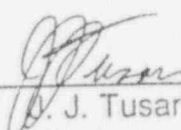
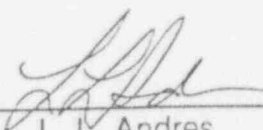


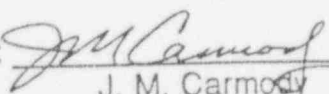
CORE OPERATING LIMITS REPORT
FOR
PEACH BOTTOM ATOMIC POWER STATION UNIT 2
RELOAD 10, CYCLE 11

Prepared By: 
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INTRODUCTION AND SUMMARY

This report provides the cycle-specific parameter limits for: Maximum Average Planar Linear Heat Generation Rate (MAPLHGR); Minimum Critical Power Ratio (MCPR); ARTS MCPR thermal limit adjustments and multipliers; ARTS MAPLHGR thermal limit multipliers; Linear Heat Generation Rate (LHGR); and Rod Block Monitor (RBM) Setpoints; and a Single Loop Operation (SLO) MCPR adjustment for Peach Bottom Atomic Power Station Unit 2 Cycle 11 (Reload 10). 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 provides the means for calculating the Operating Limit MCPR and MAPLHGR thermal limits for all points in the operating region of the power/flow (105% rated power) map including Maximum Extended Load Line Limit (MELLL) down to 81% of rated core flow during full power operation, Increased Core Flow (ICF), End-of-Cycle Power Coastdown and intermediate points, as well as for Feedwater Temperature Reduction (FWTR) to a temperature reduction of 55 °F at end of cycle and Feedwater Heater Out of Service (FWHOOS) to a 55 °F reduction at any time during the cycle. The thermal limits in this report support ICF up to 110% of rated flow. However, ICF operation will be limited to 105% of rated flow until the current Technical Specifications (TS) are revised or replaced by Improved TS.

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 Energy Fuel and Services Division Procedure FM-105, "Reload Licensing Documentation".

This report contains all thermal limit parameters related to the implementation of the Maximum Extended Load Line Limit and ARTS Improvement Program analyses (ARTS/MELLLA) for Peach Bottom Unit 2 Cycle 11. This is the first application of ARTS/MELLLA at Peach Bottom Unit 2.

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) with supporting documentation in Reference (10) and Reference (11).

MAPLHGR LIMITS

The standard limiting MAPLHGR 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 3.5.1. These values were obtained from References (2), (3) and (9). The Siemens Power Corporation (SPC) and Asea Brown Boveri (ABB) Atom Lead Use Assemblies (LUAs) will be monitored to modified GE9B-P8DWB320-10GZ (Reload 8 bundle) MAPLHGR limits per References (12) and (13). The MAPLHGR power and flow multipliers are given in Figures 12 and 13, respectively. No reduction in MAPLHGR limits is required under ARTS during single loop operation (SLO MAPLHGR multiplier = 1.0).

M CPR LIMITS

The rated (100% power) Operating Limit M CPR (OLM CPR) for use in Technical Specification (TS) 3.5.K for each fuel type is given in Figures 9 through 11 and in Tables 1 and 2. These values are determined by the cycle-specific fuel reload analyses in Reference (2). Table 1 is used when the requirement of TS 4.5.K.2.a is met. When this requirement cannot be met, the OLM CPR values as a function of TAU are given in Figures 9 through 11. At times when the surveillance requirement of specification 4.5.K.2 is not performed, Table 2 is used. The OLM CPR is increased by 0.01 when operating in SLO (due to the safety limit increase). All M CPR values presented herein are for the Recirculation Pump Trip Out-of-Service (RPTOOS) condition. The OLM CPR values are documented in Reference (2) for the GE8B, GE9B and GE11 fuel designs, Reference (7) for SPC LUAs and Reference (8) for ABB LUAs. The ARTS-based M CPR(P) power adjustment factor for use in Technical Specification 3.5.K is given in Figure 14 and the M CPR(F) flow dependent limit is given in Figure 15. The M CPR(P) values below the turbine scram bypass power are documented in Reference (6). The values are conservatively based on a 10 inch increase (actual 6 inch) in the analytical limit for the high (L8) water level feedwater and main turbine trip setpoint.

Note in the aforementioned figures and tables that the term "EOC" refers to the cycle exposure at which operation at "rated conditions" is no longer possible (i.e., the cycle exposure at which cycle extension begins) as assumed during the cycle-specific reload licensing analyses in Reference 2.

OVERALL GOVERNING M CPR AND MAPLHGR LIMITS

ARTS provides for power- and flow-dependent thermal limit adjustments and multipliers which allow for a more reliable administration of the M CPR and MAPLHGR thermal limits. At any given power/flow state (P,F), all four limits are to be determined: MAPFAC(P), MAPFAC(F), M CPR(P), and M CPR(F) from Figures 12, 13, 14 and 15, respectively [per Reference (5)]. The most limiting M CPR and the most limiting MAPLHGR [maximum of M CPR(P) and M CPR(F) and minimum of MAPLHGR(P) and MAPLHGR(F)] for a given (P,F) condition will be the governing limits. The rated OLM CPRs are determined by the cycle-specific fuel reload analyses in Reference (2). Rated MAPLHGR values are a composite of results obtained from bundle-specific thermal-mechanical and emergency core cooling system analyses. 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), (7) and (8).

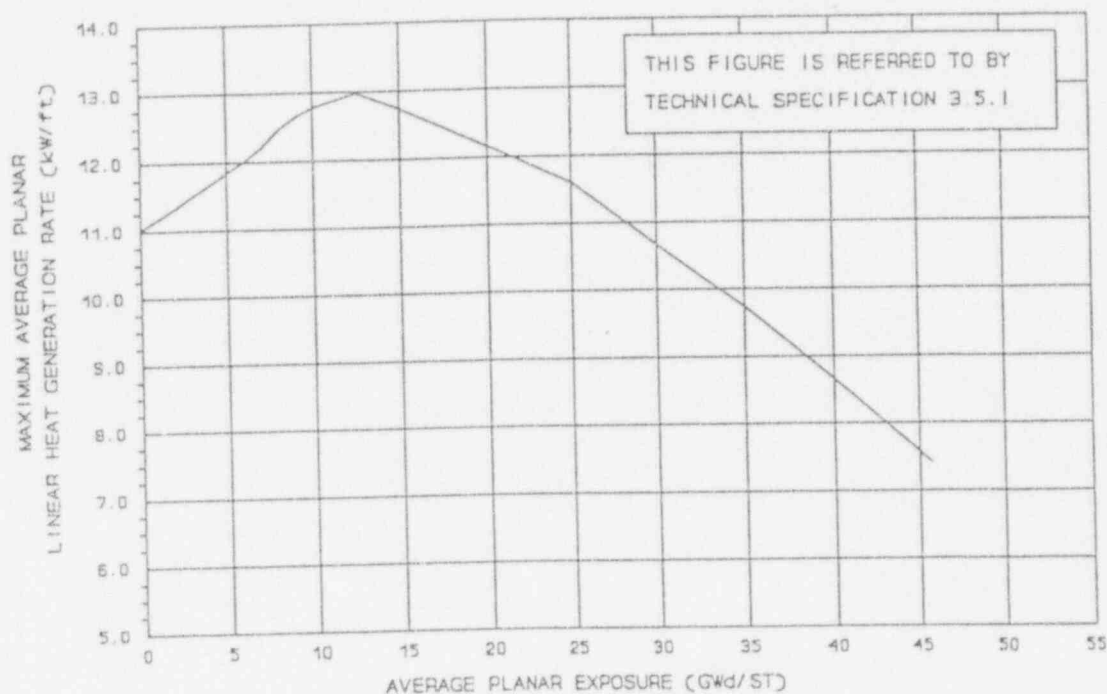
REFERENCES

- 1) "Technical Specifications and Bases for Peach Bottom Atomic Power Station Unit 2", Docket No. 50-277, Appendix A to License No. DPR-44.

- 2) "Supplemental Reload Licensing Report for Peach Bottom Atomic Power Station Unit 2, Reload 10, Cycle 11", General Electric Company Document No. 24A5154, Rev. 0, September 1994.
- 3) "Loss-of-Coolant Accident Analyses for Peach Bottom Atomic Power Station Unit 2", Supplement 1, NEDE-24081-P-2, 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) "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Peach Bottom Atomic Power Station Unit 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 9x9-9X+ Qualification Fuel Assembly Safety Analysis Report", ANF-90-133(P), Revision 2, August 1992.
- 8) ABB Atom Document, "Supplemental Lead Fuel Assembly Licensing Report, SVEA-96 LFAs to Peach Bottom 2 Summary", BR 90-004, October, 1990.
- 9) "Lattice Dependent MAPLHGR Report for Peach Bottom Atomic Power Station Unit 2 Reload 9 Cycle 10", 23A7188AA, Revision 0, September, 1992.
- 10) GE Internal Memo, G. N. Marrotte to G. R. Hull "Revised RBM Setpoints for Peach Bottom-3 Cycle 10 and Limerick-1 Cycle 6", Feb. 18, 1994.
- 11) Letter, G. V. Kumar to H. J. Ryan, "Justification for Reduction of Rod Block Monitor System Downscale Trip Setpoint For Peach Bottom Atomic Power Station", May 23, 1994.
- 12) Letter, H. G. Shaw to H. J. Diamond, "Relaxation of LHGR and MAPLHGR Limits for the 9x9-9X+ Qualification Fuel Assembly for Peach Bottom Unit 2", February 11, 1994.
- 13) Letter, D. Ebeling-Koning to A. M. Olson, "Revised Peach Bottom-2 SVEA-96 Lead Fuel Assembly (LFA) LOCA Limits", February 14, 1994.

FIGURE 1

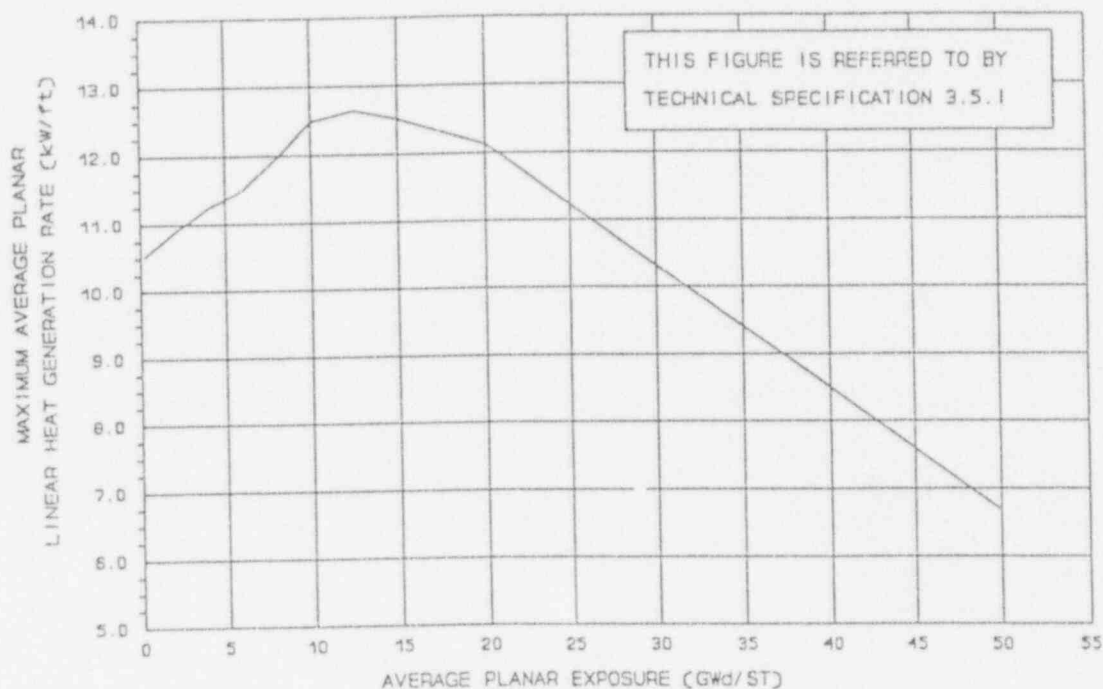
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE P8DQB321-11GZ (BD321A, GE8x8EB)



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	45.7	7.41
4.0	11.67	12.5	12.98		
5.0	11.84	15.0	12.74		

FIGURE 2

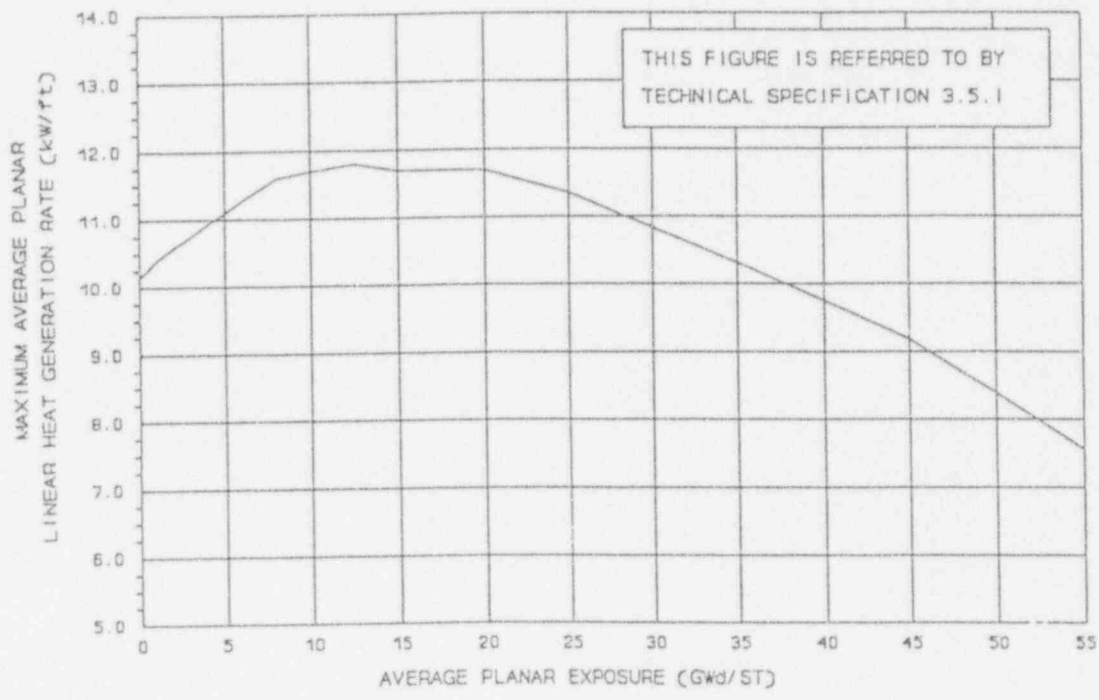
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE P8DWB310-11GZ (GE9B, GE8x8NB)



Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)	Avg Plan Exposure (GWd/ST)	MAPLHGR (kW/ft)
0.2	10.53	6.0	11.49	12.5	12.64
2.0	10.89	8.0	11.96	15.0	12.52
4.0	11.24	10.0	12.49	20.0	12.13
				50.0	6.67

FIGURE 3

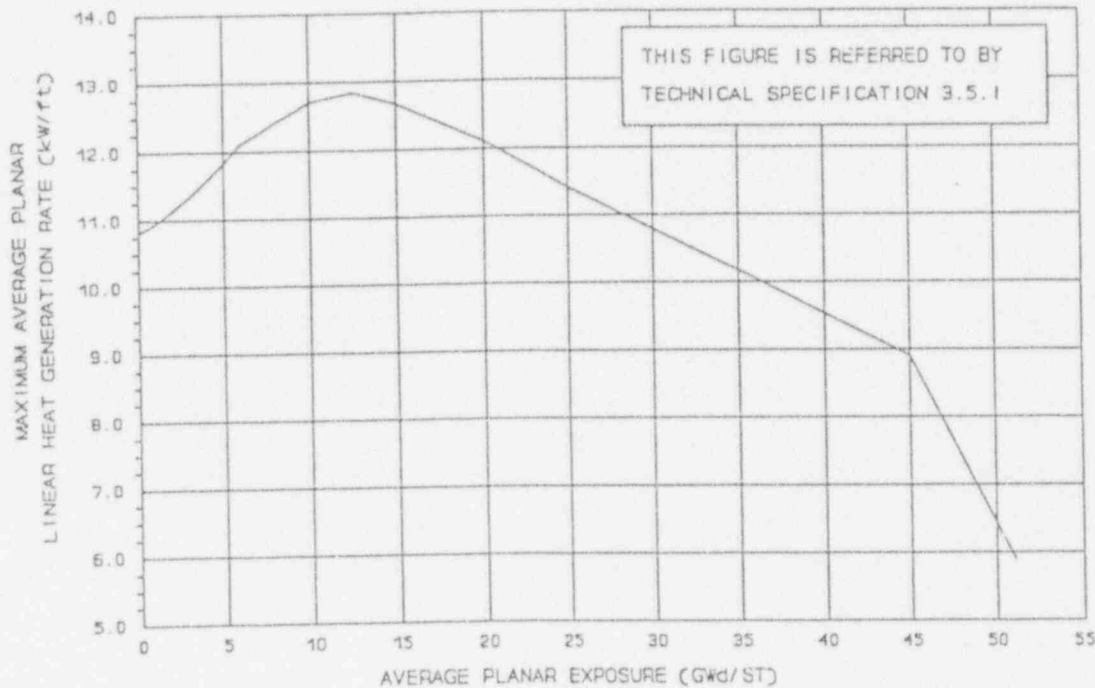
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE P9HUB307-5G5.0/4G4.0 (GE11 LUA)



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	10.15	7.0	11.43	25.0	11.35
0.2	10.20	8.0	11.60	30.0	10.84
1.0	10.40	9.0	11.65	35.0	10.31
2.0	10.58	10.0	11.70	40.0	9.75
3.0	10.75	12.5	11.80	50.0	8.39
4.0	10.93	15.0	11.70	55.0	7.56
5.0	11.10	17.5	11.70		
6.0	11.27	20.0	11.70		

FIGURE 4

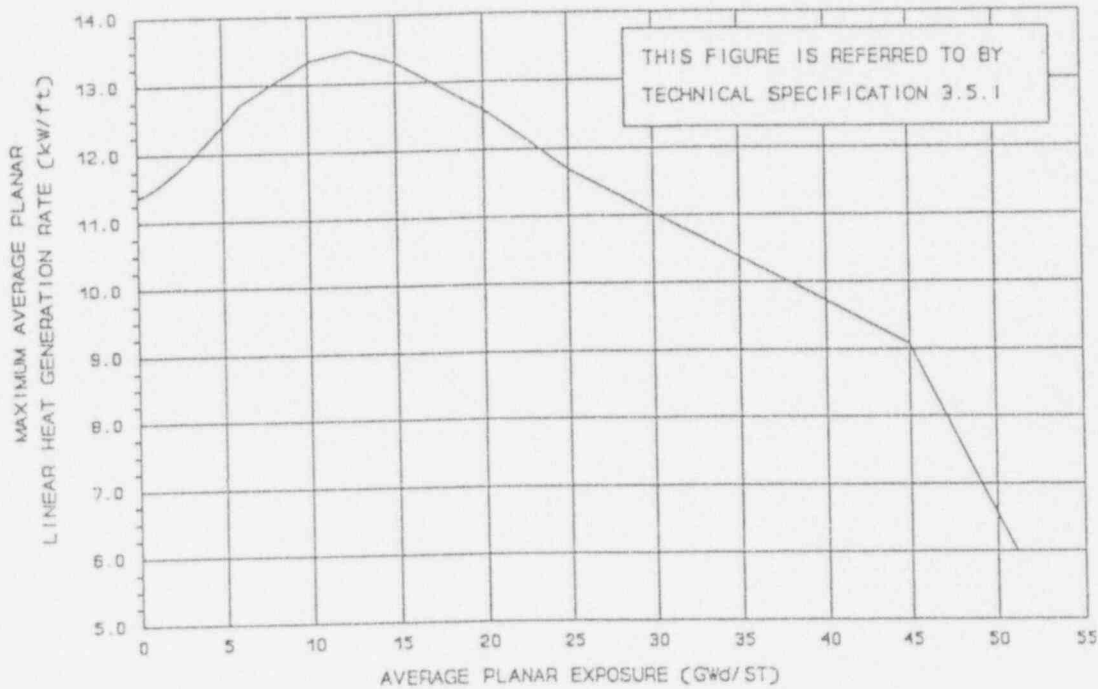
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE P8DWB320-10GZ (GE9B, GE8x8NB)



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	10.82	6.0	12.11	20.0	12.11
0.2	10.85	7.0	12.26	25.0	11.41
1.0	10.95	8.0	12.42	35.0	10.18
2.0	11.13	9.0	12.56	45.0	8.90
3.0	11.34	10.0	12.71	51.08	5.90
4.0	11.58	12.5	12.85		
5.0	11.83	15.0	12.67		

FIGURE 5

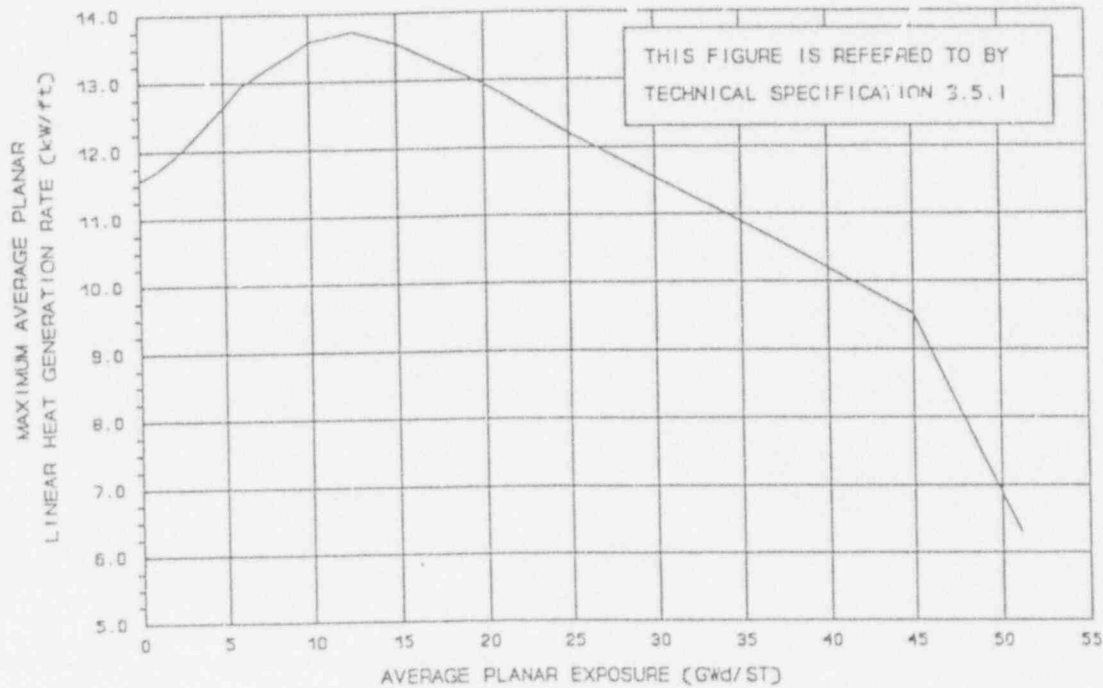
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE SPC 9x9-9X+ (LUA)



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	11.36	6.0	12.71	20.0	12.59
0.2	11.39	7.0	12.87	25.0	11.69
1.0	11.49	8.0	13.04	35.0	10.38
2.0	11.68	9.0	13.18	45.0	9.07
3.0	11.90	10.0	13.34	51.08	6.01
4.0	12.15	12.5	13.49		
5.0	12.42	15.0	13.30		

FIGURE 6

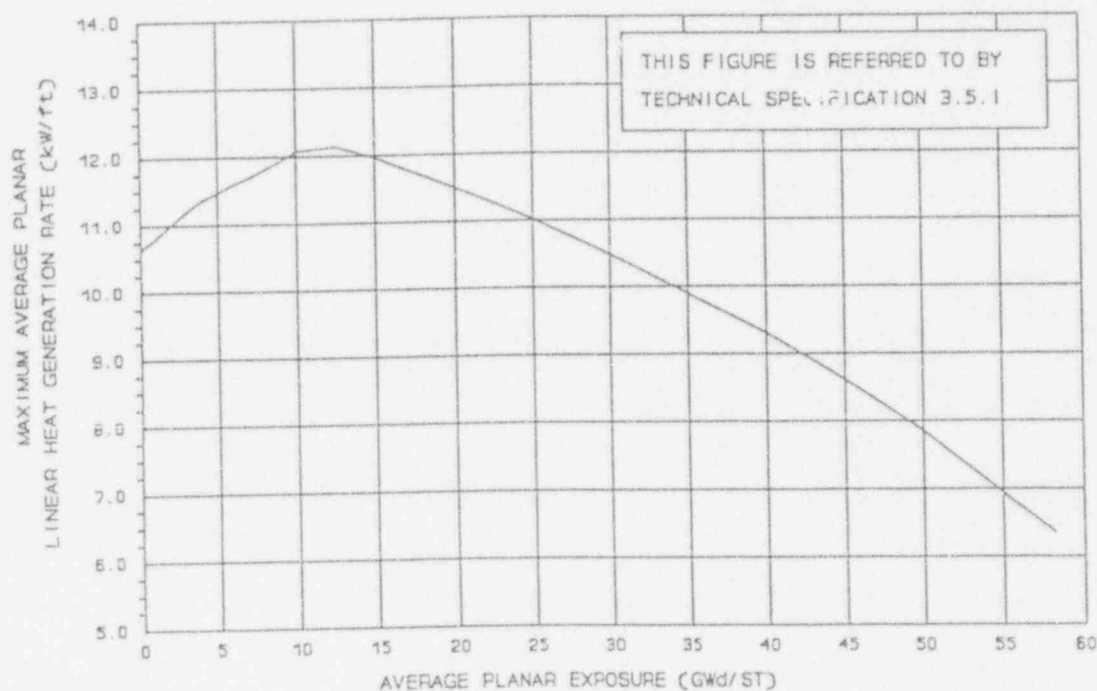
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE ABB SVEA-96 (LUA)



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	11.57	6.0	12.95	20.0	12.95
0.2	11.60	7.0	13.11	25.0	12.20
1.0	11.71	8.0	13.28	35.0	10.89
2.0	11.90	9.0	13.43	45.0	9.52
3.0	12.13	10.0	13.59	51.08	6.31
4.0	12.39	12.5	13.74		
5.0	12.65	15.0	13.55		

FIGURE 7

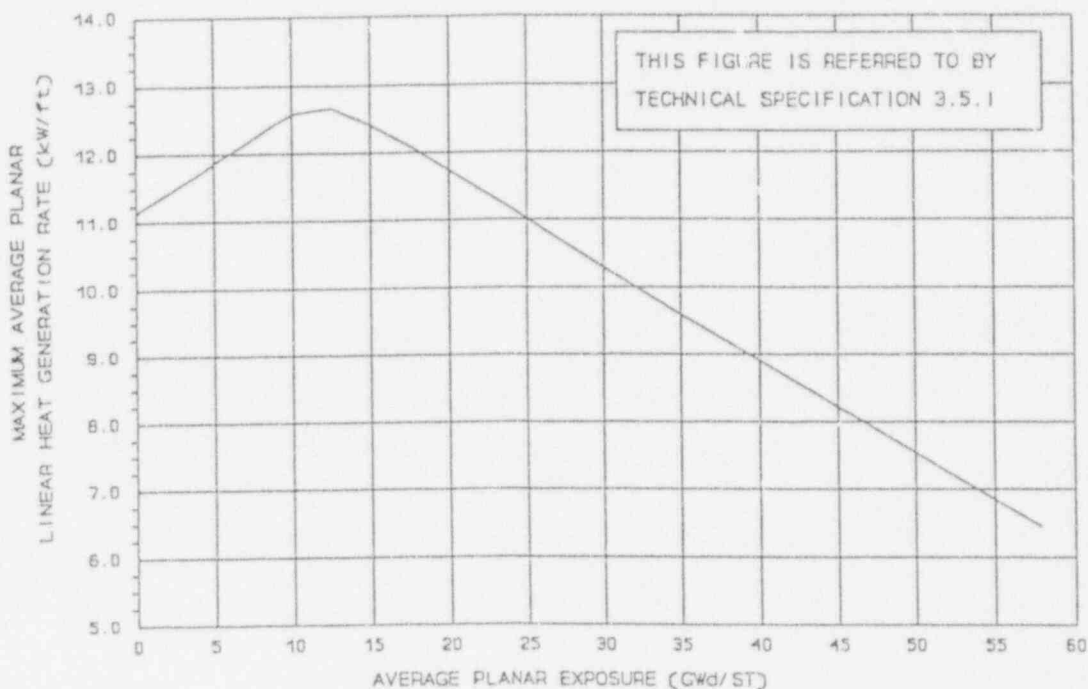
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE P9HUB334-10GZ1 (GE11)



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	10.63	7.0	11.70	25.0	11.02
0.2	10.68	8.0	11.81	30.0	10.49
1.0	10.82	9.0	11.93	35.0	9.90
2.0	11.01	10.0	12.07	40.0	9.31
3.0	11.20	12.5	12.13	45.0	8.61
4.0	11.37	15.0	11.97	50.0	7.85
5.0	11.48	17.5	11.74	55.0	6.93
6.0	11.59	20.0	11.50	58.2	6.36

FIGURE 8

MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE P9HUB387-12GZ3 (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	11.13	7.0	12.15	25.0	11.01
0.2	11.18	8.0	12.30	30.0	10.29
1.0	11.28	9.0	12.44	35.0	9.59
2.0	11.42	10.0	12.58	40.0	8.90
3.0	11.56	12.5	12.66	45.0	8.22
4.0	11.70	15.0	12.42	50.0	7.54
5.0	11.86	17.5	12.10	55.0	6.85
6.0	12.01	20.0	11.74	57.85	6.45

FIGURE 9

RATED MCPR vs. TAU
FUEL TYPES GE8B, GE9B and GE11
(Valid for all operating domains in conjunction with Figures 14 and 15)
•Add 0.01 to the Rated MCPR when in single loop operation

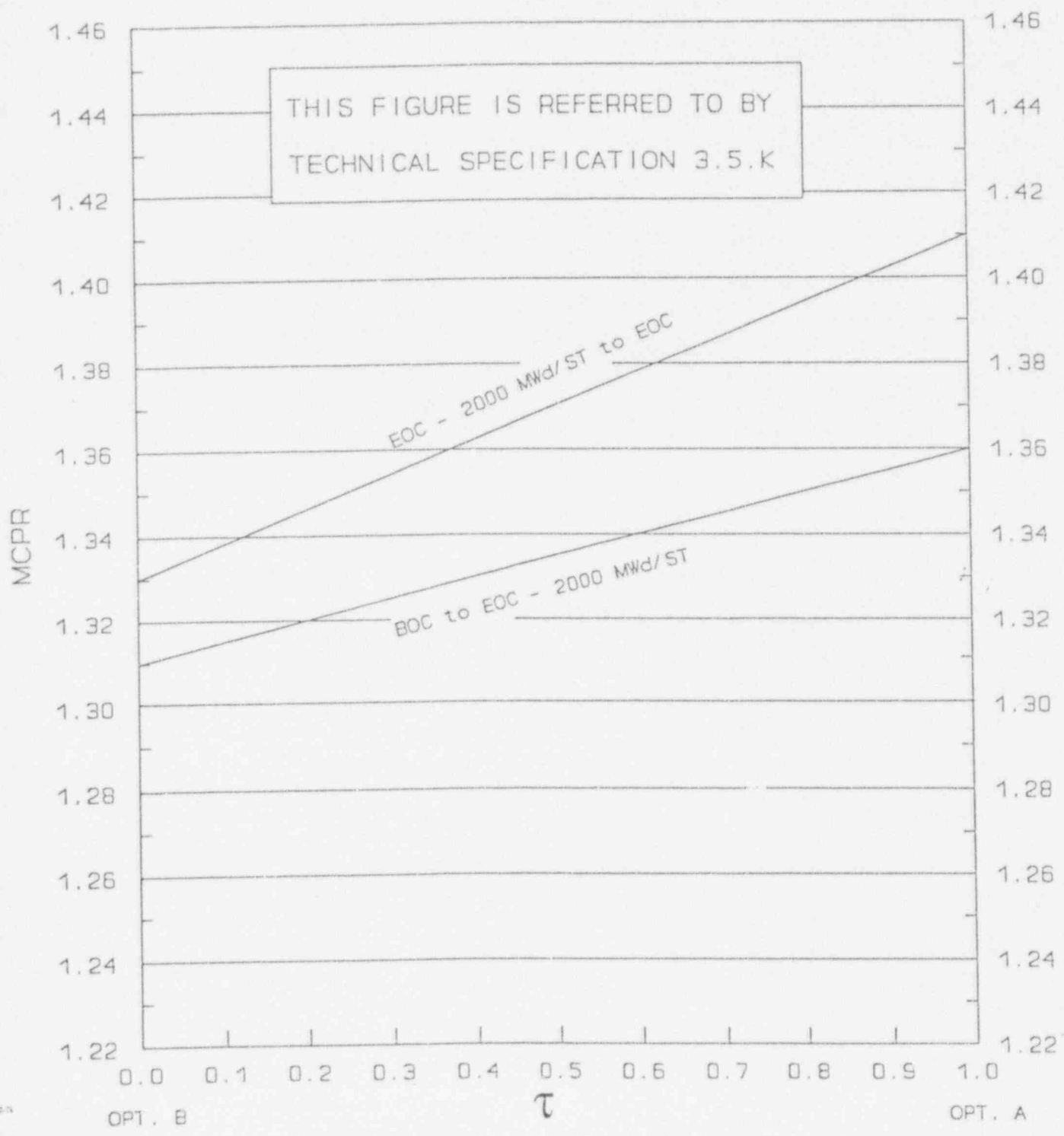


FIGURE 10

RATED MCPR vs. TAU
FUEL TYPE SPC 9x9-9X+ (LUA)
(Valid for all operating domains in conjunction with Figures 14 and 15)
•Add 0.01 to the Rated MCPR when in single loop operation

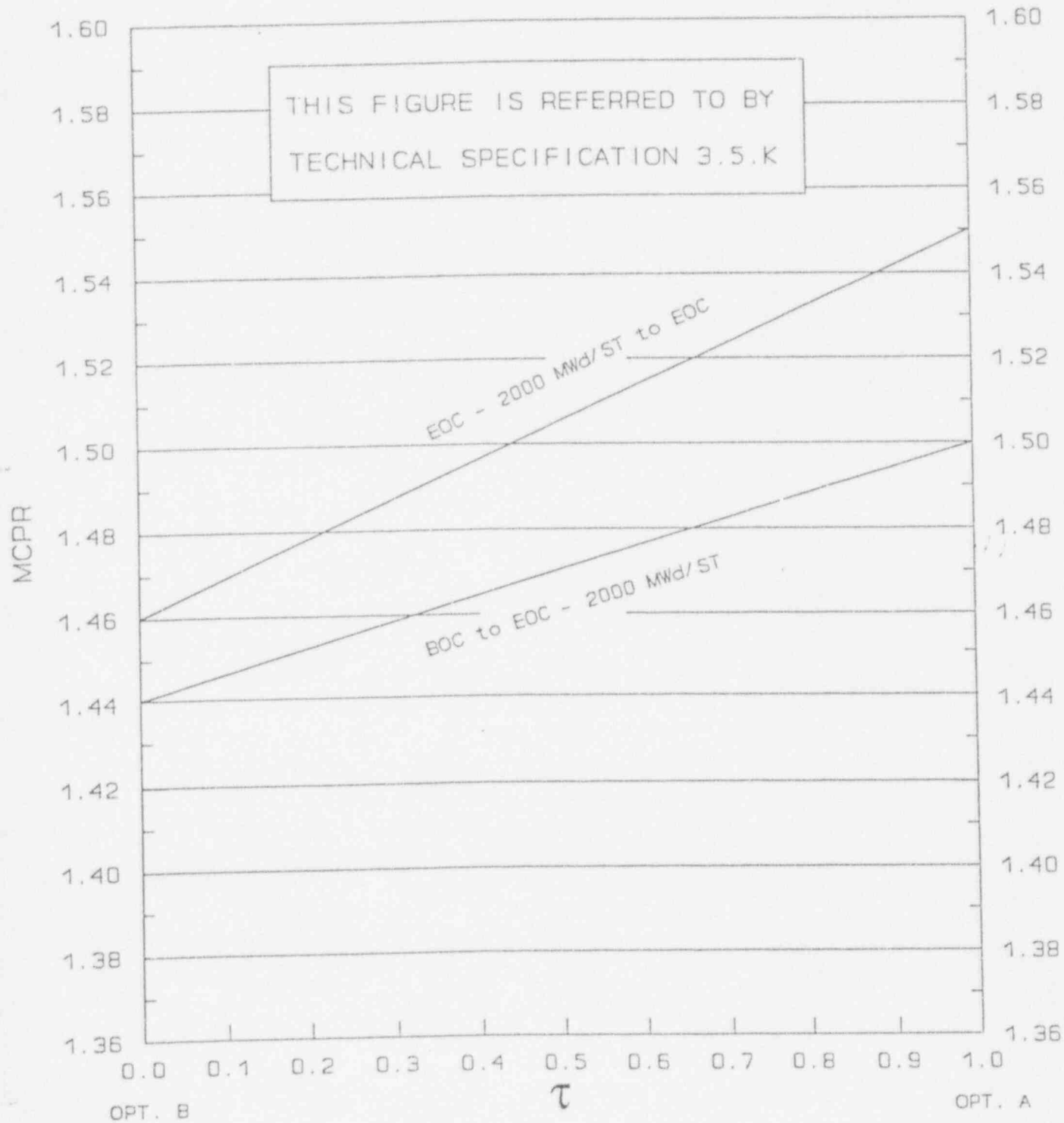
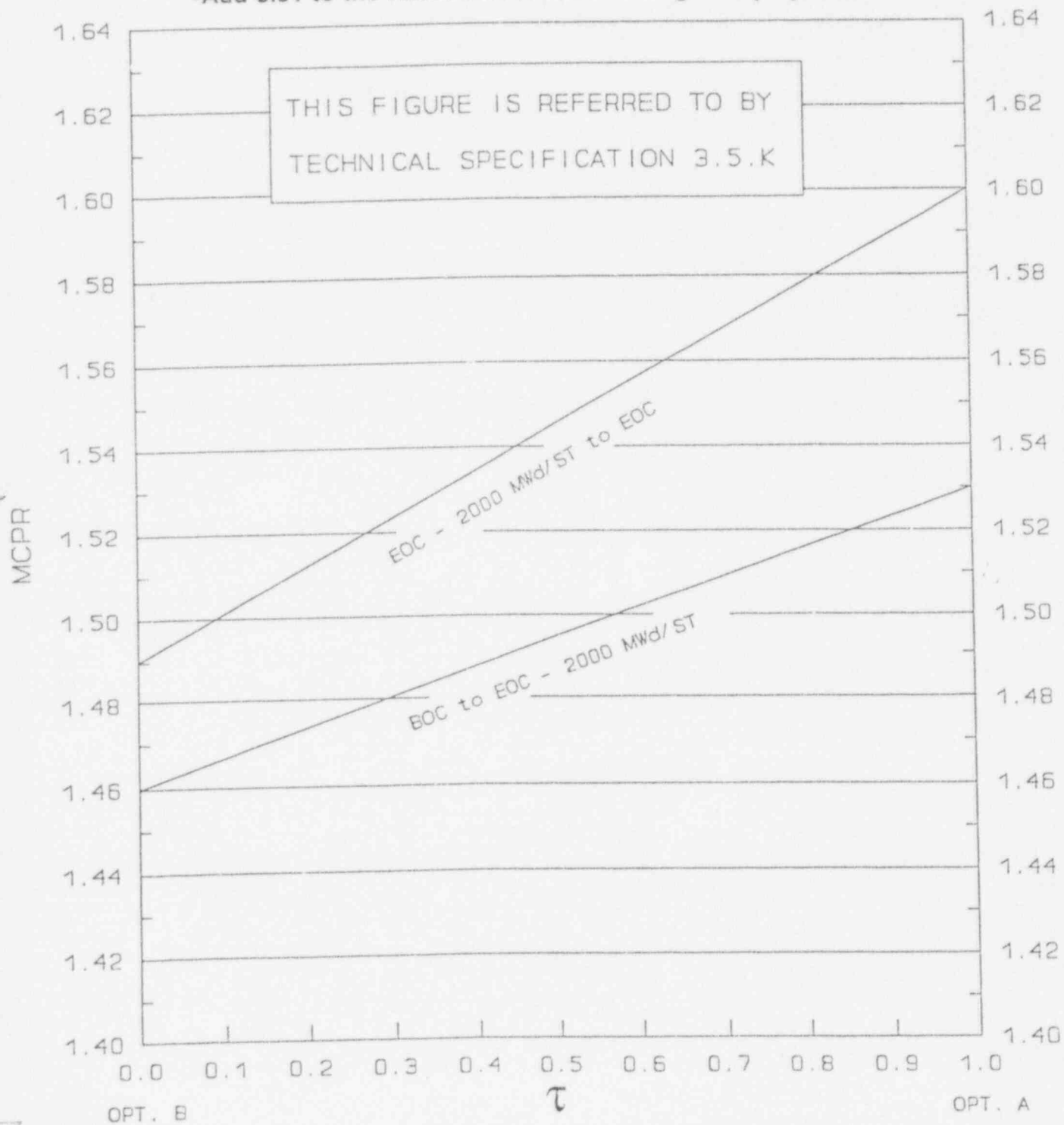


FIGURE 11

RATED MCPR vs. TAU
FUEL TYPE ABB SVEA-96 (LUA)
(Valid for all operating domains in conjunction with Figures 14 and 15)
•Add 0.01 to the Rated MCPR when in single loop operation



PEACH BOTTOM UNIT 2 CYCLE 11
POWER-DEPENDENT MAPLHGR MULTIPLIER

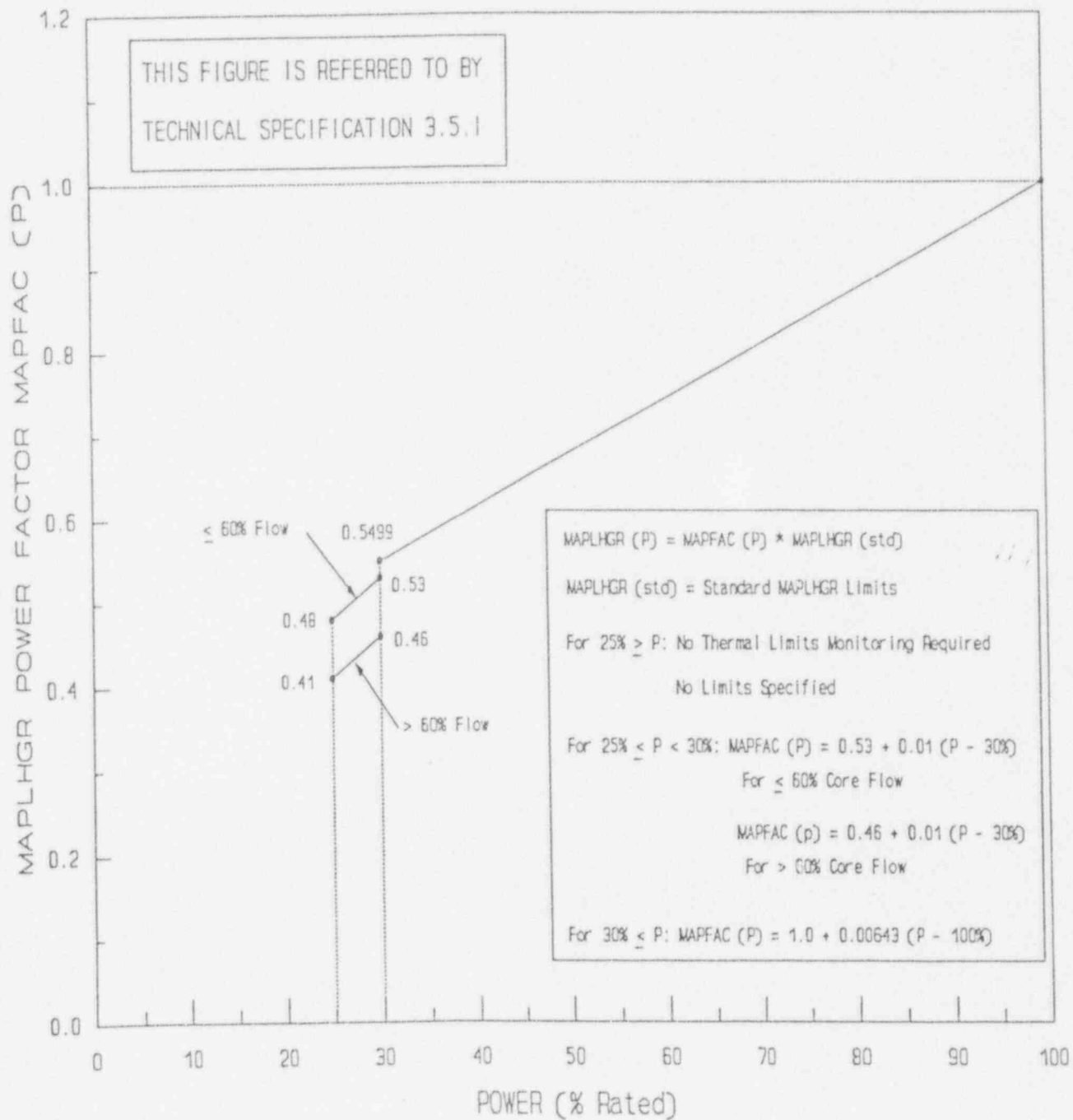


FIGURE 13

PEACH BOTTOM UNIT 2 CYCLE 11
FLOW-DEPENDENT MAPLHGR MULTIPLIER

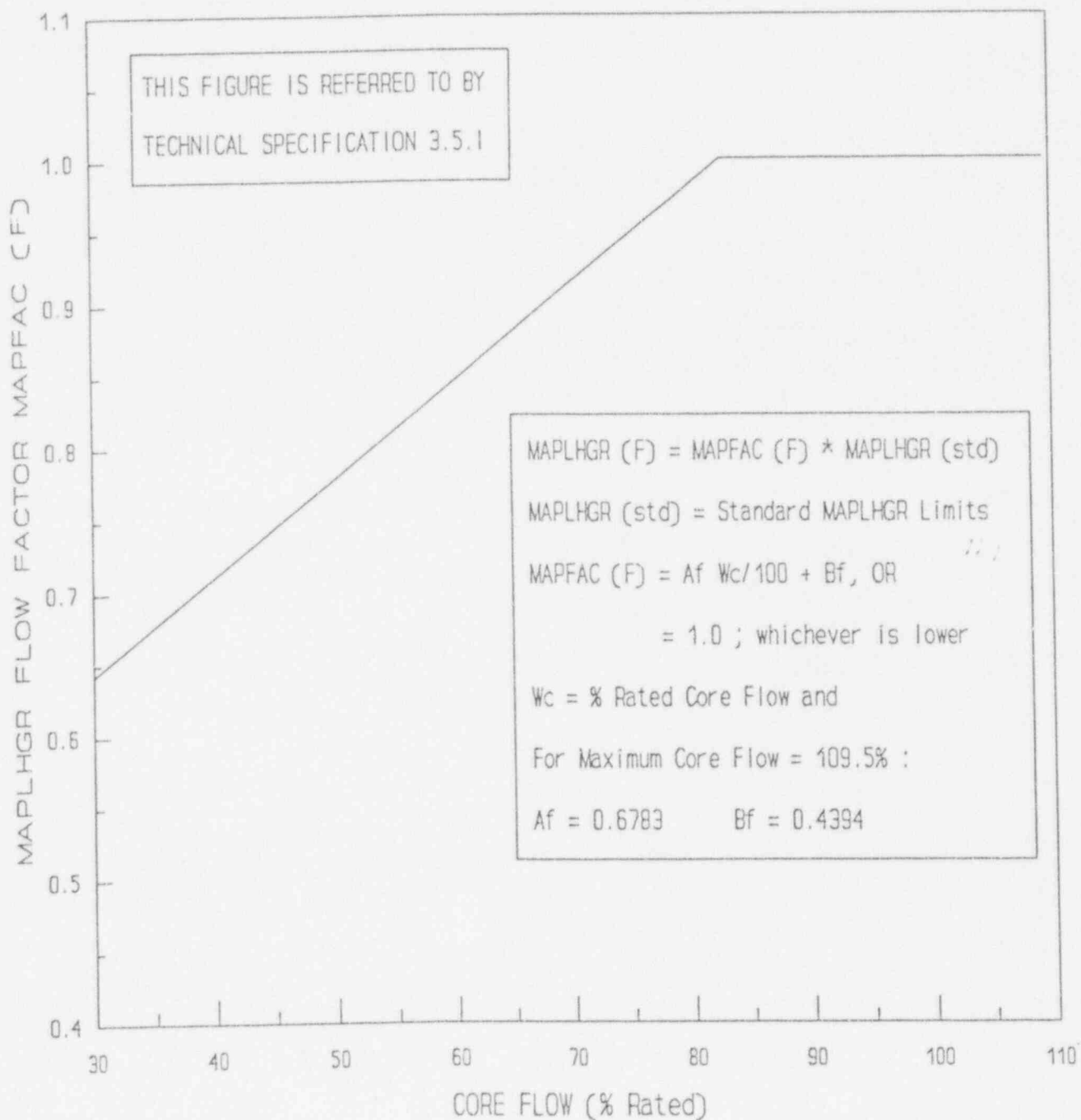


FIGURE 14

PEACH BOTTOM UNIT 2 CYCLE 11
POWER-DEPENDENT MCPR LIMITS

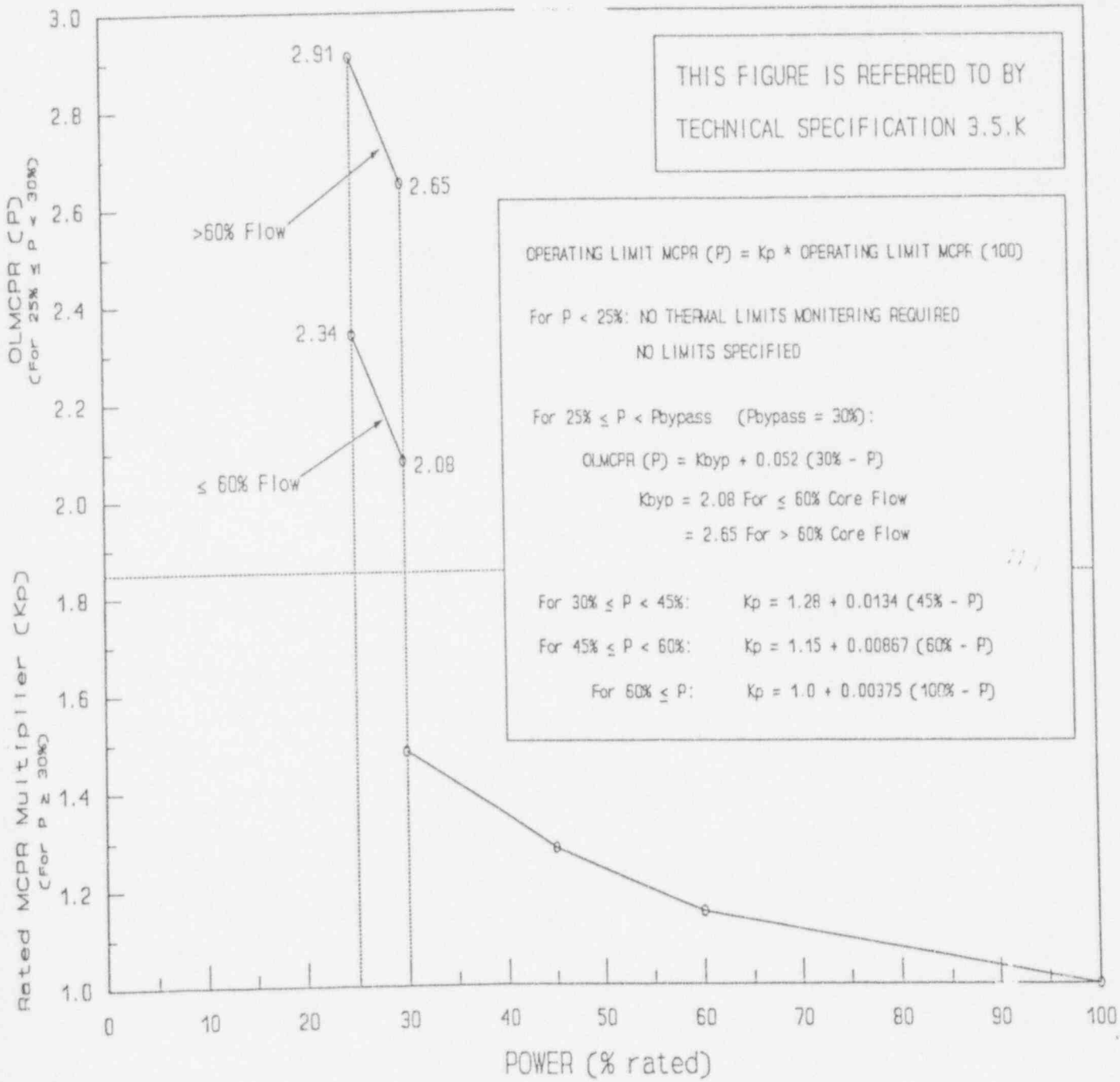


FIGURE 15

PEACH BOTTOM UNIT 2 CYCLE 11
FLOW-DEPENDENT MCPR LIMITS

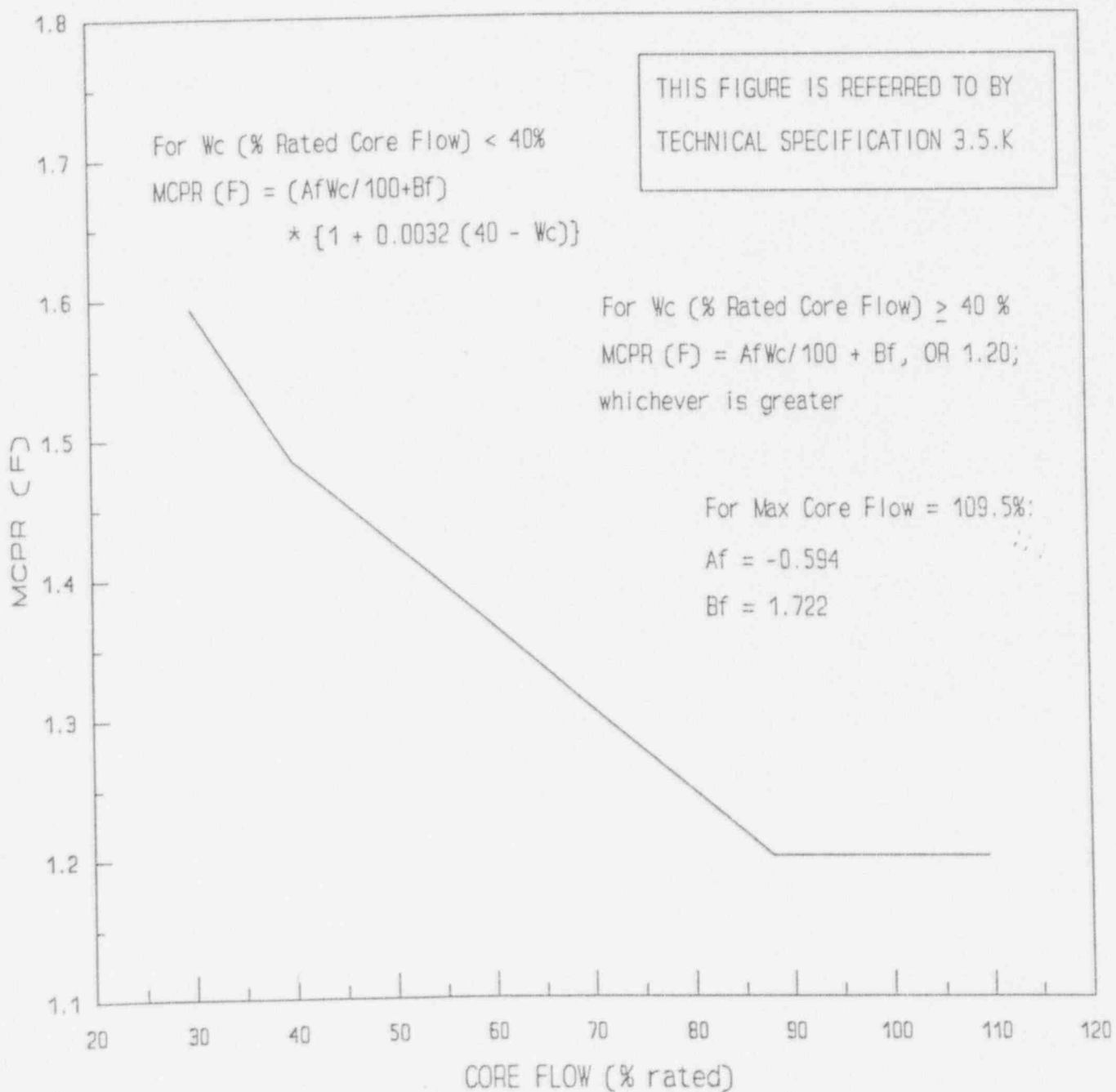


TABLE 1

OPERATING LIMIT MCPR VALUES
FOR VARIOUS CORE EXPOSURES*

<u>FUEL TYPE</u>	<u>MCPR OPERATING LIMIT**</u> <u>FOR INCREMENTAL CYCLE CORE AVERAGE EXPOSURE</u>	
	BOC TO 2000 MWd/ST BEFORE EOC	2000 MWd/ST BEFORE EOC TO EOC
GE8x8EB	1.31	1.33
GE8x8NB	1.31	1.33
GE11	1.31	1.33
SPC 9x9-9X+ LUA	1.44	1.46
ABB SVEA-96 LUA	1.46	1.49

* 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*

<u>FUEL TYPE</u>	<u>MCPR OPERATING LIMIT**</u> <u>FOR INCREMENTAL CYCLE CORE AVERAGE EXPOSURE</u>	
	BOC TO 2000 MWd/ST BEFORE EOC	2000 MWd/ST BEFORE EOC TO EOC
GE8x8EB	1.36	1.41
GE8x8NB	1.36	1.41
GE11	1.36	1.41
SPC 9x9-9X+ LUA	1.50	1.55
ABB SVEA-96 LUA	1.53	1.60

* 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

Low Trip Setpoint (LTSP)	$\leq 123.0\%$
Intermediate Trip Setpoint (ITSP)	$\leq 118.0\%$
High Trip Setpoint (HTSP)	$\leq 113.2\%$
Downscale Trip Setpoint (DTSP)	$\geq 1.0\%$

These Trip Level Settings (with RBM filter) are based on a MCPR limit of 1.30 and are consistent with an RBM filter time constant between 0.1 seconds and 0.55 seconds.

TABLE 4

DESIGN LINEAR HEAT GENERATION RATE LIMITS

<u>FUEL TYPE</u>	<u>LHGR LIMIT</u>
GE8B	14.4 kW/ft
GE9B	14.4 kW/ft
GE11	14.4 kW/ft
SPC 9x9-9X+ (LUA)	14.7 kW/ft
SVEA-96 (LUA)	16.3 kW/ft