ENTERGY OPERATIONS

WATERFORD 3

CORE OPERATING LIMITS REPORT

FOR CYCLE 8

REVISION 0

WATERFORD 3

CORE OPERATING LIMITS REPORT
Cycle 8, REVISION 0

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I. INTRODUCTION

This CORE OPERATING LIMITS REPORT (COLR) has been prepared in accordance with the requirements of Waterford 3 Technical Specification 6.9.5 for Waterford 3 Cycle 8. The core operating limits have been developed using the NRC approved methodologies specified in Section IV. This is the initial issuance of the Cycle 8 COLR.

II. AFFECTED TECHNICAL SPECIFICATIONS

1)	3.1.1.1	Shutdown Margin - Any Full Length CEA Withdrawn
2)	3.1.1.2	Shutdown Margin - All Full Length CEA Fully Inserted
3)	3.1.1.3	Moderator Temperature Coefficient
4)	3.1.2.9	Boron Dilution
5)	3.1.3.1	Movable Control Assemblies - CEA Position
6)	3.1.3.6	Regulating CEA Insertion Limits
7)	3.1.3.7	Part Length CEA Insertion Limits
8)	3.2.1	Linear Heat Rate
9)	3.2.3	Azimuthal Power Tilt - T_q
10)	3.2.4	DNBR Margin
11)	3.2.7	Axial Shape Index
12)	3.9.1	Boron Concentration

III. CORE OPERATING LIMITS

The operating limits for the specifications listed are presented below:

1) 3.1.1.1 - Shutdown Margin - Any Full Length CEA Withdrawn

The SHUTDOWN MARGIN shall be greater than or equal to 5.15% Δk/k when T_{avg} is greater than 200 °F or 2.0% Δk/k when T_{avg} is less than or equal to 200 °F.

2) 3.1.1.2 - Shutdown Margin - All Full Length CEA Fully Inserted

The SHUTDOWN MARGIN shall be greater than or equal to that shown in Figure 1.

3) 3.1.1.3 - MODERATOR TEMPERATURE COEFFICIENT

The Moderator Temperature Coefficient (MTC) shall be within the region of acceptable operation of Figure 9.

4) 3.1.2.9 - BORON DILUTION

Limiting Condition for Operation
With one or both start-up channel high neutron flux alarms inoperable, do not operate the plant in the configurations prohibited by Table 1 through 5 for the current Mode.

Action
With one or both start-up channel high neutron flux alarms inoperable, the RCS boron concentration shall be determined at the applicable monitoring frequency specified in Tables 1 through 5.

Surveillance Requirements
Each required boron dilution alarm shall be adjusted to less than or equal to twice (2x) the existing neutron flux (cps) at the following frequencies:

a. At least once per 5 hours if the reactor has been shut down less than 25 hours;

b. At least once per 24 hours if the reactor has been shut down greater than or equal to 25 hours but less than 7 days;

c. At least once per 7 days if the reactor has been shut down greater than or equal to 7 days.

5) **3.1.3.1 - MOVABLE CONTROL ASSEMBLIES - CEA POSITION**

With one or more full-length or part-length CEAs trippable but misaligned from any other CEAs in its group by more than the Technical Specification 3.1.3.1 allowed value, operation in Modes 1 and 2 may continue, provided that core power is reduced in accordance with Figure 2.

6) **3.1.3.6 - REGULATING CEA INSERTION LIMITS**

The regulating CEA groups shall be limited to the withdrawal sequence and to the insertion limits shown on Figure 3.

7) **3.1.3.7 - PART LENGTH CEA INSERTION LIMITS**

The part length CEA group shall be limited to the insertion limits shown on Figure 4.

8) **3.2.1 - LINEAR HEAT RATE**

The linear heat rate shall be maintained:

a. Within the region of acceptable operation of Figure 5.

b. Within the region of acceptable operation of Figure 6, when COLSS is out of service.

9) **3.2.3 - AZIMUTHAL POWER TILT- T_q**

The measured AZIMUTHAL POWER TILT shall be maintained ≤ 0.03.

10) **3.2.4 - DNBR MARGIN**

The DNBR limit shall be maintained by one of the following methods:

a) When COLSS is in service and neither CEAC is operable: maintain COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR decreased by 13% RATED THERMAL POWER.

b) When COLSS is out of service and at least one CEAC is operable: operate within the Region of Acceptable Operation shown on Figure 7, using any operable CPC channel.

c) When COLSS is out of service and neither CEAC is operable: operate within the Region of Acceptable Operation shown on Figure 8, using any operable CPC channel.

11) 3.2.7 - AXIAL SHAPE INDEX

The AXIAL SHAPE INDEX (ASI) shall be maintained within the following limits:

COLSS OPERABLE
$-0.22 \leq$ ASI $\leq +0.27$ for THERMAL POWERS $\geq$ 70% of RATED THERMAL POWER
$-0.27 \leq$ ASI $\leq +0.27$ for THERMAL POWERS < 70% of RATED THERMAL POWER

COLSS Out of Service
$-0.17 \leq$ ASI $\leq +0.22$ for THERMAL POWERS $\geq$ 70% of RATED THERMAL POWER
$-0.22 \leq$ ASI $\leq +0.22$ for THERMAL POWERS < 70% of RATED THERMAL POWER

12) 3.9.1 - BORON CONCENTRATION

While in Mode 6, the RCS boron concentration shall be maintained sufficient to ensure that the more restrictive of the following reactivity conditions is met:

a. Either K_{eff} of 0.95 or less, or

b. A boron concentration of greater than or equal to 1720 ppm.

IV. METHODOLOGIES

The analytical methods used to determine the core operating limits listed above are those previously reviewed and approved by the NRC in:

1. "The ROCS and DIT Computer Codes for Nuclear Design," CENPD-266-P-A, April 1983; and "C-E Methodology for Core Designs Containing Gadolinia-Urania Burnable Absorber," CENPD-275-P-A, May 1988. Methodology for the limit on Shutdown Margins, MTC, and the Regulating CEA Insertion Limits.

2. "C-E Method for Control Element Assembly Ejection Analysis," CENPD-0190-A, January 1976. Methodology for the Regulating CEA Insertion Limits and Azimuthal Power Tilt.

3. "Modified Statistical Combination of Uncertainties" CEN-356(V)-P-A, May 1988, Methodology for the limits on the DNBR Margin and the ASI.

4. "Calculative Methods for the C-E Large Break LOCA Calculation Model For The Analysis of C-E and W Designed NSSS," CENPD-132, Supplement 3-P-A, June 1985. Methodology for the limits on the MTC, Linear Heat Rate, Azimuthal Power Tilt and ASI.

5. "Calculative Methods for the C-E Small Break LOCA Evaluation Model," CENPD-137-P, August 1974: Supplement 1, January 1977. Methodology for the limits on the MTC, Linear Heat Rate, Azimuthal Power Tilt and ASI.

6. "CESEC - Digital Simulation of a Combustion Engineering Nuclear Steam Supply System", CENPD-107, December 1981. Methodology for the limits on the Shutdown Margins, MTC, Movable Control Assemblies - CEA Position, Regulating CEA Insertion Limits, Part Length CEA Insertion Limits and Azimuthal Power Tilt.

V. LIST OF FIGURES

Shutdown Margin as a Function of Cold Leg Temperature

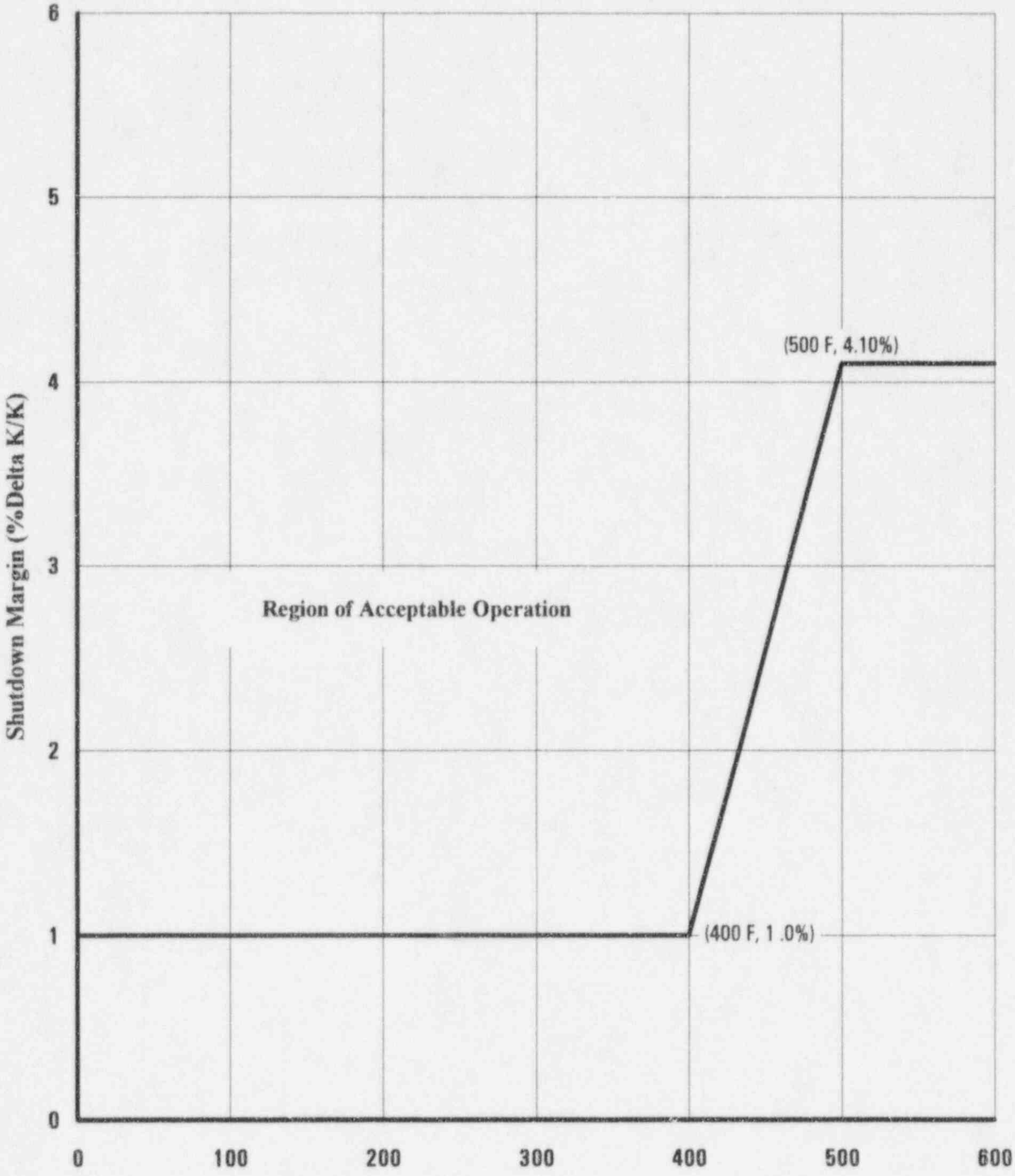


Figure 1

Required Power Reduction After Single CEA Deviation

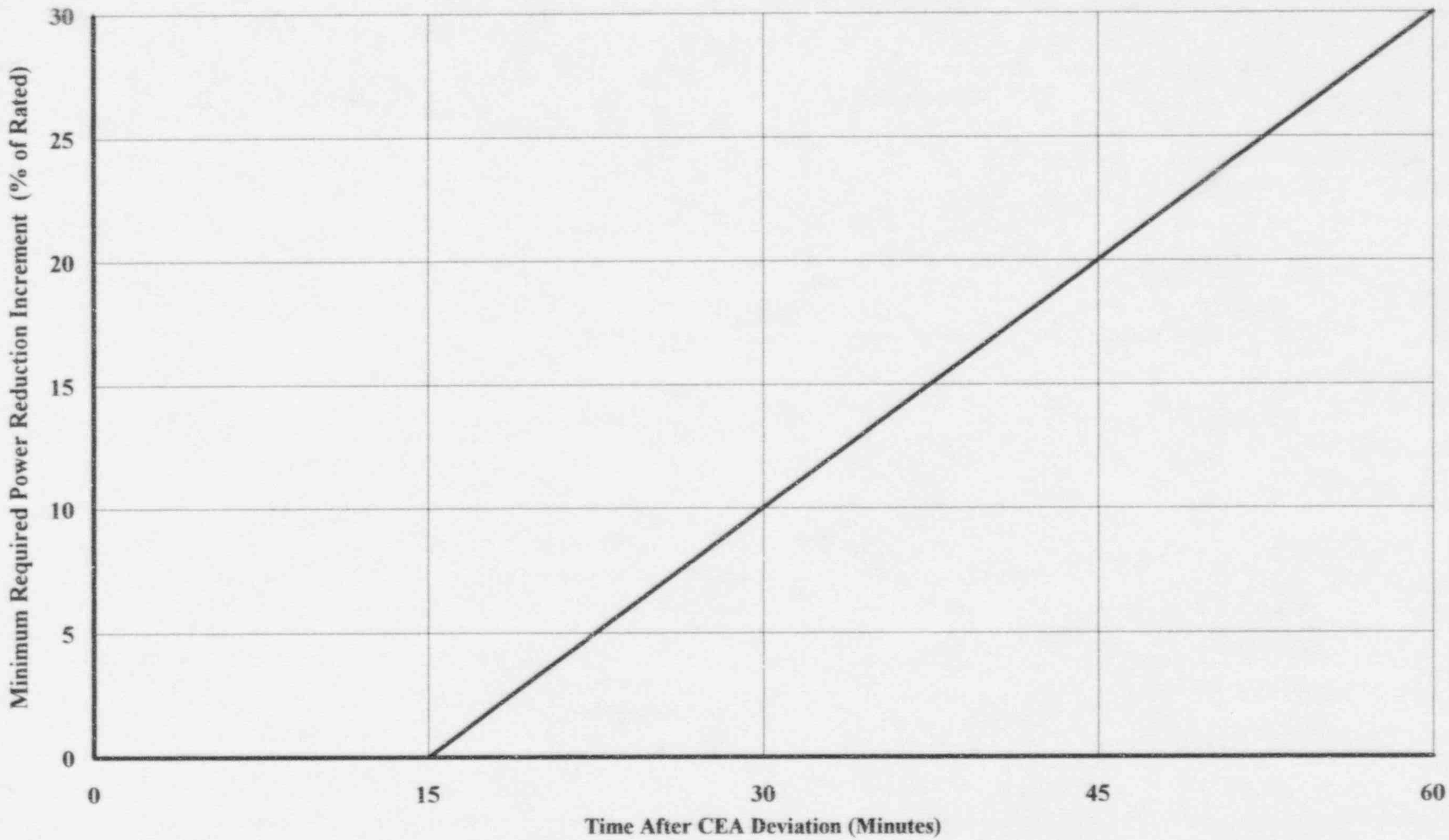


Figure 2

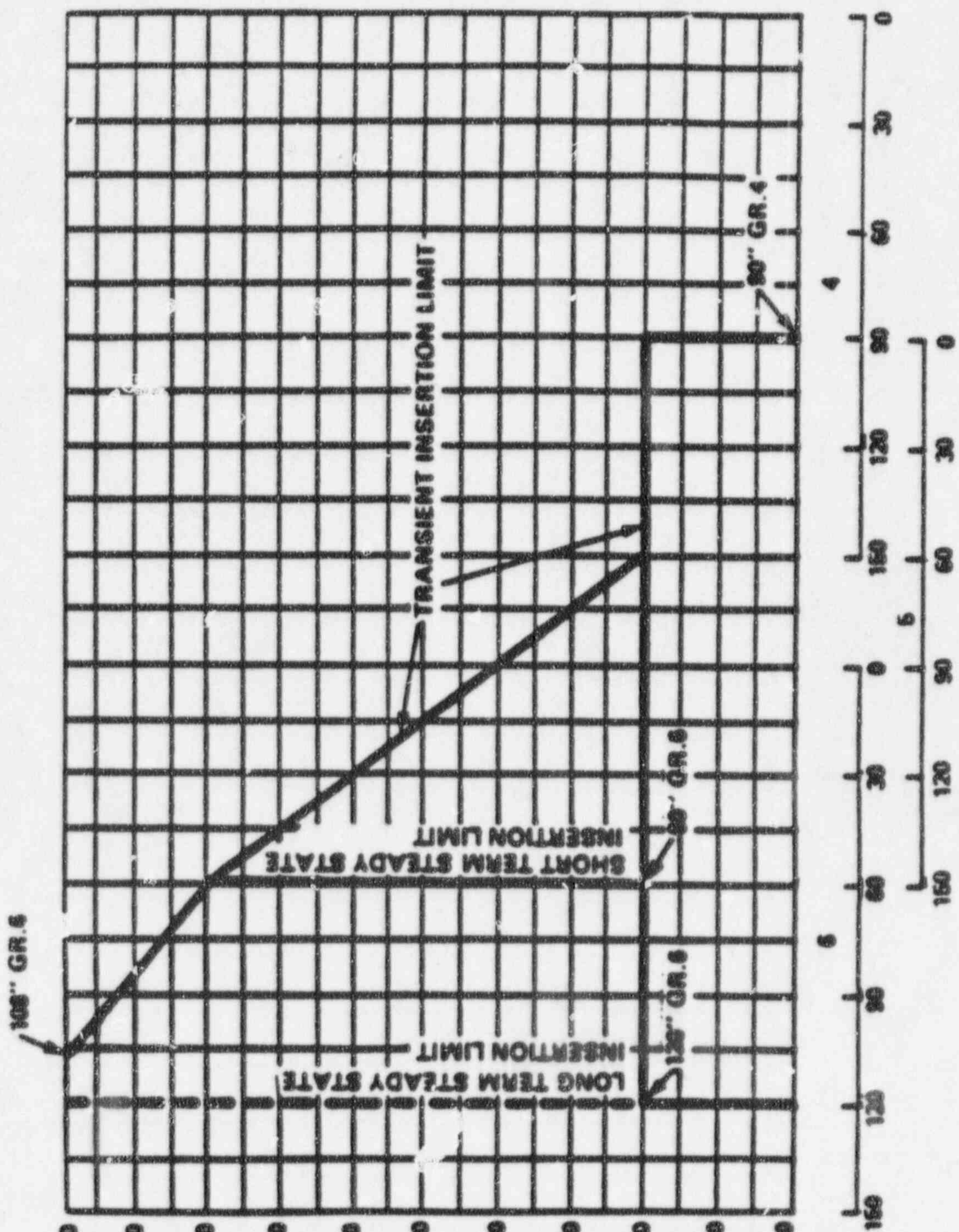


FIGURE 3
CEA INSERTION LIMITS VS THERMAL POWER

Part Length CEA Insertion Limit vs Thermal Power

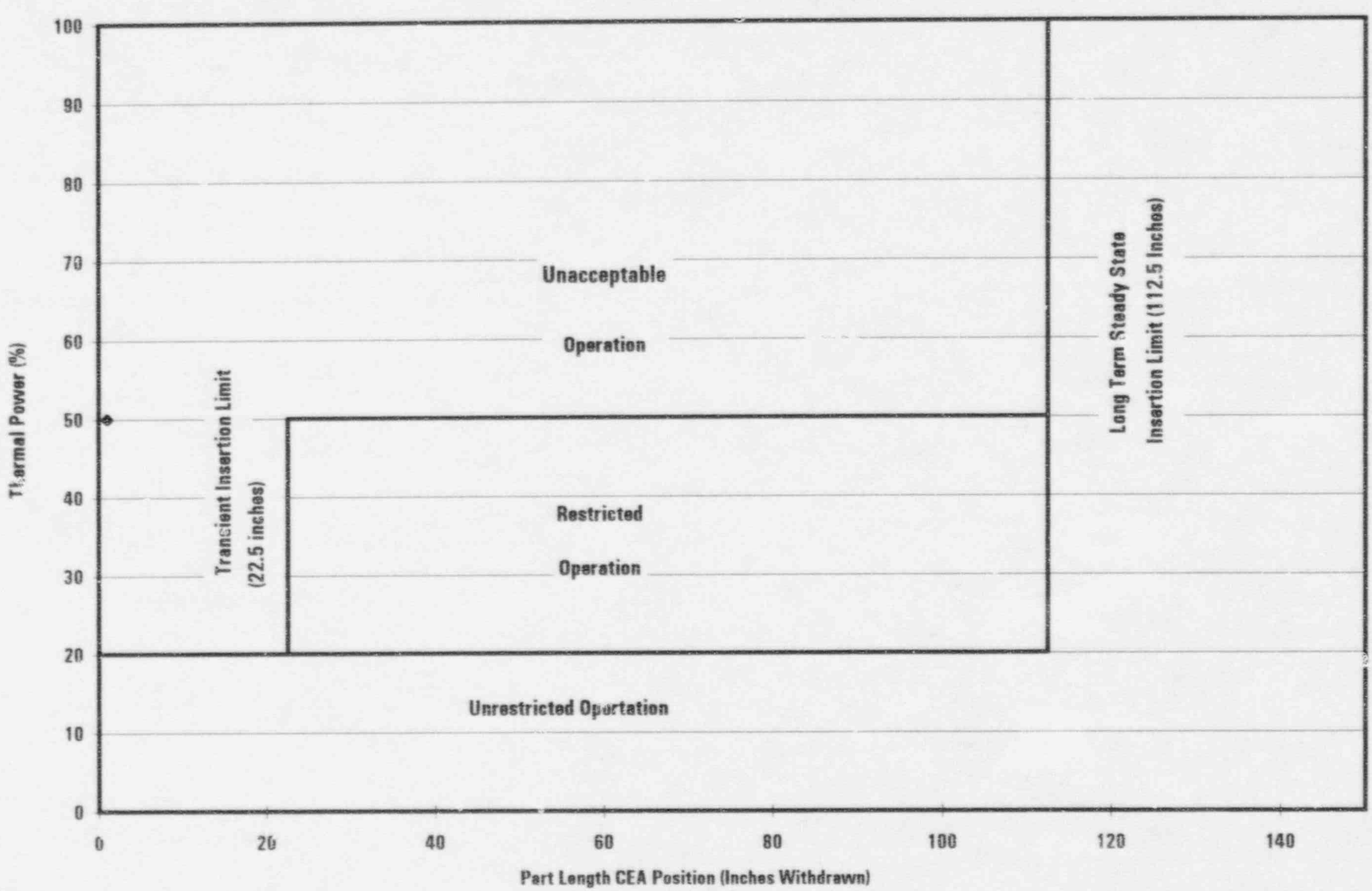


Figure 4

Allowable Peak Linear Heat Rate vs Tc

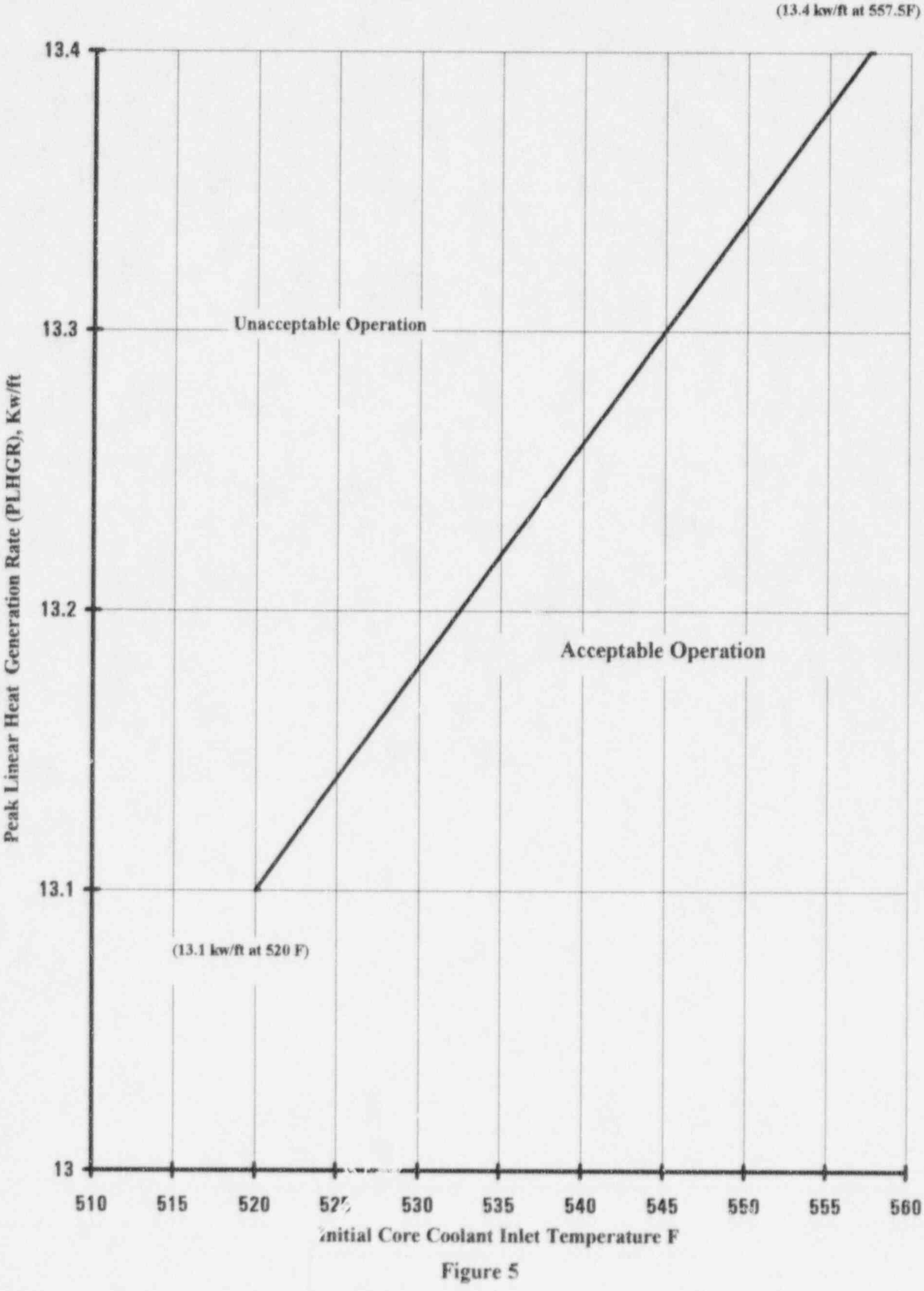


Figure 5

Allowable Peak Linear Heat Rate vs Tc For COLSS Out of Service

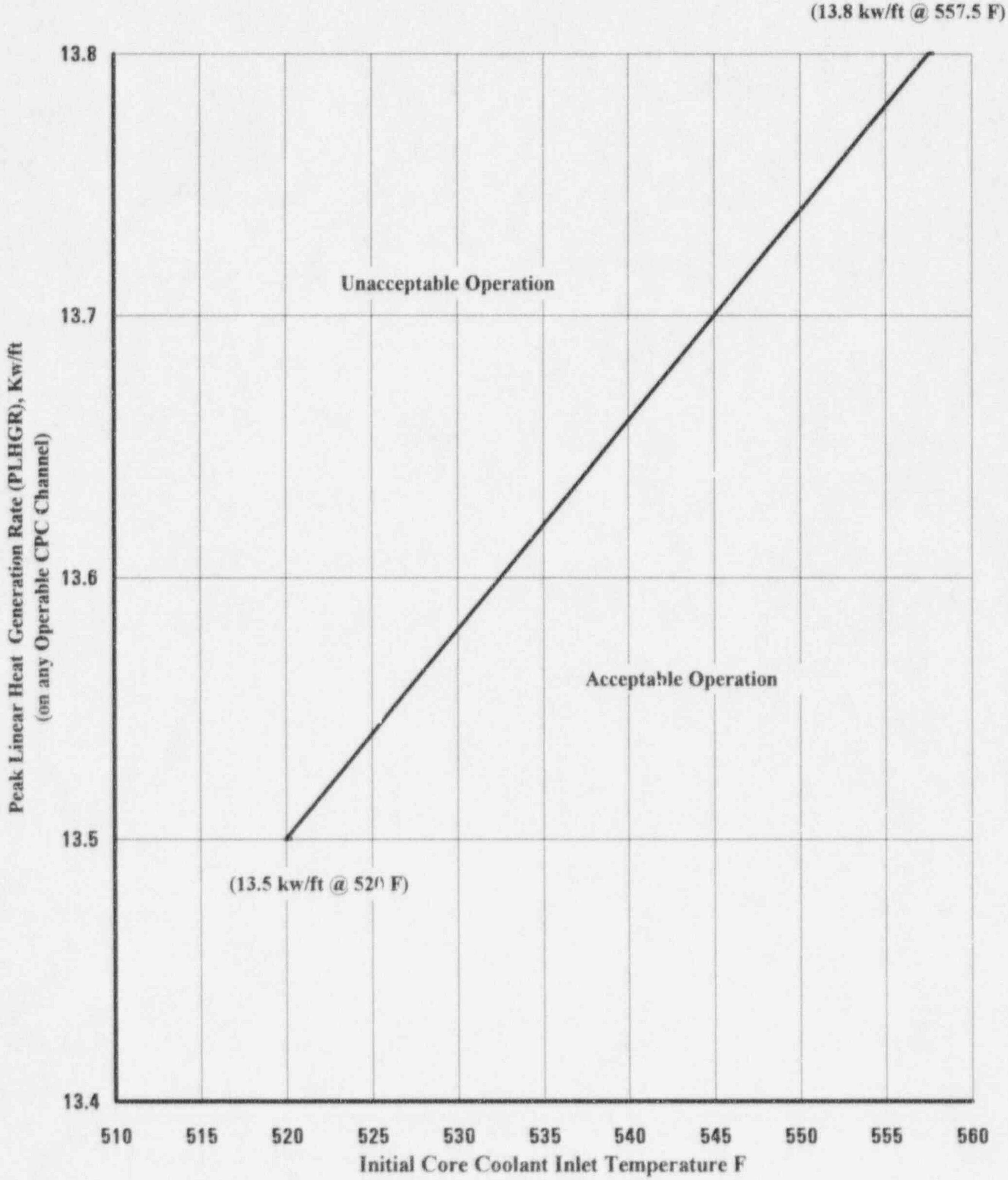


Figure 6

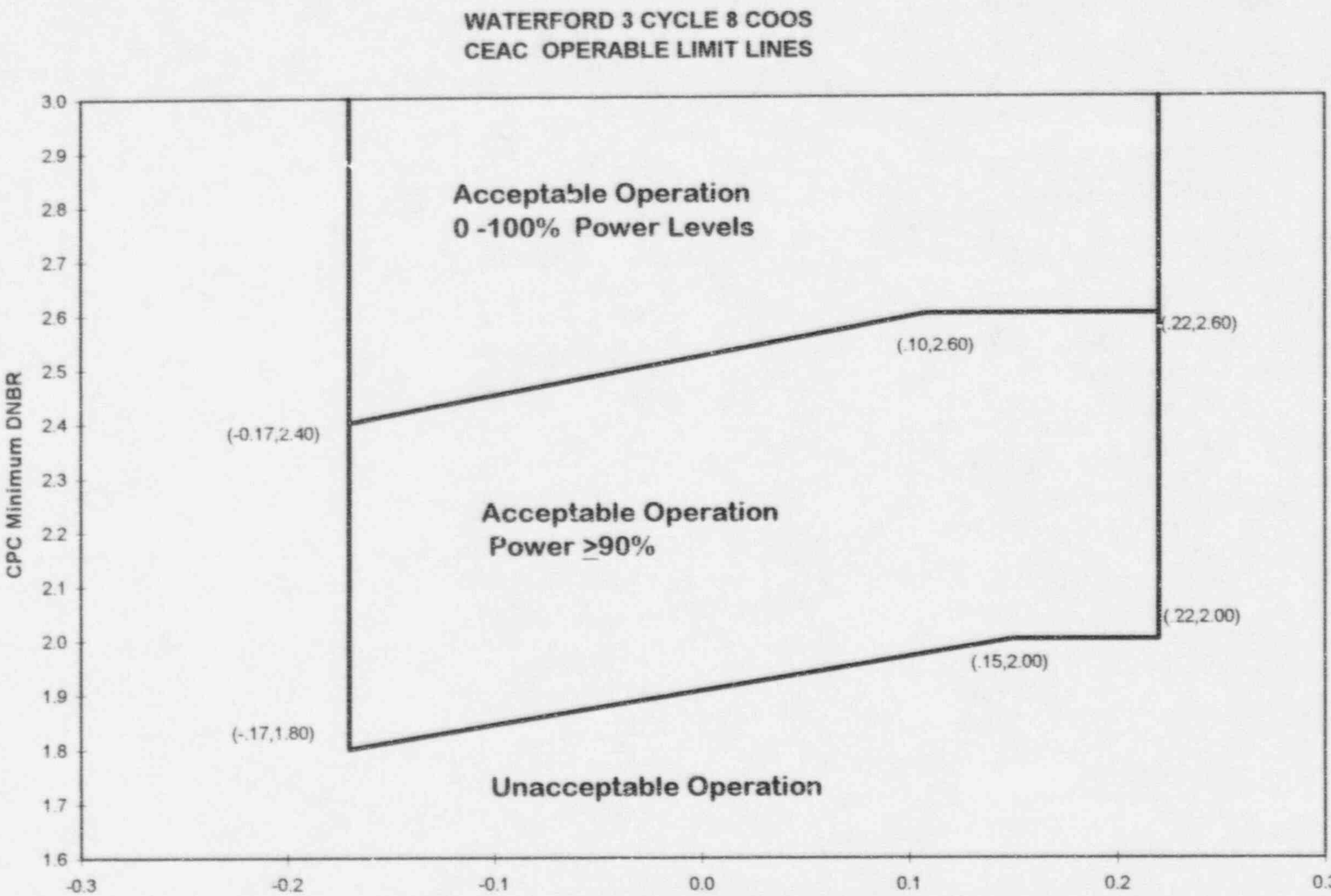
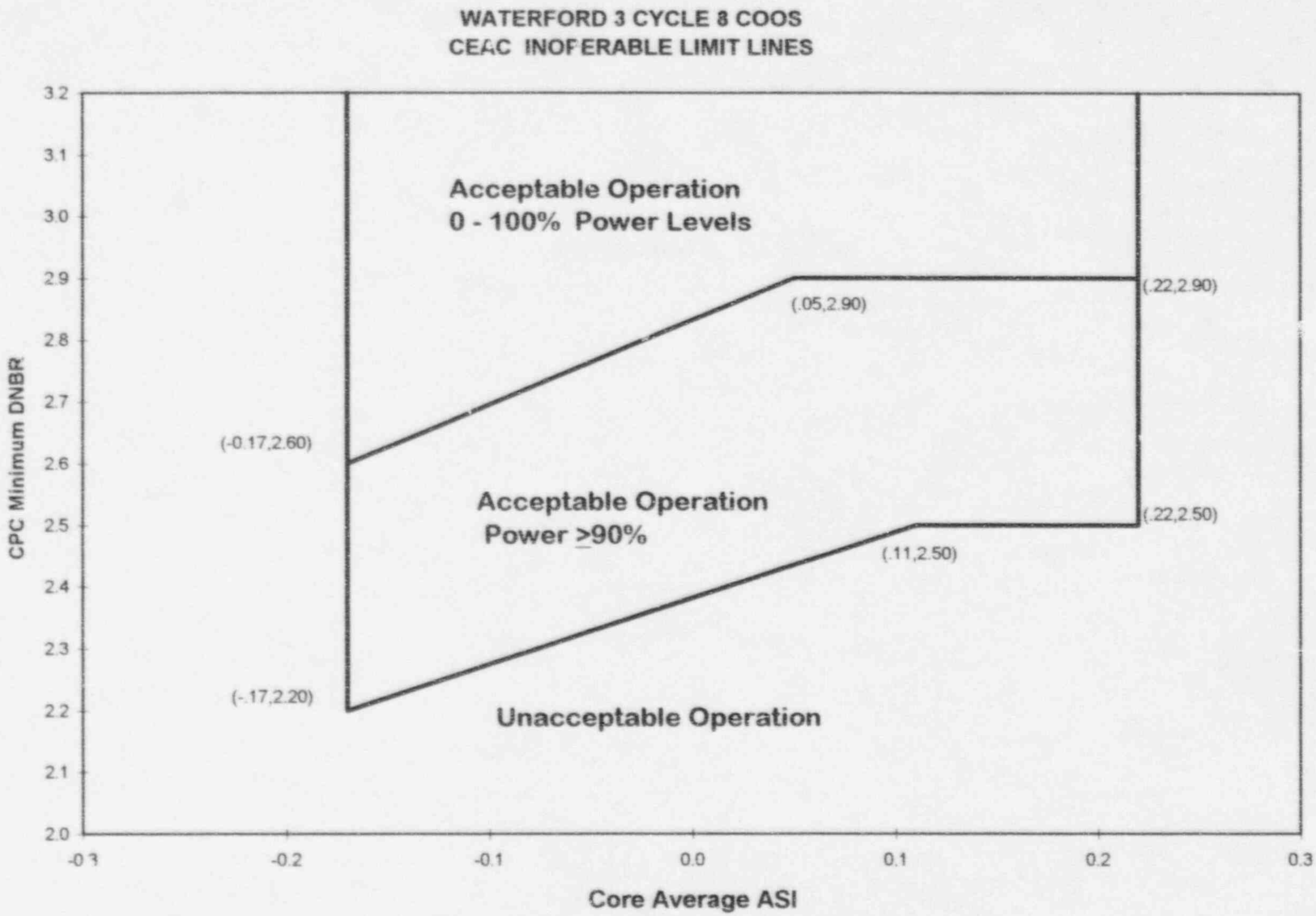

WATERFORD 3 CYCLE 8 COOS
CEAC OPERABLE LIMIT LINES
Acceptable Operation
0 -100% Power Levels
Acceptable Operation
Power ≥90%
Unacceptable Operation
(-0.17,2.40)
(.10,2.60)
(.22,2.60)
(.22,2.00)
(.15,2.00)
(-.17,1.80)
CPC Minimum DNBR
Core Average ASI
3.0
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1.6
-0.3
-0.2
-0.1
0.0
0.1
0.2
0.3

Figure 7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(.05,2.90)
(.22,2.90)
(.22,2.50)
(.11,2.50)
(-.17,2.20)
CPC Minimum DNBR
Core Average ASI
3.2
3.1
3.0
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2.0
-0.3
-0.2
-0.1
0.0
0.1
0.2
0.3

Figure 8

MTC as a Function of Core Power

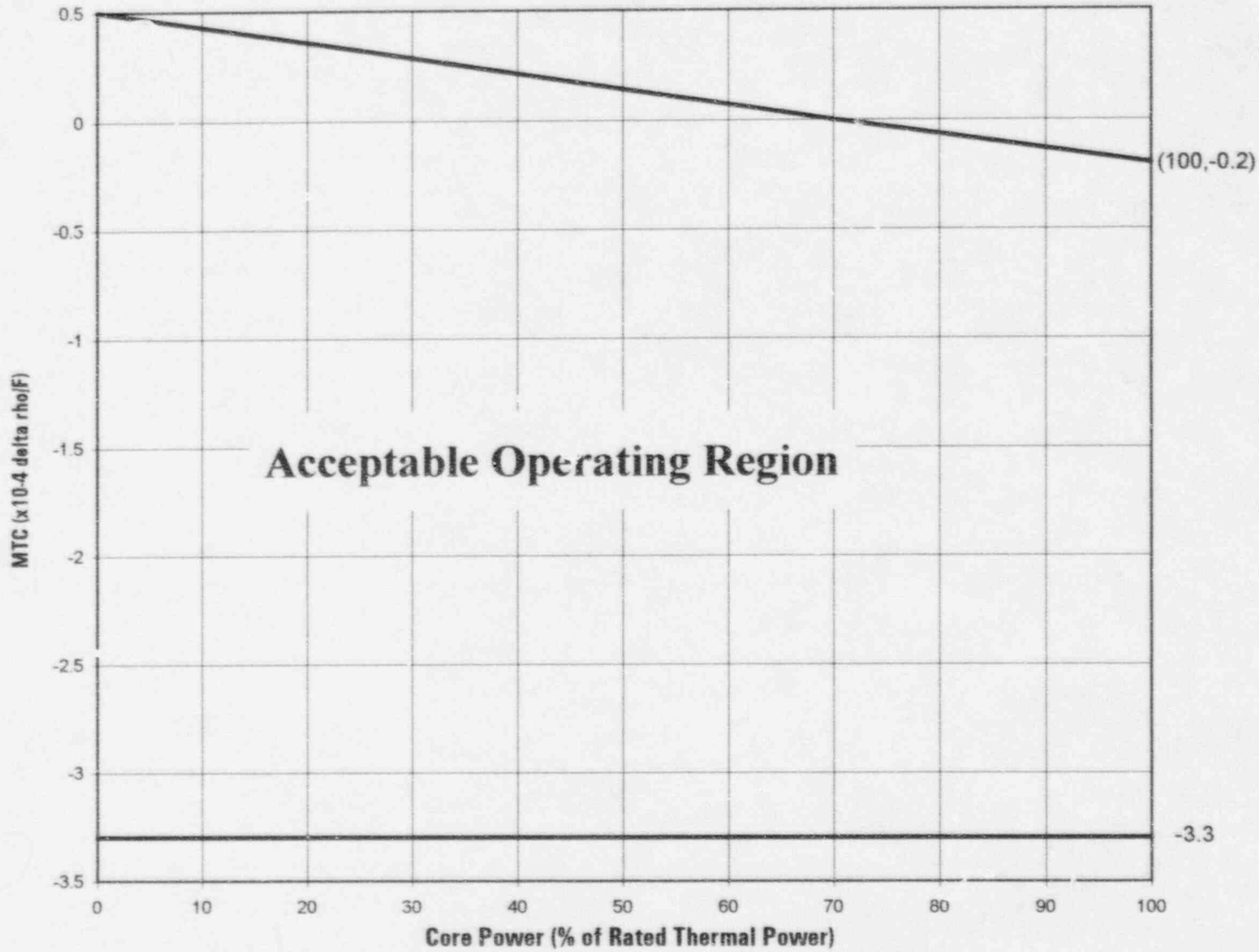

Figure 9

List of Tables

TABLE 1

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR K_{eff} GREATER-THAN 0.98

$K_{eff} > 0.98$

OPERATIONAL MODE	Number of Operating Charging Pumps* 0	1	2	3
3	12 hours	0.75 hours	Operation not allowed **	
4	12 hours	Operation not allowed **		
5 RCS filled	8 hours	Operation not allowed **		
5 RCS partially drained	8 hours	Operation not allowed **		
6	Operation not allowed **			

* Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

** The precluded number of charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

TABLE 2

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR K_{eff} GREATER-THAN 0.97 AND LESS THAN OR EQUAL TO 0.98

$0.98 \geq K_{eff} > 0.97$

OPERATIONAL MODE	Number of Operating Charging Pumps* 0	1	2	3
3	12 hours	2.0 hours	0.5 hours	Operation not allowed**
4	12 hours	0.75 hours	Operation not allowed**	
5 RCS filled	8 hours	1.0 hours	Operation not allowed**	
5 RCS partially drained	8 hours	0.75 hours	Operation not allowed**	
6		Operation not allowed**		

* Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

** The precluded number of charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

TABLE 3

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR K_{eff} GREATER-THAN 0.96 AND LESS THAN OR EQUAL TO 0.97

$0.97 \geq K_{eff} > 0.96$

OPERATIONAL MODE	Number of Operating Charging Pumps*			
	0	1	2	3
3	12 hours	3.0 hours	1.25 hours	0.5 hours
4	12 hours	1.5 hours	0.5 hours	Operation not allowed**
5 RCS filled	8 hours	1.5 hours	0.5 hours	Operation not allowed**
5 RCS partially drained	8 hours	0.75 hours	Operation not allowed**	
6	Operation not allowed**			

* Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

** The precluded number of charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

TABLE 4

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR K_{eff} GREATER-THAN 0.95 AND LESS THAN OR EQUAL TO 0.96

$0.96 \geq K_{eff} > 0.95$

OPERATIONAL MODE	Number of Operating Charging Pumps* 0	1	2	3
3	12 hours	4.0 hours	2.0 hours	1.0 hours
4	12 hours	2.25 hours	0.75 hours	Operation not allowed**
5 RCS filled	8 hours	2.5 hours	0.75 hours	Operation not allowed**
5 RCS partially drained	8 hours	2.0 hours	0.5 hours	Operation not allowed**
6		Operation not allowed**		

* Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

** The precluded number of charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

TABLE 5

REQUIRED MONITORING FREQUENCIES FOR BACKUP BORON DILUTION DETECTION AS A FUNCTION OF OPERATING CHARGING PUMPS AND PLANT OPERATIONAL MODES FOR K_{eff} LESS THAN OR EQUAL TO 0.95

$K_{eff} \leq 0.95$

OPERATIONAL MODE	Number of Operating Charging Pumps* 0	1	2	3
3	12 hours	5.0 hours	2.0 hours	1.0 hours
4	12 hours	3.0 hours	1.0 hours	0.5 hours
5 RCS filled	8 hours	3.0 hours	1.25 hours	0.5 hours
5 RCS partially drained	8 hours	2.75 hours	1.0 hours	Operation not allowed**
6	24 hours	2.25 hours	0.75 hours	Operation not allowed**

* Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

** The precluded number of charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.