

ATTACHMENT E

Cycle 12 Core Operating Limits Report

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## 1.0 INTRODUCTION

This report provides the cycle-specific limits for operation of the Maine Yankee plant through Cycle 12. It includes the limits for:

1. Symmetric Offset Trip Limit
2. Specified Acceptable Fuel Design Limit (SAFDL).
3. Power Dependent Insertion Limit (PDIL).
4. Excore Symmetric Offset (LOCA Limiting With Incore Monitors Inoperable and CEAs Restricted Above 100% PDIL).
5. Excore Symmetric Offset (LOCA Limiting With Incore Monitors Inoperable).
6. Total Radial Peaking Limit.
7. Required Shutdown Margin.
8. Excore Symmetric Offset LCO.
9. Excore Symmetric Offset LCO (IMPIN Operation).
10. Linear Heat Generation Limits.

In addition, this report includes a number of cycle-specific coefficients used in the generation of certain reactor protective system trip setpoints or allowable increases in radial peaking. If any of the limits contained within this report are exceeded, corrective action will be taken as defined in the Technical Specifications.

This report has been prepared in accordance with the requirements of Technical Specification 5.14. The core operating limits have been developed using the NRC-approved methodologies listed in Technical Specification 5.14.2.

## 2.0 CORE OPERATING LIMITS

The values and limits presented within this section have been derived using the NRC-approved methodologies listed in Technical Specification 5.14. All values and limits in this section apply to the Cycle 12. Cycle 12 must be operated within the bounds of these limits and all others specified in the Technical Specifications.



TABLE 1

THERMAL MARGIN/LOW PRESSURE REACTOR TRIP COEFFICIENTS  
(Technical Specification 2.1.1.b and 3.10.C.2.b.1)

<u>Coefficient</u>	<u>Value</u>
A	2053.2
B	17.9
C	-10053.0
A <sub>1</sub>	See Figure 1
QR <sub>1</sub>	See Figure 2

---

Note: The thermal margin/low pressure trip setpoint is calculated as the greater of:

$$A[A_1 \cdot QR_1] + BT_c + C$$

or 1835 psig

TABLE 2

SPECIFIED ACCEPTABLE FUEL DESIGN LIMIT  
(Technical Specification 2.2.B)

<u>Fuel Type</u>	<u>Limit (kw/ft)*</u>	
	<u>BOC</u>	<u>EOC</u>
M	20.8	20.0
P	21.1	20.0
Q	22.1	20.6
R	23.5	22.4

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\*The limit for each fuel type decreases linearly with the cycle average burnup. The EOC burnup for the purposes of establishing this relationship is 14500 MWD/MTU cycle average burnup.

TABLE 3

Power Reduction Coefficients with an  
inoperable Incore Monitoring System  
(Technical Specification 3.10.C.3.a)

<u>R value</u>	<u>Symmetric Offset Range</u>
75	+0.05 to +0.10
81	0.00 to +0.05
96	0.00 to -0.05
90	-0.05 to -0.10

CR Value

0.80



FIGURE 1

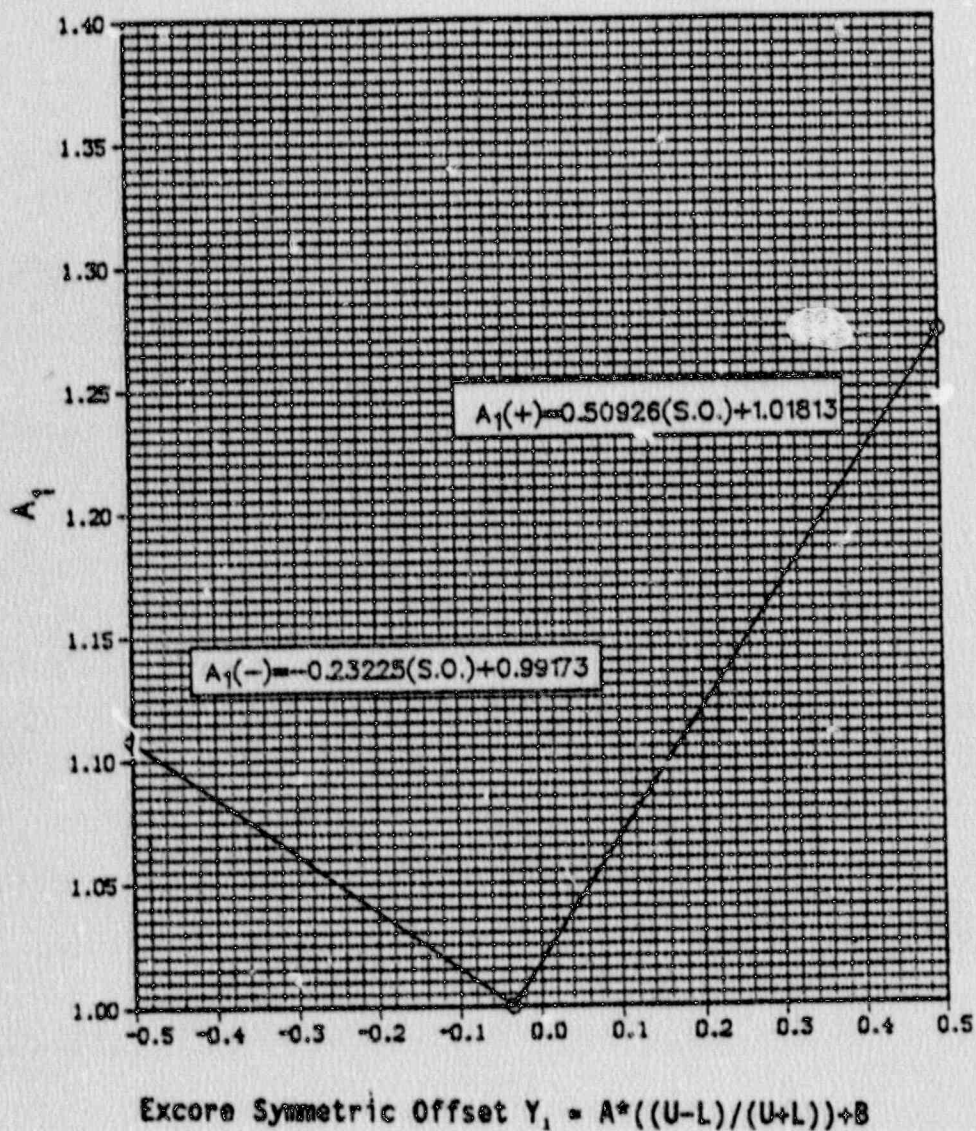
Thermal Margin/Low Pressure Trip Setpoint  
(A<sub>1</sub> versus Excure Symmetric Offset)

(Technical Specification 2.1.1.b)  
(Technical Specification 3.10.C.2.b.1)

WHERE:  $Q_{DNB} = A_1 \cdot QR_1$

AND  $P_{VAR}^{TRIP} = 2053.2 Q_{DNB} + 17.9T_C - 10053.0$

$T_C$  = COLD LEG TEMPERATURE, °F





**FIGURE 2**

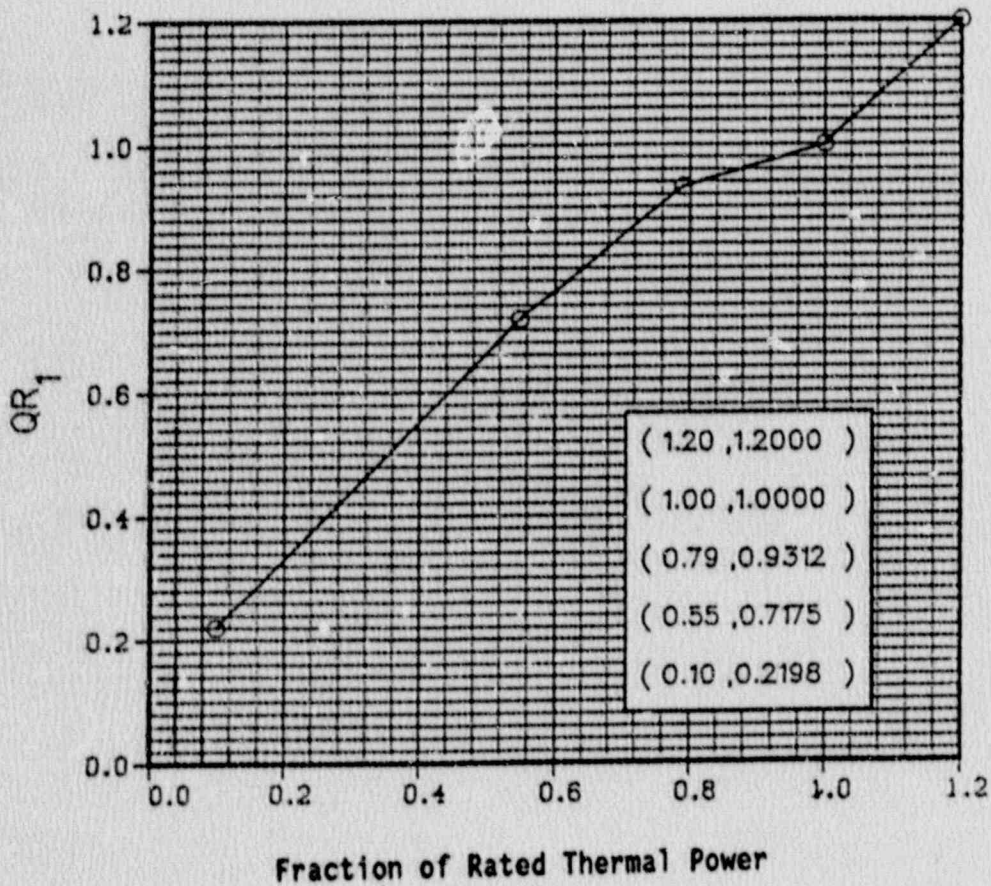
Thermal Margin/Low Pressure Trip Setpoint  
(QR<sub>1</sub> versus Fraction Rated Thermal Power)

(Technical Specification 2.1.1.b)  
(Technical Specification 3.10.C.2.b.1)

WHERE:  $Q_{DNB} = A_1 * QR_1$

AND  $P_{VAR}^{TRIP} = 2053.2 Q_{DNB} + 17.5T_C - 10053.0$

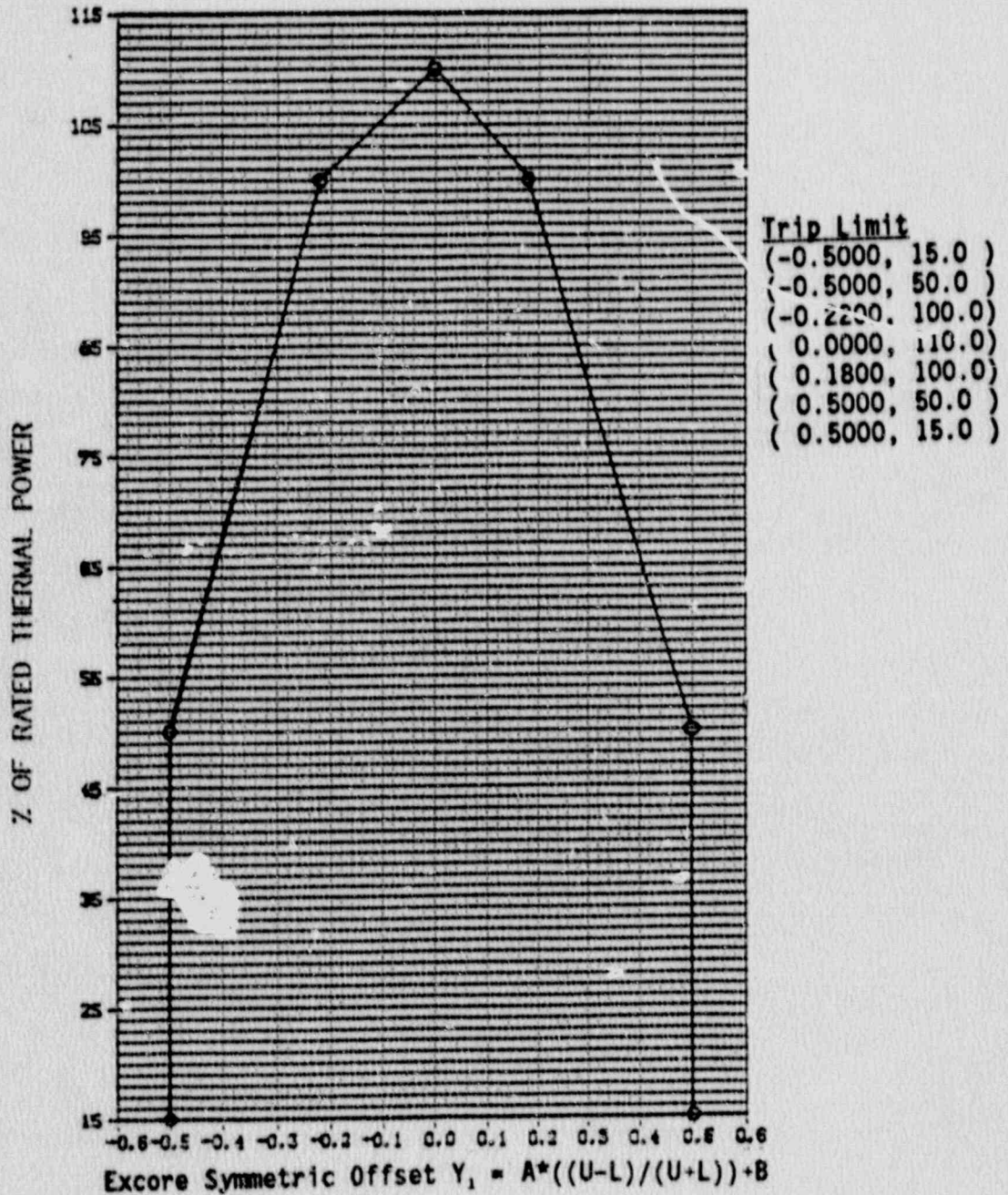
$T_C$  = COLD LEG TEMPERATURE, °F



**FIGURE 3**

Symmetric Offset Trip Limit

(Technical Specification 2.1.1.c)  
(Technical Specification 3.10.C.2.b.1)

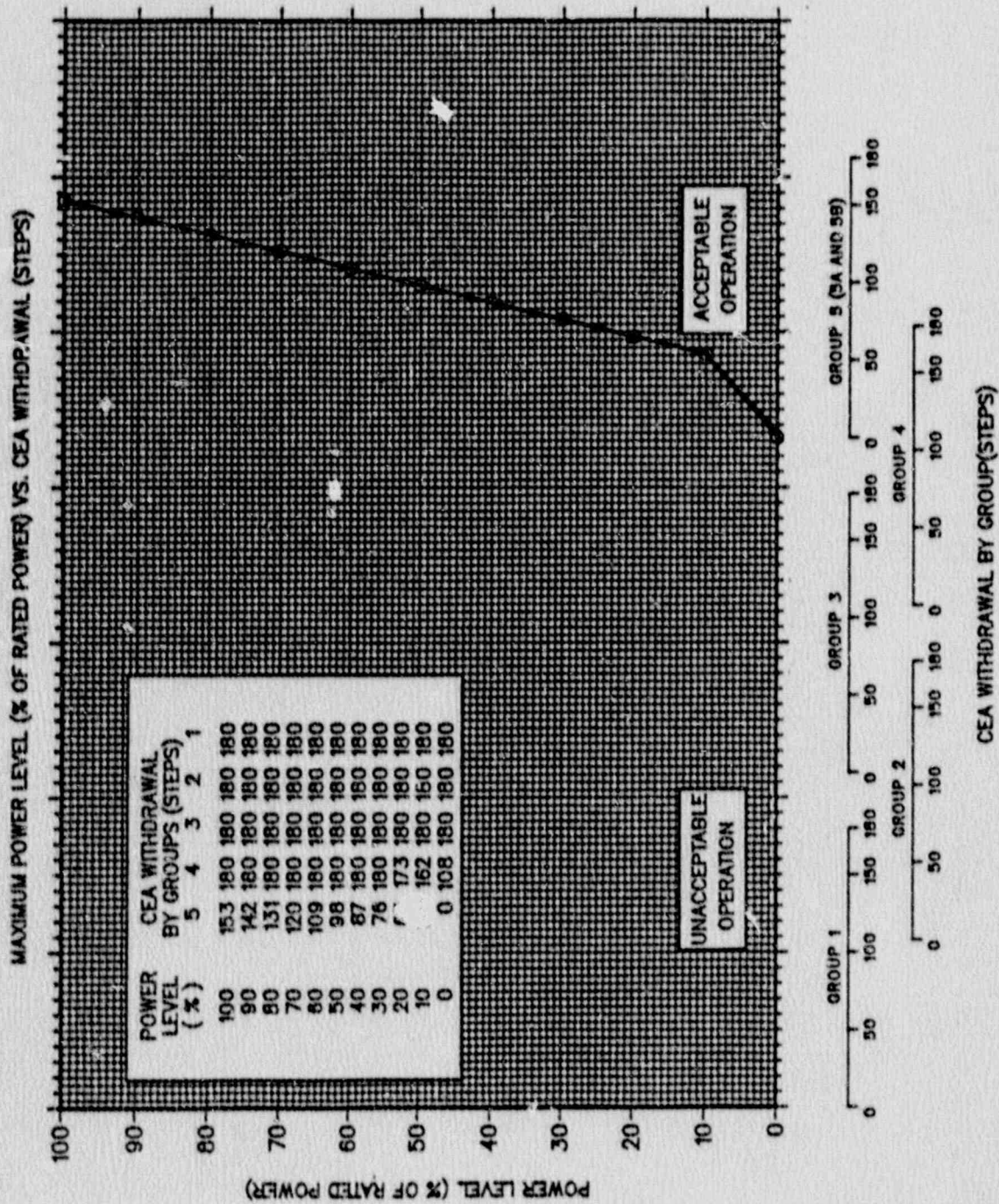




**FIGURE 4**

Power Dependent Insertion Limit

(Technical Specification 3.10.A.1)  
 (Technical Specification 3.10.C.2.b.1)



**FIGURE 5**

Excure Symmetric Offset, (LOCA Limiting)

(Incore Monitors Inoperable and CEAs Restricted Above 100% PDIL)

(Technical Specification 3.10.C.2.b.1)

(Technical Specification 3.10.C.3.a.2)

Coordinates (Excure Symmetric Offset, % Rated Power)  
(-0.40,20.) (-0.40,50.) (+0.0,60.) (+0.40,50.) (+0.40,20.)

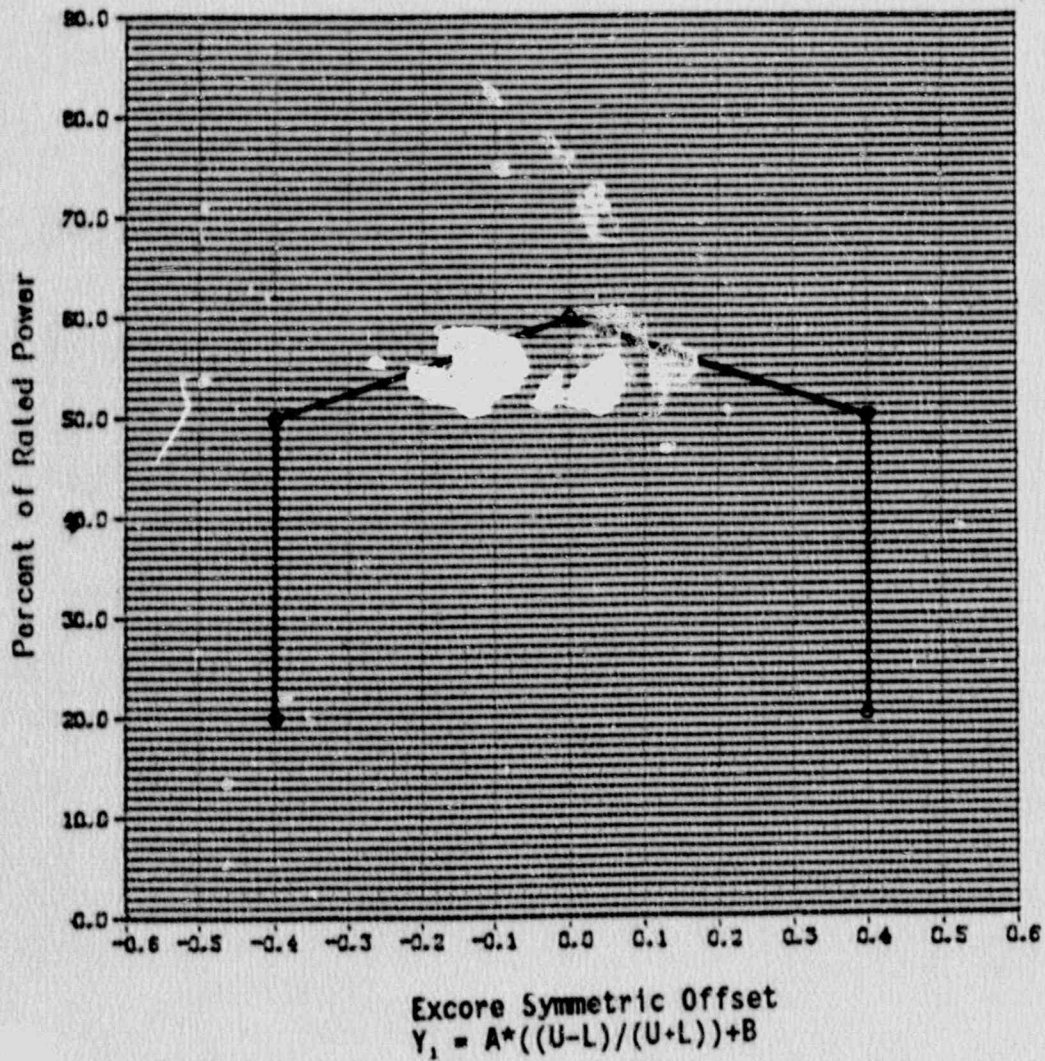




FIGURE 6

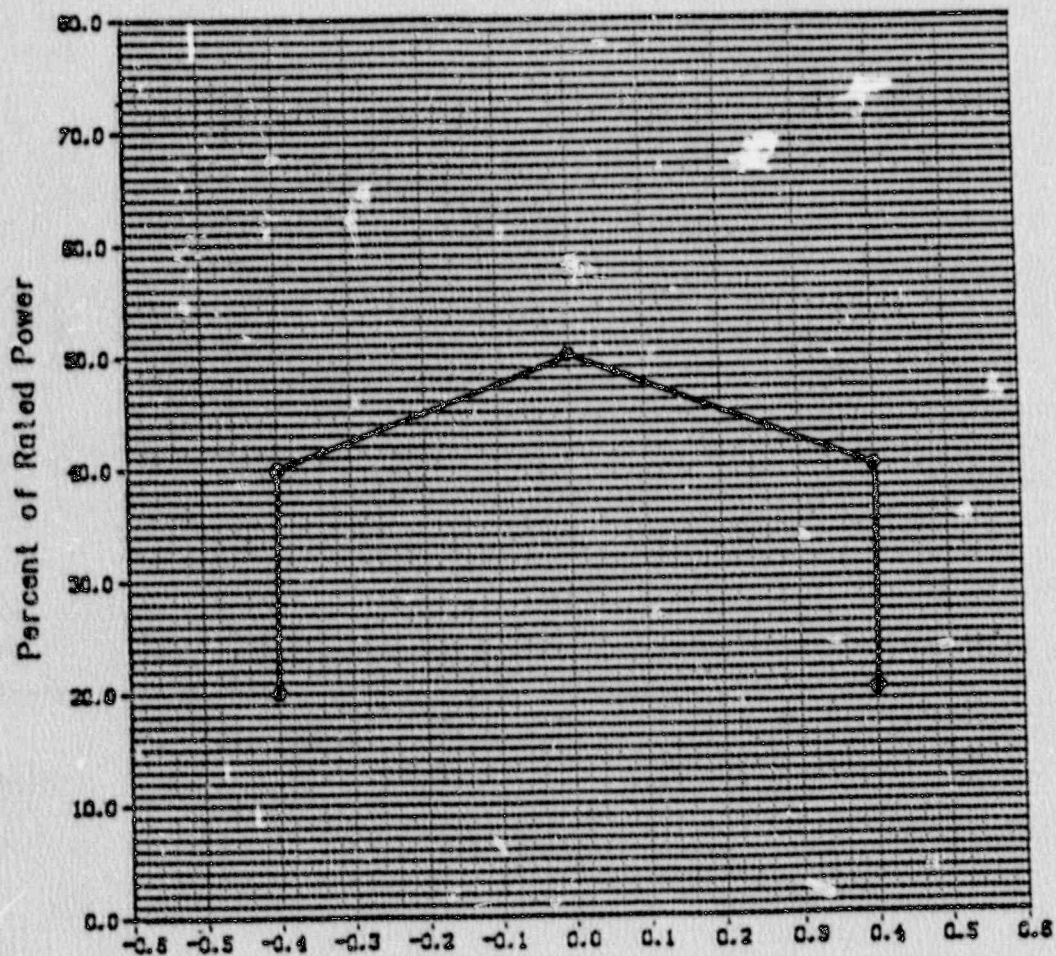
Excure Symmetric Offset, (LOCA Limiting)

(Incore Monitors Inoperable)

(Technical Specification 3.10.C.2.b.1)

(Technical Specification 3.10.C.3.a.3)

Coordinates (Excure Symmetric Offset, % Rated Power)  
(-0.40,20.) (-0.40,40.) (-0.0,50.) (+0.40,40.0) (+0.40,20.0)

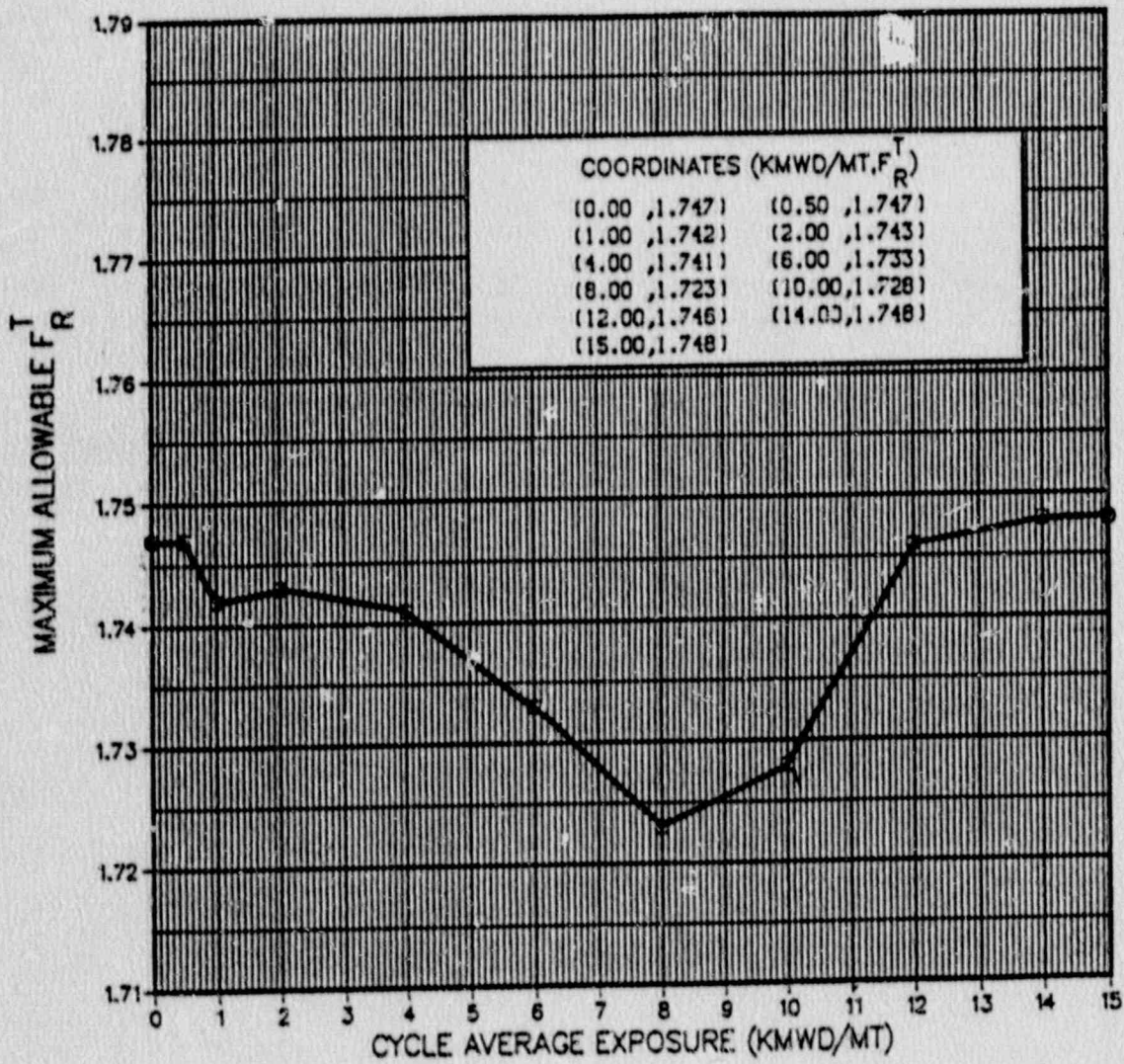


Excure Symmetric Offset  
$$Y_1 = A * ((U-L)/(U-L)) + B$$

**FIGURE 7**

Total Radial Peaking Limit  
(Technical Specification 3.10.C.2.b)

- NOTE: 1. THIS CURVE INCLUDES 10% CALCULATIONAL UNCERTAINTY  
2.  $F_R^T = F_R^P \times 1.03$   
3. MEASURED  $F_R^T$  SHOULD BE AUGMENTED BY MEASUREMENT UNCERTAINTY (8%) BEFORE COMPARISON TO THIS CURVE.





**FIGURE 8**

Allowable Percent Increase in Total Radial Peak  
(Technical Specification 3.10.C.2.b.2)

NOTE: CEA's are maintained at or above 100% power  
insertion limit when applying 3.10.C.2.b.2

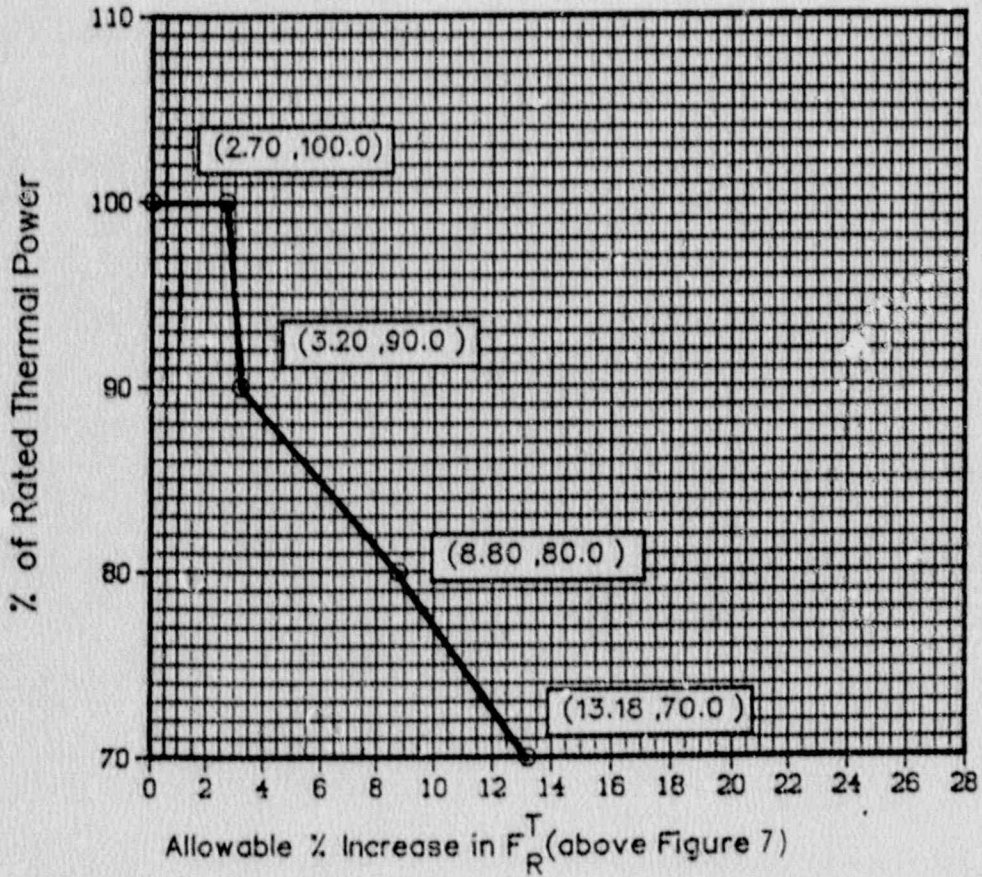


FIGURE 9

Required Shutdown Margin  
(Technical Specification 3.10.B.1)

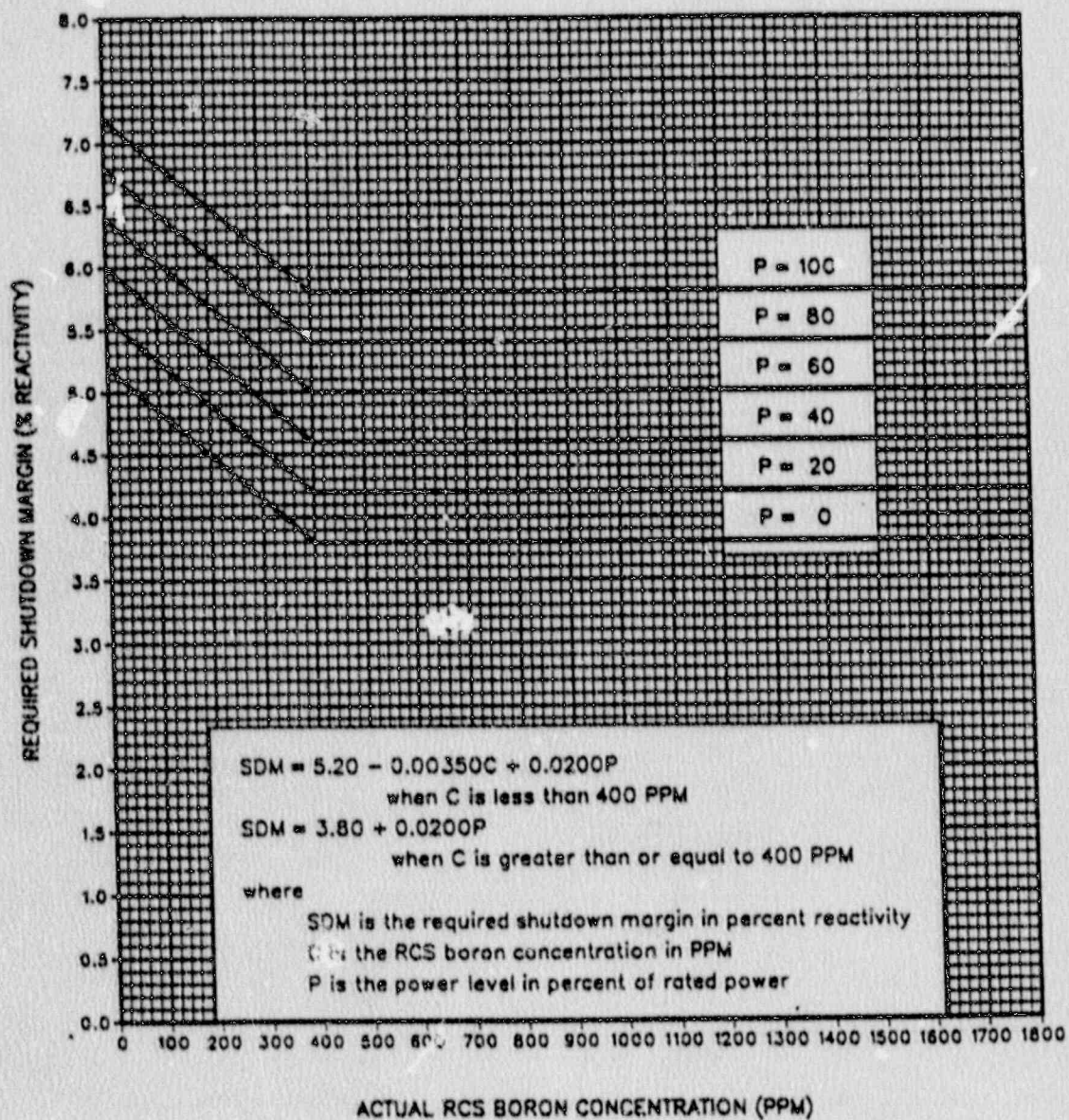




FIGURE 10

Excure Symmetric Offset LCO

(Technical Specification 3.10.C.2.b.1)  
(Technical Specification 3.10.C.7)

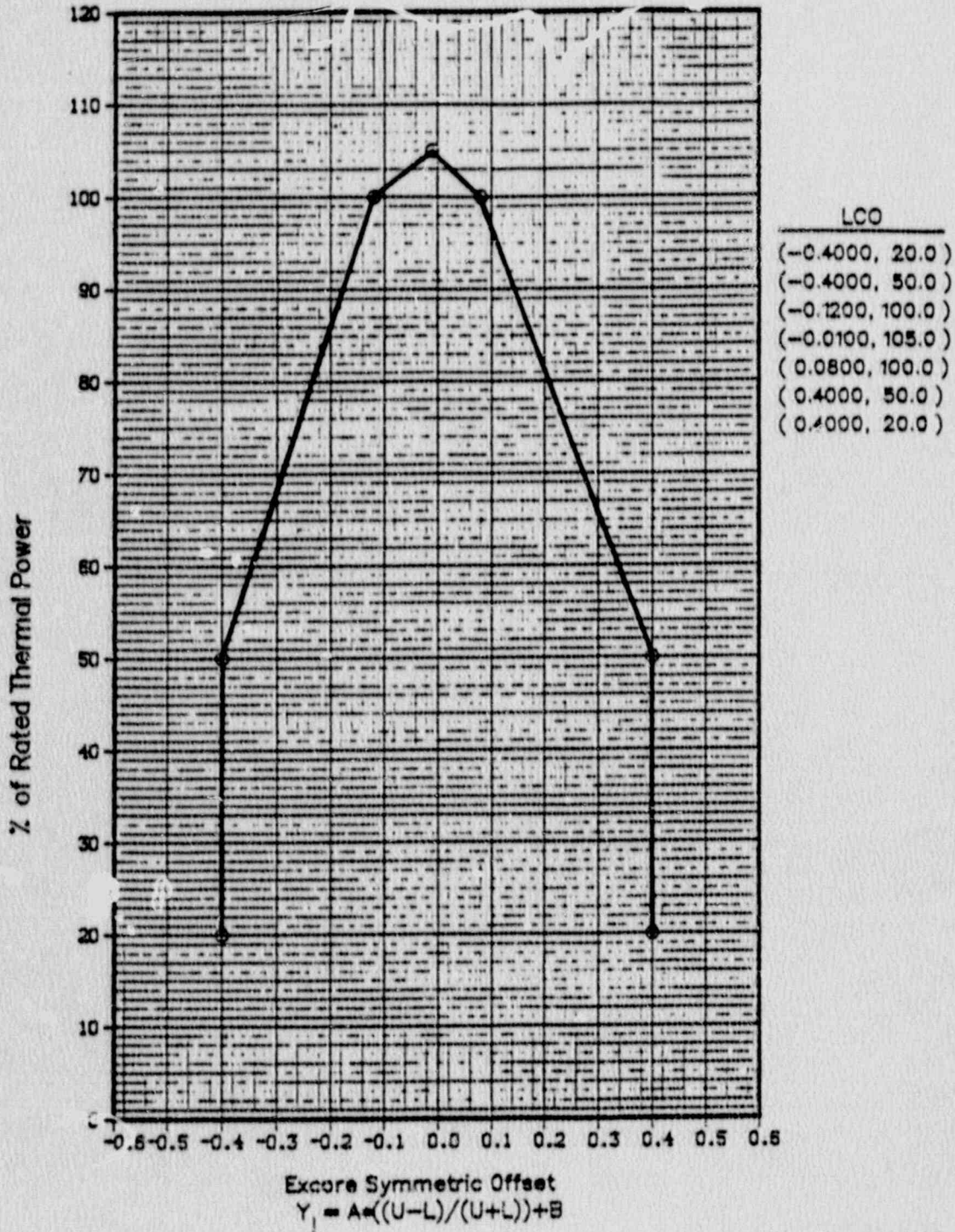


FIGURE 11

Excure Symmetric Offset LCO for Turbine Operation in IMPIN Mode

(Technical Specification 3.10.C.2.b.1)  
(Technical Specification 3.10.C.7)

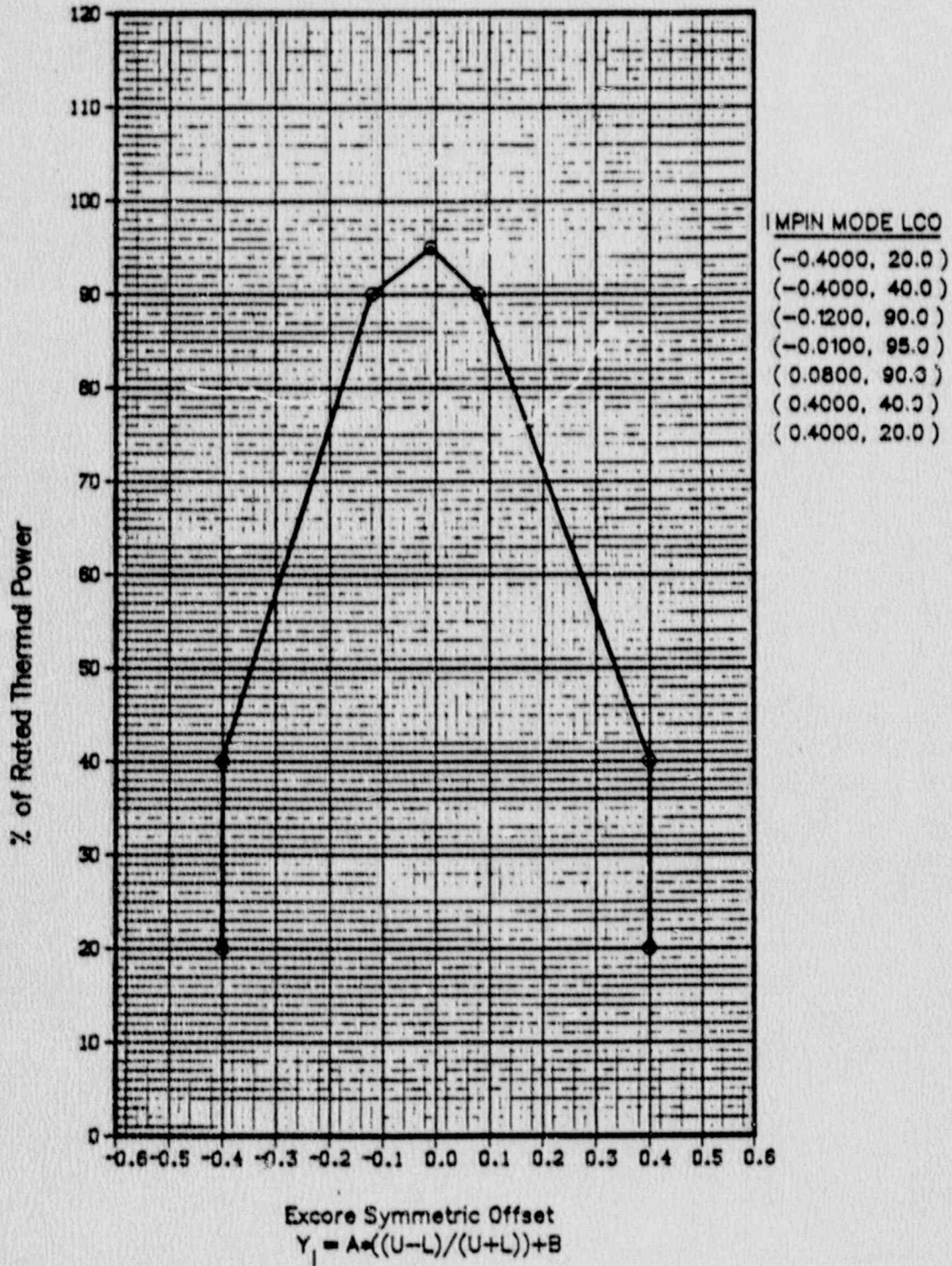




FIGURE 12

Linear Heat Generation Rate Limits versus Core Height

(Technical Specification 3.10.C.1)  
(Technical Specification 3.10.C.2.b.1)  
(Technical Specification 3.10.C.2.b.2)

