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W3F1-2003-0094

November 17, 2003

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Core Operating Limits Report – Cycle 13 Revision 1
Waterford Steam Electric Station, Unit 3 (Waterford 3)
Docket No. 50-382
License No. NPF-38

Dear Sir or Madam:

Waterford 3 Technical Specification 6.9.1.11.3 requires submittal of the Core Operating Limits Report (COLR) for each reload cycle. Revision 0 of the COLR for Waterford 3 Cycle 13 was submitted on November 5, 2003, by letter W3F1-2003-0085.

The attached COLR Cycle 13 Revision 1 revises Figures 6 and 7 to implement a 0.1 Kw/ft reduction in peak linear heat generation rate for the specified temperature range to account for greater than 500 but less than 600 plugged tubes in Steam Generator Number 1.

If you have any questions concerning this submittal please contact P.M. Melancon at (504) 739-6614.

There are no new commitments contained in this submittal.

Sincerely,

Gautam Sen

G. Sen
Licensing Manager

GS/TMM/cbh

Attachment(s)

A001

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Attachment 1

W3F1-2003-0094

Waterford 3 Core Operating Limits Report
Cycle 13, Revision 1

ENTERGY OPERATIONS

WATERFORD 3

CORE OPERATING LIMITS REPORT

FOR CYCLE 13

REVISION 1

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Licensing

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WATERFORD 3

CORE OPERATING LIMITS REPORT
CYCLE 13, REVISION 1

LIST OF EFFECTIVE PAGES	
Revision 0	Pages 1-6, COLR 3/4 1-1 through COLR 3/4 9-1 and Page 33
Revision 1	Pages 1-6, COLR 3/4 1-1 through COLR 3/4 9-1 and Page 33

LIST OF FIGURES

LIST OF EFFECTIVE FIGURE PAGES	
Revision 0	COLR 3/4 1-3A, 1-4A, 1-18A, 1-25A, 1-25B, 2-1A, 2-1B, 2-6A, 2-6B, 2-6C
Revision 1	COLR 3/4 1-3A, 1-4A, 1-18A, 1-25A, 1-25B, 2-1A, 2-1B, 2-6A, 2-6B, 2-6C

LIST OF TABLES PAGE

LIST OF EFFECTIVE TABLE PAGES	
Revision 0	COLR 3/4 1-15A through COLR 3/4 1-15E
Revision 1	COLR 3/4 1-15A through COLR 3/4 1-15E

WATERFORD 3

CORE OPERATING LIMITS REPORT
CYCLE 13, REVISION 1

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 13. The core operating limits have been developed using the NRC approved methodologies specified in Section III. This is Revision 1 of the Cycle 13 COLR.

The major changes between the Cycle 13 Revision 0 COLR and the Cycle 12 COLR are listed below:

- The Table of Contents List of Effective Pages was updated.
- The List of Figures were revised to add COLR Figure 8A and to update the List of Effective Figure Pages
- This Introduction section was revised to reflect the changes for Cycle 13.
- The surveillance requirements for Section 3.1.2.9 were changed based on results of a corrective action of Condition Report CR-WF3-2003-02844.
- Clarifying notes were added below Sections 3.1.3.1.a and 3.1.3.1.b regarding the correspondence of these sections to Technical Specifications.
- The title for Section 3.1.3.6 was revised to match references in Section III and the Table of Contents
- Figures 6 & 7 were revised to provide vertical lines from the endpoints of the plotted line to the temperature axis. Also, the equation for the plotted line was added.
- Section 3.2.4.b was revised to allow use of Figure 8A
- Notes below the text of Section 3.2.4 for use with Figures 8, 8A & 9 were updated and new notes were added.
- Figure 8, was revised to incorporate cycle-specific limits for Cycle 13.
- Figure 8A, was added to provide better resolution for the three power ranges in the lower portion of Figure 8.
- Figure 9, was revised to incorporate cycle-specific limits for Cycle 13.
- Section III.7 was revised to add the document date.
- Section III.8 was added in accordance with License Amendment 191.

The changes between the Cycle 13 Revision 1 COLR and the Cycle 13 Revision 0 COLR are listed below:

- Figures 6 & 7 were revised to implement a 0.1 KW/FT reduction for the specified temperature range to account for greater than 500 but less than 600 plugged tubes in Steam Generator #1 (Ref. ER-WF3-2003-0117-000)

II. AFFECTED TECHNICAL SPECIFICATIONS

CORE OPERATING LIMITS REPORT

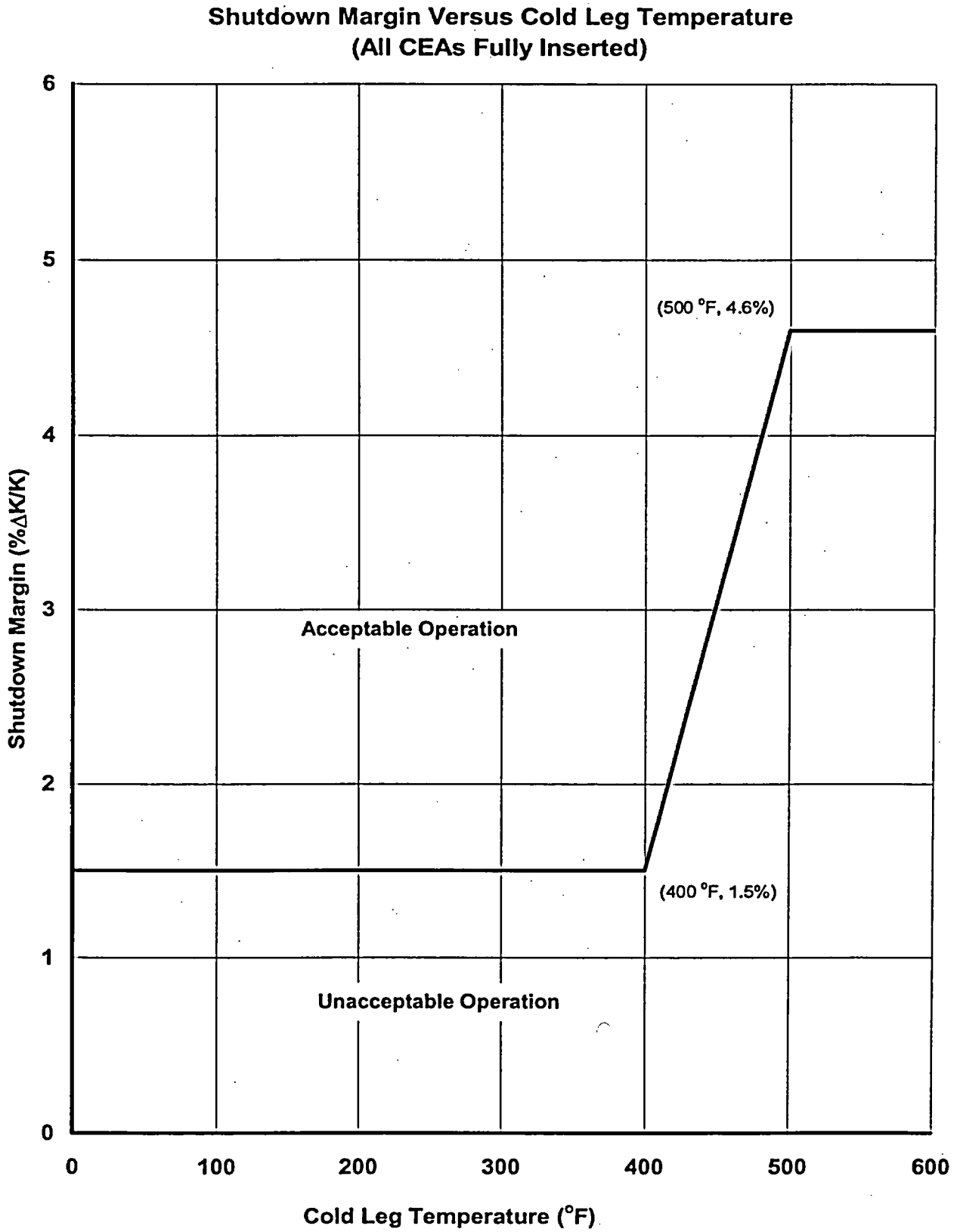
SHUTDOWN MARGIN - ANY CEA WITHDRAWN

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.



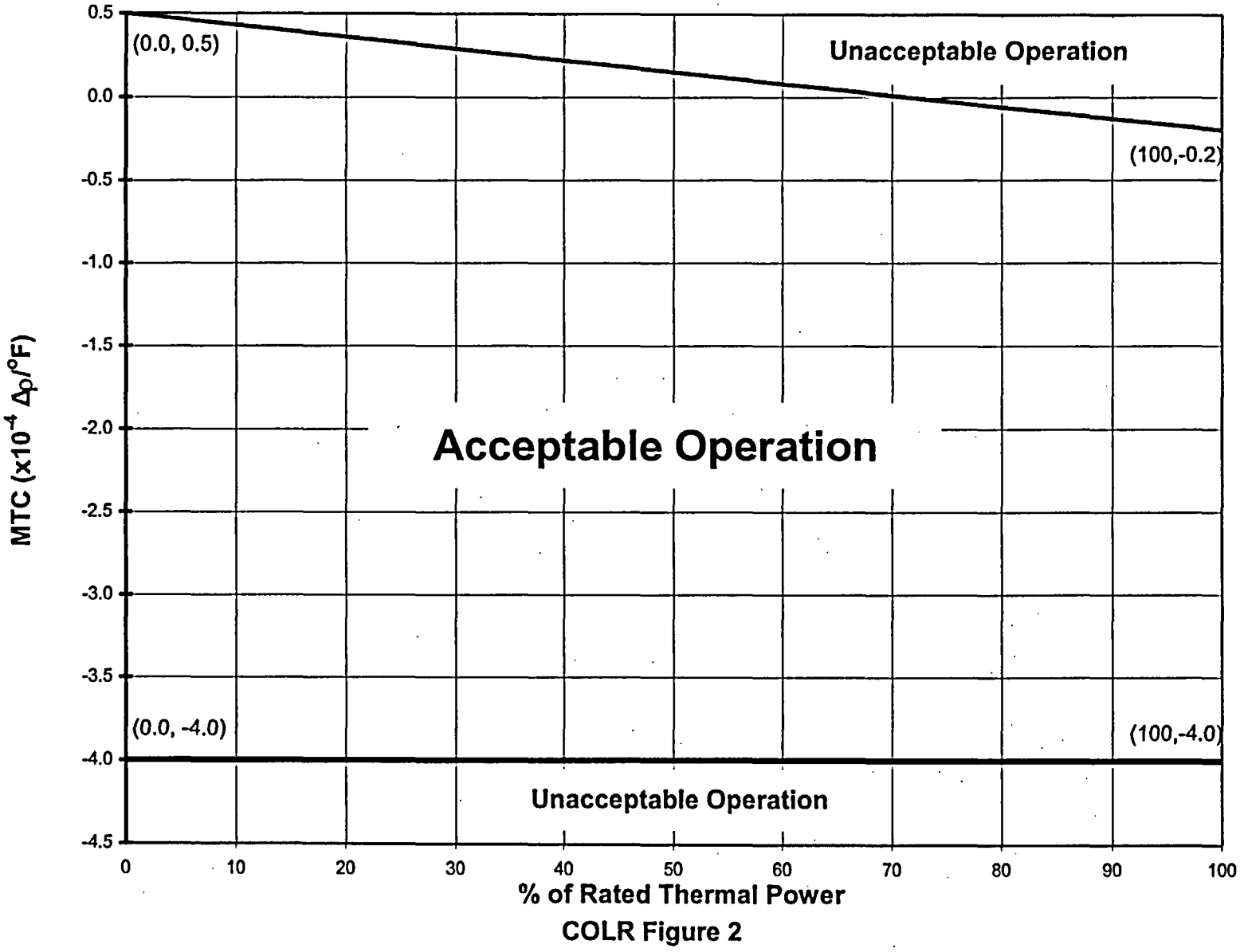
COLR Figure 1

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

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 1.75 times (1.75x) the existing neutron flux (cps) at the following frequencies:

a. No sooner than one half hour after shutdown and no later than 1 hour after shutdown.

b. At least once per one-half (1/2) hour if the reactor has been shut down $\geq$ 0.5 hour but < 2 hours

c. At least once per hour if the reactor has been shutdown $\geq$ 2 hours but < 10 hours.

d. At least once per 5 hours if the reactor has been shut down $\geq$ 10 hours but < 25 hours.

e. At least once per 24 hours if the reactor has been shut down $\geq$ 25 hours but < 21 days.

f. 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

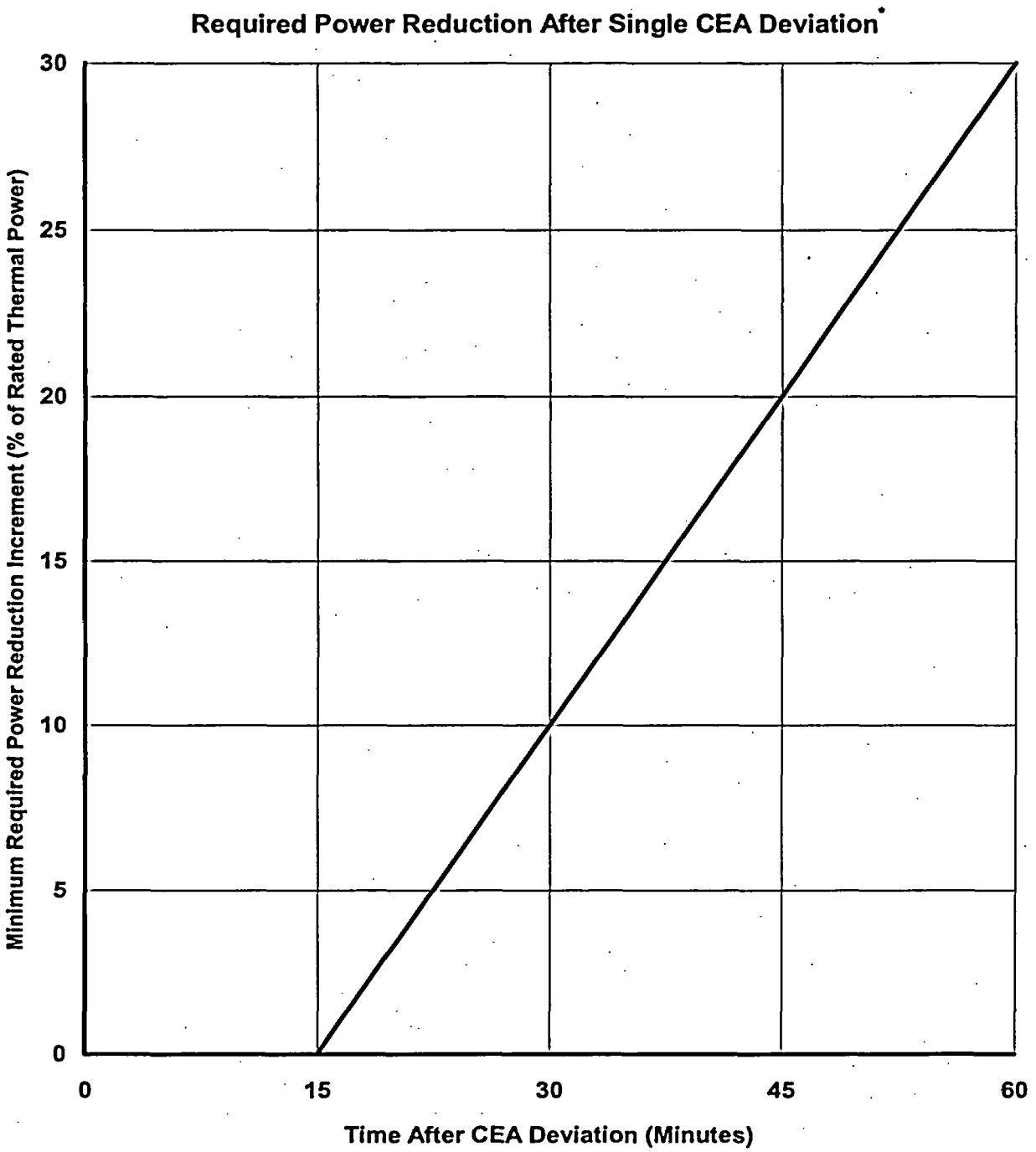
MOVABLE CONTROL ASSEMBLIES - CEA POSITION

3.1.3.1.a With one 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.

NOTES

1. Item 3.1.3.1.a corresponds with ACTION "c" of Technical Specification 3.1.3.1.
2. Item 3.1.3.1.b corresponds with ACTION "d" of Technical Specification 3.1.3.1.



COLR Figure 3

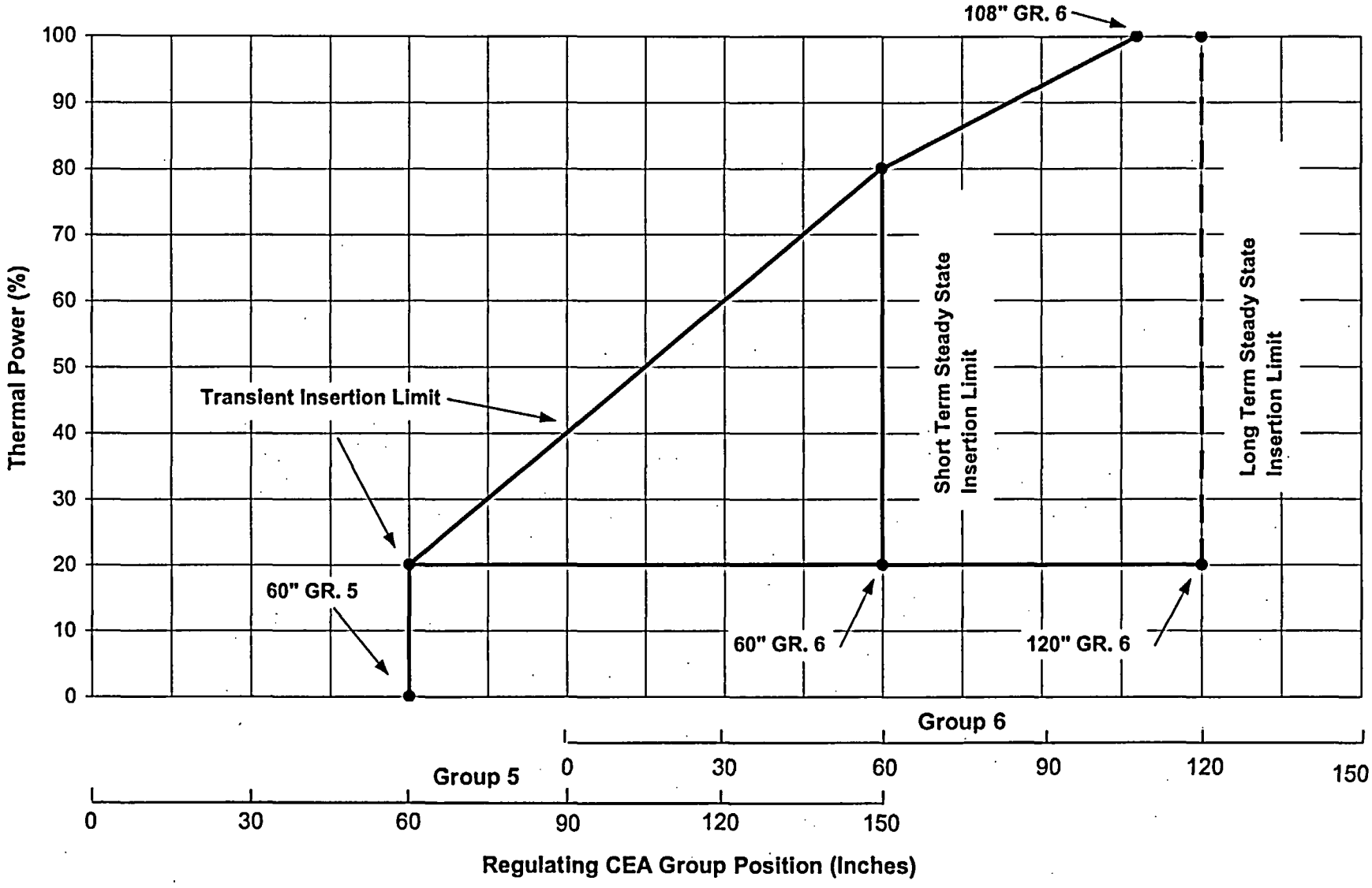
*** When thermal power is reduced to 60% of rated thermal power per this limit curve, further reduction is not required by this Technical Specification.**

CORE OPERATING LIMITS REPORT

REGULATING AND GROUP P CEA INSERTION LIMITS

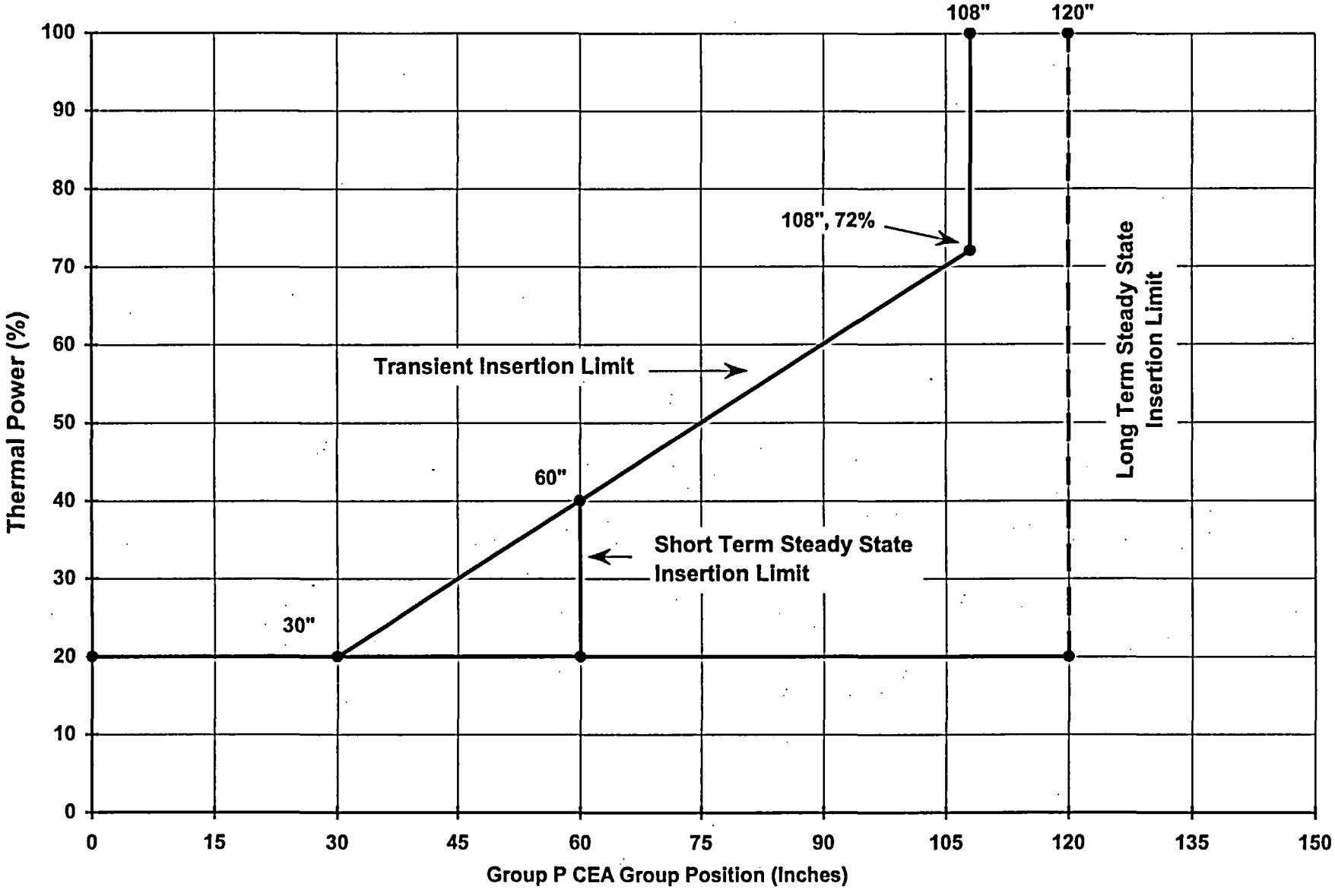
3.1.3.6 The regulating CEA groups and Group P CEAs shall be limited to the withdrawal sequence and to the insertion limits shown on COLR Figure 4 (regulating groups) and Figure 5 (Group P).

Regulating CEA Group Insertion Limits Versus Thermal Power



COLR Figure 4

Group P CEA Group Insertion Limits Versus Thermal Power



COLR Figure 5

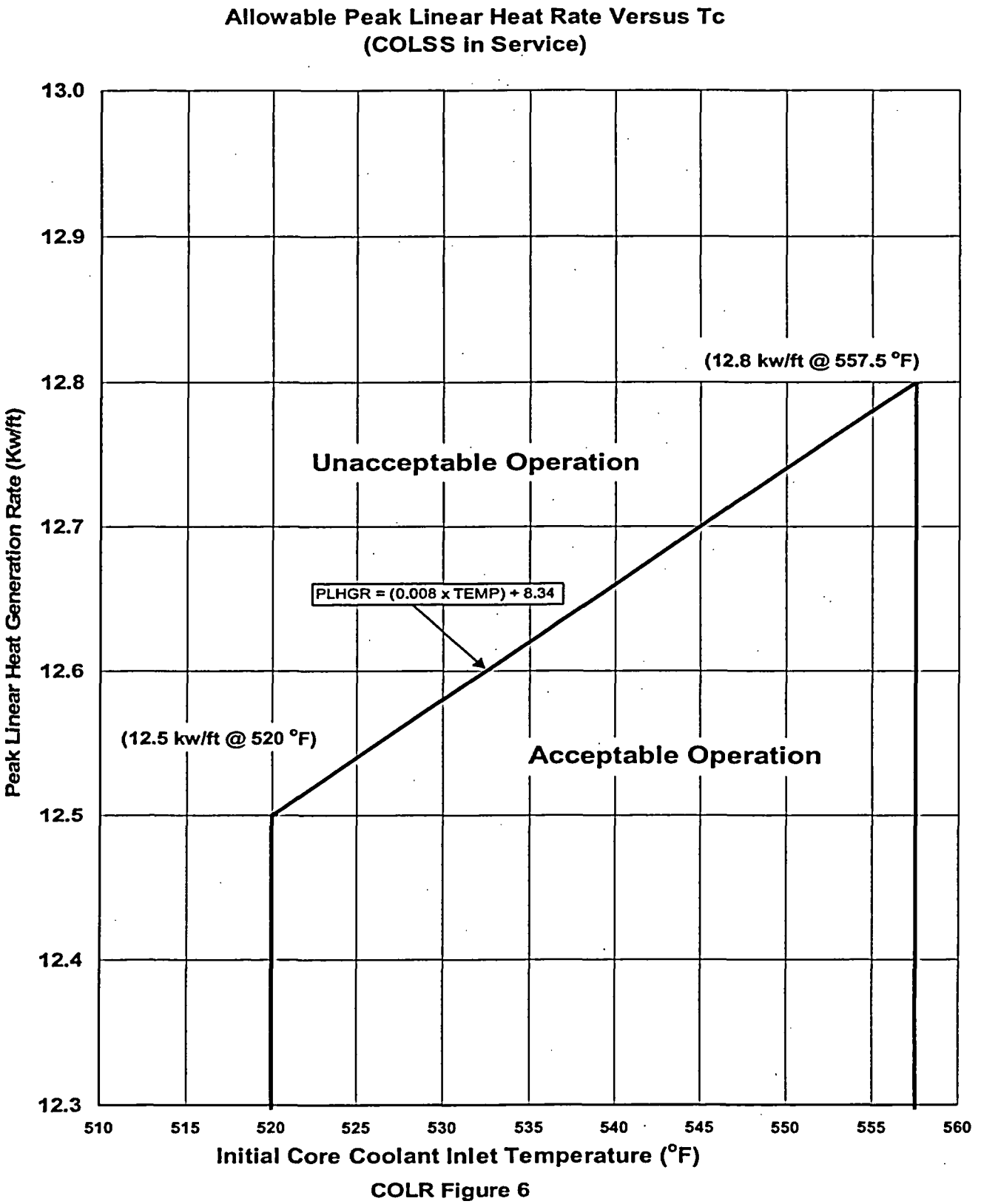
CORE OPERATING LIMITS REPORT

LINEAR HEAT RATE

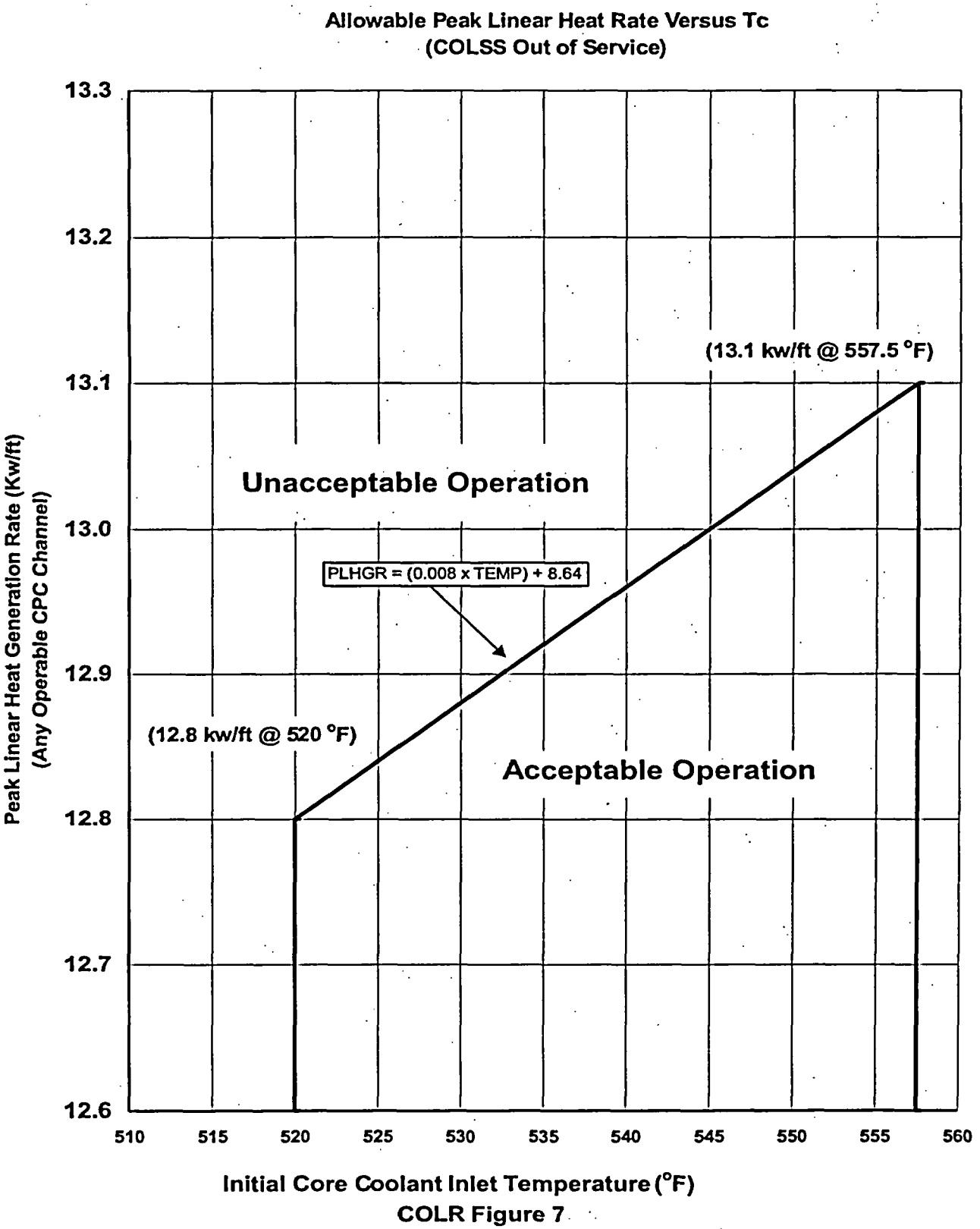
3.2.1 The linear heat rate shall be maintained:

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.



COLR Figure 6



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 (or 8A as appropriate), 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

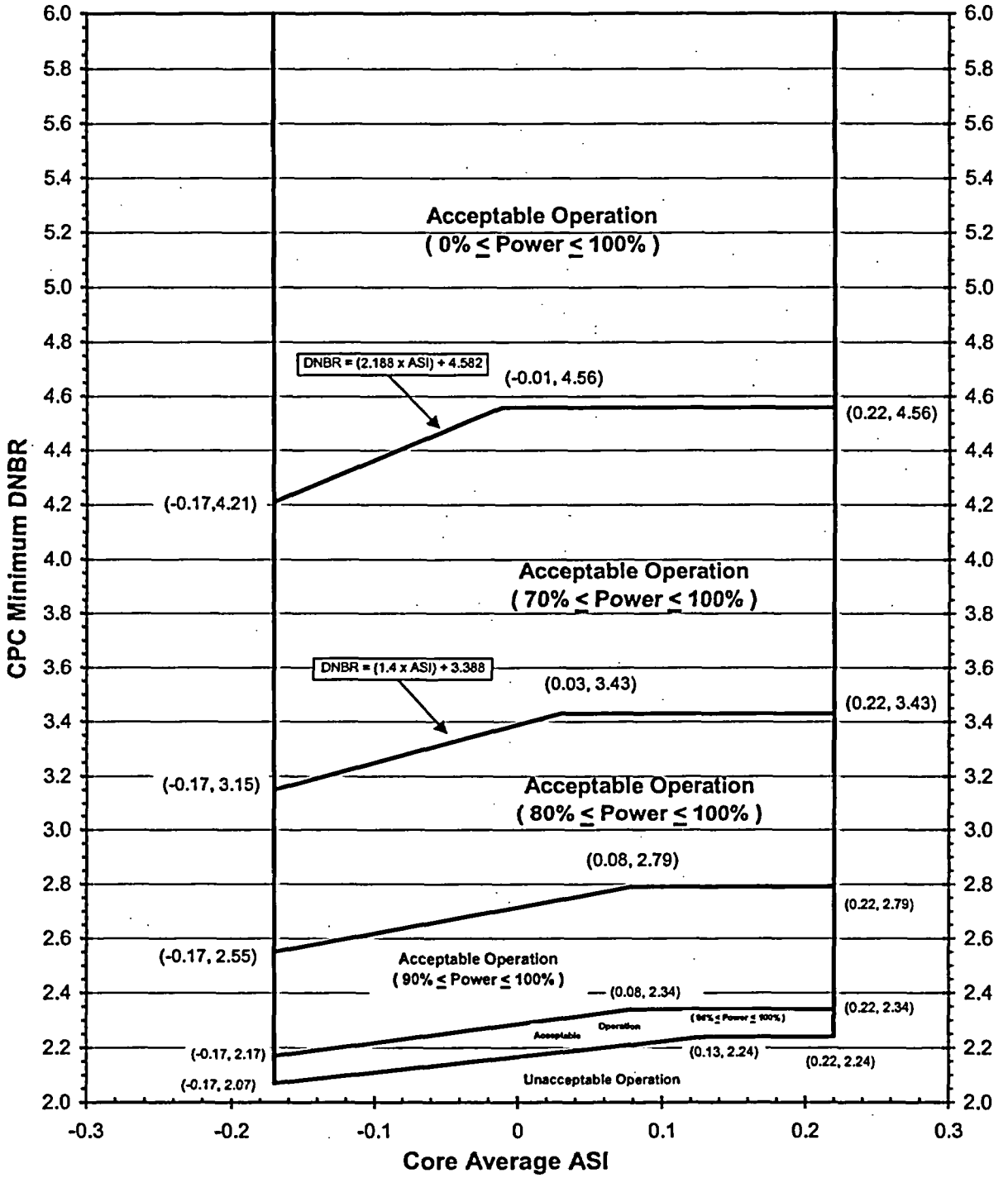
1. The DNBR limit lines shown between the vertical ASI limit lines drawn at –0.17 and 0.22 on Figures 8, 8A, and 9 represent the minimum CPC-calculated DNBR required for operation in the power range displayed in the area above each line. Operation at lower power levels requires that a larger DNBR be maintained. For example, with ASI equal to –0.17 and a core power of 85%, CPC calculated DNBR must be minimum of 2.55. At 79% power and the same ASI value, the calculated DNBR must be at least 3.15. At 65% power and the same ASI value, DNBR must be a minimum of 4.21. At 90% power and an ASI value of +0.08, DNBR must be no less than 2.34.

2. The vertical ASI limit lines shown at –0.17 and 0.22 on Figures 8, 8A, and 9 may be considered as extending beyond the maximum DNBR value shown on the charts. Therefore, when monitoring DNBR with these figures, compliance is achieved at all power levels shown on a given figure when DNBR is greater than the largest DNBR value on the vertical scale.

3. Figure 8A is provided to offer better resolution for the three power ranges in the lower portion of Figure 8.

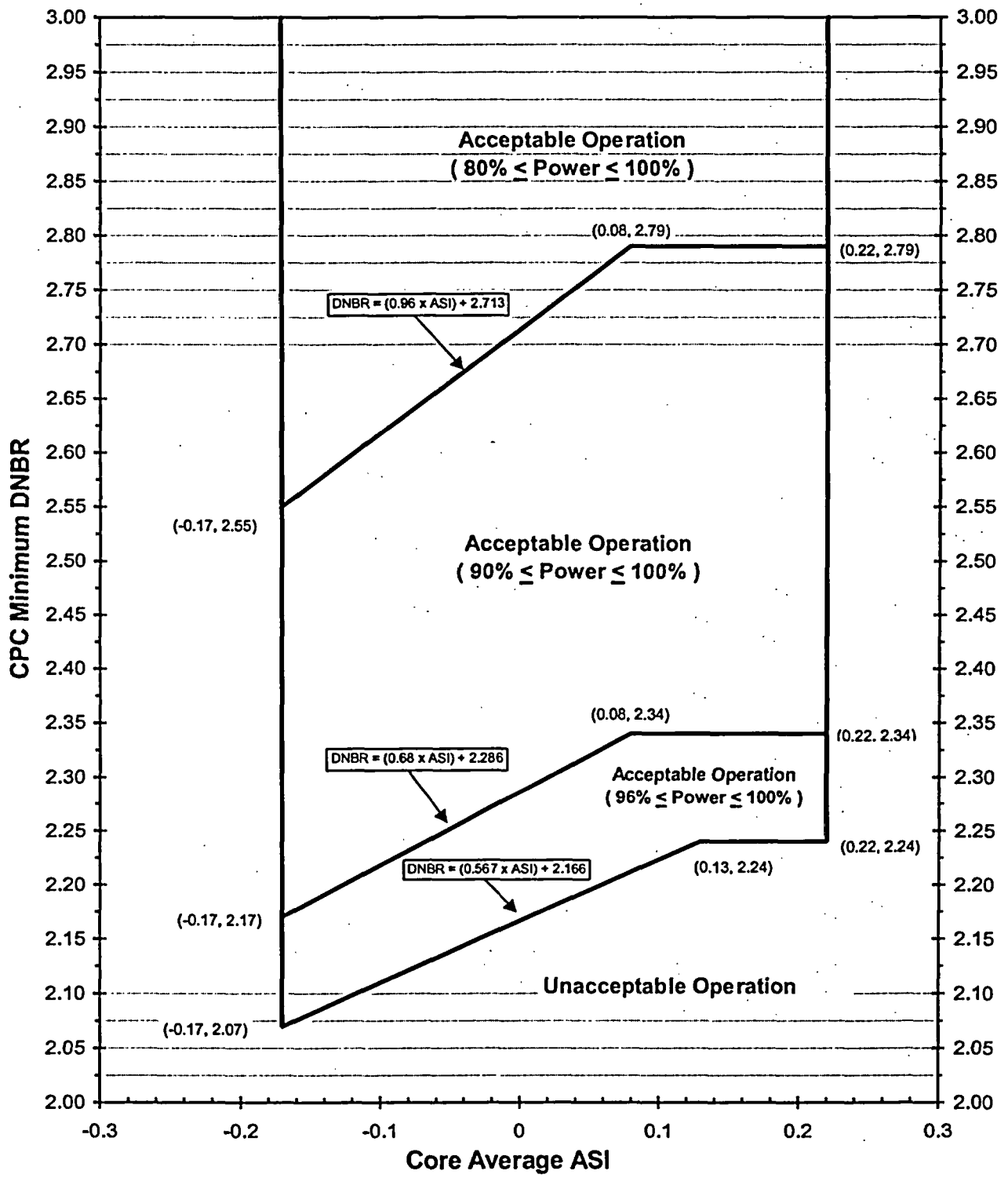
4. Equations are provided on Figures 8, 8A, and 9 to assist in determining DNBR limits in the sloped portions of the plots.

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



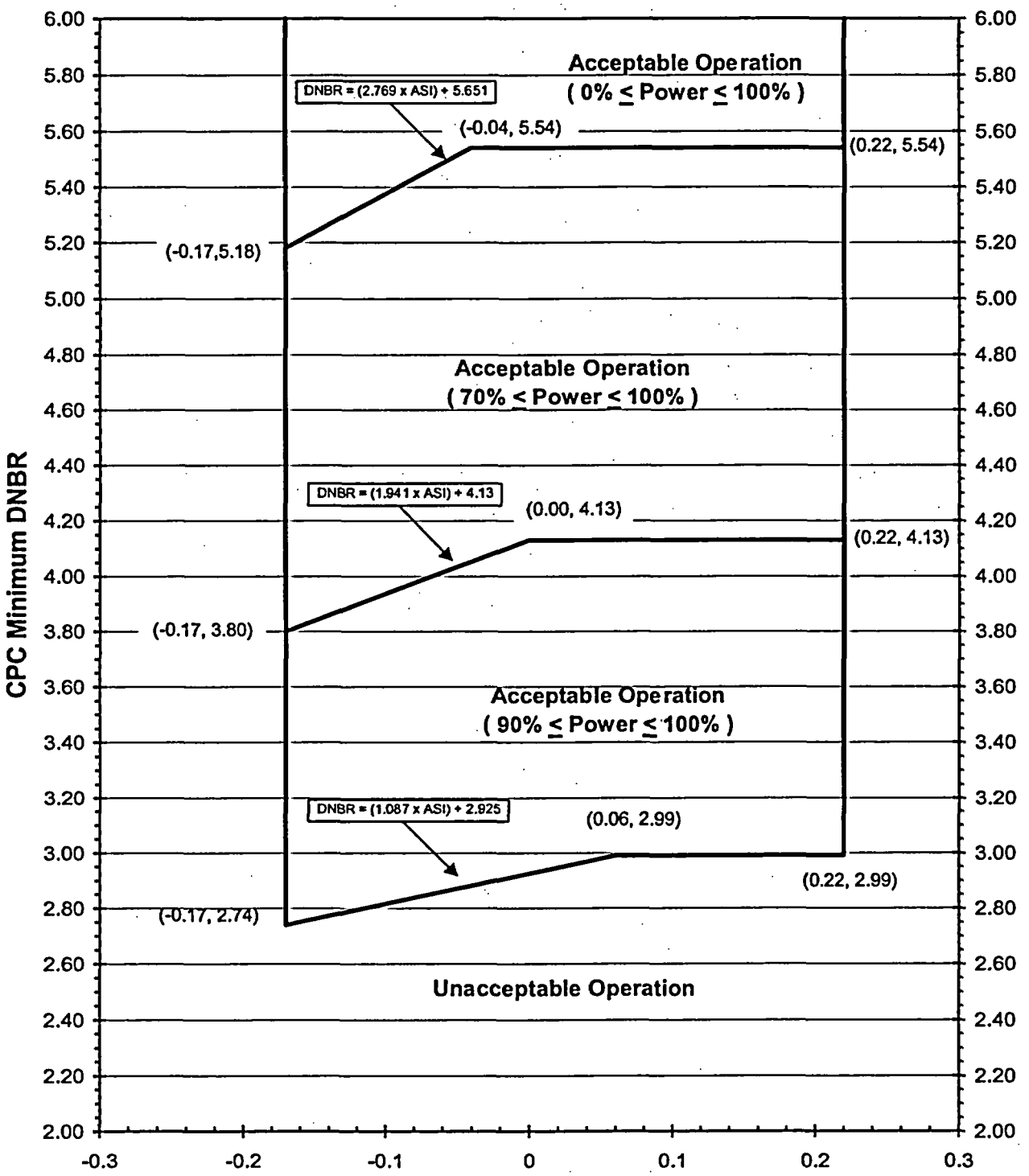
COLR Figure 8

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



COLR Figure 8A

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

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

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

COLSS Out of Service

$-0.17 \leq ASI \leq +0.22$ 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, December 21, 1993. (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).

8. "Fuel Rod Maximum Allowable Gas Pressure," CEN-372-P-A, May 1990. (Methodology for Specification 3.2.1, Linear Heat Rate).