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W3F1-2000-0151
A4.05
PR

October 27, 2000

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 11

Gentlemen:

Waterford 3 Technical Specification 6.9.1.11.3 requires submittal of the Core Operating Limits Report (COLR) for each reload cycle. Attached is the Waterford 3 submittal of the Core Operating Limits Report for Cycle 11.

This letter contains no commitments. If you have any questions concerning this matter, please contact Ron Williams at (504) 739-6255.

Very truly yours,

A handwritten signature in black ink, appearing to read "Everett P. Perkins, Jr." with a stylized flourish at the end.

E.P. Perkins, Jr.
Director,
Nuclear Safety Assurance

EPP/RLW/rtk
Attachment: Core Operating Limits Report for Cycle 11

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

A001

ENERGY OPERATIONS

WATERFORD 3

CORE OPERATING LIMITS REPORT

FOR CYCLE 11

REVISION 0

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WATERFORD 3
CORE OPERATING LIMITS REPORT
CYCLE 11, REVISION 0

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WATERFORD 3

CORE OPERATING LIMITS REPORT CYCLE 11, 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 11. The core operating limits have been developed using the NRC approved methodologies specified in Section III. This is Revision 0 of the Cycle 11 COLR.

The major changes between the Cycle 11 and Cycle 10 COLR are listed below:

- Section 3.1.1.3 Figure 2 lower MTC limit was changed from $-3.3 \times 10^{-4} \Delta\rho/^\circ\text{F}$ to $-4.0 \times 10^{-4} \Delta\rho/^\circ\text{F}$.
- The COLR Cycle 10 Section 3.1.1.3 Figures 2A, 2B, and 2C were deleted and the corresponding restrictions were deleted.
- Section 3.2.1 Figure 6 and 7 Peak Linear Heat Generation Rates (kw/ft) were decreased by 0.1 kw/ft.
- Section 3.2.7 ASI values (COLSS operable at $\geq 70\%$ rated thermal power) were reduced to meet the requirements of the Cycle 11 reload.

II. AFFECTED TECHNICAL SPECIFICATIONS

CORE OPERATING LIMITS REPORT

SHUTDOWN MARGIN - ANY FULL LENGTH CEA WITHDRAWN

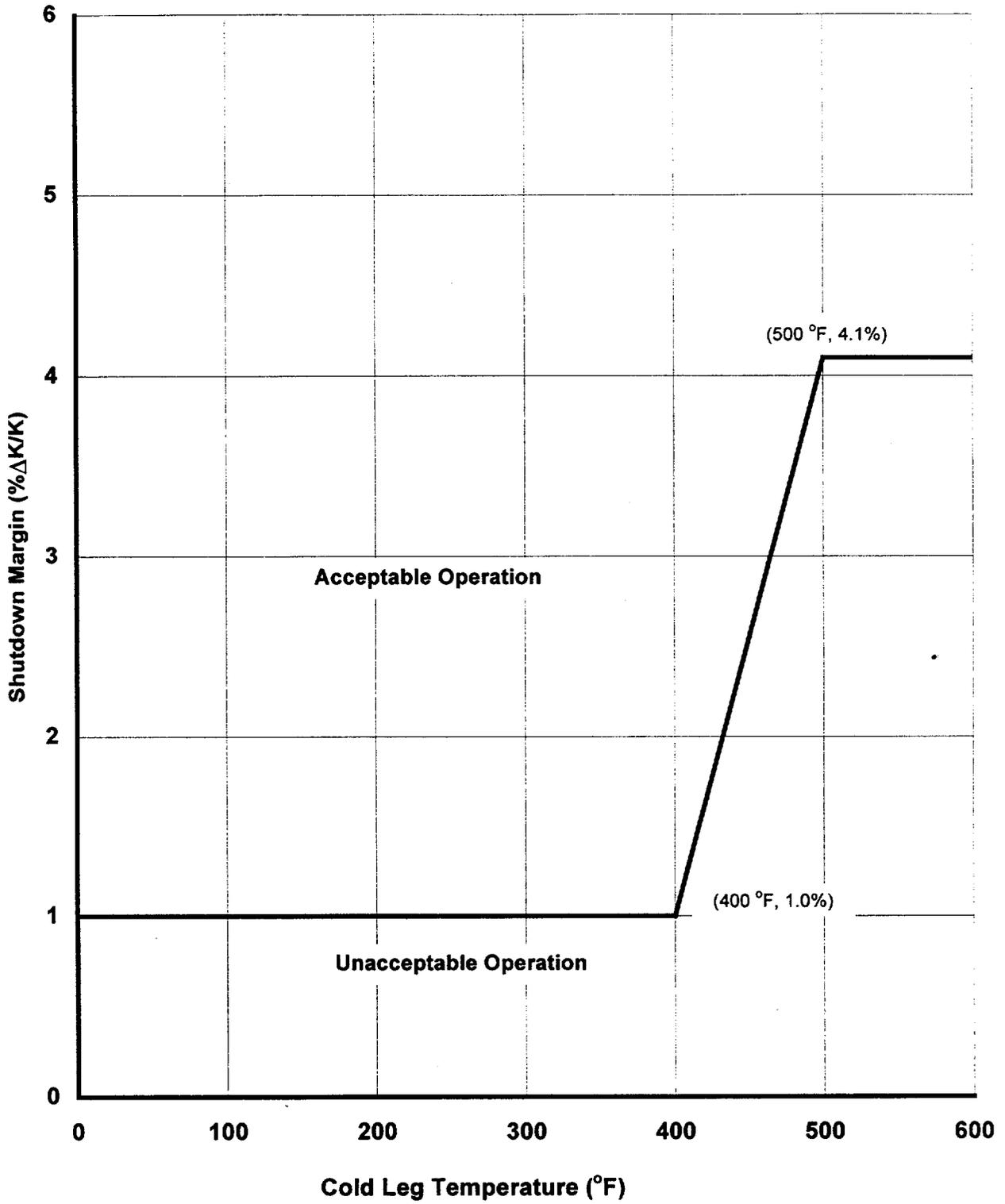
- 3.1.1.1 The SHUTDOWN MARGIN shall be greater than or equal to 5.15% $\Delta k/k$ when T_{avg} is greater than 200 °F or 2.0% $\Delta k/k$ when T_{avg} is less than or equal to 200 °F.

CORE OPERATING LIMITS REPORT

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

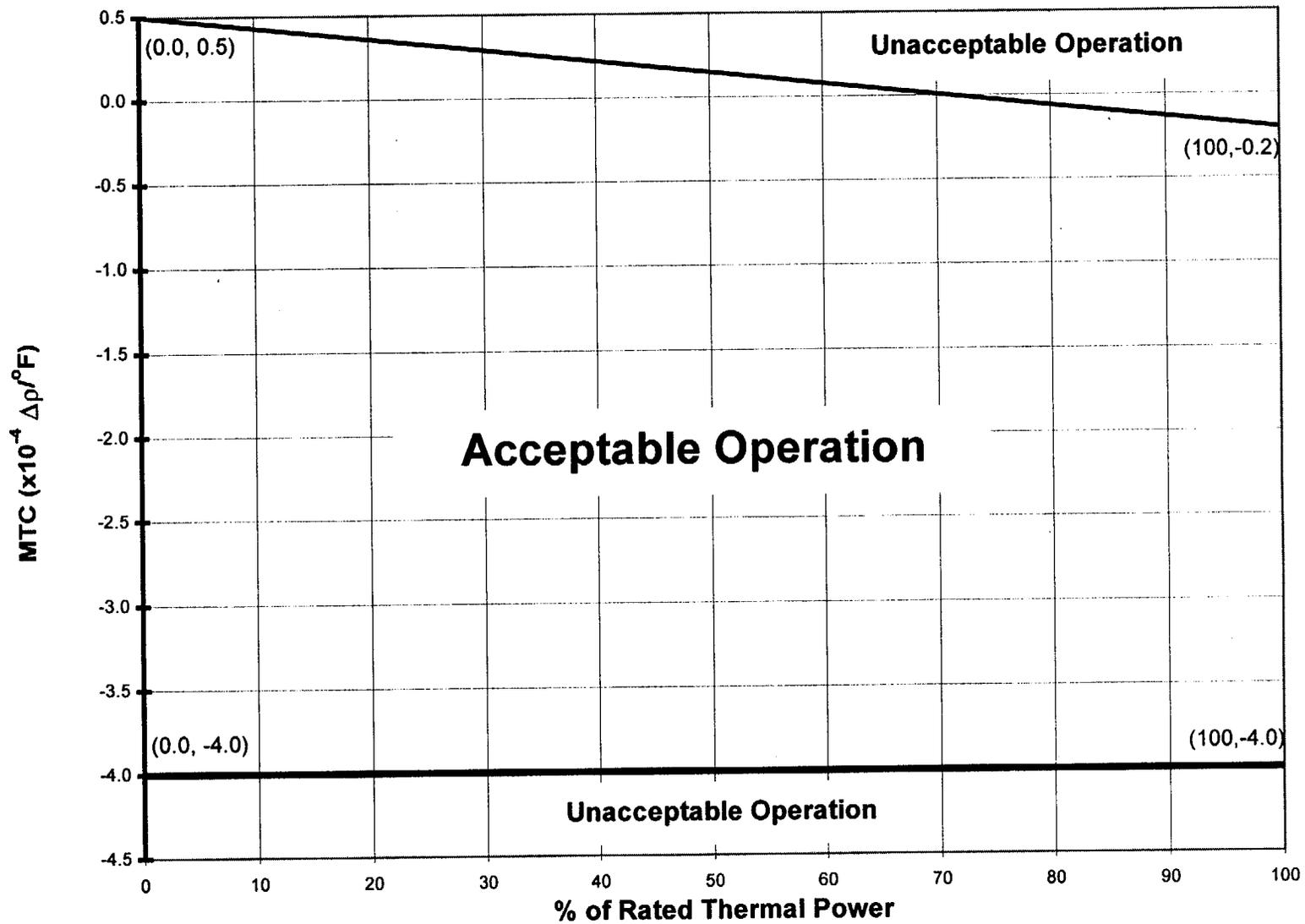


COLR Figure 1

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	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.

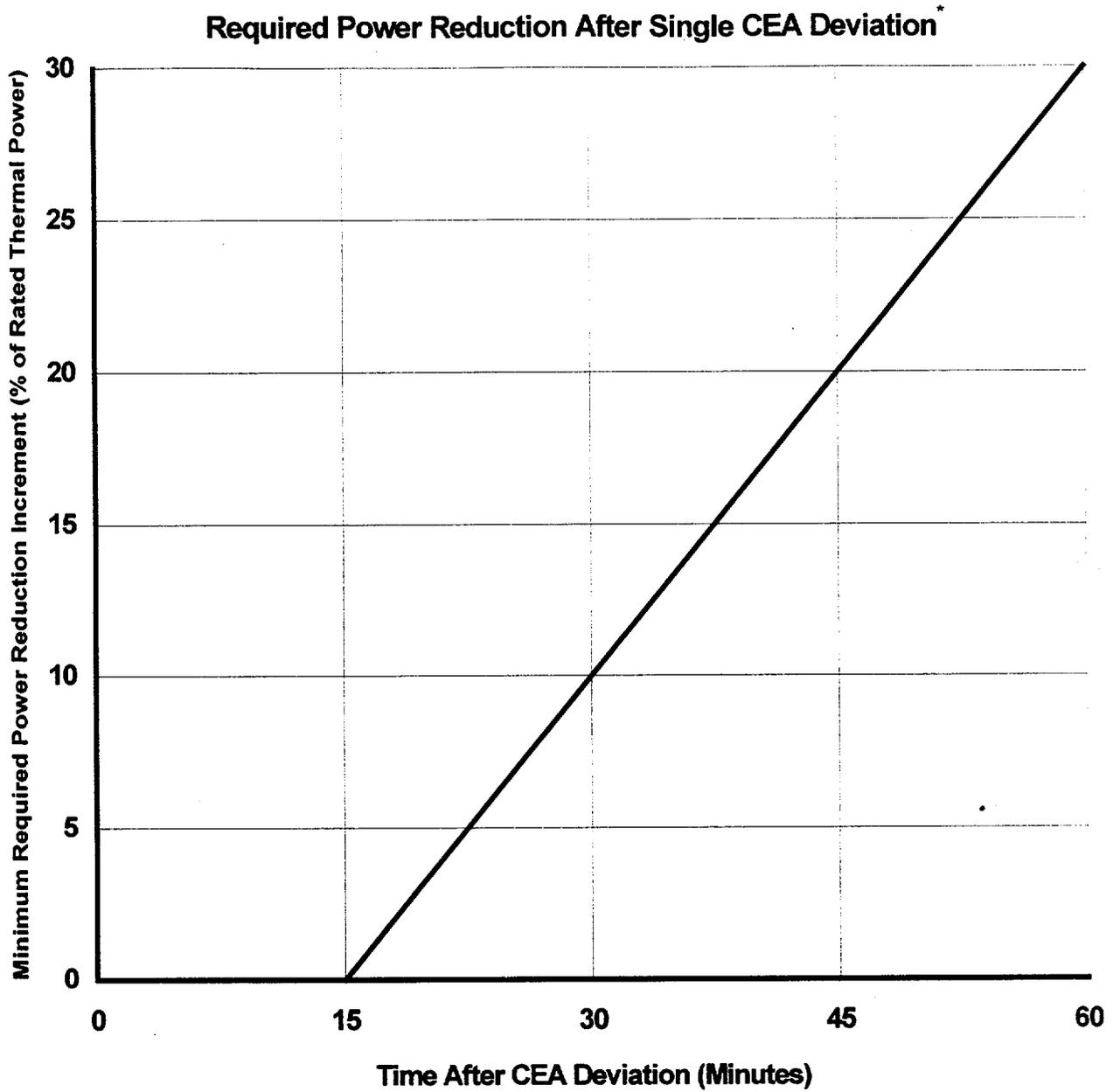
** The precluded number of charging pumps shall be verified to be inoperable by racking out their motor circuit breakers.

CORE OPERATING LIMITS REPORT

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.



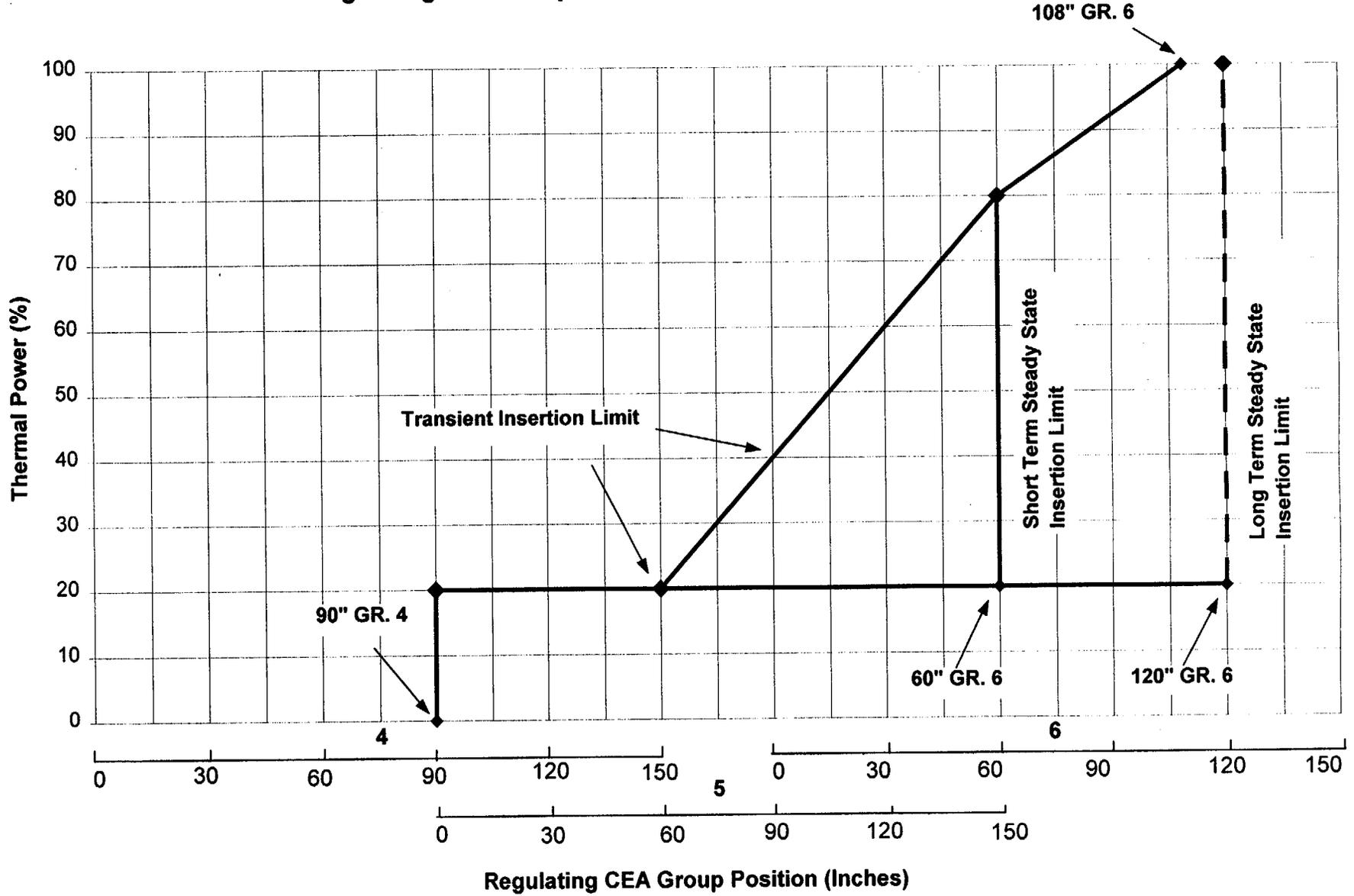
COLR Figure 3

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

CORE OPERATING LIMITS REPORT
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.

Regulating CEA Group Insertion Limits Versus Thermal Power



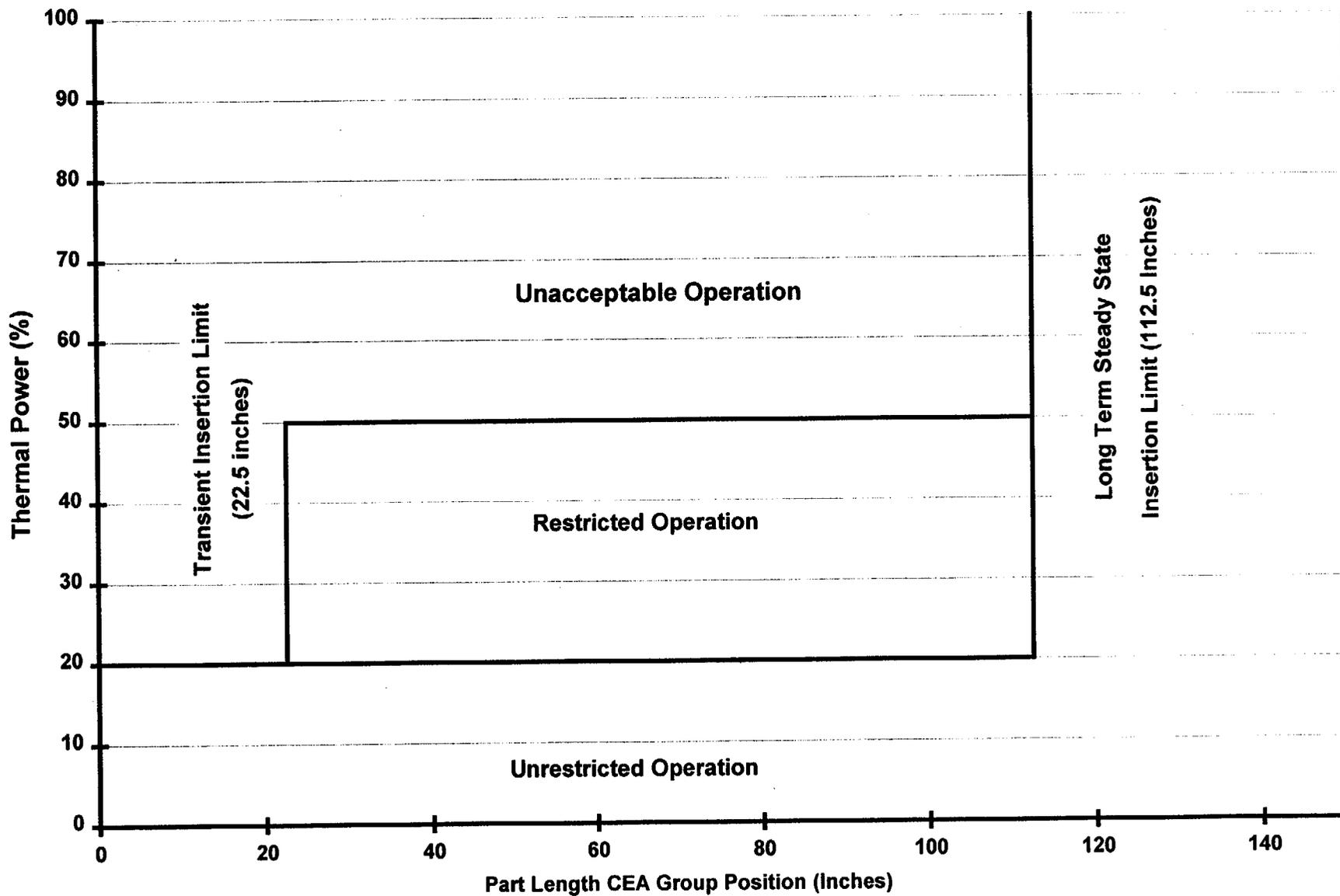
COLR Figure 4

CORE OPERATING LIMITS REPORT

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

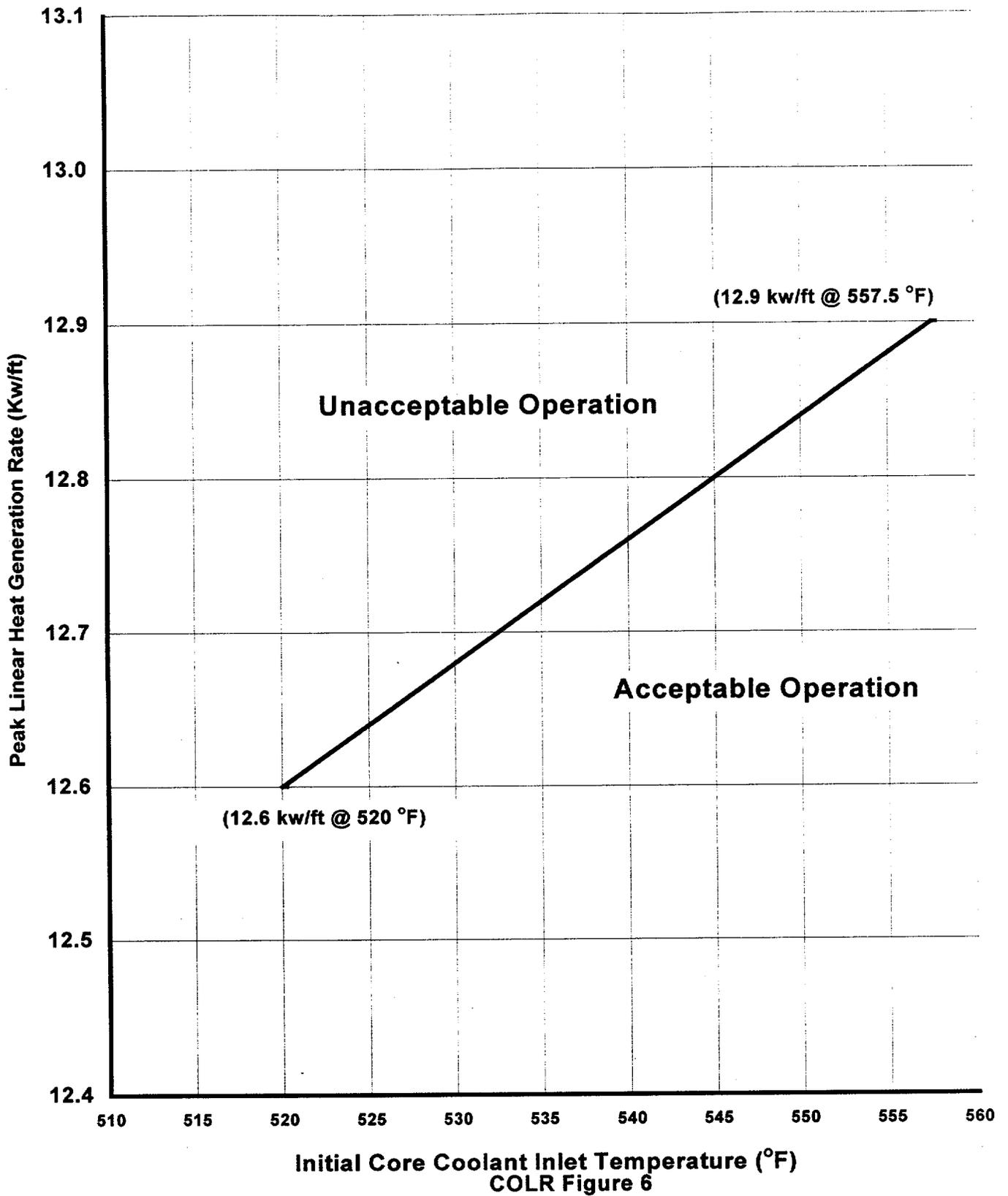
CORE OPERATING LIMITS REPORT

LINEAR HEAT RATE

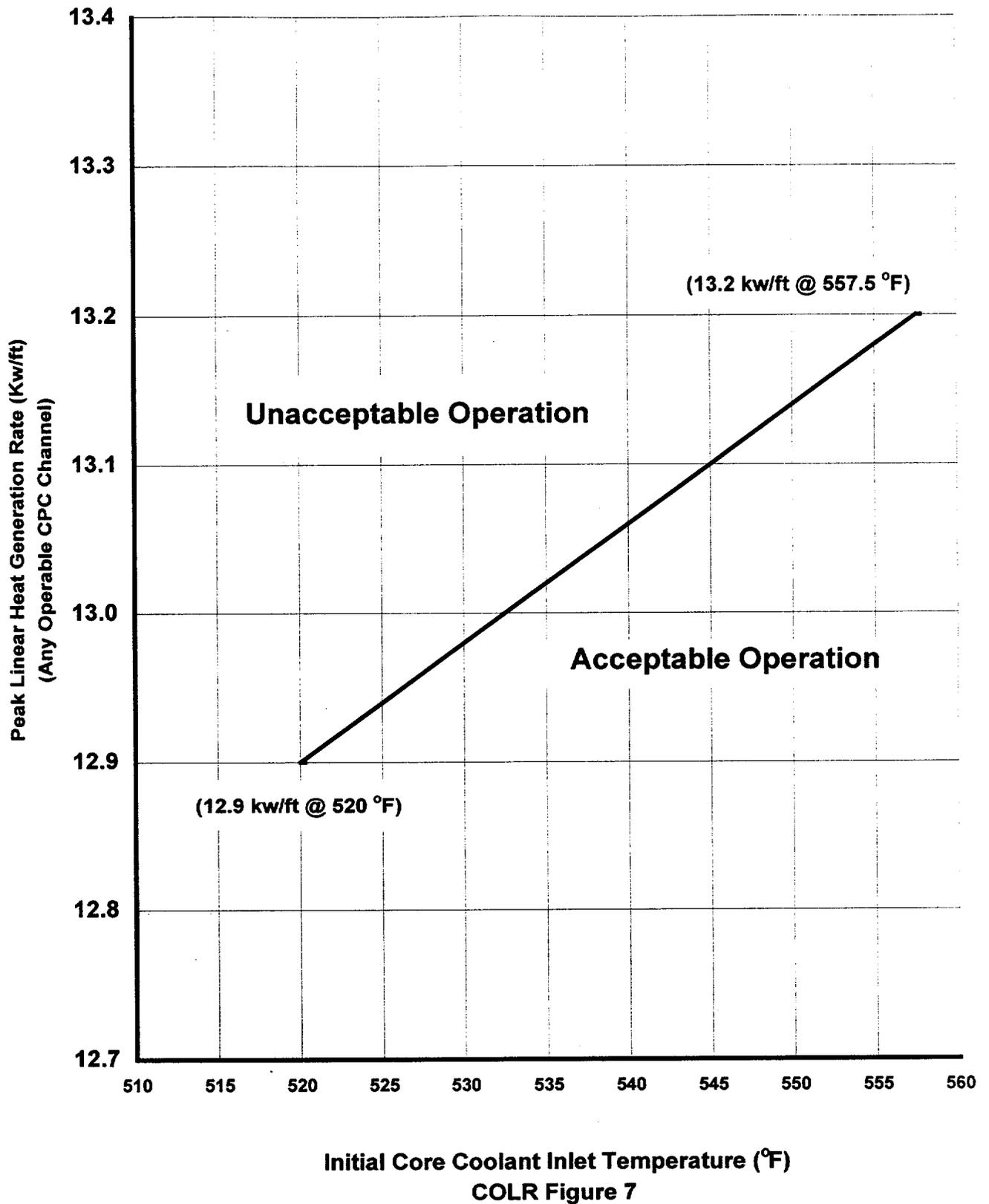
3.2.1 The linear heat rate shall be maintained:

- 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)



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



CORE OPERATING LIMITS REPORT
AZIMUTHAL POWER TILT- T_q

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

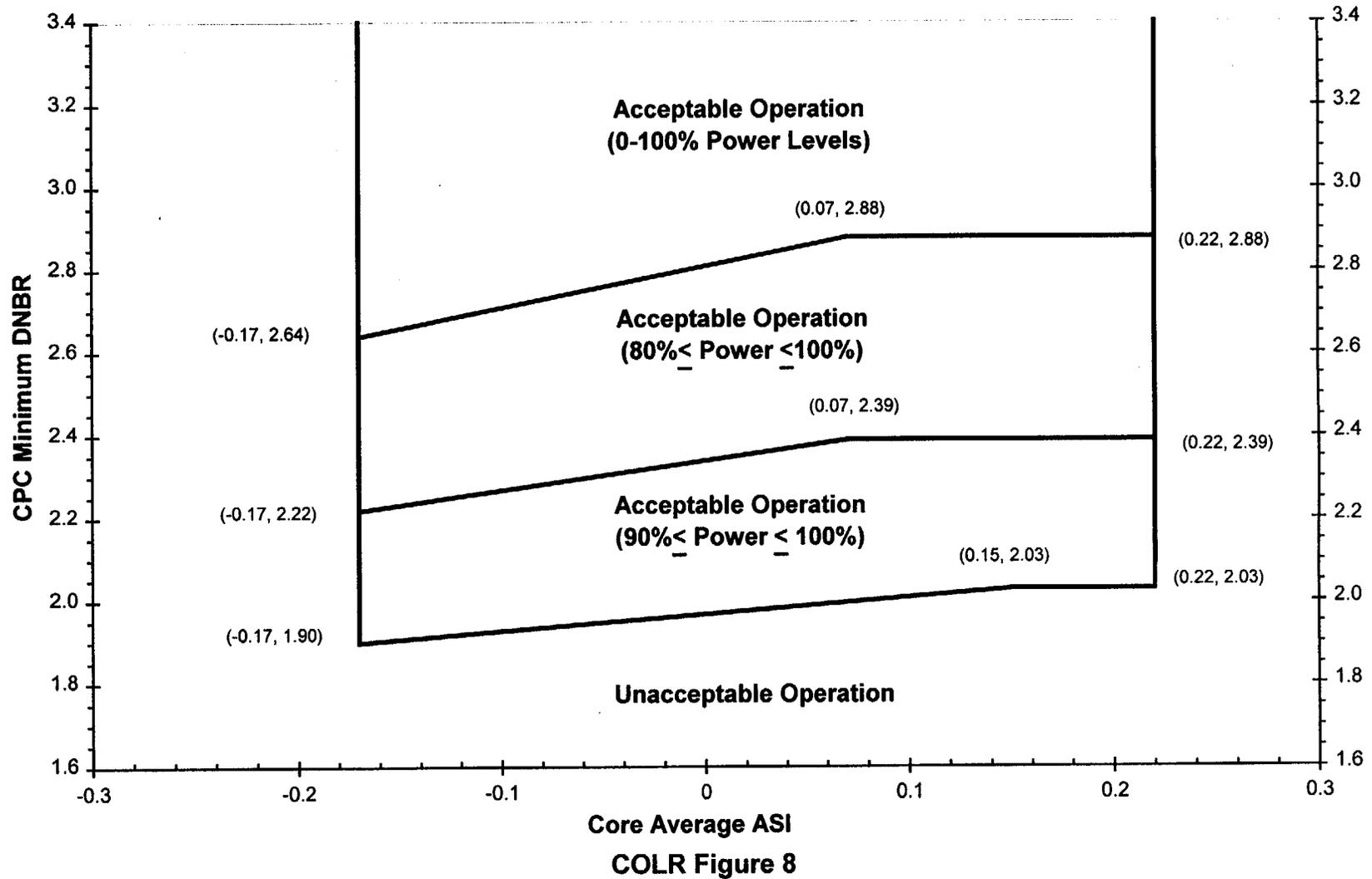
CORE OPERATING LIMITS REPORT

DNBR MARGIN

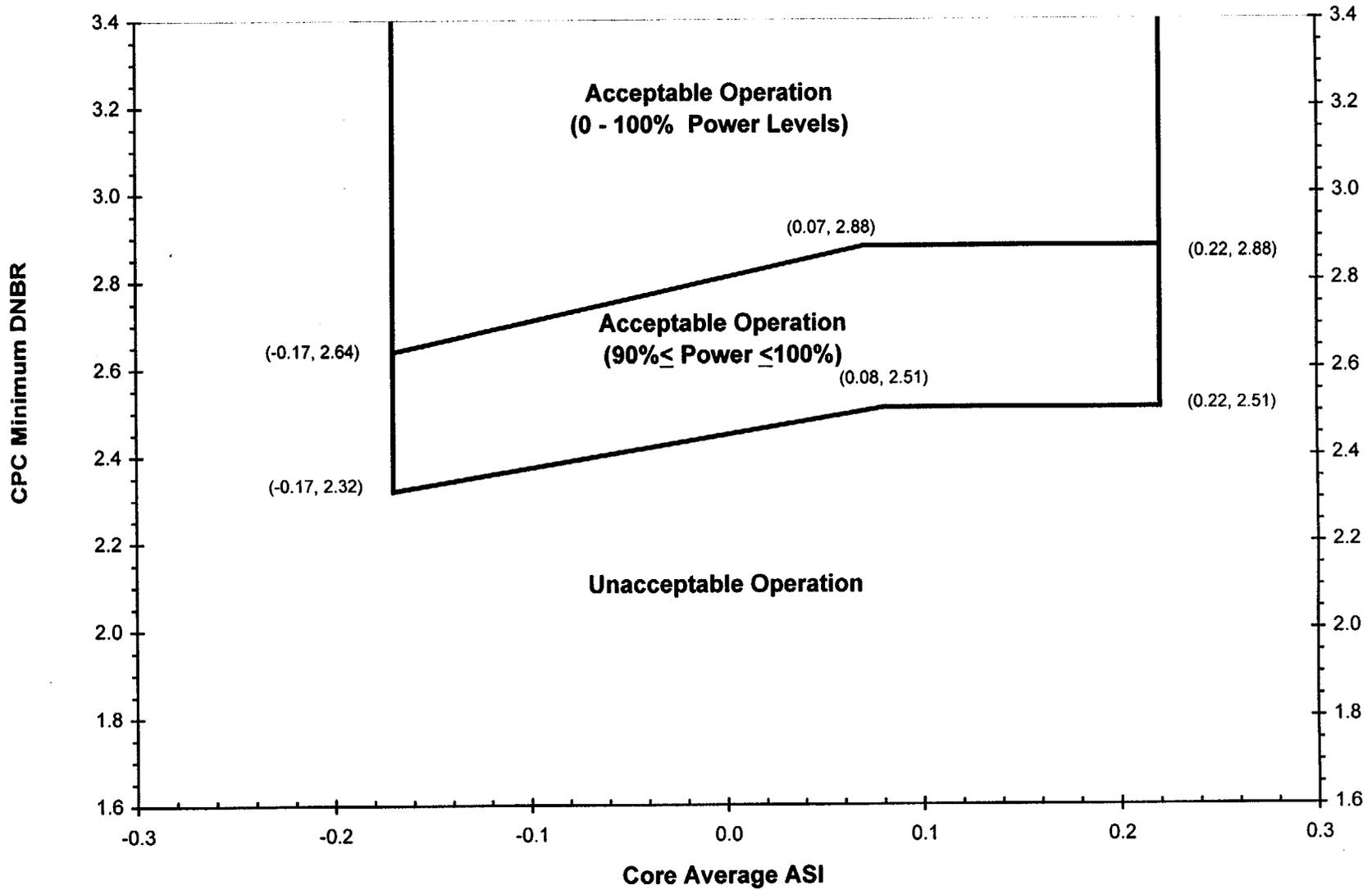
3.2.4 The DNBR margin shall be maintained by one of the following methods:

- 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.

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



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



COLR Figure 9

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 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 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 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 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 CEA Insertion Limits, 3.1.3.7 for Part Length CEA Insertion Limits and 3.2.3 for Azimuthal Power Tilt).