Proprietary Information Withhold from Public Disclosure Per 10 CFR 2.390

Entergy

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Pete Dietrich
Site Vice President - JAF

JAFP-10-0096
July 28, 2010

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

Subject: Response to Request for Additional Information Re: James A. FitzPatrick Nuclear Power Plant Proposed Change to the James A. FitzPatrick Nuclear Power Plant's Technical Specification Concerning the Safety Limit Minimum Critical Power Ratio (TAC No. ME3786)

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

References:

1. Entergy Letter, JAFP-10-0050, Proposed Change to the James A. FitzPatrick Nuclear Power Plant's Technical Specification Concerning the Safety Limit Minimum Critical Power Ratio (TAC No. ME3786), dated April 21, 2010.

2. NRC Request For Additional Information Regarding James A. FitzPatrick Nuclear Power Plant Proposed Change to the James A. FitzPatrick Nuclear Power Plant's Technical Specification Concerning the Safety Limit Minimum Critical Power Ratio (TAC No. ME3786), dated June 7, 2010

3. Revised NRC Request For Additional Information Regarding James A. FitzPatrick Nuclear Power Plant Proposed Change to the James A. FitzPatrick Nuclear Power Plant's Technical Specification Concerning the Safety Limit Minimum Critical Power Ratio (TAC No. ME3786), dated July 1, 2010

Dear Sir or Madam:

On April 21, 2010, Entergy Nuclear Operations, Inc. (ENO), submitted a proposed change to the James A. FitzPatrick Nuclear Power Plant (JAF) Technical Specification Safety Limit Minimum Critical Power Ratio (SLMCPR) [Reference 1]. On June 7, 2010, JAF received Request for Additional Information (RAI) from the Nuclear Regulatory Commission (NRC) staff [Reference 2]. On June 14, 2010, in a conference call with the NRC Staff it was determined that question 3 of the RAI required significant rewording.

Attachment 1 to this letter contains Proprietary Information which should be withheld from public disclosure per 10 CFR 2.390. When separated from Attachment 1 this letter is suitable for public disclosure.

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NRR

The revised question was provided to JAF on June 25, 2010. The revised question was discussed with the NRC Staff in a conference call on July 1, 2010. The NRC Staff agreed to an additional revision to question 3 and provided the revised question to JAF on July 1, 2010 [Reference 3].

Based on the clarifying discussions with the staff, ENO is submitting the attached response to the RAI questions [Attachment 1]. Attachment 1 contains Global Nuclear Fuels (GNF) proprietary information. An affidavit attesting to the proprietary nature of the information is included in Attachment 1. The proprietary information is enclosed by the double brackets [[ ]]. Attachment 2 provides the RAI responses with the proprietary information removed.

The attached response does not affect the No Significant Hazards Determination submitted with the proposed technical specification change, dated April 21, 2010.

There are no new commitments made in this letter.

Questions concerning this submittal 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 28th day of July 2010.

Sincerely,

Pete Dietrich
Site Vice President - JAF

PD/JP/ed

Attachments: 1. Response to Request for Additional Information Questions (Proprietary Version)
2. Response to Request for Additional Information Questions (Non-proprietary Version)

cc: (Next Page)

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Document contents: 001 Transmittal letter with attachments

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Attachment 2

Response to Request for Additional Information Questions

(Non-Proprietary Version)

(8 Pages)

Responses to Request for Additional Information Questions (Non-proprietary)

Question 1:

"Please provide the number of fuel assemblies for each fuel type in Figures 1 and 2 for Cycle 20 and Cycle 19. In addition, please provide the details to obtain a final core loading pattern as shown in Figure 1 including procedures, guidelines, criteria, and approved methodologies used for this analysis."

Response:

Number of fuel assemblies for each fuel type in Figure 1 of Attachment 4

Cycle 20 Core (Current Cycle)			
Fuel Type Name	Fuel Type	Cycle Loaded	# Bundles
GE14-P10DNAB405-16GZ-2906 (GE14C)	B	18	35
GE14-P10DNAB402-10G6.0/4G5.0/1G2.0-2905 (GE14C)	A	18	125
GNF2-P10DG2B394-13GZ-3077 (GNF2)	G	19	24
GNF2-P10DG2B407-6G6.0/6G5.0-3076 (GNF2)	F	19	40
GNF2-P10DG2B396-15GZ-3075 (GNF2)	E	19	24
GNF2-P10DG2B379-14GZ-3074 (GNF2)	D	19	88
GNF2-P10DG2B377-13GZ-3073 (GNF2)	C	19	24
GNF2-P10DG2B390-14GZ-3300 (GNF2)	K	20	104
GNF2-P10DG2B404-12GZ-3297 (GNF2)	J	20	40
GNF2-P10DG2B380-16GZ-3298 (GNF2)	I	20	24
GNF2-P10DG2B378-16GZ-3299 (GNF2)	H	20	32

Number of fuel assemblies for each fuel type in Figure 2 of Attachment 4

Cycle 19 Core (Previous Cycle)			
Fuel Type Name	Fuel Type	Cycle Loaded	# Bundles
GE14-P10DNAB405-16GZ-2794 (GE14C)	A	17	140
GE14-P10DNAB405-15G6.0-2793 (GE14C)	B	17	20
GE14-P10DNAB405-16GZ-2906 (GE14C)	D	18	48
GE14-P10DNAB402-10G6.0/4G5.0/1G2.0-2905 (GE14C)	C+E	18	152
GNF2-P10DG2B394-13GZ-3077 (GNF2)	J	19	24
GNF2-P10DG2B407-6G6.0/6G5.0-3076 (GNF2)	I	19	40
GNF2-P10DG2B396-15GZ-3075 (GNF2)	H	19	24
GNF2-P10DG2B379-14GZ-3074 (GNF2)	G	19	88
GNF2-P10DG2B377-13GZ-3073 (GNF2)	F	19	24

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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 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

Methods used analyze the core loading pattern are in accordance with GESTAR II. GESTAR II is the umbrella for all procedures, guidelines, criteria, and approved methodologies used for this analysis. There is no change in approved methodologies. This is a Tech. Spec. change within approved methodologies. SLMCPR is not the primary driver in developing fuel cycle core design. The energy plan, reactivity and thermal margins are the primary drivers.

The figure below represents a comparison of the Cycle 19 and 20 core loading patterns. Colors represent the number of cycles in the core, blue is 3rd cycle fuel, yellow is 2nd cycle and white is fresh fuel. The only significant difference in the two cores (as far as loading pattern) is use of 3rd cycle fuel in the Cycle 20 core center to reduce hot excess reactivity.

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SITE	1	3	5	7	9	11	13	15	17	19	21	23	25	
52	Current Cycle, refer to Figure 1 of Attachment 4								B	A	A	A	A	1
50								A	B	A	B	A	A	2
48					A	A	A	A	D	F	D	D	G	3
46				A	A	A	D	D	J	J	J	J	K	4
44			A	A	B	C	F	I	F	K	E	K	F	5
42			A	A	C	F	J	K	K	E	I	E	I	6
40			A	D	F	J	G	K	D	H	D	H	D	7
38		A	A	D	I	K	K	F	H	C	H	D	K	8
36	A	B	D	J	F	K	D	H	G	K	D	K	C	9
34	B	A	F	J	K	E	H	C	K	G	K	D	K	10
32	A	B	D	J	E	I	D	H	D	K	A	K	A	11
30	A	A	D	J	K	E	H	D	K	D	K	G	K	12
28	A	A	G	K	F	I	D	K	C	K	A	K	B	13
	1	2	3	4	5	6	7	8	9	10	11	12	13	GE
26	A	A	A	I	C	G	C	F	C	G	C	G	C	14
24	A	A	A	I	J	D	G	C	G	C	F	D	G	15
22	A	A	C	I	D	J	C	G	D	G	C	F	C	16
20	A	A	A	I	J	E	G	C	G	E	G	C	G	17
18	B	A	C	I	C	H	E	G	C	G	D	G	C	18
16		A	A	C	G	H	F	D	G	C	G	C	F	19
14			B	D	C	H	C	F	D	G	C	G	C	20
12			A	D	C	C	H	H	H	C	J	C	G	21
10			A	A	A	C	C	G	C	J	D	J	E	22
8				A	A	D	D	C	I	I	I	I	I	23
6					B	A	A	B	C	A	C	A	A	24
4	Previous Cycle, refer to Figure 2 of Attachment 4							A	A	A	A	A	A	25
2									A	A	A	B	A	26
SITE	1	3	5	7	9	11	13	15	17	19	21	23	25	

Responses to Request for Additional Information Questions (Non-proprietary)

Question 2:

"It appears that the current cycle for JAF is cycle 20. Please clarify that the proposed MCPR values for Cycle 20 are mainly for mid-cycle operation and not intended for the coming cycle 21 operation."

Response:

The current cycle for JAF is cycle 19. Entergy's request applies to operation in Cycle 20. The application was required because the Safety Limit analysis values for Cycle 20 are not bounded by the current Technical Specification MCPR Safety Limit. Specifically the Single Loop Operation (SLO) result at the limiting point, End Of Cycle (EOC), is not bounded by the Tech Spec SLMCPR. As stated in the original amendment request (Reference 1), "The SLMCPR calculated cycle specific value for Two Loop Operation (TLO) would support continued use of the 1.07 value, 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." The intent is to bound future cycles with a conservative and predicted Tech. Spec. value to eliminate a need for a Technical Specification submittal for subsequent reloads. Each subsequent cycle analysis will confirm this value or a Tech. Spec. revision will be requested.

The BOC, Middle of Cycle (MOC) and EOC are studied. The EOC minimum core flow case was limiting for TLO. MOC (7250 MWd/STU cycle exposure) was limiting for rated core flow SLO cases. However, the EOC minimum core flow SLO case was the cycle limiting SLO case. The value proposed bounds all other exposure points in Table 1.

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Question 3:

"GNF2 fuel deviates from traditional 10x10 design through the introduction of a new part length rod configuration, the use of higher linear power, and the use of mixing vanes. The staff considers this a new fuel design with regards to the four restrictions identified in the Safety Evaluation of GE Licensing Topical Reports NEDC-32601P, NEDC-32694 and Amendment 25 to NEDE-24011-P-A. Given that JAF Cycle 20 uses a core loading pattern which includes GNF2 fuel, please provide the following: (1) an evaluation of the four restrictions in NEDC-32601P, NEDC-32694 and Amendment 25 to NEDE-24011-P-A, (2) a description that explains under what conditions the methodologies listed in Section 1.0 of Attachment 4 are applied to the JAF Cycle 20 application, and (3) the reason why GNF2 has much higher critical Power uncertainty than that of GE14 as shown in Table 6 of Attachment 4."

Response:

(1): The four restrictions for GNF2 were determined acceptable by the NRC review of the "GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II), NEDC-33270P, Revision 0, FLN-2007-011, March 14, 2007." Specifically, in the NRC audit report ML081630579 for the said document, Section 3.4.1 page 59 states:

"The NRC staff's SE of NEDC-32694P-A (Reference 69 of NEDE 33270P) provides four actions to follow whenever a new fuel design is introduced. These four conditions are listed in Section 3.0 of the SE. The analysis and evaluation of the GNF2 fuel design was evaluated in accordance with the limitations and conditions stated in the NRC staff's SE, and is acceptable."

Additionally, the NRC audit report, ML081630579, Section 3.4.2.2.1 page 59 states:

"The NRC staff finds that the calculational methods, evaluations and applicability of the OLMCPR and SLMCPR are in accordance with existing NRC-approved methods and thus valid for use with the GNF2 fuel."

(2): There are 4 references listed in Section 1.0 of Attachment 4. The applicability of each of the four references is discussed. The four references are:

A. NEDC-32601P-A "Methodology and Uncertainties for Safety Limit MCPR Evaluations" (August 1999).

B. NEDC-32694P-A "Power Distribution Uncertainties for Safety Limit MCPR Evaluations" (August 1999).

C. NEDC-32505P-A "R-Factor Calculation Method for GE11, GE12 and GE13 Fuel" (Revision 1, July 1999).

D. NEDO-10958-A "General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation and Design Application" (January 1977).

References A and B are directly applicable to the analysis in Attachment 4, and Table 2 in

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Attachment 4 identifies them as the actual methodologies used for the SLMCPR calculations.

Reference C is the generic R-factor methodology report that describes the changed methodology that was adopted after part length rods were introduced. The NRC staff's SE for NEDC-32505P-A has a requirement that the applicability of the R-factor methodology is confirmed when a new fuel type is introduced. The confirmation for GNF2 was determined to be acceptable by the NRC staff review of the "GEXL17 Correlation for GNF2 Fuel, NEDC-33292P, Revision 0, FLN-2007-011, March 14, 2007" in the NRC audit report ML081630579, Section 3.5.5 page 62.

Reference D is not used for this specific analysis.

(3): It should be noted that correlation uncertainty, or standard deviation, for GEXL correlations tends to be in the range of [[ ]]. There is no definitive explanation for the higher uncertainty with GEXL17. While it is acknowledged that the GEXL17 standard deviation is slightly higher than that associated with GEXL14, the absolute magnitude remains typical and GEXL17 adequately predicts the onset of boiling transition for GNF2.

**Responses to Request for Additional Information Questions
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Question 4:

"Please provide: (1) an approximation of the correlation for MCPR Importance Parameter (MIP) and R-Factor Importance Parameter (RIP) including applicable fuel related coefficients and constants leading to the results of two-loop operation (TLO) SLMCPR estimate using the MIPRIP Correlation shown in Table 3, and (2) justification that the approximation is still applicable to GNF2 fuel considering there are no GNF2 data points in Figure 5."

Response:

(1): The correlation provides an estimate to check the reasonableness of the Monte Carlo result. It is not used for any other purpose. The methodology and final SLMCPR is based on the rigorous Monte Carlo analysis. The MIP formulation is provided in NEDC-32601P-A. RIP is similarly formulated, but is in terms of bundle R-Factor rather MCPR. A description of the correlation used for SLMCPR estimate using the MIPRIP correlation is provided below.

[[ ]]

(2): The 10x10 GE14 and GNF2 data points from several cases are added to Figure 5. Also updated are the lattice configurations (e.g. 8x8, 9x9, 10x10) of each fuel product line.

[[ ]]

Responses to Request for Additional Information Questions (Non-proprietary)

Question 5:

In Section 2.1 "Major Contributors to SLMCPR Changes," it states that "Table 3 presents estimated impacts on the TLO SLMCPR due to methodology deviations, penalties, and/or uncertainties deviations from approved values." Please provide: (1) calculation details and justification that the results listed in Table 3 are conservative related to "methodology deviations, penalties, and/or uncertainties deviations from approved values," and (2) justification that all affected factors including any fuel related Part 21 issues are included in Table 3.

Response:

(1): The intent of the correlation is to provide an estimate to check the reasonableness of the Monte Carlo result. It is not used for any other purpose. The methodology and final SLMCPR is based on the rigorous Monte Carlo analysis. The results are conservative because: (1) the uncertainties are increased relative to the approved methodology values, and (2) consequently, the SLMCPR estimate increases as the result of the increased uncertainties.

There are two items in Table 3 that result in the increase of the estimated SLMCPR: (1) R-factor, and (2) Core Flow Rate. These items are discussed below.

a) The R-Factor uncertainty increase is discussed in Section 2.2.1 of Attachment 4. It accounts for an increase in channel bow due to the 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. Reference 4 of Attachment 4 provides the technical justification for this increase.

b) The core flow rate uncertainty increase, and the associated random effective TIP reading uncertainty increase, is discussed in Section 2.2.2 of Attachment 4. The treatment of the core flow uncertainty is based on the assumption that the signal to noise ratio deteriorates as core flow is reduced. 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 as the flow decreases. The magnitudes of the estimated impacts were determined by generic Monte Carlo sensitivity studies to the respective uncertainties.

(2): GNF2 bent spacer wing related Part 21 issues are not included in Table 3. However, the effect of this on Fitzpatrick Cycle 20 has been assessed and it is less than a [[ ]] increase in the SLMCPR. The Technical Specification SLMCPR submitted in Attachment 4 remains unchanged for the bent wing Part 21 since there is margin between the GNF calculated values (1.073 in TLO and 1.096 in SLO) and the application values of 1.08 and 1.11 in TLO and SLO, respectively.