Proprietary Information – Withhold From Public Disclosure Under 10 CFR 2.390
The Balance Of This Letter May Be Considered Non-Proprietary Upon Removal Of Enclosure 4

Jeffery A. Hardy
Manager Regulatory Assurance
Grand Gulf Nuclear Station
Tel: 802-380-5124

GNRO2024-00031

September 10, 2024

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

SUBJECT: Grand Gulf Nuclear Station, Unit 1, Pre-Submittal Slides for License Amendment Request, Criticality Safety Analysis, Technical Specification 4.3.1, Criticality and Technical Specification 5.5.14, Spent Fuel Storage Rack Neutron Absorber Monitoring Program

Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

Pursuant to the provisions Section 50.90 of Title 10 Code of Federal Regulations (CFR), Entergy Operations, Inc.(Entergy) is planning a license amendment to the Grand Gulf Nuclear Station, Unit 1 (GGNS). The proposed amendment includes, 1) a revision to the criticality safety analysis for the spent fuel storage racks, 2) addition of requirements for the analysis for the fuel pool storage racks as contained in TS 4.3, Fuel Storage; Subpart 4.3.1, Criticality, and 3) addition of the requirements for monitoring of the neutron absorber material in the storage racks in TS 5.5, Programs and Manuals, New-Subpart 5.5.14, Spent Fuel Storage Rack Neutron Absorber Monitoring Program.

Entergy has requested a Pre-Submittal meeting the week of September 16, 2024. To support the meeting, Entergy is providing as enclosures to this letter its presentation for this meeting. Enclosures 1 and 2 are non-proprietary. Enclosure 4 is proprietary and Entergy requests it to be withheld from public disclosure in accordance with 10 CFR 2.390 of the Commission's regulations.

To support withholding the slides in Enclosure 4 from public disclosure, Enclosure 3 provides an affidavit, signed by Lisa K. Schichlein. The affidavit sets forth the basis by which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR 2.390 of the Commission's regulations.

This letter contains no new regulatory commitments.

Should you have any questions or require additional information, please contact me at (802) 380-5124.

Respectfully,

JAH/ram

Enclosure:

1. Entergy Pre-Submittal Call Slides (Non-Proprietary)
2. GNF Pre-Submittal Call Slides (Non-Proprietary)
3. GNF Affidavit
4. GNF Pre-Submittal Call Slides (Proprietary)

cc: NRC Region IV Regional Administrator
NRC Senior Resident Inspector – Grand Gulf Nuclear Station
NRC Project Manager – Grand Gulf Nuclear Station
State Health Officer, Mississippi Department of Health

Enclosure 1
GNRO2024-00031

Entergy Pre-Submittal Call Slides (Non-Proprietary)
(19 pages below)

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GRAND GULF NUCLEAR STATION PRE-SUBMITTAL MEETING

Proposed License Amendment Request

Spent Fuel Pool and Upper Containment Pool Neutron Absorber Inserts And Criticality Safety Analysis

September 19, 2024

OPENING REMARKS / AGENDA

Jeff Hardy
Manager Regulatory Assurance
Grand Gulf Nuclear Station

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Purpose

- Discuss Grand Gulf Nuclear Station's plan to install NETCO SNAP-IN® neutron absorber inserts into the spent fuel storage rack cells within the spent fuel pool and upper containment pool
- Describe the methodology for a new spent fuel pool and upper containment pool criticality safety analysis, crediting the inserts and supporting the license amendment request
- Review the proposed license changes to credit the inserts
- Seek feedback from the NRC staff before making the submittal

Agenda (Non-Proprietary Session)

Background / Objective	Jeff Hardy
SNAP-IN Inserts Overview	Brian Rickard
Criticality Safety Analysis Overview	Christopher Kmiec
Proposed License Changes	Jeff Hardy
Questions	

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BACKGROUND / OBJECTIVE

Jeff Hardy
Manager Regulatory Assurance
Grand Gulf Nuclear Station

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Background / Objective

- Current GGNS spent fuel criticality safety analysis credits Boraflex neutron absorber material within the spent fuel pool and upper containment pool
- Contracted with Curtiss-Wright Nuclear Division to design, manufacture, and install neutron absorber inserts
- Contracted with Global Nuclear Fuel-Americas to prepare new criticality safety analysis which removes credit for Boraflex and credits inserts
- The license renewal application commitment to Boraflex monitoring will be replaced with a Neutron Absorbing Material Monitoring Program, consistent with NEI 16-03-A

SNAP-IN® INSERTS OVERVIEW

Brian Rickard
Engineering Supervisor
Curtiss-Wright Nuclear Division (CWND)

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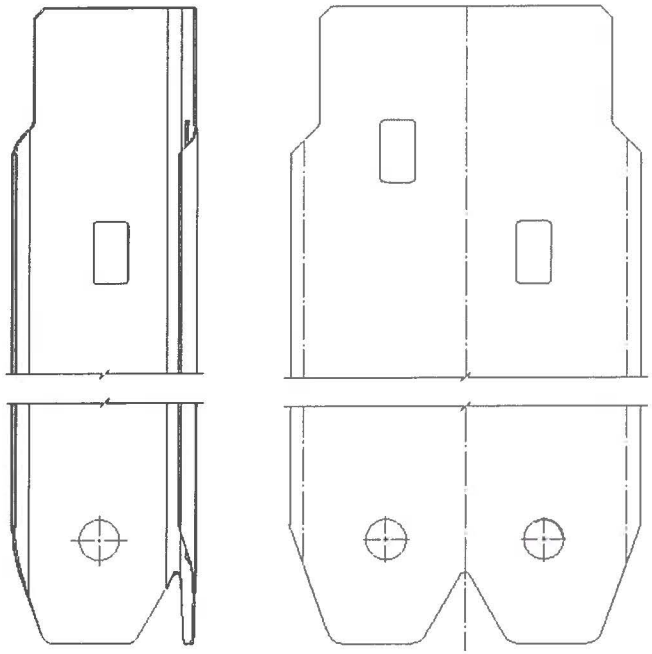
NETCO-SNAP-IN® Inserts



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NETCO-SNAP-IN® Inserts

- Simple design, L-shaped (chevron), full length inserts
- Top of bent edges are "coped" to provide clearance for fuel channel spacers
- Robust material, Rio Tinto Alcan's Boralcan™; a metal matrix of aluminum alloy with nuclear grade B_4C
- Similar inserts installed in BWR racks for LaSalle, Peach Bottom, Quad Cities, Fermi, and River Bend
- Ample neutron absorption
  - Nominal B_4C content = 23 vol%
  - Minimum certified B^{10} areal density = 0.0141 g B^{10}/cm^2

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NETCO-SNAP-IN® Inserts

- Monitoring program will be implemented:
  - Complies with NEI 16-03-A, Rev. 0, "Guidance for Monitoring of Fixed Neutron Absorbers in Spent Fuel Pools"
  - Includes 3 different types of test coupons installed in the spent fuel pool (general, bend, and galvanic) and examined periodically
    - Inspections may include visual, dimensional, neutron attenuation, corrosion, dependent on coupon type
  - Includes full insert in-situ and removal inspections
    - Visual for physical deformities (in-situ and removal)
    - Thickness

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CRITICALITY SAFETY ANALYSIS OVERVIEW

Christopher Kmiec
Engineering Technical Leader
GE Hitachi Nuclear Energy

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Criticality Safety Analysis Overview

- Consistent with most current NRC and industry guidance
  - Regulatory Guide 1.240, "Fresh and Spent Fuel Pool Criticality Analyses"
  - NEI 12-16, Rev. 4, "Guidance for Performing Criticality Analyses of Fuel Storage at Light-Water Reactor Power Plants"
- No credit for Boraflex neutron absorber; only credit for inserts
- Analysis performed with TGBLA06 and MCNP-05P
- Peak Standard Cold Core Geometry (SCCG) in-core eigenvalue (k_∞) criterion,
  - Established maximum cold, uncontrolled peak in-core k_∞ of 1.29, so that $k_{max} < 0.95$ for all credible abnormal conditions, manufacturing tolerance implications, and computational uncertainties

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Criticality Safety Analysis Overview

- Assessed current fuel types and all legacy fuel
- Uniform pool loading – all fuel storage locations loaded with an insert and the bundle with the highest rack efficiency
- Misload of fuel outside the rack was evaluated
- Missing insert evaluated to address removal during fuel movement and during periodic removal for inspection

PROPOSED LICENSE CHANGES

Jeff Hardy
Manager Regulatory Assurance
Grand Gulf Nuclear Station

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Proposed License Changes

- Proposed Submittal Schedule
  - Submittal of License Amendment Request in the fourth quarter 2024
  - Requested approval in the second quarter of 2026
  - Implementation time of 120 days from approval of the License Amendment or after the completion of insert installation

- Design Features Technical Specification 4.3.1.1 (Fuel Storage - Criticality)
  - Add statement to address that neutron absorbing inserts are installed
  - Revise maximum k_{∞} in the normal reactor core configuration at cold conditions
  - Deletion of 4.3.1.1.e and all of its sub-steps, removal of Region II spent fuel rack classification within the spent fuel pool

- Administrative Controls Technical Specification 5.5 (Programs and Manuals)
  - Add new section to describe the Spent Fuel Storage Rack Neutron Absorber Monitoring Program that will be implemented in accordance with NEI-16-03-A, "Guidance for Monitoring of Fixed Neutron Absorbers in Spent Fuel Pools"

Proposed License Changes (Draft)

4.3.1 Criticality

4.3.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. keff 0.95 if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1.2 of the UFSAR;

b. A nominal fuel assembly center to center storage spacing of 6.26 inches, with a neutron absorber insert within the storage cells, in the spent fuel storage pool and in the upper containment pool.

c. Fuel assemblies having a maximum K-infinity of 1.29 in the normal reactor core configuration at cold conditions;

Proposed License Changes (Draft)

4.0 DESIGN FEATURES

4.3.1.1 (continued)

d. Fuel assemblies having a maximum nominal U-235 enrichment of 4.9 weight percent;

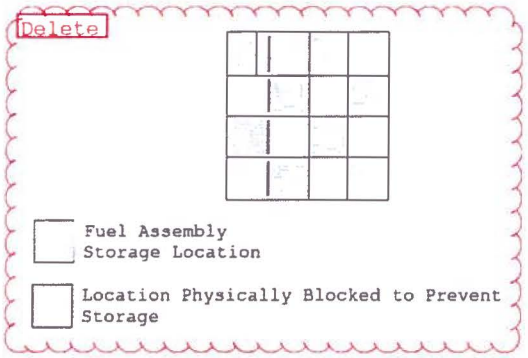
~~e. Region II racks are controlled as follows:~~

~~1. Storage cells with any Boraflex panel which has received a gamma dose in excess of 2.3E10 rads or which has a Boron-10 areal density less than 0.0165, which are designated within the Spent Fuel Pool Rack Boraflex Monitoring Program, are treated as Region II panels.~~

~~2. Storage cells face-adjacent to Region II panels are either restricted from fuel storage by physically blocking the isolated cells or are configured to meet, as a minimum (i.e., additional cells may be blocked), the Region II fuel storage configuration requirements in Figure 4.3-1.~~

~~3. When a 4x4 array of cells is classified as Region II and face-adjacent to another Region II 4x4 storage array, the new Region II 4x4 array is required to be blocked in the same 8-of-16 pattern and at the same orientation as the adjacent Region II 4x4 storage configuration.~~

~~Figure 4.3-1~~
~~Region II 4x4 Storage Configuration~~



(continued)

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Proposed License Changes (Draft)

5.5.14 Spent Fuel Storage Rack Neutron Absorber Monitoring Program

This program provides controls for monitoring the condition of the neutron absorber inserts used in the high density spent fuel storage racks to verify the Boron-10 areal density is consistent with the assumptions in the spent fuel pool criticality analysis. The program shall be in accordance with NEI 16-03-A, "Guidance for Monitoring of Fixed Neutron Absorbers in Spent Fuel Pools," Revision 0, May 2017.

QUESTIONS

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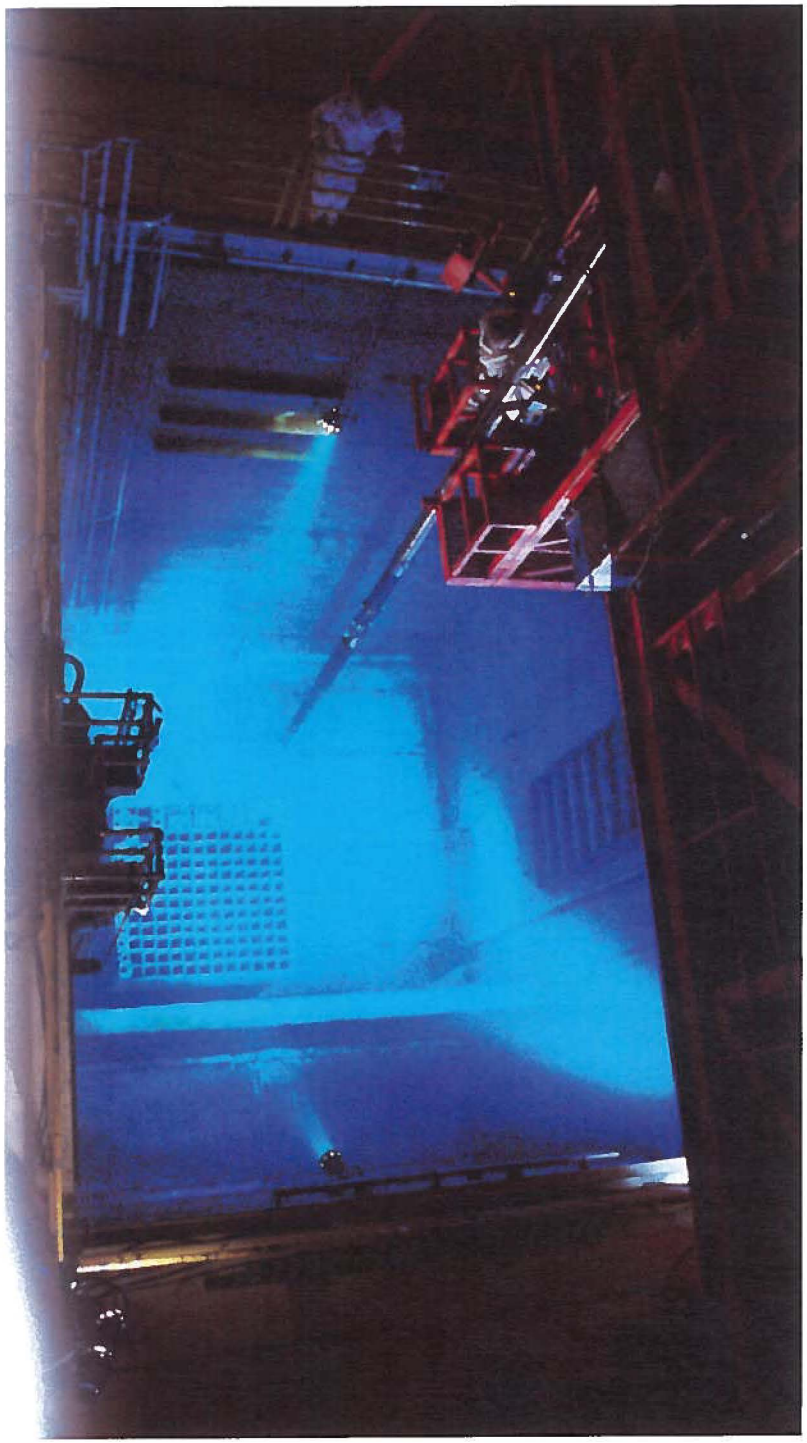
Enclosure 2
GNRO2024-00031

GNF Pre-Submittal Call Slides (Non-Proprietary)
(12 pages below)

Grand Gulf Nuclear Station Spent Fuel Pool Criticality Analysis of Boraflex Storage Racks with NETCO-SNAP-IN® Rack Inserts



Global Nuclear Fuel

Regulatory Requirements

10 CFR 50.68(b)(4)

"If credit is taken for soluble boron, the k-effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with borated water, and the k-effective must remain below 1.0 (subcritical), at a 95 percent probability, 95 percent confidence level, if flooded with unborated water."

$$K_{\max(95/95)} \leq 0.95$$

General Design Criterion 62, Appendix A to 10 CFR 50

"Criticality in the fuel storage and handling system shall be prevented by physical systems or processes, preferably by use of geometrically safe configurations."

Methodology Overview

- Follows the process outlined in NEI 12-16 Revision 4, "Guidance for Performing Criticality Analyses of Fuel Storage at Light-Water Reactor Power Plants."
- Consistent with Regulatory Guide 1.240, "Fresh and Spent Fuel Pool Criticality Analyses."
- Peak reactivity analysis with most limiting (bounding) lattice in every usable rack cell location.
- No credit for the Boraflex neutron absorber (modeled as water).
- B-10 areal density used for rack insert analysis (0.0139 g B-10/cm^2) is less than the certified minimum areal density.
- Quantification of credible normal and abnormal conditions with consideration of biases, rack/fuel tolerances and computational uncertainties.
- Covers current and legacy fuel product lines at Grand Gulf Nuclear Station.

Analysis Uncertainty Quantification

Derived from NEI 12-16 Equation 1.

$$k_{max(95/95)} = \Delta k_{Normal} + \Delta k_{Bias} + \Delta k_{Uncertainty}$$

The contribution from the biases are:

$$\Delta k_{Bias} = \sum_{i=1}^{n} \Delta k_{B_i}$$

The contribution from the uncertainties are:

$$\Delta k_{Uncertainty} = \sqrt{\sum_{i=1}^{n} \Delta k_{T_i}^2 + \sum_{i=1}^{n} \Delta k_{U_i}^2}$$

Computer Code Calculations

TGBLA06 [a]

- NRC-approved lattice physics code (NEDE-30130-P-A).
- TGBLA solves Two-Dimensional (2D) diffusion equations with diffusion parameters corrected by transport theory to provide system multiplication factors and perform burnup (depletion) calculations.
- Uses ENDF/B-V cross-section data.
- Performs coarse-mesh, broad-group, diffusion theory calculations; including thermal neutron scattering with hydrogen using an S(α,β) light water thermal scattering kernel.

a) A 95/95 bias uncertainty is added to the fuel rack studies related to eigenvalue calculations performed using TGBLA06 which is based on [[

]]

MCNP-05P [b]

- Monte Carlo N-Particle code used for in rack reactivity (k_{eff}) calculations.
- Uses point-wise (i.e., continuous) ENDF/B-VII cross-section library, and all reactions in a given cross-section evaluation are considered.
- GNF has benchmarked MCNP5 with [[

]] for validation purposes using the ENDF/B-VII cross-section library.
- The critical experiment modeling results, along with the calculation demonstrate the associated bias and bias uncertainty terms at the 95/95 confidence level using the NUREG/CR-6698 guidance.

b) MCNP-05P is the GNF controlled production version of the Los Alamos National Laboratory code MCNP5.

Usable Rack Cell Model with Inserts

[[

- No credit taken for Boraflex neutron absorber.
- [[

]]

- Stainless steel rack modeled.
- B-10 areal density used in the rack insert model is lower than the certified minimum (95/95).
- [[

]]

]]

Design Basis Bundle

[[

- [[

]] bounds current and legacy fuel types at Grand Gulf Nuclear Station.

- Design basis bundle is selected to be the bundle with the worst rack reactivity suppression capability (i.e., highest rack efficiency) [[

]]

- The design basis bundle is used to:
  - Define the nominal in rack k_{eff} result.
  - Used for performing all biases, manufacturing tolerances, computational uncertainty calculations, and all credible abnormal/accident condition calculations.

]]

Fuel Storage Conditions Analyzed

Credible Normal Conditions

- Storage of non-channeled assemblies
- Eccentric Loading
- [[ ]]
- Pool moderation temperature variation

Credible Abnormal Conditions

- Dropped/Damaged assembly
- Abnormal position of a fuel assembly outside the fuel storage rack
- Misplacement of fuel bundles in unpoisoned equipment racks next to the fuel racks
- Dropped bundle on rack
- Rack sliding due to seismic event
- Loss of fuel pool cooling

Bias Cases Analyzed

Fuel Depletion Bias

- [[

]]

- Depleted with clad creep

Normal Bias

- No inserts on rack periphery
- Missing rack insert
- Fuel out of rack during normal fuel handling/inspections

Tolerance Cases Analyzed

- Fuel enrichment increase
- Fuel pellet density increase
- Gadolinia wt.% decrease
- Rod cladding thickness increase/decrease
- Channel thickness increase/decrease
- Fuel pellet outer diameter increase/decrease
- Fuel rod pin pitch increase/decrease
- Rack wall thickness increase/decrease
- Rack pitch increase/decrease
- Rack insert thickness increase/decrease
- Rack insert length decrease

Analysis Uncertainties

- MCNP-05P critical benchmarking uncertainty with ENDF/B-VII continuous energy cross-section library
- TGBLA06 eigenvalue uncertainty
- MCNP-05P code statistical uncertainty for k_{Normal} (2σ)
- Uncertainty of bias contributors
- Uncertainty of tolerance contributors
- Fuel depletion uncertainty

Summary

- Analysis complies with requirements in 10 CFR 50.68(b)(4) and GDC 62.
- Follows guidance in NEI 12-16 Revision 4 and RG 1.240.
- Consideration given to all credible abnormal conditions, manufacturing tolerance implications, and computational uncertainties in determining maximum in-rack eigenvalue.
- The analysis resulted in a storage rack maximum k_{eff} less than the 0.95 limit from 10 CFR 50.68(b)(4) for normal and credible abnormal operation with tolerances and computational uncertainties considered.

Enclosure 3
GNRO2024-00031

GNF Affidavit
(3 pages below)

Global Nuclear Fuel – Americas, LLC

AFFIDAVIT

I, **Lisa K. Schichlein,** state as follows:

(1) I am a Senior Licensing Engineer, Regulatory Affairs, Global Nuclear Fuel – Americas, LLC ("GNF"), 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 GNF's letter, KGO-ENO-JB1-24-064, Kimberly O'Connor to Jedidiah Romo (Entergy Operations, Inc.), entitled "Grand Gulf Nuclear Station Criticality Safety Analysis of Fuel Storage Racks with Inserts Presentation Slides," September 06, 2024. GNF proprietary information in Enclosure 1, which is entitled "Grand Gulf Nuclear Station Spent Fuel Pool Criticality Analysis of Boraflex Storage Racks with NETCO-SNAP-IN® Rack Inserts," is identified by a dotted underline inside double square brackets. [[This sentence is an example.{3}]] Figures and large objects containing GNF proprietary information 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 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's competitors without license from GNF 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 customer-funded development plans and programs, resulting in potential products to GNF;

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, 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, 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.

(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 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), above, is classified as proprietary because it contains details of GNF'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 or its licensor.

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

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GNF's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GNF'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.

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's competitive advantage will be lost if its competitors are able to use the results of the GNF 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 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 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 is true and correct.

Executed on this 5th day of September 2024.

Lisa K. Schichlein

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