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JAFP-10-0050
April 21, 2010

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

SUBJECT: Proposed Change to the James A. FitzPatrick Nuclear Power Plant's Technical Specification Concerning the Safety Limit Minimum Critical Power Ratio

James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
License No. DPR-59

REFERENCES:

1. GNF Additional Information Regarding the Requested Changes to the Technical Specifications SLMCPR, FitzPatrick Cycle 20, Proprietary Version, eDRF Section: 0000-0108-3692-R1, dated March 11, 2010

2. GNF Additional Information Regarding the Requested Changes to the Technical Specifications SLMCPR, FitzPatrick Cycle 20, Non-Proprietary Version, eDRF Section: 0000-0108-3692-R1, dated March 11, 2010

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, Entergy Nuclear Operations Inc. (ENO), hereby proposes to amend the James A. FitzPatrick Nuclear Power Plant (JAF) Facility Operating License (FOL), DPR-59, by incorporating the attached proposed change into the JAF Technical Specifications (TS). This proposed change provides revised values for the Safety Limit Minimum Critical Power Ratio (SLMCPR) for both single and dual recirculation loop operation.

Attachment 1 to this letter contains the Application for Amendment, the Determination of No Significant Hazards Consideration and the Environmental Impact Assessment. Attachment 2 provides the marked-up version of the current FOL and TS pages. Attachment 3 contains the re-typed FOL and TS pages. Attachment 4 is a summary of the technical bases for the SLMCPR values and is considered proprietary information by Global Nuclear Fuels – Americas, LLC (GNF). In accordance with 10 CFR 2.390(b)(1), an affidavit attesting to the proprietary nature of the enclosed information and requesting withholding from public disclosure is included with Attachment 4. Attachment 5 is the same GNF summary with the proprietary information removed, and is provided for public disclosure.

A001
NRR

JAF has reviewed the proposed Technical Specification change in accordance with 10 CFR 50.92 and concludes that the proposed change does not involve a significant hazards consideration.

JAF has evaluated the proposed amendment against the criteria of 10 CFR 51.22 for environmental considerations and believes that the proposed change is eligible for categorical exclusion from the requirements for an environmental review in accordance with 10 CFR 51.22(c)(9).

Regarding our proposed schedule for this amendment, we request your review and approval of the revised SLMCPR by September 7, 2010, with a 30-day implementation period, to coincide with start-up from our refueling outage.

This submittal contains no new regulatory commitments.

Questions concerning this amendment application may be addressed to Mr. Joseph Pechacek, Licensing Manager, at (315) 349-6766.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on the 21st day of April 2010.

Sincerely,

PTD

Pete Dietrich
Site Vice President - JAF

PD/JP/ed

Attachments:
1. Application for Amendment to Modify the Technical Specifications Requirements Concerning the Safety Limit Minimum Critical Power Ratio
2. Proposed Technical Specification Changes (on current marked-up page)
3. Proposed Technical Specification Changes (on typed final format page)
4. GNF Additional Information Regarding the Requested Changes to the Technical Specifications SLMCPR, FitzPatrick Cycle 20, eDRF Section: 0000-0108-3692-R1 (Proprietary Version with Affidavit)
5. GNF Additional Information Regarding the Requested Changes to the Technical Specifications SLMCPR, FitzPatrick Cycle 20, eDRF Section: 0000-0108-3692-R1 (Non-Proprietary Version)

cc: next page

cc:

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JAFP-10-0050

Attachment 1

Application for Amendment to Modify the Technical Specifications Requirements Concerning the Safety Limit Minimum Critical Power Ratio

(3 Pages)

Application for Amendment to Modify the Technical Specifications Requirements Concerning the Safety Limit Minimum Critical Power Ratio

Description of the Proposed Change

Pursuant to 10 CFR 50.90, Entergy Nuclear Operations Inc. (ENO), proposes to amend the James A. FitzPatrick Nuclear Power Plant (JAF) Technical Specifications (TS) Section 2.1.1.2, Safety Limit Minimum Critical Power Ratio (SLMCPR). The proposed changes to the Technical Specifications are as follows:

Page 2.0-1, Specification 2.1.1.2 – Replace the listed SLMCPR values of 1.07 for two recirculation loop operation (TLO) and 1.09 for single recirculation loop operation (SLO) with new values of 1.08 and 1.11, respectively.

Reason for the Proposed Change

The current SLMCPR value for SLO contained in the JAF Technical Specifications (1.09) is not applicable for the upcoming operating cycle due to core loading design and fuel type changes. Based upon the core loading and fuel design change, the cycle specific SLMCPR value was determined to be 1.10 for SLO.

The SLMCPR calculated cycle specific value for TLO would support continued use of the 1.07 value, in Cycle 20, however, it is likely that a similar amendment would be required for the next cycle of operation. Therefore, based on the calculated values and adding appropriate conservatisms for future core designs, ENO proposes revising the TLO value to 1.08 and the SLO value to 1.11.

Safety Assessment of Proposed Change

The purpose of the SLMCPR is to ensure that specified acceptable fuel design limits are not exceeded during steady state operation and analyzed transients. The fuel cladding is one of the physical barriers that separate the radioactive materials from the environment. The integrity of this cladding barrier is related to its relative freedom from perforations or cracking. Fuel cladding perforations can result from thermal stresses, which can occur from reactor operation significantly above design conditions. Since the parameters that result in fuel damage are not directly observable during reactor operation, the thermal and hydraulic conditions that result in the onset of transition boiling have been used to mark the beginning of the region in which fuel cladding damage could occur. Although it is recognized that the onset of transition boiling would not result in damage to the BWR fuel rod cladding, the critical power at which boiling transition is calculated to occur has been adopted as a convenient and conservative limit. However, the uncertainties in monitoring the core operating state and the procedures used to calculate the critical power result in an uncertainty in the value of the critical power. Therefore, the SLMCPR is defined as the critical power ratio in the limiting fuel assembly (with margin) for which more than 99.9% of the fuel rods in the core are expected to avoid boiling transition, considering the power distribution within the core and all uncertainties.

The revised SLMCPR for JAF was determined using cycle-specific fuel and core parameters, with NRC approved methodology, as discussed in Attachment 4 (GNF Additional Information Regarding the Requested Changes to the Technical Specification SLMCPR) and Attachment 5

Application for Amendment to Modify the Technical Specifications Requirements Concerning the Safety Limit Minimum Critical Power Ratio

(a non-proprietary version of GNF summary) and adding appropriate conservatism for future core reload. Analysis of the limiting Abnormal Operational Transients (AOT) provides the allowed operating conditions in terms of MCPR during the fuel cycle, such that if an event were to occur, the transient MCPR would not be less than the SLMCPR. The SLMCPR value for SLO is increased to account for increased core flow measurement uncertainties.

No plant hardware or operational changes are required with this proposed change.

Determination of No Significant Hazards Considerations

Pursuant to 10 CFR 50.92, JAF has reviewed the proposed change and concludes that the change does not involve a significant hazards consideration since the proposed change satisfies the criteria in 10 CFR 50.92(c). These criteria require that operation of the facility in accordance with the proposed amendment will not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated, (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety. The discussion below addresses each of these criteria and demonstrates that the proposed amendment does not constitute a significant hazard.

The proposed change does not involve a significant hazards consideration because:

1. <u>The operation of JAF in accordance with the proposed amendment will not involve a significant increase in the probability or consequences of an accident previously evaluated.</u>

   The basis of the Safety Limit Minimum Critical Power Ratio (SLMCPR) is to ensure no mechanistic fuel damage is calculated to occur if the limit is not violated. The new SLMCPR values preserve the existing margin to transition boiling and probability of fuel damage is not increased. The derivation of the revised SLMCPR for JAF, for incorporation into the Technical Specifications and its use to determine plant and cycle-specific thermal limits, has been performed using NRC approved methods. These plant-specific calculations are performed each operating cycle and, if necessary, will require future changes to these values based upon revised core designs. The revised SLMCPR values do not change the method of operating the plant and have no effect on the probability of an accident initiating event or transient.

   Based on the above, JAF has concluded that the proposed change will not result in a significant increase in the probability or consequences of an accident previously evaluated.

2. <u>The operation of JAF in accordance with the proposed amendment will not create the possibility of a new or different kind of accident from any accident previously evaluated.</u>

   The proposed changes result only from a specific analysis for the JAF core reload design. These changes do not involve any new or different methods for operating the facility. No new initiating events or transients will result from these changes.

Application for Amendment to Modify the Technical Specifications Requirements Concerning the Safety Limit Minimum Critical Power Ratio

Based on the above, JAF has concluded that the proposed change will not create the possibility of a new or different kind of accident from those previously evaluated.

3. The operation of JAF in accordance with the proposed amendment will not involve a significant reduction in a margin of safety.

   The new SLMCPR is calculated using NRC approved methods with plant and cycle specific parameters for the current core design. The SLMCPR value remains conservative enough to ensure that greater than 99.9% of all fuel rods in the core will avoid transition boiling if the limit is not violated, thereby preserving the fuel cladding integrity. The operating MCPR limit is set appropriately above the safety limit value to ensure adequate margin when the cycle specific transients are evaluated. Accordingly, the margin of safety is maintained with the revised values.

   As a result, JAF has determined that the proposed change will not result in a significant reduction in a margin of safety.

   On the basis of the above, JAF has determined that operation of the facility in accordance with the proposed change does not involve a significant hazards consideration as defined in 10 CFR 50.92(c), in that it: (1) does not involve a significant increase in the probability or consequences of an accident previously evaluated; (2) does not create the possibility of a new or different kind of accident from any accident previously evaluated; and (3) does not involve a significant reduction in a margin of safety.

ENVIRONMENTAL IMPACT

The proposed Technical Specification changes were reviewed against the criteria of 10 CFR 51.22 for environmental considerations. The proposed changes do not involve a significant hazards consideration, a significant increase in the amounts of effluents that may be released offsite, or a significant increase in individual or cumulative occupational radiation exposure. Based on the foregoing, Entergy concludes the proposed Technical Specifications meet the criteria in 10 CFR 51.22(c)(9) for a categorical exclusion from the requirements for an Environmental Impact Statement.

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Attachment 2

Proposed Technical Specification Changes
(on current marked-up page)

<u>Page</u>
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(4) ENO pursuant to the Act and 10 CFR Parts 30, 40, and 70 to receive, possess, and use, at any time, any byproduct, source and special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration; or associated with radioactive apparatus, components or tools..

(5) Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

ENO is authorized to operate the facility at steady state reactor core power levels not in excess of 2536 megawatts (thermal).

(2) Technical Specifications

The Technical Specifications contained in Appendix A , as revised through Amendment No. ~~295~~, are hereby incorporated in the renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

(3) Fire Protection

ENO shall implement and maintain in effect all provisions of the approved fire protections program as described in the Final Safety Analysis Report for the facility and as approved in the SER dated November 20, 1972; the SER Supplement No. 1 dated February 1, 1973; the SER Supplement No. 2 dated October 4, 1974; the SER dated August 1, 1979; the SER Supplement dated October 3, 1980; the SER Supplement dated February 13, 1981; the NRC Letter dated February 24, 1981; Technical Specification Amendments 34 (dated January 31, 1978), 80 (dated May 22, 1984), 134 (dated July 19, 1989), 135 (dated September 5, 1989), 142 (dated October 23, 1989), 164 (dated August 10, 1990), 176 (dated January 16, 1992), 177 (dated February 10, 1992), 186 (dated February 19, 1993), 190 (dated June 29, 1993), 191 (dated July 7, 1993), 206 (dated February 28, 1994) and 214 (dated June 27, 1994); and NRC Exemptions and associated safety evaluations dated April 26, 1983, July 1, 1983, January 11, 1985, April 30, 1986, September 15, 1986 and September 10, 1992 subject to the following provision:

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 ≥ ~~1.07~~ 1.08 for two recirculation loop operation or ≥ ~~1.09~~ 1.11 for single recirculation 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.

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Attachment 3

Proposed Technical Specification Changes
(on typed final format page)

Pages

FOL Page 3
TS Page 2.0-1

(4) ENO pursuant to the Act and 10 CFR Parts 30, 40, and 70 to receive, possess, and use, at any time, any byproduct, source and special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration; or associated with radioactive apparatus, components or tools..

(5) Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

ENO is authorized to operate the facility at steady state reactor core power levels not in excess of 2536 megawatts (thermal).

(2) Technical Specifications

The Technical Specifications contained in Appendix A , as revised through Amendment No. , are hereby incorporated in the renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

(3) Fire Protection

ENO shall implement and maintain in effect all provisions of the approved fire protections program as described in the Final Safety Analysis Report for the facility and as approved in the SER dated November 20, 1972; the SER Supplement No. 1 dated February 1, 1973; the SER Supplement No. 2 dated October 4, 1974; the SER dated August 1, 1979; the SER Supplement dated October 3, 1980; the SER Supplement dated February 13, 1981; the NRC Letter dated February 24, 1981; Technical Specification Amendments 34 (dated January 31, 1978), 80 (dated May 22, 1984), 134 (dated July 19, 1989), 135 (dated September 5, 1989), 142 (dated October 23, 1989), 164 (dated August 10, 1990), 176 (dated January 16, 1992), 177 (dated February 10, 1992), 186 (dated February 19, 1993), 190 (dated June 29, 1993), 191 (dated July 7, 1993), 206 (dated February 28, 1994) and 214 (dated June 27, 1994); and NRC Exemptions and associated safety evaluations dated April 26, 1983, July 1, 1983, January 11, 1985, April 30, 1986, September 15, 1986 and September 10, 1992 subject to the following provision:

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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 ≥ 1.08 for two recirculation loop operation or ≥ 1.11 for single recirculation 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.

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Attachment 5

GNF Additional Information Regarding the Requested Changes to the Technical Specifications SLMCPR, FitzPatrick Cycle 20, eDRF Section: 0000-0108-3692-R1

(Non-Proprietary Version)

(24 Pages)

3/11/2010

GNF-0000-0108-3692-R1-NP

eDRFSection: 0000-0108-3692-R1

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

FitzPatrick Cycle 20

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.

Important Notice Regarding Contents of this Report
Please Read Carefully

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1.0 Methodology

GNF performed the FitzPatrick Cycle 20 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 and the current cycle 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, penalties, 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 [[ ]] and the inherent variation in the Monte Carlo results [[ ]], the change in the FitzPatrick Cycle 20 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 [[ ]] 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 [[ ]] accounts for a channel bow uncertainty of up to [[ ]].

FitzPatrick has predicted control blade shadow corrosion-induced channel bow to the extent that an increase in the NRC-approved R-Factor uncertainty [[ ]] is deemed prudent to address its impact. Accounting for the control blade shadow corrosion-induced channel bow, the FitzPatrick Cycle 20 analysis shows an expected channel bow uncertainty of [[ ]], which is bounded by a GEXL R-Factor uncertainty of [[ ]]. Thus the use of a GEXL R-Factor uncertainty of [[ ]] adequately accounts for the expected control blade shadow corrosion-induced channel bow for FitzPatrick Cycle 20.

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.

For the TLO calculations performed at 79.8% core flow, the approved uncertainty values for the core flow rate (2.5%) and the random effective TIP reading (1.2%) are conservatively adjusted by dividing them by 79.8/100. The steps "σ CORE FLOW" and "σ TIP (INSTRUMENT)" in Figure 4.1 from NEDC-32601P-A, which has been provided for convenience in Figure 3 of this attachment) are affected by this deviation, respectively.

Historically, these values have been construed to be somewhat dependent on the core flow conditions as demonstrated by the fact that higher values have always been used when performing SLO calculations. It is for this reason that GNF determined that it is appropriate to consider an increase in these two uncertainties when the core flow is reduced. The amount of increase is determined in a conservative way. For both parameters it is assumed that the absolute uncertainty remains the same as the flow is decreased so that the percentage uncertainty increases inversely proportional to the change in core flow. This is conservative relative to the core flow uncertainty since the variability in the absolute flow is expected to decrease somewhat as the flow decreases. For the random effective TIP uncertainty, there is no reason to believe that the percentage uncertainty should increase as the core flow decreases for TLO. Nevertheless, this uncertainty is also increased as is done in the more extreme case for SLO primarily to preserve the historical precedent established by the SLO evaluation. Note that the TLO condition is different than the SLO condition because for TLO there is no expected tilting of the core radial power shape.

The treatment of the core flow and random effective TIP reading uncertainties is based on the assumption that the signal to noise ratio deteriorates as core flow is reduced. GNF believes this is conservative and may in the future provide justification that the original uncertainties (non-flow dependent) are adequately bounding.

The core flow and random TIP reading uncertainties used in the SLO minimum core flow SLMCPR analysis remain the same as in the rated core flow SLO SLMCPR analysis because these uncertainties (which are substantially larger than used in the TLO analysis) already account for the effects of operating at reduced core flow.

2.3. Departure from NRC-Approved Methodology

No departures from NRC-approved methodologies were used in the FitzPatrick Cycle 20 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:

[[

]]

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:

[[

]]

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 FitzPatrick Cycle 20 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, 3, and 9.

No new GNF fuel designs are being introduced in FitzPatrick Cycle 20; therefore, the NEDC-32505-P-A statement "...if new fuel is introduced, 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

For FitzPatrick Cycle 20, the minimum core flow SLMCPR calculation performed at 79.8% core flow and rated core power condition was limiting as compared to the rated core flow and rated core power condition. At low core flows, the search spaces for the limiting rod pattern and the nominal rod pattern are essentially the same. Additionally, the condition that MIP [[ ]], establishes a reasonably bounding limiting rod pattern. Hence, the rod patterns used to calculate the SLMCPR at 100 percent rated power / 79.8 percent rated flow 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 FitzPatrick Cycle 20. Consequently, the SLMCPR value calculated from the 79.8% core flow and rated core power condition limiting MCPR distribution reasonably bounds this mode of operation for FitzPatrick Cycle 20.

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 FitzPatrick Cycle 20.

2.8. Core Monitoring System

For FitzPatrick Cycle 20, the 3D Monicore 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 FitzPatrick Cycle 20, no additional SLMCPR licensing conditions are included in the analysis.

2.13. Summary

The requested changes to the Technical Specification SLMCPR values are 1.08 for TLO and 1.11 for SLO for FitzPatrick Cycle 20.

3.0 References

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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.

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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.

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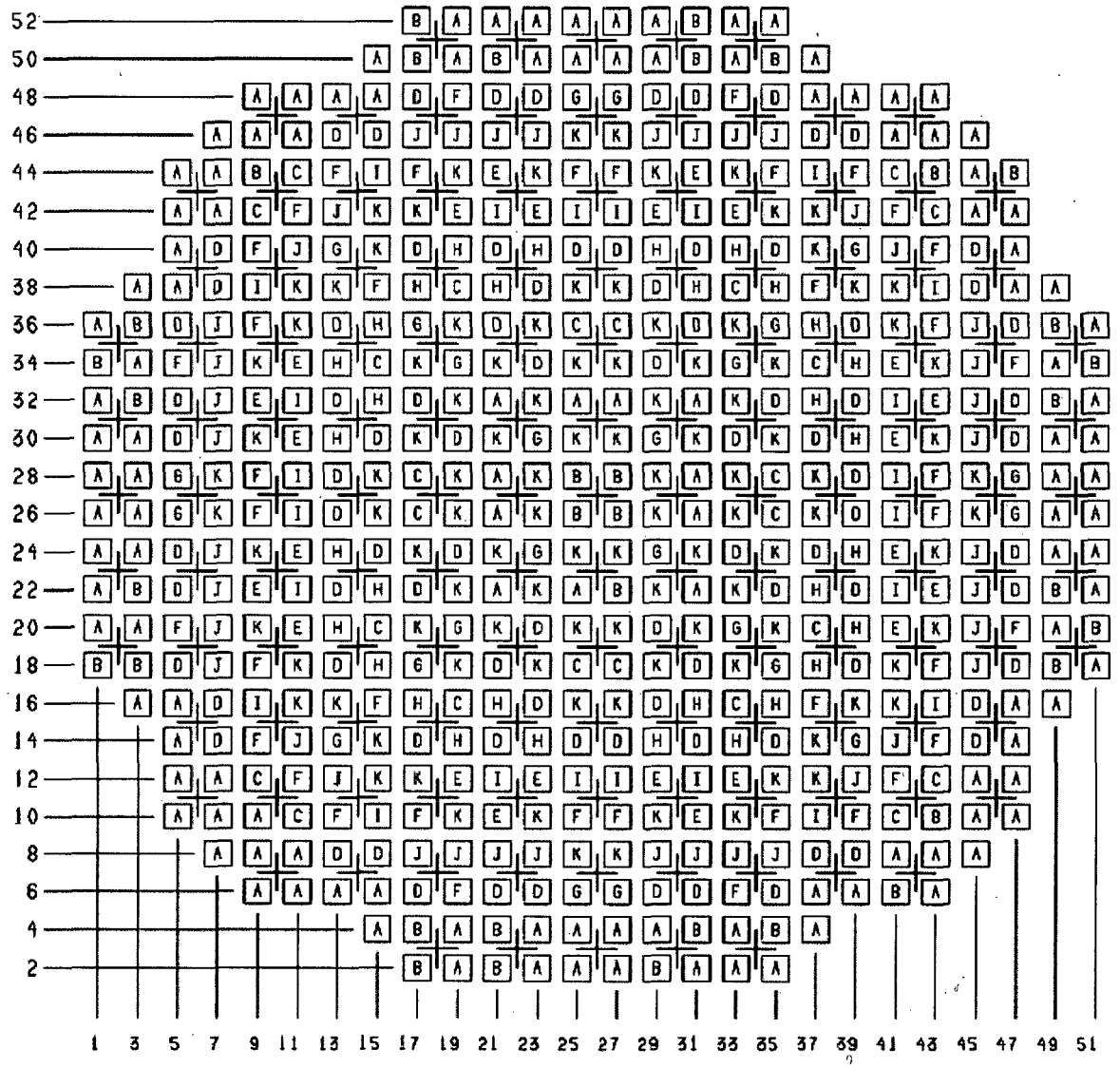
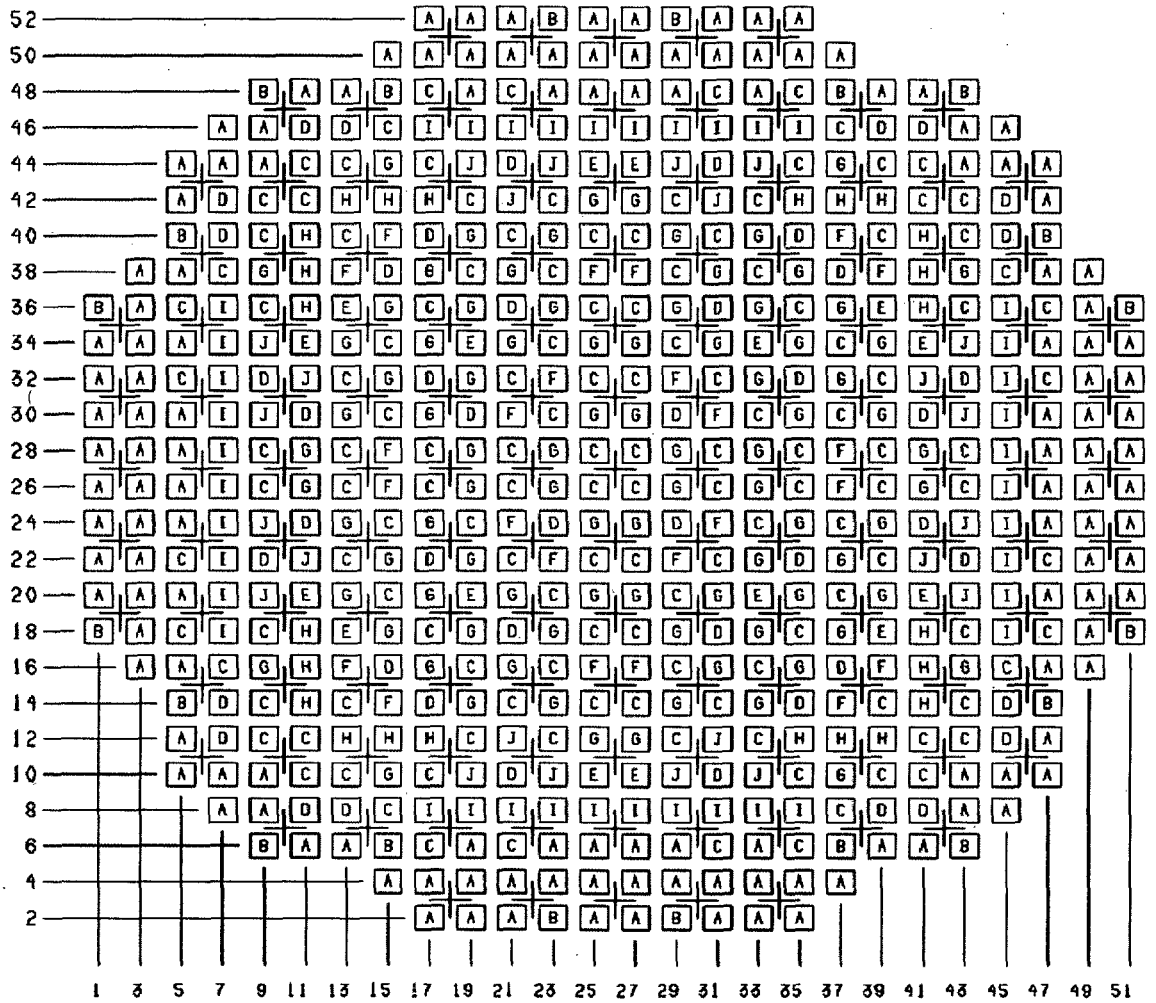
8. Letter, Andrew A. Lingenfelter (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with cc to MC Honcharik (NRC), "Removal of Penalty Being Applied to GE14 Critical Power Correlation for Outlet Peaked Axial Power Shapes", FLN-2007-031, September 18,2007.

9. Letter, Andrew A. Lingenfelter (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with cc to MC Honcharik (NRC), "GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II), NEDC-33270P, Revision 2, June 2009 and GEXL Correlation for GNF2 Fuel, NEDC-33292P, Revision 3, June 2009", MFN 09-436, June 30, 2009.



FUEL TYPE	
A = GE14-P10DNAB402-10G6.0/4G5.0/1G2.0-100T-150-T6-2905	G = GNF2-P10DG2B394-13GZ-100T2-150-T6-3077
B = GE14-P10DNAB405-16GZ-100T-150-T6-2906	H = GNF2-P10DG2B378-16GZ-100T2-150-T6-3299
C = GNF2-P10DG2B377-13GZ-100T2-150-T6-3073	I = GNF2-P10DG2B380-16GZ-100T2-150-T6-3298
D = GNF2-P10DG2B379-14GZ-100T2-150-T6-3074	J = GNF2-P10DG2B404-12GZ-100T2-150-T6-3297
E = GNF2-P10DG2B396-15GZ-100T2-150-T6-3075	K = GNF2-P10DG2B390-14GZ-100T2-150-T6-3300
F = GNF2-P10DG2B407-6G6.0/6G5.0-100T2-150-T6-3076	

Figure 1. Current Cycle Core Loading Diagram



FUEL TYPE	
A = GE14-P10DNAB405-16GZ-100T-150-T6-2794	F = GNF2-P10DG2B377-13GZ-100T2-150-T6-3073
B = GE14-P10DNAB405-15G6.0-100T-150-T6-2793	G = GNF2-P10DG2B379-14GZ-100T2-150-T6-3074
C = GE14-P10DNAB402-10G6.0/4G5.0/1G2.0-100T-150-T6-2905	H = GNF2-P10DG2B396-15GZ-100T2-150-T6-3075
D = GE14-P10DNAB405-16GZ-100T-150-T6-2906	I = GNF2-P10DG2B407-6G6.0/6G5.0-100T2-150-T6-3076
E = GE14-P10DNAB402-10G6.0/4G5.0/1G2.0-100T-150-T6-2905	J = GNF2-P10DG2B394-13GZ-100T2-150-T6-3077

Figure 2. Previous Cycle Core Loading Diagram

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

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

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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	560		560	
Limiting Cycle Exposure Point (i.e. BOC/MOC/EOC)	EOC	EOC	EOC	BOC (TLO) MOC (SLO)
Cycle Exposure at Limiting Point (MWd/STU)	13500	13500	12450	200
% Rated Core Flow	79.8	100.0	79.8	100.0
Reload Fuel Type	GNF2		GNF2	
Latest Reload Batch Fraction, %	35.7		35.7	
Latest Reload Average Batch Weight % Enrichment	3.88		3.90	
Core Fuel Fraction: GE14 GNF2	0.643 0.357		0.286 0.714	
Core Average Weight % Enrichment	3.98		3.93	

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-32601-P-A		NEDC-32601-P-A	
Power Distribution Methodology	NEDC-32601-P-A		NEDC-32601-P-A	
Power Distribution Uncertainty	NEDC-32694-P-A		NEDC-32694-P-A	
Core Monitoring System	3D Monicore		3D Monicore	

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

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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	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Feedwater Temperature Measurement	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Reactor Pressure Measurement	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Core Inlet Temperature Measurement	0.2	0.2	0.2	0.2	0.2
Total Core Flow Measurement	6.0 SLO/2.5 TLO	6.0 SLO/3.1 TLO	6.0 SLO/2.5 TLO	6.0 SLO/3.1 TLO	6.0 SLO/2.5 TLO
Channel Flow Area Variation	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Friction Factor Multiplier	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Channel Friction Factor Multiplier	5.0	5.0	5.0	5.0	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	[[ ]]	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	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Random Effective TIP Reading	2.85 SLO/1.2 TLO	2.85 SLO/1.5 TLO	2.85 SLO/1.2 TLO	2.85 SLO/1.5 TLO	2.85 SLO/1.2 TLO
TIP Integral	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Four Bundle Power Distribution Surrounding TIP Location	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Contribution to Bundle Power Uncertainty Due to LPRM Update	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]

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	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Contribution to Bundle Power Due to Failed LPRM	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Total Uncertainty in Calculated Bundle Power	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Uncertainty of TIP Signal Nodal Uncertainty	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]

Table 6. Critical Power Uncertainties

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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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