TVA

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

November 1, 2001

TVA-BFN-TS-416

10 CFR 50.90
10 CFR 2.790

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

Gentlemen:

In the Matter of	)	Docket No. 50-296
Tennessee Valley Authority	)	

BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 3 - TECHNICAL SPECIFICATIONS (TS) CHANGE 416 - REVISED SAFETY LIMIT MINIMUM CRITICAL POWER RATIO (SLMCPR) (TAC NO. MB0436)

Reference: NRC Letter to TVA dated March 13, 2001, Browns Ferry Nuclear Plant, Unit 2 - Issuance of Amendment Regarding Safety Limit Minimum Critical Power Ratio (TAC NO. MB0436)

In accordance with the provisions of 10 CFR 50.90, TVA is submitting a request for an amendment (TS-416) to facility operating license DPR-68 to change the TS for BFN Unit 3. The proposed change revises the Reactor Core Safety Limit MCPR in TS Section 2.1.1.2 from 1.10 to 1.07 for two reactor recirculation loop operation and from 1.12 to 1.09 for single loop operation. The change is requested to support the Unit 3, Cycle 11 reload fuel cycle analysis which utilizes the Global Nuclear Fuels (GNF) licensing document, *General Electric Standard Application for Reactor Fuel*, GESTAR-II, Amendment 25, dated June 2000. GESTAR-II, Amendment 25 which has been approved by NRC, describes an improved methodology which results in a reduction in the SLMCPR while continuing to meet the fuel cycle design requirements of General Design Criterion 10 of Appendix A to 10 CFR 50. This change is similar to the amendment issued by NRC for Browns Ferry Unit 2 on March 13, 2001 (Reference). Use of the improved methodology allows the design of a more efficient and economic fuel cycle which TVA estimates will ultimately result in a cost savings of approximately $300,000 per reload fuel cycle.

D030

***** This letter contains proprietary information *****

TVA has determined that there are no significant hazards considerations associated with the proposed change and that the change is exempt from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9). The BFN Plant Operations Review Committee and the BFN Nuclear Safety Review Board have reviewed this proposed change and determined that operation of BFN Unit 3 in accordance with the proposed change will not endanger the health and safety of the public. 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.

Enclosure 1 to this letter provides the description and evaluation of the proposed change. This includes TVA's determination that the proposed change does not involve a significant hazards consideration, and is exempt from environmental review. Enclosures 2 and 3 contain a marked up and revised copy, respectively, of the applicable TS section reflecting the proposed change. A non-proprietary version of a letter report prepared by GNF in support of the proposed change is provided in Enclosure 4. Enclosure 5 provides a proprietary version of the same report. GNF has requested that the proprietary report be withheld from public disclosure pursuant to 10 CFR 2.790. Accordingly, an application and affidavit as required by 10 CFR 2.790(b)(1) is also contained in Enclosure 5.

TVA requests that the proposed TS change be issued by March 1, 2002, and that the revised TS be made effective within 30 days of NRC approval. This letter does not contain any new commitments. If you have any questions about this change, please telephone me at (256) 729-2636.

Sincerely,

T. E. Abney

T. E. Abney
Manager of Licensing
and Industry Affairs

Subscribed and sworn to before me
on this 1st day of November 2001.

Barbara A. Blanton
Notary Public

My Commission Expires 09/22/2002

Enclosures
cc: See page 3

Enclosures
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ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3

PROPOSED TECHNICAL SPECIFICATIONS (TS) CHANGE TS-416
DESCRIPTION AND EVALUATION OF THE PROPOSED CHANGE

I. DESCRIPTION OF THE PROPOSED CHANGE

The proposed change to Unit 3 TS section 2.1.1.2 revises the Reactor Core Safety Limit Minimum Critical Power Ratio (SLMCPR) to 1.07 and 1.09 for dual and single recirculation loop operation, respectively. The specific changes are described below. (Deleted and added text are indicated by ~~strikeouts~~ and ***bold italics***, respectively.)

The current Reactor Core Safety Limit, 2.1.1.2 on page 2.0-1 for Unit 3 is revised to read as follows:

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

MCPR shall be ≥ ~~1.10~~ ***1.07*** for two recirculation loop operation or ≥ ~~1.12~~ ***1.09*** for single loop operation.

II. REASON FOR THE PROPOSED CHANGE

The SLMCPR values for the current BFN Unit 3 fuel cycle are based upon the cycle-specific procedures and analytical methodologies referenced in Global Nuclear Fuels (GNF) licensing document, *General Electric Standard Application for Reactor Fuel (GESTAR-II)*, NEDE-24011-P-A, Revision 13 dated August 1996 and the US Supplement, NEDE-24011-P-A-US, dated August 1996. The reload analysis for the upcoming fuel cycle is based upon updated methodology and procedures which incorporate reduced power distribution uncertainties described in GESTAR-II, Revision 14 (Amendment 25) dated June 2000 and Licensing Topical Reports NEDC-32601P-A, "*Methodology and Uncertainties for Safety Limit MCPR Evaluations*" and NEDC-32694P-A, "*Power Distribution Uncertainties for Safety Limit MCPR Evaluation*" (References 1-3). Application of the updated methodology to the design of Unit 3, Cycle 11 results in a revised TS SLMCPR.

III. SAFETY ANALYSIS

Background

General Design Criterion 10 requires, and SLs ensure, that specified acceptable fuel design limits are not exceeded during steady state operation, normal operational transients, and abnormal operational transients.

The fuel cladding integrity SL is established such that no fuel damage is calculated to occur if the limit is not violated. Maintaining a MCPR greater than the limit specified in TS 2.1.1.2 represents a conservative margin relative to the conditions required to maintain fuel cladding integrity. The fuel cladding SL is defined with a margin to the conditions that would produce onset of transition boiling (i.e., MCPR = 1.00). These conditions represent a significant departure from the condition intended by design for planned operation. The MCPR fuel cladding integrity SL ensures that during normal operation and during abnormal operational transients, at least 99.9% of the fuel rods in the core would not experience transition boiling.

Methodology

The SLMCPR is being revised for BFN Unit 3 because of the core design for the upcoming Cycle 11 operations. The reactor core for Cycle 11 will utilize two GNF fuel bundle designs, containing fresh GE14 type fuel and previously irradiated GE13 type fuel. The current BFN Unit 3 cycle-specific SLMCPR evaluation methodology employs uncertainties associated with the GETAB (Reference 4) thermal analysis basis. In an effort to improve both the economic performance and operational flexibility (i.e., enhanced CPR margin), GNF has developed a revised methodology for applying fuel bundle power uncertainties. GESTAR-II provides the revised methodology for determining the cycle-specific MCPR safety limits. The latest version of GESTAR-II was used for determining the Unit 3, Cycle 11 SLMCPRs. Specifically, Amendment 25 of NEDE-24011-P-A-14, which describes the methodology for determining the SLMCPR, was incorporated in GESTAR-II as of June 2000. The NRC safety evaluation approving Amendment 25 is contained in a letter from the NRC to General Electric dated March 11, 1999 (Reference 5).

The SLMCPRs for Unit 3, Cycle 11 are 1.07 (two-loop operation) and 1.09 (single-loop operation) as shown on the marked up and revised page in Enclosures 2 and 3. Enclosures 4 and 5 contain non-proprietary and proprietary versions of a GNF letter report, "*Additional Information Regarding the Cycle Specific SLMCPR for BFN Unit 3, Cycle 11,*" which provides a results comparison of the cycle 11 analysis utilizing the updated methodology, Cycle 11 utilizing the GETAB methodology, and the previous fuel Cycle 10 GETAB results. These comparisons demonstrate that the differences between the revised methodology and previous GETAB methodology are expected and statistically consistent. This information is provided to address issues which have been raised by NRC during the review of similar amendments at other facilities.

Precedent exists for the requested change. A similar TS change referencing the NRC approved GESTAR-II, Amendment 25 methodology was issued by NRC for BFN, Unit 2 on March 13, 2001 (Reference 6).

Conclusion

The revised SLMCPR values in the proposed change to TS 2.1.1.2 have been determined using NRC approved methodologies. The SLMCPR analysis establishes revised SLMCPR values that will continue to satisfy the SLMCPR design basis; that during normal operation and during abnormal operational transients, at least 99.9% of the fuel rods in the core do not experience transition boiling. It is therefore concluded that the proposed changes are acceptable.

IV. NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

The proposed amendment would change the Browns Ferry, Unit 3 Technical Specification (TS) 2.1.1.2 to revise the Safety Limit Minimum Critical Power Ratio (SLMCPR) for the upcoming fuel cycle. The proposed change is supported by the cycle-specific reload analysis performed for Unit 3, Cycle 11 . The analysis utilizes the methodology described in Amendment Number 25 to NEDE-24011-P-A (GESTAR II) and Licensing Topical Reports NEDC-32601P-A, ``*Methodology and Uncertainties for Safety Limit MCPR Evaluations*" and NEDC-32694P-A, ``*Power Distribution Uncertainties for Safety Limit MCPR Evaluation*." This improved methodology, which has been approved by NRC, results in reduced power distribution uncertainties, allowing a reduction in the SLMCPR while continuing to meet the fuel cycle design requirements of General Design Criterion 10 of Appendix A to 10 CFR 50.

Basis for proposed no significant hazards consideration determination: As required by 10 CFR 50.91(a), TVA has provided its analysis of the issue of no significant hazards consideration, which is presented below:

A. **The proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated.**

The proposed amendment establishes revised SLMCPR values for two recirculation loop operation and for single recirculation loop operation. The probability of an evaluated accident is derived from the probabilities of the individual precursors to that accident. The proposed SLMCPRs 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 SLMCPRs have been performed 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.

B. **The proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.**

The proposed license amendment involves a revision of the SLMCPR for two recirculation loop operation and for single loop operation based on the results of an analysis of the Cycle 11 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.

C. **The proposed amendment does not involve a significant reduction in a margin of safety.**

The margin of safety as defined in the TS bases will remain the same. The new SLMCPRs are calculated using NRC-approved methods and procedures which are in accordance with the current fuel design and licensing criteria. The SLMCPRs remain high enough to ensure that greater than 99.9% 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 changes do not involve a reduction in the margin of safety.

IV. ENVIRONMENTAL IMPACT CONSIDERATION

The proposed amendment does not involve a significant hazards consideration, a significant change in the types of or significant increase in the amounts of any effluents that may be released offsite, or a significant increase in individual or cumulative occupational radiation exposure. Therefore, the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9), and pursuant to 10 CFR 51.22(b), an environmental assessment of the proposed amendment is not required.

ENCLOSURE 1 (continued)

REFERENCES

1. General Electric Standard Application for Reactor Fuel (GESTAR-II), NEDE-24011-P-A-14, Revision 13 dated June 2000 and the US Supplement, NEDE-24011-P-A-14-US, dated June 2000.
2. Methodology and Uncertainties for Safety Limit MCPR Evaluations, NEDC-32601P-A, August 1999.
3. Power Distribution Uncertainties for Safety Limit MCPR Evaluation, NEDC-32694P-A, August 1999.
4. General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation and Design Application, NEDO-10958-A, January 1977.
5. Letter from F. Akstulewicz (NRC) to G. A. Watford (GE) dated March 11, 1999, 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)
6. NRC Letter to TVA dated March 13, 2001, Browns Ferry Nuclear Plant, Unit 2 - Issuance of Amendment Regarding Safety Limit Minimum Critical Power Ratio (TAC NO. MB0436)

ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3

PROPOSED TECHNICAL SPECIFICATIONS (TS) CHANGE TS-416
MARKED-UP PAGE

I. AFFECTED PAGE LIST

Unit 3 - page 2.0-1

II. MARKED-UP PAGE

See attached.

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:

MCPR shall be ≥ ~~1.10~~ 1.07 for two recirculation loop operation or ≥ ~~1.12~~ 1.09 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 3

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3

PROPOSED TECHNICAL SPECIFICATIONS (TS) CHANGE TS-416
REVISED PAGE

I. AFFECTED PAGE LIST

Unit 3 - page 2.0-1

II. REVISED PAGE

See attached.

2.0 SAFETY LIMITS (SLs)

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ENCLOSURE 4

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3

Global Nuclear Fuels Report Letter Report

[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 Nos. 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 Browns Ferry Unit 3 Cycle 11 SLMCPR Value

Table 1 summarizes the relevant input parameters and results of the safety limit MCPR (SLMCPR) determination for the Browns Ferry Unit 3 Cycle 11 and Cycle 10 cores. Table 2 provides a more detailed presentation of the bases and results for the Cycle 11 and Cycle 10 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 Browns Ferry Unit 3 Cycle 11 and Cycle 10 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 10 column and the GETAB power distribution uncertainty column for Cycle 11 are both provided for comparison to the Cycle 11 reduced power distribution uncertainty column.

In general, the calculated safety limit is dominated by two key parameters: (1) flatness ofthe 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 Browns Ferry Unit 3 Cycle 11 bundles and the Cycle 10 bundles. Pin-by-pin power distributions are characterized in terms of R-factors using the NRC approved methodology[2]. For the Browns Ferry Unit 3 Cycle 11 limiting case analyzed at PHE, [[ ]] the Browns Ferry Unit 3 Cycle 11 bundles are flatter than the bundles used for the Cycle 10 SLMCPR analysis.

With a flatter core MCPR distribution in Cycle 10 than in Cycle 11, but a flatter bundle R-factor distribution in Cycle 11 relative to the Cycle 10 bundles, it would be expected that the Cycle 11 SLMCPR result would be equal to or slightly less than the Cycle 10 result. Table 1 shows that when using the same uncertainties both SLMCPR values are the same. Table 2, which shows these same values to greater precision, confirms that the Cycle 11 result is slightly less than the Cycle 10 value.

As indicated in Table 1, the NRC approved[1] reduced power distribution uncertainties have been assumed for the Browns Ferry Unit 3 Cycle 11 analyses. For the Cycle 10 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 0.03.

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 Browns Ferry Unit 3 Cycle 11 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 10. The revised bases to support the proposed Tech Spec change in safety limit for Cycle 11 are identified in column 3b of Table 2. The GETAB bases and values for Cycle 11 are provided for comparison purposes in column 3a. By comparing the values from columns 2 for Cycle 10 and column 3a for Cycle 11, one may see that the calculated SLMCPR for Cycle 11 is only very slightly lower [[ ]] than the value for Cycle 10 when using the same GETAB model and uncertainties for both calculations.

The revised model and reduced power distribution uncertainties affect the calculated SLMCPR for Browns Ferry Unit 3 Cycle 11 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 Browns Ferry Unit 3 Cycle 11 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 Browns Ferry Unit 3 Cycle 10 core/cycle has a flatter core MCPR distribution [[ ]] than what was used to perform the Cycle 11 SLMCPR evaluation; and the Browns Ferry Unit 3 Cycle 11 core/cycle has a flatter in-bundle power distributions [[ ]] than what was used to perform the Cycle 10 SLMCPR evaluation.

The calculated 1.07 Monte Carlo SLMCPR for Browns Ferry Unit 3 Cycle 11 is consistent with what one would expect [[ ]] the 1.07 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 1.07 for the Browns Ferry Unit 3 Cycle 11 core is appropriate. It is reasonable that this value is smaller than the 1.10 value calculated for the previous cycle.

For single loop operations (SLO) the calculated safety limit MCPR for the limiting case is 1.09 as determined by specific calculations for Browns Ferry Unit 3 Cycle 11.

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 Browns Ferry Unit 3 Cycle 10 and 11 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.

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Verified by:

J.E. Fawks, Jr.

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Global Nuclear Fuel - Americas

Table 1

Comparison of the Browns Ferry Unit 3 Cycle 11 and Cycle 10 SLMCPR

QUANTITY, DESCRIPTION	**Browns Ferry Unit 3 Cycle 10**	**Browns Ferry Unit 3 Cycle 11**	
Number of Bundles in Core	764	764	764
Limiting Cycle Exposure Point	PHE	PHE	PHE
Cycle Exposure at Limiting Point [MWd/STU]	9,000	10,500	10,500
Reload Fuel Type	GE13	GE14	GE14
Latest Reload Batch Fraction [%]	37.7%	37.2%	37.2%
Latest Reload Average Batch Weight % Enrichment	4.05%	4.02%	4.02%
Batch Fraction for GE14	0.0%	37.2%	37.2%
Batch Fraction for GE13	75.9%	62.8%	62.8%
Batch Fraction for GE11	24.1%	0.0%	0.0%
Core Average Weight % Enrichment	3.75%	3.98%	3.98%
Core MCPR (for limiting rod pattern)	1.29	1.36	1.36
[[			]]
[[			]]
[[			]]
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	**1.10**	**1.10**	**1.07**

Table 2

Browns Ferry Unit 3 Cycles 10 and 11 SLMCPR Results Assessment

1	2	3a	3b	4
Quantity	Cycle 10 GETAB Value	Cycle 11 GETAB Value	Cycle 11 Revised Bases	Impact on SLMCPR for Cycle 11 (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
Feedwater flow uncertainty	[[		]]	None
Reactor pressure uncertainty	[[		]]	None
Channel flow area uncertainty	[[		]]	None
Friction multiplier uncertainty	[[		]]	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	[[		]]	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	[[		]]	[[ ]]
3. Secondary Impact on SLMCPR because Reduced SLMCPR causes a Lower OLMCPR				
Target OLMCPR	1.29	1.36	1.36	None
[[			]]	None
[[			]]	None
[[			]]	None
				[[ ]]
Total Impact on Tech Spec SLMCPR and SLO SLMCPR				
Calculated SLMCPR	[[			]]
Calculated SLO SLMCPR	[[			]]
Tech Spec SLMCPR	1.10	[[ ]]	1.07	[[ ]]
Tech Spec SLO SLMCPR	1.11	[[ ]]	1.09	[[ ]]

Figure 1 Reference Core Loading Pattern – Cycle 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1									14	13	13	13	13	13	13	13	13	13	13	13	13	14									60
2			Bundle IAT					14	16	16	16	15	16	16	16	16	16	16	15	16	16	16	14								58
3						14	13	14	16	15	14	16	16	14	15	15	14	16	16	14	15	16	14	13	14						56
4						13	16	16	7	7	7	7	7	7	7	7	7	7	7	7	7	7	16	16	13						54
5					13	16	15	7	15	7	15	6	16	6	16	16	6	16	6	15	7	15	7	15	16	13					52
6			13	13	16	16	7	15	7	14	6	15	6	15	6	6	15	6	15	6	14	7	15	7	16	16	13	13			50
7			13	16	15	7	15	7	15	6	15	6	15	6	14	14	6	15	6	15	6	15	7	15	7	15	16	13			48
8		13	14	16	7	15	7	13	6	15	6	14	6	15	6	6	15	6	14	6	15	6	13	7	15	7	16	14	13		46
9	14	16	16	7	15	7	15	6	15	6	15	6	15	6	15	15	6	15	6	15	6	15	6	15	7	15	7	16	16	14	44
10	14	16	15	7	7	14	6	15	6	14	6	15	6	13	6	6	13	6	15	6	14	6	15	6	14	7	7	15	16	14	42
11	13	16	14	7	15	6	15	6	15	6	13	6	15	6	14	14	6	15	6	13	6	15	6	15	6	15	7	14	16	13	40
12	14	15	16	7	6	15	6	14	6	15	6	15	6	14	6	6	14	6	15	6	15	6	14	6	15	6	7	16	15	14	38
13	13	16	16	7	16	6	15	6	15	6	15	6	14	6	15	15	6	14	6	15	6	15	6	15	6	16	7	16	16	13	36
14	14	16	14	7	6	15	6	15	6	13	6	14	6	15	6	6	15	6	14	6	13	6	15	6	15	6	7	14	16	14	34
15	14	16	15	7	16	6	14	6	15	6	14	6	15	6	14	14	6	15	6	14	6	15	6	14	6	16	7	15	16	14	32
16	14	16	15	7	16	6	14	6	15	6	14	6	15	6	14	14	6	15	6	14	6	15	6	14	6	16	7	15	16	14	30
17	14	16	14	7	6	15	6	15	6	13	6	14	6	15	6	6	15	6	14	6	13	6	15	6	15	6	7	14	16	14	28
18	13	16	16	7	16	6	15	6	15	6	15	6	14	6	15	15	6	14	6	15	6	15	6	15	6	16	7	16	16	13	26
19	14	15	16	7	6	15	6	14	6	15	6	15	6	14	6	6	14	6	15	6	15	6	14	6	15	6	7	16	15	14	24
20	13	16	14	7	15	6	15	6	15	6	13	6	15	6	14	14	6	15	6	13	6	15	6	15	6	15	7	14	16	13	22
21	14	16	15	7	7	14	6	15	6	14	6	15	6	13	6	6	13	6	15	6	14	6	15	6	14	7	7	15	16	14	20
22	14	16	16	7	15	7	15	6	15	6	15	6	15	6	15	15	6	15	6	15	6	15	6	15	7	15	7	16	16	14	18
23		13	14	16	7	15	7	13	6	15	6	14	6	15	6	6	15	6	14	6	15	6	13	7	15	7	16	14	13		16
24			13	16	15	7	15	7	15	6	15	6	15	6	14	14	6	15	6	15	6	15	7	15	7	15	16	13			14
25			13	13	16	16	7	15	7	14	6	15	6	15	6	6	15	6	15	6	14	7	15	7	16	16	13	13			12
26					13	16	15	7	15	7	15	6	16	6	16	16	6	16	6	15	7	15	7	15	16	13					10
27						13	16	16	7	7	7	7	7	7	7	7	7	7	7	7	7	7	16	16	13						08
28						14	13	14	16	15	14	16	16	14	15	15	14	16	16	14	15	16	14	13	14						06
29								14	16	16	16	15	16	16	16	16	16	16	15	16	16	16	14								04
30									14	13	13	13	13	13	13	13	13	13	13	13	13	14									02
	01	03	05	07	09	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	

Bundle Name	IAT	# in Core	# Fresh	Cycle Loaded
GE13-P9DTB400-13GZ1-100T-146-T	6	192	192	10
GE13-P9DTB414-15GZ-100T-146-T	7	96	96	10
GE11-P9HUB323-5G5.0/4G4.0-100T-146-T	13	76	0	8
GE11-P9HUB323-8G4.0-100T-146-T	14	108	0	8
GE13-P9HTB372-11GZ-100T-146-T	15	176	0	9
GE13-P9HTB386-12GZ-100T-146-T	16	116	0	9
	Total	764	288	

Figure 2 Reference Core Loading Pattern – Cycle 11

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1									16	15	15	15	16	15	15	15	15	16	15	15	15	16									60
2			Bundle IAT					15	6	6	16	7	6	6	16	16	6	6	7	16	6	6	15								58
3						16	15	16	7	6	6	6	6	7	6	6	7	6	6	6	6	7	16	15	16						56
4						15	6	7	3	18	3	3	3	3	3	3	3	3	3	3	18	3	7	6	15						54
5					15	16	6	3	7	18	7	18	6	18	6	6	18	6	18	7	18	7	3	6	16	16					52
6			16	15	16	6	18	7	18	16	18	16	18	16	18	18	16	18	16	18	16	18	7	18	6	15	15	16			50
7			15	6	6	18	18	6	6	18	6	3	7	18	16	16	18	7	3	6	18	6	6	18	18	6	6	15			48
8		15	16	7	3	7	6	15	18	7	18	6	18	6	18	18	6	18	6	18	7	18	15	6	7	3	7	16	15		46
9	16	6	7	3	7	18	6	18	16	18	6	18	7	18	6	6	18	7	18	6	18	16	18	6	18	7	3	7	6	16	44
10	15	6	6	18	18	16	18	7	18	6	18	6	18	16	18	18	16	18	6	18	6	18	7	18	16	18	18	6	6	15	42
11	15	16	6	3	7	18	6	18	6	18	15	18	6	18	7	7	18	6	18	15	18	6	18	6	18	7	3	6	16	15	40
12	15	7	6	3	18	16	3	6	18	6	18	7	18	16	18	18	16	18	7	18	6	18	6	3	16	18	3	6	7	15	38
13	16	6	6	3	6	18	7	18	7	18	6	18	16	18	6	6	18	16	18	6	18	7	18	7	18	6	3	6	6	16	36
14	15	6	7	3	18	16	18	6	18	16	18	16	18	7	18	18	7	18	16	18	16	18	6	18	16	18	3	7	6	15	34
15	15	16	6	3	6	18	16	18	6	18	7	18	6	18	16	16	18	6	18	7	18	6	18	16	18	6	3	6	16	15	32
16	15	16	6	3	6	18	16	18	6	18	7	18	6	18	16	16	18	6	18	7	18	6	18	16	18	6	3	6	16	15	30
17	15	6	7	3	18	16	18	6	18	16	18	16	18	7	18	18	7	18	16	18	16	18	6	18	16	18	3	7	6	15	28
18	16	6	6	3	6	18	7	18	7	18	6	18	16	18	6	6	18	16	18	6	18	7	18	7	18	6	3	6	6	16	26
19	15	7	6	3	18	16	3	6	18	6	18	7	18	16	18	18	16	18	7	18	6	18	6	3	16	18	3	6	7	15	24
20	15	16	6	3	7	18	6	18	6	18	15	18	6	18	7	7	18	6	18	15	18	6	18	6	18	7	3	6	16	15	22
21	15	6	6	18	18	16	18	7	18	6	18	6	18	16	18	18	16	18	6	18	6	18	7	18	16	18	18	6	6	15	20
22	16	6	7	3	7	18	6	18	16	18	6	18	7	18	6	6	18	7	18	6	18	16	18	6	18	7	3	7	6	16	18
23		15	16	7	3	7	6	15	18	7	18	6	18	6	18	18	6	18	6	18	7	18	15	6	7	3	7	16	15		16
24			15	6	6	18	18	6	6	18	6	3	7	18	16	16	18	7	3	6	18	6	6	18	18	6	6	15			14
25			16	15	15	6	18	7	18	16	18	16	18	16	18	18	16	18	16	18	16	18	7	18	6	15	15	16			12
26					16	16	6	3	7	18	7	18	6	18	6	6	18	6	18	7	18	7	3	6	16	16					10
27						15	6	7	3	18	3	3	3	3	3	3	3	3	3	3	18	3	7	6	15						08
28						16	15	16	7	6	6	6	6	7	6	6	7	6	6	6	6	7	16	15	16						06
29								15	6	6	16	7	6	6	16	16	6	6	7	16	6	6	15								04
30									16	15	15	15	16	15	15	15	15	16	15	15	15	16									02
	01	03	05	07	09	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	

Bundle Name	IAT	# in Core	# Fresh	Cycle Loaded
GE14-P10DNAB401-14GZ-100T-150-T-2514	3	64	64	11
GE13-P9DTB400-13GZ1-100T-146-T	6	192	0	10
GE13-P9DTB414-15GZ-100T-146-T	7	96	0	10
GE13-P9HTB372-11GZ-100T-146-T	15	76	0	9
GE13-P9HTB386-12GZ-100T-146-T	16	116	0	9
GE14-P10DNAB402-15GZ-100T-150-T-2513	18	220	220	11
	Total	764	284	