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JAFP-14-0103
August 21, 2014

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

Subject: Response to Request for Additional Information (RAI) Regarding Proposed Safety Limit Minimum Critical Power Ratio License Amendment (SLMCPR) (TAC No. MF4164)

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

References:

1. Entergy letter, Proposed Change to the James A. FitzPatrick Nuclear Power Plant's Technical Specification Concerning the SLMCPR, JAFP-14-0047, dated May 1, 2014
2. NRC letter, James A. FitzPatrick Nuclear Power Plant – Request for Additional Information Regarding Proposed SLMCPR License Amendment (TAC No. MF4164), dated July 25, 2014

By letter dated May 1, 2014 [Reference 1], Entergy Nuclear Operations Inc. (ENO) submitted a license amendment application to revise the SLMCPR for the James A. FitzPatrick Nuclear Power Plant (JAF). In processing the submittal, the Nuclear Regulatory Commission (NRC) determined that additional information was required to complete the review [Reference 2]. The specific questions provided to JAF in the NRC RAI are addressed in the attachments to this letter.

The attached response does not affect the No Significant Hazards Determination submitted with the proposed technical specification change dated May 1, 2014 [Reference 1].

There are no regulatory commitments in this submittal. Should you have any questions please contact Mr. Chris M. Adner at 315-349-6766.

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

Executed on the 21st day of August 2014.

Sincerely,

Lawrence M. Coyle
Site Vice President – JAF
LMC/CMA/ds

Attachments: 1. Response to Request for Additional Information
2. JAF Cycle 22 Core Inventory

cc: Regional Administrator, Region I
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JAFP-14-0103

ATTACHMENT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

(5 Pages)

Class I

August 13, 2014
GNF-PLM-001N8352-R0

GNF Response to Requests for Additional Information (RAIs) Regarding the Requested Changes to the Technical Specification SLMCPR

FitzPatrick Cycle 22

SRXB-RAI-1

Figure 5, Attachment 4 of the LAR indicates identical behavior relationship between the MCPR importance parameter (MIP) and critical power ratio (CPR) margin for GNF2 fuel and GE14 fuel. Explain the differences in the design and geometrical considerations between GNF2 and GE14 and explain the reason for this identical MCPR related behavior.

GNF Response

Because the SLMCPR calculation is performed on a core wide basis, the 10x10 (GE14, GNF2) points shown in Figure 5 reflect cores transitioning to GNF2 fuel, so they all have a mix of 10x10 fuel products. Thus, there are no specific GNF2 data points in Figure 5. In general, the MCPR behavior is largely driven by the fresh fuel.

SRXB-RAI-2

2-1) Explain the reload methodology and the loading schemes used for Cycles 21 and 22.

GNF Response

RELOAD METHODOLOGY:

The methods used to analyze the core loading pattern are in accordance with the methods and processes defined in GESTAR II. There is no change in approved core design or SLMCPR methodologies. This Technical Specification (TS) change based on the FitzPatrick Cycle 22 design was completed within approved methodologies. SLMCPR is not the primary driver in developing fuel cycle core designs. The energy plan, reactivity and thermal margins are the primary drivers.

SAFETY LIMIT METHODOLOGY:

The SLMCPR methodology uses set of random perturbations (Monte Carlo) in the calculation process to determine the cycle-specific SLMCPR. For each cycle, cycle-specific SLMCPR calculations are performed for the specific fuel bundle design and core loading used in the cycle reload design. The core radial power distribution must represent a reasonable bound on the number of fuel bundles at or near thermal limits, and the fuel assembly local power distribution must be based on the actual bundle design. The cycle-specific analysis is performed at multiple exposure points throughout the cycle and the most limiting calculated SLMCPR is compared to the TS value. In most cycles, the SLMCPR does not change to the extent that a request for a TS change is necessary. If the calculated cycle specific SLMCPR is bounded by the TS value then no TS change is required. A

reduction in the SLMCPR TS could be requested if the calculated value is lower than the existing TS. Although rarely used, there is also an approved provision to use an exposure-dependent SLMCPR.

LOADING SCHEMES:

The loading pattern is developed by GNF based on Entergy input. Among the inputs are:

- Batch size and cycle energy – fuel bundle design (nuclear) and loading patterns are developed together
- Thermal limit design margins
- Reactivity margins – Minimum shutdown margin, minimum and maximum hot excess reactivity
- Discharge exposure limitations and other limits as established by safety analysis
- Desired control rod patterns – sequences and durations
- Minimize channel bow - One of the measures undertaken in the last few cycles' designs is an effort to maximally reduce effective control blade exposure for fresh fuel. It resulted in FitzPatrick transition to later cores designed to operate with much lower control rod density and lower peak hot excess reactivity. This reload design approach was introduced starting with FitzPatrick Cycle 20 core.
- Minimize preconditioning limitations

The core designs for Cycles 22 and 21 are similar. Due to differences in the scheduled refueling outage durations, both cycles were designed to deliver different final energy. Cycle 22 has been specified to operate for 636 Effective Full Power Days (EFPD), while Cycle 21 designed energy was 657 EFPD.

2-2) For the initial core loadings of Cycles 21 and 22, specify the fuel type, number of fresh, once burned, twice and thrice burned fuel.

GNF Response

Both JAF Cycles 21 and 22 are uniformly loaded with GNF2 fuel design and only fresh, once burned, and twice burned fuel is loaded. FitzPatrick does not load thrice burned fuel starting with Cycle 14.

The average enrichment of Cycle 22 reload of 184 bundles is 3.879 wt% and the highest lattice enrichment is 4.54 wt%.

The average enrichment of Cycle 21 reload of 196 bundles is 3.891% and the highest lattice enrichment is 4.52 wt%.

Figures 1 and 2 of Attachment 4 of the LAR identify Cycles 22 and 21, respectively, specific fuel by reload, location, enrichment and number of gadolinia pins.

2-3) For Cycles 21 and 22 provide calculated beginning of cycle (BOC) core excess hot reactivity and the core average burnup at end of cycle (EOC).

GNF Response

Cycle 22 core excess hot reactivity at BOC is 1.71%dk (1.52%dk at 200 MWd/ST after samarium builds into the fresh fuel). Core average burnup at end-of-cycle rated conditions is 13,710 MWD/ST.
Cycle 21 core excess hot reactivity at BOC is 1.81%dk (1.60%dk at 200 MWd/ST). Core average burnup at end-of-cycle rated conditions was 13,827 MWD/ST.

<u>SRXB-RAI-3</u>

For Cycles 21 and 22, provide the expected maximum cell-averaged bow, the methodology used and the analysis that determined its value.

GNF Response

The core-average cell-averaged bow used for both Cycles 21 and 22 is -55 mils. The amount of bow is characterized as a function of batch average discharge exposure and fresh batch fraction. The bow is determined by a technical design procedure table lookup based on the given discharge exposure, batch fraction, lattice type (C/S or D) and loading pattern style (either 'conventional', or 'control cell core'[1]). The channel bow that is used in the calculations throughout the cycle is conservatively based upon end of cycle exposures.

<u>SRXB-RAI-4</u>

Table 3 of Attachment 4 of the LAR indicates that JAFP is affected by the off-rated flow condition as explained in the GNF SLMCPR Part 21 report dated August 24, 2004 (MFN 04-081).
Explain the reason for the change in the "estimated SLMCPR value" for Cycle 22 compared to the previous cycle where the MIPRIP correlation (combines the MIP and RIP (R-Factor Importance Parameter) values**)** and the Monte Carlo were used for the analysis (see Table 3 of Attachment 4.)

[1] Fitzpatrick is a 'D' lattice plant. Cycles 21 and 22 were both loaded using a 'conventional' pattern.

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GNF Response

MFN 04-081 concerned the discovery that the SLMCPR for JAFP and some other plants was more limiting when calculated at the condition of minimum licensed flow for rated power than at the rated flow / rated power condition. Following that discovery in 2004 it has been standard procedure for GNF to calculate the SLMCPR at the minimum flow / rated power condition in addition to the rated power / rated flow condition. Previously, SLMCPR was calculated only at the rated power / flow condition.

The reason for the change in the "estimated SLMCPR value" for Cycle 22 compared to the previous cycle is directly related to the different values of MIP and RIP for the two cycles. For example, for the rated flow case, the Cycle 22 MIPRIP is slightly less than that of Cycle 21. This is consistent with the slightly lower Cycle 22 estimated SLMCPR compared to that of Cycle 21. For the minimum core flow cases, the Cycle 22 MIPRIP is greater than that of Cycle 21. This is consistent with the greater Cycle 22 estimated SLMCPR compared to that of Cycle 21. Please note that the use of the MIPRIP empirical correlation is only a reasonableness check of the approved licensing basis Monte Carlo analysis.

In a conference call with NRC staff on July 24, 2014, an additional question relating to the aforementioned Part 21 report arose. The question is why the Single Loop Operation (SLO) SLMCPR is always greater than that of the Two Loop Operation (TLO). The reason is that two of the uncertainties applied in the analysis are considerably greater for SLO operation. These are the uncertainty for the core flow rate and for the random effective TIP reading. Otherwise, the SLO analysis is identical to the TLO analysis.

JAFP-14-0103

ATTACHMENT 2

JAF CYCLE 22 CORE INVENTORY

(1 Page)

JAF CYCLE 22 CORE INVENTORY (BEGINNING OF CYCLE)

CYCLES BURNED	NUMBER OF ASSEMBLIES
0	184
1	196
2	180
	TOTAL: 560