CORE OPERATING LIMITS REPORT

FOR

PEACH BOTTOM ATOMIC POWER STATION UNIT 3

RELOAD 9, CYCLE 10

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INTRODUCTION AND SUMMARY

This report provides the cycle-specific parameter limits for: Average Planar Linear Heat Generation Rate (APLHGR); Minimum Critical Power Ratio (MCPR); power and flow dependent adjustments to MCPR and APLHGR; Linear Heat Generation Rate (LHGR); Rod Block Monitor Power Biased Setpoints for Peach Bottom Atomic Power Station Unit 3, Cycle 10, Reload 9. These values have been determined using NRC-approved methodology and are established such that all applicable limits of the plant safety analysis are met.

This report is submitted in accordance with Technical Specification 6.9.1.e of Reference (1). Preparation of this report was performed in accordance with PECo Fuel and Services Section Procedure FM-105.

ROD BLOCK MONITOR SETPOINTS

The RBM power-biased setpoints for use in Technical Specification 3.2.C is given in Table 3 per Reference (5).

APLHGR LIMITS

The limiting APLHGR value for the most limiting lattice (excluding natural uranium) of each fuel type as a function of average planar exposure is given in Figures 1 through 8. These figures are used when hand calculations are required as specified in Technical Specification 3.5.I. These values were obtained from Rererences (3) and (8). The Siemens Power Corporation (SPC) Lead Fuel Assemblies (LFAs) will be monitored to modified GE9B-P8DWB320-10GZ MAPLHGR limits per Reference (7). The APLHGR power and flow multipliers are given in Figures 14 and 15, respectively.

MCPR LIMITS

The MCPR value for use in Technical Specification 3.5.K for each fuel type is given in Figures 9 through 13 and in Tables 1 and 2. Table 1 is used when the requirement of 4.5.K.2.a is met. When this requirement cannot be met, the Operating Limit MCPR values as a function of TAU are given in Figures 9 through 13. At times when the surveillance requirement of specification 4.5.K.2 is not performed Table 2 is used. These values are documented in References (2) and (7). The MCPR(p) power adjustment factor for use in Technical Specification 3.5.K is given in Figure 16 and the MCPR(f) flow dependent limit is given in Figure 17. The MCPR(p) values below the turbine scram bypass power were taken from Reference (6). The values are based on a 4 inch increase in the analytical limit for the high (L8) water level trip setpoint.

OVERALL GOVERNING MCPR AND MAPLHGR LIMITS

At any given power/flow state, all four (P/F) limits are to be determined: MAPFAC(p), MAPFAC(f), MCPR(p) and MCPR(f) Figures 14, 15, 16 and 17, respectively (per Reference (5)). The most limiting MCPR value as determined by Technical Specification 3.5.K.2 or 3.5.K.3, or MCPR(f) or by the application of MCPR(p) shall be the governing limit. The most limiting APLHGR as determined by application of MAPLHGR(p) and MAPLHGR(f) shall be the governing limit. See Reference (5) for further details.

LINEAR HEAT GENERATION RATES

The LHGR value for use in Technical Specification 3.5.J for each fuel type is given in Table 4. These values are documented in References (4)and (7).

REFERENCES

1) "Technical Specifications and Bases for Peach Bottom Atomic Power Station Unit 3", Docket No. 50-278, Appendix A to License No. DPR-56.

2) "Supplemental Reload Licensing Report for Peach Bottom Atomic Power Station Unit 3, Reload 9, Cycle 10", General Electric Company Document No. 23A7215, Rev. 0, October 1993.

3) "Loss-of-Coolant Accident Analyses for Peach Bottom Atomic Power Station Unit 3", Supplement 1, NEDE-24082-P-2, Revision 1, January 1988 as amended.

4) "General Electric Standard Application for Reactor Fuel", NEDE-24011-P-A-10, February 1991; and NEDE-24011-P-A-10-US, March 1991.

5) "MELLL and ARTS Improvement Program Analysis for Peach Bottom Atomic Power Station Units 2 and 3", NEDC-32162P Revision 1, February 1993.

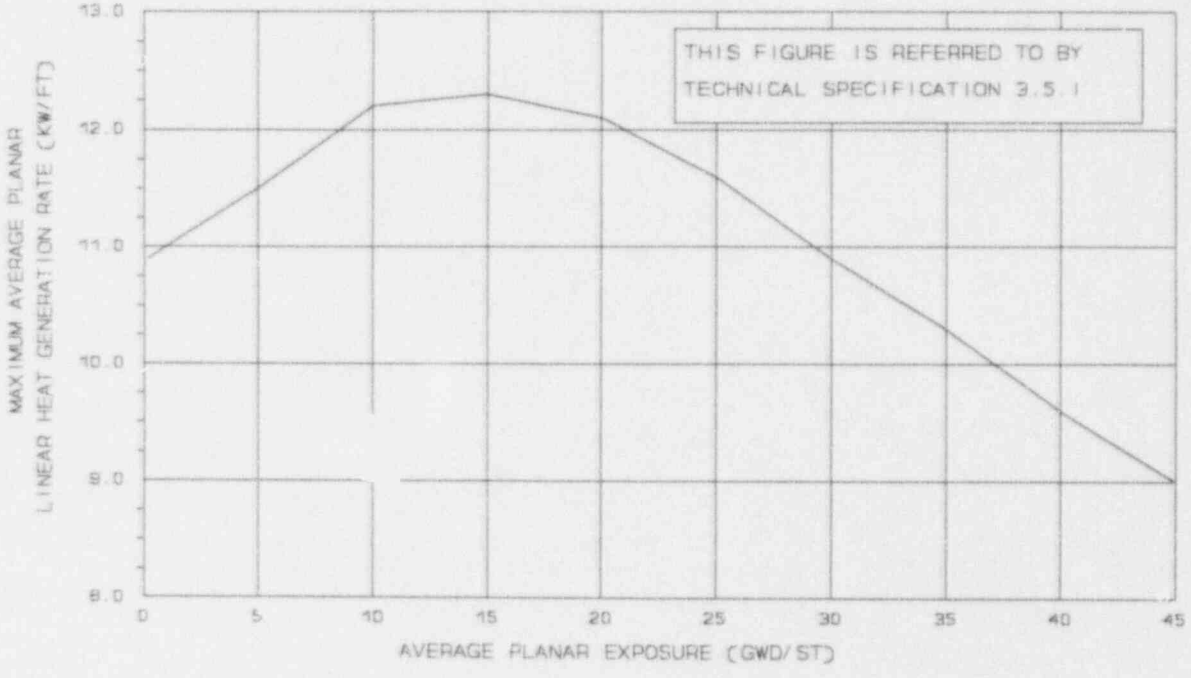
6) "Level 8 Analytical Limit Increase Engineering Report for Peach Bottom 2 and 3", NEDC-32231P, August 1993.

7) Siemens Power Corporation Document, "Peach Bottom Unit 3 9X9-A Lead Fuel Assembly Safety Analysis Report", EMF-93-115(P), July, 1993.

8) "Lattice-Dependent MAPLHGR Report for Peach Bottom Atomic Power Station Unit 3 Reload 9 Cycle 10", 23A7215AA, Revision 0, October, 1993.

Figure 1

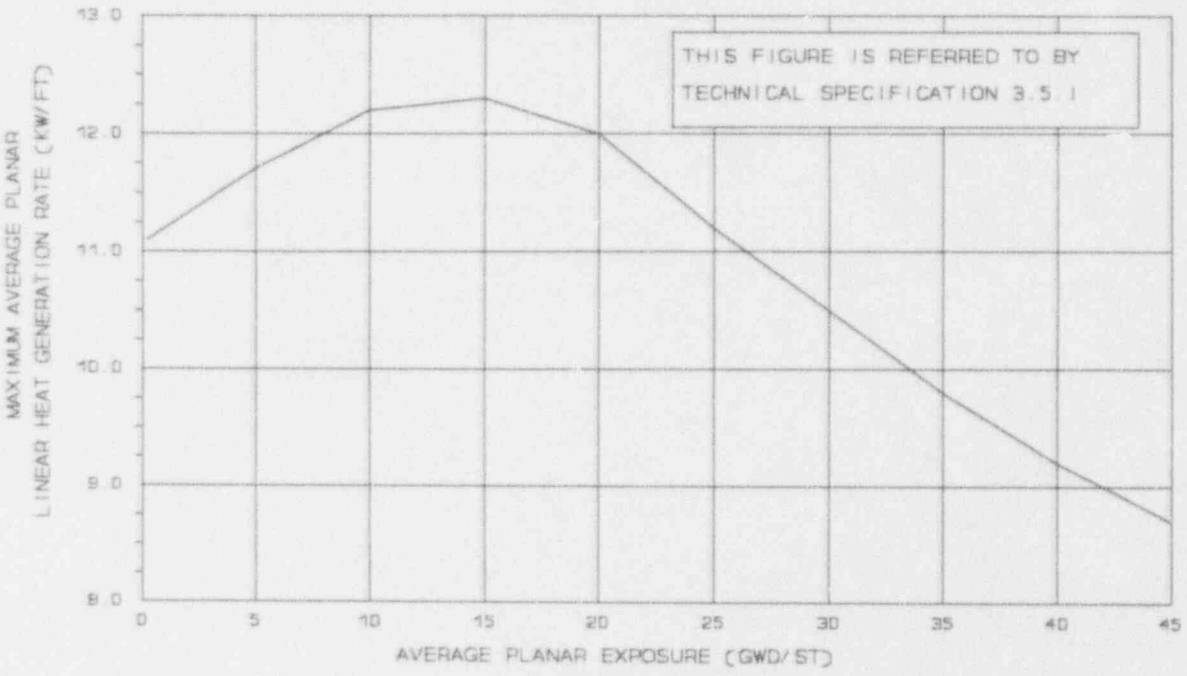
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE BP8DRB299 (GE7B, BP8x8R)



Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.2	10.90	25.0	11.60
1.0	11.00	30.0	11.90
5.0	11.50	35.0	10.30
10.0	12.20	40.0	9.60
15.0	12.30	45.0	9.00
20.0	12.10		

Figure 2

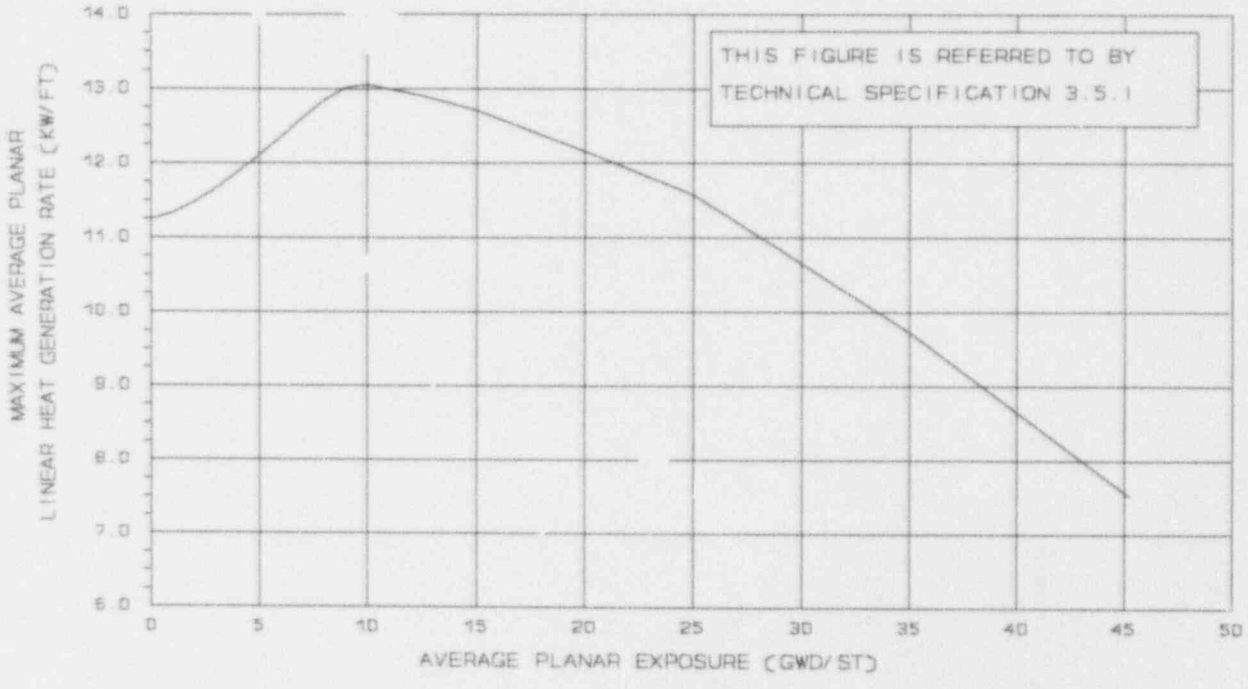
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE BP8DRB299H (GE7B, BP8x8R)



Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.2	11.10	25.0	11.20
1.0	11.20	30.0	10.50
5.0	11.70	35.0	9.80
10.0	12.20	40.0	9.20
15.0	12.30	45.0	8.70
20.0	12.00		

Figure 3

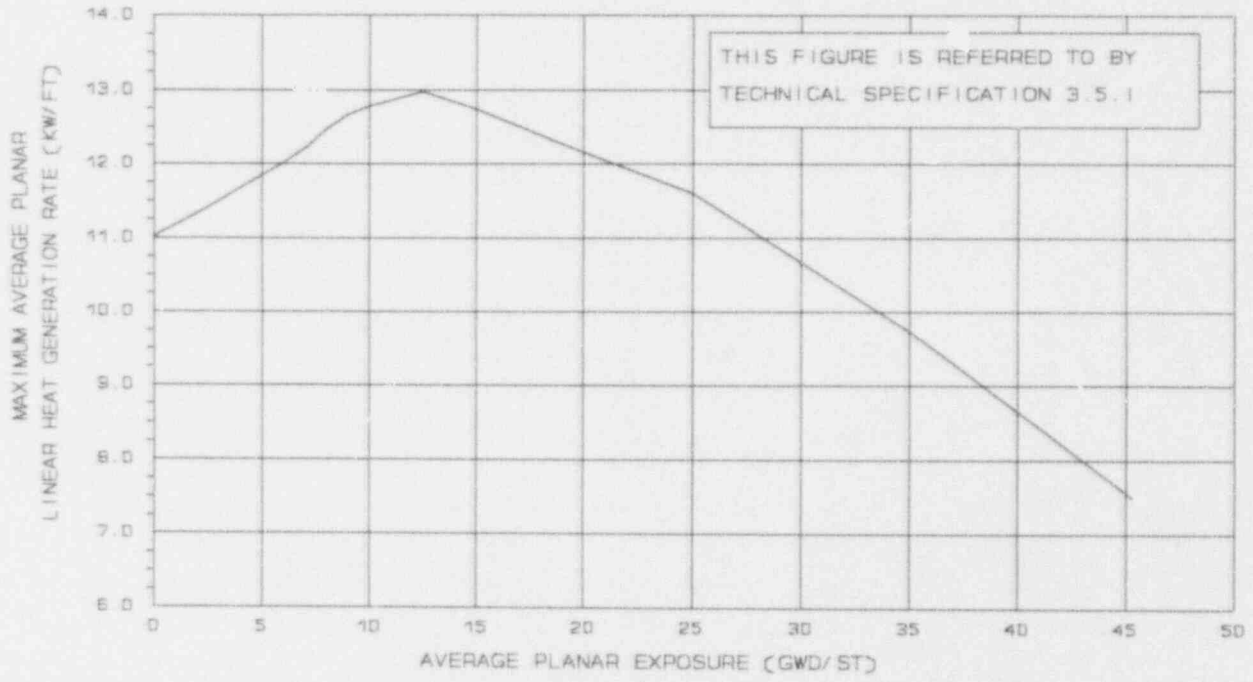
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE P8DQB319-9GZ (GE8B, GE8x8EB)



Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.0	11.25	6.0	12.34	20.0	12.16
0.2	11.26	7.0	12.60	25.0	11.58
1.0	11.33	8.0	12.84	35.0	9.73
2.0	11.48	9.0	13.01	45.0	7.58
3.0	11.66	10.0	13.06	45.25	7.52
4.0	11.87	12.5	12.91		
5.0	12.10	15.0	12.71		

Figure 4

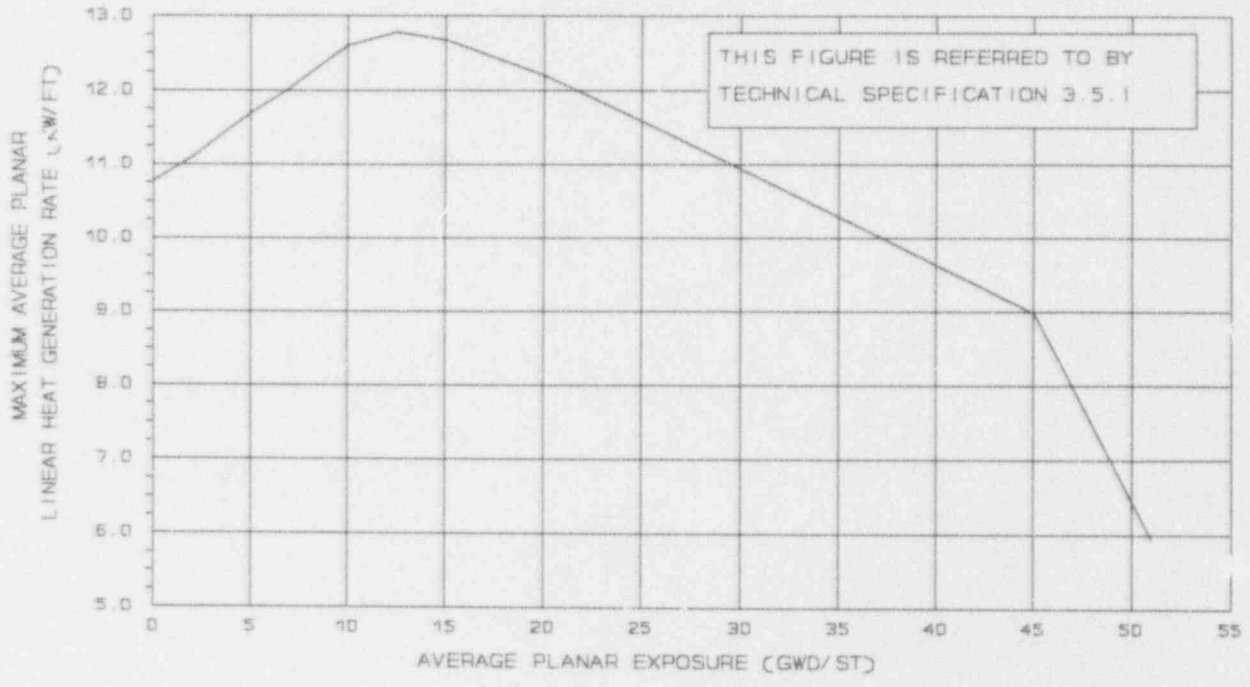
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE P8DQB321-11GZ (GE8B, GE8x8EB)



Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.0	11.00	6.0	12.01	20.0	12.16
0.2	11.06	7.0	12.21	25.0	11.60
1.0	11.17	8.0	12.47	35.0	9.74
2.0	11.33	9.0	12.66	45.0	7.57
3.0	11.50	10.0	12.78	45.29	7.50
4.0	11.67	12.5	12.98		
5.0	11.84	15.0	12.74		

Figure 5

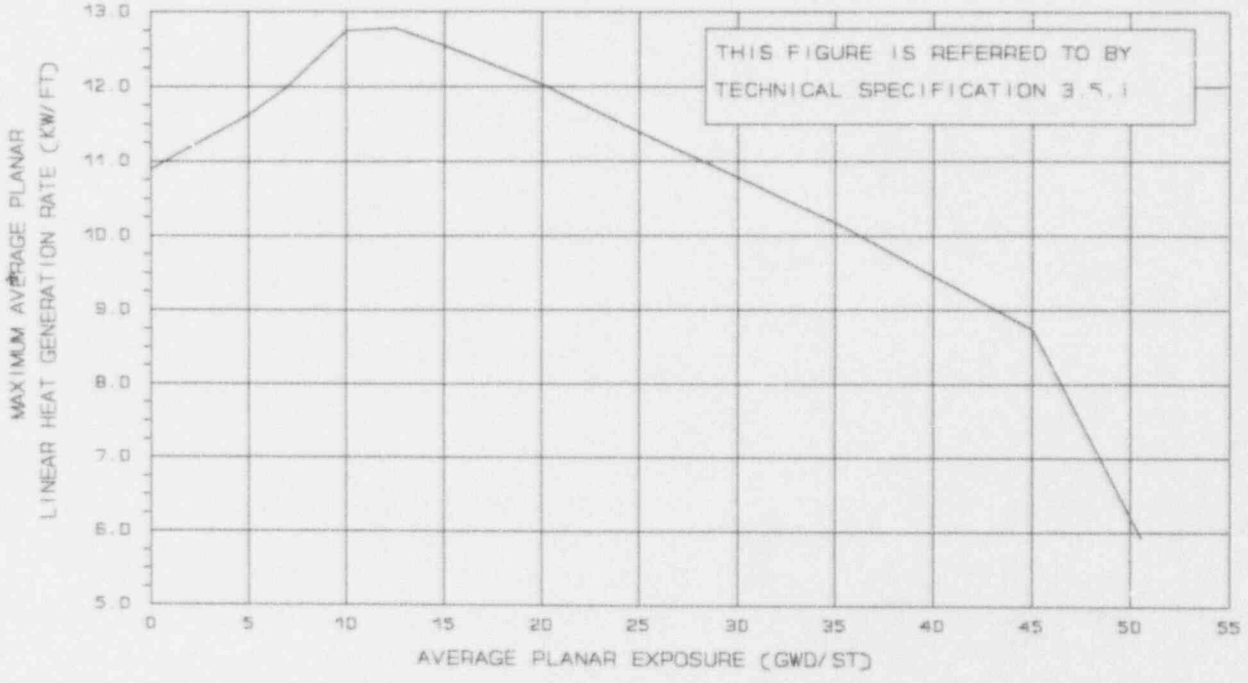
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE P8DWB324-10GZ1 (GE9B, GE8x8NB)



Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.0	10.77	6.0	11.85	20.0	12.21
0.2	10.80	7.0	12.02	25.0	11.58
1.0	10.91	8.0	12.21	35.0	10.29
2.0	11.09	9.0	12.40	45.0	8.98
3.0	11.29	10.0	12.60	50.99	5.95
4.0	11.50	12.5	12.78		
5.0	11.69	15.0	12.68		

Figure 6

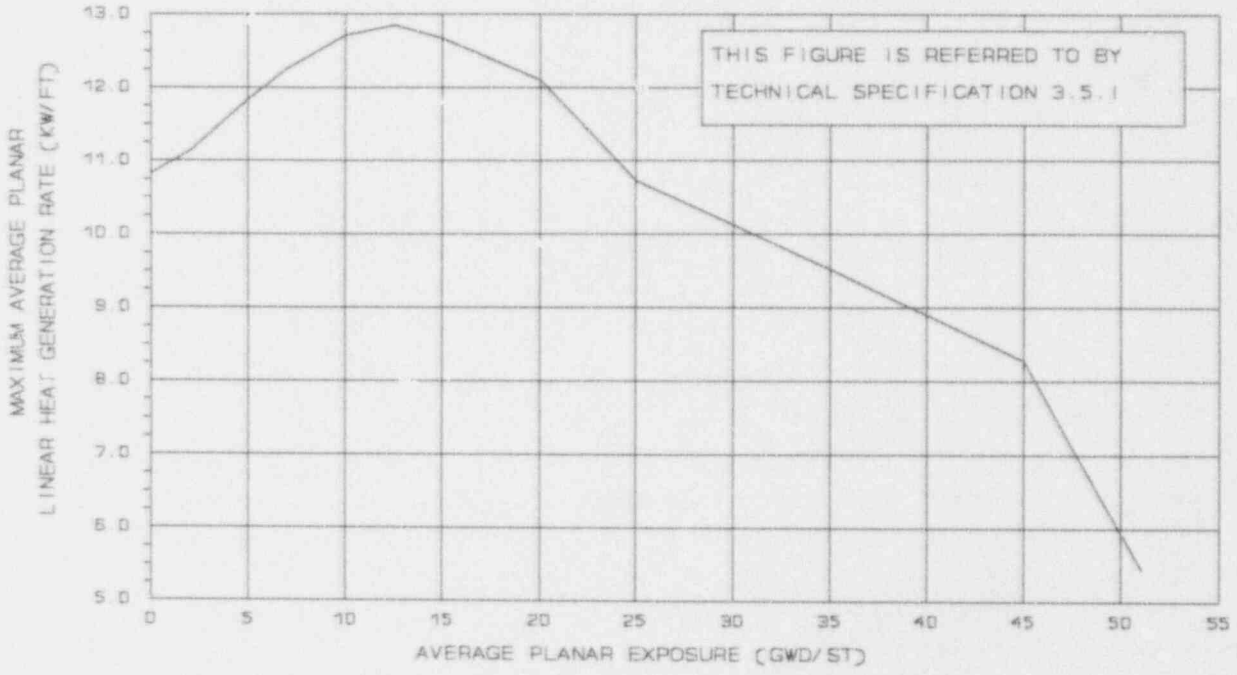
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE P8DWB328-11GZ (GE9B, GE8x8NB)



Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.0	10.89	6.0	11.77	20.0	12.03
0.2	10.97	7.0	11.99	25.0	11.39
1.0	11.06	8.0	12.28	35.0	10.18
2.0	11.19	9.0	12.56	45.0	8.75
3.0	11.33	10.0	12.75	50.56	5.93
4.0	11.47	12.5	12.78		
5.0	11.62	15.0	12.55		

Figure 7

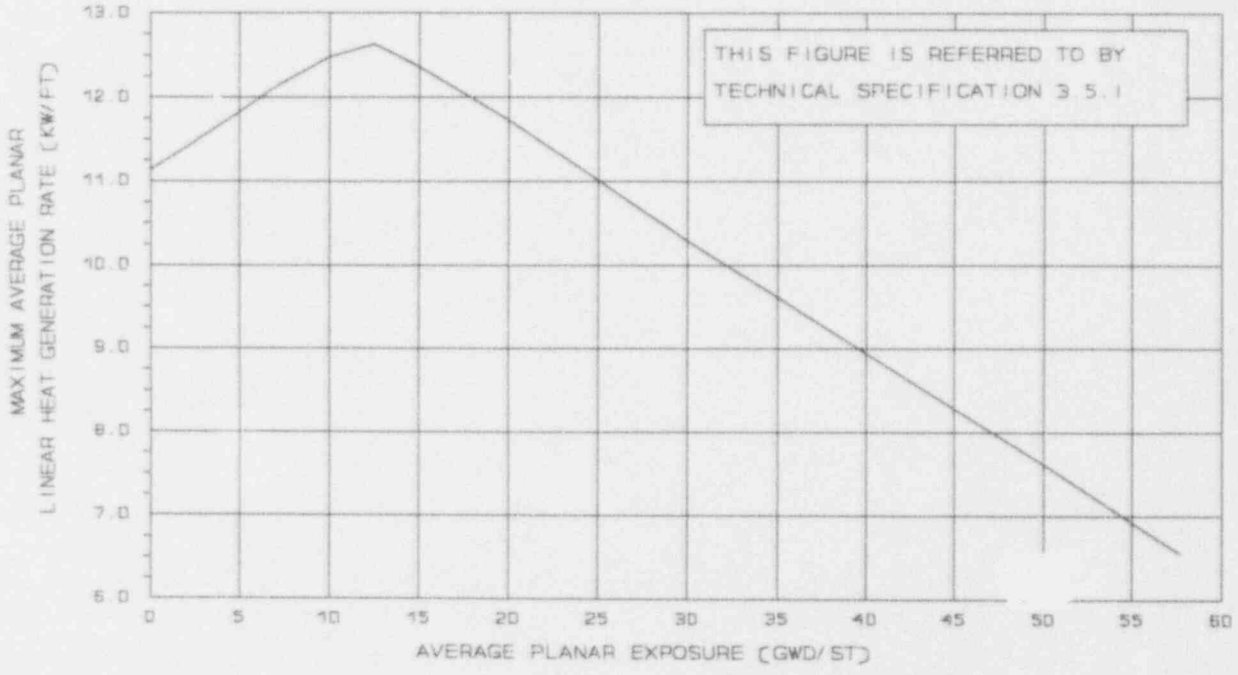
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE SPC 9x9-A (LFA)



Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.0	10.82	6.0	12.11	20.0	12.11
0.2	10.85	7.0	12.26	25.0	10.74
1.0	10.95	8.0	12.42	35.0	9.53
2.0	11.13	9.0	12.56	45.0	8.29
3.0	11.34	10.0	12.71	51.06	5.45
4.0	11.58	12.5	12.85		
5.0	11.83	15.0	12.67		

Figure 8

MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE P9HUB367-11GZ (GE11)



Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.0	11.14	7.0	12.13	25.0	11.00
0.2	11.18	8.0	12.26	30.0	10.29
1.0	11.27	9.0	12.36	35.0	9.61
2.0	11.40	10.0	12.48	40.0	8.94
3.0	11.53	12.5	12.64	45.0	8.28
4.0	11.67	15.0	12.37	50.0	7.62
5.0	11.82	17.5	12.07	55.0	6.93
6.0	11.97	20.0	11.73	57.64	6.56

FIGURE 9

MCPR vs. TAU
FUEL TYPE BP8x8R (GE7B)
(INCREASED CORE FLOW AND FEEDWATER TEMPERATURE REDUCTION)

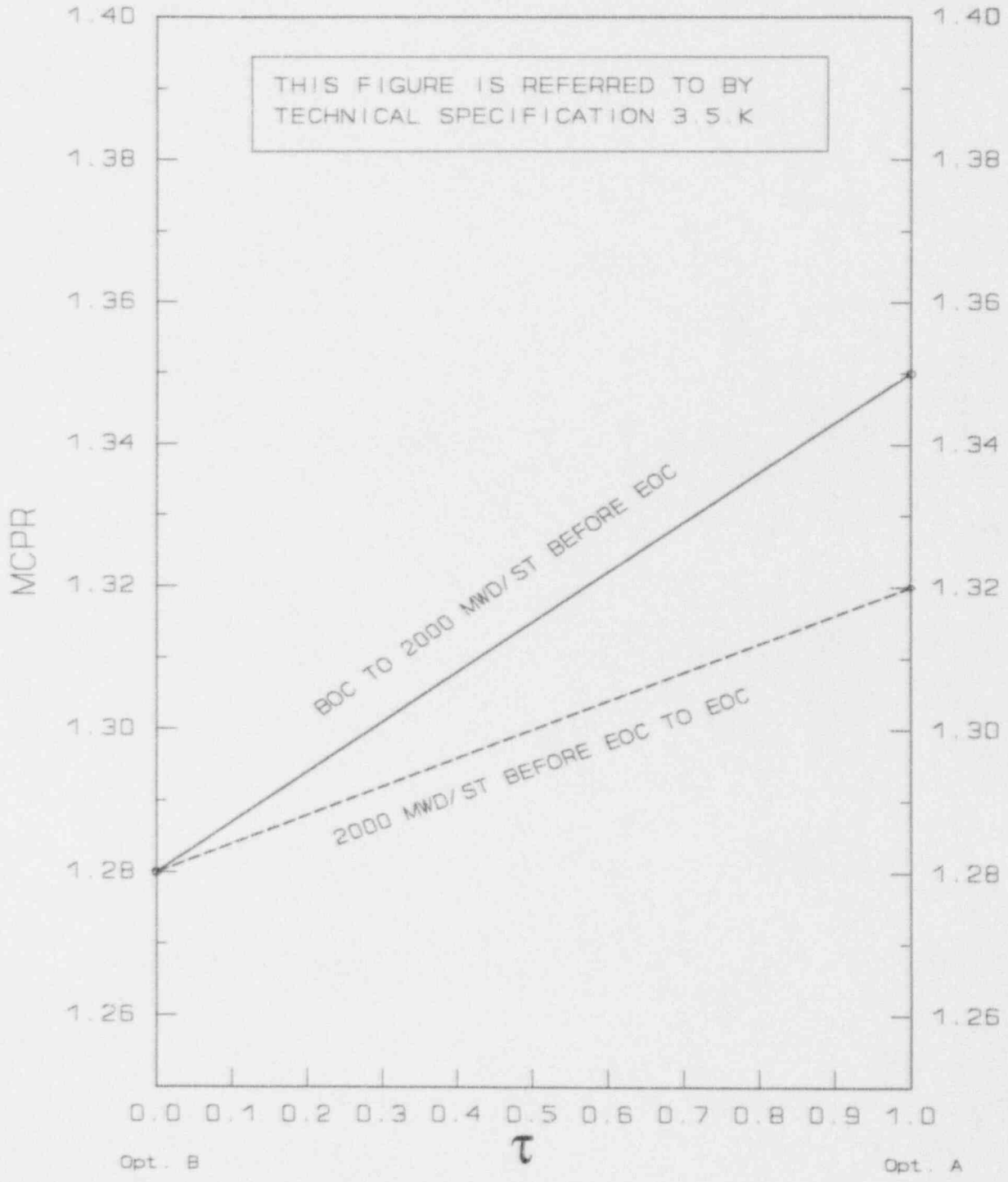


FIGURE 10

MCPR vs. TAU
FUEL TYPE GE8x8EB (GE8B)
(INCREASED CORE FLOW AND FEEDWATER TEMPERATURE REDUCTION)

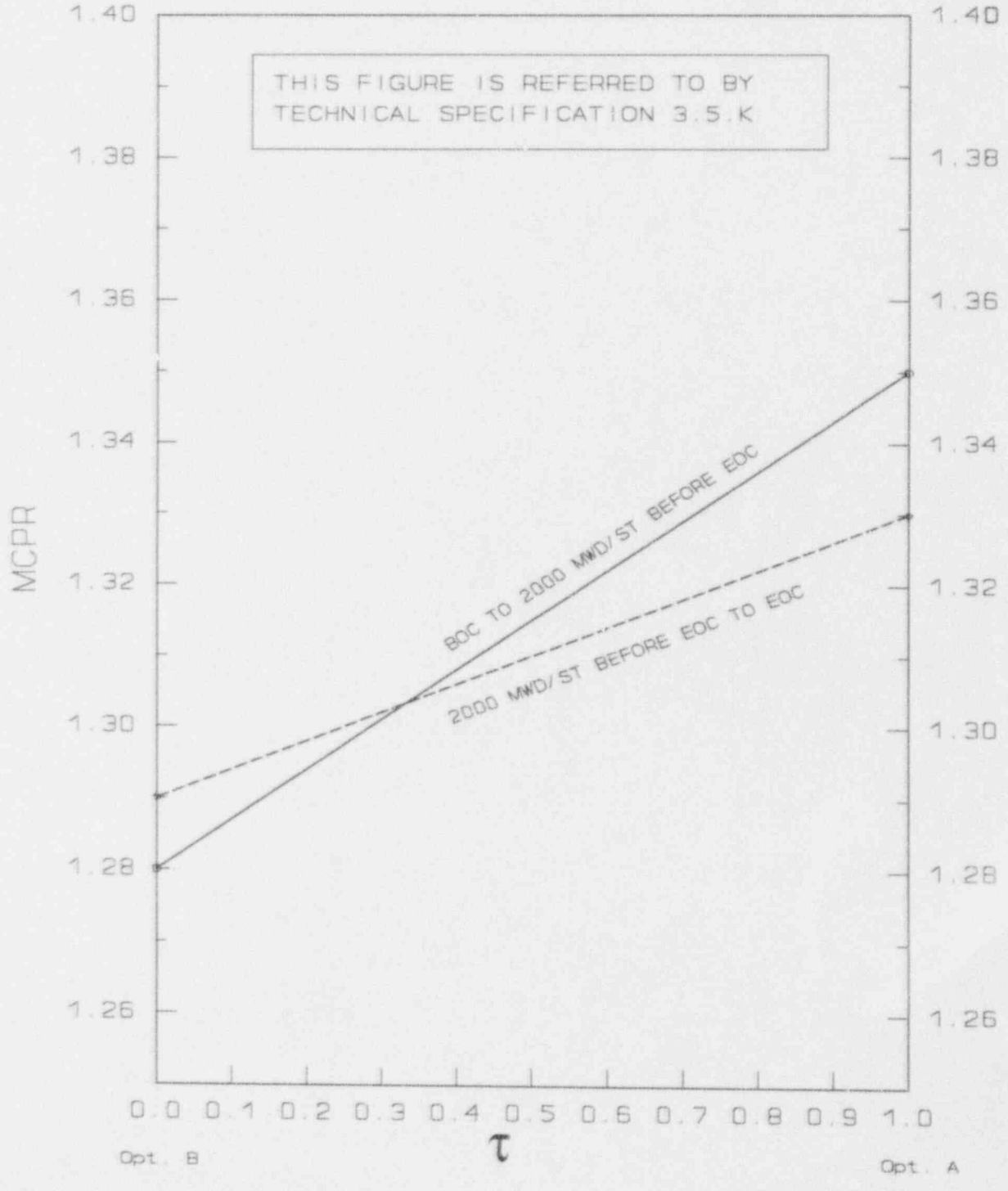


FIGURE 11

MCPR vs. TAU
FUEL TYPE GE8x8NB (GE9B)
(INCREASED CORE FLOW AND FEEDWATER TEMPERATURE REDUCTION)

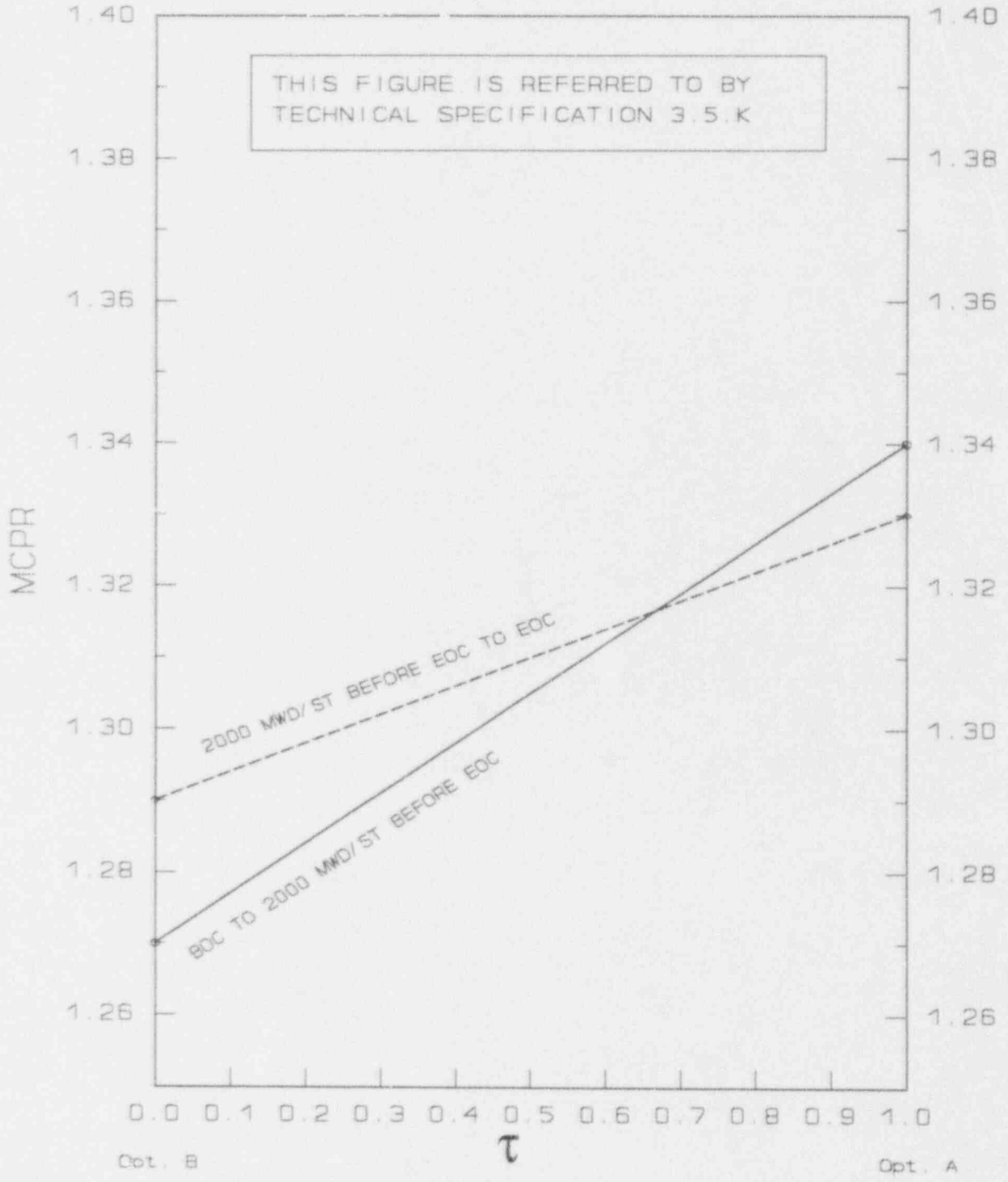


FIGURE 12

MCPR vs. TAU
FUEL TYPE SPC 9x9-A (LFA)
(INCREASED CORE FLOW AND FEEDWATER TEMPERATURE REDUCTION)

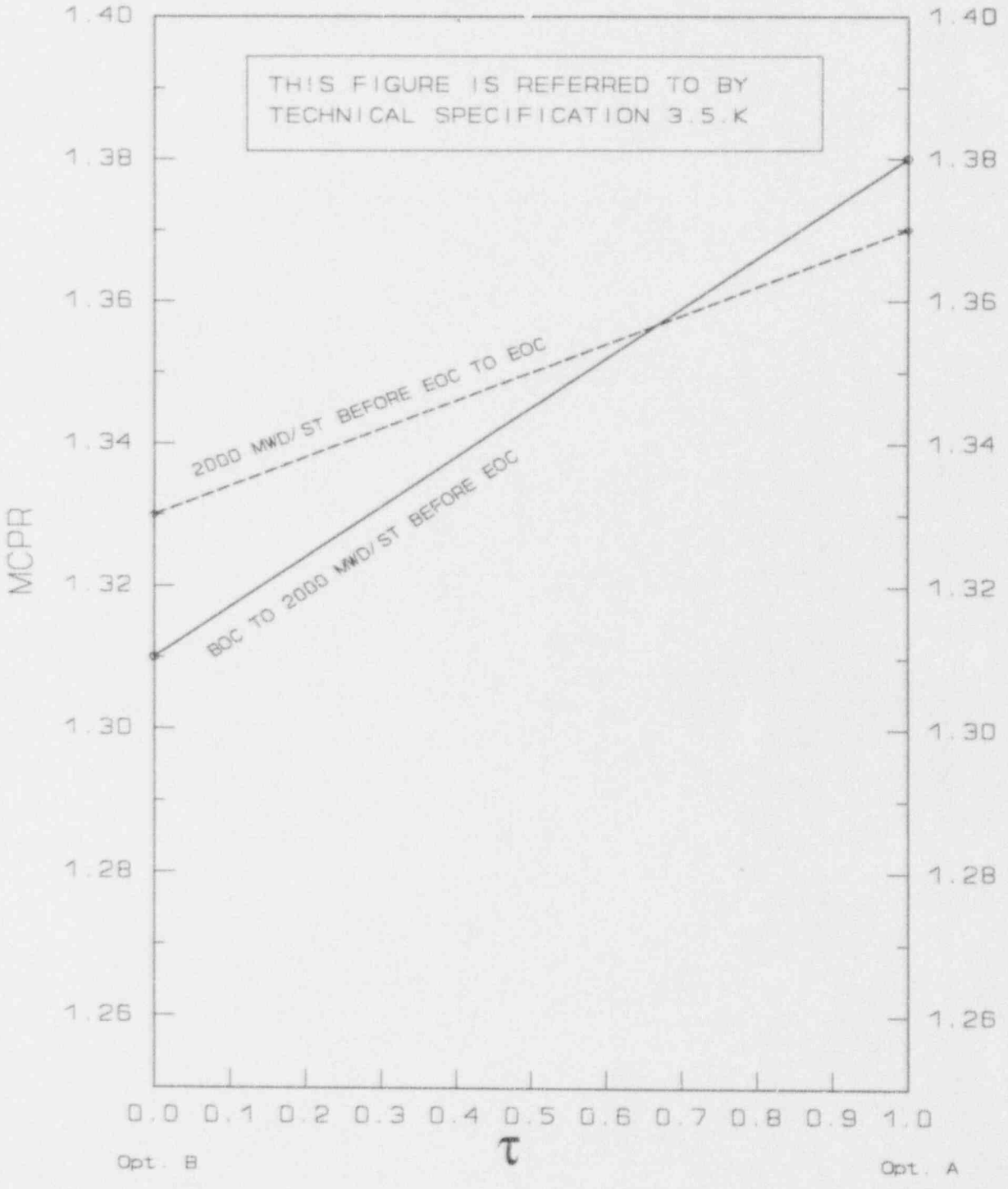


FIGURE 13

MCPR vs. TAU
FUEL TYPE GE11
(INCREASED CORE FLOW AND FEEDWATER TEMPERATURE REDUCTION)

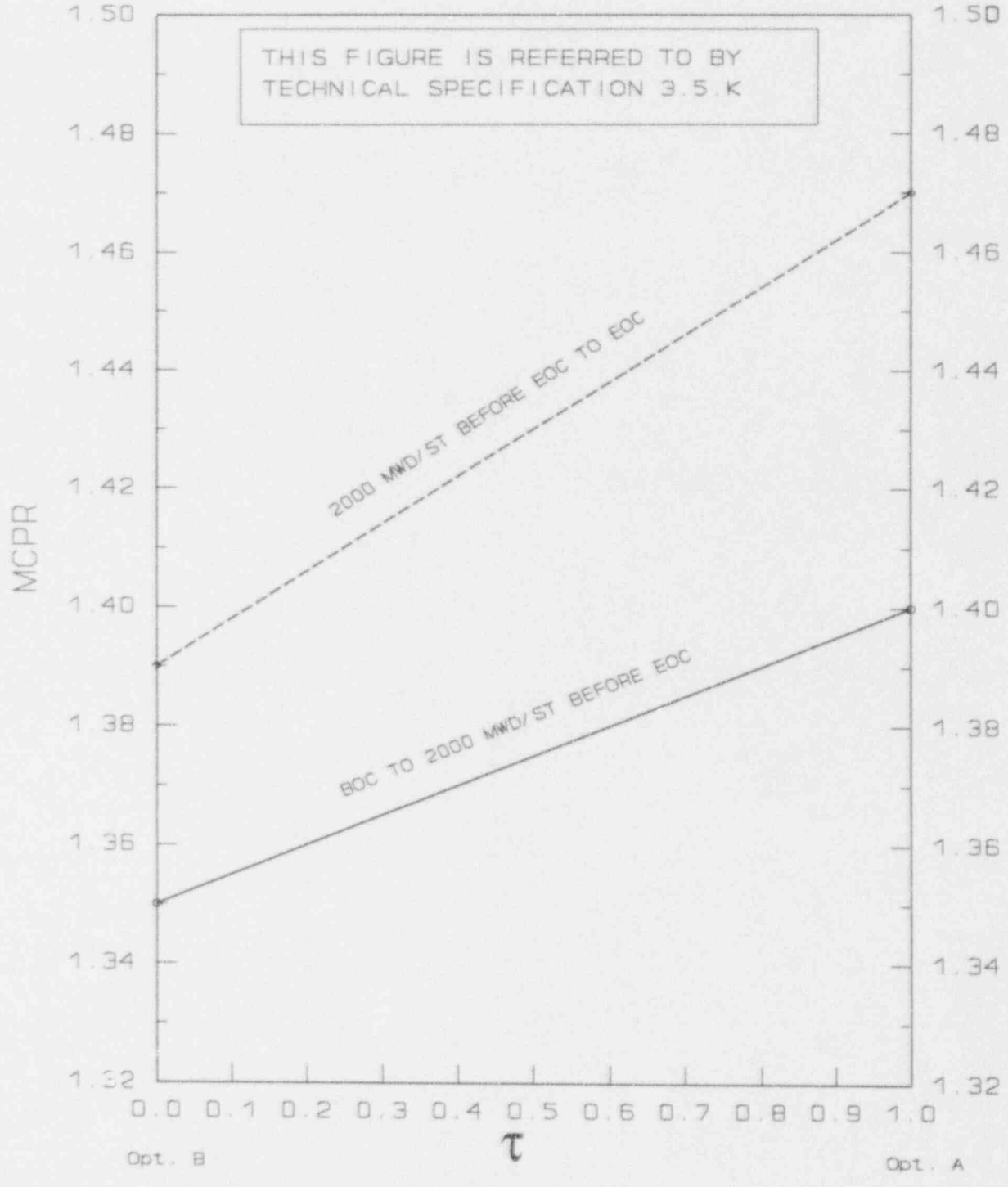


FIGURE 14

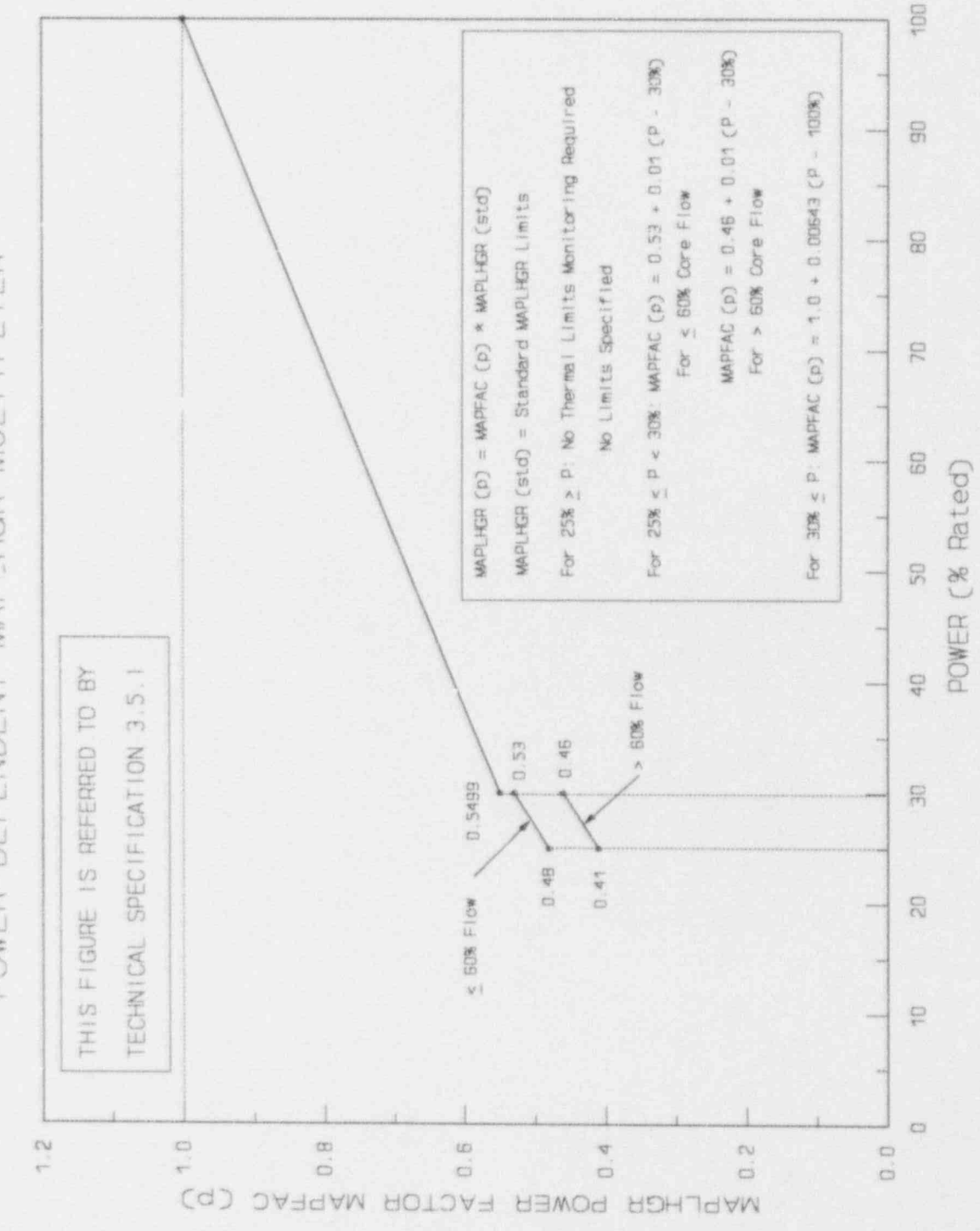

PEACH BOTTOM UNIT 3 CYCLE 10
POWER-DEPENDENT MAPLHGR MULTIPLIER
THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.5.1
MAPLHGR (p) = MAPFAC (p) * MAPLHGR (std)
MAPLHGR (std) = Standard MAPLHGR Limits
For 25% ≥ P: No Thermal Limits Monitoring Required
No Limits Specified
For 25% ≤ P < 30%: MAPFAC (p) = 0.53 + 0.01 (P - 30%)
For ≤ 60% Core Flow
MAPFAC (p) = 0.46 + 0.01 (P - 30%)
For > 60% Core Flow
For 30% ≤ P: MAPFAC (p) = 1.0 + 0.00643 (P - 100%)
0.5499
0.53
0.46
0.48
0.41
≤ 60% Flow
> 60% Flow
MAPLHGR POWER FACTOR MAPFAC (p)
POWER (% Rated)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
10
20
30
40
50
60
70
80
90
100

FIGURE 15

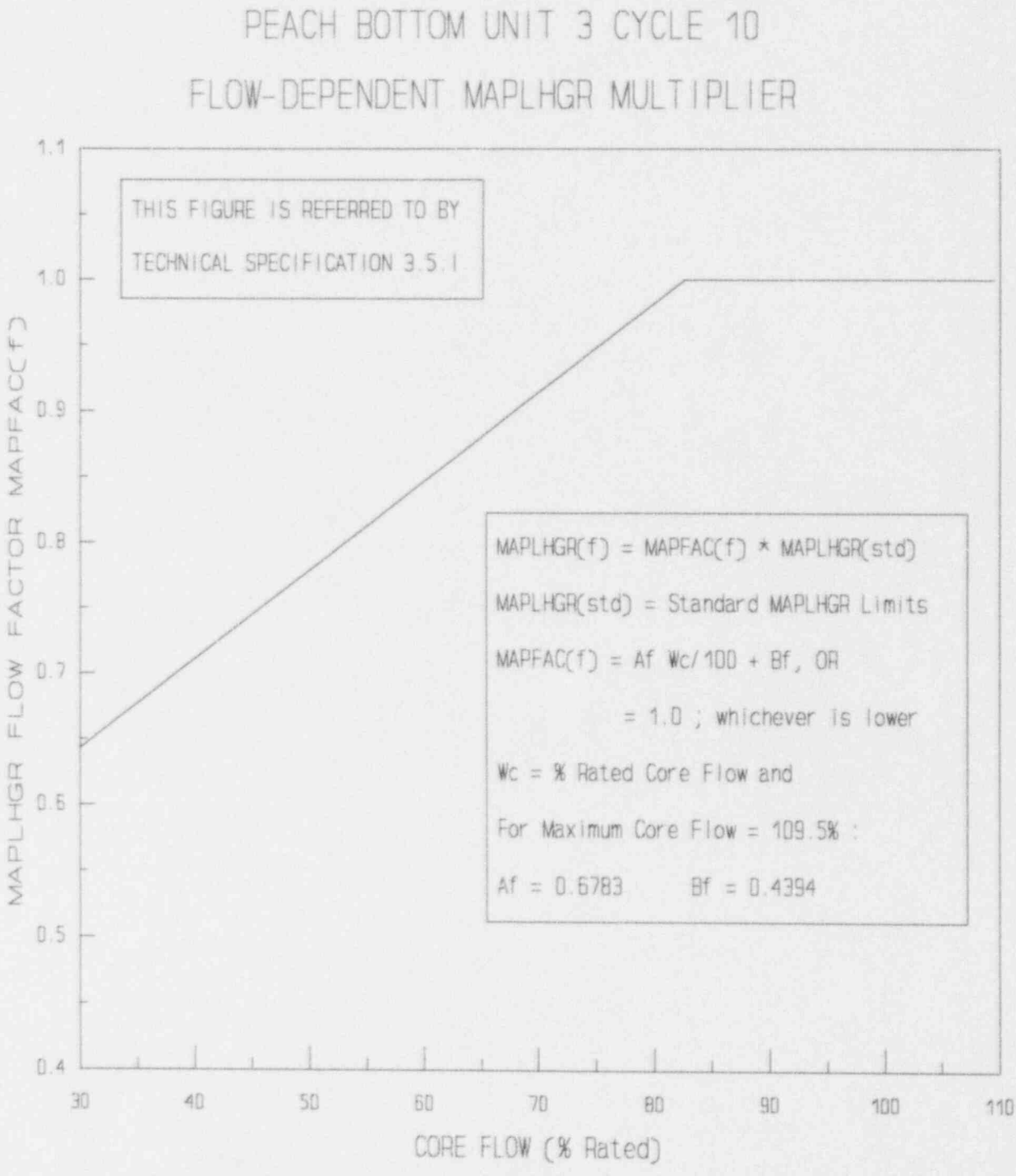

PEACH BOTTOM UNIT 3 CYCLE 10
FLOW-DEPENDENT MAPLHGR MULTIPLIER
THIS FIGURE IS REFERRED TO BY
TECHNICAL SPECIFICATION 3.5.1
MAPLHGR(f) = MAPFAC(f) * MAPLHGR(std)
MAPLHGR(std) = Standard MAPLHGR Limits
MAPFAC(f) = Af Wc/100 + Bf, OR
= 1.0 ; whichever is lower
Wc = % Rated Core Flow and
For Maximum Core Flow = 109.5% :
Af = 0.6783 Bf = 0.4394
MAPLHGR FLOW FACTOR MAPFAC(f)
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
30
40
50
60
70
80
90
100
110
CORE FLOW (% Rated)

FIGURE 16

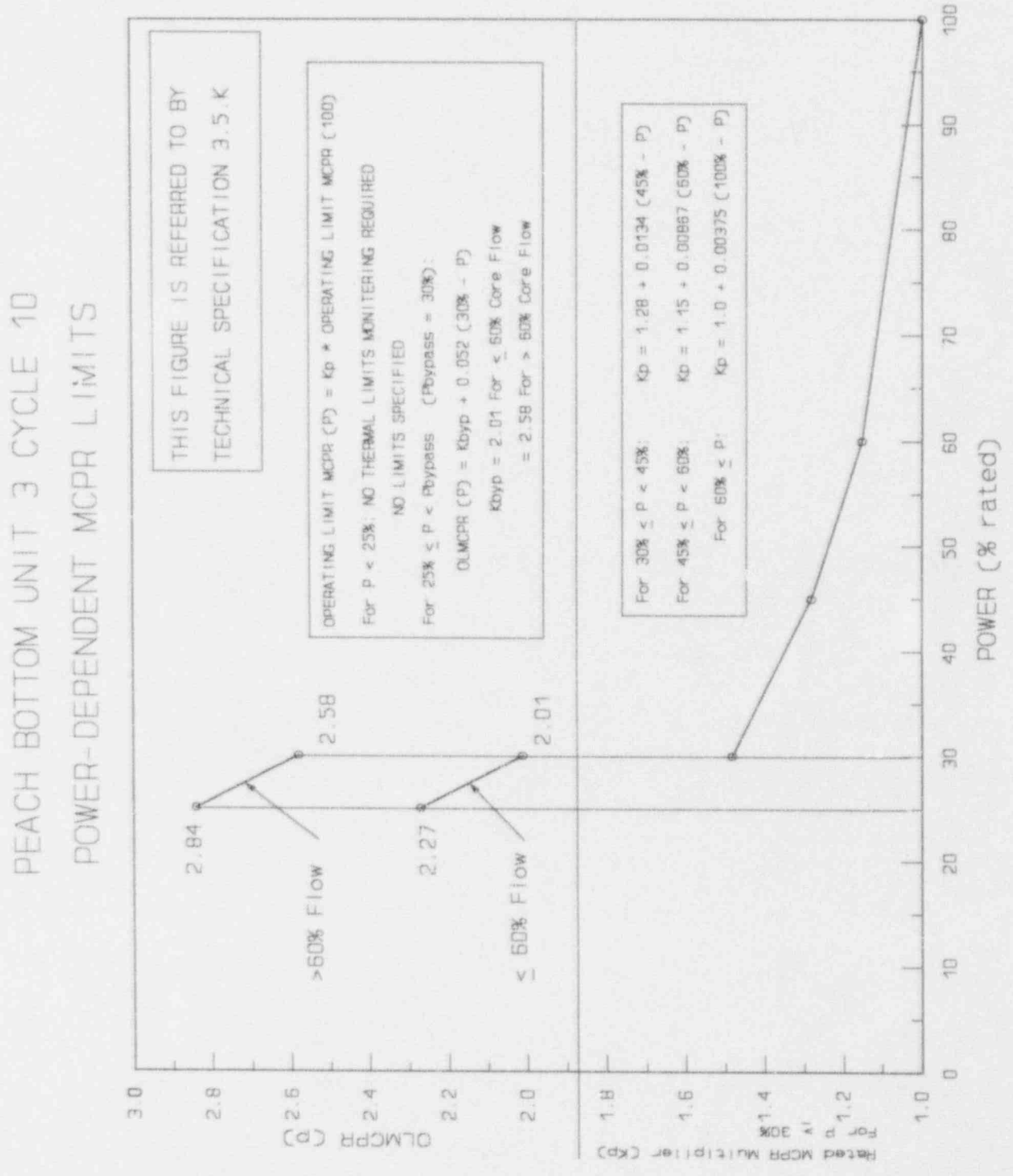

PEACH BOTTOM UNIT 3 CYCLE 10
POWER-DEPENDENT MCPR LIMITS
THIS FIGURE IS REFERRED TO BY TECHNICAL SPECIFICATION 3.5.K
OPERATING LIMIT MCPR (P) = Kp * OPERATING LIMIT MCPR (100)
For P < 25%, NO THERMAL LIMITS MONITERING REQUIRED
NO LIMITS SPECIFIED
For 25% ≤ P < Pbypass (Pbypass = 30%):
OLMCPR (P) = Kbyp + 0.052 (30% - P)
Kbyp = 2.01 For ≤ 60% Core Flow
= 2.58 For > 60% Core Flow
For 30% ≤ P < 45%: Kp = 1.28 + 0.0134 (45% - P)
For 45% ≤ P < 60%: Kp = 1.15 + 0.00867 (60% - P)
For 60% ≤ P: Kp = 1.0 + 0.00375 (100% - P)
2.84
2.58
2.27
2.01
>60% Flow
≤ 60% Flow
OLMCPR (a)
Rated MCPR Multiplier (Kp)
For P ≥ 30%
POWER (% rated)

FIGURE 17

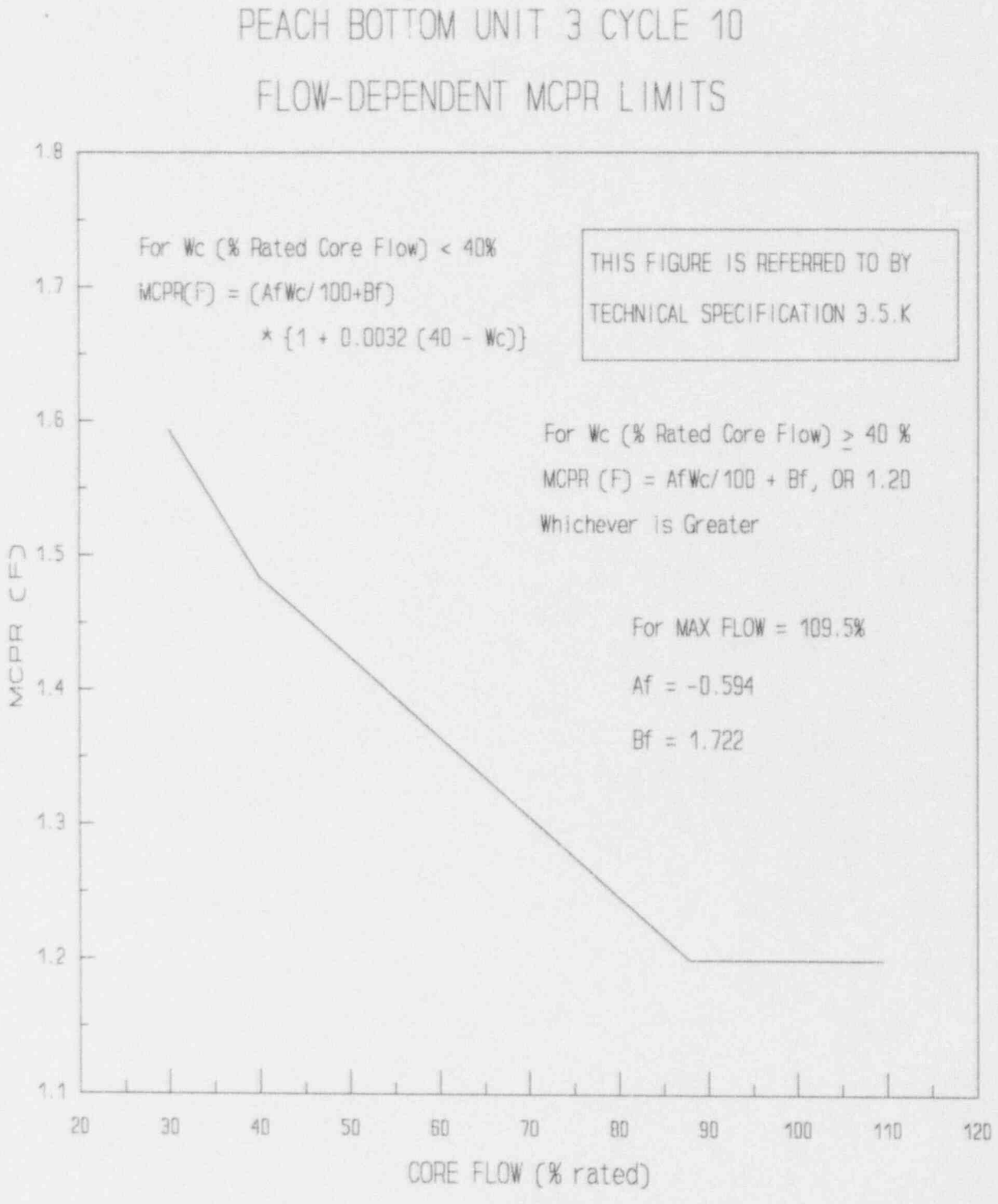

PEACH BOTTOM UNIT 3 CYCLE 10
FLOW-DEPENDENT MCPR LIMITS
For Wc (% Rated Core Flow) < 40%
MCPR(F) = (AfWc/100+Bf)
* {1 + 0.0032 (40 - Wc)}
THIS FIGURE IS REFERRED TO BY
TECHNICAL SPECIFICATION 3.5.K
For Wc (% Rated Core Flow) ≥ 40 %
MCPR (F) = AfWc/100 + Bf, OR 1.20
Whichever is Greater
For MAX FLOW = 109.5%
Af = -0.594
Bf = 1.722
MCPR (F)
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
20
30
40
50
60
70
80
90
100
110
120
CORE FLOW (% rated)

TABLE 1

OPERATING LIMIT MCPR VALUES FOR VARIOUS CORE EXPOSURES*

FUEL TYPE	MCPR OPERATING LIMIT** FOR INCREMENTAL CYCLE CORE AVERAGE EXPOSURE	
	BOC TO 2000 MWD/T BEFORE EOC	2000 MWD/T BEFORE EOC TO EOC
BP8X8R	1.28	1.28
GE8X8EB	1.28	1.29
GE8X8NB	1.27	1.29
SPC-LFA	1.31	1.33
GE11	1.35	1.39

* If Technical Specification Requirement 4.5.K.2.a is met.

** These values shall be increased by 0.01 for single loop operation.

TABLE 2

OPERATING LIMIT MCPR VALUES FOR VARIOUS CORE EXPOSURES*

FUEL TYPE	MCPR OPERATING LIMIT** FOR INCREMENTAL CYCLE CORE AVERAGE EXPOSURE	
	BOC TO 2000 MWD/T BEFORE EOC	2000 MWD/T BEFORE EOC TO EOC
BP8X8R	1.35	1.32
GE8X8EB	1.35	1.33
GE8X8NB	1.34	1.33
SPC-LFA	1.38	1.37
GE11	1.40	1.47

* If Technical Specification Requirement 4.5.K.2 is not performed.

** These values shall be increased by 0.01 for single loop operation.

TABLE 3

ROD BLOCK MONITOR SETPOINTS

The following values are the analytical limits corresponding to a filter time constant of between 0.10 and 0.55 seconds

LTSP ≤ 117.0%

ITSP ≤ 111.2%

HTSP ≤ 107.4%

DTSP ≥ 90.4%

TABLE 4

DESIGN LINEAR HEAT GENERATION RATE LIMITS

FUEL TYPE	LHGR LIMIT
GE7B	13.4 kW/ft
GE8B	14.4 kW/ft
GE9B	14.4 kW/ft
GE11	14.4 kW/ft
SPC 9x9-A (LFA)	14.4 kW/ft