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

Edwin I. Hatch Nuclear Plant
Unit 2 Cycle 18 Core Operating Limits Report (COLR), Revision 1

Ladies and Gentlemen:

In accordance with Technical Specification 5.6.5, Southern Nuclear Operating Company (SNC) hereby submits the Edwin I. Hatch Nuclear Plant Unit 2 Cycle 18 Core Operating Limits Report, Revision 1.

This revision is needed to reflect changes in the APLHGR Limits for GE13 fuel and the addition of values to the PBDA Amplitude Setpoint table.

This letter contains no NRC commitments. If you have any questions, please advise.

Sincerely,

H. L. Sumner, Jr.

HLS/IL

Enclosure: Unit 2 Cycle 18 Core Operating Limits Report, Revision 1

cc: Southern Nuclear Operating Company
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SOUTHERN NUCLEAR OPERATING COMPANY
EDWIN I. HATCH NUCLEAR PLANT

Unit 2 Cycle 18
CORE OPERATING LIMITS REPORT

Revision 1

Southern Nuclear Operating Company
Post Office Box 1295
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Edwin I. Hatch Nuclear Plant
Unit 2 Cycle 18 Core Operating Limits Report

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1.0 INTRODUCTION

The Core Operating Limits Report (COLR) for Plant Hatch Unit 2 Cycle 18 is prepared in accordance with the requirements of Technical Specification 5.6.5. The core operating limits presented herein were developed using NRC-approved methods (References 1 and 2). Results from the reload analyses for the fuel in Unit 2 Cycle 18 are documented in References 2 and 3.

The following core operating limits are included in this report:

a. Average Planar Linear Heat Generation Rate (APLHGR) – Technical Specification 3.2.1

b. Minimum Critical Power Ratio (MCPR) – Technical Specification 3.2.2

From a fuel thermal limits perspective, the following limitations are placed on Unit 2 operation with equipment out of service.

Equipment / Condition	Limitation
EOC-RPT Out of Service AND Turbine Bypass Valves Inoperable Simultaneously	Not analyzed
High Pressure Feedwater Heater(s) Out of Service AND Pressure Regulator Inoperable Simultaneously	Not analyzed
Single-Loop Operation (SLO)	• ≤ 2000 MWt • ≤ 56% Core Flow
Pressure Regulator Inoperable	Option B Scram Speeds Met (in place)

Also included in this report are the maximum allowable scram setpoints for the Period Based Detection Algorithm (PBDA) in the Oscillation Power Range Monitor (OPRM).

2.0 APLHGR LIMITS (Technical Specification 3.2.1)

The APLHGR limit for each fuel assembly is the applicable rated-power, rated-flow APLHGR limit taken from Figures 2-3 through 2-8, multiplied by the smaller of either:

a. The flow-dependent multiplier, $MAPFAC_F$, from Figure 2-1,

or

b. The power-dependent multiplier, $MAPFAC_P$, as determined by Table 2-1.

Since every assembly in the core contains more than one enriched lattice, GESTAR-II (Reference 1) requires that the appropriate APLHGR limit from Figures 2-3 through 2-8 be applied to every axial location in the fuel assembly, when APLHGR values are hand-calculated.

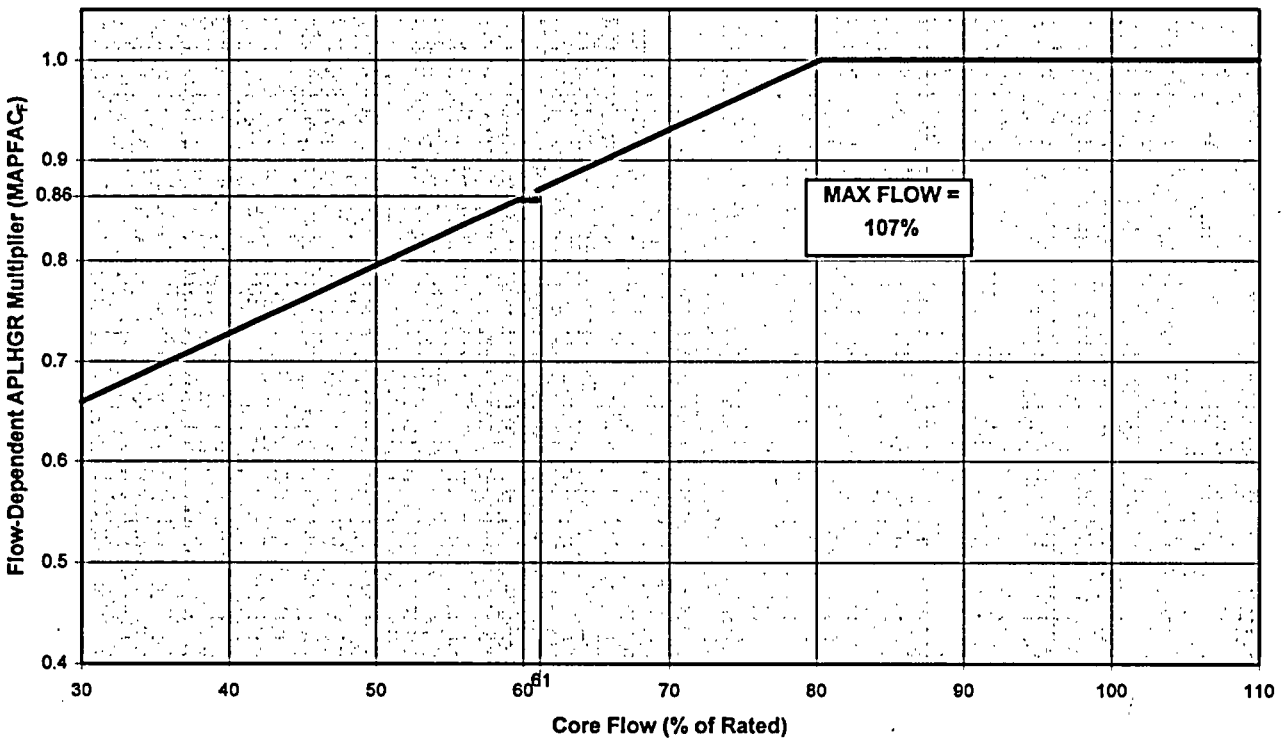
When APLHGR values are determined by the process computer, the lattice type-dependent APLHGR limits are used. Under these conditions, some axial locations may have APLHGR values exceeding the values shown in the figures.

TABLE 2-1

APLHGR Operating Flexibility Options

Cycle Average Exposure	Turbine Bypass Valves	Pressure Regulator	High Pressure Feedwater Heaters	$MAPFAC_P$ < 28% Power	$MAPFAC_P$ ≥ 28% Power
BOC to EEOC	Operable	Operable	In Service	Figure 2-2A	Figure 2-2A
BOC to EEOC	Inoperable	Operable	In Service	Figure 2-2B	Figure 2-2B
BOC to EEOC	Operable or Inoperable	Inoperable	In Service	Figure 2-2C	Figure 2-2C
BOC to EEOC	Operable	Operable	Out of Service	Figure 2-2A	Figure 2-2D
BOC to EEOC	Inoperable	Operable	Out of Service	Figure 2-2B	Figure 2-2D

BOC = Beginning of Cycle
EEOC = Extended End of Cycle



MAPFAC$_F$ = Minimum [1.0, (A + B*F), MAPMULT]

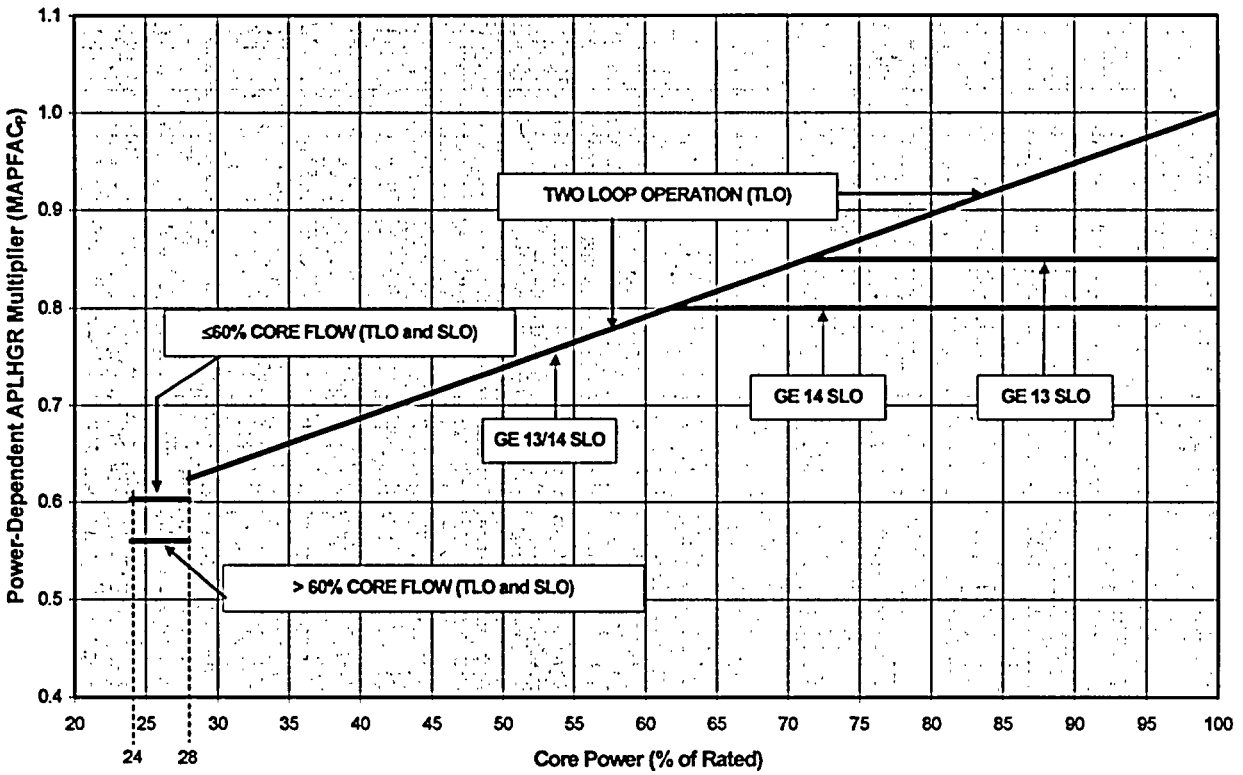
Maximum Core Flow (% of Rated)	A	B
107.0	0.4574	0.006758

MAPMULT = 1.0 for F > 61.0
0.86 for F ≤ 61.0

F = Percent of Rated Core Flow

FIGURE 2-1

Flow-Dependent APLHGR Multiplier (MAPFAC$_F$) versus Core Flow



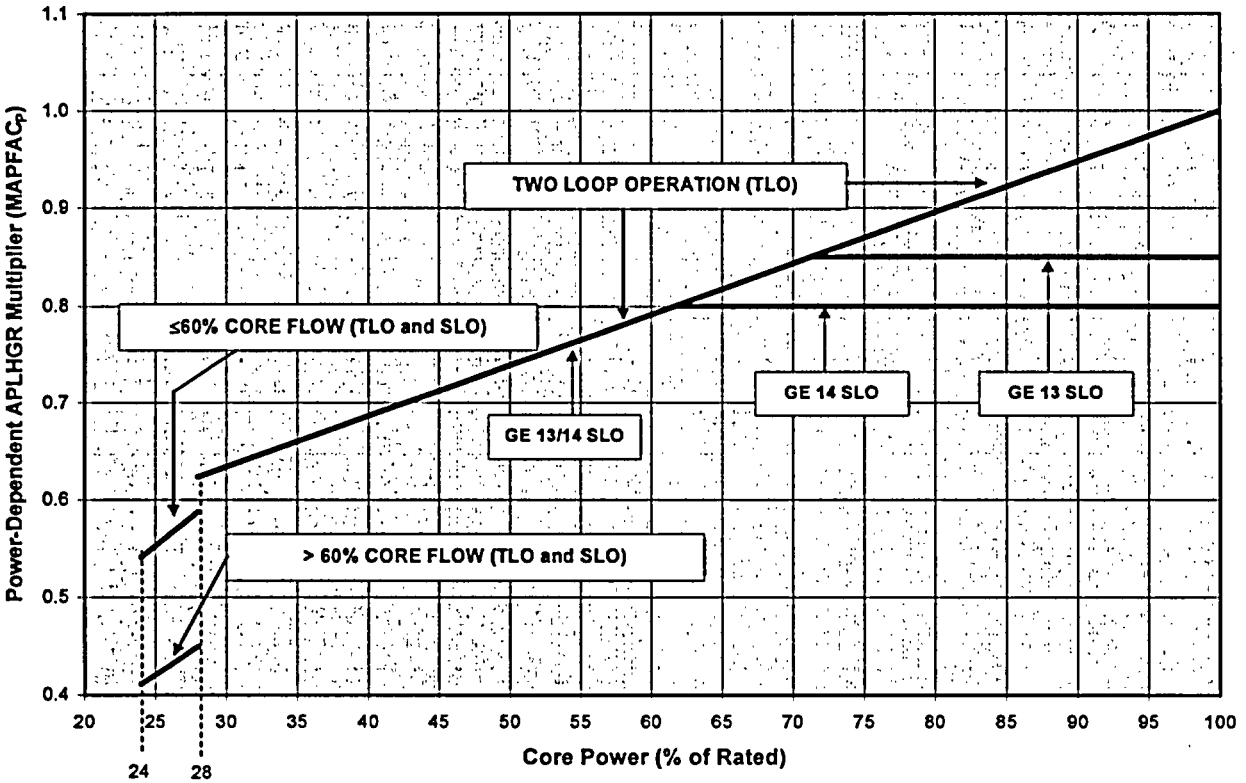
$MAPFAC_P = A - B (P_0 - P)$

Operating Conditions				Values of Variables		
P	F	SLO / TLO	Fuel Type	A	B	P_0
24 ≤ P < 28	F ≤ 60	SLO / TLO	All	0.603	0.00	28
24 ≤ P < 28	F > 60	SLO / TLO	All	0.560	0.00	28
28 ≤ P < 61.72	All	SLO / TLO	All	1.00	0.005224	100
61.72 ≤ P < 71.28	All	SLO / TLO	GE13	1.00	0.005224	100
61.72 ≤ P < 71.28	All	TLO	GE14	1.00	0.005224	100
P ≥ 71.28	All	TLO	All	1.00	0.005224	100
P ≥ 71.28	All	SLO	GE13	0.85	0.00	100
P ≥ 61.72	All	SLO	GE14	0.80	0.00	100

P = Percent of Rated Core Power
F = Percent of Rated Core Flow

FIGURE 2-2A

Power-Dependent APLHGR Multiplier ($MAPFAC_P$) versus Core Power
(All Equipment In Service)



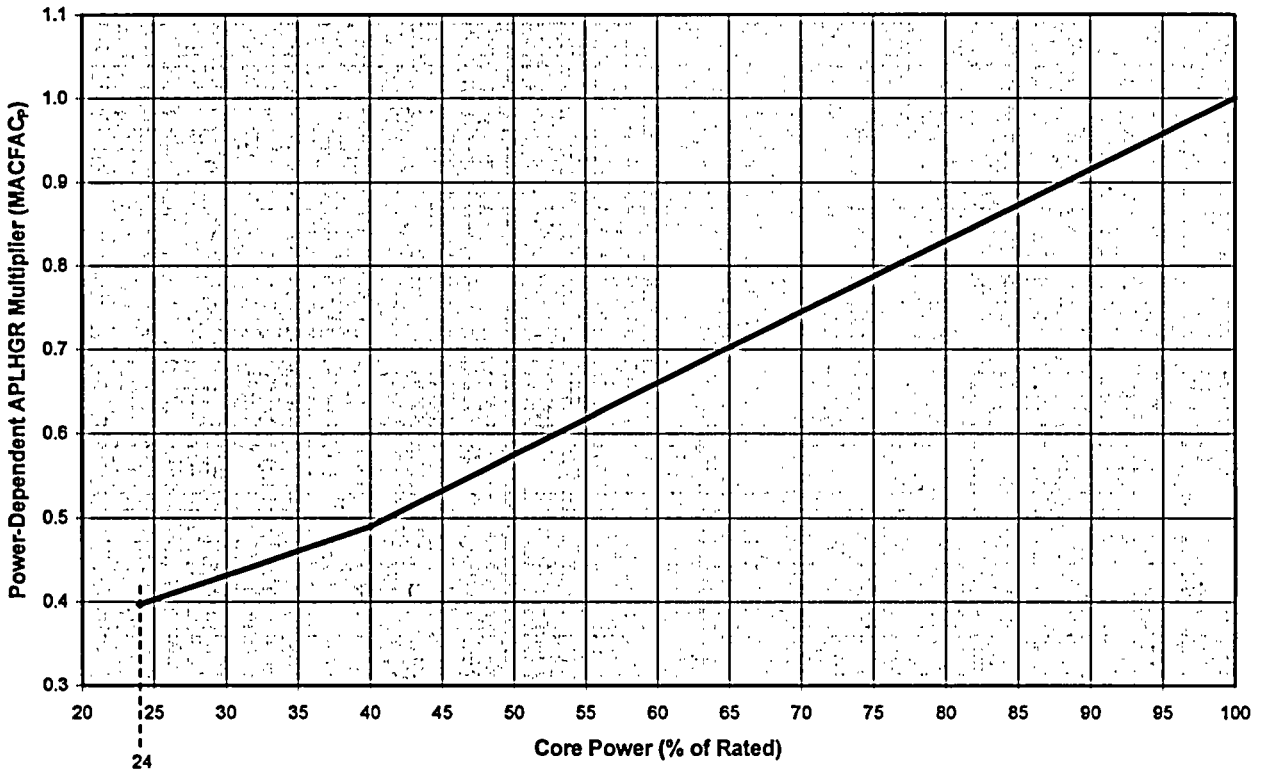
$MAPFAC_P = A - B (P_0 - P)$

Operating Conditions				Values of Variables		
P	F	SLO / TLO	Fuel Type	A	B	P_0
$24 \le P < 28$	$F \le 60$	SLO / TLO	All	0.588	0.01167	28
$24 \le P < 28$	$F > 60$	SLO / TLO	All	0.450	0.00967	28
$28 \le P < 61.72$	All	SLO / TLO	All	1.00	0.005224	100
$61.72 \le P < 71.28$	All	SLO / TLO	GE13	1.00	0.005224	100
$61.72 \le P < 71.28$	All	TLO	GE14	1.00	0.005224	100
$P \ge 71.28$	All	TLO	All	1.00	0.005224	100
$P \ge 71.28$	All	SLO	GE13	0.85	0.000	100
$P \ge 61.72$	All	SLO	GE14	0.80	0.000	100

P = Percent of Rated Core Power
F = Percent of Rated Core Flow

FIGURE 2-2B

Power-Dependent APLHGR Multiplier ($MAPFAC_P$) versus Core Power
(Turbine Bypass Valves Inoperable)



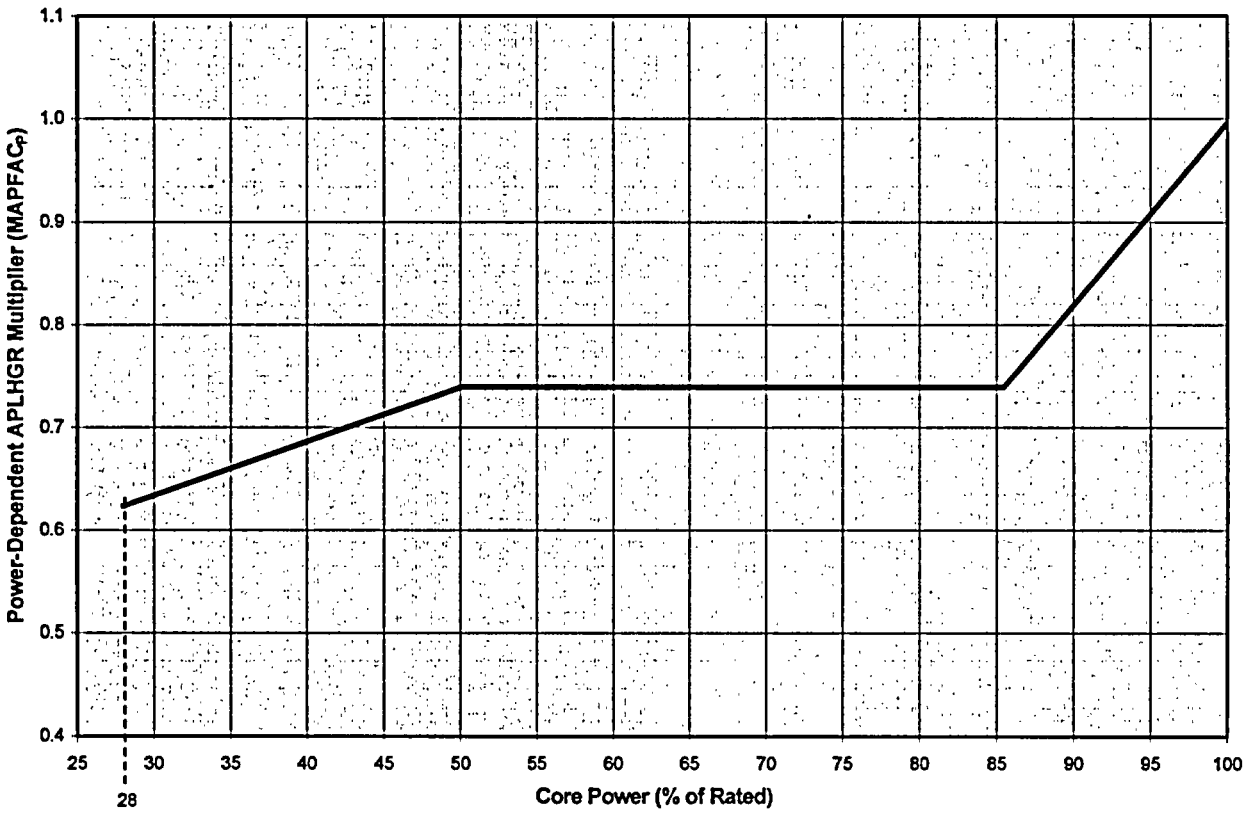
$MAPFAC_P = A - B (P_0 - P)$

Operating Conditions				Values of Variables		
P	F	SLO / TLO	Fuel Type	A	B	P_0
$24 \leq P < 40$	All	SLO / TLO	All	0.49	0.0058	40
$40 \leq P \leq 100$	All	SLO / TLO	All	1.00	0.0085	100

P = Percent of Rated Core Power
F = Percent of Rated Core Flow

FIGURE 2-2C

Power-Dependent APLHGR Multiplier ($MAPFAC_P$) versus Core Power
(Pressure Regulator Inoperable)



$MAPFAC_P = A - B (P_0 - P)$

Operating Conditions				Values of Variables		
P	F	SLO / TLO	Fuel Type	A	B	P_0
$24 \le P < 28$	All	SLO / TLO	All	*	*	*
$28 \le P < 50.04$	All	SLO / TLO	All	1.000	0.005224	100
$50.04 \le P < 85.50$	All	SLO / TLO	All	0.739	0.000	N/A
$85.50 \le P \le 100$	All	TLO	All	0.996	0.01771	100

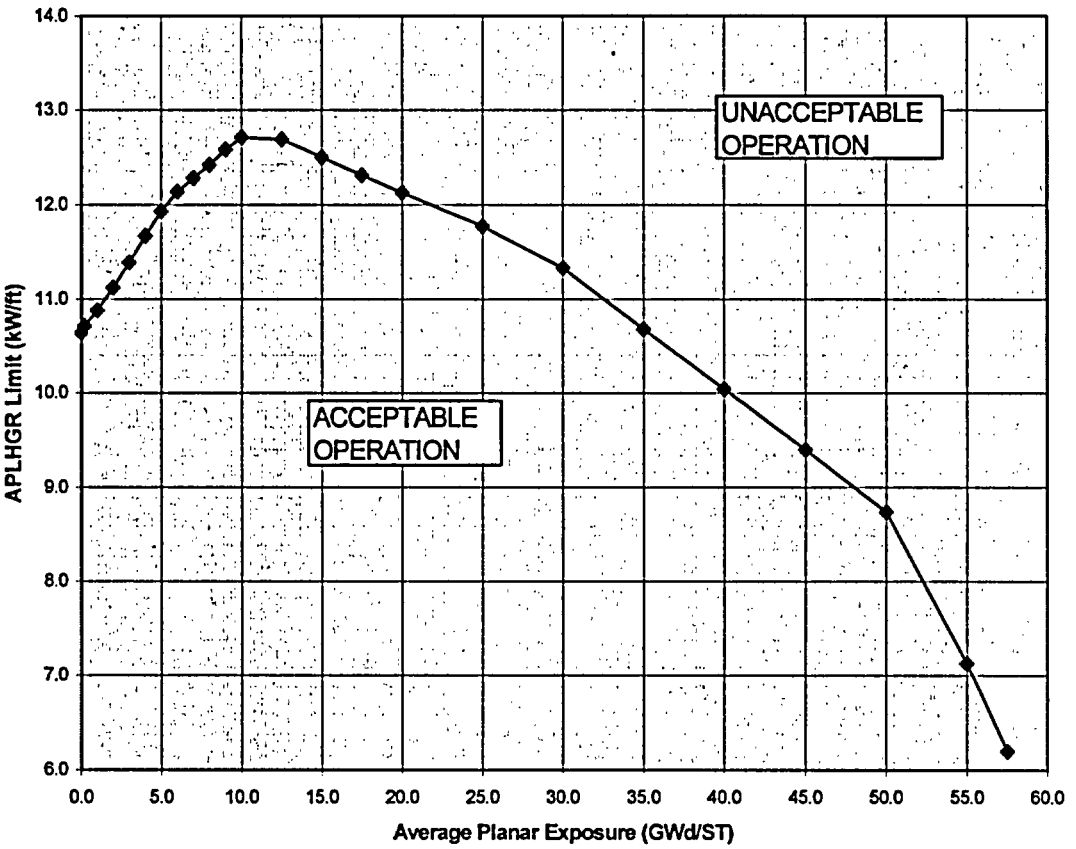
P = Percent of Rated Core Power
F = Percent of Rated Core Flow

* See Table 2-1

FIGURE 2-2D

Power-Dependent APLHGR Multiplier ($MAPFAC_P$) versus Core Power
(High Pressure Feedwater Heater(s) Out of Service)

Average Planar Exposure	APLHGR Limit
0.00	10.64
0.20	10.71
1.00	10.88
2.00	11.12
3.00	11.39
4.00	11.67
5.00	11.93
6.00	12.14
7.00	12.28
8.00	12.42
9.00	12.58
10.00	12.71
12.50	12.69
15.00	12.50
17.50	12.31
20.00	12.13
25.00	11.77
30.00	11.33
35.00	10.68
40.00	10.04
45.00	9.40
50.00	8.74
55.00	7.13
57.53	6.20

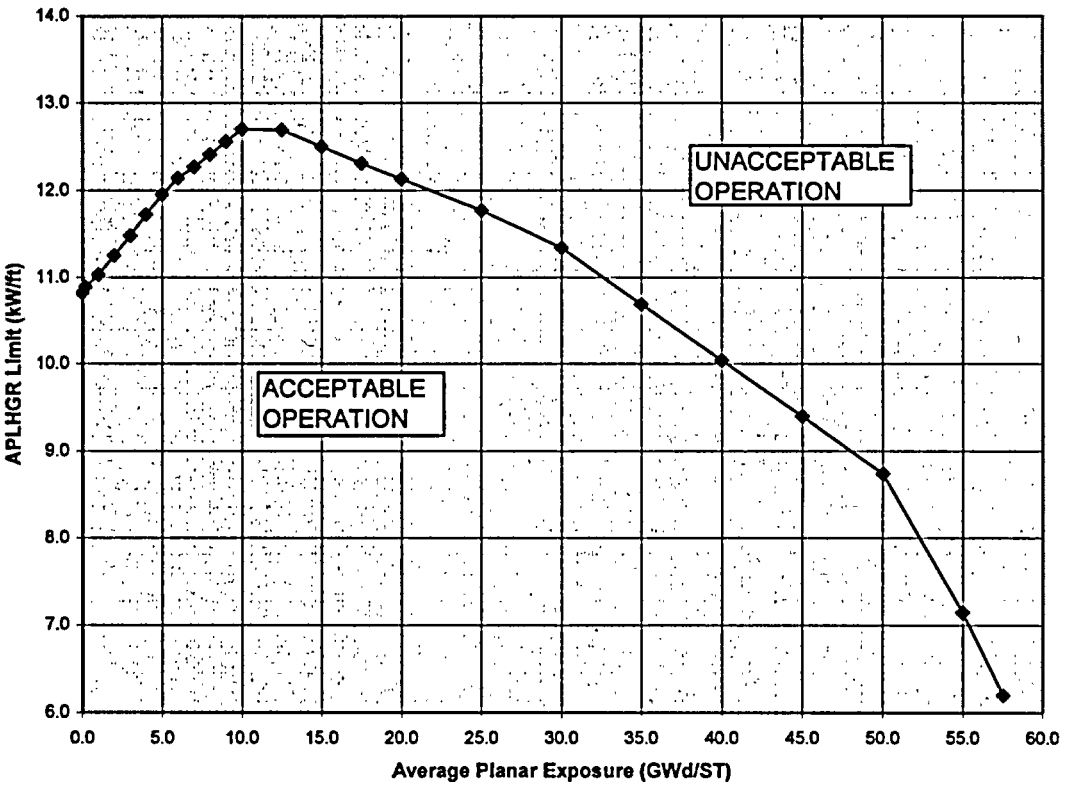


NOTE: THIS IS THE APLHGR LIMIT FOR THE MOST LIMITING LATTICE AS A FUNCTION OF AVERAGE PLANAR EXPOSURE.

FIGURE 2-3

APLHGR Limit versus Average Planar Exposure
(Fuel Type: GE13-P9DTB378-6G5.0/6G4.0/1G2.0-100T-146-T)

Average Planar Exposure	APLHGR Limit
0.00	10.82
0.20	10.89
1.00	11.03
2.00	11.25
3.00	11.48
4.00	11.72
5.00	11.95
6.00	12.14
7.00	12.27
8.00	12.41
9.00	12.56
10.00	12.70
12.50	12.69
15.00	12.50
17.50	12.31
20.00	12.13
25.00	11.77
30.00	11.34
35.00	10.69
40.00	10.04
45.00	9.40
50.00	8.74
55.00	7.14
57.53	6.20

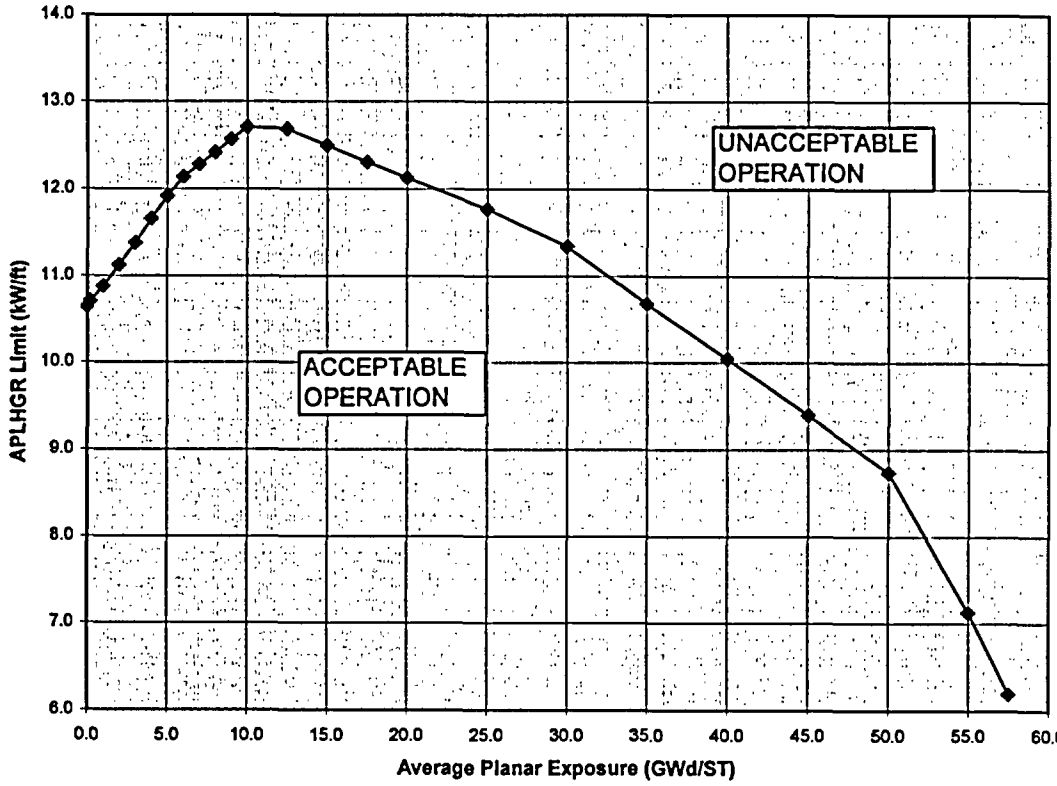


NOTE: THIS IS THE APLHGR LIMIT FOR THE MOST LIMITING LATTICE AS A FUNCTION OF AVERAGE PLANAR EXPOSURE.

FIGURE 2-4

APLHGR Limit versus Average Planar Exposure
(Fuel Type: GE13-P9DTB378-6G5.0/6G4.0-100T-146-T-2398)

Average Planar Exposure	APLHGR Limit
0.00	10.64
0.20	10.71
1.00	10.88
2.00	11.12
3.00	11.38
4.00	11.66
5.00	11.92
6.00	12.14
7.00	12.28
8.00	12.42
9.00	12.57
10.00	12.71
12.50	12.69
15.00	12.50
17.50	12.31
20.00	12.13
25.00	11.77
30.00	11.34
35.00	10.68
40.00	10.04
45.00	9.40
50.00	8.74
55.00	7.13
57.51	6.20

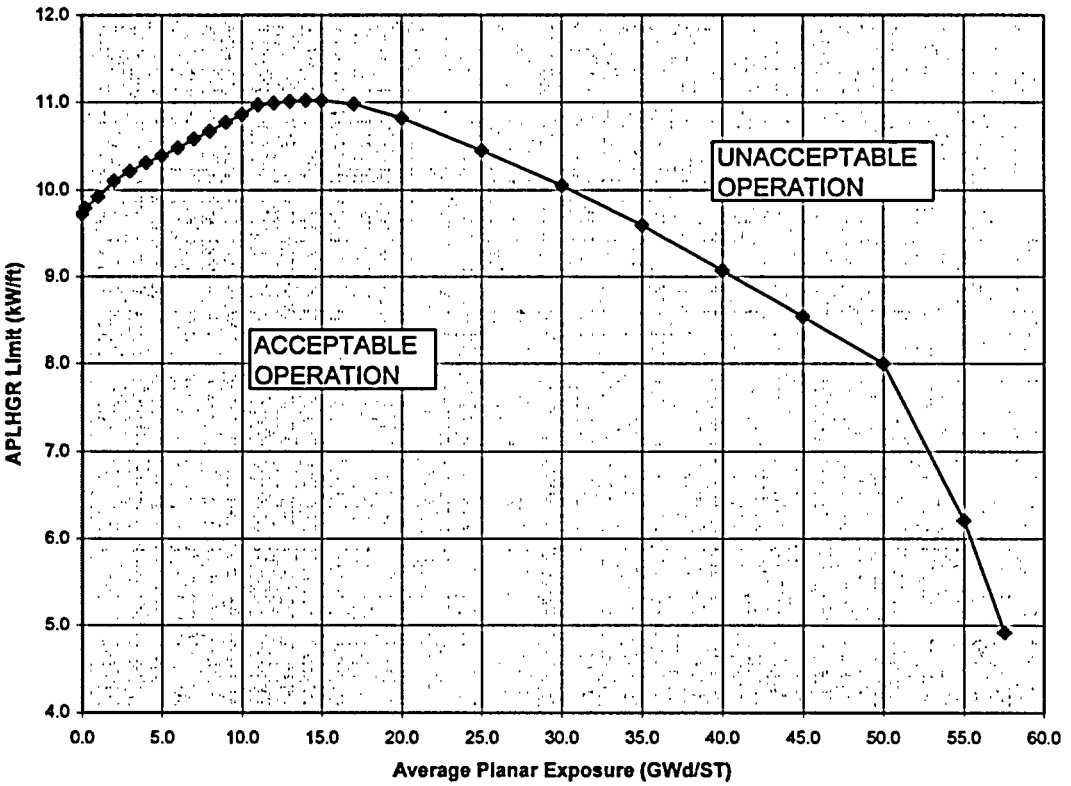


NOTE: THIS IS THE APLHGR LIMIT FOR THE MOST LIMITING LATTICE AS A FUNCTION OF AVERAGE PLANAR EXPOSURE.

FIGURE 2-5

APLHGR Limit versus Average Planar Exposure
(Fuel Type: GE13-P9DTB378-6G5.0/6G4.0/1G2.0-100T-146-T-2402)

Average Planar Exposure	APLHGR Limit
0.00	9.72
0.20	9.79
1.00	9.92
2.00	10.10
3.00	10.21
4.00	10.31
5.00	10.39
6.00	10.48
7.00	10.58
8.00	10.67
9.00	10.77
10.00	10.86
11.00	10.97
12.00	10.99
13.00	11.01
14.00	11.02
15.00	11.02
17.00	10.98
20.00	10.82
25.00	10.45
30.00	10.05
35.00	9.59
40.00	9.07
45.00	8.54
50.00	8.00
55.00	6.21
57.54	4.92

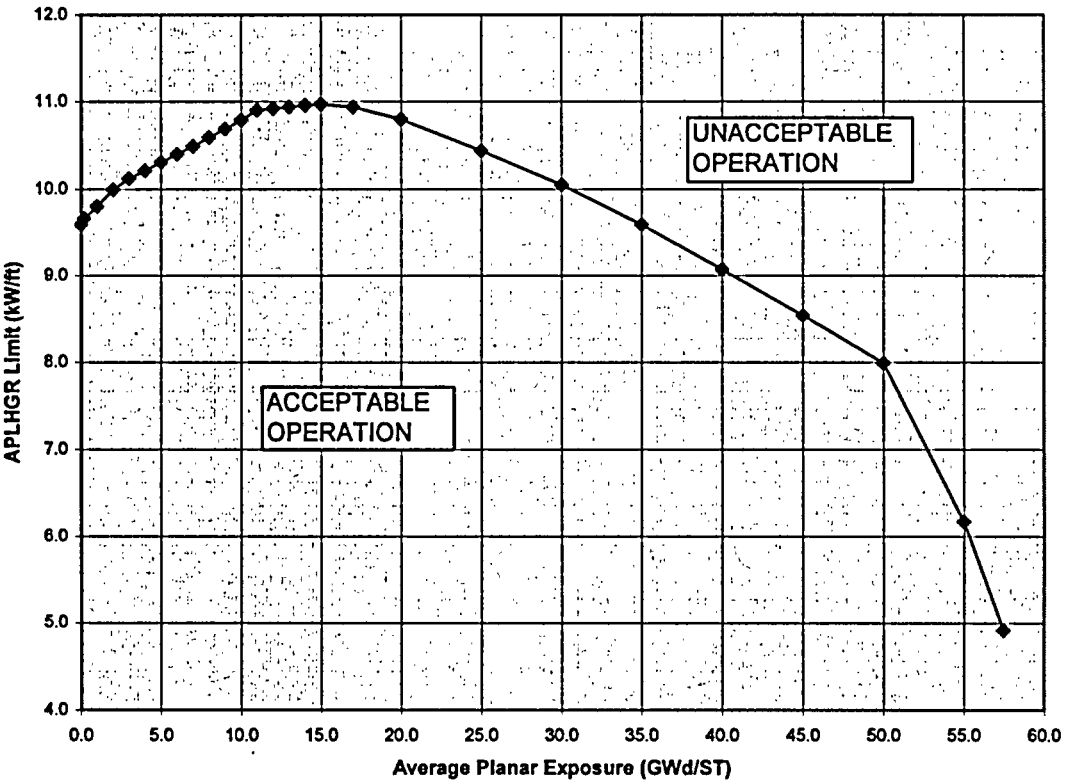


NOTE: THIS IS THE APLHGR LIMIT FOR THE MOST LIMITING LATTICE AS A FUNCTION OF AVERAGE PLANAR EXPOSURE.

FIGURE 2-6

APLHGR Limit versus Average Planar Exposure
(Fuel Type: GE14-P10DNAB398-4G7.0/10G6.0-100T-150-T-2615)

Average Planar Exposure	APLHGR Limit
0.00	9.59
0.20	9.66
1.00	9.80
2.00	9.99
3.00	10.12
4.00	10.21
5.00	10.31
6.00	10.40
7.00	10.49
8.00	10.59
9.00	10.69
10.00	10.79
11.00	10.90
12.00	10.92
13.00	10.94
14.00	10.96
15.00	10.97
17.00	10.94
20.00	10.80
25.00	10.44
30.00	10.05
35.00	9.59
40.00	9.07
45.00	8.54
50.00	7.99
55.00	6.17
57.46	4.92

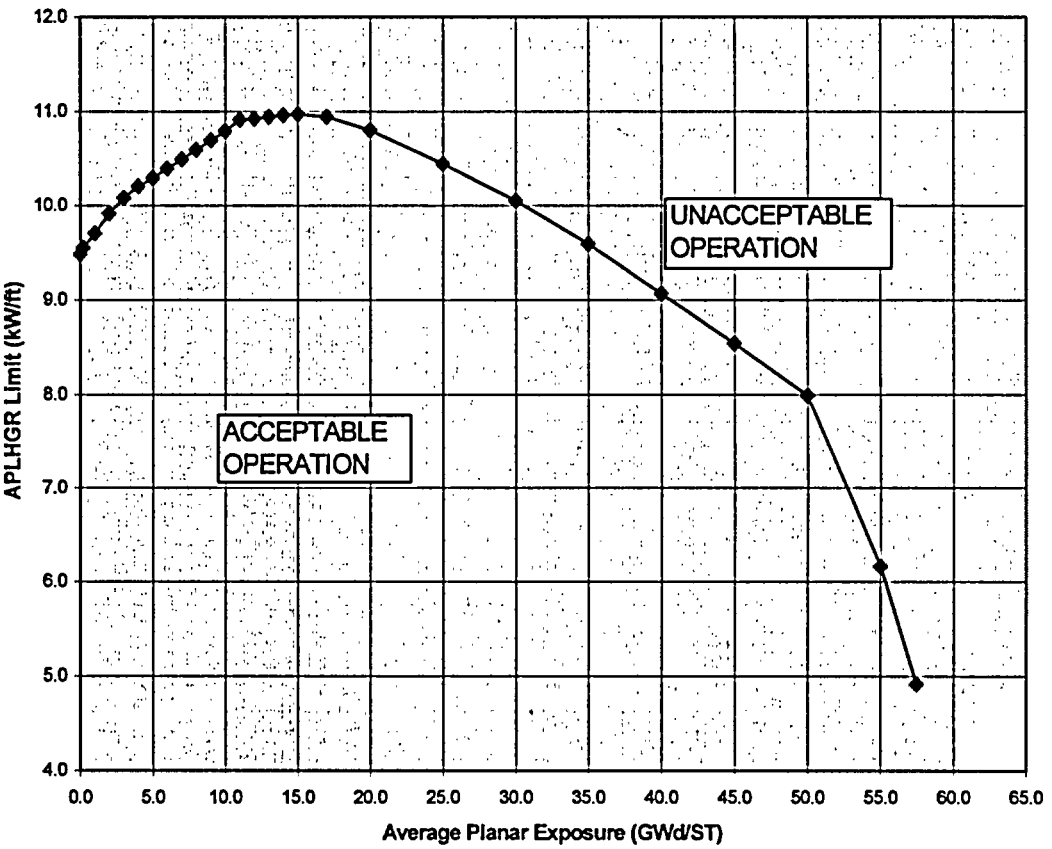


NOTE: THIS IS THE APLHGR LIMIT FOR THE MOST LIMITING LATTICE AS A FUNCTION OF AVERAGE PLANAR EXPOSURE.

FIGURE 2-7

APLHGR Limit versus Average Planar Exposure
(Fuel Type: GE14-P10DNAB398-4G7.0/11G6.0-100T-150-T-2616)

Average Planar Exposure	APLHGR Limit
0.00	9.48
0.20	9.55
1.00	9.70
2.00	9.91
3.00	10.08
4.00	10.20
5.00	10.29
6.00	10.39
7.00	10.49
8.00	10.59
9.00	10.69
10.00	10.79
11.00	10.91
12.00	10.92
13.00	10.94
14.00	10.96
15.00	10.97
17.00	10.94
20.00	10.80
25.00	10.44
30.00	10.05
35.00	9.59
40.00	9.07
45.00	8.54
50.00	7.99
55.00	6.16
57.45	4.92



NOTE: THIS IS THE APLHGR LIMIT FOR THE MOST LIMITING LATTICE AS A FUNCTION OF AVERAGE PLANAR EXPOSURE.

FIGURE 2-8

APLHGR Limit versus Average Planar Exposure
(Fuel Type: GE14-P10DNAB398-4G7.0/11G6.0/1G2.0-100T-150-T-2617)

3.0 MCPR OPERATING LIMITS (Technical Specification 3.2.2)

The MCPR operating limit (OLMCPR) for each fuel type is a function of core power, core flow, average scram time, number of operating recirculation loops, EOC-RPT status, and operability of the turbine bypass valves.

With both recirculation pumps in operation (TLO), the OLMCPR for each fuel type is determined as follows:

a. For 24% ≤ power < 28%, the power-dependent MCPR limit, $MCPR_P$, as determined by Table 3-1.

b. For power ≥ 28%, the OLMCPR is the greater of either:

   1) The flow-dependent MCPR limit, $MCPR_F$, from Figure 3-2,

      or

   2) The product of the power-dependent multiplier, K_P, as determined by Table 3-1 and the rated-power, rated-flow MCPR limit as determined by Table 3-1.

With only one recirculation pump in operation (SLO), the OLMCPR for each fuel type is the TLO OLMCPR plus 0.02.

These limits apply to all modes of operation with intermittent feedwater temperature reduction, as well as operation with normal feedwater temperatures.

In Figures 3-4A through 3-4E, Option A scram time MCPR limits correspond to $\tau = 1.0$, where τ is determined from scram time measurements performed in accordance with Technical Specifications Surveillance Requirements 3.1.4.1 and 3.1.4.2. Option B values correspond to $\tau = 0.0$. For scram times between Option A and Option B, the MCPR limit for each fuel type corresponds to τ. If τ has not been determined, Option A limits are to be used. Refer to Table 3-1 to determine the applicable set of fuel-type dependent curves.

The average scram time of the control rods, τ, is defined as:

$$\tau = 0, \text{ or } \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B}, \text{ whichever is greater.}$$

where: τ_A = 1.08 sec (Technical Specification 3.1.4, Table 3.1.4-1, scram time limit to notch 36).

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

where: μ = 0.822 sec (mean scram time used in the transient analysis).

σ = 0.018 sec (standard deviation of μ).

$$\tau_{ave} = \frac{\sum_{i=1}^{n} Ni\tau_i}{\sum_{i=1}^{n} Ni}$$

where: n = number of surveillance tests performed to date in the cycle.

N_i = number of active control rods measured in the *ith* surveillance test.

τ_i = average scram time to notch 36 of all rods in the *ith* surveillance test.

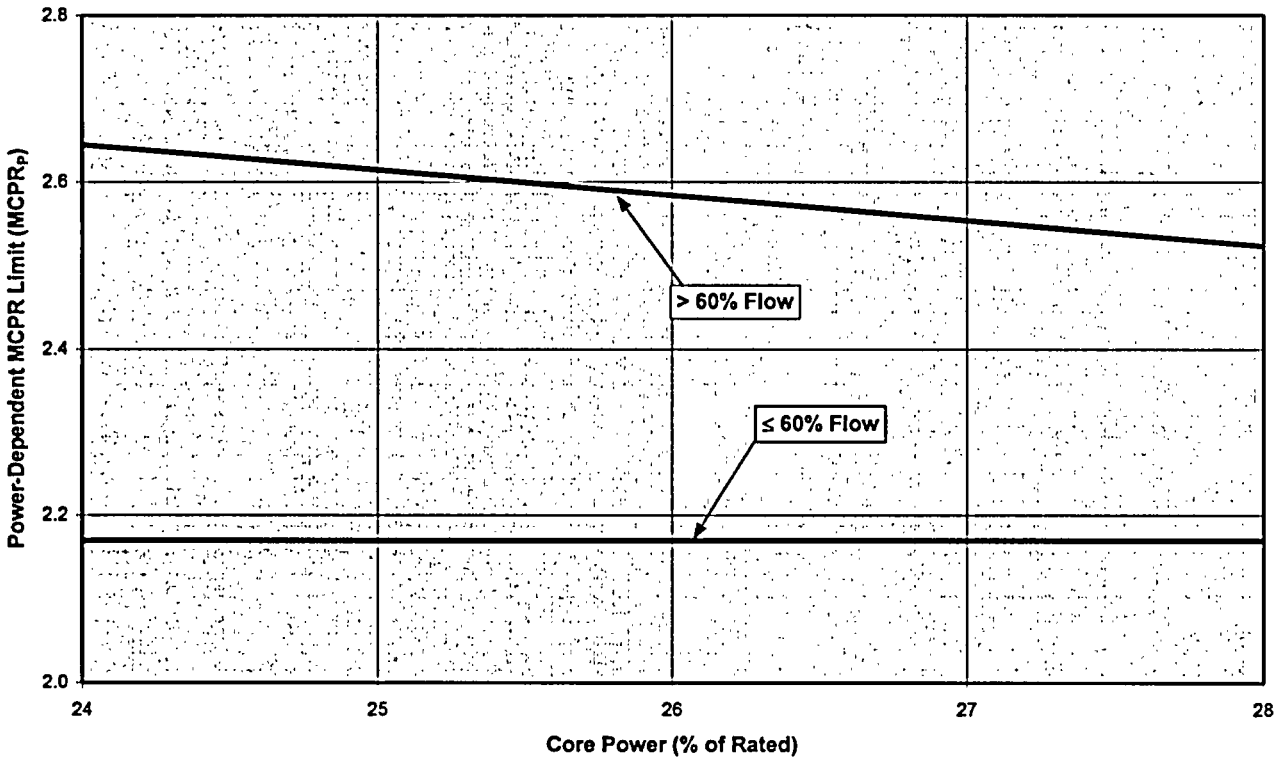
N_1 = total number of active rods measured in Technical Specifications Surveillance Requirement 3.1.4.1.

TABLE 3-1

MCPR Operating Flexibility Options

Cycle Average Exposure	EOC-RPT	Turbine Bypass Valves	Pressure Regulator	$MCPR_P$ Curve	Kp Curve	Rated-Power, Rated-Flow MCPR Limits
BOC to EOR-2000	In Service	Operable	Operable	Figure 3-1A	Figure 3-3A	Figure 3-4A
BOC to EOR-2000	In Service	Operable	Inoperable	Figure 3-1A	Figure 3-3B	Figure 3-4A
BOC to EOR-2000	Out of Service	Operable	Operable	Figure 3-1A	Figure 3-3A	Figure 3-4B
BOC to EOR-2000	Out of Service	Operable	Inoperable	Figure 3-1A	Figure 3-3B	Figure 3-4B
BOC to EEOC	In Service	Inoperable	Operable	Figure 3-1B	Figure 3-3A	Figure 3-4C
BOC to EEOC	In Service	Inoperable	Inoperable	Figure 3-1B	Figure 3-3B	Figure 3-4C
EOR-2000 to EEOC	In Service	Operable	Operable	Figure 3-1A	Figure 3-3A	Figure 3-4D
EOR-2000 to EEOC	In Service	Operable	Inoperable	Figure 3-1A	Figure 3-3B	Figure 3-4D
EOR-2000 to EEOC	Out of Service	Operable	Operable	Figure 3-1A	Figure 3-3A	Figure 3-4E
EOR-2000 to EEOC	Out of Service	Operable	Inoperable	Figure 3-1A	Figure 3-3B	Figure 3-4E

BOC = Beginning of Cycle
EOR = End of rated conditions (100% power, 100% flow, ARO, with nominal feedwater temp.)
EEOC = Extended End of Cycle (beyond EOR, 100% power, 105% flow, with reduced feedwater temp.)



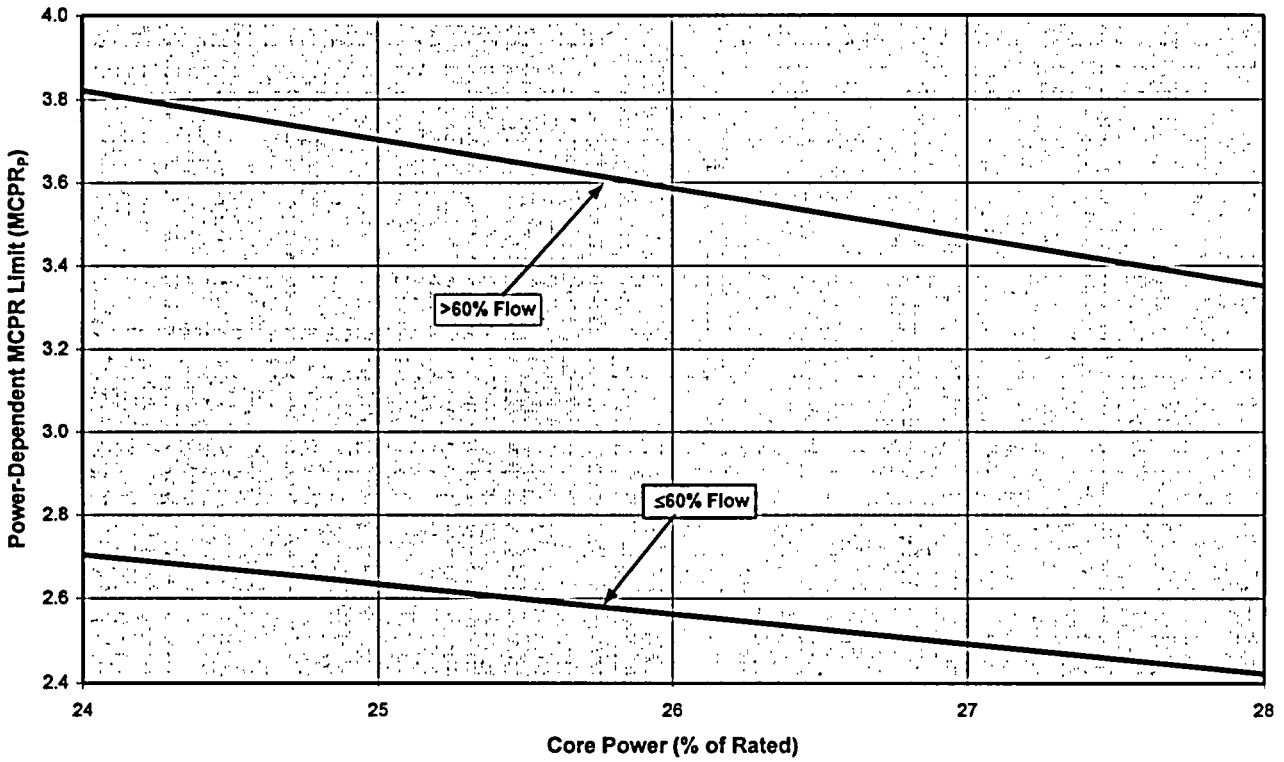
$MCPR_P = A + B (28 - P)$

F	A	B
F ≤ 60	2.17	0.0000
F > 60	2.52	0.0303

P = Percent of Rated Core Power
F = Percent of Rated Core Flow

FIGURE 3-1A

Power-Dependent MCPR Limit ($MCPR_P$) versus Core Power from 24% to 28% of Rated Core Power
(Turbine Bypass Valves Operable)



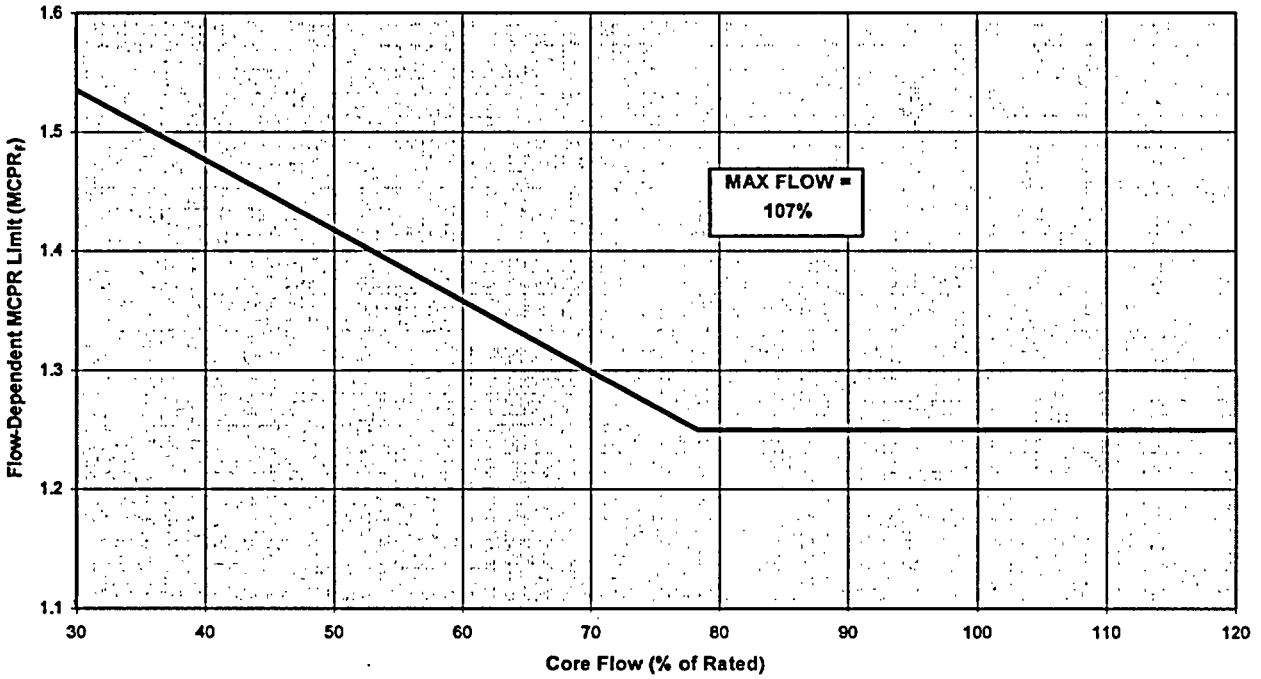
$MCPR_P = A + B (28 - P)$

F	A	B
F ≤ 60	2.42	0.0707
F > 60	3.35	0.1178

P = Percent of Rated Core Power
F = Percent of Rated Core Flow

FIGURE 3-1B

Power-Dependent MCPR Limit ($MCPR_P$) versus Core Power from 24% to 28% of Rated Core Power
(Turbine Bypass Valves Inoperable)



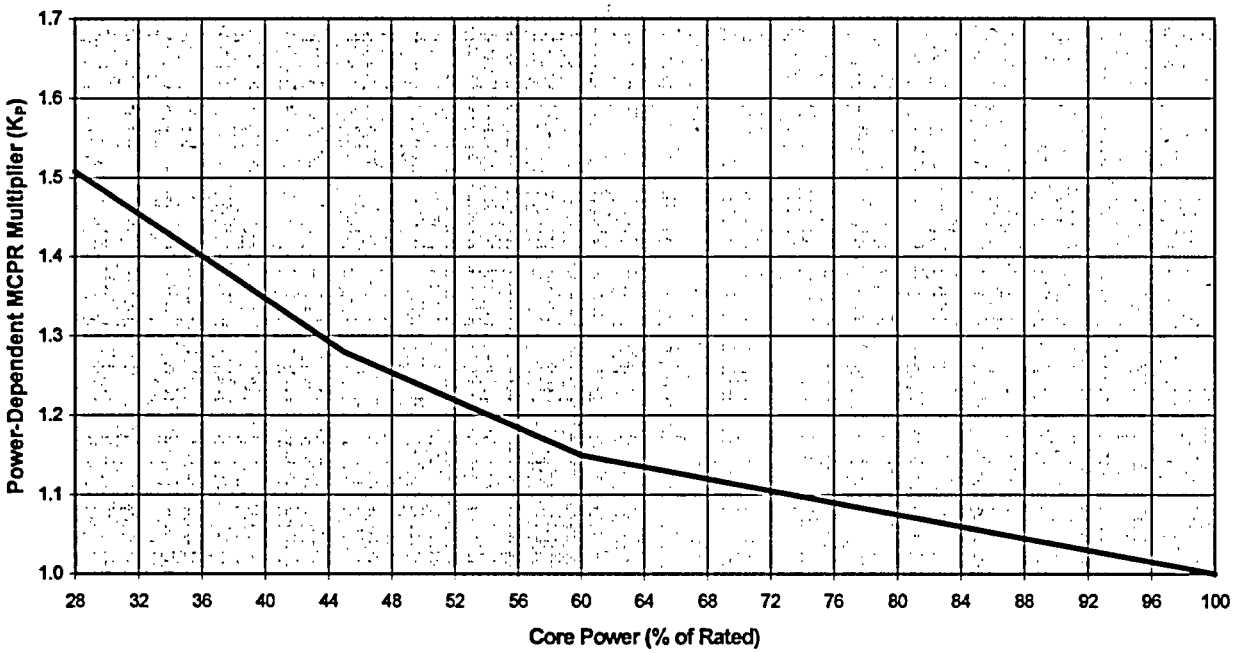
$MCPR_F$ = Maximum [1.25, (A*F + B)]

Operating Conditions	Values of Variables	
Maximum Core Flow (% of Rated)	A	B
107.0	-0.00591	1.713

F = Percent of Rated Core Flow

FIGURE 3-2

Flow-Dependent MCPR Limit ($MCPR_F$) versus Core Flow



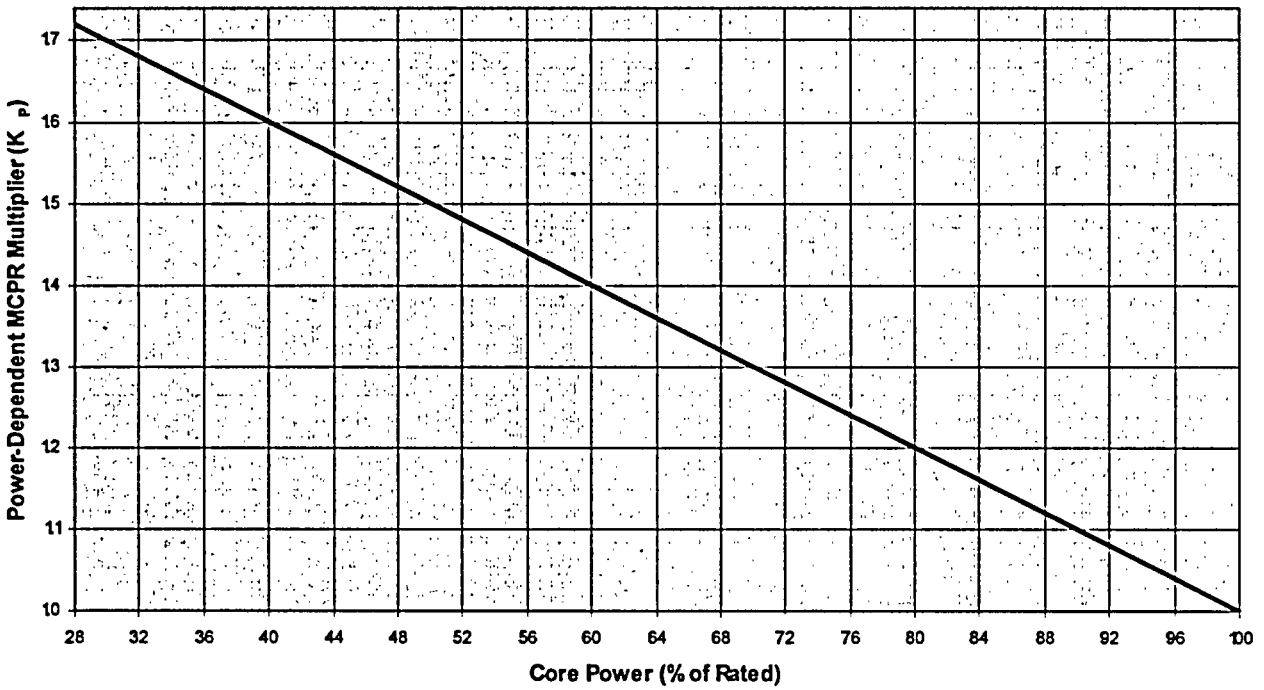
$K_P = A + B (P_0 - P)$

P	A	B	P_0
$28 \leq P < 45$	1.28	0.01340	45
$45 \leq P < 60$	1.15	0.00867	60
$60 \leq P$	1.00	0.00375	100

P = Percent of Rated Core Power

FIGURE 3-3A

Power-Dependent MCPR Multiplier (K_P) versus Core Power
(Pressure Regulator Operable)



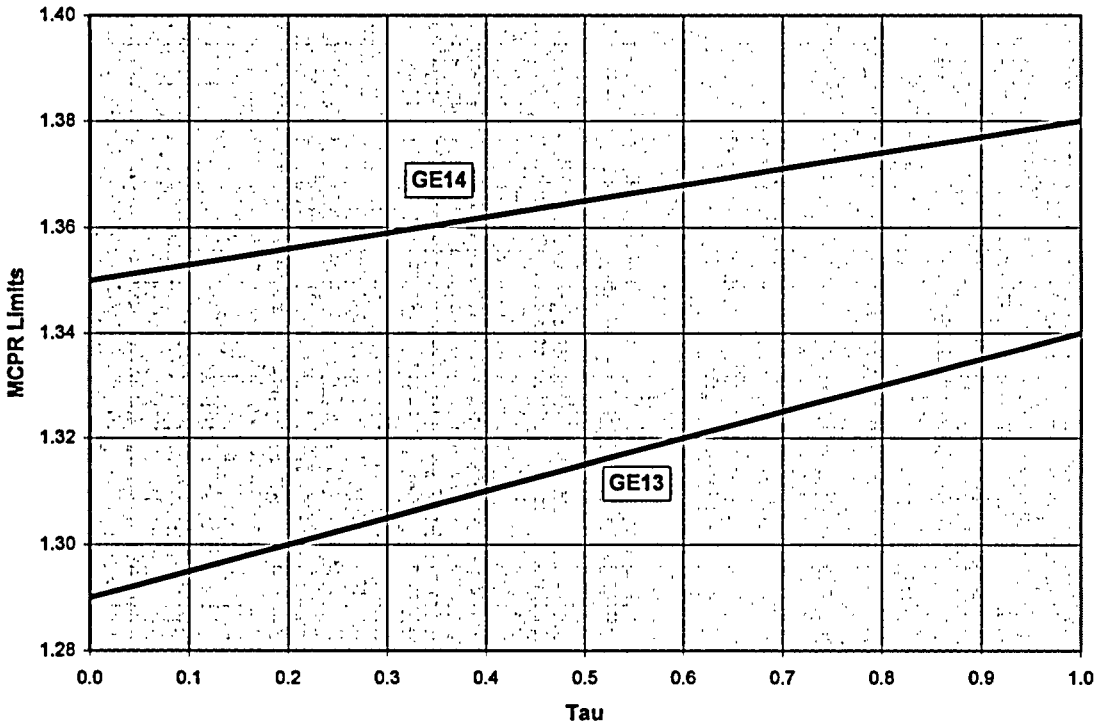
$K_P = A + B (P_0 - P)$

P	A	B	P_0
$28 \leq P \leq 100$	1.00	0.01000	100

P = Percent of Rated Core Power

FIGURE 3-3B

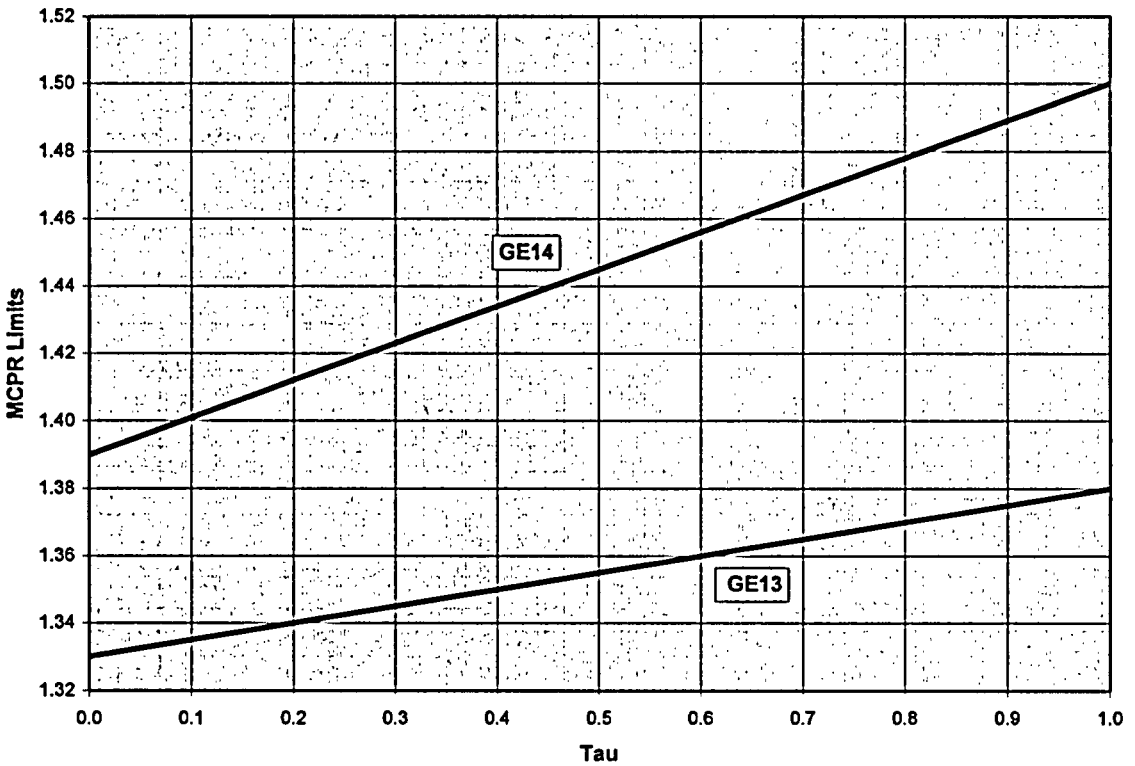
Power-Dependent MCPR Multiplier (K_P) versus Core Power
(Pressure Regulator Inoperable)



Tau	GE14	GE13
1.0	1.38	1.34
0.0	1.35	1.29

FIGURE 3-4A

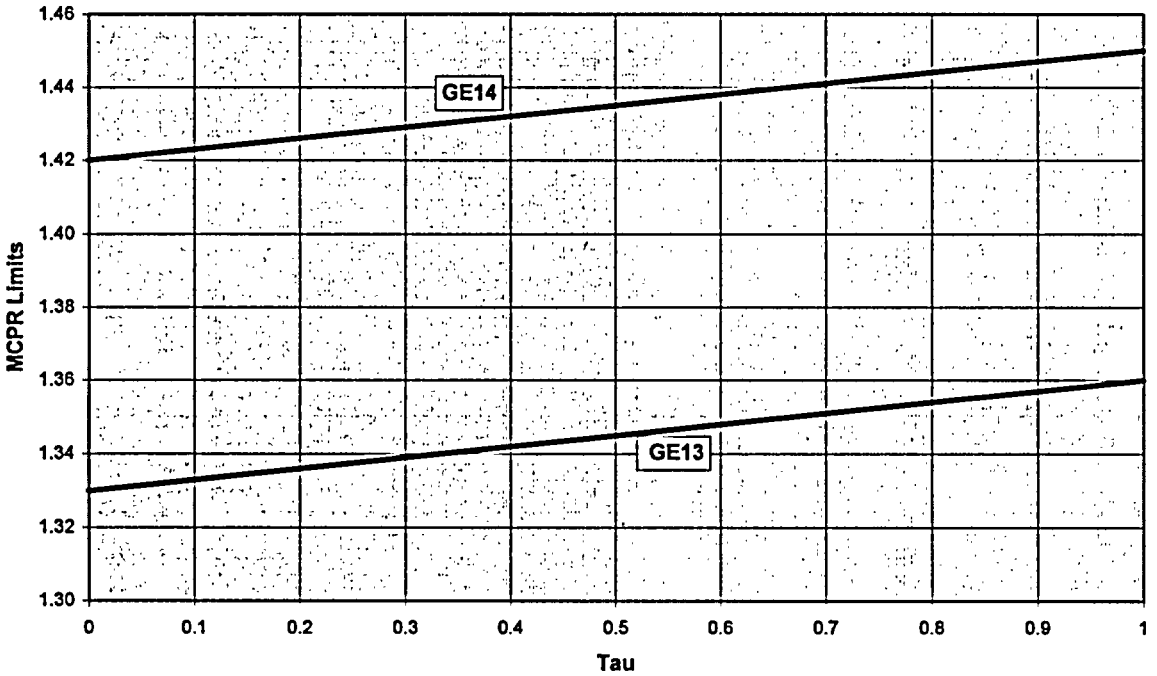
MCPR Limits versus Average Scram Time
(BOC to EOR-2000 MWd/st with EOC-RPT In Service and Turbine Bypass Valves Operable)



Tau	GE14	GE13
1.0	1.50	1.38
0.0	1.39	1.33

FIGURE 3-4B

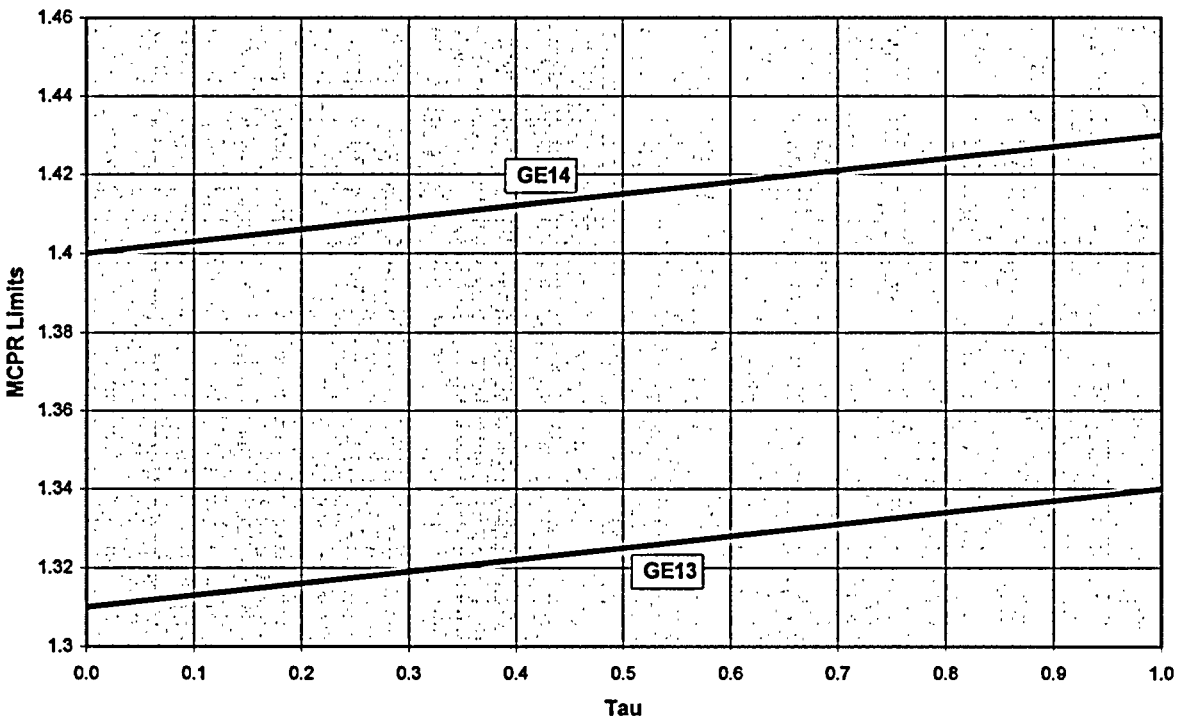
MCPR Limits versus Average Scram Time
(BOC to EOR-2000 MWd/st with EOC-RPT Out of Service and Turbine Bypass Valves Operable)



Tau	GE14	GE13
1.0	1.45	1.36
0.0	1.42	1.33

FIGURE 3-4C

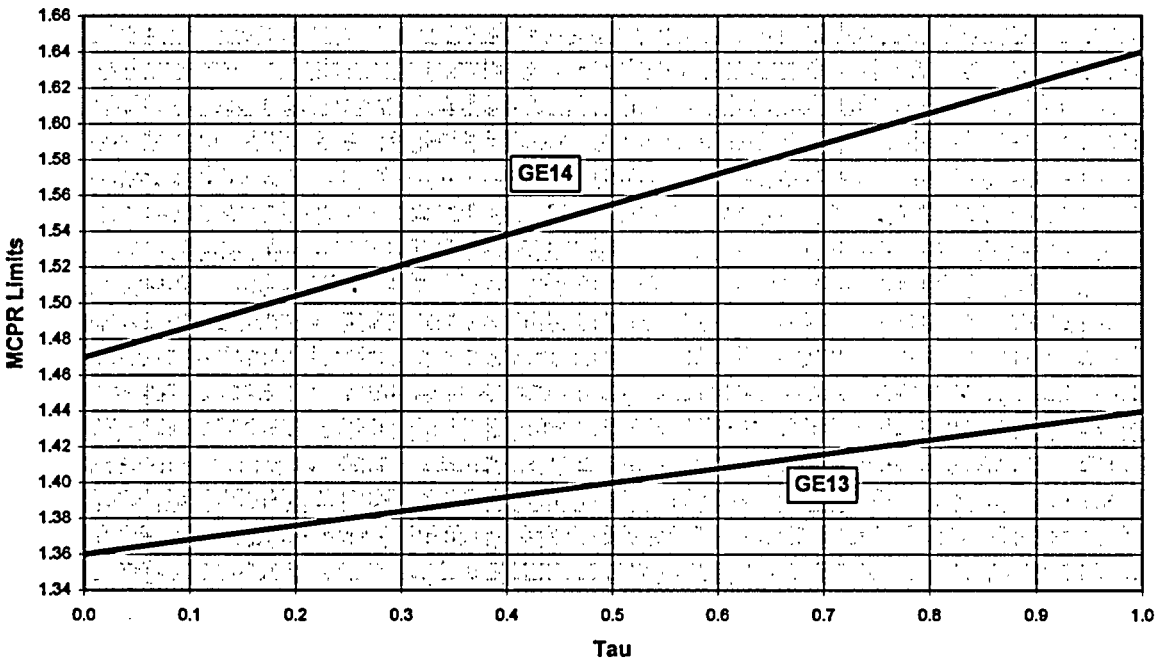
MCPR Limits versus Average Scram Time
(BOC to EEOC with EOC-RPT In Service and Turbine Bypass Valves Inoperable)



Tau	GE14	GE13
1.0	1.43	1.34
0.0	1.40	1.31

FIGURE 3-4D

MCPR Limits versus Average Scram Time
(EOR-2000 MWd/st to EEOC with EOC-RPT In Service and Turbine Bypass Valves Operable)



Tau	GE14	GE13
1.0	1.64	1.44
0.0	1.47	1.36

FIGURE 3-4E

MCPR Limits versus Average Scram Time
(EOR-2000 MWd/st to EEOC with EOC-RPT Out of Service and Turbine Bypass Valves Operable)

4.0 PBDA AMPLITUDE SETPOINT

The amplitude trip setpoint in the Period Based Detection Algorithm in the OPRM system shall not exceed the values reported in the Table below. This applies to instruments 2C51K615 A, B, C, and D. Projected Figure of Merit (FOM) value(s) throughout the cycle will be supplied by the Hatch Core Analysis Group.

OLMCPR	0.0 ≤ FOM ≤92.1	92.1 < FOM ≤96.9	96.9 < FOM ≤ 102.4	102.4 < FOM ≤ 108.0
1.29	1.12	1.10	1.09	1.08
1.30	1.13	1.11	1.09	1.08
1.31	1.13	1.11	1.09	1.08
1.32	1.13	1.11	1.09	1.09
1.33	1.14	1.12	1.10	1.09
1.34	1.14	1.12	1.10	1.09
1.35	1.14	1.12	1.10	1.09
1.36	1.15	1.12	1.10	1.10
1.37	1.15	1.13	1.11	1.10
1.38	1.15	1.13	1.11	1.10
1.39	1.15	1.13	1.11	1.10
1.40	1.15	1.14	1.11	1.10
1.41	1.15	1.14	1.12	1.11
1.42	1.15	1.14	1.12	1.11
1.43	1.15	1.14	1.12	1.11
1.44	1.15	1.15	1.12	1.11
1.45	1.15	1.15	1.13	1.12

5.0 REFERENCES

1. "General Electric Standard Application for Reactor Fuel," NEDE-24011-P-A-14, June 2000, and the US Supplement, NEDE-24011-P-A-14-US, June 2000.

2. "Supplemental Reload Licensing Report for Hatch 2 Reload 17 Cycle 18," Global Nuclear Fuel document 0000-0007-0430-SRLR, Revision 1, March 2003.

3. SNC Memo CAH-NF-2410, "H2C18 SNC ARTS Analyses," W. R. Mertz to K. S. Folk, March 11, 2003.