CORE OPERATING LIMITS REPORT

FOR

LIMERICK GENERATING STATION UNIT 1

RELOAD 4, CYCLE 5

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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); Flow Adjustment Factor (K_f); Linear Heat Generation Rate (LHGR); Rod Block Monitor flow biased upscale and high flow clamped setpoints; and Turbine Bypass Valve parameters for Limerick Generating Station Unit 1, Cycle 5, Reload 4. 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 of Reference (1). Preparation of this report was performed in accordance with PECO Fuel Management Section Procedure FM-105.

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 6. These figures are used when hand calculations are required as specified in Technical Specification 3.2.1. The reduction factor for use during single recirculation loop operation is given in Table 1.

MCPR LIMITS

The MCPR value for use in Technical Specification 3.2.3 for each fuel type is given in Figures 7 through 13. The K_f core flow adjustment factor for use in Technical Specification 3.2.3 is given in Figure 14.

The MCPR values shown in these figures are the bounding values for Increased Core Flow (up to 105% of rated core flow), Rated Core Flow (100% of rated core flow), Extended Load Line (down to 87% of rated core flow), Feedwater Temperature Reduction (up to 60 degrees F), power coastdown, and a combination of all of these options. The curves labelled "Increased Core Flow and Feedwater Temperature Reduction" represent bounding operating limit MCPRs for the ELL, RCF, ICF, and ICF plus FWTR operating domains. Curves are also provided for inoperable Recirc Pump Trip or inoperable Steam Bypass System.

ROD BLOCK MONITOR SETPOINTS

The N value for the RBM flow biased upscale and high flow clamped setpoints for use in Technical Specification 3.3.6 is given in Table 2.

LINEAR HEAT GENERATION RATES

The LHGR value for use in Technical Specification 3.2.4 for each fuel type is given in Table 3.

STEAM BYPASS SYSTEM OPERABILITY

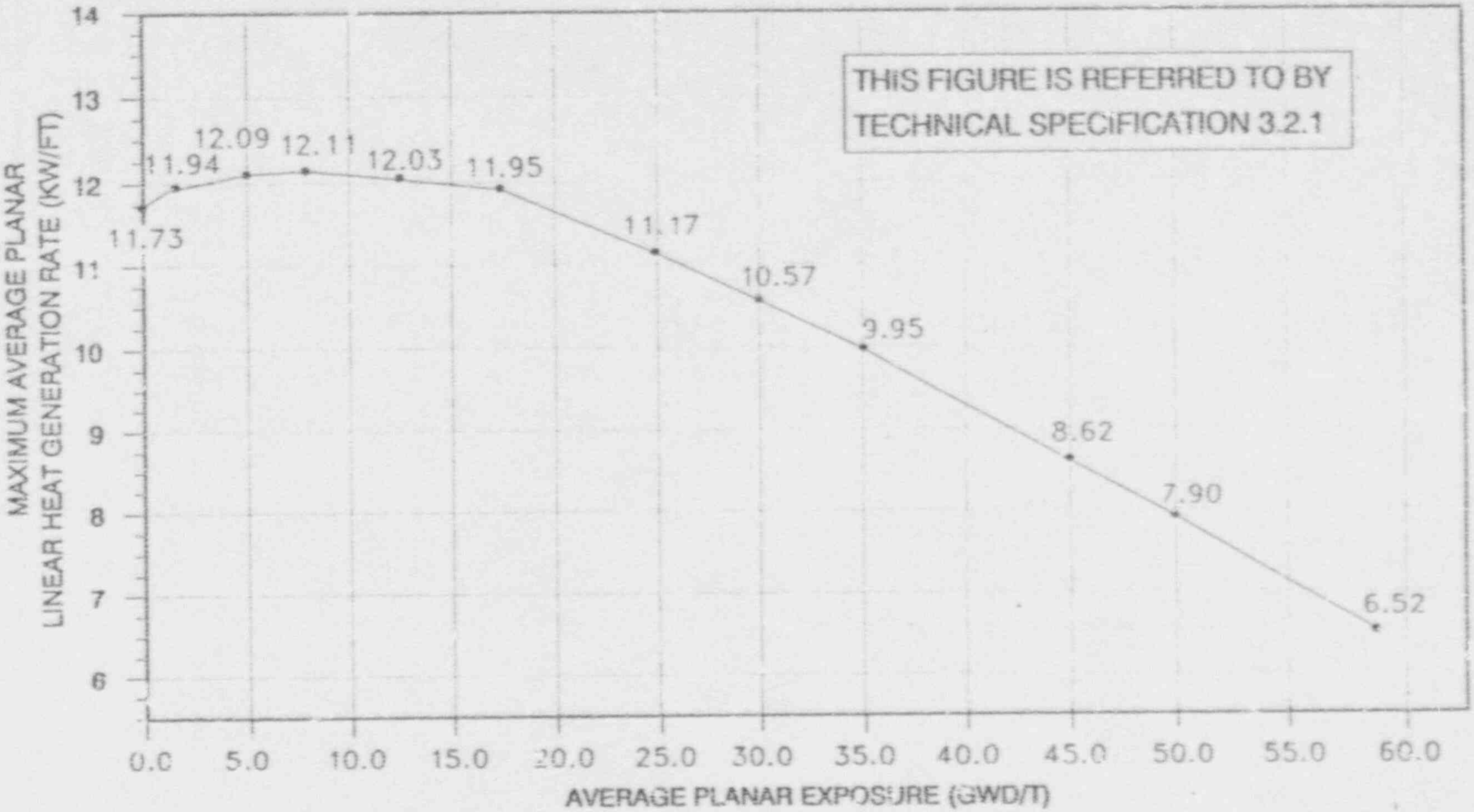
The operability requirements for the steam bypass system for use in Technical Specifications 3.7.8 and 4.7.8.C are found in Table 4. If these requirements cannot be met the MCPR limits for inoperable steam bypass system must be used.

REFERENCES

1) "Technical Specifications and Bases for Limerick Generating Station Unit 1", Docket No. 50-352 Appendix A to License No. NPF-39.

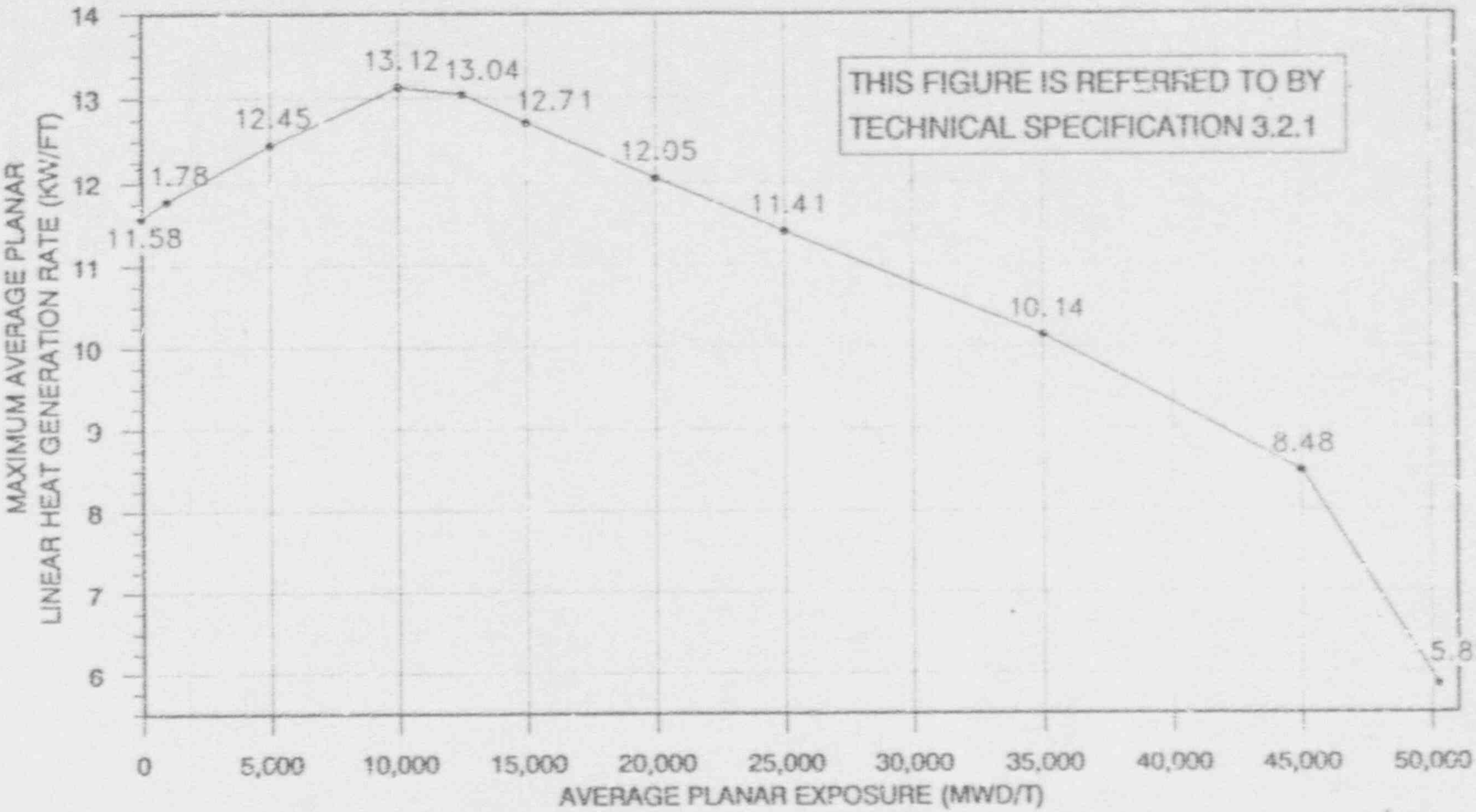
2) "Supplemental Reload Licensing Report for Limerick Generating Station Unit 1, Reload 4, Cycle 5", General Electric Company Document No. 23A7156, Rev. 0.

3) "Basis of MAPLHGR Technical Specifications for Limerick 1", NEDE-31401-P, E&A No. 4, April 1992.



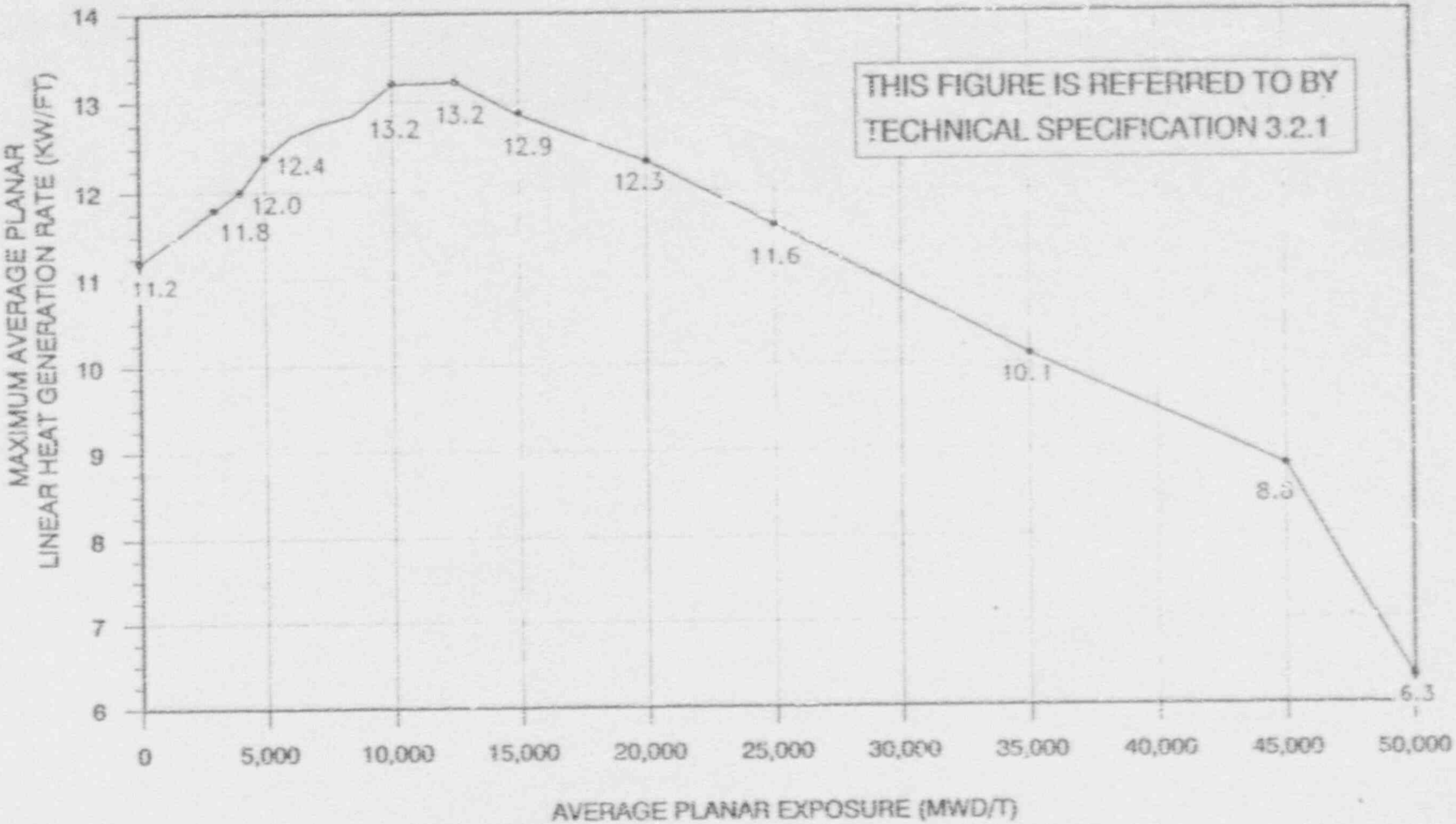
MAXIMUM AVERAGE PLANAR LINEAR HEAT GENERATION RATE (MAPLHGR) VERSUS AVERAGE PLANAR EXPOSURE FUEL TYPE P9CUB331 (GE11)

FIGURE 1



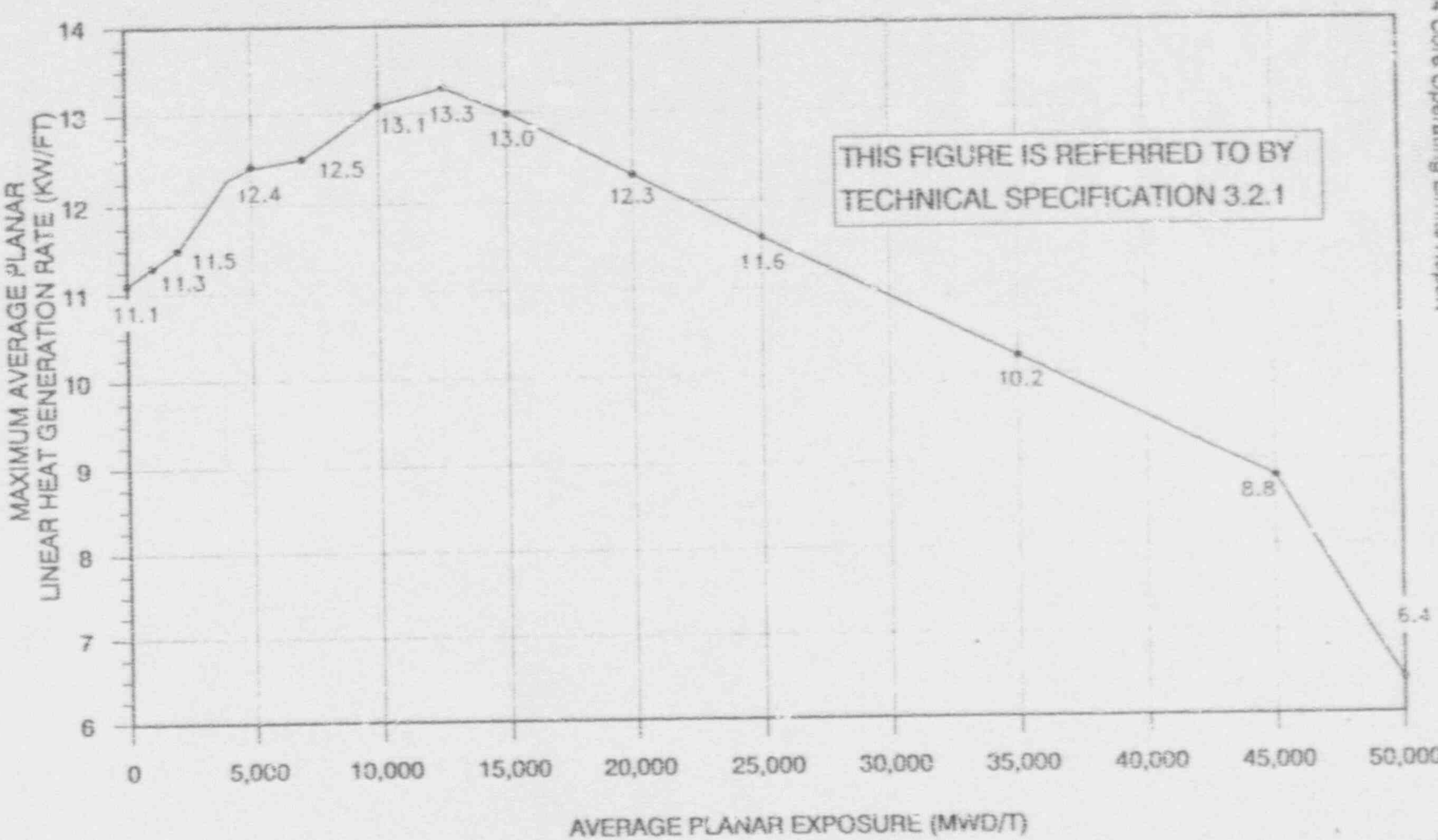
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE P8CWB319 (GE9B)

FIGURE 2



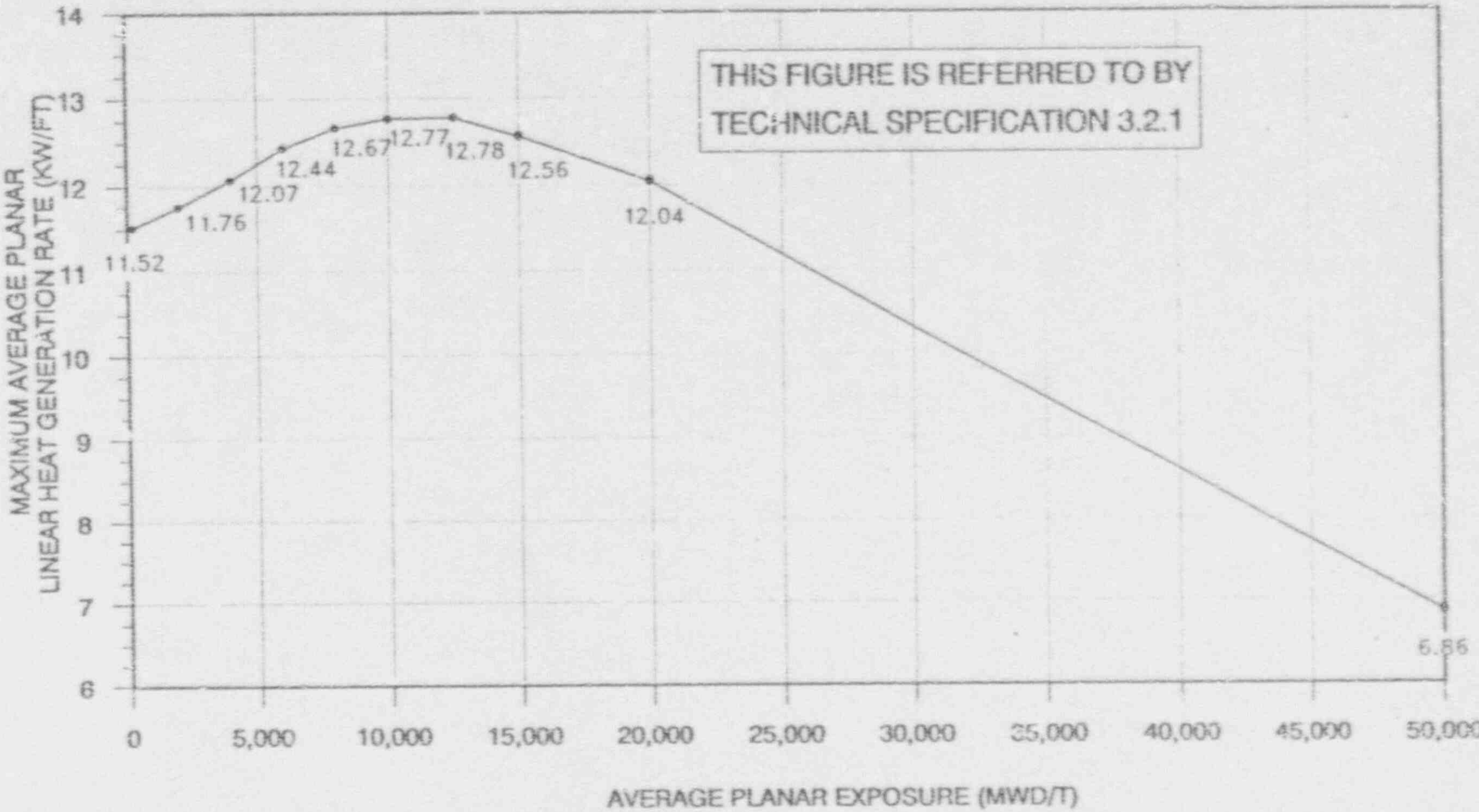
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE BC318A (GE84WR)

FIGURE 3



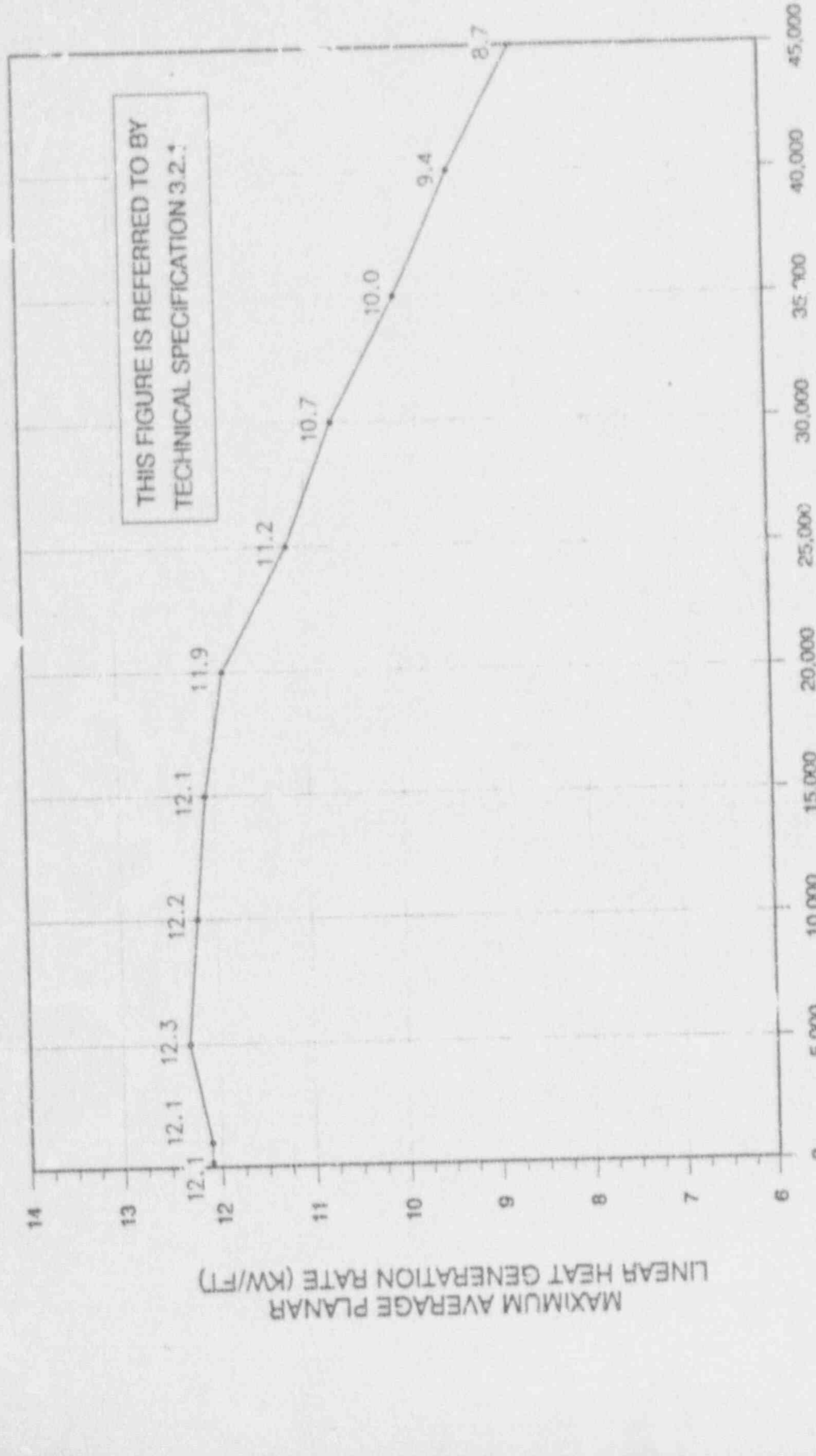
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE BC322A (GE84WR)

FIGURE 4



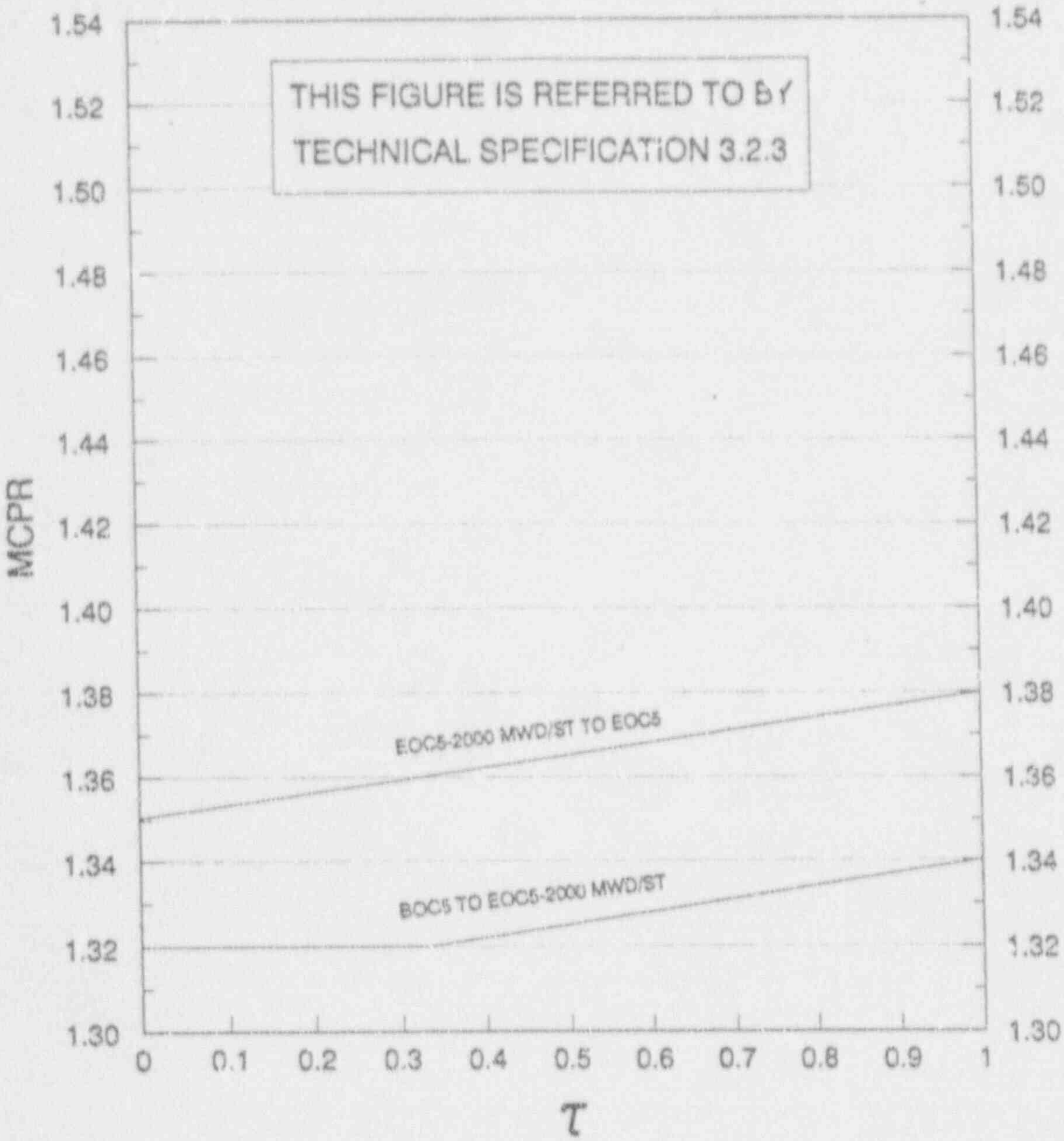
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE BC320A (GE82WR)

FIGURE 5



MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
FUEL TYPE BP8CRB248 (BP8x8R)

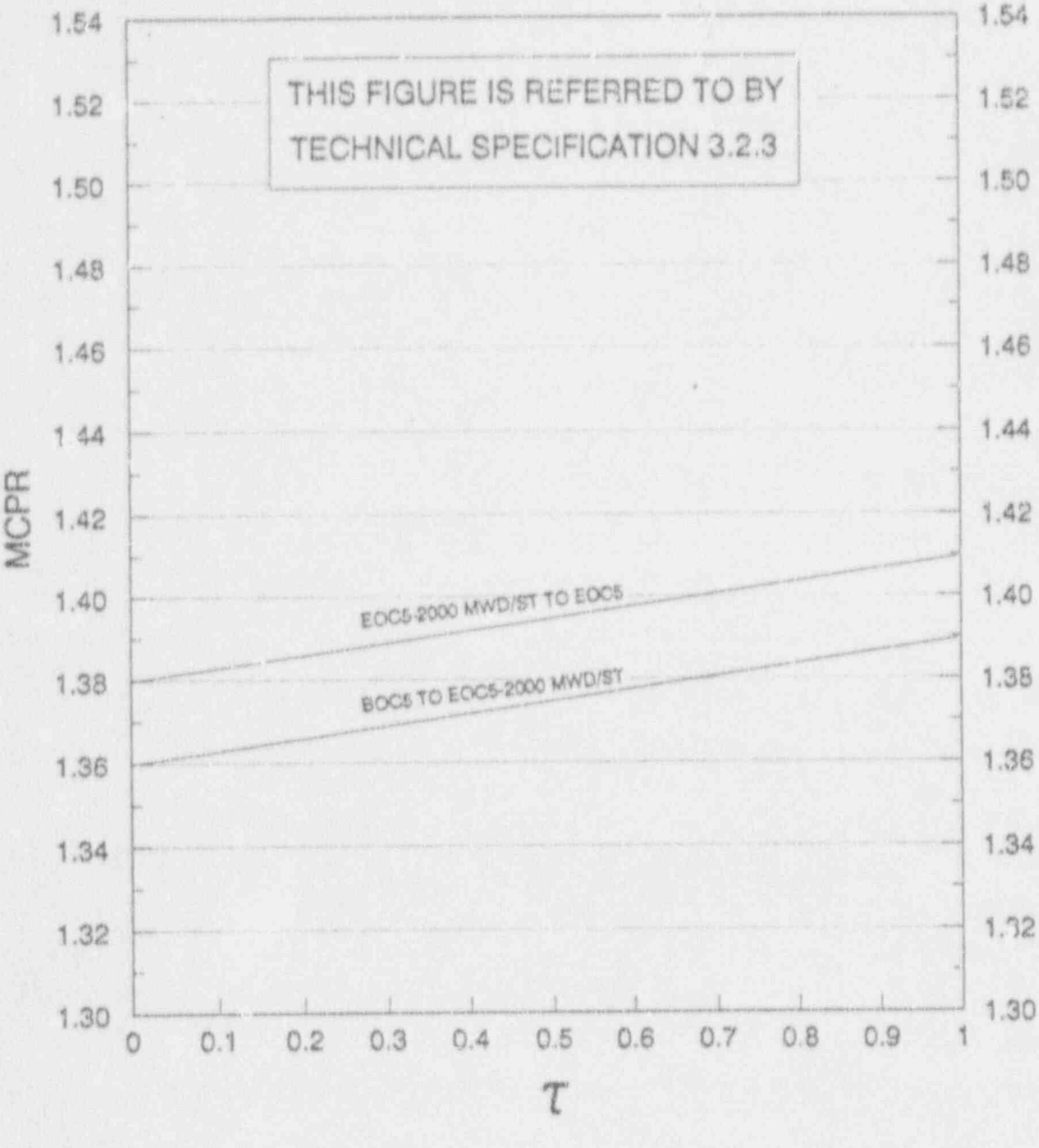
FIGURE 6



MCPR VS TAU
FUEL TYPE GE11

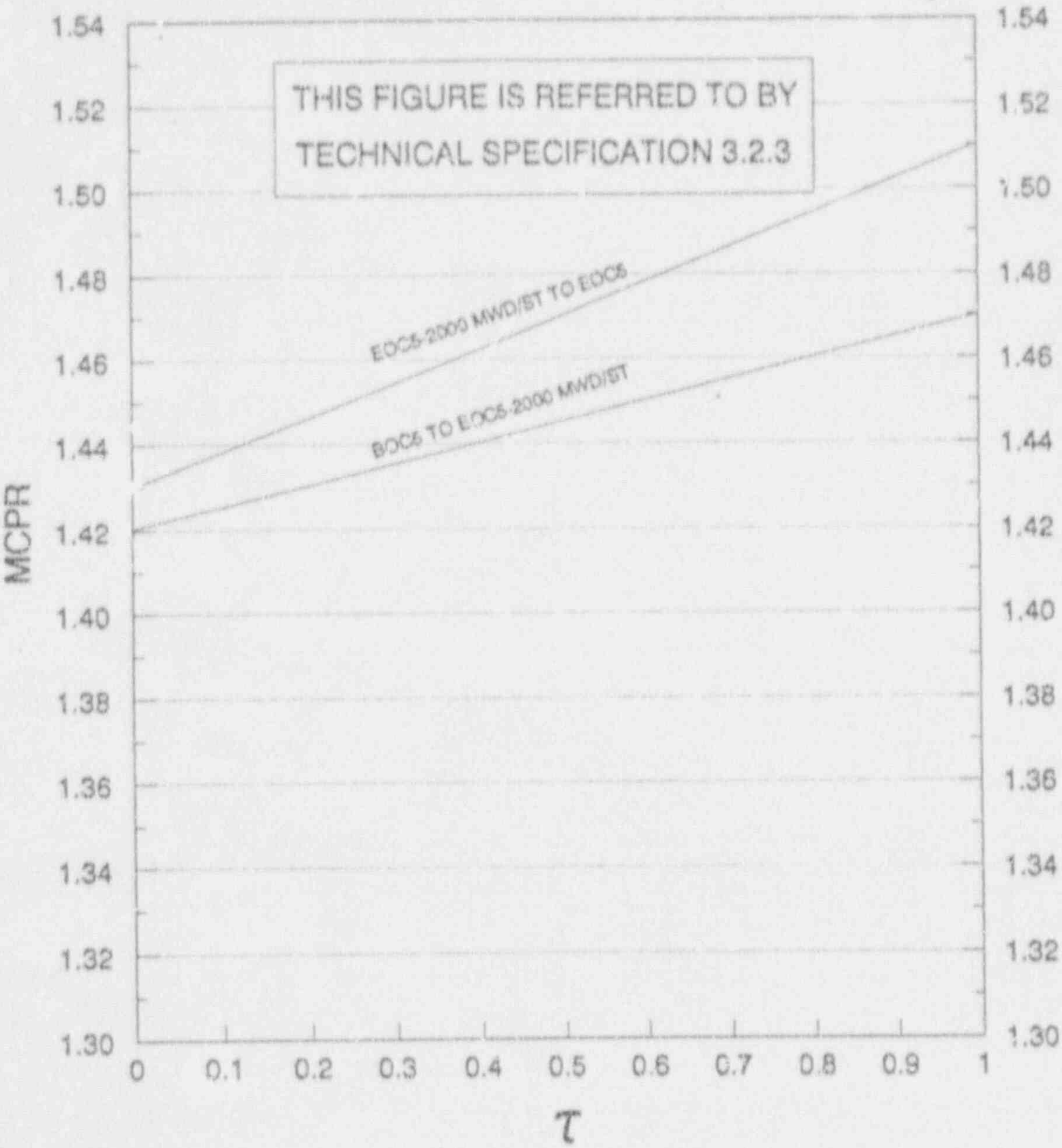
(INCREASED CORE FLOW and FEEDWATER TEMPERATURE REDUCTION)

FIGURE 7



MCPR VS TAU
FUEL TYPE GE11
(TBVOOS)

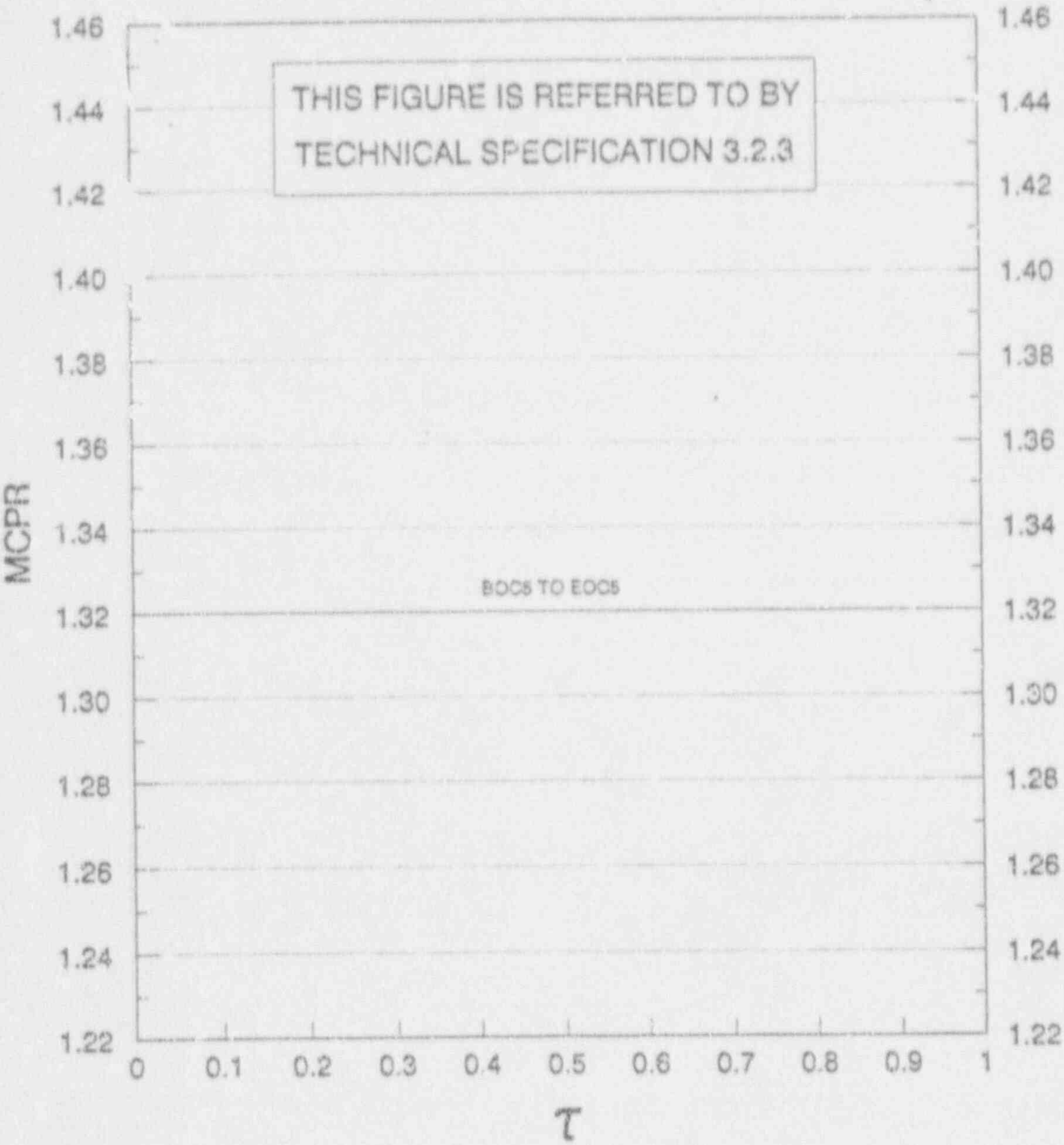
FIGURE 8



MCPR VS TAU
FUEL TYPE GE11

(WITHOUT RPT, or WITHOUT RPT and TBVOOS)

FIGURE 9

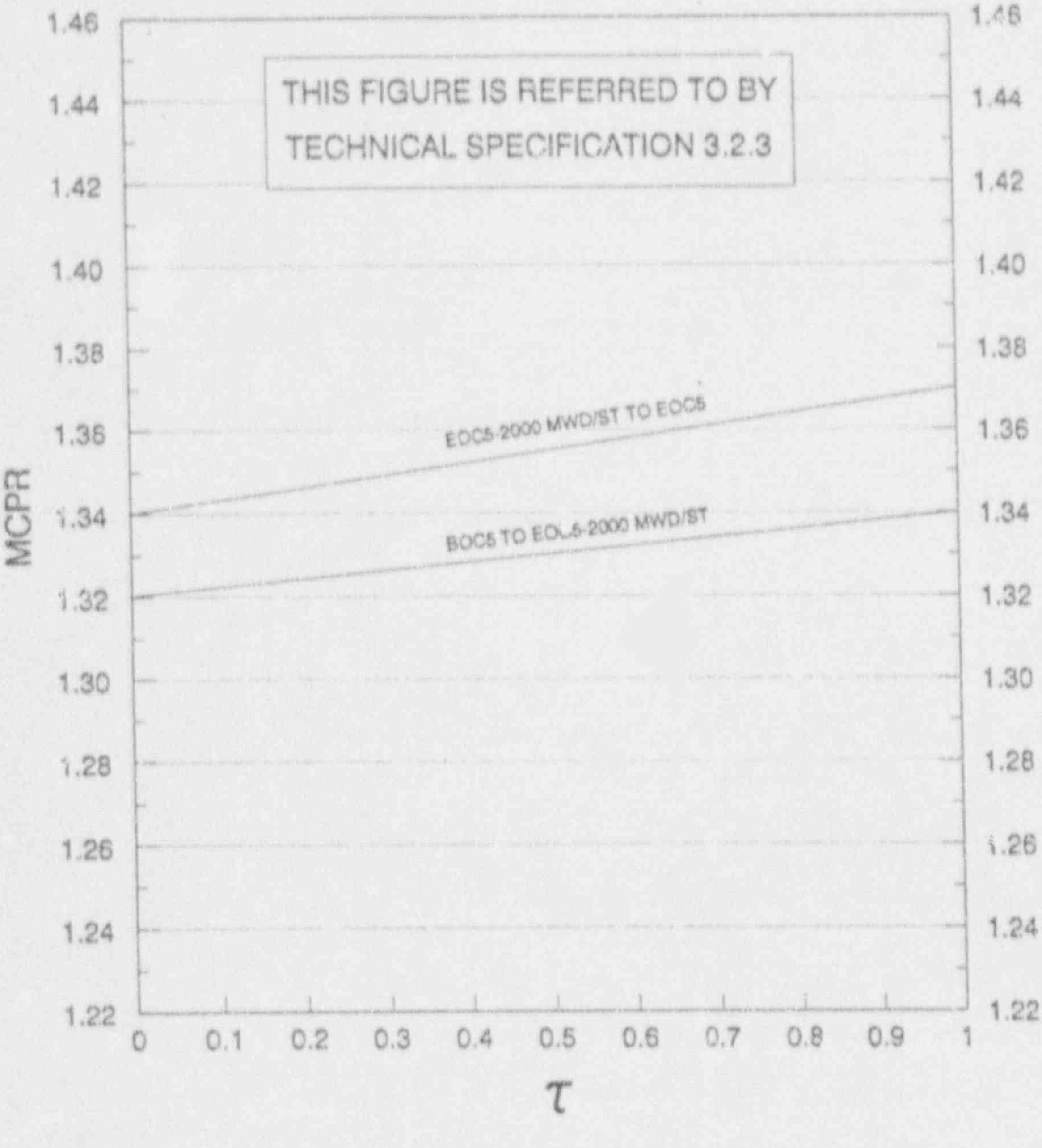


MCPR VS TAU

FUEL TYPES GE9B, GE84WR, GE82WR, and BP8x8R

(INCREASED CORE FLOW and FEEDWATER TEMPERATURE REDUCTION, and TBVOOS)

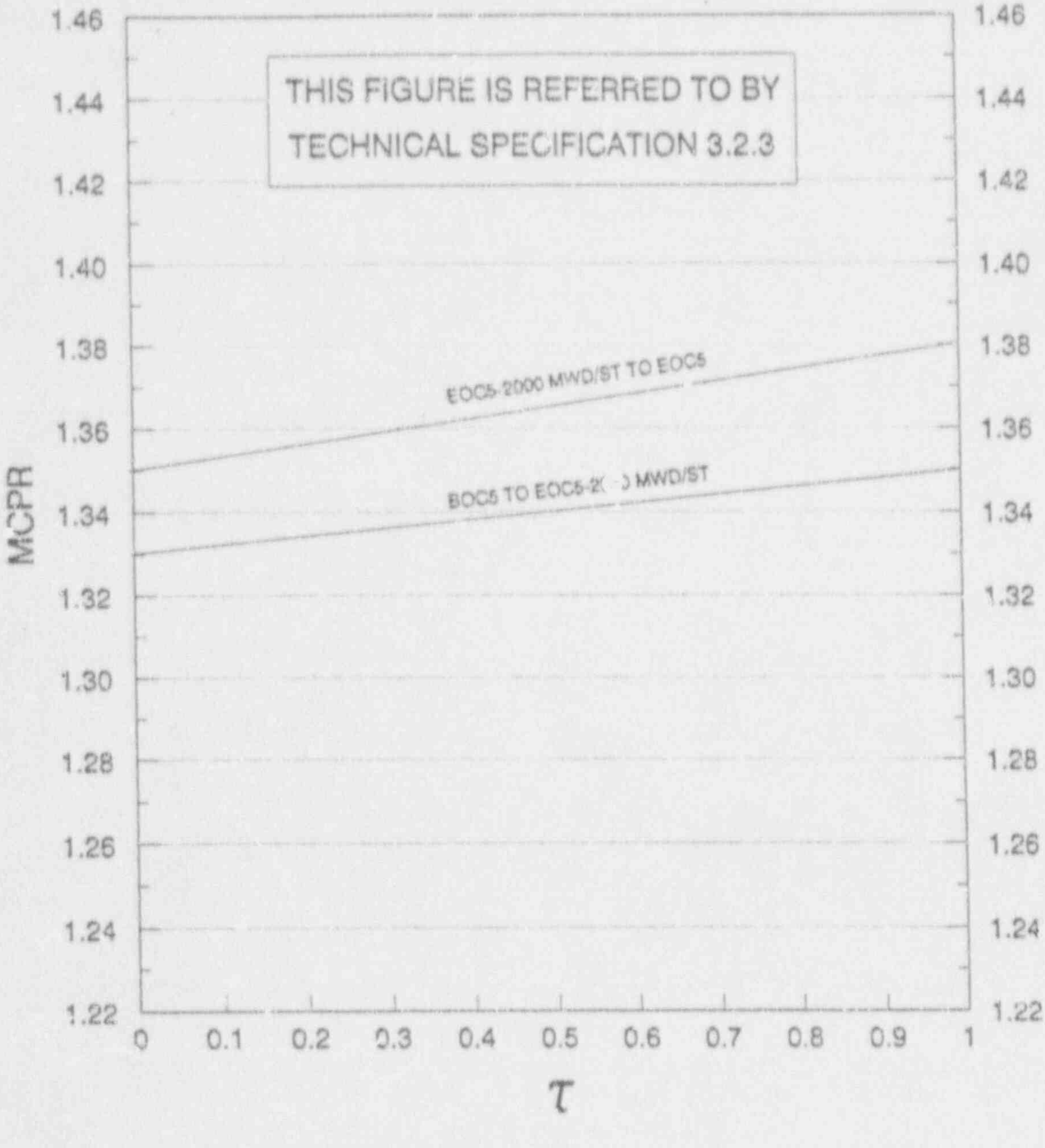
FIGURE 10



MCPR VS TAU
FUEL TYPE GE9B

(WITHOUT RPT, or WITHOUT RPT and TBVOOS)

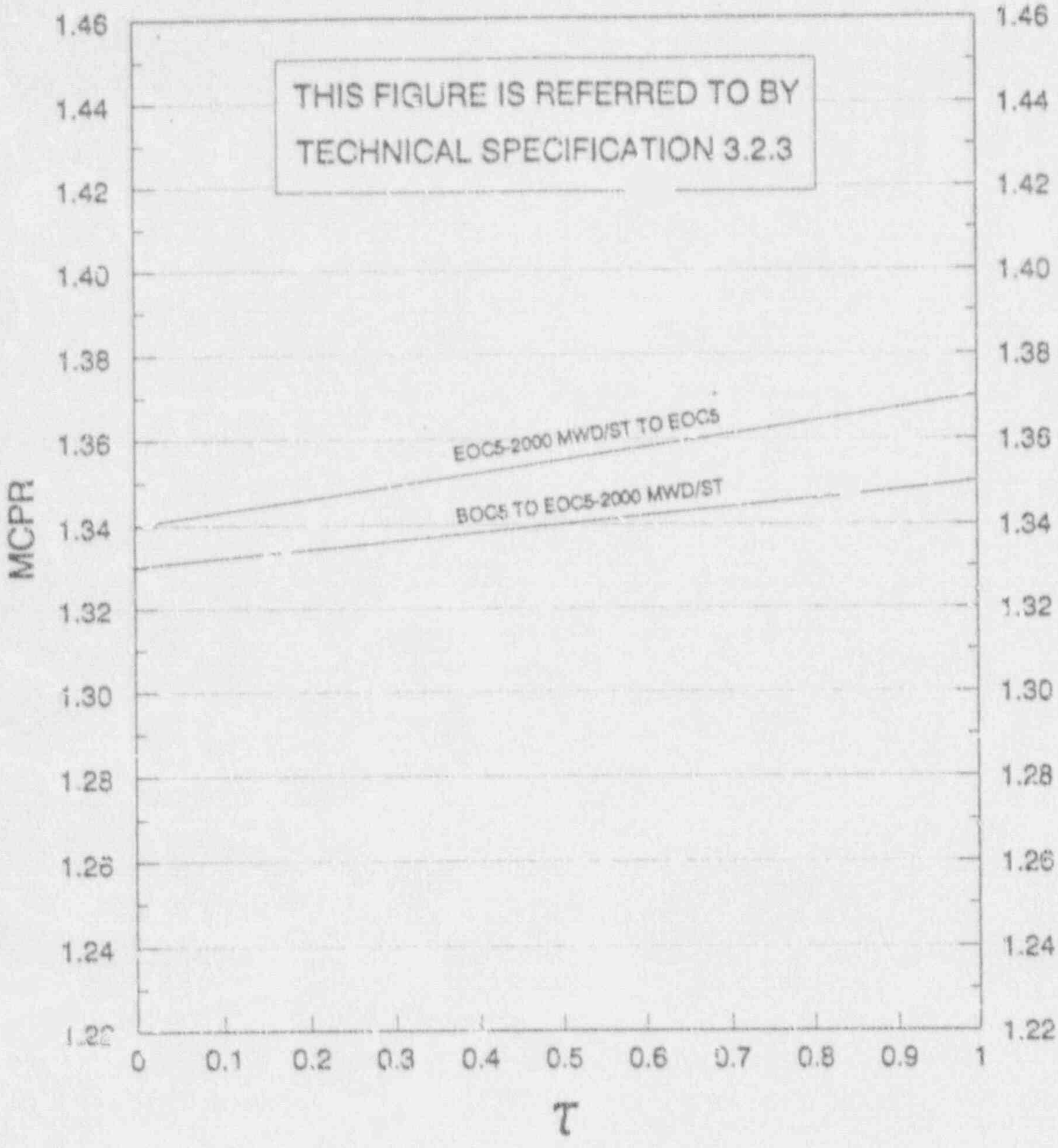
FIGURE 11



MCPR VS TAU
FUEL TYPE GE84WR

(WITHOUT RPT, or WITHOUT RPT and TEVOOS)

FIGURE 12



MCPR VS TAU
FUEL TYPES GE82WR and BP8x8R
(WITHOUT RPT, or WITHOUT RPT and TBVOOS)

FIGURE 13

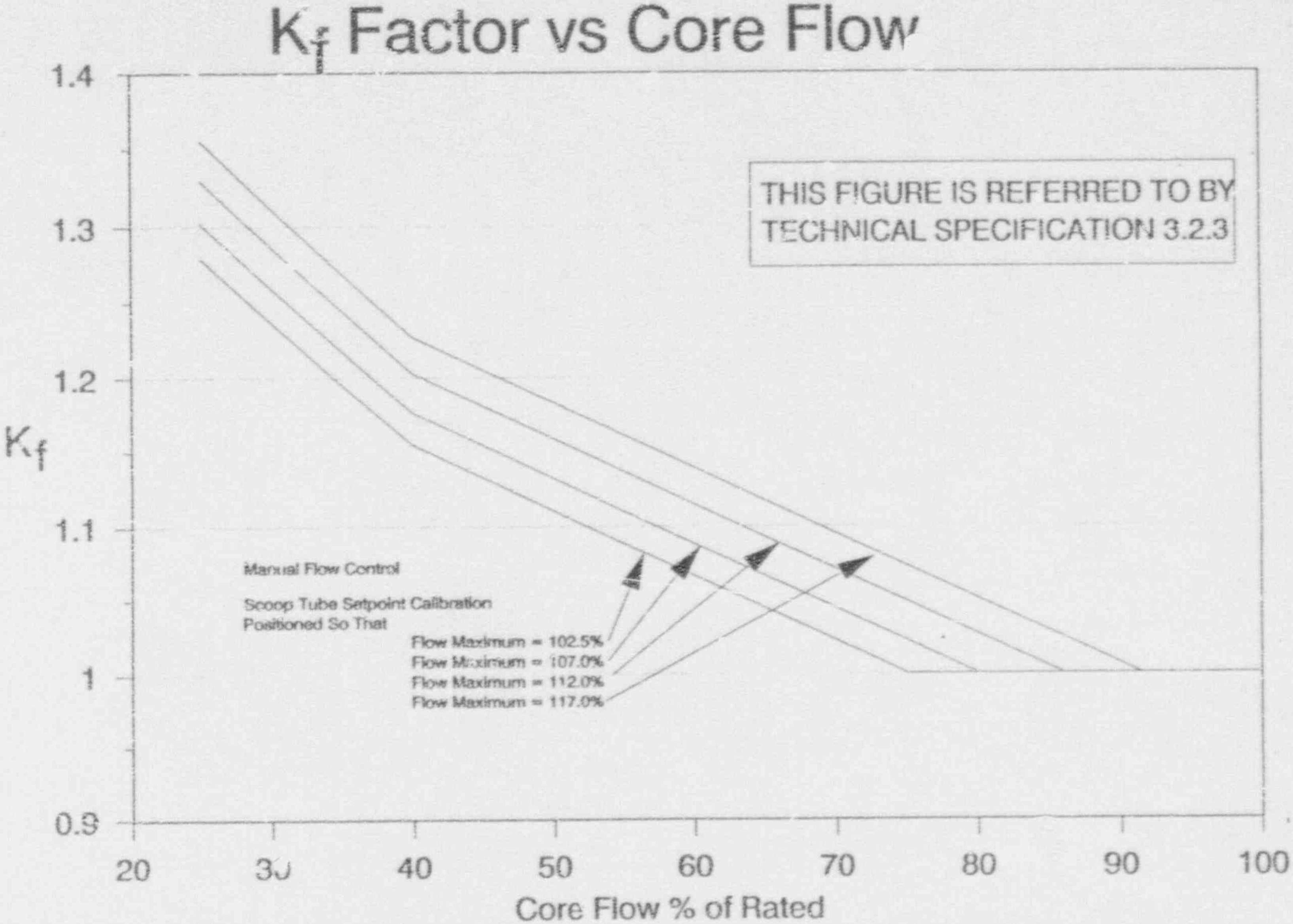

K_f Factor vs Core Flow
THIS FIGURE IS REFERRED TO BY
TECHNICAL SPECIFICATION 3.2.3
K_f
1.4
1.3
1.2
1.1
1
0.9
20
30
40
50
60
70
80
90
100
Core Flow % of Rated
Manual Flow Control
Scoop Tube Setpoint Calibration
Positioned So That
Flow Maximum = 102.5%
Flow Maximum = 107.0%
Flow Maximum = 112.0%
Flow Maximum = 117.0%

FIGURE 14

TABLE 1

SINGLE LOOP REDUCTION FACTORS

0.82	GE11 fuel
0.89	all other fuel types

TABLE 2

ROD BLOCK MONITOR SETPOINT

N=108

TABLE 3

LINEAR HEAT GENERATION RATE LIMITS

FUEL TYPE	MAXIMUM VALUE
BP8x8R	13.4 kW/ft
GE82WR	14.4 kW/ft
GE84WR	14.4 kW/ft
GE9B	14.4 kW/ft
GE11	14.4 kW/ft

TABLE 4

TURBINE BYPASS VALVE PARAMETERS

TURBINE BYPASS SYSTEM RESPONSE TIME

Maximum delay time before start of bypass valve opening following generation of the turbine bypass valve flow signal	0.1 sec
Maximum time after generation of a turbine bypass valve flow signal for bypass valve position to reach 80% of full stroke (includes the above delay time)	0.3 sec

MINIMUM REQUIRED BYPASS VALVES TO MAINTAIN SYSTEM OPERABILITY

Number of valves = 7