

10 CFR 50.90

RS-03-242

December 23, 2003

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001Quad Cities Nuclear Power Station, Unit 2  
Facility Operating License No. DPR-30  
NRC Docket No. 50-265**Subject:** Supplemental Information for Technical Specifications Change for Minimum Critical Power Ratio Safety Limit**Reference:** Letter from P. R. Simpson (Exelon Generation Company, LLC) to U. S. NRC, "Request for Technical Specifications Change for Minimum Critical Power Ratio Safety Limit," dated November 14, 2003

In the above referenced letter, Exelon Generation Company, LLC (EGC) submitted a request for a change to the operating license and Technical Specifications (TS) for Quad Cities Nuclear Power Station (QCNPS), Unit 2. The proposed change revises the values of the Safety Limit for the Minimum Critical Power Ratio (SLMCPR) in TS Section 2.1.1, "Reactor Core SLs," for Unit 2, Cycle 18, for both two loop operation and single loop operation to 1.09 and 1.10, respectively.

On December 18, 2003, Global Nuclear Fuel (GNF) provided EGC with revised calculations used in the determination of the SLMCPR limits for QCNPS Unit 2, Cycle 18. These changes occurred following a review of the previously calculated results. EGC is submitting copies of these documents as Attachments 1 and 2 of this letter.

The following changes are reflected in Table 1 of the revised documents.

- The limiting cycle exposures identified in Table 1 were revised for Cycle 18. For Cycle 18, the limiting dual loop operation (DLO) SLMCPR of 1.09 occurs at 12,000 Megawatt-Days per Metric Tonne (MWD/MT), however the single loop operation (SLO) SLMCPR of 1.10 occurs at 15,000 MWD/MT. Revised text on pages 1 and 2 of the attachments to this letter reflect these changes.
- Due to changes in the limiting exposure point, core MCPR for Cycle 18 was revised from 1.49 to 1.43.
- The MCPR Importance Parameter (MIP) and R-factor Importance Parameter (RIP) in Table 1 were revised for Cycles 17 and 18. The revised values for Cycle 17 reflect the most recent analysis performed for that cycle. The Cycle 18 values were updated based on the revised limiting exposure point.

APD1

The following change was made to Table 2.

- The Cycle 17 value for the GEXL R-factor was provided in Column 2 to identify the difference between Cycles 17 and 18.

The QCNPS Unit 2, Cycle 18, SLMCPR values were not impacted in the revision, and these values remain consistent with those provided in the referenced letter.

Some of the information contained in Attachment 1 is classified as proprietary to our fuel supplier, GNF, and is identified as text contained between opening double brackets ([[ and closing double brackets ]]). The proprietary information is of the type that GNF maintains in confidence and withholds from public disclosure. It has been handled and classified as proprietary as supported by the affidavit in Attachment 2. EGC hereby requests that this information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.790, "Public inspections, exemptions, requests for withholding." Attachment 2 provides an edited, non-proprietary version of the information in Attachment 1.

EGC has reviewed the information supporting a finding of no significant hazards consideration that was previously provided to the NRC in Attachment 1 of the above referenced letter. The supplemental information provided in this submittal does not affect the bases for concluding that the proposed TS change does not involve a significant hazards consideration.

Should you have any questions related to this letter, please contact Mr. Thomas G. Roddey at (630) 657-2811.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 23<sup>rd</sup> day of December 2003.

Respectfully,



P. R. Simpson  
Manager — Licensing

Attachments:

1. Additional Information Regarding the Cycle Specific SLMCPR for Quad Cities Unit 2 Cycle 18 – December 18, 2003 (GNF Proprietary Version)
2. Affidavit and Additional Information Regarding the Cycle Specific SLMCPR for Quad Cities Unit 2 Cycle 18 – December 18, 2003 (GNF Non-Proprietary Version)

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

## ATTACHMENT 2

Affidavit and Additional Information Regarding the Cycle Specific  
SLMCPR for Quad Cities Unit 2 Cycle 18 - December 18, 2003  
(GNF Non-Proprietary Version)

**Affidavit**

**I, Jens G. M. Andersen, state as follows:**

- (1) I am Fellow and project manager, TRACG Development, 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 Quad Cities Unit 2 Cycle 18,” December 18, 2003. GNF proprietary information is indicated by enclosing it in double brackets. In each case, the superscript notation <sup>(3)</sup> refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.
- (3) In making this application for withholding of proprietary information of which it is the owner or licensee, GNF-A relies upon the exemption from disclosure set forth in the Freedom of Information Act (“FOIA”), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4) and 2.790(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.

Affidavit

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b., above.

- (5) To address the 10 CFR 2.790 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GNF-A, and is in fact so held. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in (6) and (7) following. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GNF-A, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.
- (6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GNF-A. Access to such documents within GNF-A is limited on a "need to know" basis.
- (7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GNF-A are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.
- (8) The information identified in paragraph (2) is classified as proprietary because it contains details of GNF-A's fuel design and licensing methodology.

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

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

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

Affidavit

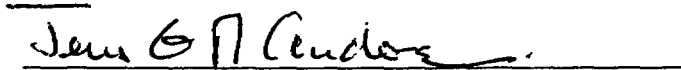
The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

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

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

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed at Wilmington, North Carolina, this 18th day of December, 2003.



Jens G. M. Andersen

Global Nuclear Fuel – Americas, LLC

**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 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.
- [6] GEXL96 Correlation for ATRIUM-9B Fuel, NEDC-32981P-A, Rev. 1, May 2002.
- [7] Letter, Glen A. Watford (GNF-A) to U. S. Nuclear Regulatory Commission Document Control Desk with attention to J. Donoghue (NRC), "Final Presentation Material for GEXL Presentation – February 11, 2002", FLN-2002-004, February 12, 2002.

**Comparison of Quad Cities Unit 2 SLMCPR Values for Cycles 18 and 17**

Table 1 summarizes the relevant input parameters and results of the SLMCPR determination for the Quad Cities Unit 2 Cycle 18 and 17 cores. The SLMCPR evaluations for Cycle 18 were performed using NRC-approved methods and uncertainties<sup>[1]</sup>, supplemented with Quad Cities Unit 2 specific uncertainties as indicated in Table 2. These calculations use the GEXL14 correlation for GE14 fuel and GEXL96<sup>[6]</sup> for the FANP fuel.

[[ ]] The dual loop operation (DLO) and single loop operation (SLO) SLMCPR values calculated for Cycle 18 of Quad Cities Unit 2 are shown in Table 1. Other quantities that have been shown to have some impact on the determination of the SLMCPR are also shown in Table 1.

[[ ]]

In comparing the Quad Cities Unit 2 Cycle 18 and Cycle 17 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.

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.

[[ ]]

Pin-by-pin power distributions are characterized in terms of R-factors using the NRC approved methodology<sup>[2]</sup>. [[ ]]

### Summary

[[ ]] have been used to compare quantities that impact the calculated SLMCPR value. Based on these bundle and core design considerations, the calculated 1.09 Monte Carlo SLMCPR for Quad Cities Unit 2 Cycle 18 is consistent with what one would expect [[ ]] the 1.09 SLMCPR value is appropriate.

Based on all of the facts, observations and arguments presented above, it is concluded that a SLMCPR value of 1.09 for the Quad Cities Unit 2 Cycle 18 core is appropriate.

For single loop operations (SLO) the safety limit MCPR at the limiting exposure of 15,000 MWD/MT is 1.10 as determined by specific calculations for Quad Cities Unit 2 Cycle 18.

### 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<sup>[1]</sup> 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 References [5] and [7]. 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 Quad Cities Unit 2 Cycles 17 and 18 is provided in Figures 1 and 2, respectively.

The power and non-power distribution uncertainties that are used in the analyses are indicated in Table 2. The referenced document numbers have previously been reviewed and approved by the NRC. The SER (Reference [1]) specifically provides that higher uncertainty values be used when necessary as was the case for this SLMCPR evaluation for Quad Cities Unit 2 Cycle 18.



**Attachment**

**Additional Information Regarding the December 18, 2003  
Cycle Specific SLMCPR for Quad Cities Unit 2 Cycle 18**

Prepared by:

Verified by:

*H. Zhang*

*Ronald Szilard*

H. Zhang  
Technical Program Manager

R. Szilard  
Exelon Technical Manager

**Table 1**  
**Comparison of the Quad Cities Unit 2 Cycle 18 and Cycle 17 SLMCPR**

QUANTITY, DESCRIPTION	Quad Cities Unit 2 Cycle 17	Quad Cities Unit 2 Cycle 18
Number of Bundles in Core	724	724
Cycle Exposure at Limiting Point [MWd/MTU]	14,991	12,000*
Reload Fuel Type	GE14	GE14
Latest Reload Batch Fraction [%]	37.0%	33.1%
Latest Reload Average Batch Weight % Enrichment	4.07%	3.99%
Batch Fraction for GE14	37.0%	70.2%
Batch Fraction for ATRIUM-9B	63.0%	29.8%
Core Average Weight % Enrichment	3.87%	3.97%
Core MCPR (for limiting rod pattern)	1.52	1.43
[[		]]
[[		]]
Power distribution uncertainty	See Table 2, Column 2	See Table 2, Column 2
Non-power distribution uncertainty	See Table 2, Column 2	See Table 2, Column 2
<b>Calculated Safety Limit MCPR (DLO)</b>	<b>1.11</b>	<b>1.09*</b>
<b>Calculated Safety Limit MCPR (SLO)</b>	<b>1.12</b>	<b>1.10*</b>

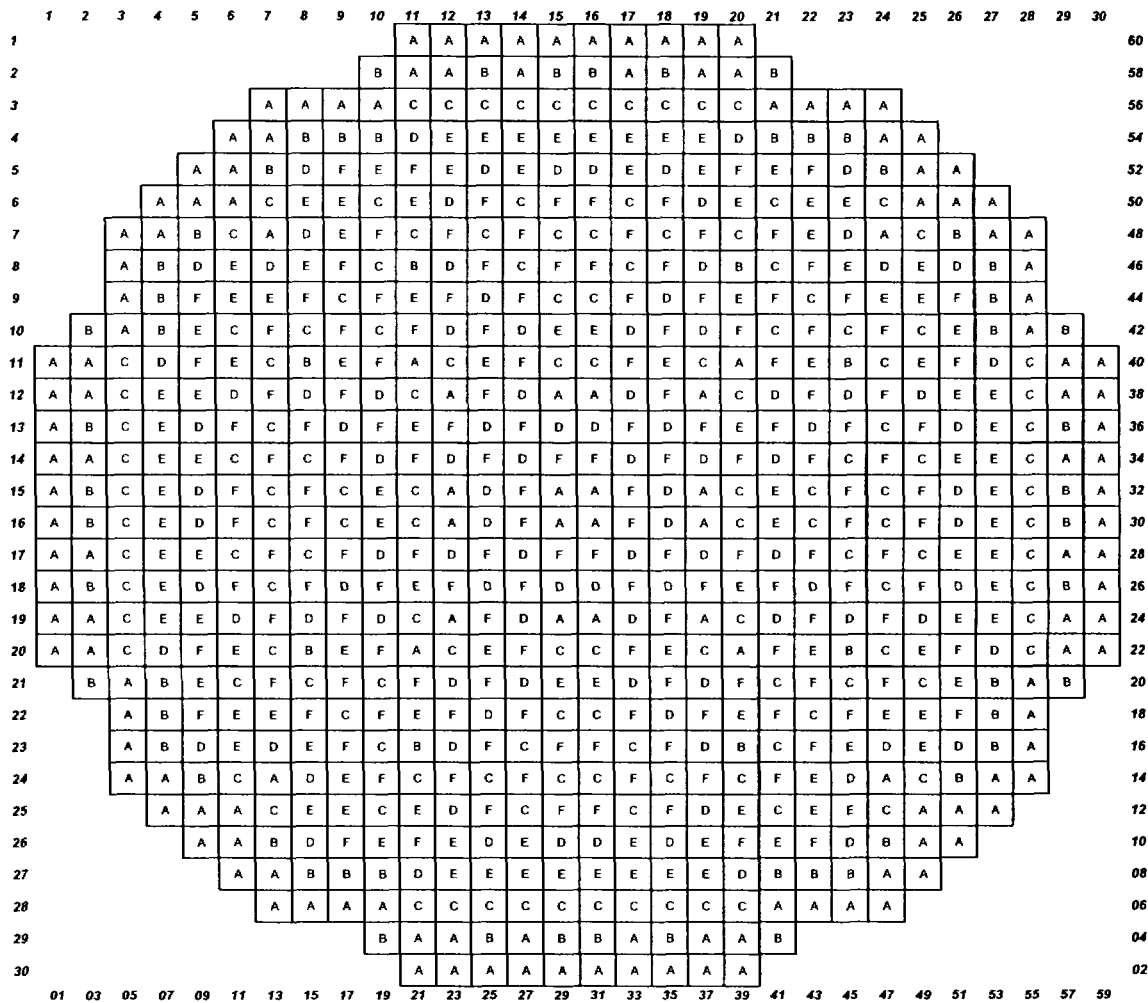
\*The limiting DLO SLMCPR of 1.09 occurs at 12,000 MWD/MT, however the limiting SLO SLMCPR of 1.10 occurs at 15,000 MWD/MT.

Table 2

## Comparison of Quad Cities Unit 2 Specific Inputs to NRC-accepted Values

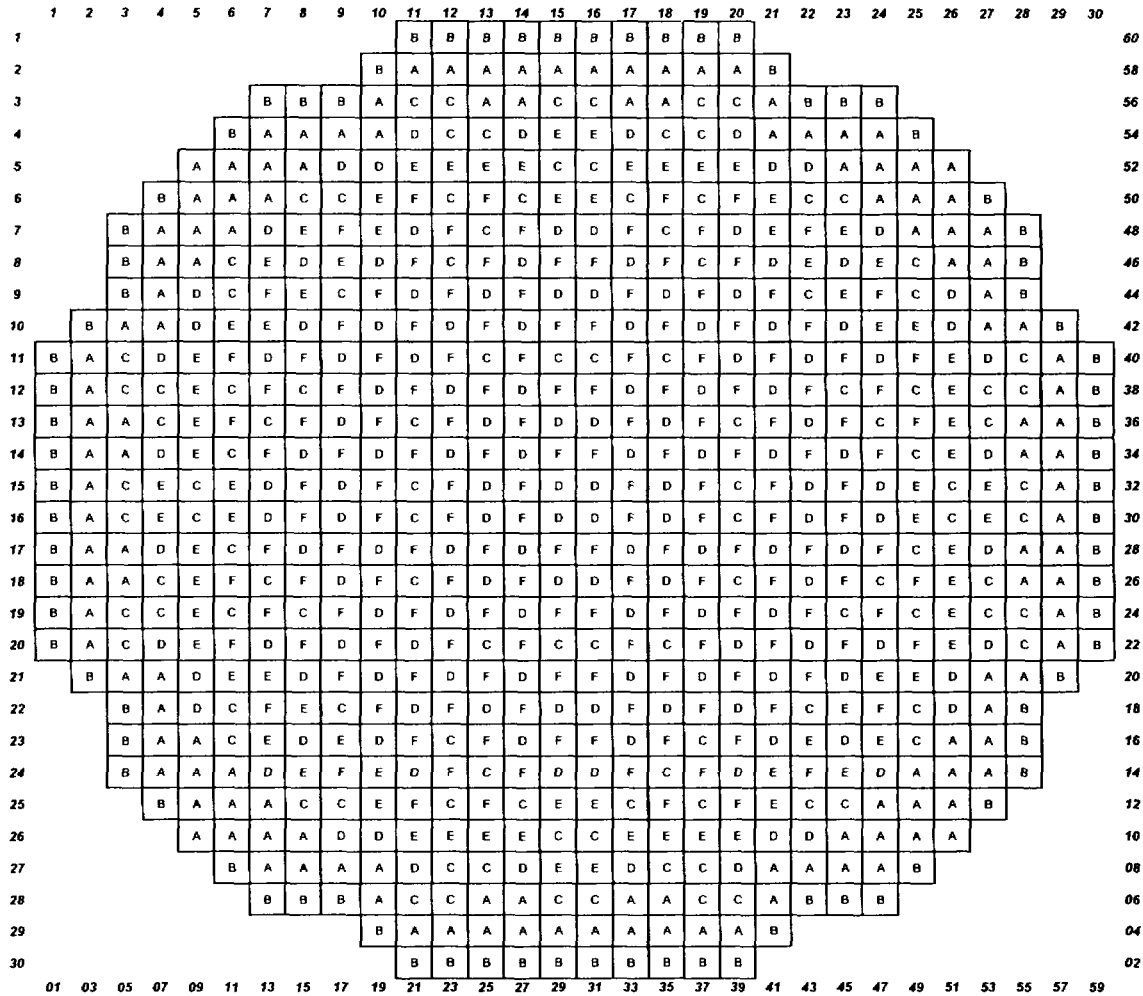
DESCRIPTION	COLUMN 1 Uncertainty Values (%) previously accepted by NRC	COLUMN 2 Quad Cities Unit 2 Specific Values (%)
<b>Non-power Distribution Uncertainties</b>	From Table 2.1 of NEDC-32601P-A	
Core flow rate (derived from pressure drop)	[[ ]] TLO [[ ]] SLO	[[ ]] TLO [[ ]] SLO
Individual channel flow area	[[ ]]	[[ ]]
Individual channel friction factor	[[ ]]	[[ ]]
Friction factor multiplier	[[ ]]	[[ ]]
Reactor pressure	[[ ]]	[[ ]]
Core inlet temperature	[[ ]]	[[ ]]
Feedwater temperature	[[ ]]	[[ ]]
Feedwater flow rate	[[ ]]	[[ ]] Cycle 18 [[ ]] Cycle 17
<b>Power Distribution Uncertainties consistent with the Revised Methodology of NEDC-32601P-A</b>	GETAB uncertainties as used to produce values shown in Table 4.1 of NEDC-32601P-A	Specific Values (%)
GEXL R-factor	[[ ]]	[[ ]] Cycle 18 [[ ]] Cycle 17
Random effective TIP reading	[[ ]] TLO [[ ]] SLO	[[ ]] TLO [[ ]] SLO
Systematic effective TIP reading	[[ ]]	[[ ]]
Integrated effective TIP reading	[[ ]]	[[ ]]
Bundle power	[[ ]]	[[ ]]
Effective total bundle power uncertainty	[[ ]]	[[ ]]

Figure 1 Reference Core Loading Pattern – Cycle 17



Bundle Name	Number in Core	Cycle Loaded
A ATRM9-P9DATB372-11GZ-SPC100T-9WR-144-T6-:	152	15
B ATRM9-P9DATB358-11GZ-SPC100T-9WR-144-T6-:	64	15
C ATRM9-P9DATB383-11GZ-SPC100T-9WR-144-T6-:	136	16
D ATRM9-P9DATB381-13GZ-SPC100T-9WR-144-T6-:	104	16
E GE14-P10DNAB409-15GZ-100T-145-T6-2507	116	17
F GE14-P10DNAB406-16GZ-100T-145-T6-2508	152	17
<b>Total</b>	<b>724</b>	

Figure 2 Reference Core Loading Pattern – Cycle 18



Bundle Name	Number in Core	Cycle Loaded
A ATRM9-P9DATB383-11GZ-SPC100T-9WR-144-T6-3918	136	16
B ATRM9-P9DATB381-13GZ-SPC100T-9WR-144-T6-3919	80	16
C GE14-P10DNAB409-15GZ-100T-145-T6-2507	116	17
D GE14-P10DNAB406-16GZ-100T-145-T6-2508	152	17
E GE14-P10DNAB418-16GZ-100T-145-T6-2646	80	18
F GE14-P10DNAB389-18GZ-100T-145-T6-2650	160	18
<b>Total</b>	<b>724</b>	