sensitivity of the end-of-life fluence prediction to the following parameters:*

- 1) coolant conditions (e.g., void fraction)*
- 2) variations in axial power distribution with burnup*
- 3) Cycle 1 fuel management*
- 4) reload, non-equilibrium fuel management*
- 5) U235 enrichment*
- 6) fuel assembly design (e.g., part-length fuel rods)*
- 7) control blade insertion patterns (e.g., fluence history)*

**GE Response:**

- 1) A high void fraction implies lower coolant density, and lower thermal flux in the adjacent fuel, which lowers the end-of-life fluence. The ESBWR fluence limit in NEDE-33243P was calculated assuming [[                    ]] fraction, which is representative of the operating conditions and provides a conservative prediction of EOL fluence.
- 2) The typical EOL axial power profile is top-peaked. The lower segment of the core is expected to experience lower power and lower void fraction, hence accumulating higher fluence. The EOL fluence of ESBWR control blade is predicted based on the depletion of top segment, and therefore is conservative.
- 3) Designs for the initial core and subsequent transition cycles have not been finalized. Related issues will be addressed in the plant-specific COL.
- 4) See 3) above
- 5) Higher enrichment is normally associated with higher thermal flux and consequently higher EOL fluence.
- 6) The vanishing rod space in the part-length-rod design effectively lowers the average lattice enrichment and results in reduced EOL fluence.
- 7) For blades partially inserted, the relative moderator density is higher, resulting in lower absorption to fission ratio in the adjacent fuel. Similarly, for blades deeply inserted in low power locations, the lower power corresponds to a higher relative moderator density, both resulted in increased EOL fluence. For blades deeply inserted in relatively high power locations, the EOL fluence approaches the predicted values presented in NEDE-33243P.

**DCD Impact:**

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

**NRC RAI 4.9-4:**

*Section 3 of NEDE-33243P describes the EOL depletion calculations. Please discuss how these depletions (e.g., B10 depletion versus blade worth) compare with similar calculations performed for the Marathon control blades employed in the current BWR fleet.*

**GE Response:**

The depletion profile for the ESBWR Marathon blade is consistent with those of the current BWR fleet (BWR/2 to BWR/6), as shown in the plot below. The ESBWR control blade EOL depletion limit, defined as the B10 depletion that reduces the quarter segment cold worth by [[ ]], is approximately [[ ]].

[[

]]

**DCD Impact:**

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

**Enclosure 3**

**MFN 07-046**

**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 07-046, James C. Kinsey to U. S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 82 Related to ESBWR Design Certification Application – DCD Chapter 4 and GNF Topical Reports - RAI Numbers 4.9-1, 4.9-3 and 4.9-4* dated January 26, 2007. The proprietary information in Enclosure 1, *Response to Portion of NRC Request for Additional Information Letter No. 82 Related to ESBWR Design Certification Application – DCD Chapter 4 and GNF Topical Reports - RAI Numbers 4.9-1, 4.9-3 and 4.9-4 – Contains GNF Proprietary Information*, 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<sup>(3)</sup> 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.

Affidavit

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

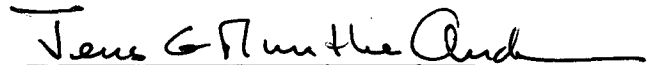
The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

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 26<sup>th</sup> day of January 2007.



Jens G. M. Andersen

Global Nuclear Fuels – Americas, LLC