GEORGIA POWER COMPANY
EDWIN I. HATCH NUCLEAR PLANT

UNIT 1 CYCLE 17
CORE OPERATING LIMITS REPORT

Revision 0

Southern Nuclear Operating Company
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Edwin I. Hatch Nuclear Plant
Unit 1 Cycle 17
Core Operating Limits Report

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1.0 INTRODUCTION

The Core Operating Limits Report (COLR) for Plant Hatch Unit 1 Cycle 17 is prepared in accordance with the requirements of Technical Specification 5.6.5. This document was also produced in accordance with the requirements of BWRCA procedure BCA 40-10 and is documented in a DRF under QA No. NFS-96-029. The core operating limits presented herein were developed using NRC-approved methods (References 1 and 2). Results from the fuel vendor's reload analyses for the fuel in Unit 1 Cycle 17 are documented in References 3 and 4.

The following cycle-specific core operating limits are included in this report:

a. Control Rod Block Instrumentation -- Technical Specification 3.3.2.1

b. Average Planar Linear Heat Generation Rate (APLHGR) -- Technical Specification 2.1

c. Minimum Critical Power Ratio (MCPR) -- Technical Specifications 3.2.2 and 3.3.2.1

d. APRM Flow Biased Simulated Thermal Power - High -- Technical Specifications Surveillance Requirement 3.3.1.1.14

2.0 ROD BLOCK MONITOR (Technical Specification 3.3.2.1)

Both Rod Block Monitor (RBM) channels shall be operable as specified in Technical Specification 3.3.2.1 and when:

a. Thermal Power is ≥ 29% and < 90% of Rated Thermal Power, and MCPR is < 1.70;

or

b. Thermal Power is ≥ 90% of Rated Thermal Power, and MCPR is < 1.40.

3.0 APLHGR LIMIT (Technical Specification 3.2.1)

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

a. The flow-dependent multiplier, $MAPFAC_F$, from Figure 3-1,

or

b. The power-dependent multiplier, $MAPFAC_P$, from Figure 3-2.

For the fuel types whose APLHGR limits are shown in Figures 3-3 through 3-8, the APLHGR limit shall be applied to each axial location in the fuel assembly.

As required by GESTAR (Reference 1), the hand-calculated APLHGR values for a multi-lattice fuel (i.e., GE9-330, GE9-331, GE13-LUA, GE9-346, and GE12-331) must be less than or equal to the APLHGR limits shown in Figures 3-3, 3-5, 3-6, 3-7, and 3-8, respectively. When APLHGR values are determined by the process computer, the lattice-dependent APLHGR limits are used. Under these conditions, some axial locations may have APLHGR values exceeding the values shown in Figures 3-3, 3-5, 3-6, 3-7, and 3-8.

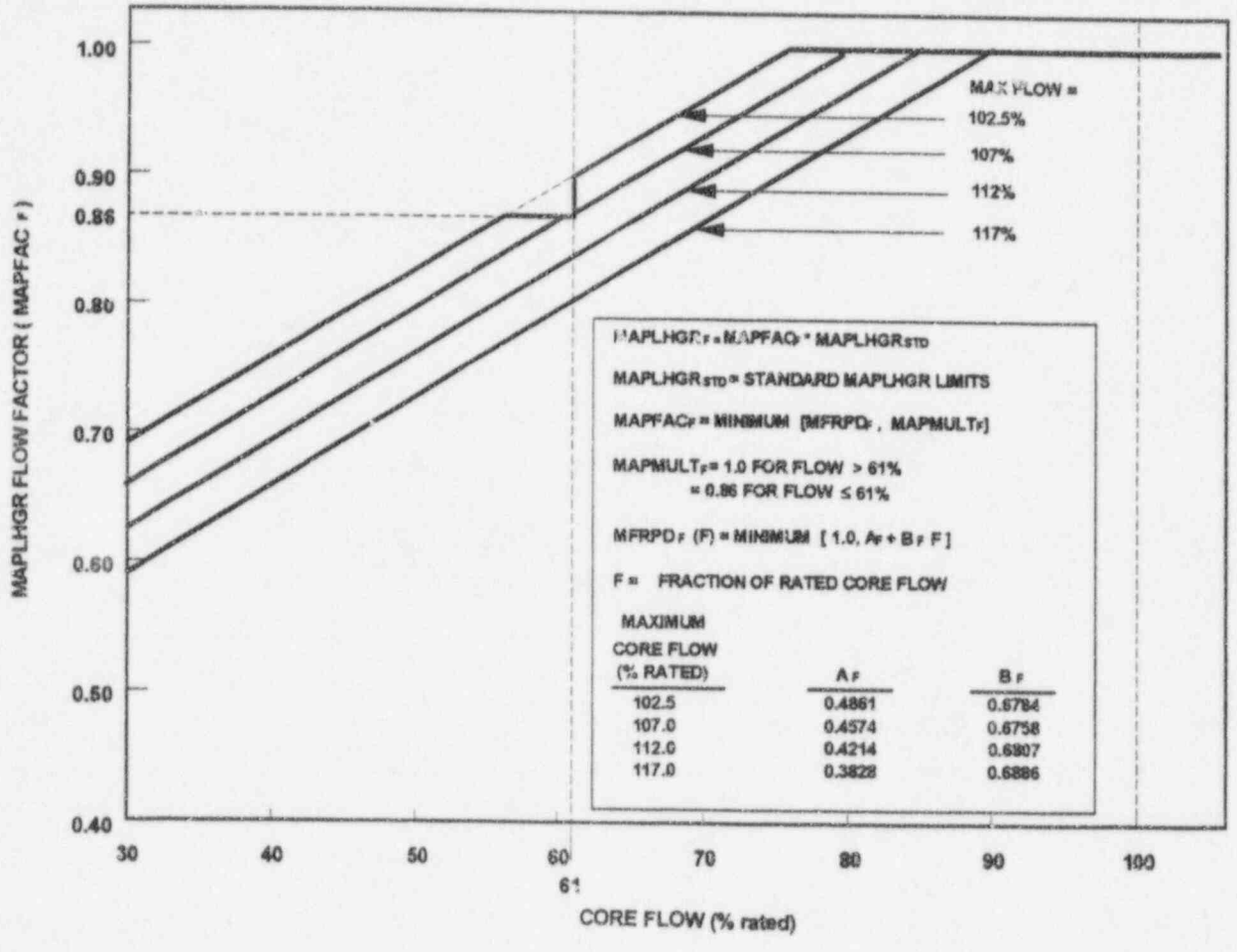


FIGURE 3-1

MAPLHGR MULTIPLIER ($MAPFAC_F$) VERSUS CORE FLOW

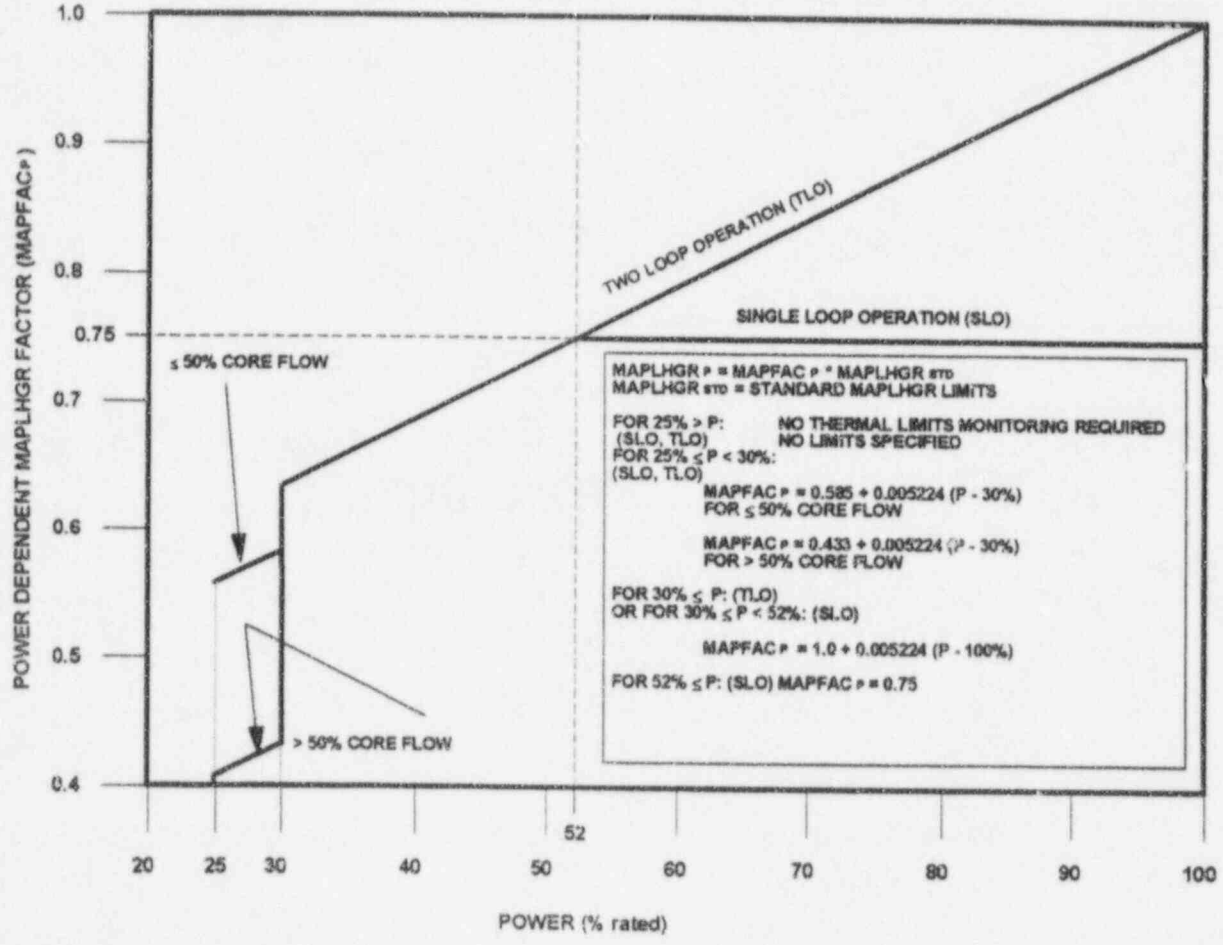


FIGURE 3-2

MAPLHGR MULTIPLIER ($MAPFAC_P$) VERSUS CORE POWER

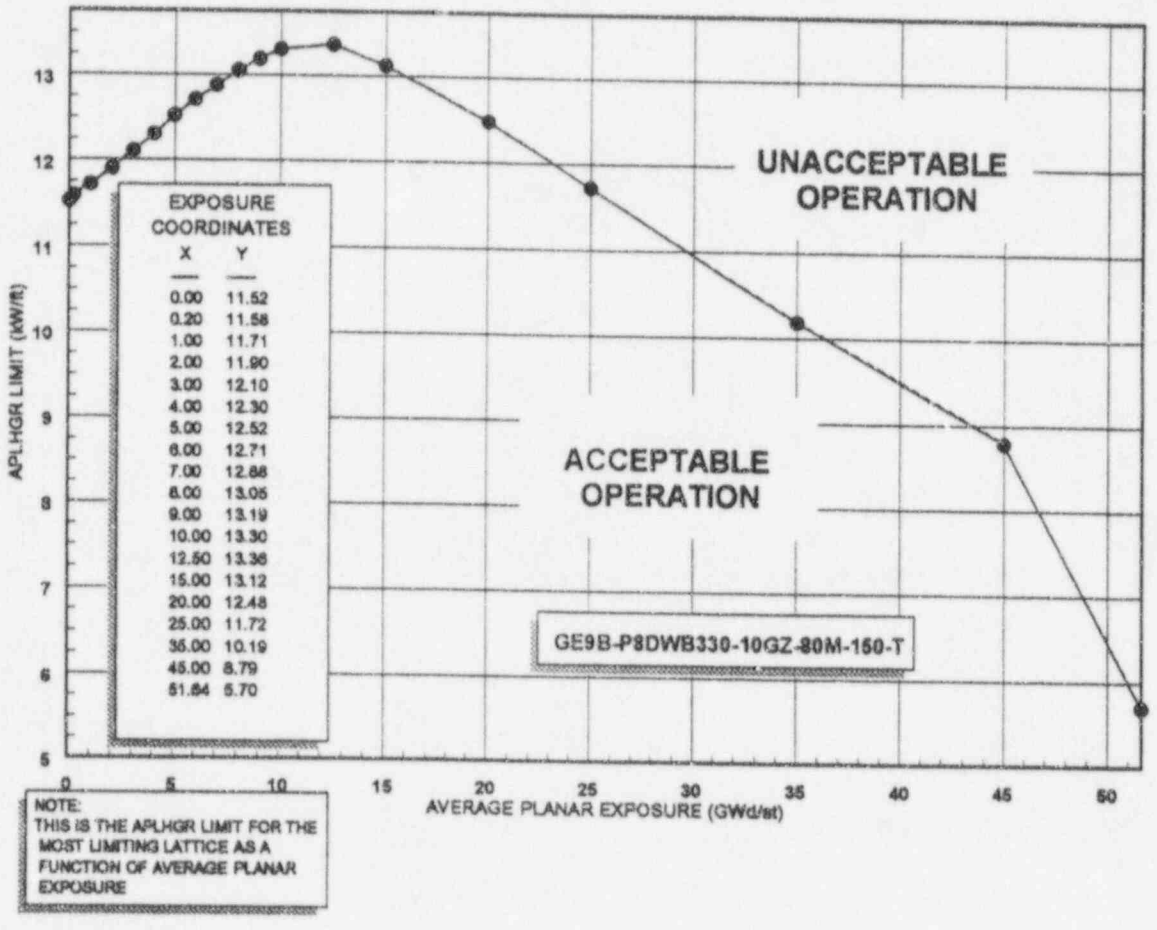


FIGURE 3-3

AVERAGE PLANAR LINEAR HEAT GENERATION RATE
VERSUS
AVERAGE PLANAR EXPOSURE
(Fuel Type: GE9B-P8DWB330-10GZ-80M-150-T)

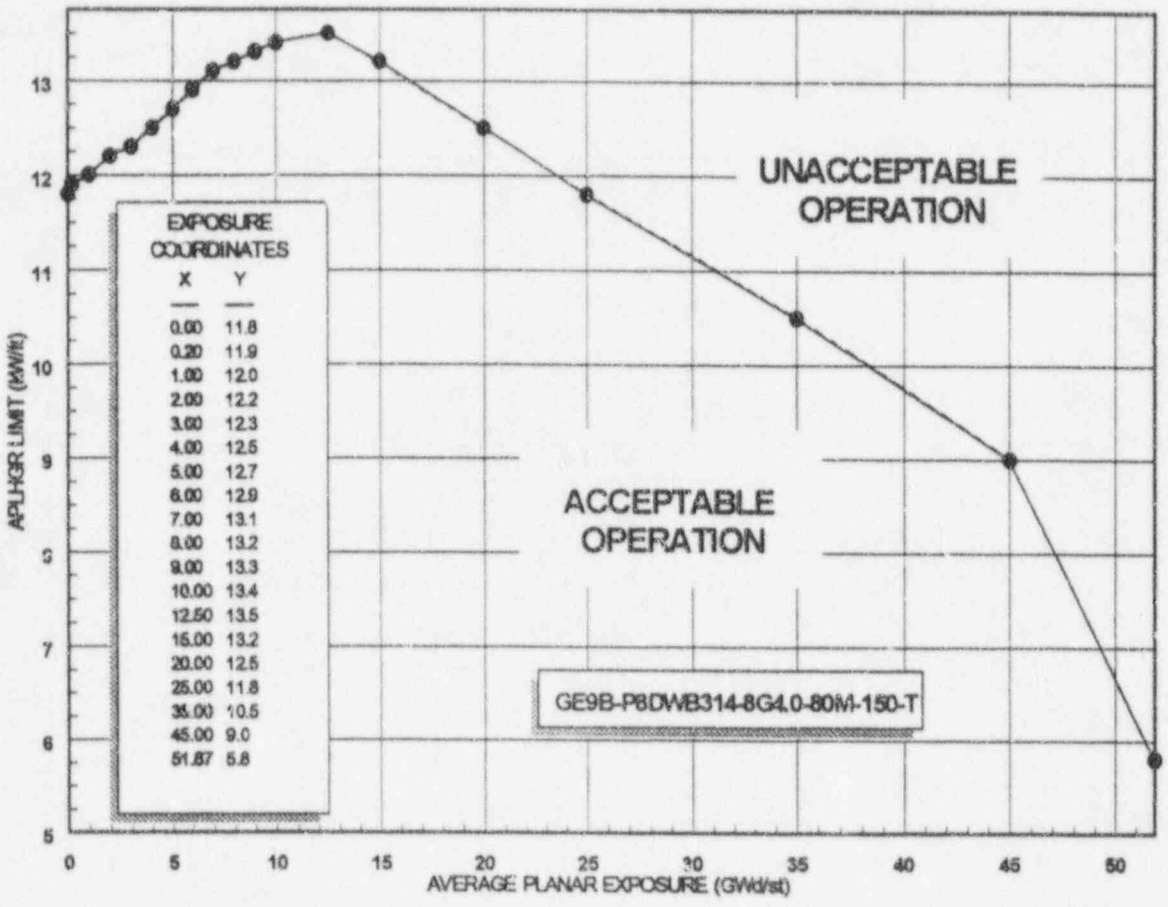


FIGURE 3-4

AVERAGE PLANAR LINEAR HEAT GENERATION RATE
VERSUS
AVERAGE PLANAR EXPOSURE
(Fuel Type: GE9B-P8DWB314-8G4.0-80M-150-T)

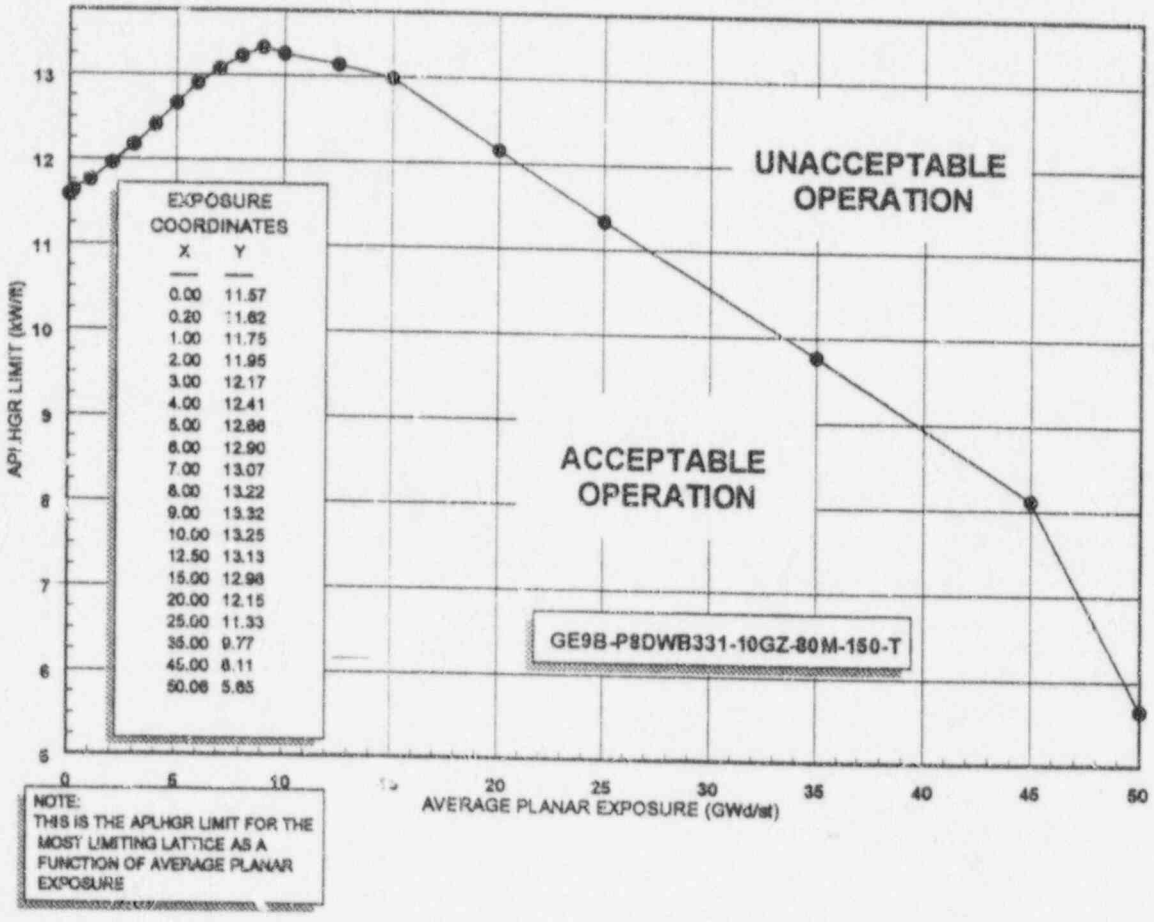


FIGURE 3-5

AVERAGE PLANAR LINEAR HEAT GENERATION RATE
VERSUS
AVERAGE PLANAR EXPOSURE
(Fuel Type: GE9B-P8DWB331-10GZ-80M-150-T)

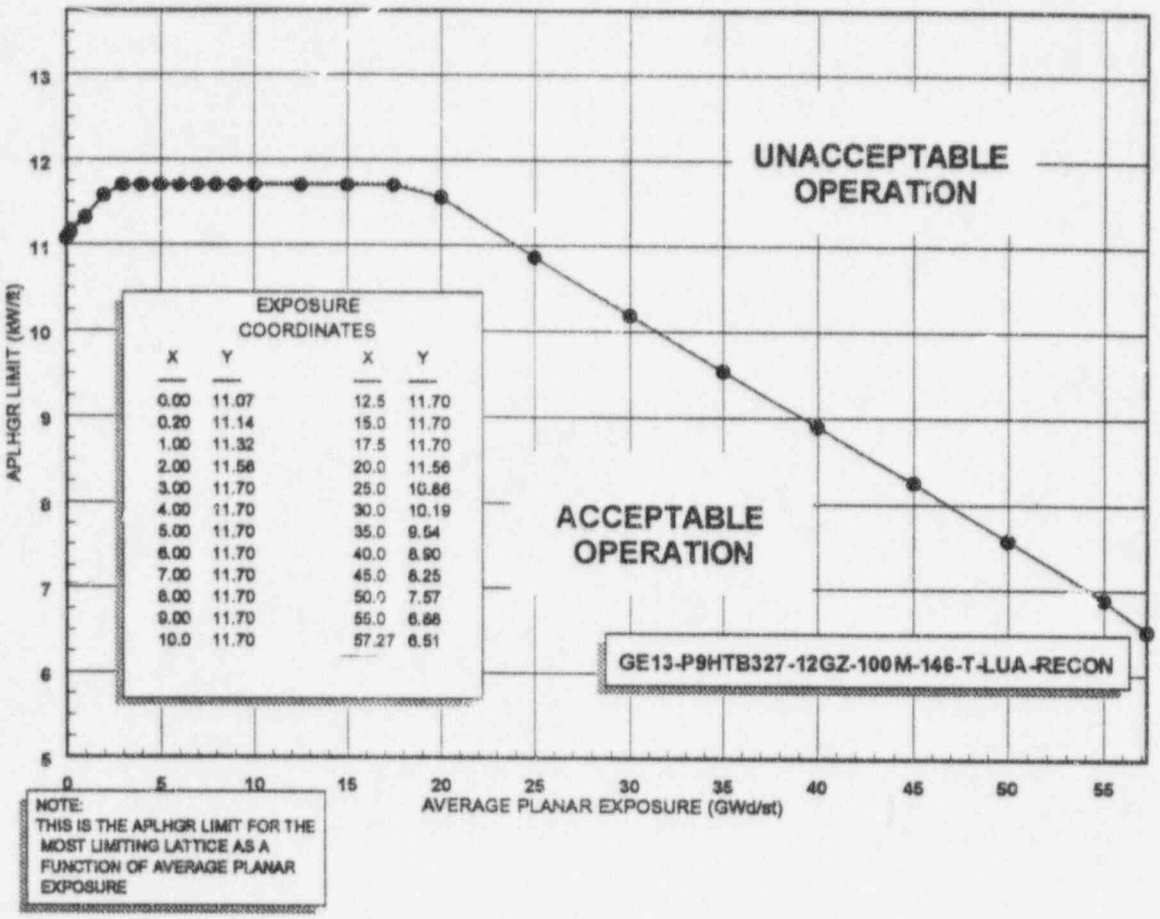


FIGURE 3-6

AVERAGE PLANAR LINEAR HEAT GENERATION RATE
VERSUS
AVERAGE PLANAR EXPOSURE
(Fuel Type: GE13-P9HTB327-12GZ-100M-146-T-LUA-RECON)

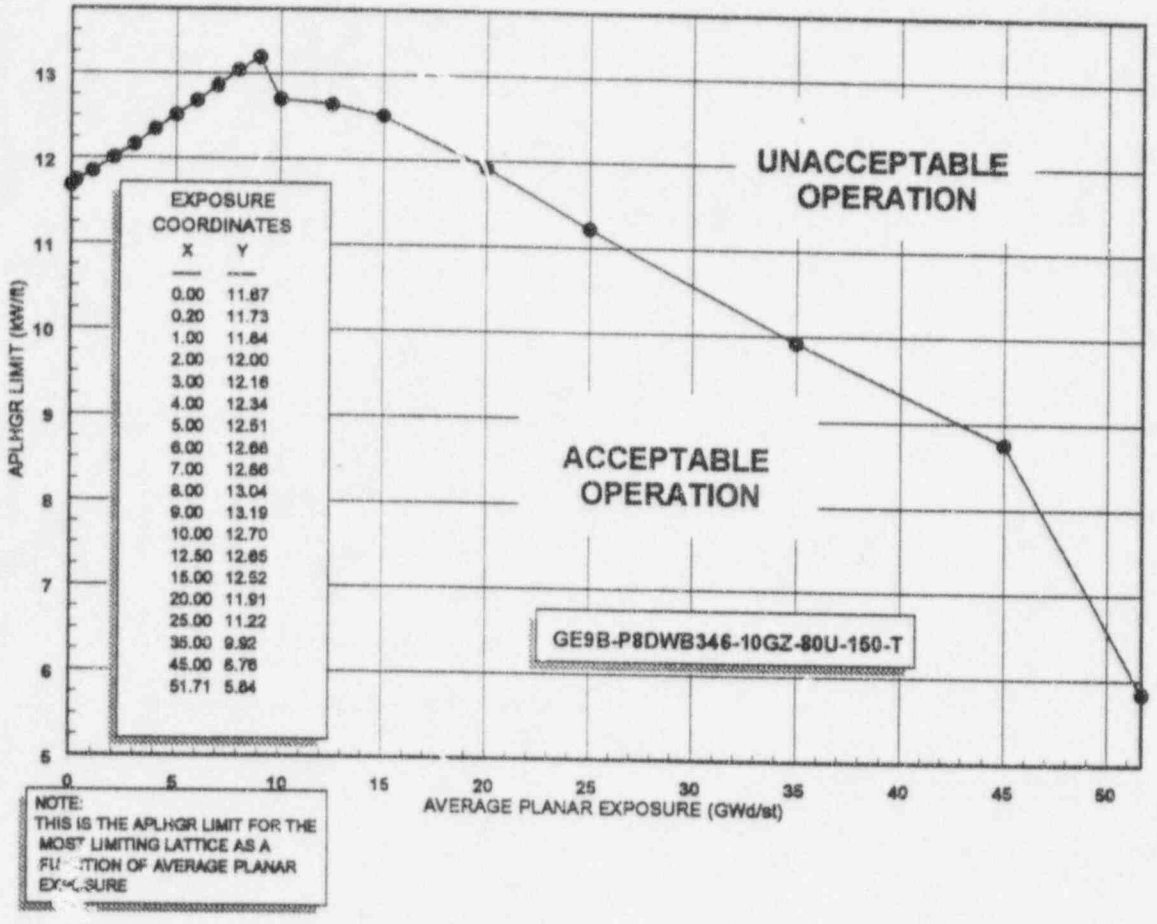


FIGURE 3-7

AVERAGE PLANAR LINEAR HEAT GENERATION RATE
VERSUS
AVERAGE PLANAR EXPOSURE
(Fuel Type: GE9B-P8DWB346-10GZ-80U-150-T)

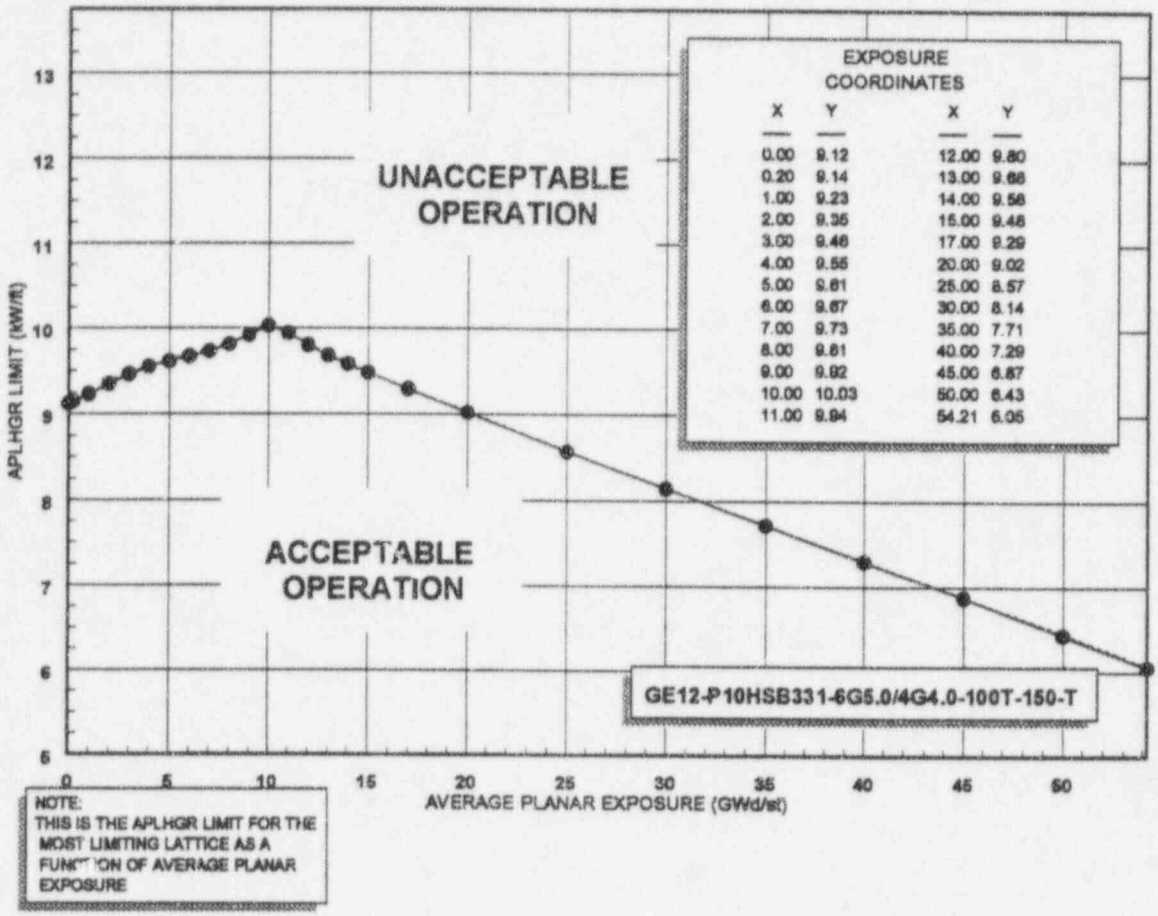


FIGURE 3-8

AVERAGE PLANAR LINEAR HEAT GENERATION RATE
VERSUS
AVERAGE PLANAR EXPOSURE
(Fuel Type: GE12-P10HSB331-6G5.0/4G4.0-100T-150-T)

4.0 MCPR LIMIT (Technical Specification 3.2.2)

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

With both recirculation pumps in operation (TLO), the OLMCPR for each fuel type with various combinations of equipment operability, scram times, core flow and core power is determined as follows:

a. For 25% ≤ power < 30%, the OLMCPR is given in Figure 4-1.

b. For power ≥ 30%, the OLMCPR is the greater of either:

   1) The flow-dependent MCPR limit determined from the applicable maximum core flow limit line of Figure 4-2,

      or

   2) The product of the values from Figure 4-1 and the applicable Figures 4-3 and 4-4 as determined by Table 4-1.

As stated in the note on Figures 4-3 and 4-4, with one recirculation pump operating (SLO), the calculated OLMCPR determined above is increased by 0.01.

In Figures 4-3 and 4-4, 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 4-1 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 4-1

OPERATING FLEXIBILITY OPTIONS APPLICABILITY

WITH: EOC-RPT	WITH: Turbine Bypass Valves	USE:
Operable	Operable	Figure 4-3
Inoperable	Operable	Figure 4-4
Operable	Inoperable	Not licensed for this operating cycle
Inoperable	Inoperable	Not licensed for this operating cycle

NOTE: Operation within the licensed power/flow region with a single recirculation loop and intermittent operation with reduced feedwater temperature are included in the MCPR limits presented in Figures 4-3 and 4-4.

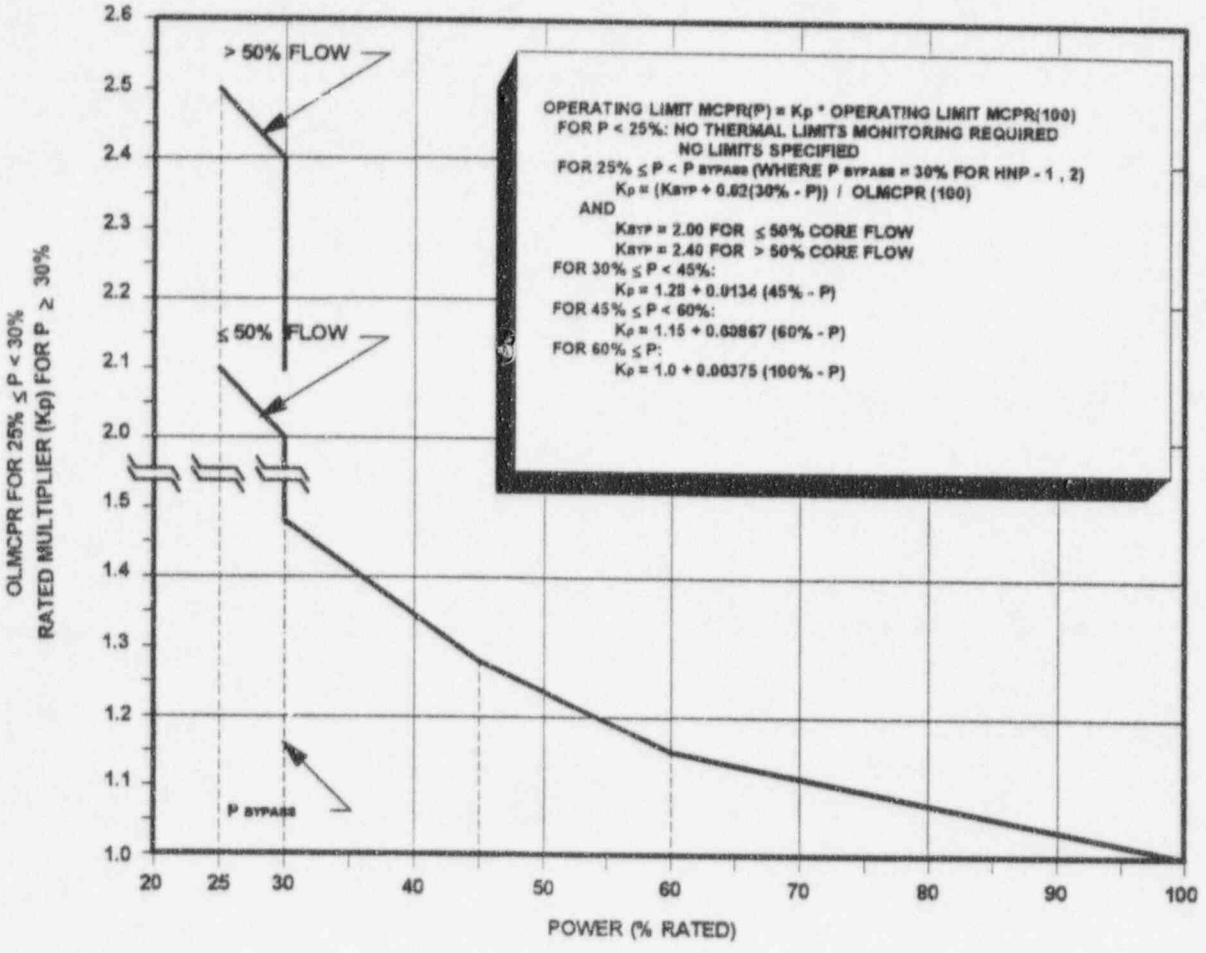


FIGURE 4-1

MCPR MULTIPLIER (K_P) VERSUS CORE POWER

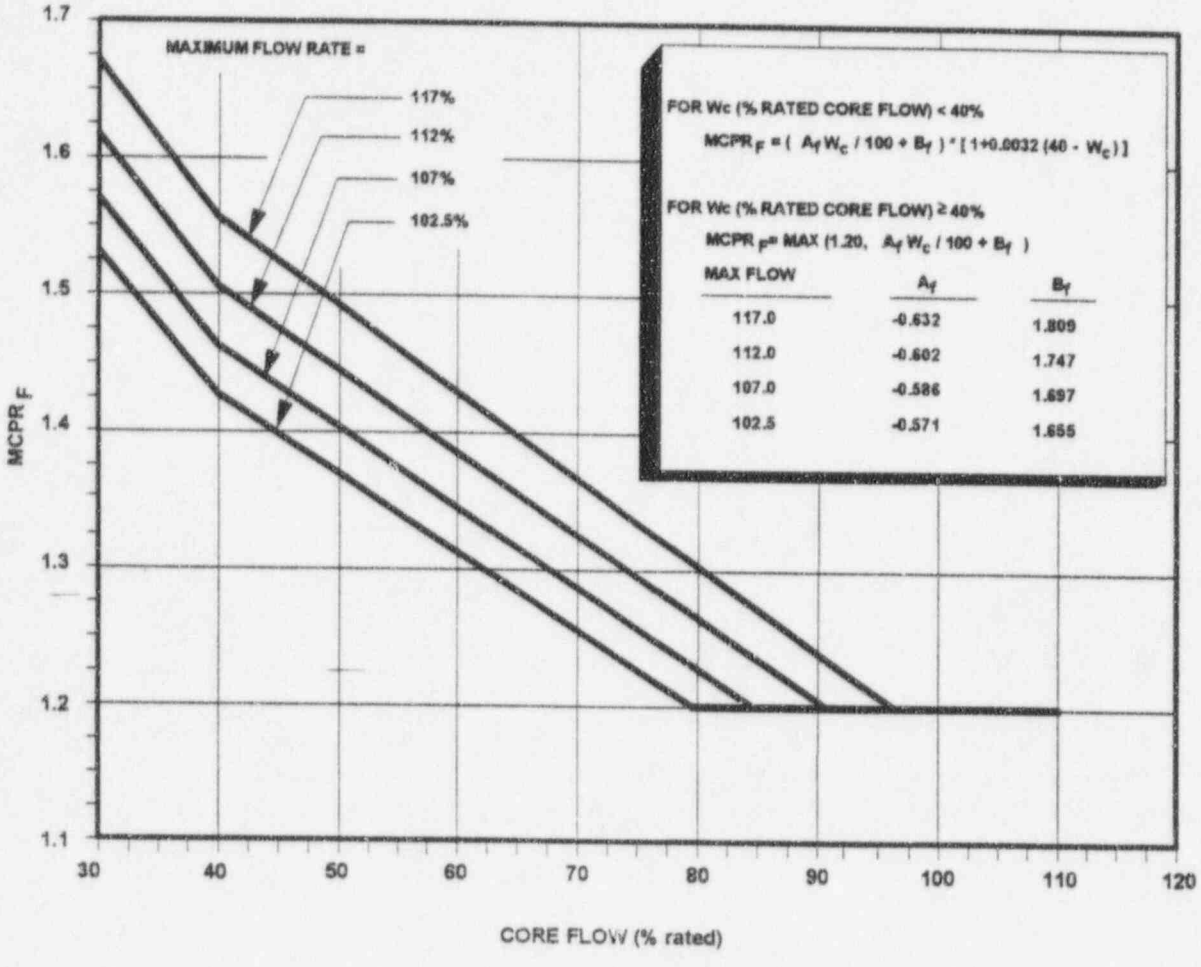
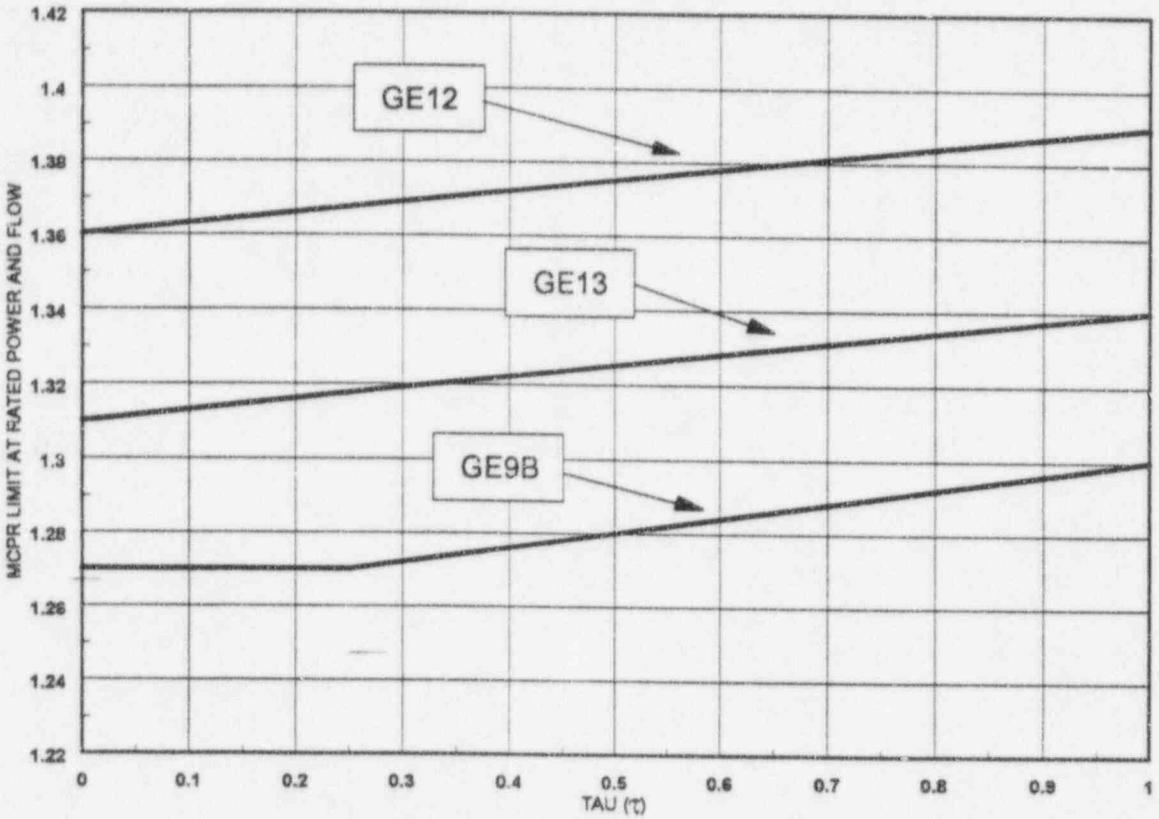


FIGURE 4-2

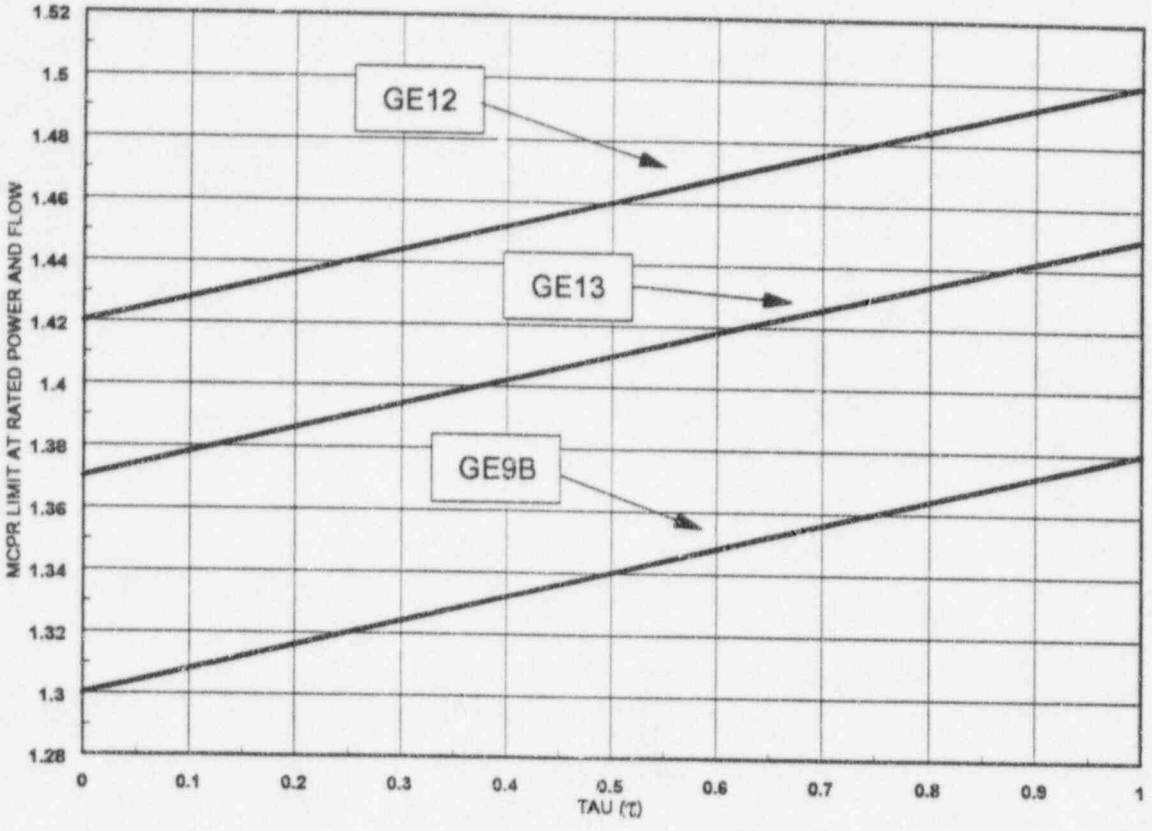
MCPR LIMITS ($MCPR_F$) VERSUS CORE FLOW



NOTE: For SLO, increase the MCPR Limit obtained from this figure by 0.01.

FIGURE 4-3

MCPR LIMIT VERSUS AVERAGE SCRAM TIME
(with Turbine Bypass Valves Operable and EOC-RPT System Operable)



NOTE: For SLO, increase the MCPR Limit obtained from this figure by 0.01.

FIGURE 4-4

MCPR LIMIT AS FUNCTION OF AVERAGE SCRAM TIME
(with Turbine Bypass Valves Operable and EOC-RPT System Inoperable)

5.0 APRM FLOW BIASED SIMULATED THERMAL POWER - HIGH Time Constant (Surveillance Requirement 3.3.1.1.14)

The allowable value for the APRM Flow Biased Simulated Thermal Power - High time constant is ≤ 7.0 seconds.

6.0 REFERENCES

1. "General Electric Standard Application for Reactor Fuel," NEDE-24011-P-A-11-US, November 1995.

2. Letter, L. P. Crocker (NRC) to W. G. Hairston (GPC), "Issuance of Amendment No. 168 to Facility Operating License DPR-57 and Amendment No. 106 to Facility Operating License NPF-5 - Edwin I. Hatch Nuclear Plant Units 1 and 2 (TAC Nos. 73614 and 73615)," December 29, 1989.

3. "Supplemental Reload Licensing Report for Edwin I. Hatch Nuclear Plant Unit 1, Reload 16, Cycle 17," General Electric Document 24A5353, Revision 0, March 1996.

4. "Edwin I. Hatch Nuclear Plant Units 1 and 2 SAFER/GESTR - LOCA Loss-of-Coolant Accident Analysis," NEDC-31376-P, December 1986.