ENTERGY OPERATIONS

WATERFORD 3

CORE OPERATING LIMITS REPORT

FOR CYCLE 10

REVISION 1

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WATERFORD 3

CORE OPERATING LIMITS REPORT
CYCLE 10, REVISION 1

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CORE OPERATING LIMITS REPORT
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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 10. The core operating limits have been developed using the NRC approved methodologies specified in Section III. This is Revision 1 of the Cycle 10 COLR.

Changes between Cycle 10, Revision 0, and Cycle 10, Revision 1, included in this revision are:

1. Figures 8 and 9 have been revised to address new DNBR limits with COLSS Out-of-Service when the CEACs are Operable or Inoperable.

II. AFFECTED TECHNICAL SPECIFICATIONS

CORE OPERATING LIMITS REPORT

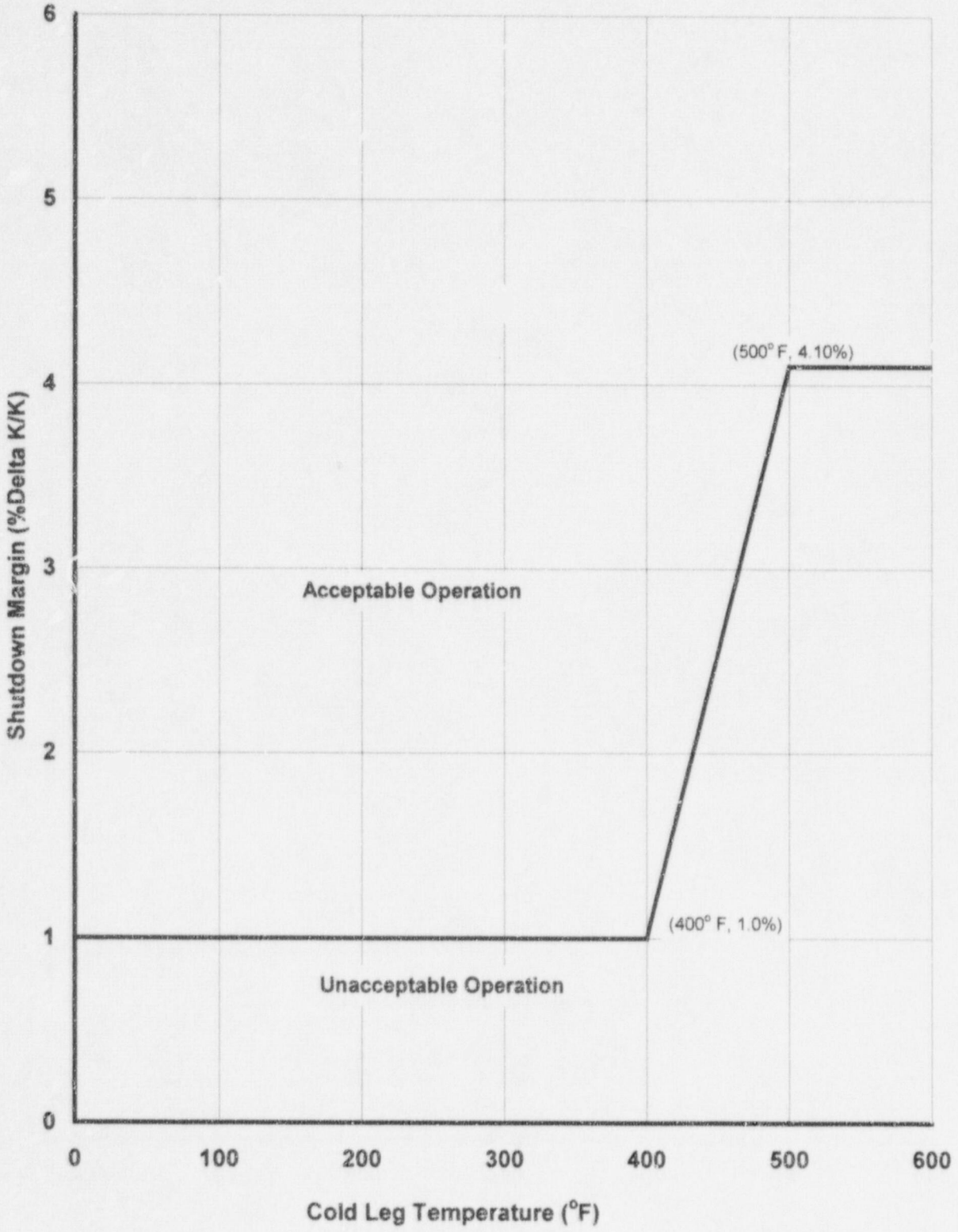
SHUTDOWN MARGIN - ANY FULL LENGTH CEA WITHDRAWN

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

SHUTDOWN MARGIN - ALL FULL LENGTH CEAs FULLY INSERTED

3.1.1.2 The SHUTDOWN MARGIN shall be maintained within the region of acceptable operation of COLR Figure 1.

Shutdown Margin Versus Cold Leg Temperature

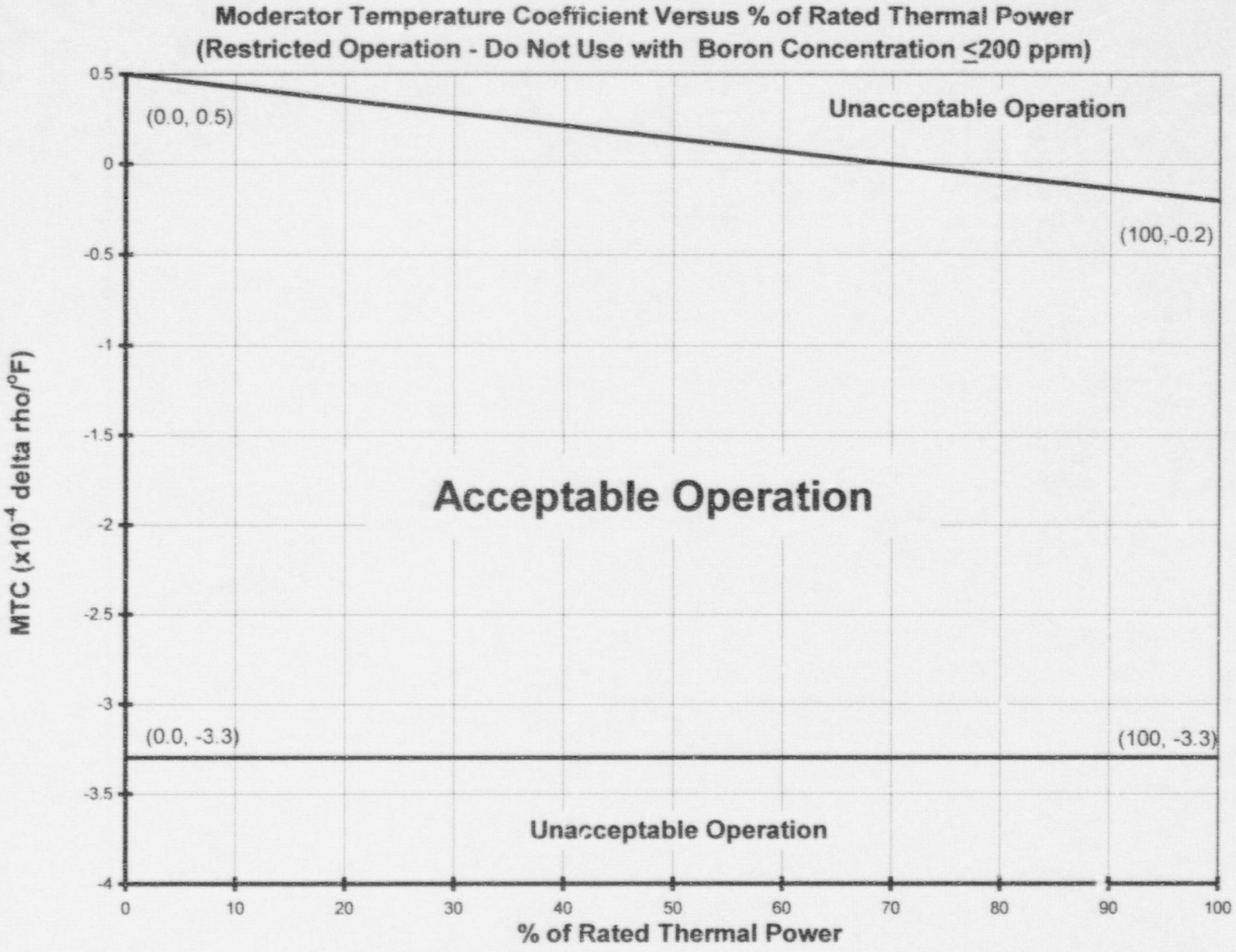


COLR Figure 1

MODERATOR TEMPERATURE COEFFICIENT

3.1.1.3 The Moderator Temperature Coefficient (MTC) shall be maintained within the region of acceptable operation of COLR Figure 2.

Restriction: The reactor shall not be operated with a critical boron concentration less than or equal to 200 ppm to ensure MTC is maintained within COLR Figure 2.



COLR Figure 2

BORON DILUTION

3.1.2.9 See COLR Tables 1 through 5 for required RCS boron concentration monitoring frequencies and Charging Pump operation limits.

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. No sooner than one half hour after shutdown.

b. At least once per hour if the reactor has been shutdown < 10 hours.

c. At least once per 5 hours if the reactor has been shut down ≥ 10 hours but < 25 hours.

d. At least once per 24 hours if the reactor has been shut down ≥ 25 hours but < 21 days.

e. At least once per 7 days if the reactor has been shut down ≥ 21 days.

COLR 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.

COLR 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	0.75 hours	Operation not allowed**	
5 RCS partially drained	8 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.

COLR 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	Operation not allowed**	
5 RCS filled	8 hours	1.5 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.

COLR 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	2.0 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.

COLR 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	2.75 hours	1.0 hours	Operation not allowed**
5 RCS filled	8 hours	3.0 hours	1.0 hours	0.5 hours
5 RCS partially drained	8 hours	2.5 hours	0.75 hours	Operation not allowed**
6	24 hours	2.25 hours	0.5 hours	Operation not allowed**

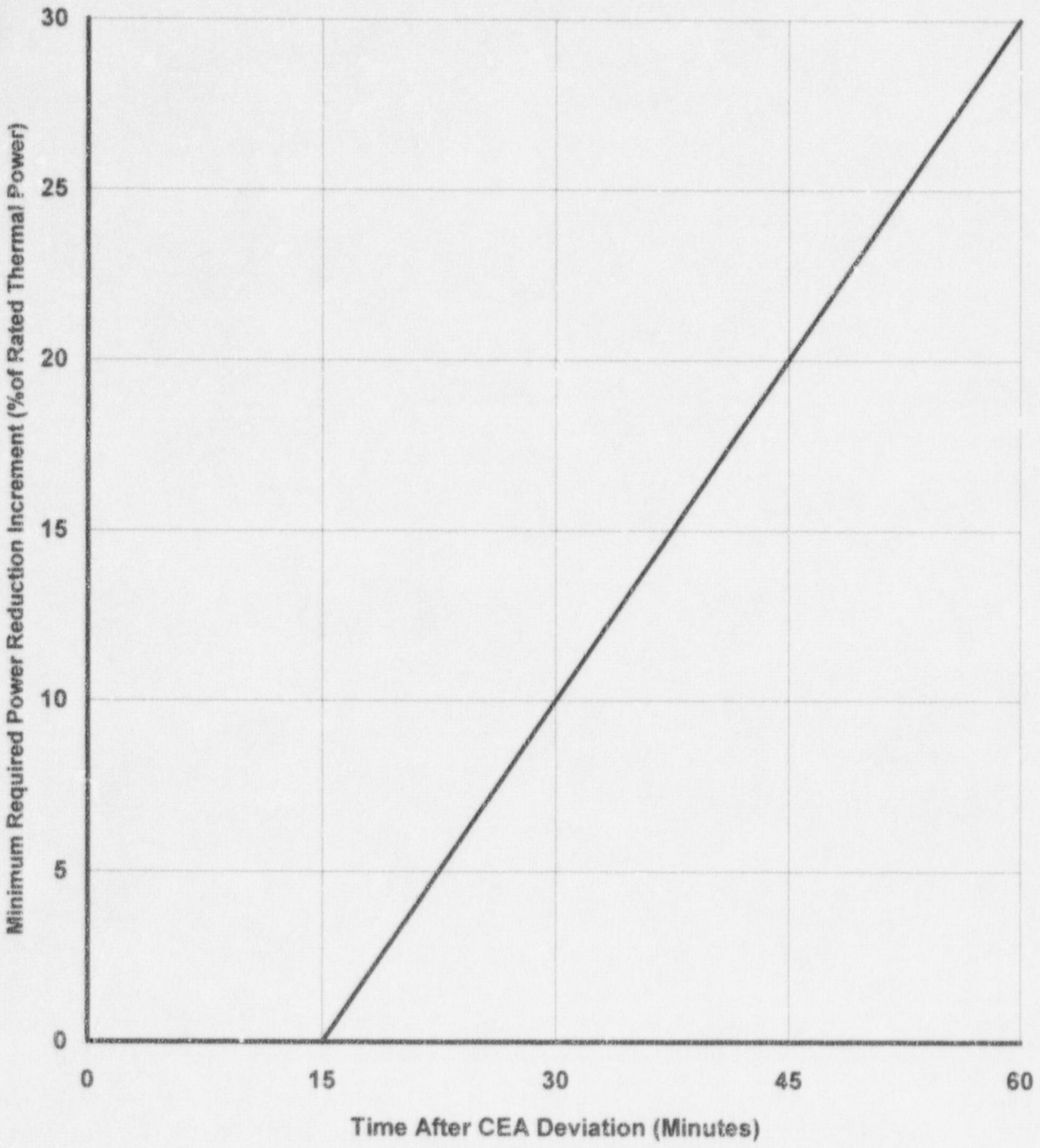
* Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

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

MOVABLE CONTROL ASSEMBLIES - CEA POSITION

3.1.3.1.a With one full-length or part-length CEA trippable but misaligned from any other CEA in its group by more than 19 inches, operation in MODES 1 and 2 may continue, provided that core power is reduced in accordance with COLR Figure 3.

3.1.3.1.b With one or more full-length or part-length CEAs trippable but misaligned from any other CEAs in its group by more than 7 inches but less than or equal to 19 inches, operation in MODES 1 and 2 may continue, provided that core power is reduced in accordance with COLR Figure 3.

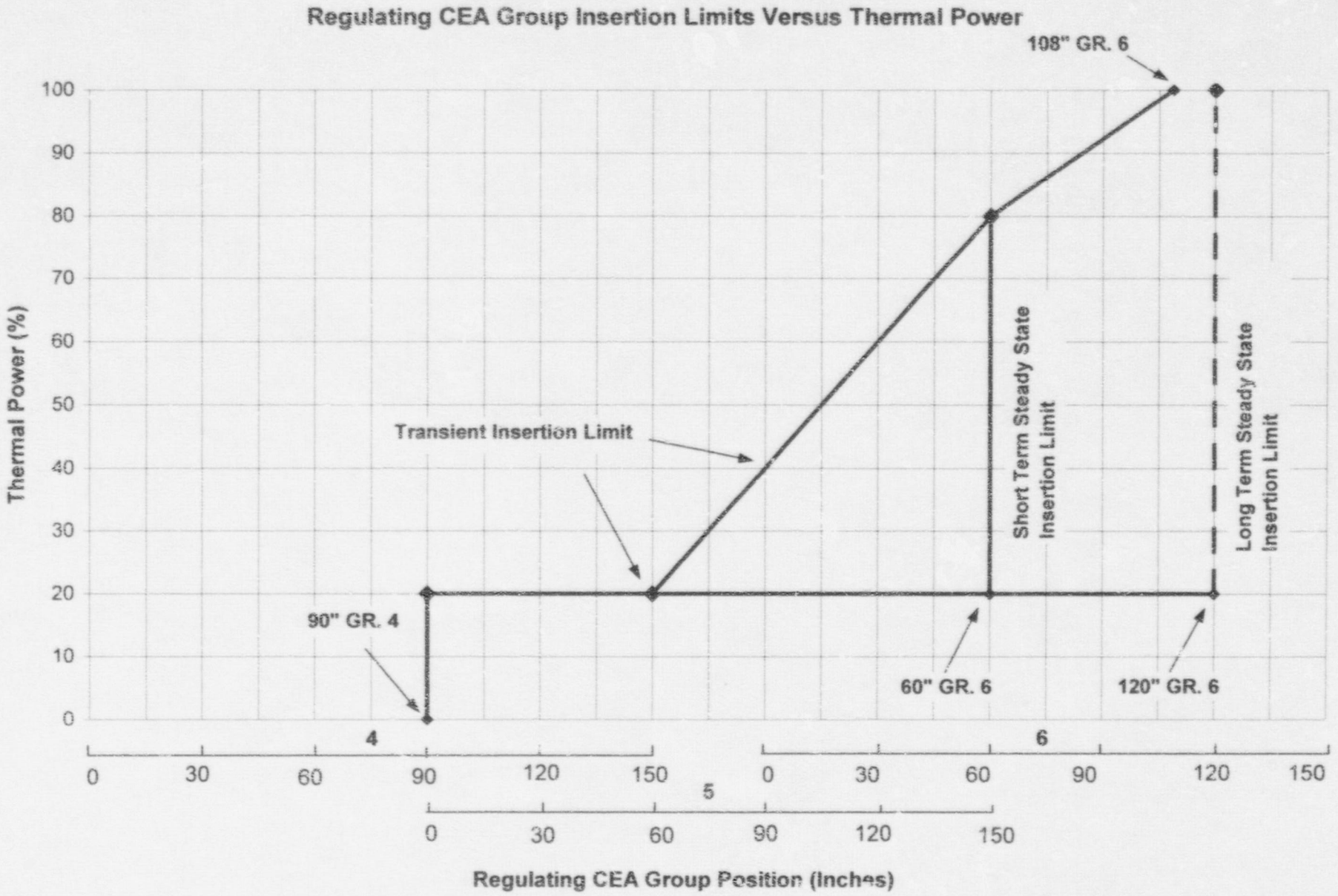


COLR Figure 3

* When thermal power is reduced to 60% of rated thermal power per this limit curve, further reduction is not required by this technical specification.

REGULATING CEA GROUP INSERTION LIMITS

3.1.3.6 The regulating CEA groups shall be limited to the withdrawal sequence and to the insertion limits shown on COLR Figure 4.

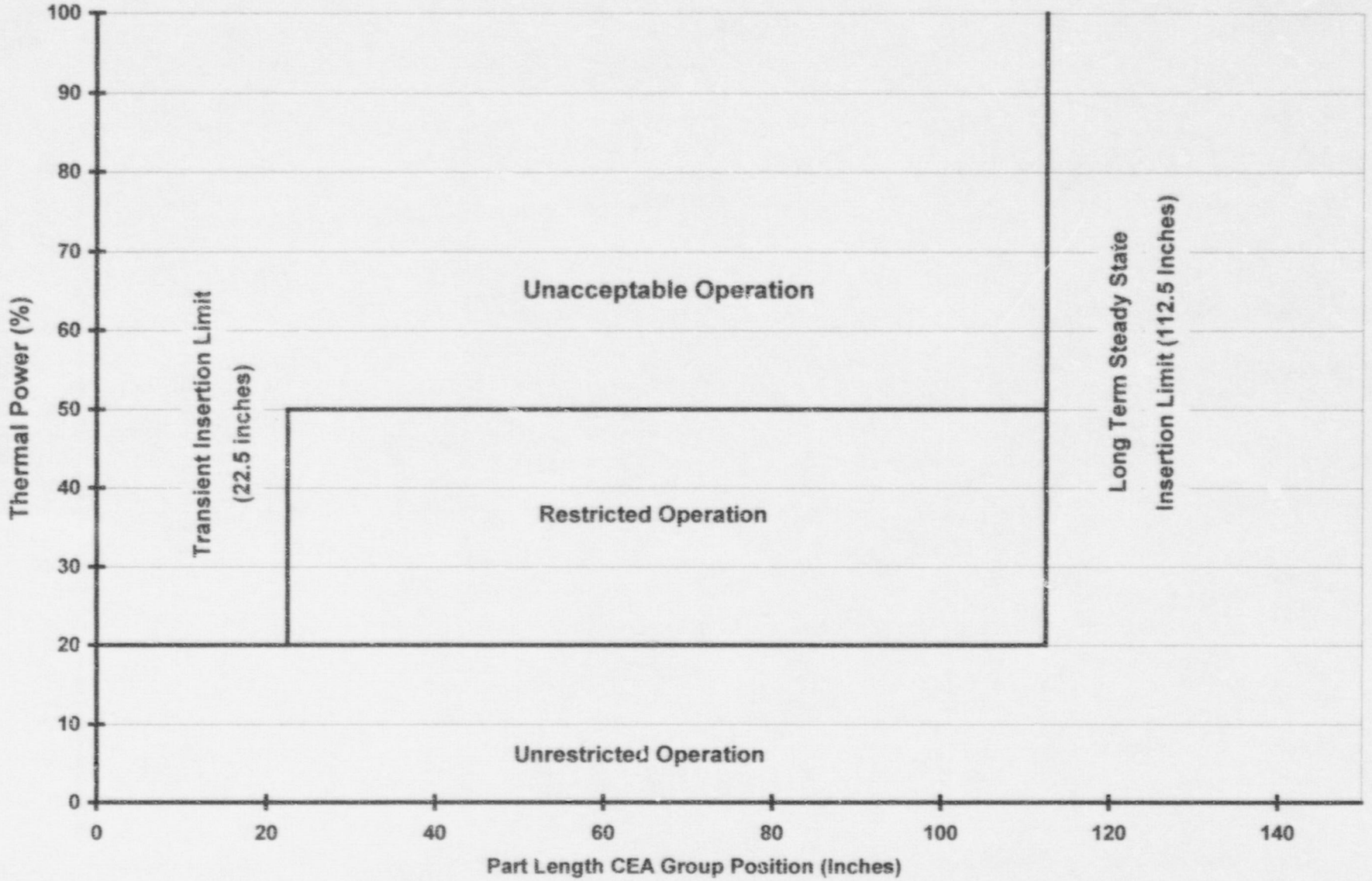


COLR Figure 4

PART LENGTH CEA GROUP INSERTION LIMITS

3.1.3.7 The part length CEA group shall be limited to the insertion limits shown on COLR Figure 5.

Part Length CEA Group Insertion Limits Versus Thermal Power



COLR Figure 5

CORE OPERATING LIMITS REPORT

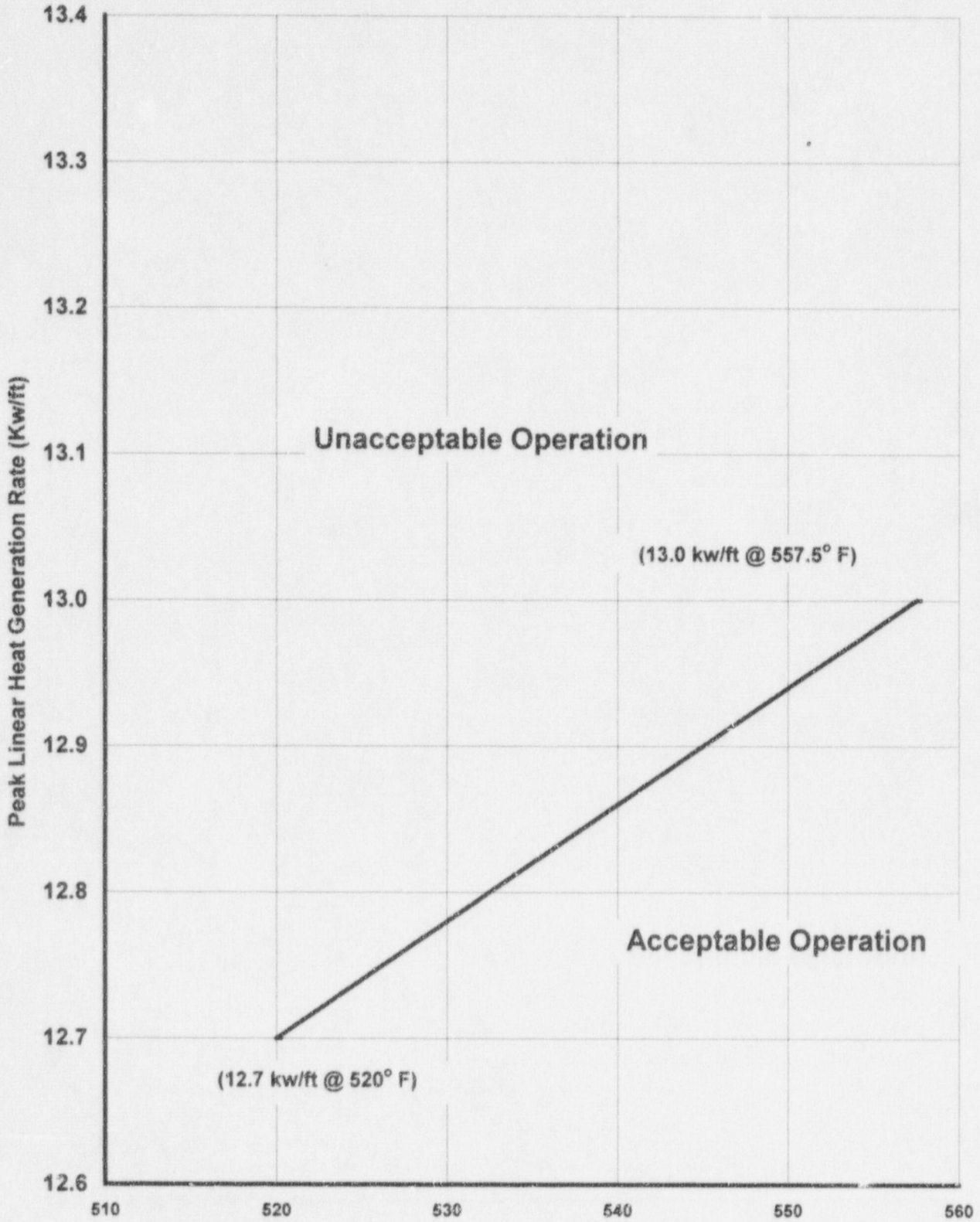
LINEAR HEAT RATE

3.2.1 The linear heat rate shall be maintained:

a. Within the region of acceptable operation of COLR Figure 6, when COLSS is in service.

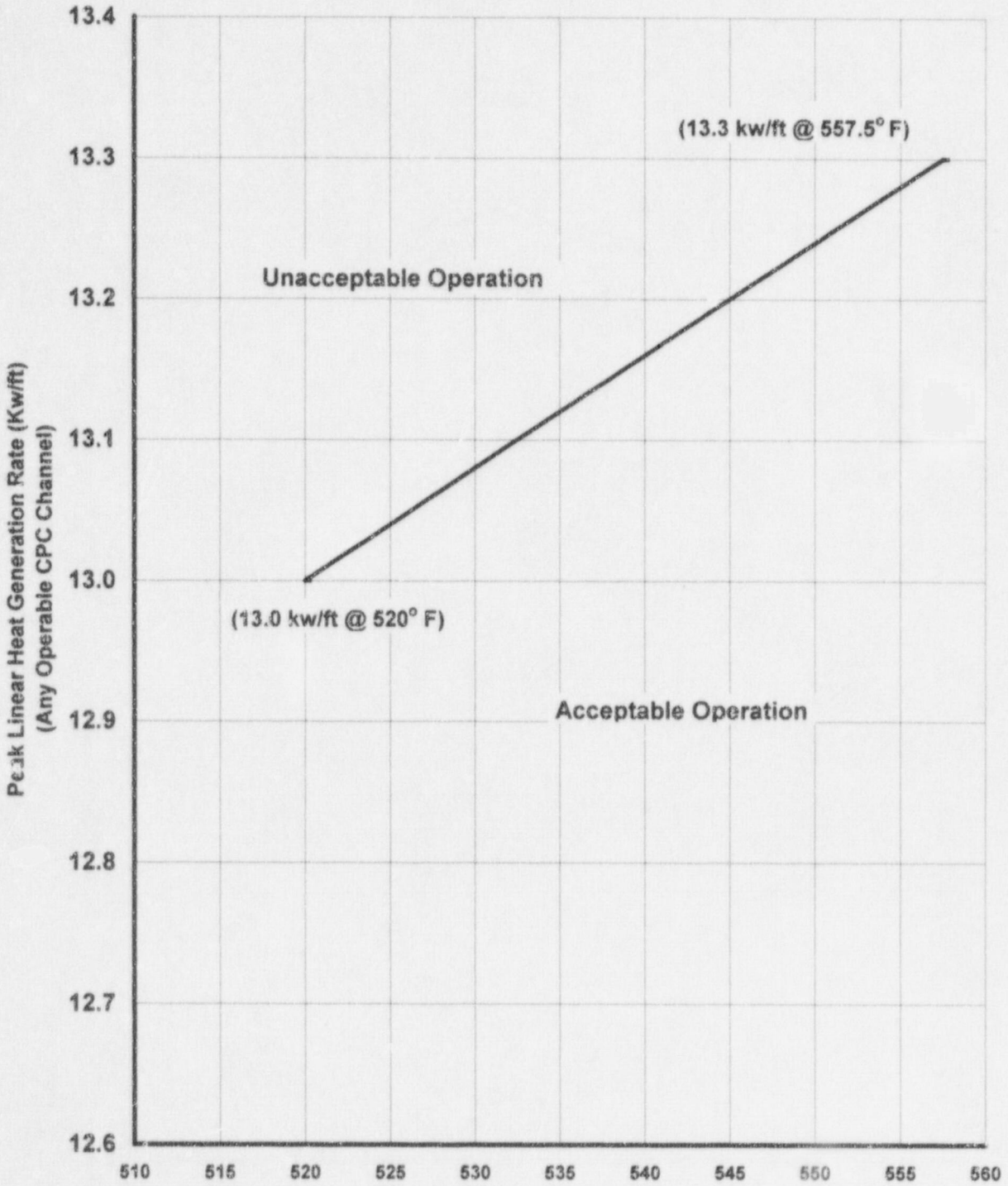
b. Within the region of acceptable operation of COLR Figure 7, when COLSS is out of service.

Allowable Peak Linear Heat Rate Versus Tc
(COLSS in Service)



COLR Figure 6

Allowable Peak Linear Heat Rate Versus Tc
(COLSS Out of Service)



COLR Figure 7

CORE OPERATING LIMITS REPORT

AZIMUTHAL POWER TILT- T_q

3.2.3 The measured AZIMUTHAL POWER TILT shall be maintained ≤ 0.03.

DNBR MARGIN

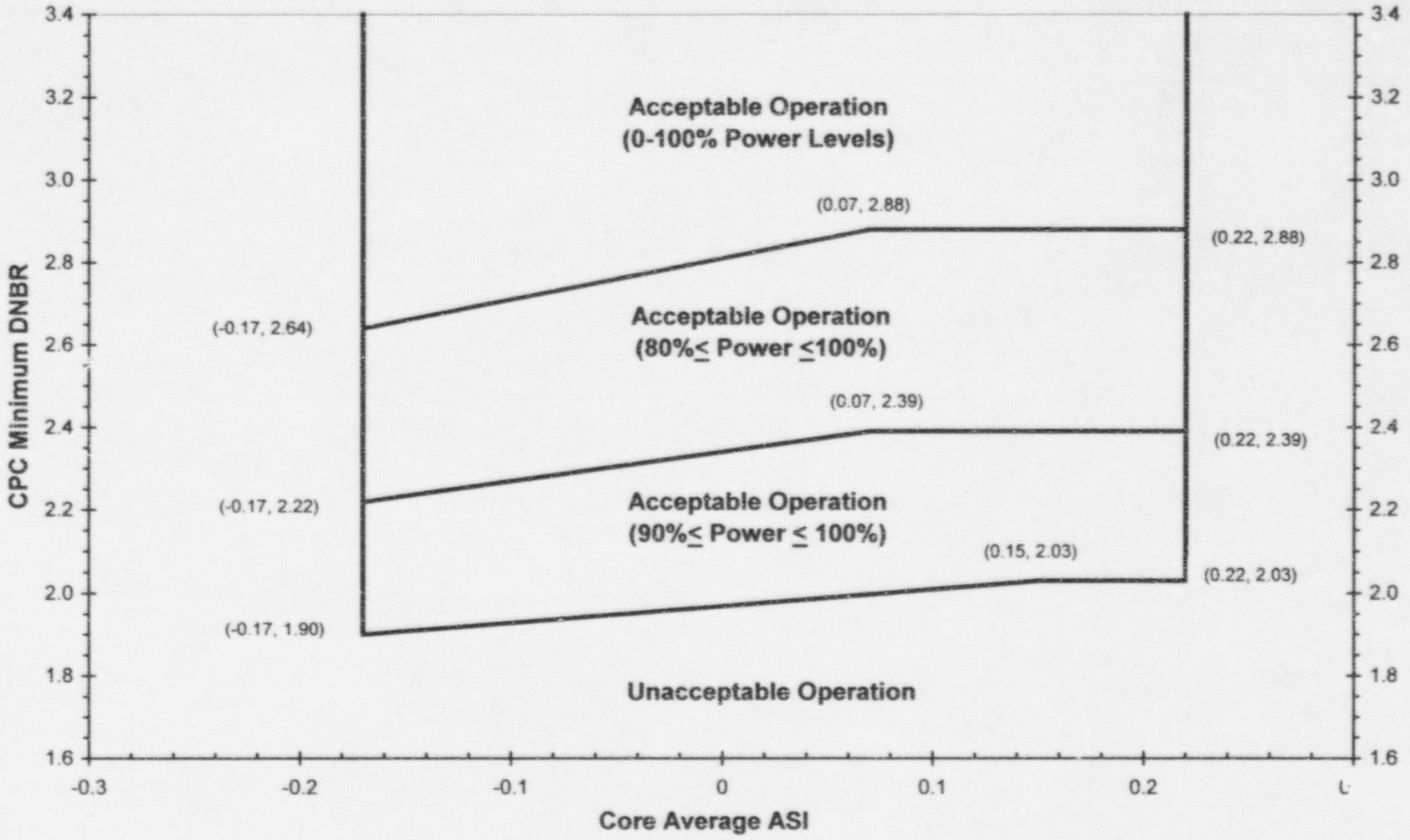
3.2.4 The DNBR margin shall be maintained by one of the following methods:

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.

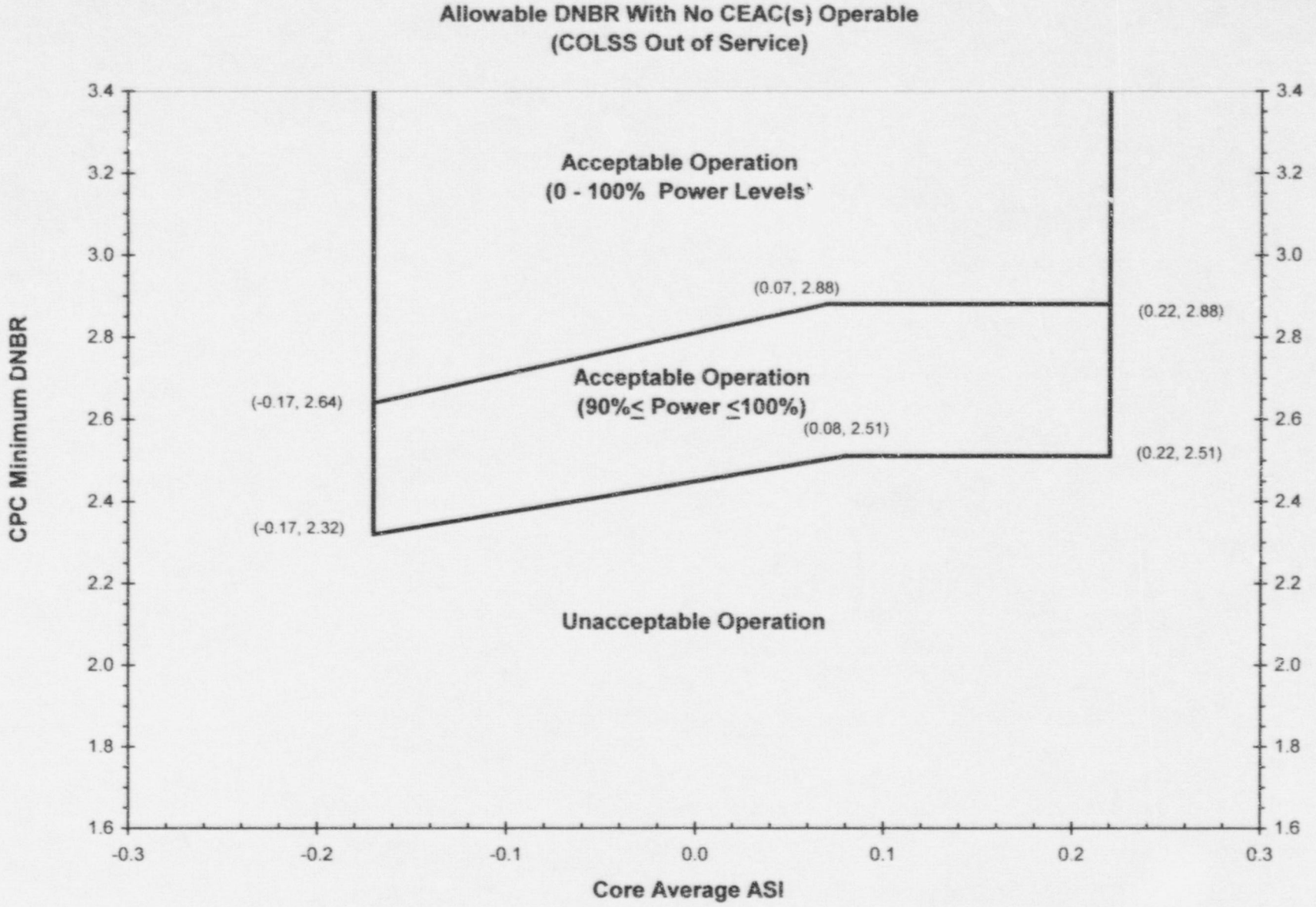
b) When COLSS is out of service and at least one CEAC is operable: operate within the region of acceptable operation shown on COLR Figure 8, using any operable CPC channel.

c) When COLSS is out of service and neither CEAC is operable: operate within the region of acceptable operation shown on COLR Figure 9, using any operable CPC channel.

Allowable DNBR with Any CEAC Operable
(COLSS Out of Service)



COLR Figure 8



COLR Figure 9

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

COLSS Operable

-0.224 ≤ ASI ≤ +0.263 for THERMAL POWERS ≥ 70% of RATED THERMAL POWER

-0.26 ≤ ASI ≤ +0.26 for THERMAL POWERS < 70% of RATED THERMAL POWER

COLSS Out of Service

-0.17 ≤ ASI ≤ +0.22 for THERMAL POWERS from 0% to 100% of RATED THERMAL POWER

CORE OPERATING LIMITS REPORT

BORON CONCENTRATION

3.9.1 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 2050 ppm.

III. 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.