

PROPRIETARY INFORMATION – WITHHOLD UNDER 10 CFR 2.390

10 CFR 50.90

January 13, 2012

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Limerick Generating Station, Unit 1
Facility Operating License No. NPF-39
NRC Docket No. 50-352

Subject: Response to Request for Additional Information - License Amendment Request Concerning Safety Limit Minimum Critical Power Ratio Change

- References:**
- 1) Letter from M. D. Jesse (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "License Amendment Request - Safety Limit Minimum Critical Power Ratio Change," dated October 12, 2011
 - 2) Letter from P. Bamford (U.S. Nuclear Regulatory Commission) to M. J. Pacilio, "Limerick Generating Station, Unit 1 – Request for Additional Information Regarding Proposed Technical Specification Safety Limit Minimum Critical Power Ratio Changes (TAC NO. ME7333)," dated December 21, 2011

In the Reference 1 letter, Exelon Generation Company, LLC (Exelon) requested a proposed change to modify Technical Specification (TS) 2.1 ("Safety Limits"). Specifically, this change incorporates revised Safety Limit Minimum Critical Power Ratios (SLMCPRs) due to the cycle specific analysis performed by Global Nuclear Fuel for Limerick Generating Station (LGS), Unit 1, Cycle 15. In the Reference 2 letter, the U.S. Nuclear Regulatory Commission requested additional information.

Attachment 1 provides the Exelon response to questions 2 and 7. Attachment 2 provides the Global Nuclear Fuel response to questions 1, 3, 4, 5, and 6.

**Attachment 2 transmitted herewith contains Proprietary Information.
When separated from attachments, this document is decontrolled.**

Response to Request for Additional Information –
License Amendment Request Concerning
Safety Limit Minimum Critical Power Ratio Change
January 13, 2012
Page 2

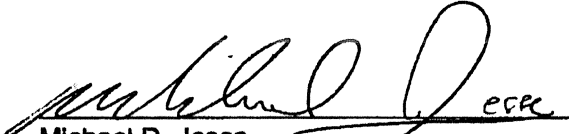
Attachment 2 (letter from C. F. Lamb (Global Nuclear Fuel) to J. Tusar (Exelon Generation Company, LLC), dated January 10, 2012) contains information proprietary to Global Nuclear Fuel. Global Nuclear Fuel requests that Attachment 2 be withheld from public disclosure in accordance with 10 CFR 2.390. Attachment 3 contains a non-proprietary version of the Global Nuclear Fuel document. An affidavit supporting this request is also contained in Attachment 4.

Additionally, there are no commitments contained within this letter.

Should you have any questions concerning this letter, please contact Tom Loomis at (610) 765-5510.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 13th day of January 2012.

Respectfully,



Michael D. Jesse
Director, Licensing & Regulatory Affairs
Exelon Generation Company, LLC

- Attachments:
- 1) Exelon Response to RAI Questions 2 and 7 for LAR Concerning SLMCPR Change
 - 2) Global Nuclear Fuel Response to Questions 1, 3, 4, 5, and 6 – Proprietary Version
 - 3) Global Nuclear Fuel Response to Questions 1, 3, 4, 5, and 6 – Non-Proprietary Version
 - 4) Affidavit

cc: USNRC Region I, Regional Administrator
USNRC Senior Resident Inspector, LGS
USNRC Project Manager, LGS
R. R. Janati, Commonwealth of Pennsylvania

ATTACHMENT 1

**Exelon Response to RAI Questions 2 and 7 for
LAR Concerning SLMCPR Change**

Question:

"2. Core design is an iterative process designed to develop an optimal configuration that meets operational requirements. In the LAR, Attachment 6, for the slides titled "Preliminary Energy Utilization Plan for Limerick 1 Cycle 15" and "Pre-Estimation – Linear Reactivity," please provide the most current updated parameters applicable to LGS, Unit 1, Cycle 15."

Response:

The final Energy Utilization Plan used for Limerick Generating Station (LGS), Unit 1 Cycle 15 is identical to the Energy Utilization Plan provided in the "Preliminary Energy Utilization Plan (EUP) for Limerick 1 Cycle 15" slide. No changes were made to the preliminary Energy Utilization Plan.

For the "Pre-Estimation – Linear Reactivity" slide, the Equilibrium Cycle Estimate approach is not relevant to LGS, Unit 1, Cycle 15 as noted on the slide. This technique (estimation approach) is used when equilibrium conditions in fuel type, cycle length, and power level will be achieved. The Equilibrium Cycle Estimation approach was not used because LGS, Unit 1 will not achieve equilibrium with the current fuel type, cycle length, and power level. LGS, Unit 1 is planning to implement an EPU (Extended Power Uprate) in Cycle 17 which will prevent reaching an equilibrium core of GNF2 fuel at the Cycle 15 power level.

Question:

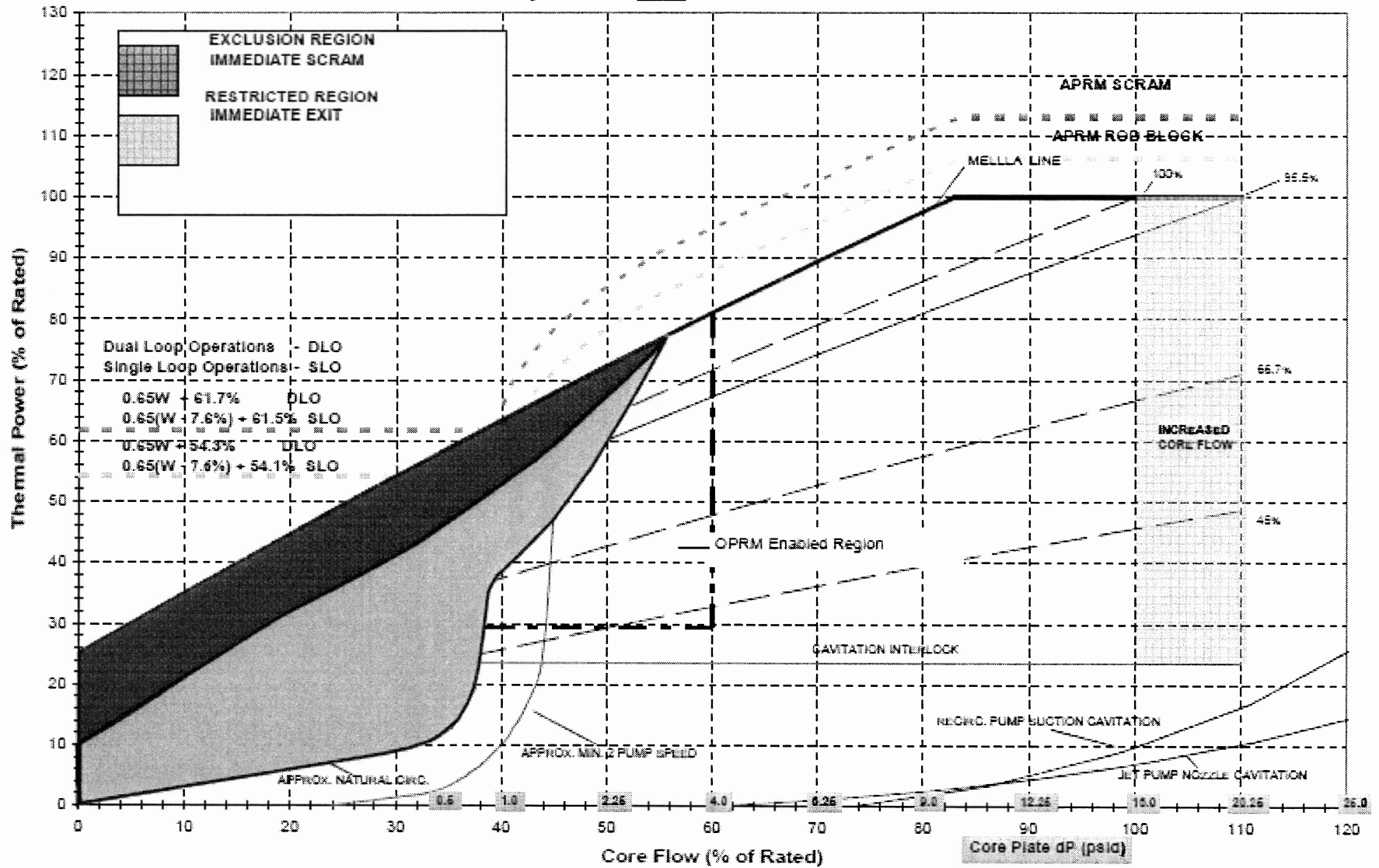
"7. Please provide an updated version of power/flow map for Cycle 15 operation, including stability Option III features of scram region and controlled entry region, based on the Boiling Water Reactor Owners Group position, as specified in NEDO-31960, for SLO and TLO."

Response:

The following is the power/flow map for back-up stability protection at LGS, Unit 1. LGS, Unit 1 does not use the controlled entry region. Instead, this region is conservatively treated as an "Immediate Exit" region on the power/flow map. The power/flow map also shows the "Immediate Scram" region. The Backup Stability Protection (BSP) region boundaries are calculated based on a specified core decay ratio per the approved stability methodology described in GESTAR (Section S.4.2.2, pg. US-38). The core decay ratio is a function of principal reactor core parameters (e.g., power and power distribution, flow, subcooling, fuel design, etc.). The core decay ratio is independent of the core flow mode – it is the same for two loop operation (TLO) and single loop operation (SLO). Therefore, the calculated BSP regions are bounding and applicable for both TLO and SLO. The power/flow map generally depicts a "natural circulation" flow line and a "maximum rod line". The BSP region boundaries are calculated based on points on the natural circulation line and the maximum rod line (identified as the MELLLA line) and the BSP regions are depicted as areas between the maximum rod line, the natural circulation line and the BSP region boundaries in the high-power, low-flow region of the map. However, the natural circulation line is approximate and the core flow measurement uncertainty is larger at low flow conditions. In the past, this has resulted in operating conditions in which the indicated power/flow condition was below (to the left of) the natural circulation line on the power/flow map. To address this situation, an operational decision was made to conservatively extend operating boundaries (e.g., maximum rod line,

stability regions, etc.) back to "zero flow". This operational enhancement to the power/flow map has been made to provide additional guidance for the unlikely, but possible circumstance of operating at these conditions.

LGS Power Flow Operation Map
OPRM Inoperable - ALL Feedwater Heaters In Service



ATTACHMENT 3

Global Nuclear Fuel Response to Questions 1, 3, 4, 5, and 6 – Non-Proprietary Version

ENCLOSURE 2

CFL-EXN-HH1-12-001

Response to NRC RAIs for Limerick Unit 1 Cycle 15 SLMCPR Submittal

Non-Proprietary Information – Class I (Public)

INFORMATION NOTICE

This is a non-proprietary version of CFL-EXN-HH1-12-001 Enclosure 1, which has the proprietary information removed. Portions of the document that have been removed are indicated by white space inside an open and closed bracket as shown here [[]].

REQUEST FOR ADDITIONAL INFORMATION
LIMERICK GENERATING STATION, UNIT 1
LICENSE AMENDMENT REQUEST REGARDING
PROPOSED SAFETY LIMIT MINIMUM CRITICAL POWER RATIO CHANGE
DOCKET NO. 50-352

By letter dated October 12, 2011 (Agencywide Documents Access and Management System Accession No. ML112870080), Exelon Generation Company, LLC (Exelon, the licensee) submitted a license amendment request (LAR) proposing to modify Technical Specification (TS) 2.1, "Safety Limits," for Limerick Generating Station (LGS), Unit 1. The requested change involves revised Safety Limit Minimum Critical Power Ratios (SLMCPRs) calculated as a result of the cycle-specific analysis performed by Global Nuclear Fuel (GNF) to support operation in the upcoming LGS, Unit 1, Cycle 15. The Nuclear Regulatory Commission (NRC) staff has been reviewing the submittal and has determined that additional information is needed to complete its review.

RAI-01:

In the LAR, Attachment 5, Tables RAI-06-1 and RAI-06-2, provide core maps to show those bundles experiencing 0.1% boiling transition criterion for limiting cases of single-loop operation (SLO) and two-loop operation (TLO). Please identify the bundle group and number of bundles in Figure 1 corresponding to their burnup status (once-burned, twice-burned, or fresh fuel) for Cycle 15.

Response to RAI-01:

Table RAI-01-1 contains the bundle group, number of bundles, bundle type, burnup status and fuel type associated with the Cycle 15 core loading map presented in Figure 1 of Attachment 4 of the LAR. All of the data presented in Table RAI-01-1 is equivalent for both TLO and SLO.

Table RAI-01-1

**Bundle Group, Number of Bundles, Bundle Type, Burnup Status and Fuel Type for Both
TLO and SLO**

[[

]]

RAI-02:

Core design is an iterative process designed to develop an optimal configuration that meets operational requirements. In the LAR, Attachment 6, for the slides titled "Preliminary Energy Utilization Plan for Limerick 1 Cycle 15" and "Pre-Estimation – Linear Reactivity," please provide the most current updated parameters applicable to LGS, Unit 1, Cycle 15.

Response to RAI-02:

Exelon will provide a response to this RAI.

RAI-03:

GNF2 fuel deviates from traditional 10x10 design through the introduction of a new part length rod configuration, the use of higher linear power, and the use of mixing vanes. The staff considers this a new fuel design with regards to the four restrictions identified in the Safety Evaluation of General Electric (GE) Licensing Topical Reports NEDC-32601P, NEDC-32694 and Amendment 25 to NEDE-24011-P-A. Given that LGS, Unit 1 Cycle 15 uses a core loading pattern which includes GNF2 fuel, please provide the following:

- (1) an evaluation of the four restrictions in NEDC-32601P, NEDC-32694 and Amendment 25 to NEDE-24011-P-A,
- (2) a description that explains under what conditions the methodologies listed in Section 1.0 of Attachment 4 are applied to the LGS, Unit 1, Cycle 15 application,
- (3) the reason why GNF2 has much higher critical power uncertainty than that of GE14, as shown in Table 6 of Attachment 4, and
- (4) a clarification for the statement “no new GNF fuel designs are being introduced in Limerick 1 Cycle 15” in Section 2.5 of Attachment 4.

Response to RAI-03-1:

The four restrictions for GNF2 were determined acceptable by the NRC review of the “GNF2 Advantage Generic Compliance with NEDE024011-P-A (GESTAR II),” NEDC-33270P, Revision 0, FLN-2007-011, March 14, 2007. Specifically, in the NRC audit report ML081630579 for the said document, Section 3.4.1 page 59 states:

“The NRC staff’s SE of NEDC-32694P-A (Reference 69 of NEDE 33207P) provides four actions to follow whenever a new fuel design is introduced. These four conditions are listed in Section 3.0 of the SE. The analysis and evaluation of the GNF2 fuel design was evaluated in accordance with the limitations and conditions stated in the NRC staff’s SE, and is acceptable.”

Additionally, the NRC audit report, ML081630579, Section 3.4.2.2.1 page 59 states:

“The NRC staff finds that the calculational methods, evaluations and applicability of the OLMCPR and SLMCPR are in accordance with existing NRC-approved methods and thus valid for use with GNF2 fuel.”

Response to RAI-03-2:

There are three references listed in Section 1.0 of Attachment 4. The applicability of each of the three references is discussed. The three references are:

- A. NEDC-32601P-A "Methodology and Uncertainties for Safety Limit MCPR Evaluations" (August 1999).
- B. NEDC-32694P-A "Power Distribution for Safety Limit MCPR Evaluations" (August 1999).
- C. NEDC-32505P-A "R-Factor Calculation Method for GE11, GE12 and GE13 Fuel" (Revision 1, July 1999).

Attachment 4 Table 2 identifies the actual methodologies used for the Cycle 15 and Cycle 14 SLMCPR calculations. References A and B are directly applicable to the analysis.

Reference C is the generic R-Factor methodology report that describes the changed methodology that was adopted after part length rods were introduced. The NRC staff's SE for NEDC-32505P-A has a requirement that the applicability of the R-Factor methodology is confirmed when a new fuel type is introduced. The confirmation for GNF2 was determined to be acceptable by the NRC staff review of the "GEXL17 Correlation for GNF2 Fuel," NEDC-33292P, Revision 0, FLN-2007-011, March 14, 2007 in the NRC audit report ML081630579, Section 3.5.5 page 62.

Response to RAI-03-3:

It should be noted that the correlation uncertainty, or standard deviation, for GEXL correlations tends to be in the range of [[]]. There is no definitive explanation for the higher uncertainty with GEXL17. While it is acknowledged that the GEXL17 standard deviation is slightly higher than that associated with GEXL14, the absolute magnitude remains typical and GEXL17 adequately predicts the onset of boiling transition for GNF2.

Response to RAI-03-4:

GNF's position is that GNF2 is an evolutionary fuel product based on GE14. It is not considered a new fuel design as it maintains the previously established 10x10 array and two water rod makeup.

RAI-04:

In the LAR, Attachment 5, "GNF Response to RAI-03 – Applied to LGS Unit 1," it states that LGS Unit 1 Cycle 15 is the first full reload of GNF2. Figure 1 of Attachment 4, indicates that Cycle 15 will contain both GE14 and GNF2 fuel. Please clarify the "full reload" statement against Figure 1.

Response to RAI-04:

The statement "full reload" refers to the fact that all fresh (reload) fuel introduced in Cycle 15 is of the same fuel type (GNF2).

RAI-05:

Please identify the breakdown of the 10x10 data shown in Attachment 4, Figure 5, by fuel type (i.e. (GE14, GNF2), because Figure 5 only shows combined data points for the two fuel types.

Response to RAI-05:

The 10x10 (GE14, GNF2) points shown in Figure 5 of Attachment 4 reflect transition cores with a mix of 10x10 fuel products. Thus, there are not specific GNF2 data points in Figure 5. The table following Figure 5 provides the GE14 and GNF2 batch sizes, and the corresponding $\left[\begin{matrix} \text{ } \\ \text{ } \end{matrix} \right]$ for the 10x10 (GE14, GNF2) points in the figure. The table is in ascending order of the abscissa of Figure 5 for ease of correlation to the figure. Sums of batch sizes and $\left[\begin{matrix} \text{ } \\ \text{ } \end{matrix} \right]$ may not add to 100% due to rounding and/or the presence of other fuel products in the core.

[[Batch Fraction (%)		[[
		GE14	GNF2		
		31.0	38.5		
		28.6	71.4		
		64.4	35.6		
		31.0	38.5		
		31.0	38.5		
		64.4	35.6		
		28.6	71.4		
		28.6	71.4		
		67.4	32.6		
		64.4	35.6		
		67.4	32.6		
]]	67.4	32.6]]

RAI-06:

Please clarify that there is no adverse impact relating to the GNF2 bent spacer wing operating experience to LGS, Unit 1, Cycle 15, operation. If there is an adverse impact, please provide an assessment of the impacts of such operation on fuel thermal performance.

Response to RAI-06:

GNF2 bent spacer wing related Part 21 issues are not applicable to Limerick Unit 1 Cycle 15 because the GNF2 fuel in this cycle is not impacted by the Part 21 issue.

RAI-07:

Please provide an updated version of power/flow map for Cycle 15 operation, including stability Option III features of scram region and controlled entry region, based on the Boiling Water Reactor Owners Group position, as specified in NEDO-31960, for SLO and TLO.

Response to RAI-07:

Exelon will provide a response to this RAI.

ATTACHMENT 4

Affidavit

ENCLOSURE 3

CFL-EXN-HH1-12-001

Affidavit

Global Nuclear Fuel – Americas

AFFIDAVIT

I, **Lukas Trosman**, state as follows:

- (1) I am Engineering Manager, Reload Design and Analysis, Global Nuclear Fuel – Americas, LLC (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 Enclosures 1 of GNF's letter, CFL-EXN-HH1-12-001, C. Lamb (GNF-A) to J. Tusar (Exelon Nuclear), entitled "GNF Response to NRC RAIs for Limerick Unit 1 Cycle 15 SLMCPR Submittal," dated January 10, 2012. GNF-A proprietary information in Enclosure 1, which is entitled "Response to NRC RAIs for Limerick Unit 1 Cycle 15 SLMCPR Submittal," is identified by a dotted underline inside double square brackets. ~~[[This sentence is an example.^{3}]]~~ A "[[" marking at the beginning of a table, figure, or paragraph closed with a "]" marking at the end of the table, figure or paragraph is used to indicate that the entire content between the double brackets is proprietary. 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, 975 F2d 871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F2d 1280 (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, 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 this methodology, along with the testing, development and approval was achieved at a significant cost to GNF-A.

The development of the fuel design and licensing methodology along with the interpretation and application of the analytical results is derived from an extensive experience database that constitutes a major GNF-A asset.

- (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.

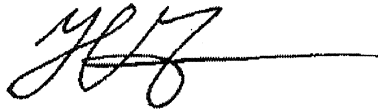
The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

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 10th day of January 2012.

A handwritten signature in black ink, appearing to read 'L. Trosman', with a horizontal line extending to the right.

Lukas Trosman
Engineering Manager, Reload Design and Analysis
Global Nuclear Fuel – Americas, LLC