TVA

Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

July 18, 2008

TVA-BFN-TS-446

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop: OWFN P1-35
Washington, D.C. 20555-0001

Gentlemen:

In the Matter of	)	Docket No. 50-259
Tennessee Valley Authority	)	

BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 1 - TECHNICAL SPECIFICATIONS (TS) CHANGE TS-446 - SAFETY LIMIT MINIMUM CRITICAL POWER RATIO (SLMCPR) - CYCLE 8 OPERATION

Pursuant to 10 CFR 50.90, the Tennessee Valley Authority (TVA) is submitting a request for a TS change (TS-446) to license DPR-33 for BFN Unit 1. The proposed change reduces the numeric values of SLMCPR in TS Section 2.1.1.2 for single and two reactor recirculation loop operation to incorporate the results of the Unit 1 Cycle 8 SLMCPR analysis. The SLMCPR analysis report was prepared by Global Nuclear Fuel (GNF) for TVA in support of this proposed TS change.

A proprietary version of the GNF SLMCPR analysis report is provided in Enclosure 3. Some of the information in Enclosure 3 is considered proprietary and GNF requests that this proprietary information be withheld from public disclosure in accordance with 10 CFR 9.17(a)(4) and 10 CFR 2.390(a)(4). A GNF affidavit supporting this request is included in Enclosure 3. Enclosure 4 provides a non-proprietary version of the same report. The SLMCPR analysis report is provided in a GNF developed template format. TVA understands that this template format is intended to provide NRC with sufficient information on GNF-based SLMCPR TS changes to minimize the need for supplemental submittals.

D030
NRR

On June 28, 2004, TVA submitted proposed TS change TS-431 (ADAMS Accession No. ML041840109) to allow operation of Unit 1 at Extended Power Uprate (EPU) conditions. Accordingly, the attached Unit 1 Cycle 8 SLMCPR analysis was performed based on EPU conditions in anticipation of NRC approval of TS-431 for Unit 1 Cycle 8 operation. Therefore, TVA is asking that this TS change be approved concurrent with TS-431 and that the implementation of the revised TS be made within 60 days of NRC approval. BFN Unit 1 Cycle 8 operation will commence in late November 2008 following a scheduled refuel outage.

TVA has determined that there are no significant hazards considerations associated with the proposed change and that the TS change qualifies for a categorical exclusion from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9). Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter and enclosures to the Alabama State Department of Public Health.

No new regulatory commitments are made in this submittal. If you have any questions regarding this letter, please contact me at (256)729-2636.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 18th day of July, 2008.

Sincerely,

David L. Langley

D. T. Langley
Manager of Licensing
and Industry Affairs

Enclosures:
1. TVA Evaluation of the Proposed Change
2. Proposed Technical Specifications Changes (mark-up)
3. Affidavit and Proprietary Version of GNF Report
4. Non-Proprietary version of GNF Report

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Enclosure 1

Browns Ferry Nuclear Plant (BFN) Unit 1

Technical Specifications (TS) Change TS-446
Safety Limit Minimum Critical Power Ratio (SLMCPR)
Cycle 8 Operation

TVA Evaluation of the Proposed Change

1.0 DESCRIPTION

Pursuant to 10 CFR 50.90, the Tennessee Valley Authority (TVA) is submitting a request for a TS change (TS-446) to Operating License DPR-33 for BFN Unit 1. The proposed change revises the numeric values of SLMCPR in TS Section 2.1.1.2 for single and two reactor recirculation loop operation to incorporate the results of the Unit 1 Cycle 8 SLMCPR analysis. Approval of TS-446 is needed for Cycle 8 operation, which is scheduled to begin in November 2008.

2.0 PROPOSED CHANGE

The proposed TS change revises the SLMCPR value in Unit 1 TS 2.1.1.2 from 1.11 to 1.09 for single recirculation loop operation and from 1.09 to 1.07 for two recirculation loop operation. A marked-up TS page is provided in Enclosure 2, which shows the TS revision.

3.0 BACKGROUND

Safety Limits (SLs) are limits upon important process variables that are found to be necessary to reasonably protect the integrity of certain physical barriers that guard against the uncontrolled release of radioactivity. One such SL included in BFN TS is the SLMCPR value in TS 2.1.1.2. The SLMCPR limit is established such that at least 99.9% of the fuel rods in the core would not be expected to experience the onset of transition boiling as a result of normal operation and transients, which in turn ensures fuel cladding damage does not occur. A general discussion of the SLMCPR parameter is maintained in Section 3.7.7.1.1, Fuel Cladding Integrity Safety Limit, of the BFN Updated Final Safety Analysis Report.

The SLMCPR limit is established such that fuel design limits are not exceeded during steady state operation, normal operational transients, and abnormal operational transients. As such, fuel damage is calculated not to occur if the limit is not violated. However, because fuel damage is not directly observable, a stepback approach is used to establish corresponding MCPR Operating Limits. In simple terms, the MCPR Operating Limits are established by summing the cycle-specific core reload transient analyses adders and the calculated SLMCPR values. The MCPR Operating Limits are required to be established and documented in the Core Operating Limits Report (COLR) for each reload cycle by TS 5.6.5, COLR. TS 3.2.2, MCPR, specifies the Limiting Conditions for Operation and Surveillance Requirements for monitoring MCPR against the MCPR Operating Limits documented in the COLR.

The absolute value of SLMCPR tends to vary cycle-to-cycle, typically due to the introduction of improved fuel bundle types, changes in fuel vendors, and changes in core loading pattern. Following the determination of the cycle-specific SLMCPR values, the MCPR Operating Limits are derived. The MCPR Operating Limits are maintained in the COLR in accordance with TS 5.6.5.a(3). However, the cycle-specific SLMCPR numeric values are listed in TS 2.1.1.2 and must be revised using the license amendment process.

The cycle-specific calculations for the Unit 1 Cycle 8 core design have been recently completed and a change to the TS 2.1.1.2 SLMCPR values for single and two recirculation loop operation is warranted. Therefore, this proposed TS change is requesting that the SLMCPR numeric values in TS 2.1.1.2 be revised to reflect the results of the Cycle 8 SLMCPR analysis.

Approval of TS-446 is being requested for BFN Unit 1 Cycle 8 operation, which is scheduled to begin in late November 2008.

4.0 TECHNICAL ANALYSIS

The SLMCPR values have been determined by Global Nuclear Fuel (GNF) for TVA for Unit 1 Cycle 8 operation using plant- and cycle-specific fuel and core parameters. A proprietary version of the SLMCPR analysis letter report prepared by GNF in support of this proposed TS change is provided in Enclosure 3. Enclosure 4 provides a non-proprietary version of the same report.

The SLMCPR evaluation was based on the cycle-specific procedures and analytical methodologies described in "General Electric Standard Application for Reactor Fuel," NEDE-24011-P-A-16 (GESTAR-II), (Reference 1) and in the US Supplement, NEDE-24011-P-A-16-US, October 2007 (Reference 1), which include

Amendment 25. Amendment 25 was approved by the NRC in a March 11, 1999, Safety Evaluation Report (SER) and provides acceptance for referencing the Licensing Topical Reports (LTRs) NEDC-32601P-A, "Methodology and Uncertainties for Safety Limit MCPR Evaluations" (Reference 2) and NEDC-32694P-A, "Power Distribution Uncertainties for Safety Limit MCPR Evaluation" (Reference 3). Also used was NEDE-32505P-A, Revision 1, "R-Factor Calculation Method for GE-11, GE-12, and GE-13 Fuel" (Reference 4). These LTR methodologies were previously used to justify the SLMCPR TS values for the current Unit 1 operating cycle (Cycle 7) as approved by NRC in the SER dated February 6, 2007 (ML0705402420) for TS change 455.

The Unit 1 Cycle 8 core is designed for Extended Power Uprate operation. The core design uses 328 fresh GE14 fuel assemblies, 108 irradiated GE13 fuel assemblies, and 328 irradiated GE14 fuel assemblies. The Unit 1 Cycle 8 core loading pattern is shown in Figure 1 of Enclosures 3 and 4.

5.0 REGULATORY SAFETY ANALYSIS

The Tennessee Valley Authority (TVA) is submitting a Technical Specifications (TS) change request to Operating License DPR-33 for Browns Ferry Nuclear Plant (BFN) Unit 1. The proposed change revises the Reactor Core Safety Limit Minimum Critical Power Ratio (SLMCPR) in TS Section 2.1.1.2 from 1.09 to 1.07 for two reactor recirculation loop operation and from 1.11 to 1.09 for single loop operation.

5.1 No Significant Hazards Consideration

TVA has evaluated whether or not a significant hazards consideration is involved with the proposed TS change by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of Amendment,", as discussed below:

1. Does the proposed Technical Specification change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

The proposed amendment establishes a revised SLMCPR value for single and two recirculation loop operation. The probability of an evaluated accident is derived from the probabilities of the individual precursors to that accident. The proposed SLMCPR values preserve the existing margin to transition boiling and the probability of fuel damage is not increased. Since the change does not require any physical plant modifications or physically affect any plant components, no individual precursors of an accident are affected and the probability of an evaluated accident is not increased by revising the SLMCPR values.

The consequences of an evaluated accident are determined by the operability of plant systems designed to mitigate those consequences. The revised SLMCPR values have been determined using NRC-approved methods and procedures. The basis of the MCPR Safety Limit is to ensure no mechanistic fuel damage is calculated to occur if the limit is not violated. These calculations do not change the method of operating the plant and have no effect on the consequences of an evaluated accident. Therefore, the proposed TS change does not involve an increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed Technical Specification change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

The proposed license amendment involves a revision of the SLMCPR value for single and two recirculation loop operation based on the results of an analysis of the Unit 1 Cycle 8 core. Creation of the possibility of a new or different kind of accident would require the creation of one or more new precursors of that accident. New accident precursors may be created by modifications of the plant configuration, including changes in the allowable methods of operating the facility. This proposed license amendment does not involve any modifications of the plant configuration or changes in the allowable methods of operation. Therefore, the proposed TS change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed Technical Specification change involve a significant reduction in a margin of safety?

Response: No

The margin of safety as defined in the TS bases will remain the same. The new SLMCPR values were calculated using referenced fuel vendor methods and procedures, which are in accordance with the fuel design and licensing criteria. The SLMCPR remains high enough to ensure that greater than 99.9 percent of all fuel rods in the core are expected to avoid transition boiling if the limit is not violated, thereby preserving the fuel cladding integrity. Therefore, the proposed TS change does not involve a reduction in the margin of safety.

Based on the above, TVA concludes that the proposed TS change presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

The SLMCPR values included in this TS submittal have been determined in accordance with the referenced NRC-approved fuel vendor methodologies. Accordingly, applicable regulatory requirements and criteria are met.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the TS changes will not be inimical to the common defense and security or the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed TS changes would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed TS changes do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed TS change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed TS change.

7.0 REFERENCES

1. General Electric Standard Application for Reactor Fuel (GESTAR-II), NEDE-24011-P-A-16, and the US Supplement, NEDE-24011-P-A-16-US, October 2007.
2. NEDC-32601P-A, Methodology and Uncertainties for Safety Limit MCPR Evaluations, August 1999.
3. NEDC-32694P-A, Power Distribution Uncertainties for Safety Limit MCPR Evaluation, August 1999.

4. NEDE-32505P-A, Revision 1, R-Factor Calculation Method for GE-11, GE-12, and GE-13 Fuel, July 1999.

Enclosure 2

Browns Ferry Nuclear Plant (BFN) Unit 1

Technical Specifications (TS) Change TS-446
Safety Limit Minimum Critical Power Ratio (SLMCPR)
Cycle 8 Operation

Proposed Technical Specification Changes (mark-up)

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 785 psig or core flow < 10% rated core flow:

THERMAL POWER shall be ≤ 25% RTP.

2.1.1.2 With the reactor steam dome pressure ≥ 785 psig and core flow ≥ 10% rated core flow:

1.07 1.09

MCPR shall be ≥ ~~1.09~~ for two recirculation loop operation or ≥ ~~1.11~~ for single loop operation.

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

2.1.2 Reactor Coolant System Pressure SL

Reactor steam dome pressure shall be ≤ 1325 psig.

2.2 SL Violations

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

Enclosure 4

Browns Ferry Nuclear Plant (BFN) Unit 1

Technical Specifications (TS) Change TS-446
Safety Limit Minimum Critical Power Ratio (SLMCPR)
Cycle 8 Operation

Non-Proprietary Version of GNF Report

5/21/2008

GNF S-0000-0076-0998

GNF Additional Information Regarding the Requested Changes to the Technical Specification SLMCPR

Browns Ferry Unit 1 Cycle 8

Proprietary Information Notice

This document is the GNF non-proprietary version of the GNF proprietary report. From the GNF proprietary version, the information denoted as GNF proprietary (enclosed in double brackets) was deleted to generate this version.

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1.0 Methodology

GNF performed the Browns Ferry Unit 1 Cycle 8 Safety Limit Minimum Critical Power Ratio (SLMCPR) calculation in accordance to NEDE-24011-P-A "General Electric Standard Application for Reactor Fuel" (Revision 16) using the following NRC-approved methodologies and uncertainties:

- NEDC-32601P-A "Methodology and Uncertainties for Safety Limit MCPR Evaluations" (August 1999).
- NEDC-32694P-A "Power Distribution Uncertainties for Safety Limit MCPR Evaluations" (August 1999).
- NEDC-32505P-A "R-Factor Calculation Method for GE11, GE12 and GE13 Fuel" (Revision 1, July 1999).
- NEDO-10958-A "General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation and Design Application" (January 1977).

Table 2 identifies the actual methodologies used for the previous Cycle 7 and the current Cycle 8 SLMCPR calculations.

2.0 Discussion

In this discussion, the TLO nomenclature is used for two recirculation loops in operation, and the SLO nomenclature is used for one recirculation loop in operation.

2.1. Major Contributors to SLMCPR Change

In general, the calculated safety limit is dominated by two key parameters: (1) flatness of the core bundle-by-bundle MCPR distribution, and (2) flatness of the bundle pin-by-pin power/R-factor distribution. Greater flatness in either parameter yields more rods susceptible to boiling transition and thus a higher calculated SLMCPR. MIP (MCPR Importance Parameter) measures the core bundle-by-bundle MCPR distribution and RIP (R-factor Importance Parameter) measures the bundle pin-by-pin power/R-factor distribution. The impact of the fuel loading pattern on the calculated TLO SLMCPR using rated core power and rated core flow conditions has been correlated to the parameter MIPRIP, which combines the MIP and RIP values.
Table 3 presents the MIP and RIP parameters for the previous cycle and the current cycle along with the TLO SLMCPR estimate using the MIPRIP correlation. If the minimum core flow case is applicable, the TLO SLMCPR estimate is also provided for that case although the MIPRIP correlation is only applicable to the rated core flow case. This is done only to provide some reasonable assessment basis of the minimum core flow case trend. In addition, Table 3 presents estimated impacts on the TLO SLMCPR due to methodology deviations, penalities, and/or uncertainties deviations from approved values. Based on the MIPRIP correlation and any

impacts due to deviations from approved values, a final estimated TLO SLMCPR is determined. Table 3 also provides the actual calculated Monte Carlo SLMCPRs. Given the bias and uncertainty in the MIPRIP correlation [[{3}]] and the inherent variation in the Monte Carlo results [[{3}]], the change in the Browns Ferry Unit 1 Cycle 8 calculated Monte Carlo TLO SLMCPR using rated core power and rated core flow conditions is consistent with the corresponding estimated TLO SLMCPR value.

2.2. Deviations in NRC-Approved Uncertainties

Tables 4 and 5 provide a list of NRC-approved uncertainties along with values actually used. A discussion of deviations from these NRC-approved values follows; all of which are conservative relative to NRC-approved values. Also, estimated impact on the SLMCPR is provided in Table 3 for each deviation.

2.2.1. R-Factor

At this time, GNF has generically increased the GEXL R-Factor uncertainty from [[{3}]] to account for an increase in channel bow due to the emerging unforeseen phenomena called control blade shadow corrosion-induced channel bow, which is not accounted for in the channel bow uncertainty component of the approved R-Factor uncertainty. The step "σ RPEAK" in Figure 4.1 from NEDC-32601P-A, which has been provided for convenience in Figure 3 of this attachment, is affected by this deviation. Reference 4 technically justifies that a GEXL R-Factor uncertainty of [[{3}]] accounts for a channel bow uncertainty of up to [[{3}]]. Currently, Browns Ferry Unit 1 has not experienced any control blade shadow corrosion-induced channel bow and is not expected to experience any in Cycle 8 to the extent that would invalidate the approved R-Factor uncertainty.

2.2.2. Core Flow Rate and Random Effective TIP Reading

At this time, GNF has not been able to show that the NRC-approved process to calculate the SLMCPR only at the rated core power and rated core flow condition is adequately bounding relative to the SLMCPR calculated at rated core power and minimum core flow, see Reference 5. The minimum core flow condition can be more limiting due to the control rod pattern used. GNF has modified the NRC-approved process for determining the SLMCPR to include analyses at the rated core power and minimum licensed core flow point in addition to analyses at the rated core power and rated core flow point. GNF believes this modification is conservative and may in the future provide justification that the original NRC-approved process is adequately bounding.

The available flow range at rated power, 99% to 100% rated core flow, does not warrant analysis at the minimum core flow point.

2.3. Departure from NRC-Approved Methodology

No departures from NRC-approved methodologies were used in the Browns Ferry Unit 1 Cycle 8 SLMCPR calculations.

2.4. Fuel Axial Power Shape Penalty

At this time, GNF has determined that higher uncertainties and non-conservative biases in the GEXL correlations for the various types of axial power shapes (i.e., inlet, cosine, outlet and double hump) could potentially exist relative to the NRC-approved methodology values, see References 3, 6, 7 and 8. The following table identifies, by marking with an "X", this potential for each GNF product line currently being offered:

[[

{3}]]

Axial bundle power shapes corresponding to the limiting SLMCPR control blade patterns are determined using the PANACEA 3D core simulator. These axial power shapes are classified in accordance to the following table:

[[

{3}]]

If the limiting bundles in the SLMCPR calculation exhibit an axial power shape identified by this table, GNF penalizes the GEXL critical power uncertainties to conservatively account for the impact of the axial power shape. Table 6 provides a list of the GEXL critical power uncertainties determined in accordance to the NRC-approved methodology contained in NEDE-24011-P-A along with values actually used.

For the limiting bundles, the fuel axial power shapes in the SLMCPR analysis were examined to determine the presence of axial power shapes identified in the above table. These power shapes were not found; therefore, no power shape penalties were applied to the calculated Browns Ferry Unit 1 Cycle 8 SLMCPR values.

2.5. Methodology Restrictions

The four restrictions identified on Page 3 of NRC's Safety Evaluation relating to the General Electric Licensing Topical Reports NEDC-32601P, NEDC-32694P, and Amendment 25 to NEDE-24011-P-A (March 11, 1999) are addressed in References 1, 2, and 3.

No new GNF fuel designs are being introduced in Browns Ferry Unit 1 Cycle 8; therefore, the NEDC-32505-P-A statement "...if new fuel is introducted, GENE must confirm that the revised R-Factor method is still valid based on new test data" is not applicable.

2.6. Minimum Core Flow Condition

The available flow range at rated power, 99% to 100% rated core flow, does not warrant analysis at the minimum core flow point.

2.7. Limiting Control Rod Patterns

The limiting control rod patterns used to calculate the SLMCPR reasonably assures that at least 99.9% of the fuel rods in the core would not be expected to experience boiling transition during normal operation or anticipated operational occurrences during the operation of Browns Ferry Unit 1 Cycle 8.

2.8. Core Monitoring System

For Browns Ferry Unit 1 Cycle 8, the 3DMonicore system will be used as the core monitoring system.

2.9. Power/Flow Map

The utility has provided the current and previous cycle power/flow map in a separate attachment.

2.10. Core Loading Diagram

Figures 1 and 2 provide the core loading diagram for the current and previous cycle respectively, which are the Reference Loading Pattern as defined by NEDE-24011-P-A. Table 1 provides a description of the core.

2.11. Figure References

Figure 3 is Figure 4.1 from NEDC-32601-P-A. Figure 4 is Figure III.5-1 from NEDC-32601P-A. Figure 5 is Figure III.5-2 from NEDC-32601P-A.

2.12. Additional SLMCPR Licensing Conditions

For Browns Ferry Unit 1 Cycle 8, the additional SLMCPR licensing condition that the SLMCPR shall be established by adding 0.02 to the cycle-specific SLMCPR value calculated using the NRC-approved methodologies documented in NEDE-24011-P-A has been applied (see Table 3).

2.13. Summary

The requested changes to the Technical Specification SLMCPR values are 1.07 for TLO and 1.09 for SLO for Browns Ferry Unit 1 Cycle 8.

3.0 References

1. 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.

2. 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.

3. Letter, Glen A. Watford (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with attention to Joseph E. Donoghue (NRC), "Final Presentation Material for GEXL Presentation – February 11, 2002", FLN-2002-004, February 12, 2002.

4. Letter, John F. Schardt (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with attention to Mel B. Fields (NRC), "Shadow Corrosion Effects on SLMCPR Channel Bow Uncertainty", FLN-2004-030, November 10, 2004.

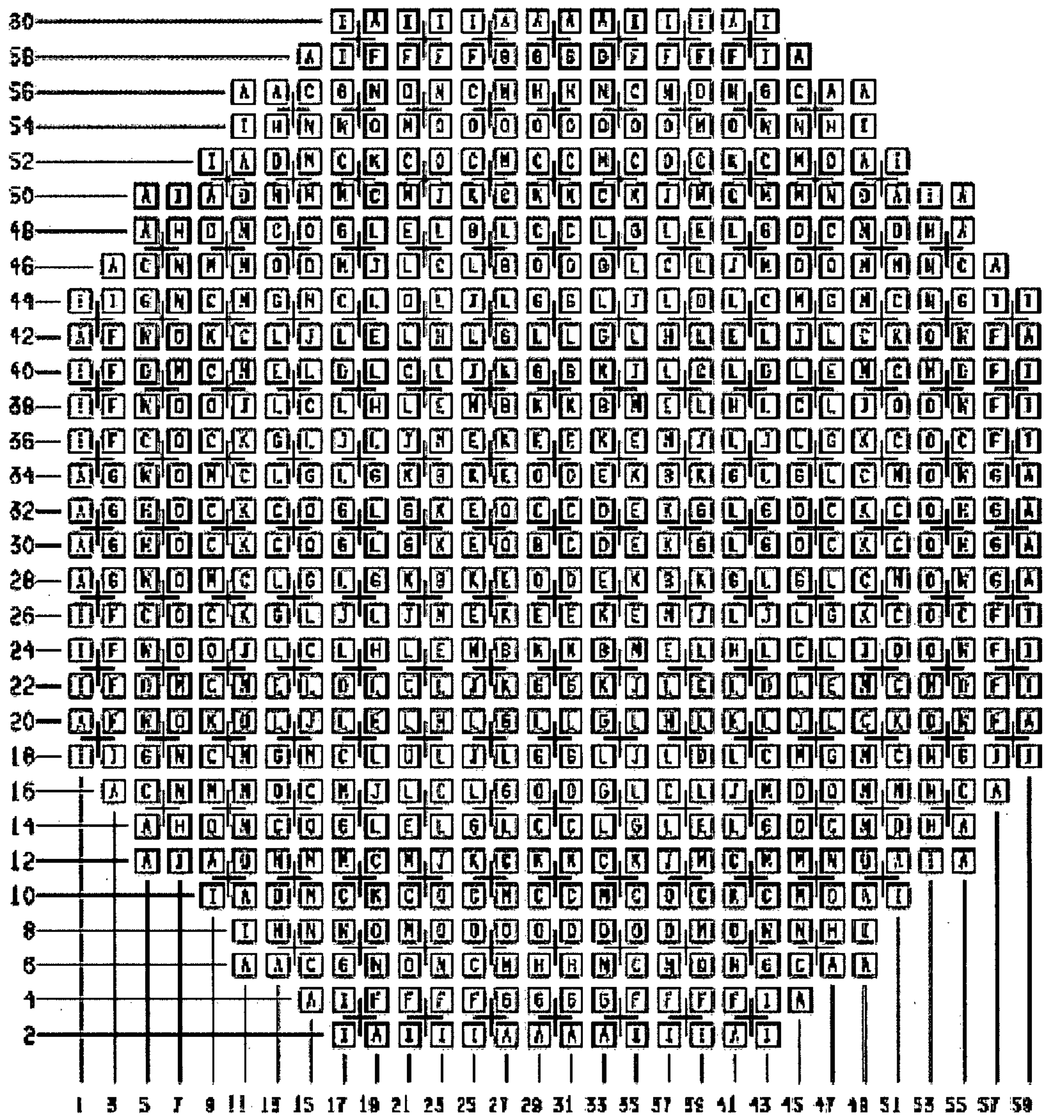
5. Letter, Jason S. Post (GENE) to U.S. Nuclear Regulatory Commission Document Control Desk with attention to Chief, Information Management Branch, et al. (NRC), "Part 21 Final Report: Non-Conservative SLMCPR", MFN 04-108, September 29, 2004.

6. Letter, Glen A. Watford (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with attention to Alan Wang (NRC), "NRC Technology Update – Proprietary Slides – July 31 – August 1, 2002", FLN-2002-015, October 31, 2002.

7. Letter, Jens G. Munthe Andersen (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with attention to Alan Wang (NRC), "GEXL Correlation for 10X10 Fuel", FLN-2003-005, May 31, 2003.

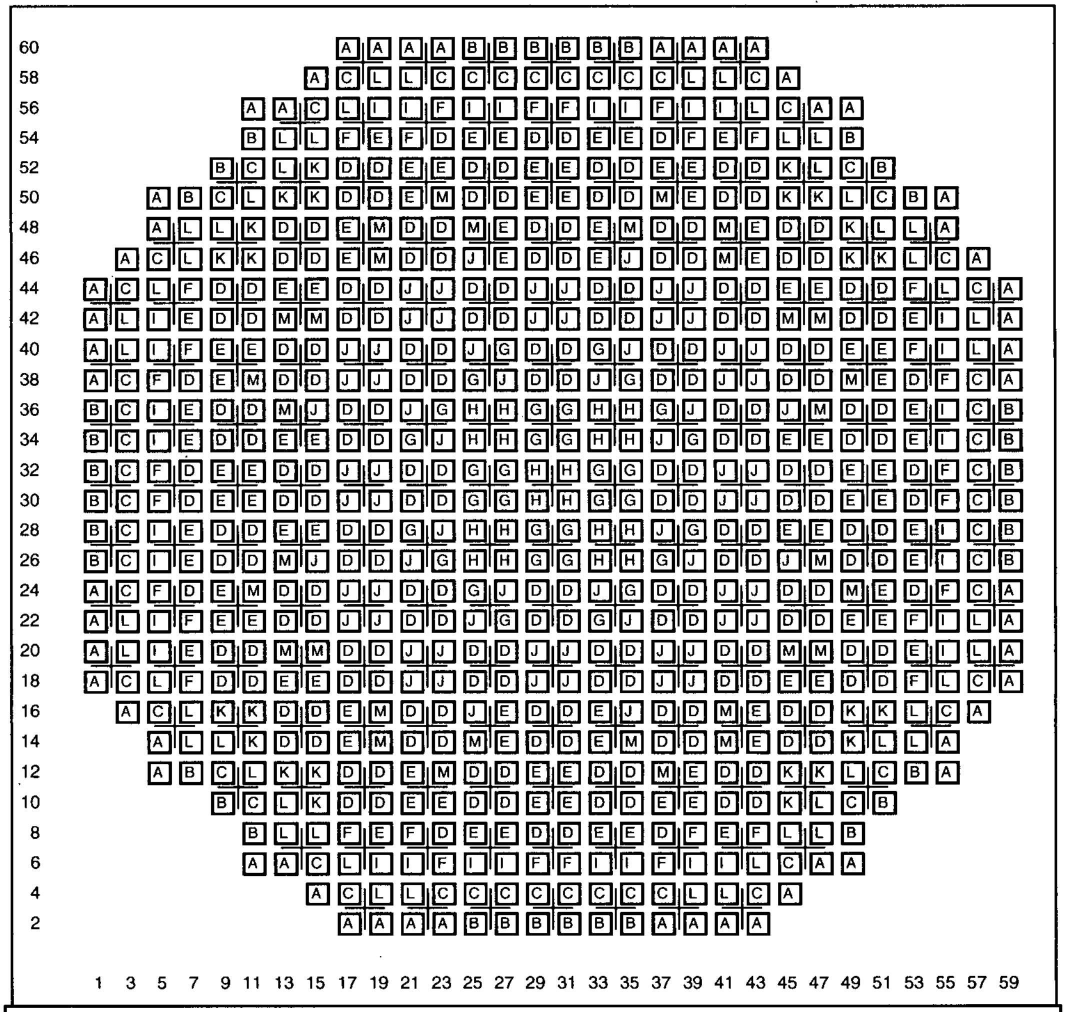
8. Letter, Andrew A. Lingenfelter (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with cc to MC Honcharik (NRC), "Removal of Penalty Being Applied to GE14 Critical Power Correlation for Outlet Peaked Axial Power Shapes", FLN-2007-031, September 18,2007.

Figure 1. Current Cycle Core Loading Diagram



A	56	GE13-P9DTB156-NOG-100T-146-T6-2887	I	52	GE13-P9DTB163-NOG-100T-146-T6-2888
B	9	GE14-P10DNAB157-NOG-100T-150-T6-2889	J	32	GE14-P10DNAB377-17GZ-100T-150-T6-2897
C	95	GE14-P10DNAB377-16GZ-100T-150-T6-2890	K	48	GE14-P10DNAB406-16GZ-100T-150-T6-3078
D	32	GE14-P10DNAB402-16GZ-100T-150-T6-2891	L	96	GE14-P10DNAB400-17GZ-100T-150-T6-3081
E	32	GE14-P10DNAB350-16GZ-100T-150-T6-2892	M	64	GE14-P10DNAB406-15GZ-100T-150-T6-3079
F	32	GE14-P10DNAB419-16GZ-100T-150-T6-2894	N	48	GE14-P10DNAB417-16GZ-100T-150-T6-3082
G	72	GE14-P10DNAB368-15GZ-100T-150-T6-2895	O	72	GE14-P10DNAB418-16GZ-100T-150-T6-3080
H	24	GE14-P10DNAB402-19GZ-100T-150-T6-2896			

Figure 2. Previous Cycle Core Loading Diagram



Code	Bundle Name	Number Loaded	Cycle Loaded
A	GE13-P9DTB391-13GZ-100T-146-T6-3964	56	BF213
B	GE14-P10DNAB200-3GZ-100T-150-T6-2609	36	BF213
C	GE13-P9DTB156-NOG-100T-146-T6-2887	56	7
D	GE14-P10DNAB157-NOG-100T-150-T6-2889	224	7
E	GE14-P10DNAB377-16GZ-100T-150-T6-2890	96	7
F	GE14-P10DNAB402-16GZ-100T-150-T6-2891	32	7
G	GE14-P10DNAB350-16GZ-100T-150-T6-2892	32	7
H	GE14-P10DNAB147-NOG-100T-150-T6-2893	20	7
I	GE14-P10DNAB419-16GZ-100T-150-T6-2894	32	7
J	GE14-P10DNAB368-15GZ-100T-150-T6-2895	72	7
K	GE14-P10DNAB402-19GZ-100T-150-T6-2896	24	7
L	GE13-P9DTB163-NOG-100T-146-T6-2888	52	7
M	GE14-P10DNAB377-17GZ-100T-150-T6-2897	32	7

[[

{3}]]

Figure 3. Figure 4.1 from NEDC-32601-P-A

[[

{3}]]

Figure 4. Figure III.5-1 from NEDC-32601P-A

[[

{3}]]

Figure 5. Figure III.5-2 from NEDC-32601P-A

Table 1. Description of Core

Description	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
Number of Bundles in the Core	764		764	
Limiting Cycle Exposure Point (i.e. BOC/MOC/EOC)	N/A	EOC	N/A	EOC
Cycle Exposure at Limiting Point (MWd/STU)	N/A	13000	N/A	16520
% Rated Core Flow	N/A	100%	N/A	100%
Reload Fuel Type	GE13/GE14		GE14	
Latest Reload Batch Fraction, %	88.0[1]		42.9	
Latest Reload Average Batch Weight % Enrichment	2.64		4.08	
Core Fuel Fraction: GE13 GE14	 21.5 78.5		 14.1 85.9	
Core Average Weight % Enrichment	2.70		3.59	

[1] Cycle 7 has all fresh bundles except for the 92 peripheral bundles which were reinserts from Browns Ferry 2.

Table 2. SLMCPR Calculation Methodologies

Description	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
Non-power Distribution Uncertainty	NEDC-32601P-A		NEDC-32601P-A	
Power Distribution Methodology	NEDC-32694P-A		NEDC-32694P-A	
Power Distribution Uncertainty	NEDC-32694P-A		NEDC-32694P-A	
Core Monitoring System	3DMonicore		3DMonicore	

Table 3. Monte Carlo Calculated SLMCPR vs. Estimate

Description	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
[[				

Table 3. Monte Carlo Calculated SLMCPR vs. Estimate

Description	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case

{3}]]

Table 4. Non-Power Distribution Uncertainties

	Nominal (NRC-Approved) Value ± σ (%)	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
GETAB					
Feedwater Flow Measurement	1.76	N/A	N/A	N/A	N/A
Feedwater Temperature Measurement	0.76	N/A	N/A	N/A	N/A
Reactor Pressure Measurement	0.50	N/A	N/A	N/A	N/A
Core Inlet Temperature Measurement	0.20	N/A	N/A	N/A	N/A
Total Core Flow Measurement	6.0 SLO/2.5 TLO	N/A	N/A	N/A	N/A
Channel Flow Area Variation	3.0	N/A	N/A	N/A	N/A
Friction Factor Multiplier	10.0	N/A	N/A	N/A	N/A
Channel Friction Factor Multiplier	5.0	N/A	N/A	N/A	N/A

Table 4. Non-Power Distribution Uncertainties

	Nominal (NRC-Approved) Value ± σ (%)	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
NEDC-32601-P-A					
Feedwater Flow Measurement	[[{3}]]	[[{3}]]	[[{3}]]	[[{3}]]	[[{3}]]
Feedwater Temperature Measurement	[[{3}]]	[[{3}]]	[[{3}]]	[[{3}]]	[[{3}]]
Reactor Pressure Measurement	[[{3}]]	[[{3}]]	[[{3}]]	[[{3}]]	[[{3}]]
Core Inlet Temperature Measurement	0.2	0.2	0.2	0.2	0.2
Total Core Flow Measurement	6.0 SLO/2.5 TLO	N/A	6.0 SLO/2.5 TLO	N/A	6.0 SLO/2.5 TLO
Channel Flow Area Variation	[[{3}]]	[[{3}]]	[[{3}]]	[[{3}]]	[[{3}]]
Friction Factor Multiplier	[[{3}]]	[[{3}]]	[[{3}]]	[[{3}]]	[[{3}]]
Channel Friction Factor Multiplier	5.0	N/A	5.0	N/A	5.0

Table 5. Power Distribution Uncertainties

Description	Nominal (NRC-Approved) Value ± σ (%)	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
GETAB/NEDC-32601-P-A					
GEXL R-Factor	[[{3}]]	N/A	N/A	N/A	N/A
Random Effective TIP Reading	2.85 SLO/1.2 TLO	N/A	N/A	N/A	N/A
Systematic Effective TIP Reading	8.6	N/A	N/A	N/A	N/A
NEDC-32694-P-A, 3DMONICORE					
GEXL R-Factor	[[{3}]]	N/A	[[{3}]]	N/A	[[{3}]]
Random Effective TIP Reading	2.85 SLO/1.2 TLO	N/A	2.85 SLO/1.2 TLO	N/A	2.85 SLO/1.2 TLO
TIP Integral	[[{3}]]	N/A	[[{3}]]	N/A	[[{3}]]
Four Bundle Power Distribution Surrounding TIP Location	[[{3}]]	N/A	[[{3}]]	N/A	[[{3}]]
Contribution to Bundle Power Uncertainty Due to LPRM Update	[[{3}]]	N/A	[[{3}]]	N/A	[[{3}]]

Table 5. Power Distribution Uncertainties

Description	Nominal (NRC-Approved) Value ± σ (%)	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
Contribution to Bundle Power Due to Failed TIP	[[{3}]]	N/A	[[{3}]]	N/A	[[{3}]]
Contribution to Bundle Power Due to Failed LPRM	[[{3}]]	N/A	[[{3}]]	N/A	[[{3}]]
Total Uncertainty in Calculated Bundle Power	[[{3}]]	N/A	[[{3}]]	N/A	[[{3}]]
Uncertainty of TIP Signal Nodal Uncertainty	[[{3}]]	N/A	[[{3}]]	N/A	[[{3}]]

Table 6. Critical Power Uncertainties

Description	Nominal Value ± σ (%)	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case

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{3}]]