Attachment 1 Contains Proprietary Information
Withhold From Public Disclosure Under 10 CFR 2.390(a)(4).
When Separated From Attachment 1, Cover Letter Is Decontrolled.

Exelon
Nuclear

Clinton Power Station
8401 Power Road
Clinton, IL 61727

U-604038
September 16, 2011

10CFR50.36

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

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Submittal of the Core Operating Limits Report for Clinton Power Station, Unit 1, Cycle 13 Revision

In accordance with Technical Specification 5.6.5, "Core Operating Limits Report (COLR)," Item d., Exelon Generation Company (EGC), LLC is submitting a mid-cycle revision of the COLR for Clinton Power Station, Unit 1. This revision is associated with the implementation of License Amendment 195 approved by the NRC on August 17, 2011, associated with TS 3.7.6, Main Turbine Bypass. Attachment 1 contains a proprietary version of the COLR that is requested to be withheld from public disclosure in accordance with 10CFR2.390(a)(4).

This submittal is subdivided as follows:

1. Attachment 1 provides a proprietary version of the COLR. Appendix A of this attachment contains an affidavit that attests to the proprietary nature of the information contained in the document.
2. Attachment 2 contains a non-proprietary version of the COLR documented in Attachment 1.

Should you have any questions concerning this report, please contact me at (217) 937-2800.

Respectfully,

Brian W. Davis
Regulatory Assurance Manager
Clinton Power Station

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A001
NRR

JLP/blf

Attachments:

1. Core Operating Limits Report for Clinton Power Station Unit 1, Cycle 13 (Proprietary Version)
2. Core Operating Limits Report for Clinton Power Station Unit 1, Cycle 13 (Non-Proprietary Version)

cc: NRC Regional Administrator, Region III
NRC Senior Resident Inspector - Clinton Power Station

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U.S. Nuclear Regulatory Commission
U-604038

ATTACHMENT 2

Core Operating Limits Report for Clinton Power Station Unit 1, Cycle 13 (Non-Proprietary Version)

**Attachment 1 Contains Proprietary Information
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CORE OPERATING LIMITS REPORT

FOR

CLINTON POWER STATION UNIT 1 CYCLE 13

Prepared By: _____ Date: 9/1/10
Gary W. Becknell

Reviewed By: _____ Date: 9/1/10
RE Reviewer

Reviewed By: _____ Date: 9/2/10
ESA Reviewer

Reviewed By: _____ Date: 9/2/10
Independent Reviewer

Approved By: _____ Date: 9/2/10
James J. Tusar

Station Qualified
Reviewer By: _____ Date: 9/13/11

Table of Contents

List of Tables

1.0 Terms and Definitions

Base Case	A case analyzed with two (2) Safety-Relief Valves Out-of-Service (OOS), one (1) ADS valve OOS, and up to a 50°F feedwater temperature reduction (FWTR includes feedwater heater OOS or final feedwater temperature reduction) at any point in the cycle operation in Dual Loop mode (Reference 3).
Coastdown	The reactor condition where thermal power gradually decreases due to fuel depletion while the following conditions are met: 1) all operable control rods are fully withdrawn and 2) all cycle extension techniques have been exhausted including FFWTR and ICF.
DLO	Dual Reactor Recirculation Loop Operation
FFWTR	Final Feedwater Temperature Reduction
FWHOOS	Feedwater Heaters Out of Service
ICF	Increased Core Flow
LHGR	Linear Heat Generation Rate
LHGRFAC(F)	LHGR thermal limit flow dependent adjustments and multipliers
LHGRFAC(P)	LHGR thermal limit power dependent adjustments and multipliers
MAPLHGR	Maximum Average Planar Linear Heat Generation Rate
MCPR	Minimum Critical Power Ratio
MCPR(P)	MCPR thermal limit power dependent adjustments and multipliers
MCPR(F)	MCPR thermal limit flow dependent adjustments and multipliers
OLMCPR	Operating Limit Minimum Critical Power Ratio
OPRM	Oscillation Power Range Monitor
SLMCPR	Safety Limit Minimum Critical Power Ratio
SLO	Single Reactor Recirculation Loop Operation
TBSOOS	Turbine Bypass System Out of Service
1TBVOOS	One Turbine Bypass Valve Out of Service

2.0 General Information

This report is prepared in accordance with Technical Specification 5.6.5 of Reference 1. Power and flow dependent limits and multipliers are listed for various power and flow levels. Linear interpolation is to be used to find intermediate values.

These values have been determined using NRC-approved methodologies presented in Reference 2 and are established such that all applicable limits of the plant safety analysis are met.

The data presented in this report is valid for all licensed operating domains on the operating map, including:

- Maximum Extended Load Line Limit down to 99% of rated core flow during full power operation
- Increased Core Flow (ICF) up to 107% of rated core flow
- Final Feedwater Temperature Reduction (FFWTR) up to 50°F during cycle extension operation
- Feedwater Heater Out of Service (FWHOOS) up to 50°F feedwater temperature reduction at any time during the cycle prior to cycle extension.

The Clinton Unit 1 Cycle 13 COLR was revised mid-cycle (Revision 5) under EC 380905 to support operation with 1TBVOOS or TBSOOS. The changes are indicated by revision bars in the right hand margin. It should be noted that the MCPR(F) values for the 0.000% core flow point in Tables 4-5 and 4-6 are different than those specified in References 3 and 6. The difference is due to References 3 and 6 truncating/rounding the value to two (2) significant digits. The values presented in Tables 4-5 and 4-6 are in agreement with the databank thermal limit set and are conservative.

3.0 MAPLHGR Limits

3.1 Technical Specification Reference:

Sections 3.2.1 and 3.4.1.

3.2 Description:

Table 3-1 is used to determine the maximum average planar linear heat generation rate (MAPLHGR) limit for each fuel type. Limits listed in Table 3-1 are for dual reactor recirculation loop operation (DLO).

For single reactor recirculation loop operation (SLO), the MAPLHGR limits given in Table 3-1 must be multiplied by a SLO MAPLHGR multiplier provided in Table 3-2. The SLO MAPLHGR multiplier for all fuel is 0.76 (Reference 3).

Table 3-1
MAPLHGR for All Fuel Types[1]
(Reference 3)

Avg. Planar Exposure (GWd/ST)	MAPLHGR Limit (kW/ft)
0.00	12.82
14.51	12.82
19.13	12.82
57.61	8.00
63.50	5.00

Table 3-2
MAPLHGR Single Loop Operation (SLO) Multiplier
(Reference 3)

Fuel Type	MAPLHGR SLO Multiplier
All Fuel Types	0.76

[1] Linear interpolation should be used for points not listed in Table 3-1.

4.0 MCPR Limits

4.1 Technical Specification Reference:

Sections 3.2.2, 3.4.1, and 3.7.6

4.2 Description:

The various MCPR limits are described below.

4.2.1 Manual Flow Control MCPR Limits

The Operating Limit MCPR (OLMCPR) is determined from either section 4.2.1.1 or 4.2.1.2, whichever is greater at any given power and flow condition.

4.2.1.1 Power-Dependent MCPR

For operation less than or equal to 33.3% core thermal power, the MCPR(P) as a function of core thermal power is shown in Table 4-2. For operation at greater than 33.3% core thermal power, the OLMCPR as a function of core thermal power is determined by multiplying the applicable rated condition OLMCPR limit shown in Table 4-1 by the applicable MCPR multiplier K(P) given in Table 4-2.

The Base Case (DLO and SLO) MCPR(P) and K(P) given in Table 4-2 are also applicable to the corresponding condition with 1TBVOOS or TBSOOS (References 3 and 6).

4.2.1.2 Flow-Dependent MCPR

Tables 4-3 through 4-6 give the MCPR(F) as a function of flow based on the applicable plant condition. The limits for dual loop operation are listed in Table 4-3. The limits for single loop operation are listed in Table 4-4. The limits for dual loop operation with 1TBVOOS or TBSOOS are listed in Table 4-5. The limits for single loop operation with 1TBVOOS or TBSOOS are listed in Table 4-6. The MCPR(F) determined from these tables is the flow dependent OLMCPR.

4.2.2 Automatic Flow Control MCPR Limits

Automatic Flow Control MCPR Limits are not provided.

4.2.3 Option A and Option B

Option A and Option B refer to use of scram speeds for establishing MCPR operating limits.

Option A scram speed is the BWR/6 Technical Specification scram speed. The Technical Specification scram speeds must be met to utilize the Option A MCPR limits. Reload analyses performed by GNF for Cycle 13 Option A MCPR limits utilized a 20% core average insertion time of 0.516 seconds (Reference 12).

To utilize the MCPR limits for the Option B scram speed, the cycle average scram insertion time for 20% insertion must satisfy equation 2 in Reference 5 Section 4. If the cycle average scram insertion time does not meet the Option B criteria, the appropriate MCPR value may be determined from a linear interpolation between the Option A and B limits as specified by equation 4 in Reference 5 Section 4.

4.2.4 Recirculation Flow Control Valve Settings

Cycle 13 was analyzed with a maximum core flow runout of 109%; therefore the recirculation flow control valve must be set to maintain core flow less than 109% (92.105 Mlb/hr) for all runout events (Reference 11).

Table 4-1
Operating Limit Minimum Critical Power Ratio
(Reference 3)

EOOS Combination	GE14C Fuel Option B All exposures	GE14C Fuel Option A All exposures	GE14I Fuel Option B All exposures	GE14I Fuel Option A All exposures
Base Case DLO	1.29 [1]	1.35	1.36	1.42
Base Case SLO[2]	1.32	1.38	1.39	1.45
1TBVOOS DLO	1.29 [1]	1.35	1.36	1.42
1TBVOOS SLO[2]	1.32	1.38	1.39	1.45
TBSOOS DLO	1.30	1.40	1.37	1.47
TBSOOS SLO[2]	1.33	1.43	1.40	1.50

Notes for Table 4-1:
1. Analyzed DLO Option B OLMCPR is 1.27 per Reference 3, value is adjusted to obtain an OPRM amplitude setpoint of 1.10.
2. SLO Option A(B) OLMCPR is the DLO Option A(B) OLMCPR plus 0.03.

Table 4-2
Power Dependent MCPR Limits MCPR(P) and Multipliers K(P)[1, 2]
(References 3 and 7)

EOOS Combination	Core Flow (% of Rated)	Core Thermal Power (%)								
		0	21.6	≤33.3	>33.3	≤43	>43	≤70	>70	100
		MCPR(P)			K(P)[3]					
Base Case DLO	≤ 50	2.20	2.20	1.97	1.351	1.347	1.313	1.212	1.15	1.00
GE14C	> 50	2.46	2.46	2.17						
Base Case SLO	≤ 50	2.23	2.23	2.00	1.351	1.347	1.313	1.212	1.15	1.00
GE14C	> 50	2.49	2.49	2.20						
Base Case DLO	≤ 50	2.27	2.27	2.04	1.351	1.347	1.313	1.212	1.15	1.00
GE14I	> 50	2.53	2.53	2.24						
Base Case SLO	≤ 50	2.30	2.30	2.07	1.351	1.347	1.313	1.212	1.15	1.00
GE14I	> 50	2.56	2.56	2.27						

Notes for Table 4-2:

1. Values are interpolated between relevant power levels.
2. Allowable EOOS conditions are listed in Section 9.0.
3. Based on 0.500 second turbine trip time delay with OLMCPR ≥ 1.27.

Table 4-3
Flow Dependent MCPR Limits MCPR(F)[1]
(Reference 3)

Core Flow (% rated)	MCPR(F) GE14C	MCPR(F) GE14I
0.000	1.8819	1.9519
25.000	1.70	1.77
84.100	1.27	-
93.721	-	1.27
109.000	1.27	1.27

Table 4-4
Single Loop Operation (SLO) Flow Dependent MCPR Limits MCPR(F)[2]
(Reference 3)

Core Flow (% rated)	MCPR(F) GE14C	MCPR(F) GE14I
0.000	1.9119	1.9819
25.000	1.73	1.80
84.100	1.30	-
93.721	-	1.30
109.000	1.30	1.30

1 Linear interpolation should be used for points not listed in Table 4-3.

2 Linear interpolation should be used for points not listed in Table 4-4.

Table 4-5
Flow Dependent MCPR Limits MCPR(F)[1] – 1TBVOOS or TBSOOS
(References 3 and 6)

Core Flow (% rated)	MCPR(F) GE14C	MCPR(F) GE14I
0.000	2.0435	2.1135
25.000	1.85	1.92
99.954	1.27	-
109.000	1.27	1.27

Table 4-6
Single Loop Operation (SLO) Flow Dependent MCPR Limits MCPR(F)[2] – 1TBVOOS or TBSOOS
(References 3 and 6)

Core Flow (% rated)	MCPR(F) GE14C	MCPR(F) GE14I
0.000	2.0735	2.1435
25.000	1.88	1.95
99.954	1.30	-
109.000	1.30	1.30

1 Linear interpolation should be used for points not listed in Table 4-5.

2 Linear interpolation should be used for points not listed in Table 4-6.

5.0 Linear Heat Generation Rate Limits

5.1 Technical Specification Reference:

Section 3.2.3, 3.4.1, and 3.7.6

5.2 Description:

The linear heat generation rate (LHGR) limit is the product of the exposure dependent LHGR limit (from Table 5-1 for UO2 fuel rods and Table 5-2 for Gadolinia fuel rods) and the minimum of: the power dependent LHGR Factor, LHGRFAC(P), the flow dependent LHGR Factor, LHGRFAC(F), or the single loop operation (SLO) multiplication factor if applicable. The LHGRFAC(P) is determined from Table 5-3. The LHGRFAC(F) is determined from Table 5-4. The SLO multiplication factor can be found in Table 5-5. Tables 5-1 and 5-2 are the LHGR limit as a function of peak pellet exposure.

The Gadolinia fuel rod limits referenced in Table 5-2 are the most limiting Gadolinia fuel rods. The most limiting values are provided here as a convenience and do not imply that all the Gadolinia fuel rods must satisfy the listed values.

For Loss of 'FULL' Feedwater Heating (±10 °F of design NORMAL temperature), LHGRFAC(P) is determined from Table 5-6 and LHGRFAC(F) is determined from Table 5-7. Concurrent operation with SLO and reduced feedwater heating has not been evaluated and thus is not a valid operating mode. (References 3, 7, 8, 9 and 10)

The Base Case (DLO and SLO) LHGRFAC(P) given in Table 5-3 or 5-6 are also applicable to the corresponding condition with 1TBVOOS or TBSOOS depending on feedwater heating status (References 3 and 6).

With 1TBVOOS or TBSOOS, the LHGRFAC(F) is determined from Table 5-8 or 5-9 depending on feedwater heating status.

Table 5-1
Linear Heat Generation Rate Limits for UO_2 Rods [1]
(Reference 4)

Fuel Type	LHGR Limit
GE14C	See Appendix A
GE14I	See Appendix A

[1] Linear interpolation should be used for points not listed in Appendix A.

Table 5-2
Linear Heat Generation Rate Limits for Gad Rods [1]
(Reference 4)

Fuel Type	LHGR Limit
GE14C	See Appendix A
GE14I	See Appendix A

Table 5-3
Power Dependent LHGR Multiplier LHGRFAC(P)[2]
(Reference 3)

EOOS Combination	Core Flow (%)	Core Thermal Power (% Rated)				
		0	21.6	≤ 33.3	>33.3	100
		LHGRFAC(P)				
Base Case DLO	≤ 50	0.634	0.634	0.689	0.689	1.000
	> 50	0.572	0.572	0.600		
Base Case SLO	≤ 50	0.634	0.634	0.689	0.689	1.000
	> 50	0.572	0.572	0.600		

Table 5-4
Flow Dependent LHGR Multiplier LHGRFAC(F)[3]
(Reference 3)

Core Flow (% rated)	LHGRFAC(F)
0.00	0.442
25.00	0.612
30.00	0.646
82.18	1.00
109.00	1.00

[1] Linear interpolation should be used for points not listed in Appendix A.
[2] Linear interpolation should be used for points not listed in Table 5-3.
[3] Linear interpolation should be used for points not listed in Table 5-4.

Table 5-5
LHGR Single Loop Operation (SLO) Reduction Factor
(Reference 3)

Fuel Type	LHGR SLO Multiplier
All Fuel Types	0.76

Table 5-6
Power Dependent LHGR Multiplier LHGRFAC(P)[1]
(Loss of 'FULL' Feedwater Heating)
(References 3, 8, 9, and 10)

EOOS Combination	Core Flow	Core Thermal Power (% Rated)				
		0	21.6	≤ 33.3	> 33.3	100
		LHGRFAC(P)				
Base Case DLO	≤ 50	0.627	0.627	0.682	0.682	0.99
	> 50	0.566	0.566	0.594		
Base Case SLO						

Table 5-7
Flow Dependent LHGR Multiplier LHGRFAC(F)[2]
(Loss of 'FULL' Feedwater Heating)
(References 3, 8, 9, and 10)

Core Flow (% rated)	LHGRFAC(F)
0.00	0.437
25.00	0.605
30.00	0.639
82.18	0.99
109.00	0.99

[1] Linear interpolation should be used for points not listed in Table 5-6.
[2] Linear interpolation should be used for points not listed in Table 5-7.

Table 5-8
Flow Dependent LHGR Multiplier LHGRFAC(F)[1] – 1TBVOOS or TBSOOS
(References 3 and 6)

Core Flow (% rated)	LHGRFAC(F)
0.00	0.14000
25.00	0.36500
40.00	0.50000
50.00	0.63000
98.30	1.00000
109.00	1.00000

Table 5-9
Flow Dependent LHGR Multiplier LHGRFAC(F)[2] – 1TBVOOS or TBSOOS
(Loss of 'FULL' Feedwater Heating)
(References 3, 6, 8, 9, and 10)

Core Flow (% rated)	LHGRFAC(F)
0	0.13860
25.00	0.36135
40.00	0.49500
50.00	0.62370
98.30	0.99000
109.00	0.99000

[1] Linear interpolation should be used for points not listed in Table 5-8.
[2] Linear interpolation should be used for points not listed in Table 5-9.

6.0 Reactor Protection System (RPS) Instrumentation

6.1 Technical Specification Reference:

Section 3.3.1.1

6.2 Description:

The Average Power Range Monitor (APRM) simulated thermal power time constant, shall be between 5.4 seconds and 6.6 seconds (Reference 12).

7.0 Turbine Bypass System Reactor Power Limitation

7.1 Technical Specification Reference:

Section 3.7.6

7.2 Description:

Table 7-1 provides the maximum allowable reactor power with 1TBVOOS or TBSOOS as specified in Technical Specification 3.7.6 action statement A.1.

Table 7-1
Reactor Power Limitation – 1TBVOOS or TBSOOS
(Reference 6)

Turbine Bypass System Status	Maximum Reactor Power (% rated)
1TBVOOS	100.0
TBSOOS	97.0

8.0 Stability Protection Setpoints

The Clinton 1 Cycle 13 OPRM Period Based Detection Algorithm (PBDA) Trip Setpoints for the OPRM System for use in Technical Specification 3.3.1.3 are found in Table 8-1. These values are based on the cycle specific analysis documented in Reference 3.

Any change to the OLMCPR value and/or ARTS-based power dependent MCPR limits should be evaluated for potential impact on the OPRM PBDA Trip Setpoints.

Table 8-1
OPRM PBDA Trip Setpoints
(Reference 3)

PBDA Trip Amplitude	Corresponding Maximum Confirmation Count Trip Setting
1.10	13

9.0 Modes of Operation

The Allowed Modes of Operation with combinations of Equipment Out-of-Service (EOOS) are as described below in Table 9-1:

Table 9-1
Modes of Operation
(Reference 3)

	Operating Region				
EOOS Options	**Standard**	**MELLLA**	**ICF**	**FFWTR[1]**	**Coastdown**
Base Case DLO, Option A	Yes	Yes	Yes	Yes	Yes
Base Case SLO[1], Option A	Yes	No	No	No	Yes
Base Case DLO, Option B	Yes	Yes	Yes	Yes	Yes
Base Case SLO[1], Option B	Yes	No	No	No	Yes
Base Case DLO, Option A, 1TBVOOS	Yes	Yes	Yes	Yes	Yes
Base Case SLO[1], Option A, 1TBVOOS	Yes	No	No	No	Yes
Base Case DLO, Option B, 1TBVOOS	Yes	Yes	Yes	Yes	Yes
Base Case SLO[1], Option B, 1TBVOOS	Yes	No	No	No	Yes
Base Case DLO, Option A, TBSOOS	Yes	Yes	Yes	Yes	Yes
Base Case SLO[1], Option A, TBSOOS	Yes	No	No	No	Yes
Base Case DLO, Option B, TBSOOS	Yes	Yes	Yes	Yes	Yes
Base Case SLO[1], Option B, TBSOOS	Yes	No	No	No	Yes

Notes:
1. Concurrent operation with SLO and Loss of 'FULL' Feedwater Heating (±10°F of design NORMAL temperature) or FFWTR has not been evaluated and thus is not a valid operating mode. (References 3, 8, 9 and 10)

10.0 Methodology

The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following document:

1. "General Electric Standard Application for Reactor Fuel", NEDE-24011-P-A-16, October 2007 and U.S. Supplement NEDE-24011-P-A-16-US, October 2007.

2. "BWR Owners' Group Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology and Reload Applications", NEDO-32465, August 1996

11.0 References

1. Nuclear Regulatory Commission, Technical Specifications for Clinton Power Station Unit 1, Docket No. 50-461, License No. NPF-62.

2. Global Nuclear Fuel Document, "General Electric Standard Application for Reactor Fuel", NEDE-24011-P-A-16, October 2007 and U.S. Supplement NEDE-24011-P-A-16-US, October 2007.

3. Global Nuclear Fuel Document, 0000-0099-4244-SRLR Revision 0, "Supplemental Reload Licensing Report for Clinton Power Station Unit 1 Reload 12 Cycle 13", December 2009.

4. Global Nuclear Fuel Document, 0000-0099-4244-FBIR-P Revision 0, "Fuel Bundle Information Report for Clinton Power Station Unit 1 Reload 12 Cycle 13", December 2009.

5. General Electric Document, GE-NE-0000-0000-7456-01P, "Option B Scram Times For Clinton Power Station", February 2002

6. GE Hitachi Nuclear Energy (GEH) Document, 0000-0086-4634-R2-P, "Clinton Power Station One Bypass Out of Service or Turbine Bypass System Out of Service Analysis – Final", Revision 1, July 2010

7. General Electric Document, GE-NE-0000-0042-4570-R0, "Clinton Offrated Analyses Below the PLU Power Level," September 2005.

8. Exelon Design Analysis, GENE-0000-0030-8309, "Engineering Report Clinton Assessment of Feedwater Riser Flow Deviation," Rev. 0, June 14, 2005.

9. Exelon Engineering Change, EC 355034 R0, "Feedwater Riser Flow Deviation Assessment", August 4, 2005

10. Exelon Engineering Change, EC 354185 R0, "Uncertainty in Feedwater Temperature for Two Loop and Single Loop Operation", April 5, 2005

11. Exelon Transmittal of Design Information, TODI NF0900164 Revision 1, "Clinton Unit 1 Cycle 13 FRED Form Revision 1 (APPROVED)", October 30, 2009

12. Exelon Transmittal of Design Information, TODI ES0900019 Revision 0, "Clinton Unit 1 Cycle 13 Resolved OPL-3 Values", October 15, 2009

Appendix A

Global Nuclear Fuel – Americas

AFFIDAVIT

I, Anthony P. Reese, state as follows:

(1) I am Manager, Reload Design & 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 the GNF proprietary report, 0000-0099-4244-FBIR-P, *Fuel Bundle Information Report for Clinton Power Station Unit 1 Reload 12 Cycle 13*, Class III, (GNF-A Proprietary Information), Revision 0, dated December 2009. The GNF proprietary information in 0000-0099-4244-FBIR-P 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, 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, 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 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 7th day of December 2009.

Anthony P. Reese
Manager, Reload Design & Analysis
Global Nuclear Fuel – Americas, LLC

Global Nuclear Fuel

A Joint Venture of GE, Toshiba, & Hitachi

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Non-Proprietary Information

Fuel Bundle Information Report
for
Clinton Power Station Unit 1
Reload 12 Cycle 13

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1. Introduction and Summary

This report, which supplements the *Supplemental Reload Licensing Report*, contains thermal-mechanical linear heat generation rate (LHGR) limits for the GNF-A fuel designs to be loaded into Clinton Power Station Unit 1 for Cycle 13. These LHGR limits are obtained from thermal-mechanical considerations only. Approved GNF-A calculation models documented in Reference 1 were used in performing this analysis.

LHGR limits as a function of exposure for each bundle of the core design are given in Appendix A. The LHGR values provided in Appendix A provide upper and lower exposure dependent LHGR boundaries which envelope the actual gadolinia dependent LHGR limits. The LHGRs reported have been rounded to two places past the decimal.

Appendix B contains a description of the fuel bundles. Table B-1 contains a summary of bundle-specific information, and the figures provide the enrichment distribution and gadolinium distribution for the fuel bundles included in this appendix. These bundles have been approved for use under the fuel licensing acceptance criteria of Reference 1.

2. References

1. *General Electric Standard Application for Reactor Fuel*, NEDE-24011-P-A-16, October 2007; and the U.S. Supplement, NEDE-24011-P-A-16-US, October 2007.

Appendix A
UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB417-15GZ-120T-150-T6-3028 (GE14C)

Bundle Number: 3028

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [1]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[1] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB418-14GZ-120T-150-T6-3027 (GE14C)

Bundle Number: 3027

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [2]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[2] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB418-15GZ-120T-150-T6-3029 (GE14C)

Bundle Number: 3029

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [3]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[3] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB422-13GZ-120T-150-T6-3031 (GE14C)

Bundle Number: 3031

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [4]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[4] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB422-15GZ-120T-150-T6-3025 (GE14C)

Bundle Number: 3025

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [5]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[5] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB419-14GZ-120T-150-T6-3030 (GE14C)

Bundle Number: 3030

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [6]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[6] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB413-16GZ-120T-150-T6-3026 (GE14C)

Bundle Number: 3026

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [7]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[7] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB418-15GZ-120T-150-T6-3240 (GE14C)

Bundle Number: 3240

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [8]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[8] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14I-P10SCOB405-13GZ-120T-150-T6-3243 (GE14I)

Bundle Number: 3243

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
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	]]

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [9]
GWd/MT (GWd/ST)	kW/ft
[[	
	]]

[9] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design [[ ]].

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB418-15GZ-120T-150-T6-3242 (GE14C)

Bundle Number: 3242

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [10]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[10] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB422-13GZ-120T-150-T6-3239 (GE14C)

Bundle Number: 3239

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [11]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[11] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB418-15GZ-120T-150-T6-3241 (GE14C)

Bundle Number: 3241

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [12]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[12] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB420-15GZ-120T-150-T6-2870 (GE14C)

Bundle Number: 2870

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [13]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[13] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

UO_2/Gd Thermal-Mechanical LHGR Limits

Bundle Type: GE14-P10SNAB419-14GZ-120T-150-T6-2871 (GE14C)

Bundle Number: 2871

Peak Pellet Exposure	UO_2 LHGR Limit
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	13.40
16.00 (14.51)	13.40
63.50 (57.61)	8.00
70.00 (63.50)	5.00

Peak Pellet Exposure	Most Limiting Gadolinia LHGR Limit [14]
GWd/MT (GWd/ST)	kW/ft
0.00 (0.00)	11.76
13.31 (12.08)	11.76
59.76 (54.21)	7.02
66.12 (59.98)	4.39

[14] Bounding gadolinia LHGR limit for all gadolinium concentrations occurring in this bundle design (8.0% Gd).

Appendix B
Fuel Bundle Information

Table B-1
Bundle Specific Information

Fuel Bundle	Bundle Number	Enrichment (wt% U-235)	Weight of UO_2 (kg)	Weight of U (kg)	Max k_∞ at 20°C [15]	Exposure at Max k_∞ GWd/MT (GWd/ST)
GE14-P10SNAB417-15GZ-120T-150-T6-3028 (GE14C)	3028	[[				
GE14-P10SNAB418-14GZ-120T-150-T6-3027 (GE14C)	3027					
GE14-P10SNAB418-15GZ-120T-150-T6-3029 (GE14C)	3029					
GE14-P10SNAB422-13GZ-120T-150-T6-3031 (GE14C)	3031					
GE14-P10SNAB422-15GZ-120T-150-T6-3025 (GE14C)	3025					
GE14-P10SNAB419-14GZ-120T-150-T6-3030 (GE14C)	3030					
GE14-P10SNAB413-16GZ-120T-150-T6-3026 (GE14C)	3026					
GE14-P10SNAB418-15GZ-120T-150-T6-3240 (GE14C)	3240					
GE14I-P10SCOB405-13GZ-120T-150-T6-3243 (GE14I)	3243					
GE14-P10SNAB418-15GZ-120T-150-T6-3242 (GE14C)	3242					
GE14-P10SNAB422-13GZ-120T-150-T6-3239 (GE14C)	3239					
GE14-P10SNAB418-15GZ-120T-150-T6-3241 (GE14C)	3241					
GE14-P10SNAB420-15GZ-120T-150-T6-2870 (GE14C)	2870					
GE14-P10SNAB419-14GZ-120T-150-T6-2871 (GE14C)	2871					]]

[15] Maximum lattice k_∞ for the most reactive uncontrolled state plus a [[ ]] adder for uncertainties.

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Figure B-1 Enrichment and Gadolinium Distribution for EDB No. 3028 Fuel Bundle GE14-P10SNAB417-15GZ-120T-150-T6-3028 (GE14C)

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Figure B-2 Enrichment and Gadolinium Distribution for EDB No. 3027 Fuel Bundle GE14-P10SNAB418-14GZ-120T-150-T6-3027 (GE14C)

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Figure B-3 Enrichment and Gadolinium Distribution for EDB No. 3029 Fuel Bundle GE14-P10SNAB418-15GZ-120T-150-T6-3029 (GE14C)

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Figure B-4 Enrichment and Gadolinium Distribution for EDB No. 3031 Fuel Bundle GE14-P10SNAB422-13GZ-120T-150-T6-3031 (GE14C)

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Figure B-5 Enrichment and Gadolinium Distribution for EDB No. 3025 Fuel Bundle GE14-P10SNAB422-15GZ-120T-150-T6-3025 (GE14C)

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Figure B-6 Enrichment and Gadolinium Distribution for EDB No. 3030 Fuel Bundle GE14-P10SNAB419-14GZ-120T-150-T6-3030 (GE14C)

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Figure B-7 Enrichment and Gadolinium Distribution for EDB No. 3026 Fuel Bundle GE14-P10SNAB413-16GZ-120T-150-T6-3026 (GE14C)

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Figure B-8 Enrichment and Gadolinium Distribution for EDB No. 3240 Fuel Bundle GE14-P10SNAB418-15GZ-120T-150-T6-3240 (GE14C)

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Figure B-9 Enrichment and Gadolinium Distribution for EDB No. 3243 Fuel Bundle GE14I-P10SCOB405-13GZ-120T-150-T6-3243 (GE14I)

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Figure B-10 Enrichment and Gadolinium Distribution for EDB No. 3242 Fuel Bundle GE14-P10SNAB418-15GZ-120T-150-T6-3242 (GE14C)

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Figure B-11 Enrichment and Gadolinium Distribution for EDB No. 3239 Fuel Bundle GE14-P10SNAB422-13GZ-120T-150-T6-3239 (GE14C)

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Figure B-12 Enrichment and Gadolinium Distribution for EDB No. 3241 Fuel Bundle GE14-P10SNAB418-15GZ-120T-150-T6-3241 (GE14C)

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Figure B-13 Enrichment and Gadolinium Distribution for EDB No. 2870 Fuel Bundle GE14-P10SNAB420-15GZ-120T-150-T6-2870 (GE14C)

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Figure B-14 Enrichment and Gadolinium Distribution for EDB No. 2871 Fuel Bundle GE14-P10SNAB419-14GZ-120T-150-T6-2871 (GE14C)