Entergy

ENTERGY NUCLEAR OPERATIONS, INC.
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
REPORT

CORE OPERATING LIMITS REPORT
REVISION 28

APPROVED BY: William Drews [signature] DATE: 9/30/14
REACTOR ENGINEERING SUPERVISOR

APPROVED BY: Brian Sullivan [signature] DATE: 10/1/2014
GENERAL MANAGER – PLANT OPERATIONS

REVISION RECORD

Revision	Cycle	Date	Description
28	22	Oct. 2014	COLR Rev. 28 is valid for Cycle 22 operation.

Summary of Changes		
Rev. 28	Effective upon final approval	Applicable for use during Cycle 22 Operation. Revision issued to update this document for FitzPatrick Reload 21 Cycle 22 cycle dependent data. GESTAR reference updated to the latest revision 20 (Ref. 3.7). Update to cycle specific references. Update for a reference with a latest revision for GNF2 GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II) Update for a reference with the final regulatory approval for PRIME implementation in downstream analysis codes. FWTR is permitted in Cycle 22 operation.Content of TABLE 8.4 defining MCPR Operating Limit for Final Feedwater Temperature Reduction is added. This revision record and summary added.
Rev. 27	Effective upon final approval	Cycle 21 exposure limit of 11,000 MWD/ST for operation placed in COLR Rev. 26 was removed with the TS Amendment approval of the modified TS definition of "Shutdown Margin" (SDM) to require calculation of the SDM at the reactor most reactive state throughout the operating cycle.

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1.0 PURPOSE

This report provides the cycle-specific operating limits for Cycle 22 of the James A. FitzPatrick Nuclear Power Plant. The following limits are addressed:

- Operating Limit Minimum Critical Power Ratio (MCPR)
- Flow Dependent MCPR Limits
- Average Planar Linear Heat Generation Rate (APLHGR)
- Linear Heat Generation Rate (LHGR)
- Flow-Biased Average Power Range Monitor (APRM) and Rod Block Monitor (RBM) Allowable Values
- Stability Option ID Exclusion Region

2.0 APPLICABILITY

The plant shall be operated within the limits specified in this report. If any of these limits are exceeded, the corrective actions specified in the Technical Specifications shall be taken.

3.0 REFERENCES

3.1 EN-LI-113, Licensing Basis Document Change process

3.2 JAFNPP Technical Specifications

3.3 EC45913, Cycle 22 Core Reload

3.4 EN-DC-503, 3D Monicore New Cycle Update and Databank Maintenance.

3.5 Plant Operation Up To 100% Power With One Steam Line Isolated, JAF-SE-96-035.

3.6 GE Report, J.A. FitzPatrick Nuclear Power Plant APRM/RBM/Technical Specifications/Maximum Extended Operating Domain (ARTS/MEOD), NEDC-33087P, Revision 1, September 2005

3.7 General Electric Standard Application for Reactor Fuel, NEDE-24011-P-A-20, May 2012; and the U.S. Supplement, NEDE-24011-P-A-20-US, December 2013.

3.8 GNF Report, Supplemental Reload Licensing Report for FitzPatrick Reload 21 Cycle 22, 001N8543-SRLR, Revision 0, Class I, August 2014. [EC 52654, ECH-NE-14-00034 R0]

3.9 "GNF2 Fuel Design Cycle-Independent Analyses for Entergy FitzPatrick", GE Report, GEH-0000-0074-2662-R1, June 2010. [EC23634, JAF-RPT-08-00013 R1]

3.10 Licensing Topical Report, ODYSY Application for Stability Licensing Calculations Including Option I-D and II Long Term Solutions, NEDE-33213P-A, April 2009

3.11 GE Letter, R. Kingston to P. Lemberg, Scram Time versus Notch Positions for Option B, REK-E: 02-009, May 28, 2002

3.12 GE Report, James A. FitzPatrick Nuclear Power Plant Final Feedwater Temperature Reduction NEDC-33077, September 2002.

3.13 JD-02-122, Final Feedwater Temperature Reduction Implementation.

3.14 KGO-ENO-JB1-13-085, NEDC-33270P, R5, GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II), May 2013

3.15 GNF Report, Fuel Bundle Information Report for FitzPatrick Reload 21 Cycle 22, 001N8544-FBIR, Revision 0, Class II, August 2014. [EC 52654, ECH-NE-14-00035 R0]

3.16 JF-03-00402, ARTS/MEOD Phase 1 Implementation

3.17 JAF-RPT-MISC-04489, Rev.7, Power-Flow Map Report

3.18 GE Hitachi, "Effect of Cycle Extension on the Reload Stability Analyses for Options I-D, II and III", 0000-0125-2402-R0, November 2010

3.19 KGO-ENO-JB1-13-062, Applicability of GE Methods to Expanded Operating Domains, NEDC-33173P-A R4, November 2012.

3.20 KGO-ENO-EP1-14-113, SL MCPR Summary Results for FitzPatrick Cycle 22, Sept.15, 14.

4.0 DEFINITIONS

4.1 Average Planar Linear Heat Generation Rate (APLHGR):

The APLHGR shall be applicable to a specific planar height and is equal to the sum of the heat generation rate per unit length of fuel rod for all the fuel rods in the specified assembly at the specified height divided by the number of fuel rods in the fuel assembly at the height.

4.2 Linear Heat Generation Rate (LHGR):

The LHGR shall be the heat generation rate per unit length of fuel rod. It is the integral of the heat flux over the heat transfer area associated with the unit length.

4.3 Minimum critical power ratio (MCPR):

The MCPR shall be the smallest critical power ratio (CPR) that exists in the core for each type of fuel. The CPR is that power in the assembly that is calculated by application of the appropriate correlation(s) to cause some point in the assembly to experience boiling transition, divided by the actual assembly operating power.

4.4 Rated Recirculation Flow :

That drive flow which produces a core flow of 77.0 x 10^6 lb/hr.

5.0 RESPONSIBILITIES

NOTE: See EN-LI-113 (Reference 3.1)

5.1 **Shift Manager:**

Assure that the reactor is operated within the limits described herein.

5.2 **Reactor Engineering Supervisor:**

Assure that the limits described herein are properly installed in the 3D-Monicore databank used for thermal limit surveillance (Reference 3.4)

6.0 SPECIAL INSTRUCTIONS/REQUIREMENTS

NONE

7.0 PROCEDURE

7.1 Operating Limit MCPR

During operation, with thermal power ≥ 25% of rated thermal power (RTP), the Operating Limit MCPR shall be equal to or greater than the limits given below.

7.1.1 Technical Specification LCO 3.2.2, Minimum Critical Power Ratio (MCPR)

7.1.2 The Operating Limit MCPR shall be determined based on the following requirement:

7.1.2.1 The average scram time to notch position 36 shall be:

$$\tau_{AVE} \leq \tau_B$$

7.1.2.2 The average scram time to notch position 36 is determined as follows:

$$\tau_{AVE} = \frac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i}$$

WHERE:

- n = Number of surveillance tests performed to date in the cycle,
- N_i = Number of active rods measured in the surveillance i
- τ_i = Average scram time to notch position 36 of all rods measured in surveillance test i.

7.1.2.3 The adjusted analysis mean scram time is calculated as follows:

$$\tau_B(\sec) = \mu + 1.65\sigma \left[\frac{N_1}{\sum_{i=1}^{n} N_i} \right]^{1/2}$$

WHERE:

μ = Mean of the distribution for the average scram insertion time to the dropout of notch position 36 = 0.830 sec.

σ = Standard deviation of the distribution for average scram insertion time to the dropout of notch position 36 = 0.019 sec.

N_1 = The total number of active rods measured in Technical Specification SR 3.1.4.4.

The number of rods to be scram tested and the test intervals are given in Technical Specification LCO 3.1.4, Control Rod Scram Times

7.1.3 When requirement of 7.1.2.1 is met, the Operating Limit MCPR shall not be less than that specified in Table 8.1, Table 8.2, Table 8.3, or Table 8.4 as applicable for $\tau = 0$.

7.1.4 **WHEN** the requirement 7.1.2.1 is not met (i.e. $\tau_{AVE} > \tau_B$), **THEN** the Operating Limit MCPR values (as a function of τ) are given in Tables 8.1, 8.2, 8.3, or 8.4 as applicable.

$$\tau = \frac{(\tau_{AVE} - \tau_B)}{(\tau_A - \tau_B)}$$

WHERE:

τ_{AVE} = The average scram time to notch position 36 as defined in 7.1.2.2.

τ_B = The adjusted analysis mean scram time as defined in 7.1.2.3.

τ_A = the scram time to notch position 36 as defined in Technical Specification Table 3.1.4-1.

7.1.5 During single-loop operation, the Operating Limit MCPR shall be increased by 0.03 for conditions given in Tables 8.2, 8.3, or 8.4. No single-loop operation adder of 0.03 is needed for single-loop operation conditions specified in Table 8.1.

7.1.6 The Operating Limit MCPR is the greater of the flow and power dependent MCPR operating limits, MCPR(F) and MCPR(P).

Operating Limit MCPR = MAX (MCPR(P), MCPR(F))

The flow dependent MCPR operating limit, MCPR(F), is provided in Figure 8.1.

For core thermal powers equal to or greater than 25%, MCPR (P) is the product of the rated Operating Limit MCPR presented in Tables 8.1, 8.2, 8.3, or 8.4 and the K (P) factor presented in Figure 8.2.

7.2 **Average Planar Linear Heat Generation Rate (APLHGR)**

7.2.1 Technical Specification LCO 3.2.1, Average Planar Linear Heat Generation Rate (APLHGR)

7.2.2 During operation, with thermal power $\geq$ 25% rated thermal power (RTP), the APLHGR shall be within the limits given in Table 8.5 for the appropriate fuel type.

7.2.3 During single loop operation, the APLHGR for each fuel type shall not exceed the values given in 7.2.2 above multiplied by the appropriate value (0.85 for GNF2 fuel, per Ref. 3.8).

7.3 **Linear Heat Generation Rate (LHGR)**

7.3.1 Technical Specification LCO 3.2.3, Linear Heat Generation Rate (LHGR)

7.3.2 During operation, with thermal power ≥ 25% rated thermal power (RTP), the applicable limiting LHGR values for each fuel rod as a function of axial location and exposure shall be the smaller of the power and flow dependent LHGR limits multiplied by the applicable power and flow adjustment or the LHGR limit multiplied by 0.85 (for GNF2) when in single loop operation.

LHGR limit = MIN (LHGR (P), LHGR (F)).

Power-dependent LHGR limit, LHGR (P), is the product of the LHGR power dependent LHGR limit adjustment factor, LHGRFAC (P), shown in Figure 8.4 and the $LHGR_{std}$ in Table 8.6.

$LHGR (P) = LHGRFAC(P) \times LHGR_{std}$

The flow-dependent LHGR limit, LHGR (F), is the product of the LHGR flow dependent LHGR limit adjustment factor, LHGRFAC (F), shown in Figure 8.3 and the $LHGR_{std}$ in Table 8.6.

$LHGR (F) = LHGRFAC(F) \times LHGR_{std}$

7.4 **APRM Allowable Values (Digital Flow Cards)**

7.4.1 **APRM Flow Referenced Flux Scram Allowable Value (Run Mode)**

7.4.1.1 Technical Specifications:
LCO 3.3.1.1, Reactor Protection System (RPS) Instrumentation

7.4.1.2 When operating in Mode 1, the APRM Neutron Flux-High (Flow Biased) Allowable Value shall be

for two loop operation:

S≤ (% RTP) = 0.38*W+61.0%	0< W ≤ 24.7%
S≤ (% RTP) = 1.15*W+42.0%	24.7< W ≤ 47.0%
S≤ (% RTP) = 0.63*W+73.7%	47.0< W ≤ 68.7%
S≤ (% RTP) = 117.00% (Clamp)	W > 68.7%

for single loop operation:

S≤ (% RTP) = 0.38*W+57.9%	0< W ≤ 32.7%
S≤ (% RTP) = 1.15*W+32.8%	32.7< W ≤ 50.1%
S≤ (% RTP) = 0.58*W+61.3%	50.1< W ≤ 95.9%
S≤ (% RTP) = 117.00% (Clamp)	W > 95.9%

WHERE:

S = Allowable value in percent of rated thermal power;

W = Recirculation flow in percent of rated;

7.4.2 APRM Neutron Flux-High (Flow Biased) Rod Block Allowable Value (Relocated to the Technical Requirements Manual)

7.5 **RBM Upscale Rod Block Allowable Value**

7.5.1 Technical Specification LCO 3.3.2.1, Control Rod Block Instrumentation

7.5.2 The RBM upscale rod block allowable value shall be:

$S \leq 0.66W + K$ for two loop operation;

$S \leq 0.66W + K - 0.66\,\Delta W$ for single loop operation;

WHERE:

S = rod block allowable value in percent of initial;

W = Loop flow in percent of rated

K = Any intercept value may be used because the RBM intercept value does not affect the MCPR Operating Limit and the RBM is not assumed to function to protect the Safety Limit MCPR.

ΔW = Difference between two loop and single loop effective drive flow at the same core flow.

NOTE: If K can be any value, then $K - 0.66\Delta W$ can also be any value, and the allowable value adjustment for single loop operation is not necessary.

7.6 **Stability Option 1-D Exclusion Region and Buffer Zone.**

7.6.1 Technical Specification LCO 3.4.1, Recirculation Loops Operating

7.6.2 The reactor shall not be intentionally operated within the Exclusion Region given in Figure 8.5 when the SOLOMON Code is operable.

7.6.3 The reactor shall not be intentionally operated within the Buffer Zone given in Figure 8.5 when the SOLOMON Code is inoperable.

8.0 TABLES AND FIGURES

8.1 Following pages present Tables 8.1 through 8.6, and Figures 8.1 through 8.6. Exact tables and figures names are listed in the Table of Content on page 3.

TABLE 8.1
MCPR Operating Limit For Incremental Cycle Core Average Exposure

		GNF2	
τ		BOC to MOC	MOC to EOC
= 0		1.43	1.49
>0.0	≤0.1	1.44	1.50
>0.1	≤0.2	1.45	1.51
>0.2	≤0.3	1.46	1.52
>0.3	≤0.4	1.47	1.53
>0.4	≤0.5	1.48	1.54
>0.5	≤0.6	1.49	1.55
>0.6	≤0.7	1.50	1.56
>0.7	≤0.8	1.51	1.57
>0.8	≤0.9	1.52	1.58
>0.9	≤1	1.53	1.59

Single Loop Operation ONLY

		GNF2	
τ		BOC to MOC	MOC to EOC
= 0		1.48	1.52
>0.0	≤0.1	1.48	1.53
>0.1	≤0.2	1.48	1.54
>0.2	≤0.3	1.49	1.55
>0.3	≤0.4	1.50	1.56
>0.4	≤0.5	1.51	1.57
>0.5	≤0.6	1.52	1.58
>0.6	≤0.7	1.53	1.59
>0.7	≤0.8	1.54	1.6
>0.8	≤0.9	1.55	1.61
>0.9	≤1	1.56	1.62

Technical Specification LCO 3.2.2, Minimum Critical Power Ratio (MCPR)

The MCPR limits in this Table are subject to Power and Flow dependent adjustment per Section 7.1.6

NOTE:

1. When entering a new Exposure Range, check the current value of τ to assure adjustment per Step 7.1.4
2. Applicable for any value of K, see Step 7.5.2

TABLE 8.2

MCPR Operating Limit for Incremental Cycle Core Average Exposure for Operation above 75% of Rated Thermal Power with Three Steam Lines in Service

		GNF2	
τ		BOC to MOC	MOC to EOC
= 0		1.45	1.51
>0.0	≤0.1	1.46	1.52
>0.1	≤0.2	1.47	1.53
>0.2	≤0.3	1.48	1.54
>0.3	≤0.4	1.49	1.55
>0.4	≤0.5	1.50	1.56
>0.5	≤0.6	1.51	1.57
>0.6	≤0.7	1.52	1.58
>0.7	≤0.8	1.53	1.59
>0.8	≤0.9	1.54	1.60
>0.9	≤1	1.55	1.61

Technical Specification LCO 3.2.2, Minimum Critical Power Ratio (MCPR)

For single loop operation, these limits shall be increased as given in Section 7.1.5.

The MCPR limits in this Table are subject to Power and Flow dependent adjustment per Section 7.1.6

NOTE: **1.** When entering a new Exposure Range, check the current value of τ to assure adjustment per Step 7.1.4

2. Applicable for any value of K, see Step 7.5.2

TABLE 8.3
MCPR Operating Limit for Operation with Turbine Bypass Valves Out of Service

τ		GNF2 BOC to EOC
= 0		1.54
>0.0	≤0.1	1.55
>0.1	≤0.2	1.56
>0.2	≤0.3	1.57
>0.3	≤0.4	1.58
>0.4	≤0.5	1.59
>0.5	≤0.6	1.60
>0.6	≤0.7	1.61
>0.7	≤0.8	1.62
>0.8	≤0.9	1.63
>0.9	≤1	1.64

Technical Specification LCO 3.2.2, Minimum Critical Power Ratio (MCPR)

Technical Specification LCO 3.7.6, Main Turbine Bypass System

For single loop operation, these limits shall be increased as given in Section 7.1.5.

The MCPR limits in this Table are subject to Power and Flow dependent adjustment per Section 7.1.6

NOTE: 1. When entering a new Exposure Range, check the current value of τ to assure adjustment per Step 7.1.4

2. Applicable for any value of K, see Step 7.5.2

TABLE 8.4
MCPR Operating Limit for Operation with Final Feedwater Temperature Reduction

		GNF2
τ		BOC to EOC
= 0		1.48
>0.0	≤0.1	1.49
>0.1	≤0.2	1.50
>0.2	≤0.3	1.51
>0.3	≤0.4	1.52
>0.4	≤0.5	1.53
>0.5	≤0.6	1.54
>0.6	≤0.7	1.55
>0.7	≤0.8	1.56
>0.8	≤0.9	1.57
>0.9	≤1	1.58

Technical Specification LCO 3.2.2, Minimum Critical Power Ratio (MCPR)

For single loop operation, these limits shall be increased as given in Section 7.1.5.

The MCPR limits in this Table are subject to Power and Flow dependent adjustment per Section 7.1.6

NOTE: 1. When entering a new Exposure Range, check the current value of τ to assure adjustment per Step 7.1.4

2. Applicable for any value of K, see Step 7.5.2

MCPR Operating Limits in this table apply when at reduced feedwater temperature near end-of-cycle, see JD-02-122 (Reference 3.13) for further information. Not applicable for operation with Turbine Bypass Valves Out of Service.

TABLE 8.5
Exposure Dependent APLHGR Limits

GNF2 Fuel Types

Average Planar Exposure	APLHGR Limit
GWd/ST	kW/ft
0.00	13.78
13.24	13.78
17.52	13.78
60.78	7.50
63.50	6.69

Technical Specification LCO 3.2.1, Average Planar Linear Heat Generation Rate (APLHGR)

For single loop operation these APLHGR values shall be multiplied by 0.85 for GNF2 fuel.

Linearly interpolate for APLHGR at intermediate exposure.

TABLE 8.6
Maximum LHGR

Maximum LHGR – GNF2

Peak Pellet Exposure, GWD/ST	UO_2 LHGR Limit, kW/ft
[[	
	]]

Peak Pellet Exposure, GWd/ST	Most Limiting Gadolinia LHGR Limit, kW/ft
[[	
	]]

Technical Specification LCO 3.2.3, Linear Heat Generation Rate (LHGR)

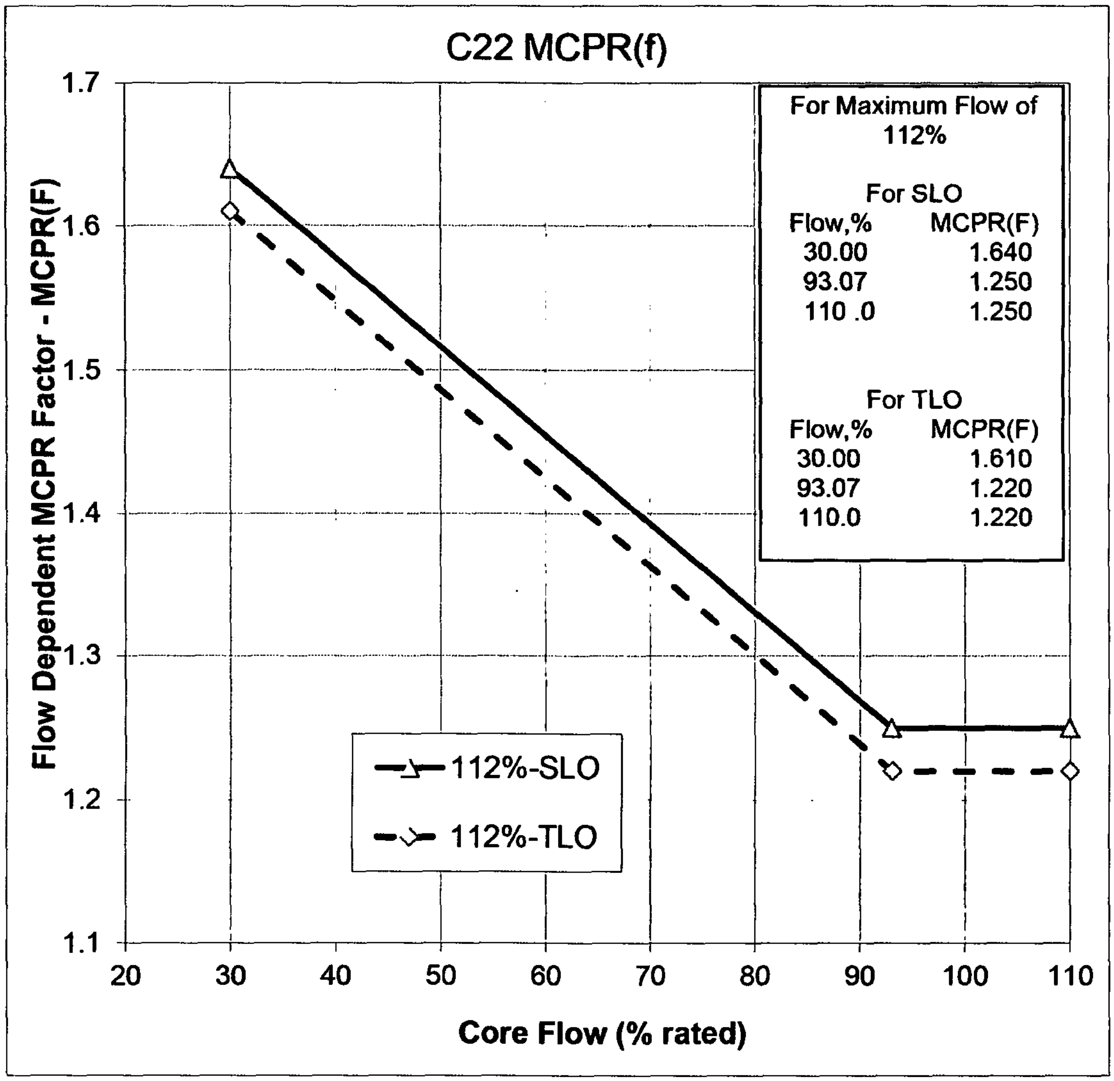
Design features of the fuel assemblies in the Cycle 22 core are provided in References 3.3, 3.14, and 3.15.

$LHGR_{std}$ values in the above Table 8.6 are subject to Power and Flow dependent adjustments per Section 7.3

For single loop operation these LHGR values shall be multiplied by 0.85 (for GNF2 fuel)

Linearly interpolate for LHGR at intermediate exposure

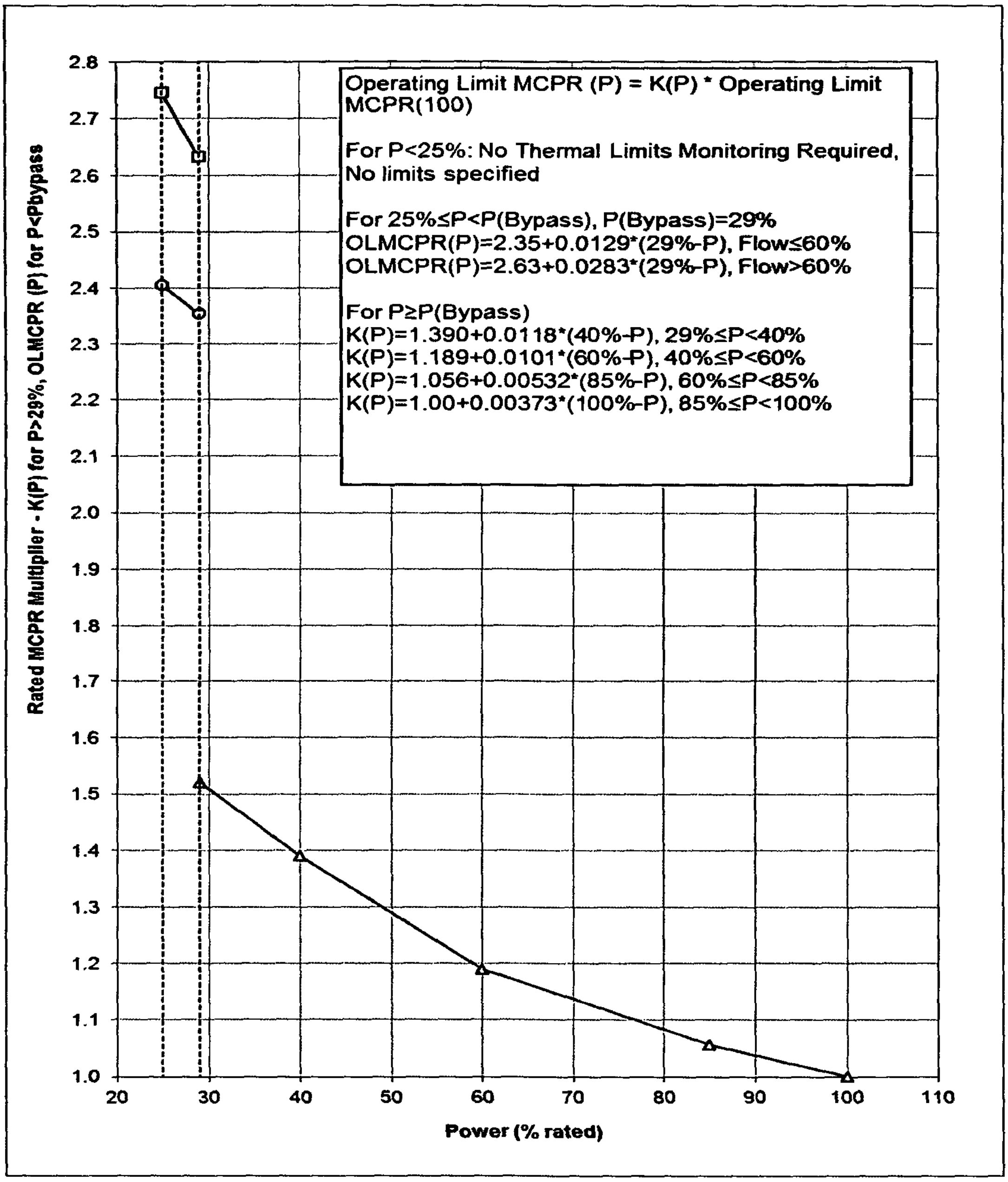
Figure 8.1
MCPR(F) Factor



Technical Specification LCO 3.2.2, Minimum Critical Power Ratio (MCPR)

Reference 3.8

Figure 8.2
K(P), OLMCPR(P) Factor

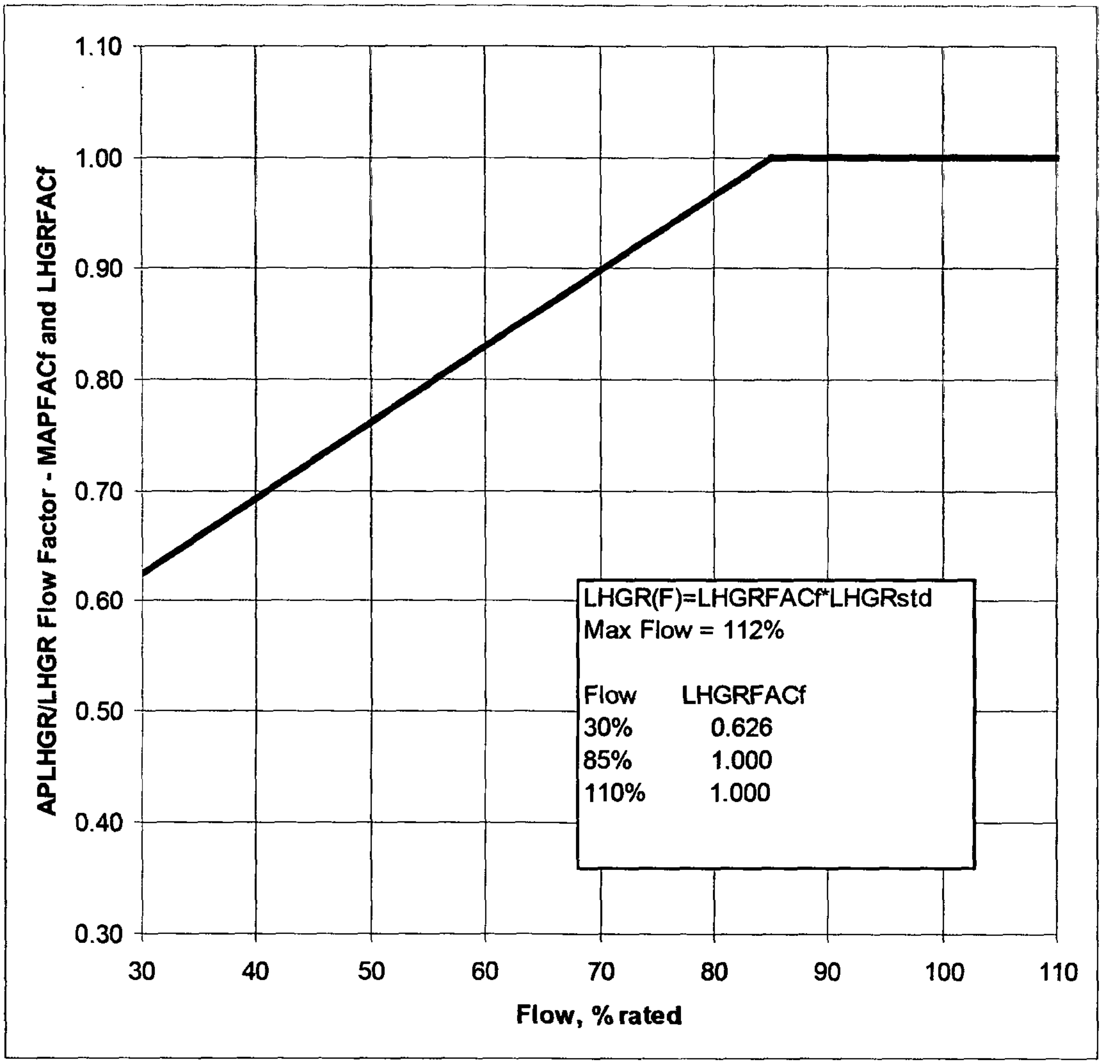


See Table 8.1, 8.2, 8.3,and Table 8.4 for Operating Limit MCPR(100)

Technical Specification LCO 3.2.2, Minimum Critical Power Ratio (MCPR)

Reference 3.8, 3.9

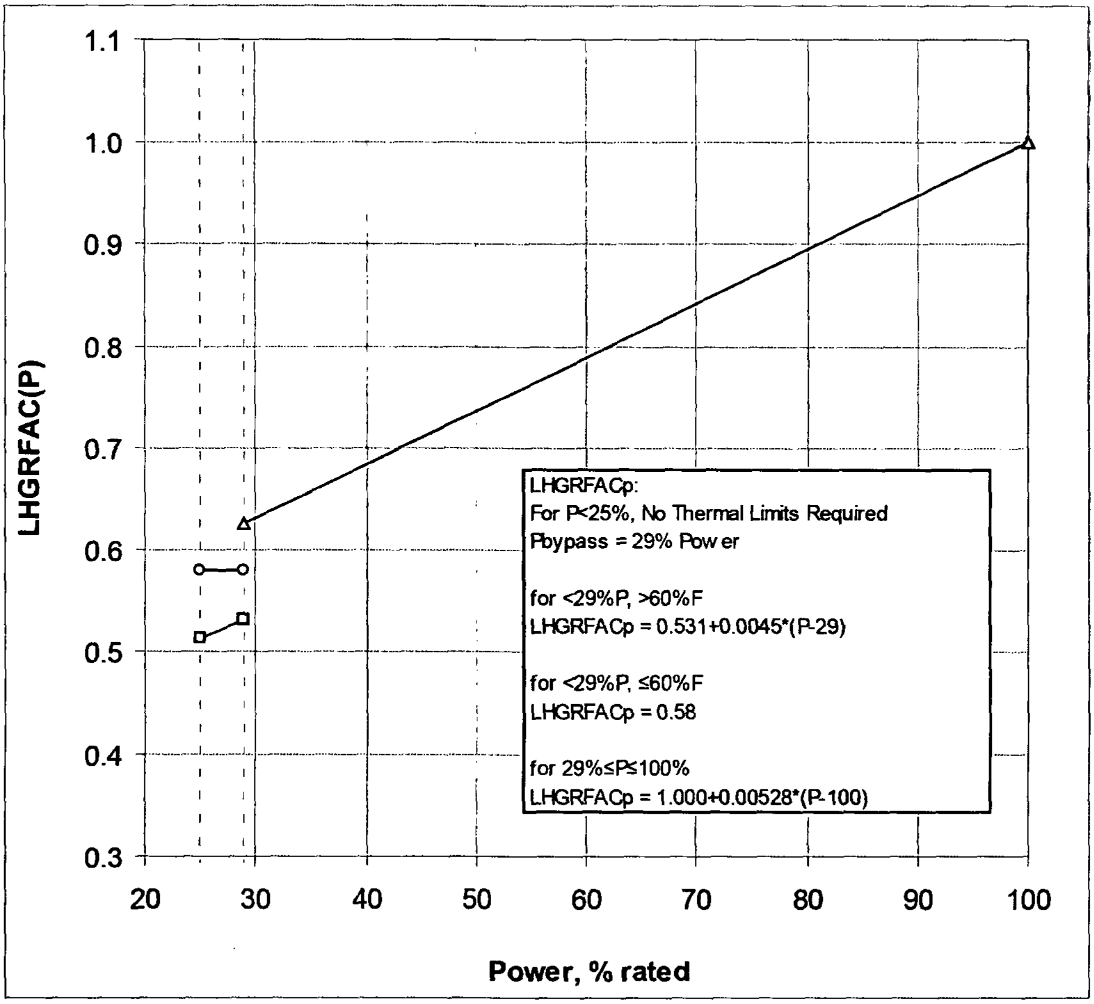
Figure 8.3
Flow-Dependent LHGR Multiplier, LHGRFAC(F)



See Table 8.6 for $LHGR_{STD}$ value

Reference 3.8, 3.9

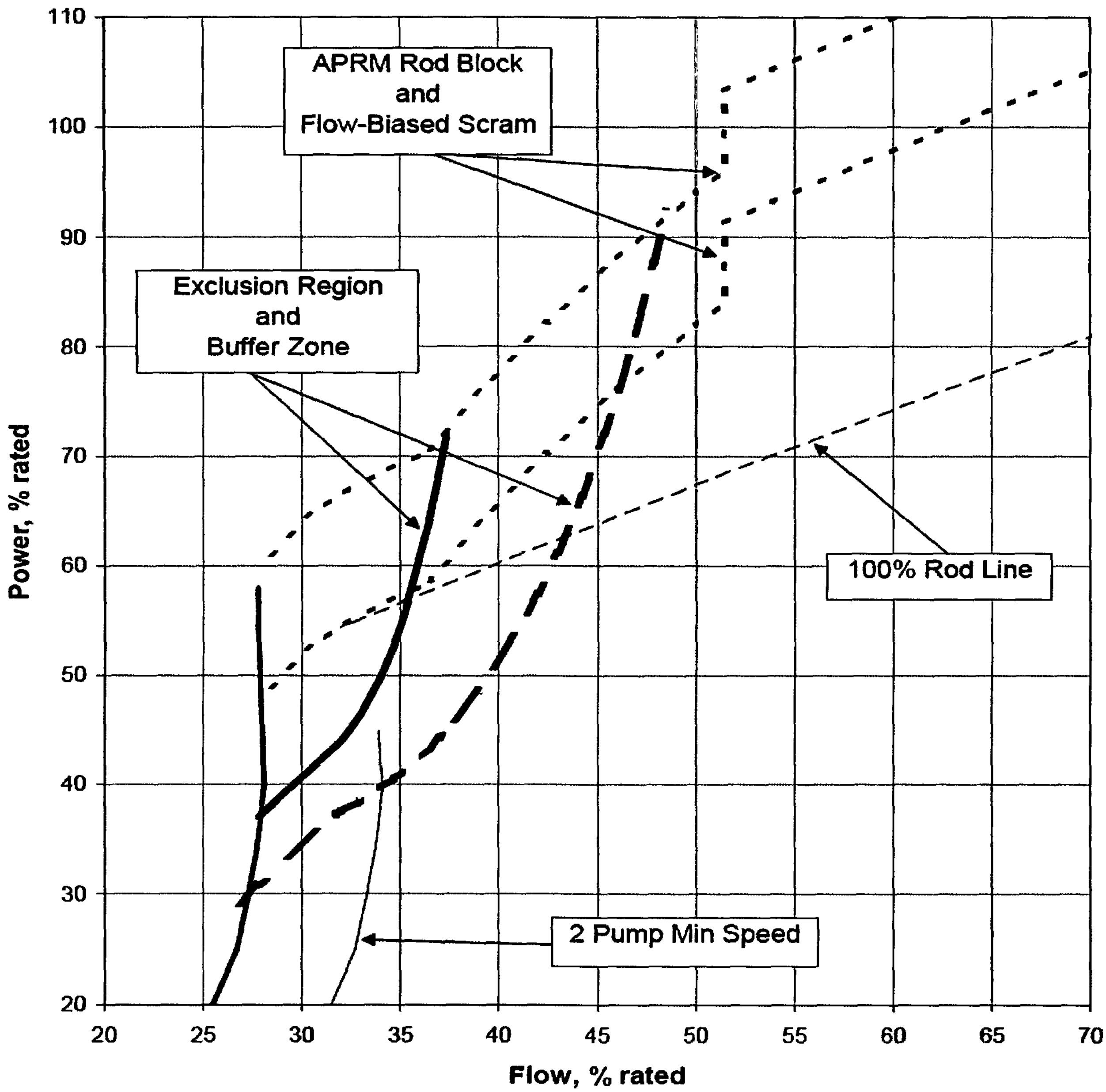
Figure 8.4
Power-Dependent LHGR Multiplier, LHGRFAC(P)



See Table 8.6 for $LHGR_{STD}$ values

Reference 3.8, 3.9

Figure 8.5
Stability Option 1-D Exclusion Region



See References 3.17 and 3.8 for details

Reference 3.18 generically removes cycle exposure limitation statement in the Supplemental Reload Licensing Report stability analysis.

Figure 8.6
Cycle 22 Loading Pattern by Bundle Design

North ⇓

52									16	16	14	16	16	12	16	14	16	16								
50								16	12	13	13	16	13	13	16	13	13	16	16							
48					12	16	16	14	14	17	17	16	17	17	16	17	17	14	14	16	12	12				
46				16	16	16	12	4	4	4	4	4	3	3	4	4	4	4	4	12	16	16	16			
44			16	16	14	4	20	4	19	3	17	3	19	19	3	17	3	19	4	20	4	14	16	16		
42			14	16	4	16	4	18	3	20	3	18	2	2	18	3	20	3	18	4	16	4	16	14		
40			16	12	20	4	20	3	18	3	18	17	18	18	17	18	3	18	3	20	4	20	12	16		
38		16	14	4	4	18	3	20	20	18	2	18	1	1	18	2	18	20	20	3	18	4	4	14	16	
36	16	12	14	4	19	3	18	20	20	3	20	2	20	20	2	20	3	20	20	18	3	19	4	14	16	16
34	16	16	17	4	3	20	3	18	3	20	1	19	2	2	19	1	20	3	18	3	20	3	4	17	16	16
32	13	13	17	4	17	3	18	2	20	1	20	2	20	20	2	20	1	20	2	18	3	17	4	17	13	13
30	16	16	16	4	3	18	17	18	2	19	2	17	14	14	17	2	19	2	18	17	18	3	4	16	16	16
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16		16	14	4	4	18	3	20	20	18	2	18	1	1	18	2	18	20	20	3	18	4	4	14	16	
14			16	12	20	4	20	3	18	3	18	17	18	18	17	18	3	18	3	20	4	20	12	16		
12			14	16	4	16	4	18	3	20	3	18	2	2	18	3	20	3	18	4	16	4	16	14		
10			16	16	14	4	20	4	19	3	17	3	19	19	3	17	3	19	4	20	4	14	16	16		
8				16	16	16	12	4	4	4	4	4	3	3	4	4	4	4	4	12	16	16	16			
6					12	16	16	14	14	17	17	16	17	17	16	17	17	14	14	16	16	12				
4								16	12	13	13	16	13	13	16	13	13	12	16							
2									16	16	16	16	13	16	16	14	13	16								
	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51

Fuel Type

1=GNF2-P10DG2B371-14GZ-100T2-150-T6-4280	(Cycle 22)	14=GNF2-P10DG2B404-12GZ-100T2-150-T6-3297	(Cycle 20)
2=GNF2-P10DG2B378-16GZ-100T2-150-T6-4281	(Cycle 22)	16=GNF2-P10DG2B390-14GZ-100T2-150-T6-3300	(Cycle 20)
3=GNF2-P10DG2B378-14GZ-100T2-150-T6-4282	(Cycle 22)	17=GNF2-P10DG2B404-12GZ-100T2-150-T6-3297	(Cycle 21)
4=GNF2-P10DG2B408-13G5.0-100T2-150-T6-4283	(Cycle 22)	18=GNF2-P10DG2B378-16GZ-100T2-150-T6-3299	(Cycle 21)
12=GNF2-P10DG2B378-16GZ-100T2-150-T6-3299	(Cycle 20)	19=GNF2-P10DG2B390-14GZ-100T2-150-T6-3300	(Cycle 21)
13=GNF2-P10DG2B380-16GZ-100T2-150-T6-3298	(Cycle 20)	20=GNF2-P10DG2B388-14GZ-100T2-150-T6-4114	(Cycle 21)

9.0 USERS GUIDE

The COLR defines thermal limits for the various operating conditions expected during the cycle. At the start of the cycle the 3D-Monicore databank limits are set for;

- Cycle exposure range of BOC to MOC
- $\tau = 0$
- Dual recirculation pump operation
- Four steam line operation, and
- Normal Feedwater Temperature

The following is a table that offers a check to assure the correct limits are applied when operating states or conditions change.

Change in Operating State	Change in Limits	Procedure Reference
Cycle Exposure = EOR22– 3.483 GWD/ST OLMCPR changes to EOC values at cycle exposure of 10.517 GWD/ST. Installed databank will use SRLR 10.517 GWD/ST.	See Table 8.1 for $\tau \neq 0$ for change in MCPR.	EN-DC-503 transition to EOC limits will occur automatically
Scram Time Test Results such that $\tau \neq 0$ Option B limits for OLMCPR must be interpolated with Option A limits	Use new τ and see Table 8.1, 8.2, 8.3, and Table 8.4.	RAP-7.4.1
Single Loop Operation The SLMCPR increases by 0.03 for OL MCPR therefore OLMCPR limits increase by 0.03, except when ≤1.48 (Rated Equivalent SLO Pump Seizure event is limiting for BOC-MOC). LHGR and MAPLHGR are reduced by a multiplier in SLO.	Switch to C22_OPTB_SLO.INP, (or C22_OPTA_SLO.INP). Afterwards, 3DM v6.59.06 will display and use correct SLO OLMCPR. Verify that 3D-Monicore has recognized the idle recirculation loop and is applying the SLO LHGR and MAPLHGR multipliers of 0.85 for GNF2.	ST-40D
Three Steam Line Operation (3SL)	Increase OLMCPR according to Table 8.2.	None
Operation with Turbine Bypass Valves Out-of-Service OLMCPR values increase, no LHGR change required	Increase OLMCPR according to Table 8.3.	None
Operation under Final Feedwater Temperature Reduction	Increase OLMCPR according to Table 8.4.	None

James A. FitzPatrick Nuclear Power Plant (JAFNPP)
SURVEILLANCE FREQUENCY CONTROL PROGRAM
LIST OF SURVEILLANCE FREQUENCIES

This document provides the list of surveillance frequencies for the James A. FitzPatrick Nuclear Power Plant (JAFNPP) Surveillance Frequency Control Program (SFCP) as required by Technical Specification (TS) Section 5.5.15. Each surveillance frequency specified in the list is associated with a corresponding TS Surveillance Requirement (SR) identified by TS SR number in the list. This is not an all inclusive list of TS surveillance frequencies. This list only includes fixed periodic surveillance frequencies. Event driven surveillance frequencies continue to be controlled by TS, and therefore, are not included in the SFCP. **NOTE: Certain individual TS SRs referenced in this document contain both fixed periodic surveillance frequencies and event driven surveillance frequencies within the same surveillance requirement. Only the fixed periodic surveillance frequencies for those requirements are included in the SFCP, and are therefore, shown in this list. Refer to the applicable TS SR for the event driven surveillance frequencies.**

Any change to the type or scope of testing, e.g., Channel Check, Channel Functional Test, or Channel Calibration, or acceptance criteria specified in the associated TS SR requires prior NRC approval through a license amendment request. As part of the SFCP, this list is intended to be used in conjunction with the TS by Operations and other station personnel to ensure that SRs specified in TS are performed at intervals sufficient to assure that associated TS Limiting Conditions for Operation (LCOs) are met.

Changes to this list may occur for one of two reasons, either: (1) addition, deletion, or modification of the associated TS SR through a license amendment processed in accordance with EN-LI-113 and issued by the NRC; or (2) station pursuit of a change to an individual surveillance frequency in the list. Changes to individual surveillance frequencies in the list, other than those approved by an NRC license amendment, are evaluated using NEI 04-10, "Risk-Informed Method for Control of Surveillance Frequencies," Revision 1, as required by TS Section 5.5.15. The process for making changes to individual frequencies is controlled by EN-DC-355 "Implementation of the Technical Specification Surveillance Frequency Control Program". The responsibility for administrative control of this list is assigned to site Nuclear Safety and Licensing. Administrative control of this list is governed by EN-LI-113, "Licensing Basis Document Change Process".

The Surveillance section of the list provides a summary description of the referenced TS SR which is provided for information purposes only and is not intended to be a substitute for the actual TS requirements. Refer to the TS for the specific action(s) required by each respective SR identified in the list.

In accordance with TS Section 5.5.15, the provisions of TS SRs 3.0.2 and 3.0.3 are applicable to the frequencies within the SFCP. TS SR 3.0.2 allows a maximum extension of up to 25% of the specified surveillance frequency. TS SR 3.0.3, for missed surveillances, allows a delay in declaring the associated LCO not met for up to 24 hours, or up to the limit of the specified surveillance frequency, whichever is greater, based on performance of a risk evaluation.

Noncompliance with the frequencies specified in the SFCP, i.e., missed surveillances, requires generation of a Condition Report (CR) in accordance with EN-LI-102, "Corrective Action Process". Based on the guidance provided in NUREG-1022, "Event Reporting Guidelines, 10 CFR 50.72 and 50.73," Rev. 3, missed surveillances are not reportable as a condition prohibited by TS unless the surveillance, once performed, indicates that the equipment was not capable of performing its specified safety function(s) for a period of time longer than allowed by the TS.

B 3.4 REACTOR COOLANT SYSTEMS (RCS)

B 3.4.A Structural Integrity

A pre-service inspection of the ASME Code Class 1 components was performed after site erection to assure the system was free of gross defects. An initial inspection program as detailed in Appendix F of the FSAR was developed and based on an approved edition of the ASME Code.

The program has been expanded to include the requirements of later, approved ASME Code editions and addenda as far as practicable. The importance of these inspections is recognized, and efforts to develop practical new alternative methods of assuring plant inservice integrity will continue. This inspection program should assure the detection of problem areas well before they represent a significant impact on safety.

The inspection program is based on an NRC approved edition of, and addenda to, Section XI of the ASME Boiler and Pressure Vessel Code which is in effect 12 months or less prior to the beginning of the inspection interval.

Several locations on the main steam lines and feedwater lines are not restrained to prevent pipe whip in the event of pipe failure at these locations. The physical layout within the drywell precludes restraints at these points. Unrestrained high stress areas have been identified in these lines where breaks could result in pipe whip such that the pipe could impact the primary containment wall. Augmented inservice inspection of these welds shall be performed during each inspection interval in accordance with the requirements specified in JAF-SE-03-004 (10 CFR 50.59 evaluation) and SEP-ISI-007, JAF ISI Inservice Inspection Program.

In addition, visual inspection in accordance with the approved ASME code will be made during periodic pressure and hydrostatic tests of critical systems. The inspection program specified encompasses the major areas of the vessel and piping system within the drywell. The inspection period is based on the observed rate of defect growth from fatigue studies sponsored by the AEC.

These studies show that thousands of stress cycles, at stresses beyond any expected to occur in a Reactor Coolant System, were required to propagate a crack. The test frequency is at intervals such that in comparison to study results, only a small number of stress cycles at values below limits will occur. On this basis, it is considered that the test frequencies are adequate.

The type of inspection planned for each component depends on location, accessibility, and type of expected defect. Direct visual examination is proposed whenever possible since it is sensitive, fast, and reliable. Magnetic particle and liquid penetration inspections are planned where practical, and where added sensitivity is required. Ultrasonic testing and/or radiography shall be used where defects can occur on concealed surfaces.

An Inservice Inspection Program for piping identified in the NRC Generic Letter 88-01 shall be implemented in accordance with NRC staff positions on schedules, methods, personnel, and sample expansion included in this Generic Letter, or in accordance with alternate measures approved by the NRC staff.

BASES (continued)

During infrequent periods of the classic NMCA process, it is acceptable for conductivity to increase up to 20 µmho/cm. This relaxation is acceptable because the reduction in crack growth over subsequent operating periods outweighs the increase in crack growth over the short duration of the noble metals application (<72 hours). The anticipated conductivity increase is due to factors unrelated to the increase in trace amounts of sulfates and chlorides contained in the noble metal compounds. OLNC on the other hand, is performed at a much lower concentration, but for a longer period of time (approximately 10 - 14 days). Reactor conductivity increase is within the range of the guidelines.

TRO 3.4.B

Limits are placed on chloride concentration, sulfate concentration, and conductivity to prevent SCC. The most important limits are those placed on chloride and sulfate concentration to prevent IGSCC of the stainless steel. Zircaloy does not exhibit similar stress corrosion failures. The most current revision of the EPRI BWR Water Chemistry Guidelines would provide guidance based on plant operating experience and recent research for BWR Chemistry Action Levels.

In the event that chemistry limits are exceeded, TRO 3.4.B Condition A requires initiation of a condition report, and commencing actions per SP-05.02. SP-05.02 provides the reactor water chemistry to be used - consistent with the current EPRI BWR Water Chemistry Guidelines - and provides direction to reduce the applicable chemistry parameter below limits, assess the impact on long term plant reliability, and in some cases, the recommendation to shutdown the plant. The 1 hour Completion Time for TRO 3.4.B Action A.2 allows operators enough time to evaluate any immediate impact on operability and to commence taking appropriate actions.

SURVEILLANCE REQUIREMENTS:

The conductivity of the reactor coolant is continuously monitored. The samples of the coolant which are taken every 96 hours when reactor coolant temperature is above 200°F will serve as a reference for calibration of these monitors and are considered adequate to assure accurate readings of the monitors. If conductivity is within its normal range, chlorides and other impurities will also be within their normal ranges. The reactor coolant samples will also be used to determine the chloride or sulfate concentration. Therefore, the sampling frequency is considered adequate to detect long-term changes in the chloride ion content.

References:

1. BWRVIP-190, BWR Water Chemistry Guidelines
2. Chemistry Procedure SP-05.02, Chemistry Surveillance and Scheduling System

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