



Entergy Operations, Inc.
17265 River Road
Killona, LA 70066
Tel 504 739 6650

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Core Operating Limits Report for Cycle 12

Gentlemen:

Waterford 3 Technical Specification 6.9.1.11.3 requires submittal of the Core Operating Limits Report for each reload cycle. Attached is the Waterford 3 submittal of the Core Operating Limits Report for Cycle 12.

This letter contains no commitments. If you have any questions concerning this submittal please contact P.M. Melancon at (504) 739-6614.

Very truly yours,

A handwritten signature in cursive script that reads "R.D. Peters".

R.D. Peters
Acting, Director
Nuclear Safety Assurance

RDP/TMM/cbh

cc: E.W. Merschoff, NRC Region IV, N. Kalyanam, NRC-NRR, J. Smith,
N.S. Reynolds, NRC Resident Inspectors Office

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ENTERGY OPERATIONS

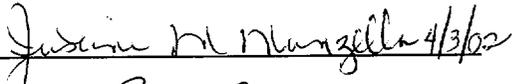
WATERFORD 3

CORE OPERATING LIMITS REPORT

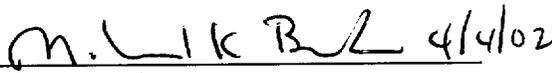
FOR CYCLE 12

REVISION 0

Prepared by: P.M. Melancon  4/3/02

Reviewed by: J.M. Manzella  4/3/02

Approved by: J. B. Holman  4/4/02
Safety & Engineering Analysis

Approved by: M. K. Brandon  4/4/02
Licensing

WATERFORD 3
CORE OPERATING LIMITS REPORT
CYCLE 12, REVISION 0

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WATERFORD 3
CORE OPERATING LIMITS REPORT
CYCLE 12, REVISION 0

I. INTRODUCTION

This CORE OPERATING LIMITS REPORT (COLR) has been prepared in accordance with the requirements of Waterford 3 Technical Specification 6.9.1.11 for Waterford 3 Cycle 12. The core operating limits have been developed using the NRC approved methodologies specified in Section III. This is Revision 0 of the Cycle 12 COLR.

The major changes between the Cycle 12 and Cycle 11 COLR are listed below:

- The Table of Contents and List of Figures were revised as necessary to reflect the changes for Cycle 12.
- The titles of Sections 3.1.1.1 and 3.1.1.2 were revised in accordance with the changes made to the corresponding Technical Specifications related to the Part-Length CEA replacement design change.
- Section 3.1.1.2, Shutdown Margin-All CEAs Fully Inserted, Figure 1 was increased by $0.5 \times 10^{-4} \Delta p/^\circ\text{F}$.
- Section 3.1.3.1.a and 3.1.3.1.b were revised to remove the reference to part-length CEAs.
- Section 3.1.3.6 text was revised to include the new Group P CEAs and to include a reference to Figure 5.
- Section 3.1.3.6, Figure 4, was revised to remove Regulating CEA Group 4 and indicate Group 5 at 60" as the maximum CEA insertion.
- Section 3.1.3.7 was deleted since part-length CEAs are being replaced with full-length, full-strength CEAs.
- Figure 5 was revised to remove reference to part-length CEAs and to provide the limits for the new CEA group, Group P.
- Section 3.2.4, Figure 8 was revised to include a limit line for the 70% and 96% power levels and to make necessary adjustments to the other limits.
- Section 3.2.4, Figure 9, was revised to include a limit line for the 70% power level and to make necessary adjustments to the other limits.
- Added clarifying notes to the text of Section 3.2.4 for use with Figures 8 & 9.
- Revised Section III.1, 2, and 6 to add a reference to Group P CEAs in accordance with the change to Technical Specification 6.9.1.11.1 related to the Part-Length CEA replacement design change.
- Added Section III.7 in accordance with Technical Specification 6.9.1.11.1 related to the Part-Length CEA replacement design change.

II. AFFECTED TECHNICAL SPECIFICATIONS

CORE OPERATING LIMITS REPORT

SHUTDOWN MARGIN - ANY CEA WITHDRAWN

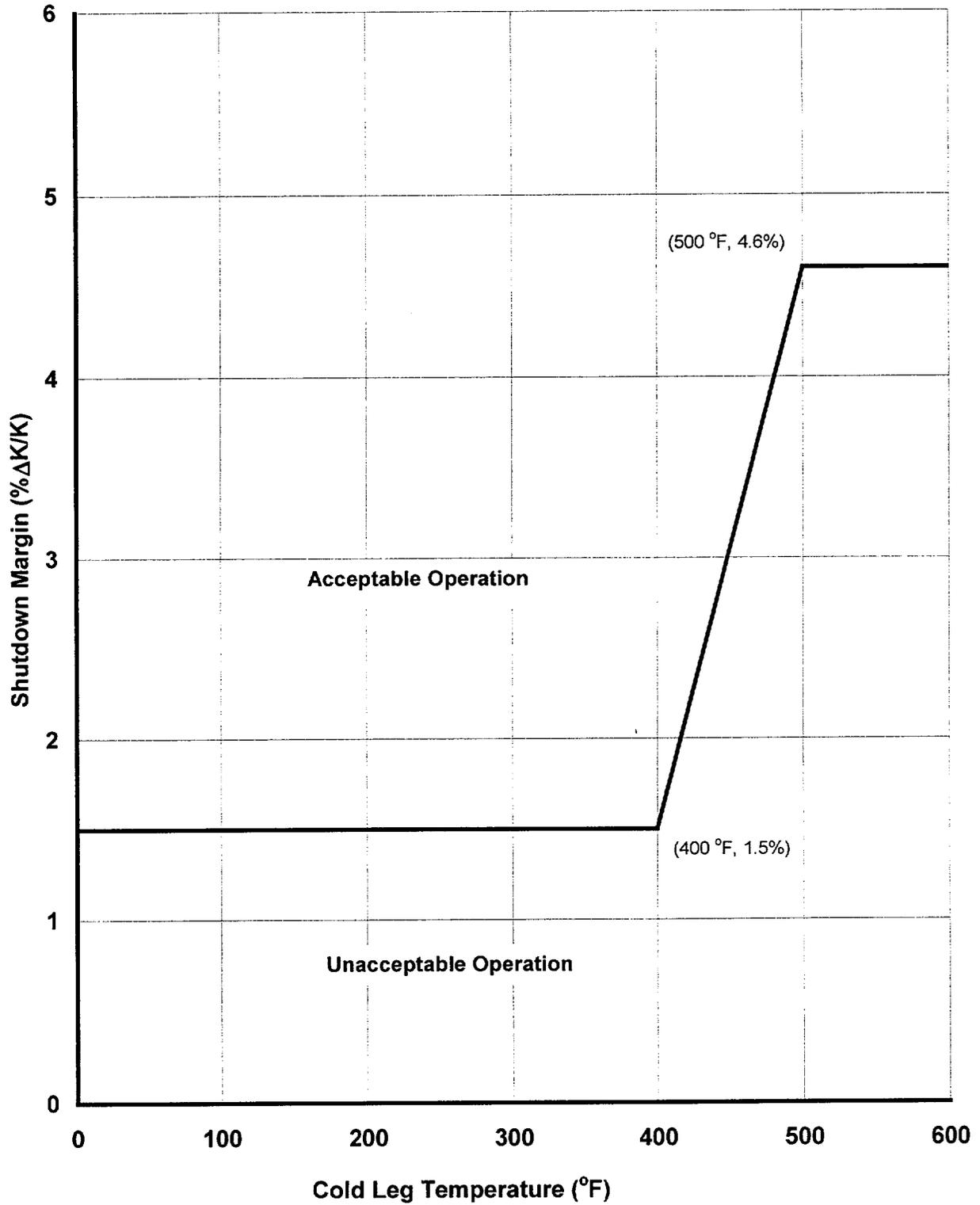
- 3.1.1.1 The SHUTDOWN MARGIN shall be greater than or equal to 5.15% $\Delta k/k$ when T_{avg} is greater than 200 °F or 2.0% $\Delta k/k$ when T_{avg} is less than or equal to 200 °F.

CORE OPERATING LIMITS REPORT

SHUTDOWN MARGIN - ALL 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 (All CEAs Fully Inserted)

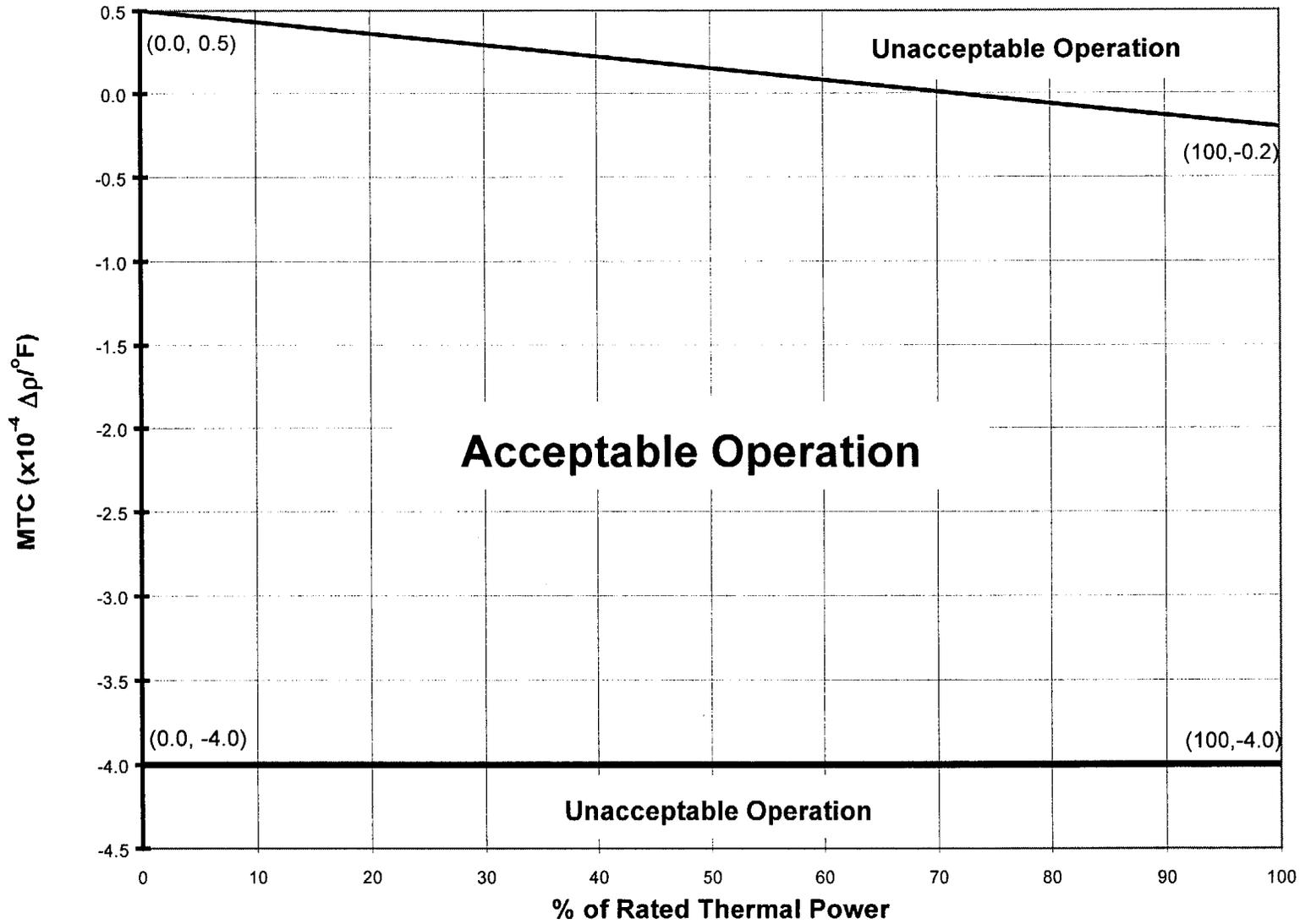


COLR Figure 1

CORE OPERATING LIMITS REPORT
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.

Moderator Temperature Coefficient Versus % of Rated Thermal Power



COLR Figure 2

CORE OPERATING LIMITS REPORT

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 \geq 10 hours but < 25 hours.
- d. At least once per 24 hours if the reactor has been shut down \geq 25 hours but < 21 days.
- e. At least once per 7 days if the reactor has been shut down \geq 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	<u>Number of Operating Charging Pumps*</u>			
	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} ≤ 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.

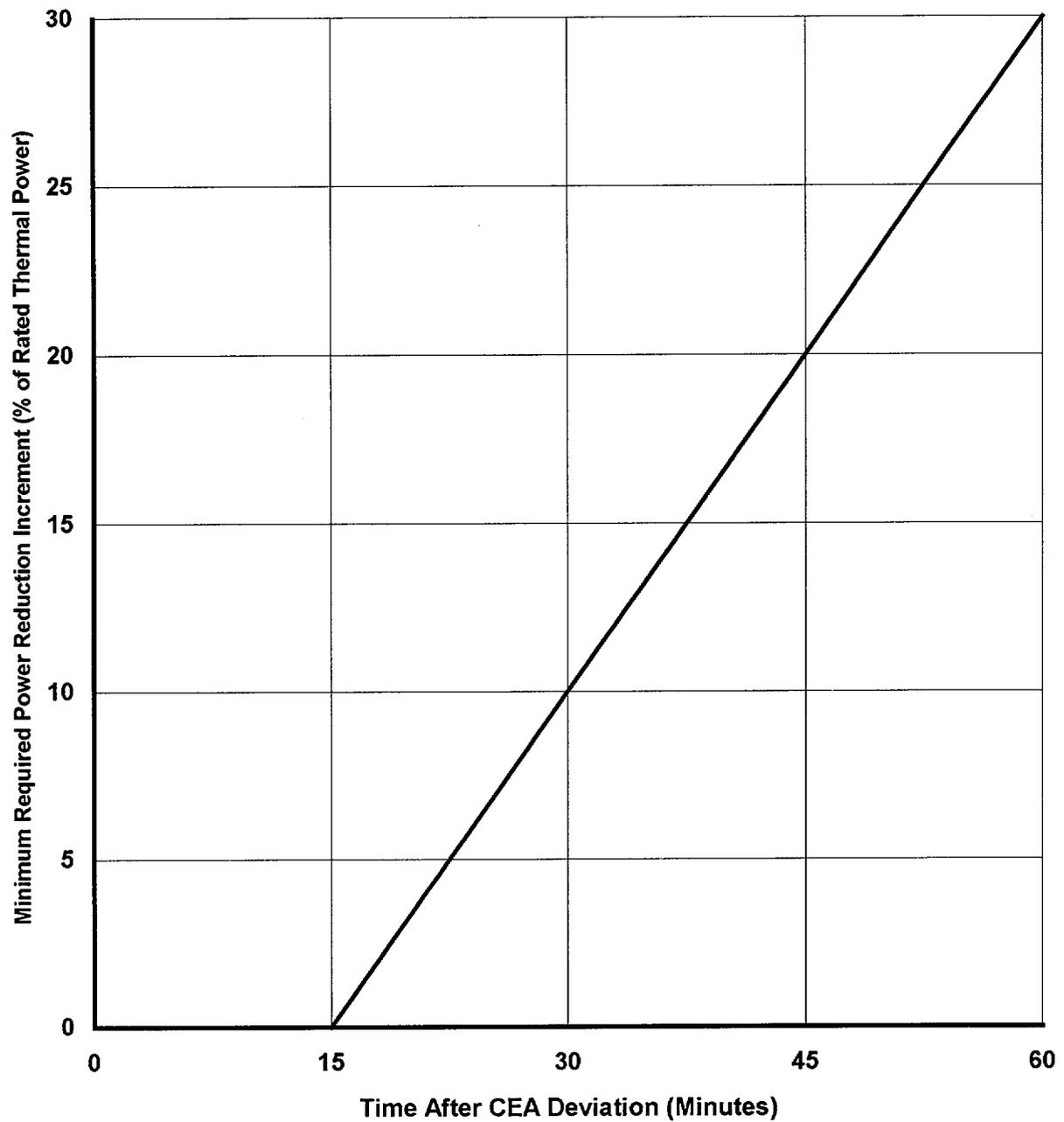
** The precluded number of charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

CORE OPERATING LIMITS REPORT

MOVABLE CONTROL ASSEMBLIES - CEA POSITION

- 3.1.3.1.a With one 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 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.

Required Power Reduction After Single CEA Deviation*



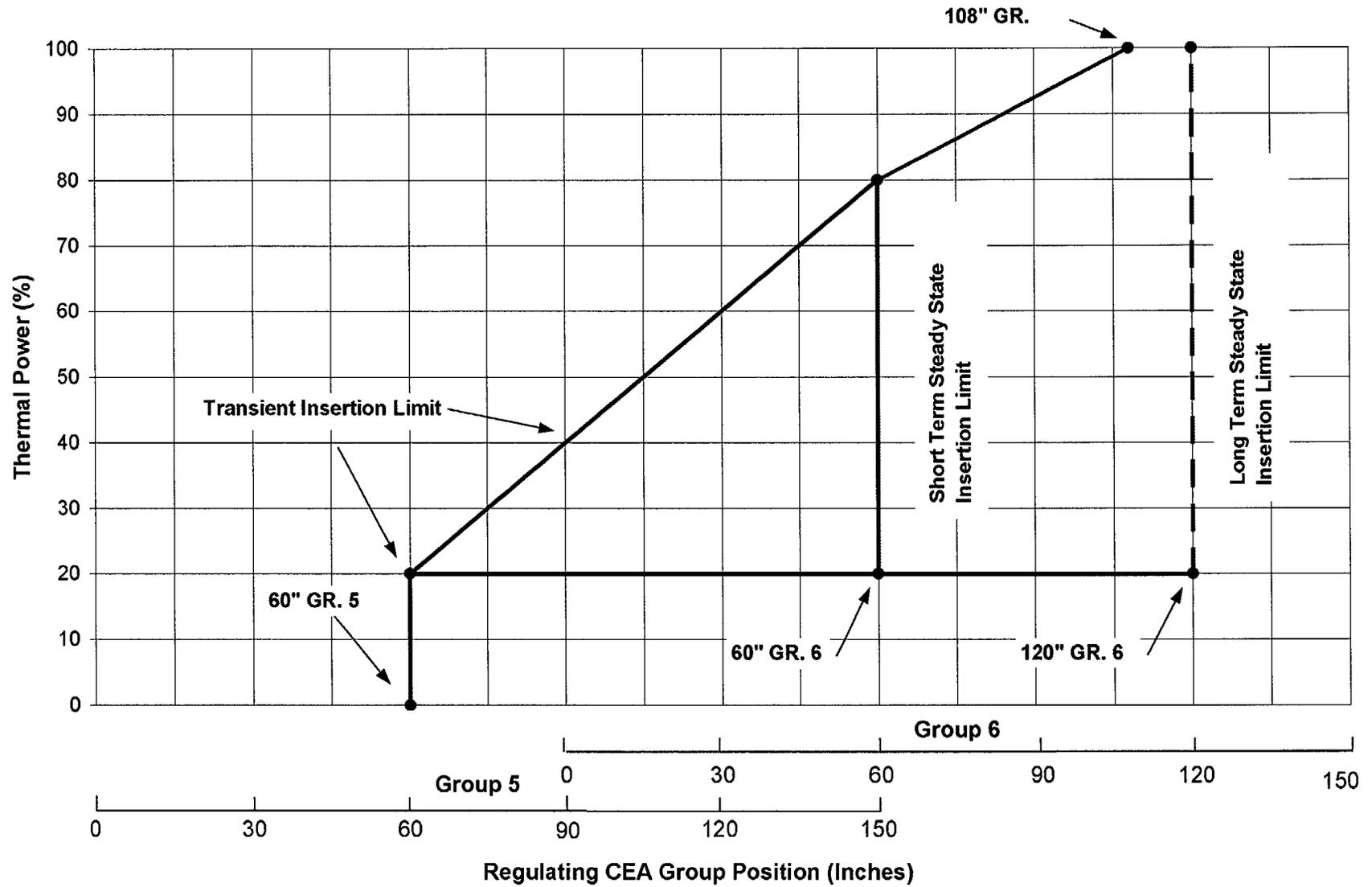
COLR Figure 3

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

CORE OPERATING LIMITS REPORT
REGULATING AND GROUP P CEA INSERTION LIMITS

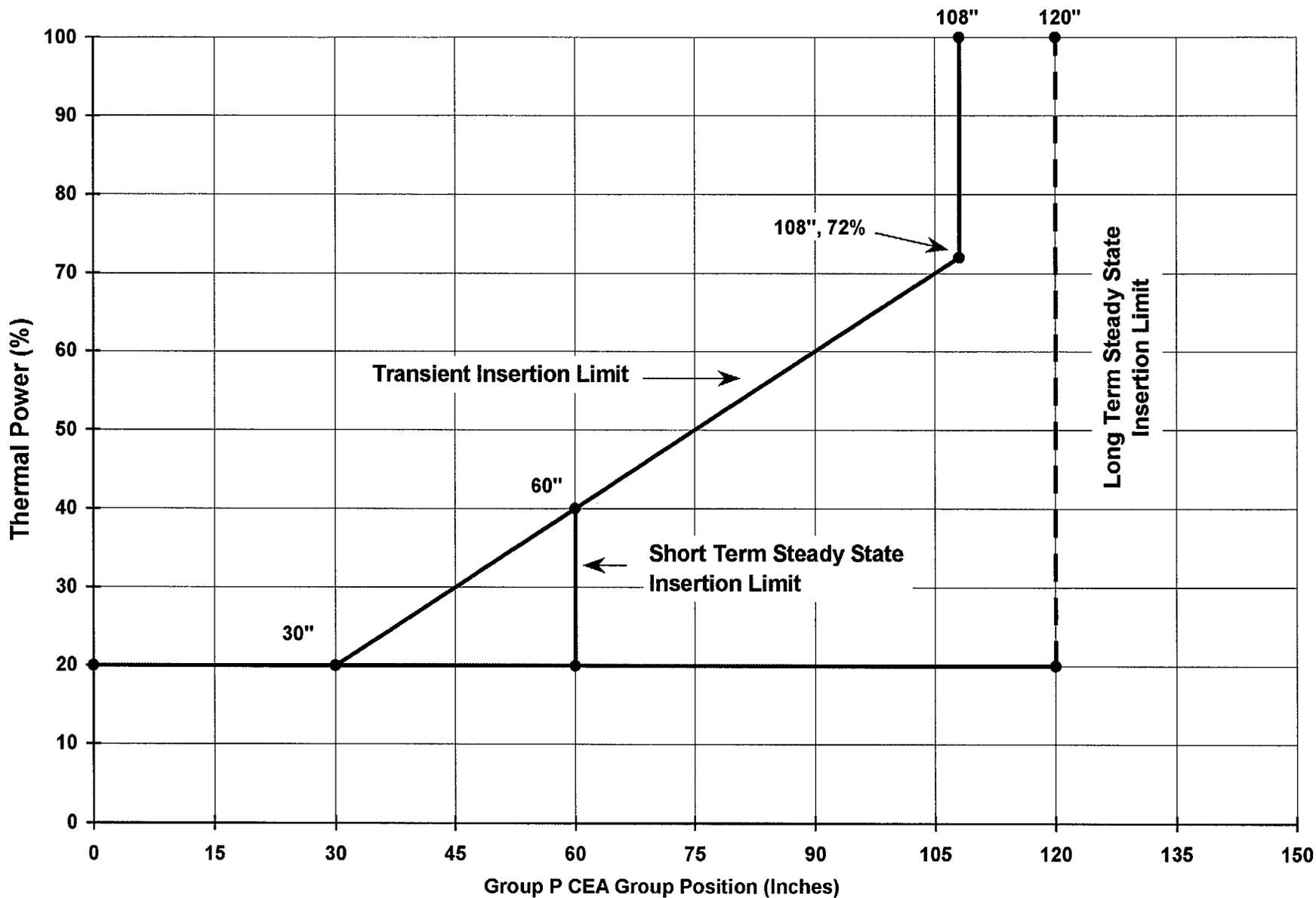
3.1.3.6 The regulating CEA groups and Group P CEAs shall be limited to the withdrawal sequence and to the insertion limits shown on COLR Figure 4 (regulating groups) and Figure 5 (Group P).

Regulating CEA Group Insertion Limits Versus Thermal Power



COLR Figure 4

Group P CEA Group Insertion Limits Versus Thermal Power



COLR Figure 5

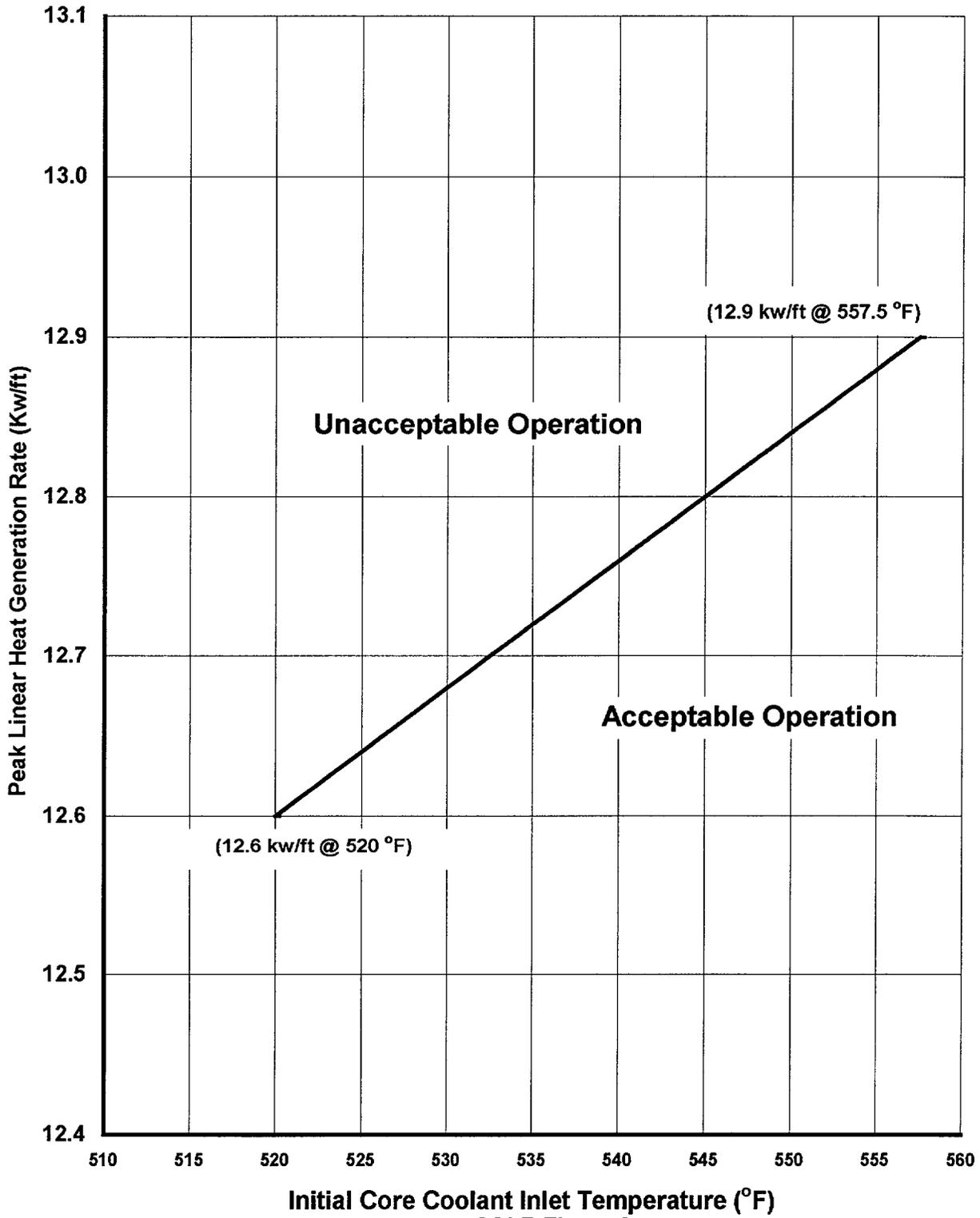
CORE OPERATING LIMITS REPORT

LINEAR HEAT RATE

3.2.1 The linear heat rate shall be maintained:

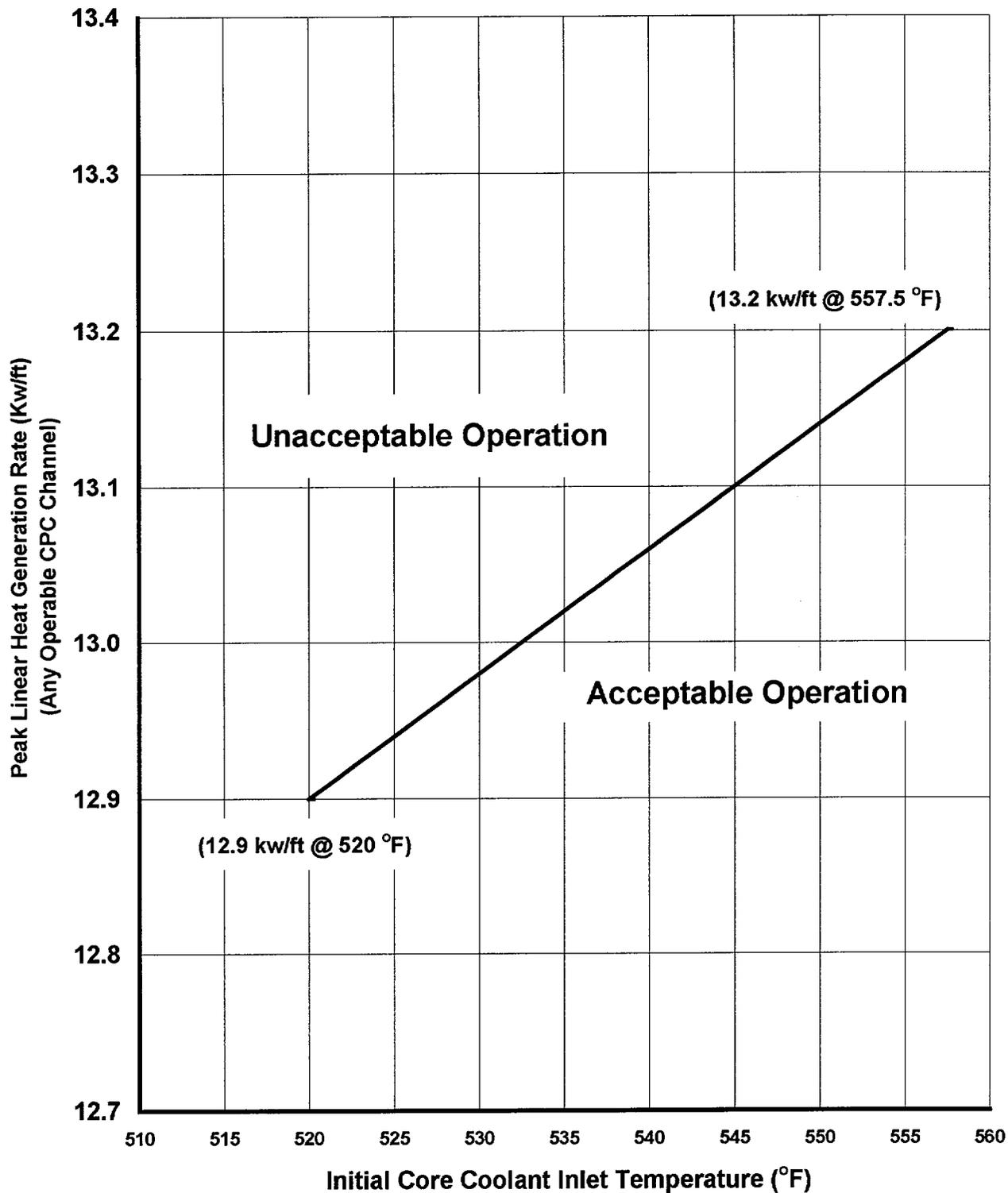
- a. Within the region of acceptable operation of COLR Figure 6, when COLSS is in service.
- b. Within the region of acceptable operation of COLR Figure 7, when COLSS is out of service.

**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 .

CORE OPERATING LIMITS REPORT

DNBR MARGIN

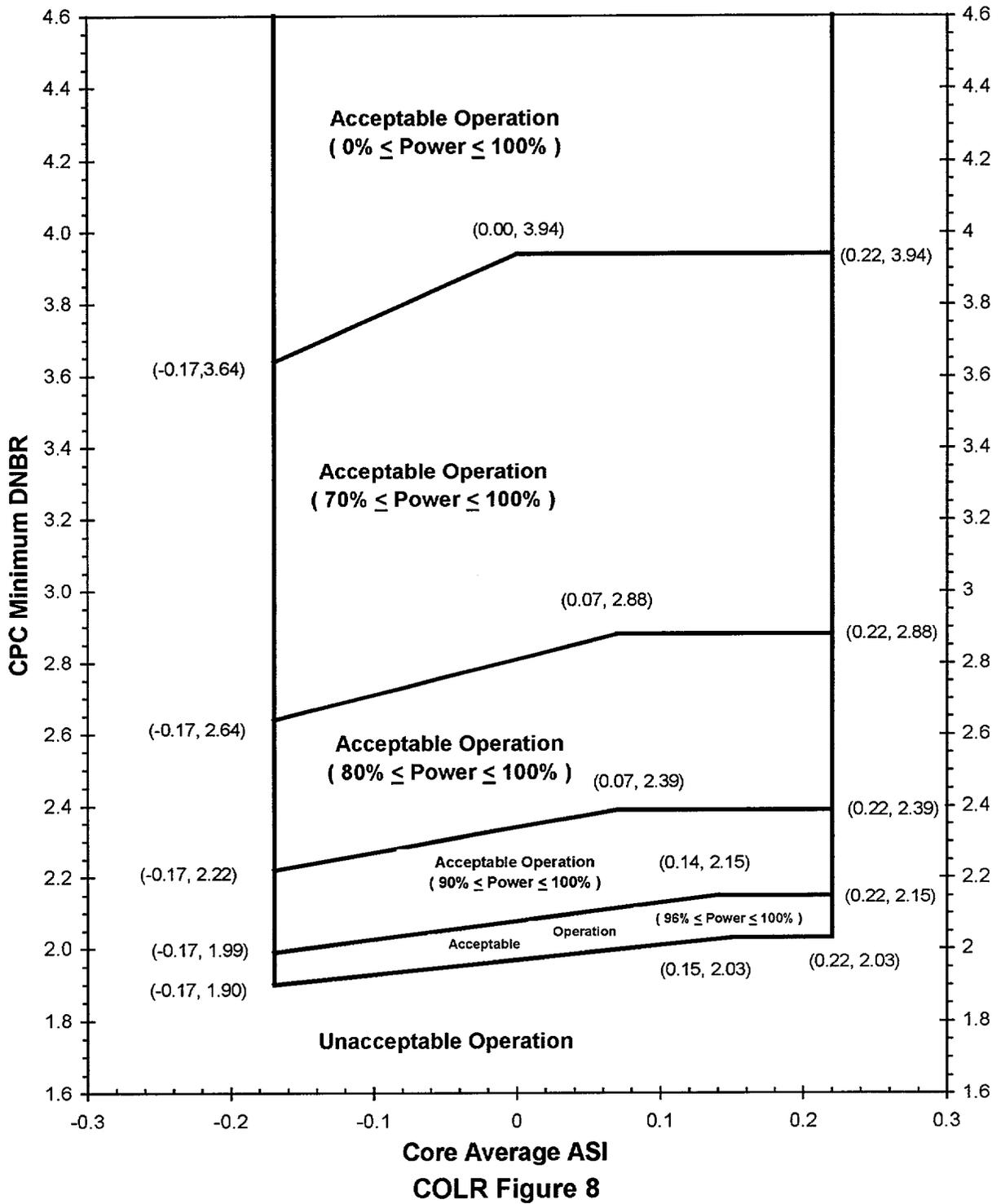
3.2.4 The DNBR margin shall be maintained by one of the following methods:

- 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.

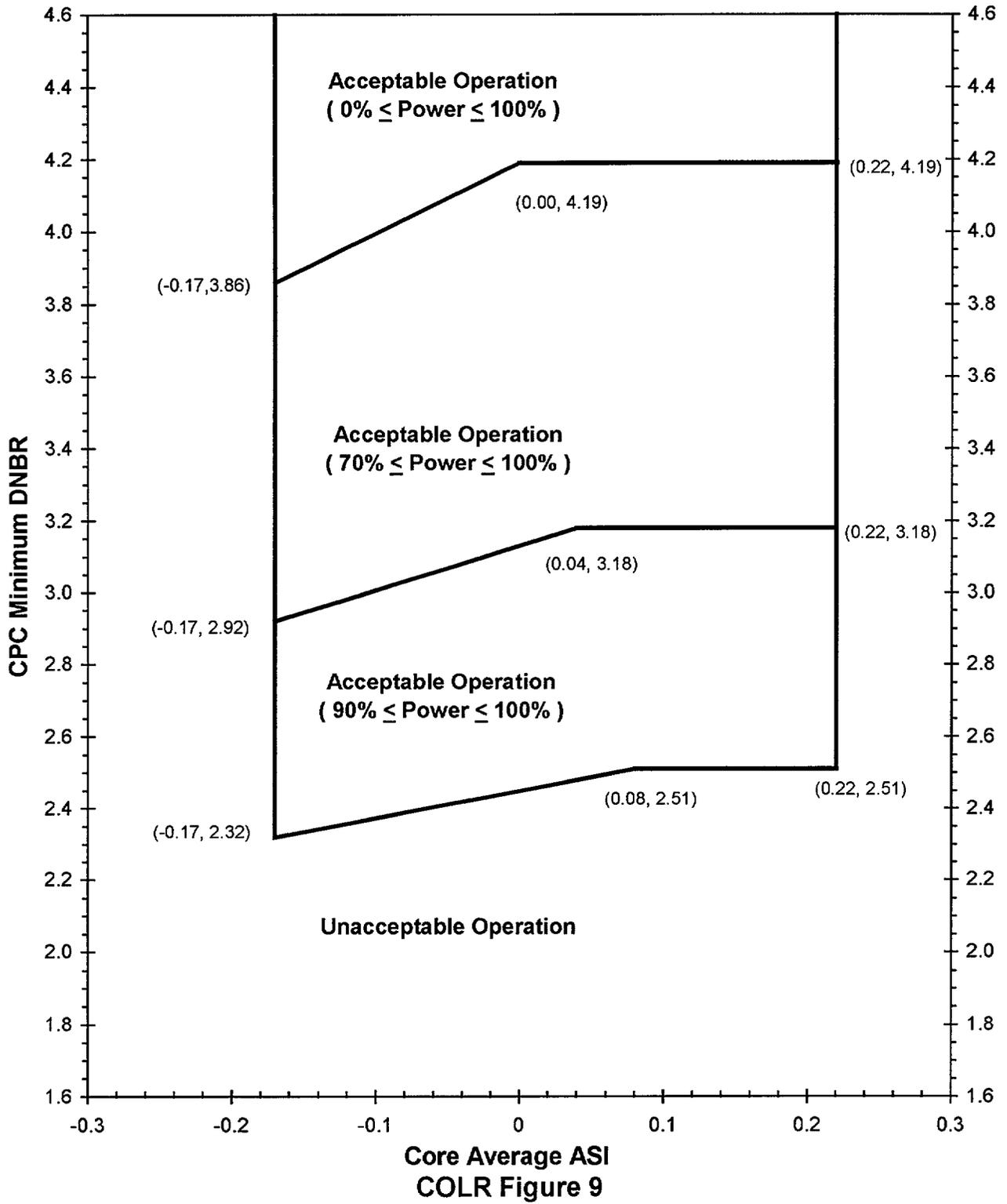
NOTES

1. The five DNBR limit lines shown between the vertical ASI limit lines drawn at -0.17 and 0.22 on Figures 8 and 9 represent the minimum DNBR value required for operation in the power range displayed in the area above each line. Operation at lower power levels requires that a larger DNBR value be maintained. For example, with ASI equal to -0.17 and a core power of 85%, CPC calculated DNBR must be minimum of 2.22. At 79% power and the same ASI value, the calculated DNBR must be at least 2.64. At 65% power and the same ASI value, DNBR must be a minimum of 3.64.
2. The vertical ASI limit lines shown at -0.17 and 0.22 on Figures 8 and 9 may be considered as extending beyond the maximum DNBR value of 4.6 shown on the charts. Therefore, when monitoring DNBR with these Figures, compliance is achieved at all power levels if the CPC-calculated DNBR is greater than 4.6.

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



**Allowable DNBR with No CEAC(s) Operable
(COLSS Out of Service)**



CORE OPERATING LIMITS REPORT

AXIAL SHAPE INDEX

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

COLSS Operable

$-0.22 \leq \text{ASI} \leq +0.26$ for THERMAL POWERS $\geq 70\%$ of RATED THERMAL POWER

$-0.26 \leq \text{ASI} \leq +0.26$ for THERMAL POWERS from 20% to 70% of RATED THERMAL POWER

COLSS Out of Service

$-0.17 \leq \text{ASI} \leq +0.22$ for THERMAL POWERS from 20% 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 sufficiently 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 Specifications 3.1.1.1 and 3.1.1.2 for Shutdown Margins, 3.1.1.3 for MTC, 3.1.3.6 for Regulating and Group P CEA Insertion Limits, 3.1.2.9 Boron Dilution (Calculation of CBC & IBW), and 3.9.1 Boron Concentration).
2. "C-E Method for Control Element Assembly Ejection Analysis," CENPD-0190-A, January 1976. (Methodology for Specification 3.1.3.6 for Regulating and Group P CEA Insertion Limits and 3.2.3 for Azimuthal Power Tilt).
3. "Modified Statistical Combination of Uncertainties" CEN-356(V)-P-A, May 1988. (Methodology for Specification 3.2.4 for DNBR Margin and 3.2.7 for ASI).
4. "Calculative Methods for the CE Large Break LOCA Evaluation Model For The Analysis of C-E and W Designed NSSS," CENPD-132, Supplement 3-P-A, June 1985. (Methodology for Specification 3.1.1.3 for MTC, 3.2.1 for Linear Heat Rate, 3.2.3 for Azimuthal Power Tilt and 3.2.7 for ASI).
5. "Calculative Methods for the ABB CE Small Break LOCA Evaluation Model," CENPD-137-P, August 1974; Supplement 2-P-A, April 1998. (Methodology for Specification 3.1.1.3 for MTC, 3.2.1 for Linear Heat Rate, 3.2.3 for Azimuthal Power Tilt and 3.2.7 for ASI).
6. "CESEC - Digital Simulation of a Combustion Engineering Nuclear Steam Supply System", CENPD-107, December 1981. (Methodology for Specification 3.1.1.1 and 3.1.1.2 for Shutdown Margins, 3.1.1.3 for MTC, 3.1.3.1 for Movable Control Assemblies – CEA Position, 3.1.3.6 for Regulating and Group P CEA Insertion Limits, and 3.2.3 for Azimuthal Power Tilt).
7. "Qualification of Reactor Physics Methods for the Pressurized Water Reactors of the Entergy System," ENEAD-01-P, Revision 0. (Methodology for Specifications 3.1.1.1 and 3.1.1.2 for Shutdown Margins, 3.1.1.3 for MTC, 3.1.3.6 for Regulating and Group P CEA Insertion Limits, 3.1.2.9 Boron Dilution (calculation of CBC & IBW), and 3.9.1 Boron Concentration).