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AmerGen SM
An Exelon/British Energy Company

RS-01-311

December 21, 2001

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

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

Subject: Additional Reactor Systems Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station

References: (1) Letter from J. M. Heffley (AmerGen Energy Company, LLC) to U.S. NRC, "Request for License Amendment for Extended Power Uprate Operation," dated June 18, 2001

(2) Letter from K. R. Jury (Exelon Generation Company, LLC) to U.S. NRC, "Additional Reactor Systems Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station," dated November 21, 2001

In Reference 1, AmerGen Energy Company (AmerGen), LLC submitted a request for changes to the Facility Operating License No. NPF-62 and Appendix A to the Facility Operating License, Technical Specifications (TS), for Clinton Power Station (CPS) to allow operation at an uprated power level. The proposed changes in Reference 1 would allow CPS to operate at a power level of 3473 megawatts thermal (MWt). This represents an increase of approximately 20 percent rated core thermal power over the current 100 percent power level of 2894 MWt. The NRC, in a conference call on December 13, 2001, requested additional information regarding the proposed response in Reference 2. Specifically, the NRC requested additional information on the CPS reload analysis and the determination of the safety limit Minimum Critical Power Ratio. Attachment A to this letter provides the requested information.

A001

A portion of the information in Attachment A is proprietary to the General Electric Company, and AmerGen requests that it be withheld from public disclosure in accordance with 10 CFR 2.790, "Public inspections, exemptions, requests for withholding," paragraph (a)(4). The proprietary information is indicated with sidebars. Attachment B provides the affidavit supporting the request for withholding the proprietary information in Attachment A from public disclosure, as required by 10 CFR 2.790, paragraph (b)(1). Attachment C contains a non-proprietary version of Attachment A.

Should you have any questions related to this information, please contact Mr. Timothy A. Byam at (630) 657-2804.

Respectfully,

for K. R. Jury
Director – Licensing
Mid-West Regional Operating Group

Attachments:

Affidavit
Attachment A: Additional Reactor Systems Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station (Proprietary version)
Attachment B: Affidavit for Withholding Portions of Attachment A from Public Disclosure
Attachment C: Additional Reactor Systems Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station (Non-Proprietary version)

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Clinton Power Station
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

STATE OF ILLINOIS	)	
COUNTY OF DUPAGE	)	
IN THE MATTER OF	)	
AMERGEN ENERGY COMPANY, LLC	)	**Docket Number**
CLINTON POWER STATION, UNIT 1	)	**50-461**

SUBJECT: **Additional Reactor Systems Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station**

AFFIDAVIT

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information and belief.

T. W. Simpkin
Manager – Licensing

Subscribed and sworn to before me, a Notary Public in and for the State above named, this 21 day of December, 2001.

Notary Public

OFFICIAL SEAL
ANESE L. GRIGSBY
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 3-13-2005

ATTACHMENT B

Affidavit for Withholding Portions of Attachment A from Public Disclosure

Affidavit

I, Glen A. Watford, being duly sworn, depose and state as follows:

(1) I am Manager, Fuel Engineering Services, 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 the attachment, "Additional Information Regarding the Cycle Specific SLMCPR for Clinton Unit 1 Cycle 9," October 1, 2001.

(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 2.790(a)(4) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information," and some portions 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 cost or price information, production capacities, budget levels, or commercial strategies of GNF-A, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future GNF-A customer–funded development plans and programs, of potential commercial value to GNF-A;

e. 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) The information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GNF-A, and is in fact so held. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in (6) and (7) following. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GNF-A, no public disclosure

has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GNF-A. Access to such documents within GNF-A is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GNF-A are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2) is classified as proprietary because it contains details of GNF-A's fuel design and licensing methodology.

The development of the methods used in these analyses, along with the testing, development and approval of the supporting methodology was achieved at a significant cost, on the order of several million dollars, to GNF-A or its licensor.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GNF-A's competitive position and foreclose or reduce the availability of profit–making opportunities. The fuel design and licensing methodology is part of GNF-A's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC–approved methods.

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

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

GNF-A's competitive advantage will be lost if its competitors are able to use the results of the GNF-A experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GNF-A would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GNF-A of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

Affidavit

State of North Carolina)
County of New Hanover) SS:

Glen A. Watford, being duly sworn, deposes and says:

That he has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information, and belief.

Executed at Wilmington, North Carolina, this 14th day of December, 2001

Glen A. Watford
Global Nuclear Fuel – Americas, LLC

Subscribed and sworn before me this 14th day of December, 2001

Notary Public, State of North Carolina

My Commission Expires Feb. 6, 2006

ATTACHMENT C

Additional Reactor Systems Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station (Non-Proprietary version)

References

[1] Letter, Frank Akstulewicz (NRC) to Glen A. Watford (GE), "Acceptance for Referencing of Licensing Topical Reports NEDC-32601P, *Methodology and Uncertainties for Safety Limit MCPR Evaluations*; NEDC-32694P, *Power Distribution Uncertainties for Safety Limit MCPR Evaluation*; and Amendment 25 to NEDE-24011-P-A on Cycle Specific Safety Limit MCPR," (TAC Nos. M97490, M99069 and M97491), March 11, 1999.

[2] Letter, Thomas H. Essig (NRC) to Glen A. Watford (GE), "Acceptance for Referencing of Licensing Topical Report NEDC-32505P, Revision 1, *R-Factor Calculation Method for GE11, GE12 and GE13 Fuel*," (TAC No. M99070 and M95081), January 11, 1999.

[3] *General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation and Design Application*, NEDO-10958-A, January 1977.

[4] Letter, Glen A. Watford (GNF-A) to U. S. Nuclear Regulatory Commission Document Control Desk with attention to R. Pulsifer (NRC), "Confirmation of 10x10 Fuel Design Applicability to Improved SLMCPR, Power Distribution and R-Factor Methodologies", FLN-2001-016, September 24, 2001.

[5] Letter, Glen A. Watford (GNF-A) to U. S. Nuclear Regulatory Commission Document Control Desk with attention to J. Donoghue (NRC), "Confirmation of the Applicability of the GEXL14 Correlation and Associated R-Factor Methodology for Calculating SLMCPR Values in Cores Containing GE14 Fuel", FLN-2001-017, October 1, 2001.

Comparison of Clinton Unit 1 Cycle 9 SLMCPR Value

Table 1 summarizes the relevant input parameters and results of the safety limit MCPR (SLMCPR) determination for the Clinton Unit 1 Cycle 9 and Cycle 8 cores. Table 2 provides a more detailed presentation of the bases and results for the Cycle 9 and Cycle 8 analyses. The SLMCPR evaluations were performed using NRC approved methods and uncertainties[1]. These evaluations yield different calculated SLMCPR values because different inputs were used. The quantities that have been shown to have some impact on the determination of the SLMCPR are provided.

In comparing the Clinton Unit 1 Cycle 9 and Cycle 8 SLMCPR values it is important to note the impact of the differences in the core and bundle designs. These differences are summarized in Table 1. The Cycle 8 column and the GETAB power distribution uncertainty column for Cycle 9 are both provided for comparison to the Cycle 9 reduced power distribution uncertainty column.

In general, the calculated safety limit is dominated by two key parameters: (1) flatness of the core bundle-by-bundle MCPR distributions and (2) flatness of the bundle pin-by-pin power/R-factor distributions. Greater flatness in either parameter yields more rods susceptible to boiling transition and thus a higher calculated SLMCPR.

[[ ]]

The uncontrolled bundle pin-by-pin power distributions were compared between the Clinton Unit 1 Cycle 9 bundles and the Cycle 8 bundles. Pin-by-pin power distributions are characterized in terms

of R-factors using the NRC approved methodology[2]. For the Clinton Unit 1 Cycle 9 limiting case analyzed at PHE, [[ ]] the Clinton Unit 1 Cycle 8 bundles are slightly flatter than the bundles used for the Cycle 9 SLMCPR analysis.

With a much flatter core MCPR distribution in Cycle 9 than in Cycle 8, but a slightly flatter bundle R-factor distribution in Cycle 8 relative to the Cycle 9 bundles, it would be expected that the Cycle 9 SLMCPR result would be higher than the Cycle 8 result. Table 1 shows that when using the same uncertainties the Cycle 9 SLMCPR value is higher than the Cycle 8 SLMCPR.

As indicated in Table 1, the NRC approved[1] reduced power distribution uncertainties have been assumed for the Clinton Unit 1 Cycle 9 analyses. For the Cycle 8 case, the standard GETAB power distribution uncertainties were used. Use of the reduced power distribution uncertainties results in a reduction of the SLMCPR by approximately 0.01 from Cycle 8.

Comparison of the GETAB and Reduced Uncertainties

The power distribution and other uncertainties that are the bases for the current Tech Spec safety limit for Clinton Unit 1 Cycle 9 are identified in Table 2. Column 2 of Table 2 shows the power distribution and other uncertainties that are the bases for the current Tech Spec safety limit for Cycle 8. The revised bases to support the proposed Tech Spec change in safety limit for Cycle 9 are identified in column 3b of Table 2. The GETAB bases and values for Cycle 9 are provided for comparison purposes in column 3a. By comparing the values from columns 2 for Cycle 8 and column 3a for Cycle 9, one may see that the calculated SLMCPR for Cycle 9 is higher [[ ]] than the value for Cycle 8 when using the same GETAB model and uncertainties for both calculations. The GE14 critical power uncertainty value was revised between Cycle 8 and Cycle 9 slightly, but this revision is not expected to have a significant impact on the comparisons.

The revised model and reduced power distribution uncertainties affect the calculated SLMCPR for Clinton Unit 1 Cycle 9 as indicated in Table 2. Bases that have not changed are not reported in either table except where it is important to indicate that the bases have not changed. For these exceptions, the impact on the SLMPCR is indicated as "None" in the rightmost column of Table 2. For the other items where a change in basis is indicated, the calculated impact that each item has on the calculated SLMCPR is indicated.

The impacts from the changes in bases have been grouped into three categories. In each category the shaded cells contain values that sum to produce the total impact for that category indicated in the cell immediately below the shaded cells.

In Section 1 of Table 2 the impact of using the "revised uncertainties not related to power distribution" is indicated as "None" since the same revised uncertainties were used for both the GETAB calculation (Column 3a) and the revised calculation (Column 3b).

Likewise, in Section 3 of Table 2 the "secondary impact on SLMCPR because the reduced SLMCPR causes a lower OLMCPR" is indicated as "None" since both the GETAB calculation and the revised calculation use the same set of limiting rod patterns, [[ ]]

The entire change in the calculated SLMCPR is the reduction that is due to use of the NRC-approved revised power distribution model and its associated reduced uncertainties as described in NEDC-32694P-A. For Clinton Unit 1 Cycle 9 the calculated SLMCPR was reduced by [[ ]] as indicated in

Section 2 of Table 2. Similar calculated reductions are seen for the SLO SLMCPR. This amount of improvement is consistent with the expected improvements as presented to the NRC in Table 4.3 of NEDC-32694P-A. Of this improvement, about [[ ]] is attributed to the reduced uncertainties themselves and the remaining [[ ]] is attributed to the methodology improvements described in NEDC-32694P-A.

Reduction in the Tech Spec SLMCPRs by these calculated amounts is warranted since the old GETAB value is overly conservative. The excessive conservatism in the GETAB model and inputs is primarily due to the higher [[ ]] uncertainty [[ ]]. These limitations are not applicable to the 3D-MONICORE (3DM) monitoring system. The revised power distribution model and reduced uncertainties associated with 3DM have been justified, reviewed and approved by the NRC (reference NEDC-32601P-A and NEDC-32694P-A). The conservatism that remains even when applying the revised model and reduced uncertainties to calculate a lower SLMCPR was documented as part of the NRC review and approval. It was noted on page A-24 of NEDC-32601P-A [[ ]]

Summary

[[ ]] have been used to compare quantities that impact the calculated SLMCPR value. Based on these comparisons, the conclusion is reached that the Clinton Unit 1 Cycle 9 core/cycle has a much flatter core MCPR distribution [[ ]] than what was used to perform the Cycle 8 SLMCPR evaluation. However, the Cycle 8 core/cycle has a slightly flatter in-bundle power distributions [[ ]] than what was used to perform the Cycle 9 SLMCPR evaluation.

The calculated 1.08 Monte Carlo SLMCPR for Clinton Unit 1 Cycle 9 is consistent with what one would expect [[ ]] the 1.08 SLMCPR value is appropriate when the approved methodology and the reduced uncertainties given in NEDC-32601P-A and NEDC-32694P-A are used.

Based on all of the facts, observations and arguments presented above, it is concluded that the calculated SLMCPR value of 1.08 for the Clinton Unit 1 Cycle 9 core is appropriate. It is reasonable that this value is less than the 1.09 value calculated for the previous cycle.

For single loop operations (SLO) the calculated safety limit MCPR for the limiting case is 1.11 as determined by specific calculations for Clinton Unit 1 Cycle 9.

Supporting Information

The following information is provided in response to NRC questions on similar submittals regarding changes in Technical Specification values of SLMCPR. NRC questions pertaining to how GE14 applications satisfy the conditions of the NRC SER[1] have been addressed in Reference [4]. Other generically applicable questions related to application of the GEXL14 correlation and the applicable range for the R-factor methodology are addressed in Reference [5]. Only those items that require a plant/cycle specific response are presented below since all the others are contained in the references that have already been provided to the NRC.

The core loading information for Clinton Cycles 8 and 9 is provided in Figures 1 and 2, respectively. The impact of the fuel loading pattern differences on the calculated SLMCPR is correlated to the

values of [[ ]] The power and non-power distribution uncertainties that are used in the analyses are indicated in Table 1.

Prepared by:

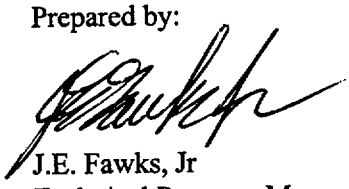

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Table 1

Comparison of the Clinton Unit 1 Cycle 8 and Cycle 9 SLMCPR

QUANTITY, DESCRIPTION	Clinton Unit 1 Cycle 8	Clinton Unit 1 Cycle 9	
Number of Bundles in Core	624	624	624
Limiting Cycle Exposure Point	EOC	PHE	PHE
Cycle Exposure at Limiting Point [MWd/STU]	8324	10,300	10,300
Reload Fuel Type	GE14	GE14	GE14
Latest Reload Batch Fraction [%]	30.1%	42.9%	42.9%
Latest Reload Average Batch Weight % Enrichment	3.53%	3.89%	3.89%
Batch Fraction for GE14	30.1%	73.1%	73.1%
Batch Fraction for GE10	69.9%	26.9%	26.9%
Core Average Weight % Enrichment	3.5%	3.7%	3.7%
Core MCPR (for limiting rod pattern)	1.43	1.33	1.33
[[			]]
[[			]]
Power distribution uncertainty	GETAB NEDO-10958-A	GETAB NEDO-10958-A	Reduced NEDC-32694P-A
Non-power distribution uncertainty	Revised NEDC-32601P-A	Revised NEDC-32601P-A	Revised NEDC-32601P-A
Calculated Safety Limit MCPR	**1.09**	**1.11**	**1.08**

Table 2

Clinton Unit 1 Cycles 8 and 9 SLMCPR Results Assessment

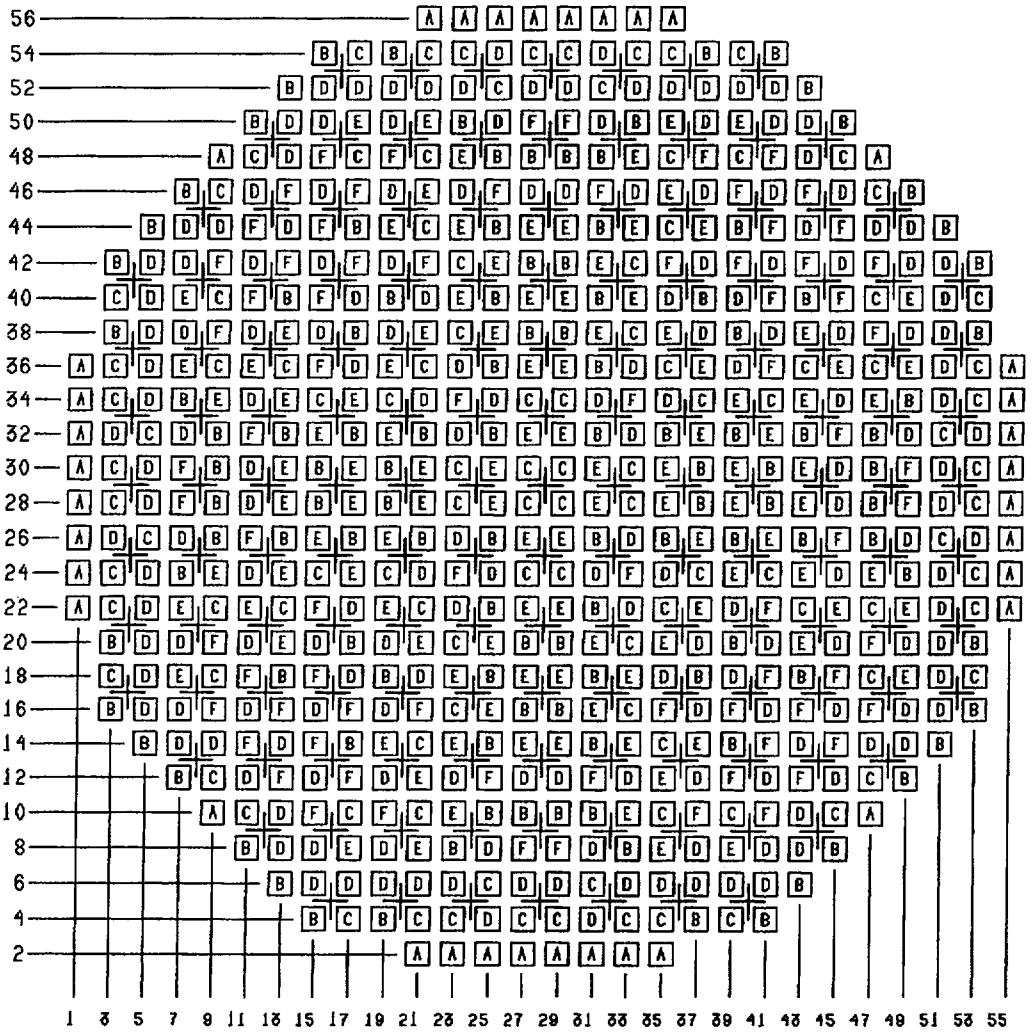
1	2	3a	3b	4
Quantity	Cycle 8 GETAB Value	Cycle 9 GETAB Value	Cycle 9 Revised Bases	Impact on SLMCPR for Cycle 9 (col. 3b-3a)
Tech Spec	Current	Used only for comparison	Proposed	-0.03
1. Impact of Revised Uncertainties Not Related to Power Distribution				
Reference Document	NEDC-32601P-A August 1999	NEDC-32601P-A August 1999	NEDC-32601P-A August 1999	Approved by NRC
Core flow rate (derived from pressure drop)	[[		]]]]	None
Individual channel flow area	[[		]]	None
Individual channel friction factor	[[		]]	None
Friction factor multiplier	[[		]]	None
Reactor pressure	[[		]]	None
Core inlet temperature	[[		]]	None
Feedwater temperature	[[		]]	None
Feedwater flow rate	[[		]]	None
				[[ ]]
2. Impact of Reduced Power Distribution Uncertainties and Revised Modeling				
Reference Document	NEDO-10958-A January 1977	NEDO-10958-A January 1977	NEDC-32694P-A August 1999	Both approved by NRC
R-factor uncertainty	[[		]]	None
Critical power uncertainty (The GE14 value revised since last cycle analysis)	[[		]]	None
TIP random uncertainty component	[[		]]]]	None
Adaptive mode used for analysis	Absolute	Absolute	Absolute	None
Effective total bundle power uncertainty	[[		]]	Part of overall TIPSYS
Effective non-random TIPSYS	[[		]]	Part of overall TIPSYS
Effective overall TIPSYS uncertainty as modeled	[[		]]	[[ ]]

Table 2 (cont.)

Clinton Unit 1 Cycles 8 and 9 SLMCPR Results Assessment

3. Secondary Impact on SLMCPR because Reduced SLMCPR causes a Lower OLMCPR				
Target OLMCPR	1.36	1.27	1.27	None
[[			]]	None
[[			]]	None
[[			]]	None
				[[ ]]
Total Impact on Tech Spec SLMCPR and SLO SLMCPR				
Calculated SLMCPR	[[			]]
Calculated SLO SLMCPR	[[			]]
Tech Spec SLMCPR	1.09	[[ ]]	1.08	]]
Tech Spec SLO SLMCPR	1.12	[[ ]]	1.11	]]

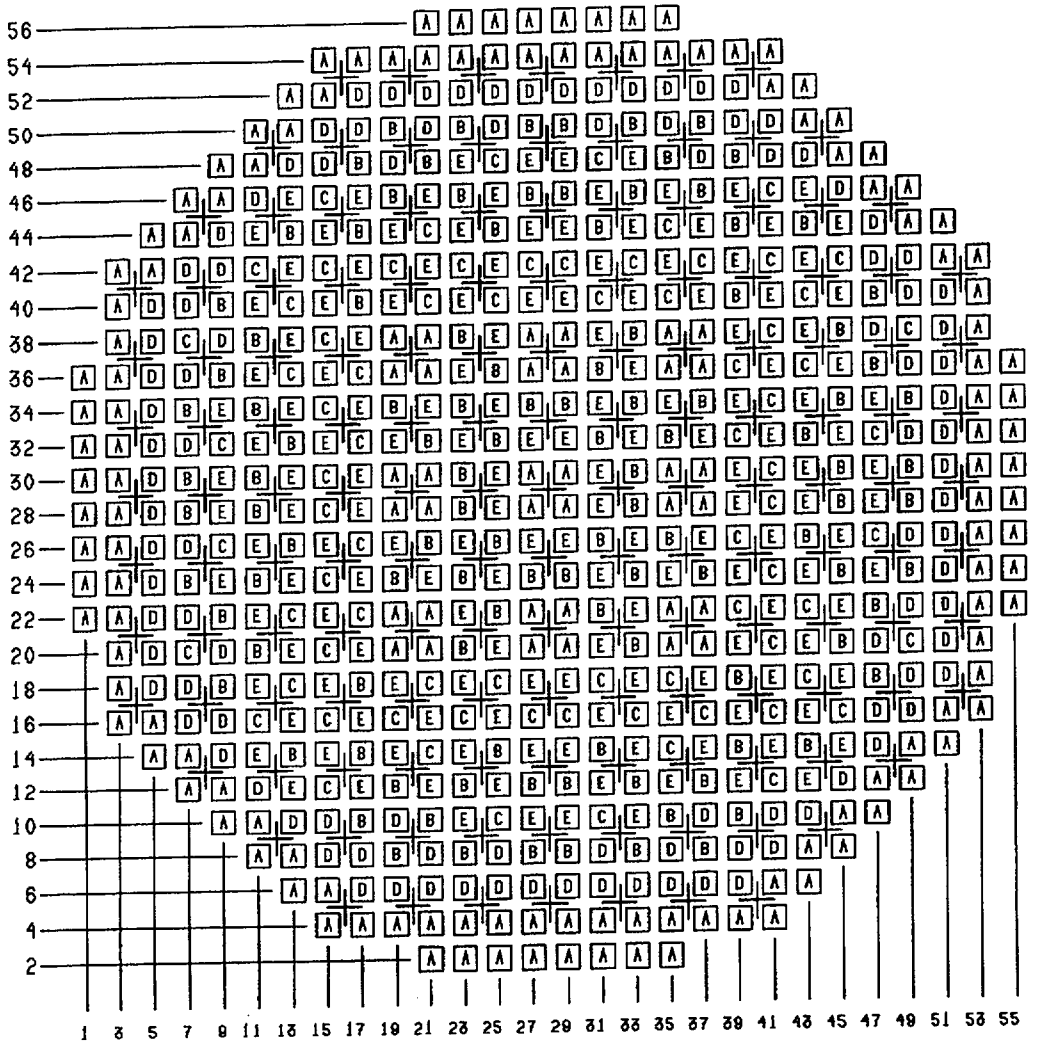
Figure 1 Reference Core Loading Pattern – Cycle 8



FUEL TYPE	
A = GE10-P8SXB322-10GZ-120M-150-T	D = GE10-P8SXB353-12GZ-120T-150-T
B = GE10-P8SXB346-10GZ-120M-150-T	E = GE14-P10SNAB353-13GZ-120T-150-T-2412
C = GE10-P8SXB348-10GZ-120M-150-T	F = GE14-P10SNAB354-15GZ-120T-150-T-2413

[[GNF Proprietary Information]]
[[enclosed by double brackets]]

Figure 2 Reference Core Loading Pattern – Cycle 9



FUEL TYPE	
A = GE10-P8SXB353-12GZ-120T-150-T	D = GE14-P10SNAB395-16GZ-120T-150-T-2519
B = GE14-P10SNAB353-13GZ-120T-150-T-2412	E = GE14-P10SNAB385-16GZ-120T-150-T-2520
C = GE14-P10SNAB354-15GZ-120T-150-T-2413	