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W3F1-2008-0041

May 20, 2008

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

SUBJECT: Core Operating Limits Report – Cycle 16 Revision 0
Waterford Steam Electric Station, Unit 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 for each reload cycle. Attached is the Waterford 3 submittal of the Core Operating Limits Report for Cycle 16.

If you have any questions concerning this submittal, please contact Robert Murillo at (504) 739-6715.

There are no new commitments contained in this submittal.

Sincerely,

RJM/RLW/

Attachment: Waterford 3 Core Operating Limits Report Cycle 16, Revision 0

A001
NRR

cc: Mr. Elmo E. Collins, Jr.
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Surveillance Division
P. O. Box 4312
Baton Rouge, LA 70821-4312

American Nuclear Insurers
Attn: Library
Town Center Suite 300S
29th S. Main Street
West Hartford, CT 06107-2445

Attachment

W3F1-2008-0041

Waterford 3 Core Operating Limits Report
Cycle 16, Revision 0

ENTERGY OPERATIONS

WATERFORD 3

CORE OPERATING LIMITS REPORT

FOR CYCLE 16

REVISION 0

Prepared by: Nasser Pazooki / Nasser Pazooki 5/13/08

Reviewed by: 5/13/08 5/13/08
Dennis Barr and Gregory C Scott

Approved by: Michael R. McKinney 5/13/08
Michael R. McKinney Fuels and Nuclear Analysis

Approved by: Fred A. Smith Mgr Fuel & Analysis 5/13/2008
Licensing

WATERFORD 3

CORE OPERATING LIMITS REPORT
CYCLE 16, REVISION 0

LIST OF EFFECTIVE PAGES	
Revision 0	Pages 1-6, COLR 3/4 1-1, 1-3, 1-4, 1-15, 1-18, 1-25, 2-1, 2-4, 2-6, 2-12, 9-1, and Pages 38 through 40

LIST OF FIGURES		PAGE
COLR Figure 1	Shutdown Margin Versus Cold Leg Temperature	COLR 3/4 1-3A
COLR Figure 2	Moderator Temperature Coefficient Versus % of Rated Thermal Power	COLR 3/4 1-4A
COLR Figure 3	Required Power Reduction After Single CEA Deviation	COLR 3/4 1-18A
COLR Figure 4	Regulating CEA Group Insertion Limits Versus Thermal Power	COLR 3/4 1-25A
COLR Figure 5	Group P CEA Group Insertion Limits Versus Thermal Power	COLR 3/4 1-25B
COLR Figure 6	Not Used	COLR 3/4 2-1A
COLR Figure 7	Not Used	COLR 3/4 2-1B
COLR Figure 8	Allowable DNBR with Any CEAC Operable (COLSS Out of Service) *(applicable only to Cycle 16 burnups up to 400 EFPD)*	COLR 3/4 2-6A
COLR Figure 8A	Subset of Allowable DNBR with Any CEAC Operable (COLSS Out of Service) *(applicable only to Cycle 16 burnups up to 400 EFPD)*	COLR 3/4 2-6B
COLR Figure 8.1	Allowable DNBR with Any CEAC Operable (COLSS Out of Service)	COLR 3/4 2-6C
COLR Figure 8.1A	Subset of Allowable DNBR with Any CEAC Operable (COLSS Out of Service)	COLR 3/4 2-6D
COLR Figure 9	Allowable DNBR with No CEAC(s) Operable (COLSS Out of Service) *(applicable only to Cycle 16 burnups up to 400 EFPD)*	COLR 3/4 2-6E
COLR Figure 9A	Subset of Allowable DNBR with No CEAC(s) Operable (COLSS Out of Service) *(applicable only to Cycle 16 burnups up to 400 EFPD)*	COLR 3/4 2-6F
COLR Figure 9.1	Allowable DNBR with No CEAC(s) Operable (COLSS Out of Service)	COLR 3/4 2-6G
COLR Figure 9.1A	Subset of Allowable DNBR with No CEAC(s) Operable (COLSS Out of Service)	COLR 3/4 2-6H

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, 2-6D, 2-6E, 2-6F, 2-6G, 2-6H

LIST OF TABLES

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

WATERFORD 3

CORE OPERATING LIMITS REPORT
CYCLE 16, 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 16. The core operating limits have been developed using the NRC approved methodologies specified in Section III. This is Revision 0 of the Cycle 16 COLR.

The major changes between the Cycle 16 Revision 0 COLR and the Cycle 15 Revision 0 COLR are listed below:

- Titles, headings, and page footers were revised to indicate Cycle 16.
- The Table of Contents List of Effective Pages and List of Effective Figure Pages were updated.
- This Introduction section was revised to reflect the changes for Cycle 16.
- Section 3.2.1 was revised to include linear heat rate limits for minimum containment average air temperatures less than 95°F but greater than or equal to 90°F.
- Section 3.2.4 was revised to:
  - Incorporate a burnup restriction on the previously existing COLSS Out-of-Service figures;
  - Include new COLSS Out-of-Service figures that incorporate a restriction on the positive ASI limit for $\geq$50% power conditions. These figures are applicable throughout Cycle 16; and
  - Incorporate revised wording to describe the use of the existing and new figures.
- Section 3.2.7 was revised to:
  - Incorporate a burnup restriction on the previously existing ASI limits for $\geq$50% power conditions; and
  - Include new ASI limits that incorporate a restriction on the positive ASI limit for $\geq$50% power conditions. These limits are applicable throughout Cycle 16.
- Items 15-19 of Section III were added to include Next Generation Fuel Topical Reports.

II. AFFECTED TECHNICAL SPECIFICATIONS

CORE OPERATING LIMITS REPORT

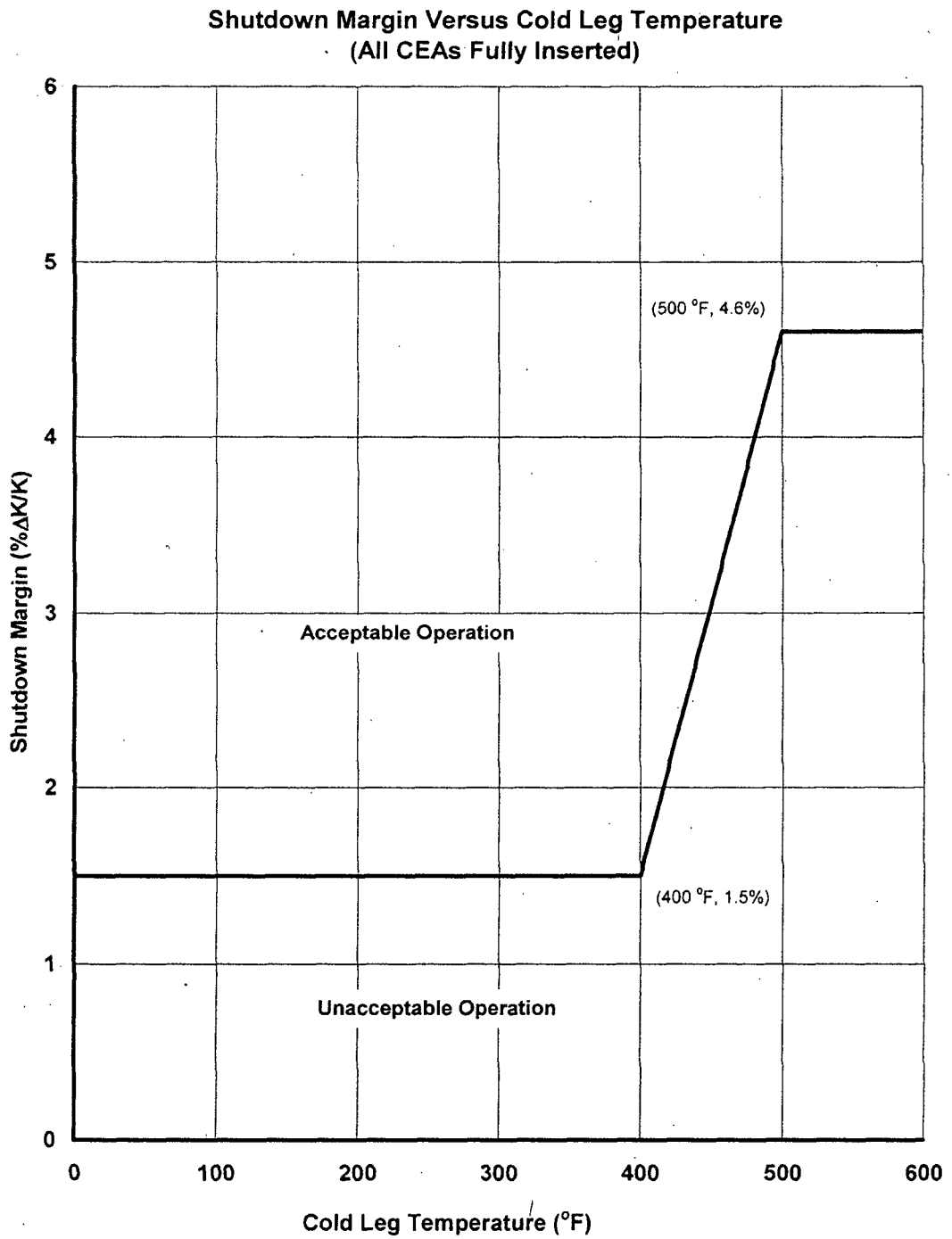
SHUTDOWN MARGIN - ANY CEA WITHDRAWN

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.

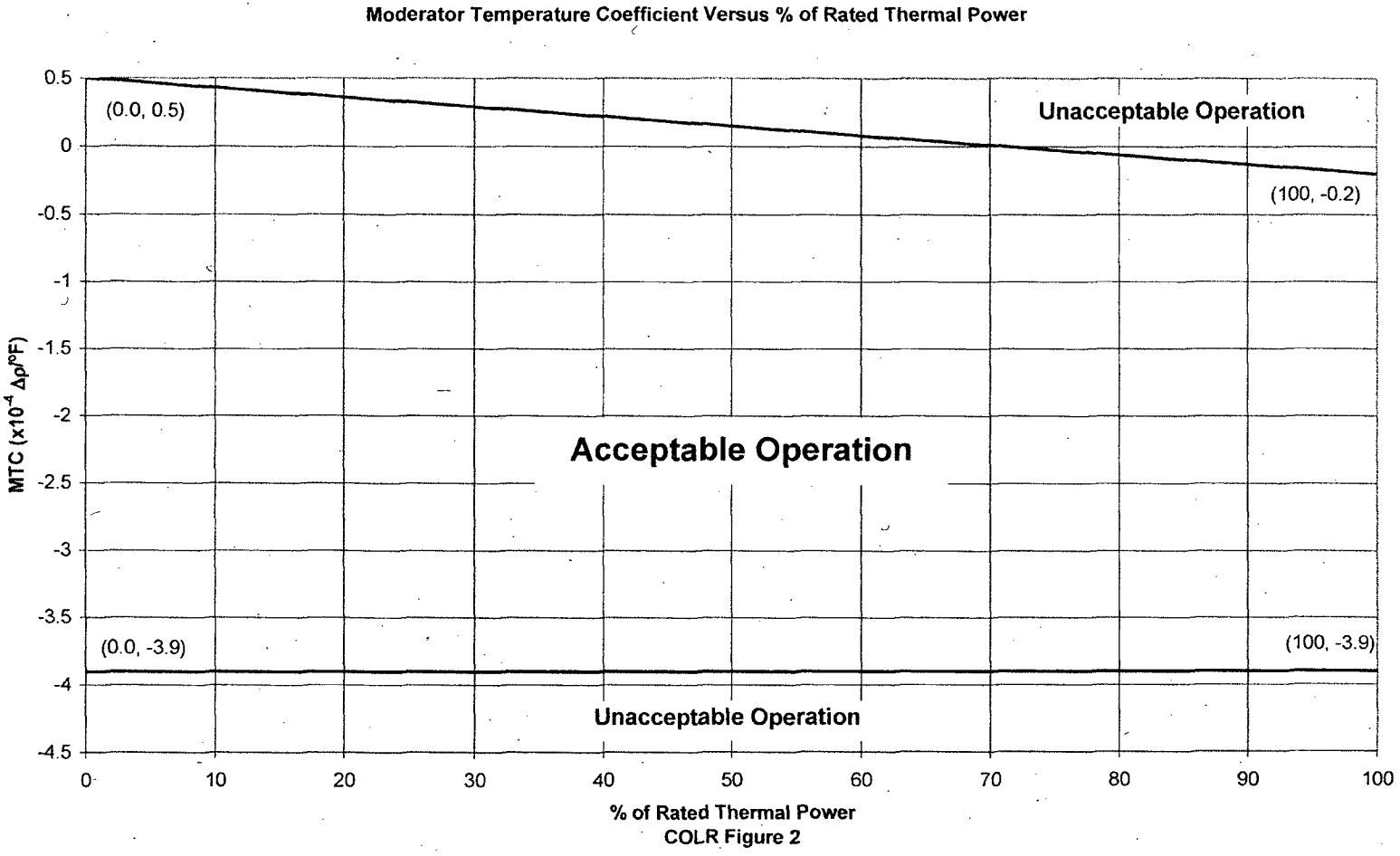


COLR Figure 1

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.



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

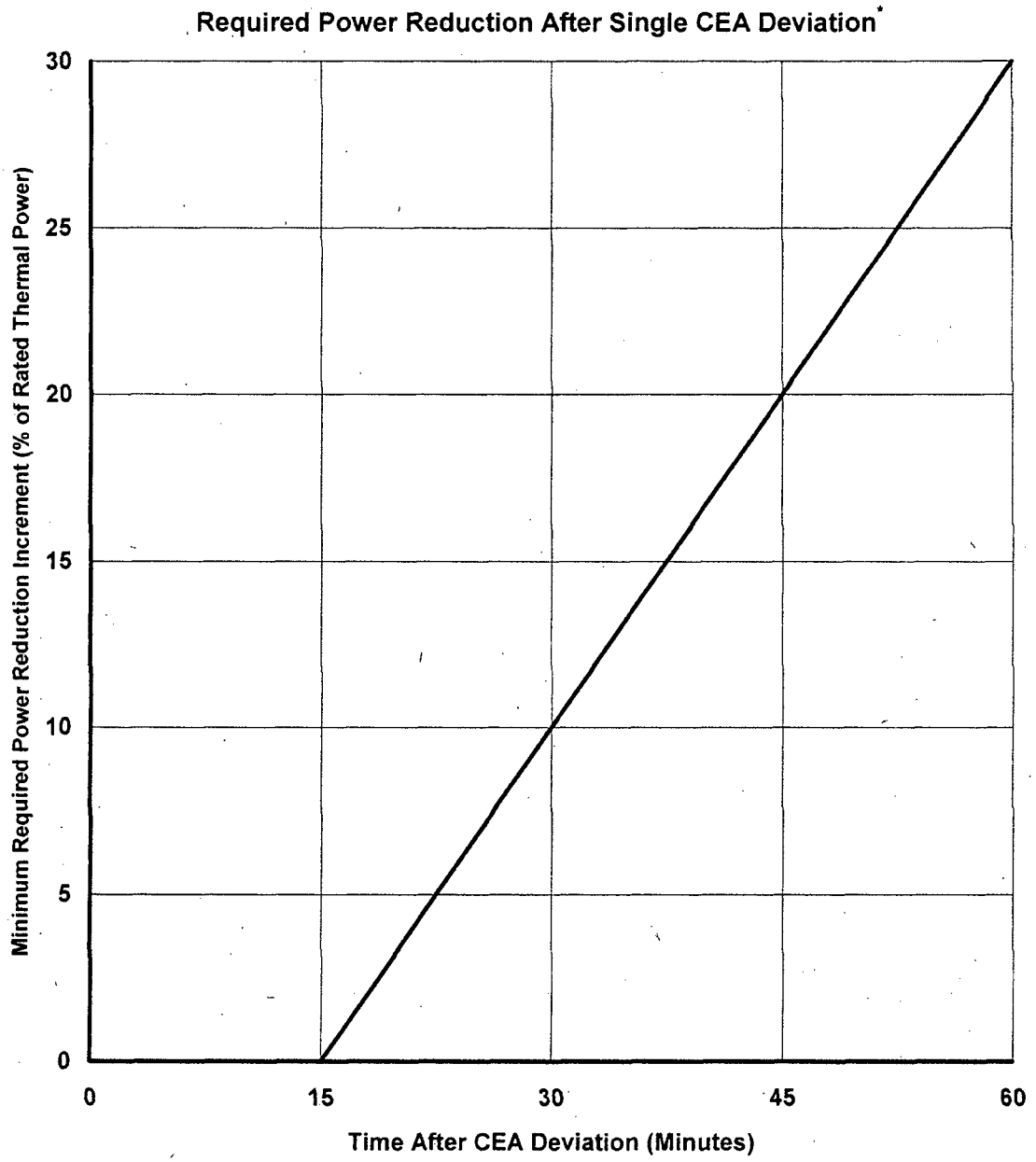
MOVABLE CONTROL ASSEMBLIES - CEA POSITION

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

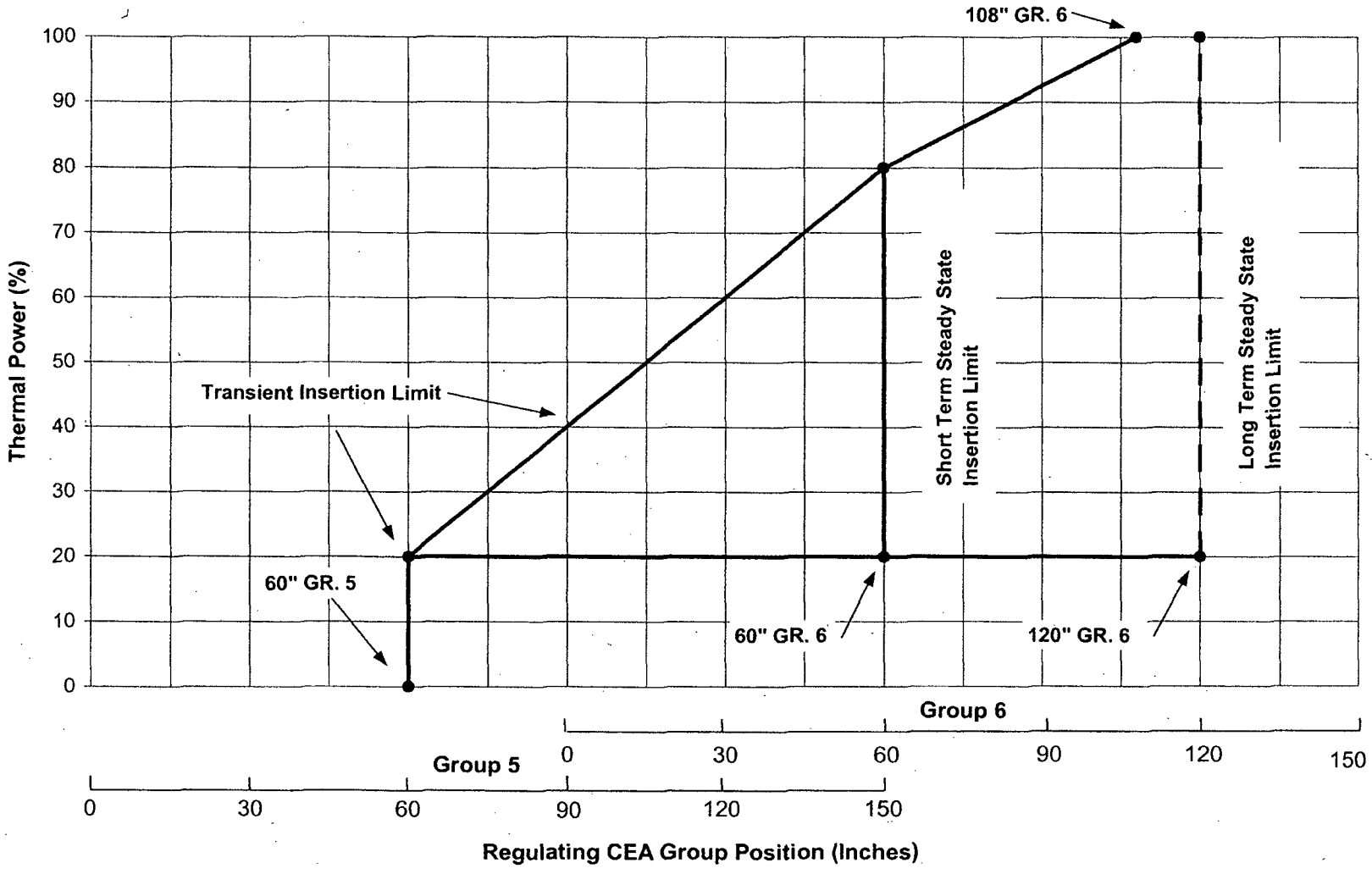
*** When thermal power is reduced to 60% of rated thermal power per this limit curve, further reduction is not required by this Technical Specification.**

CORE OPERATING LIMITS REPORT

REGULATING AND GROUP P CEA INSERTION LIMITS

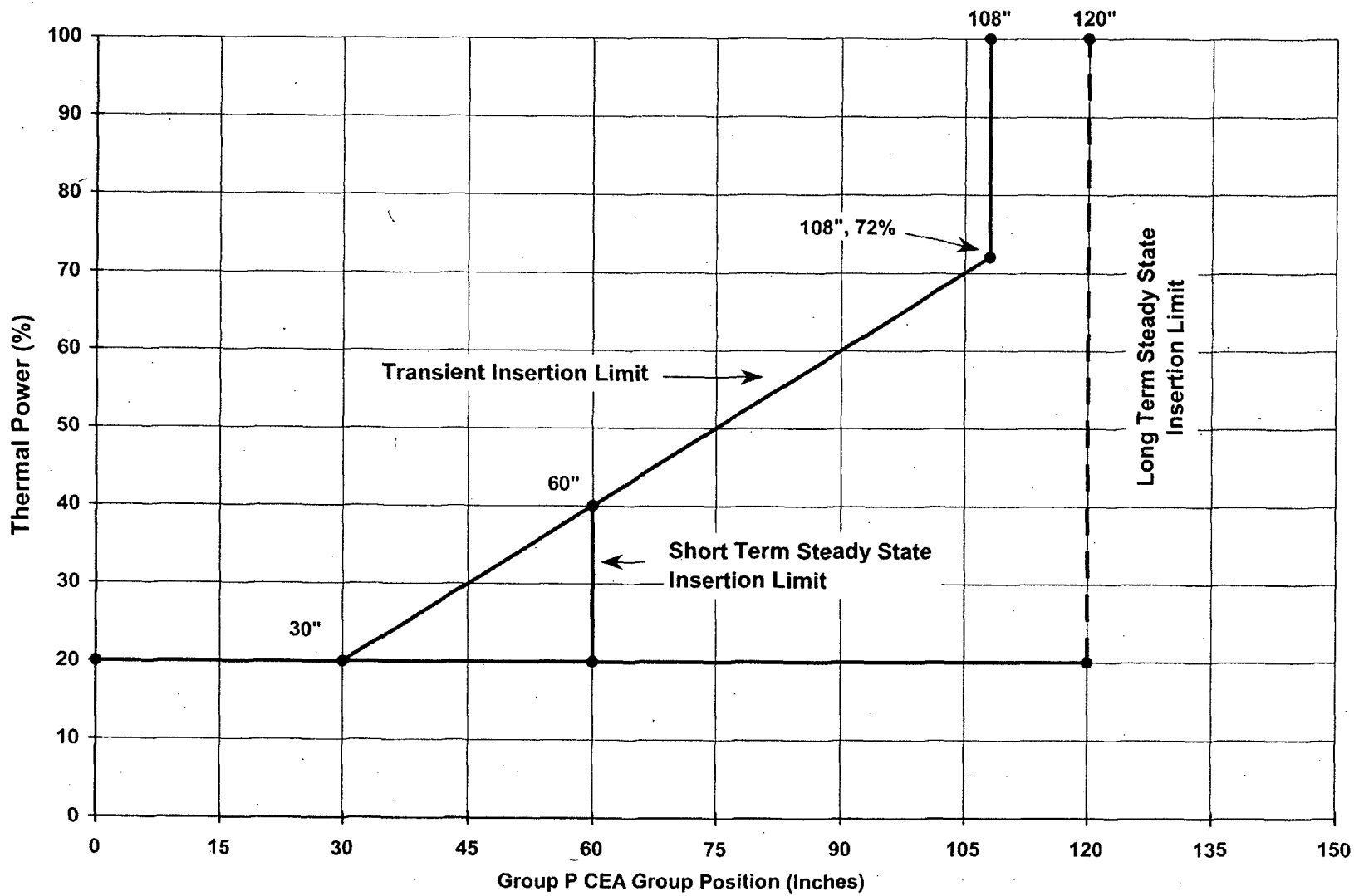
3.1.3.6 The regulating CEA groups and Group P CEAs shall be limited to the withdrawal sequence and to the insertion limits shown on COLR Figure 4 (regulating groups) and Figure 5 (Group P).

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. ≤ 12.9 kW/ft when COLSS is in service

b. ≤ 13.2 kW/ft when COLSS is out of service

In accordance with Technical Specification 3.6.1.5 Action a, with the minimum containment average air temperature less than 95°F but greater than or equal to 90°F, the linear heat rate shall be maintained:

a. ≤ 12.7 kW/ft when COLSS is in service

b. ≤ 13.0 kW/ft when COLSS is out of service

COLR Figure 6

(Not Used)

COLR Figure 7

(Not Used)

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:

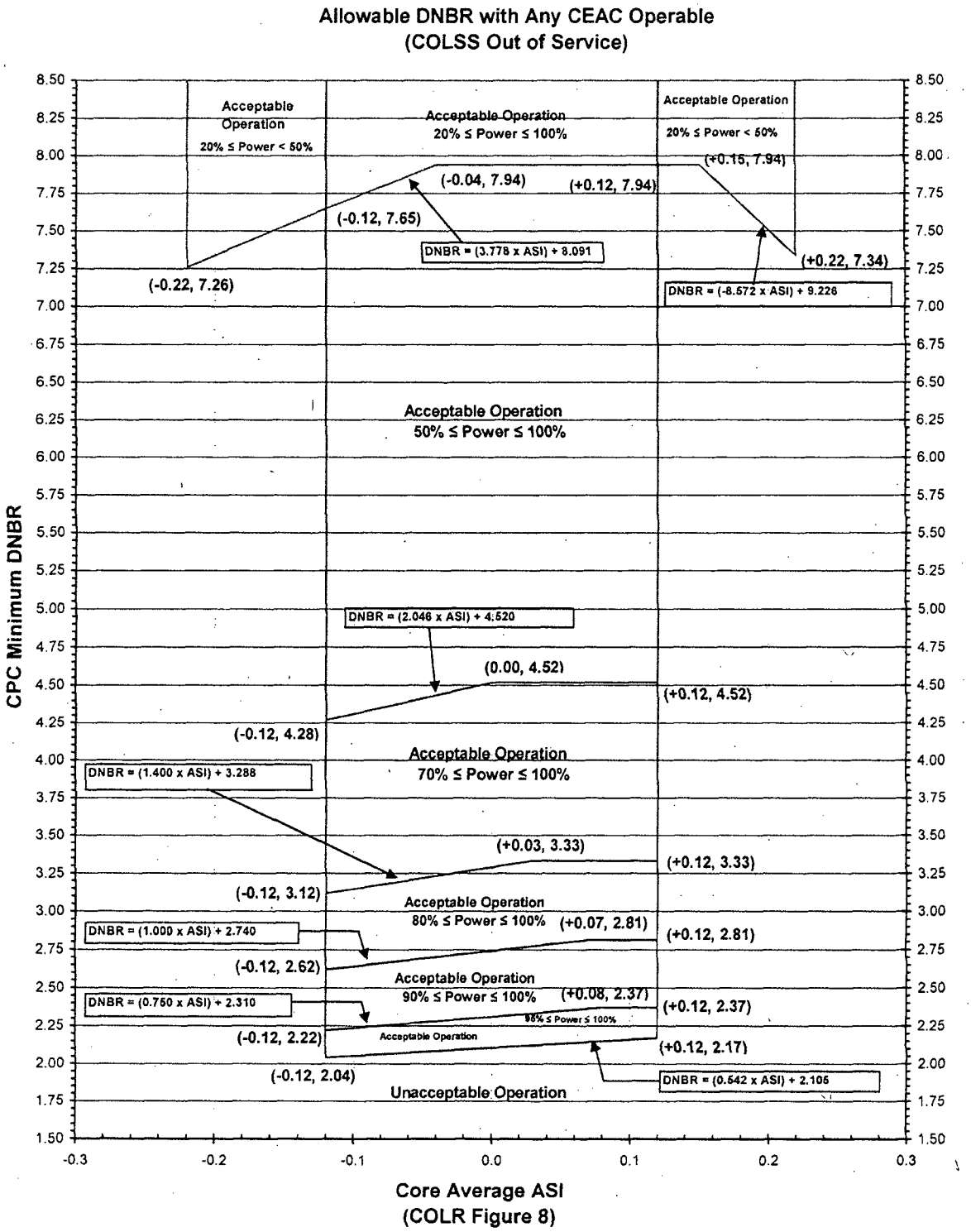
a) When COLSS is in service and neither CEAC is operable: maintain COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR decreased by 13% RATED THERMAL POWER.

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 8.1 (or 8.1A as appropriate), using any operable CPC channel. Figures 8 and 8A may be used in place of Figures 8.1 and 8.1A through 400 EFPD.

c) When COLSS is out of service and neither CEAC is operable: operate within the region of acceptable operation shown on COLR Figure 9.1 (or 9.1A as appropriate), using any operable CPC channel. Figures 9 and 9A may be used in place of Figures 9.1 and 9.1A through 400 EFPD.

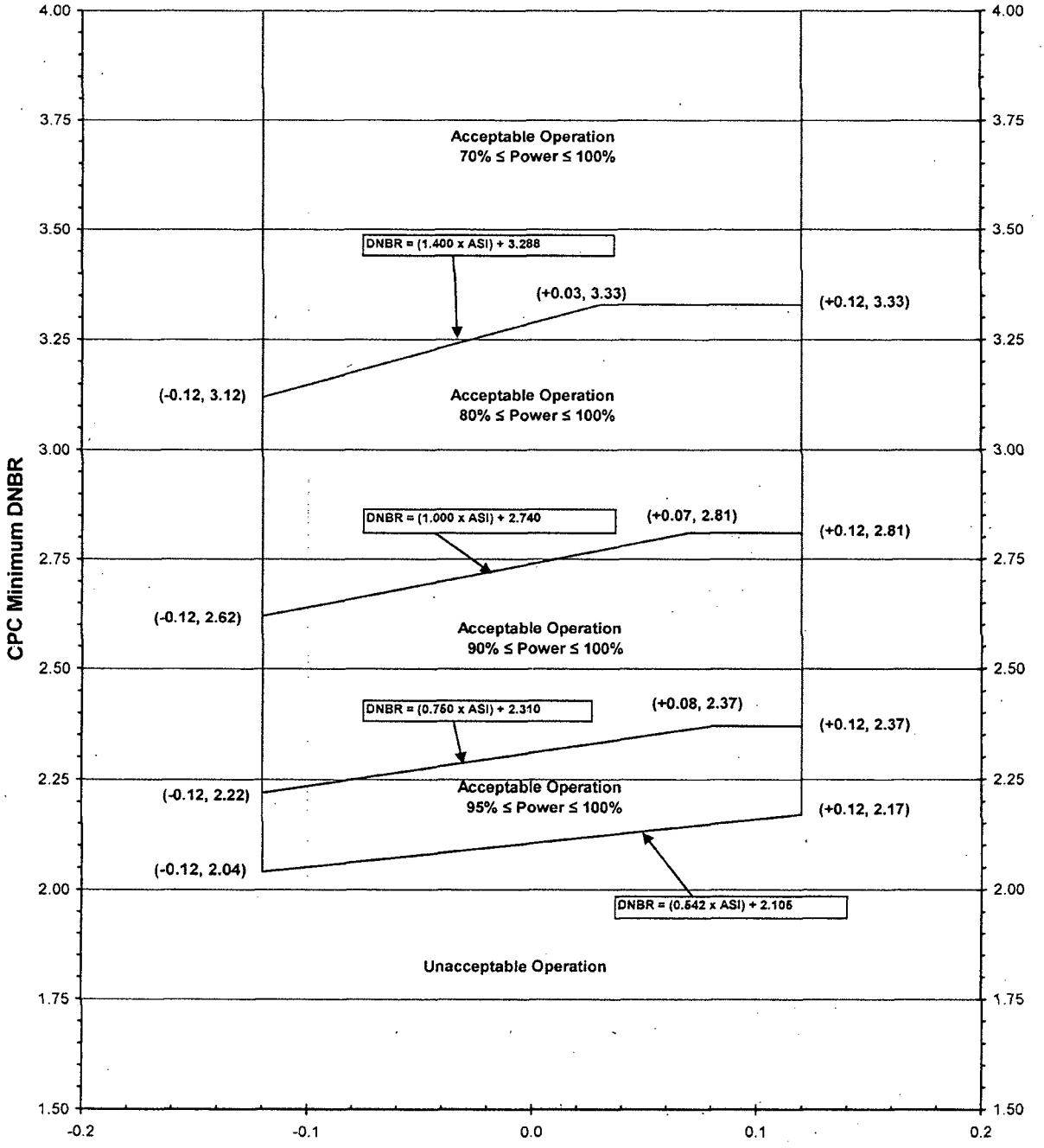
NOTES

1. The various DNBR limit lines shown between the vertical ASI limit lines on Figures 8, 8A, 9, 9A, 8.1, 8.1A, 9.1, and 9.1A represent the minimum CPC-calculated 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 -0.12 and a core power of 85%, CPC calculated DNBR must be a minimum of 2.62 with any CEAC Operable. At 79% power and the same ASI value with any CEAC Operable, the calculated DNBR must be at least 3.12. At 65% power and the same ASI value, DNBR must be a minimum of 4.28. At 90% power and an ASI value of +0.08, DNBR must be no less than 2.37.
2. The vertical ASI limit lines shown on Figures 8, 8A, 9, 9A, 8.1, 8.1A, 9.1, and 9.1A may be considered as extending beyond the maximum DNBR value on the Y-axis of 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. Figures 8A and 8.1A are provided to offer better resolution for the four power ranges in the lower portion of Figures 8 and 8.1. Figures 9A and 9.1A are provided to offer better resolution for the four power ranges in the lower portion of Figures 9 and 9.1.
4. Equations are provided on Figures 8, 8A, 9, 9A, 8.1, 8.1A, 9.1, and 9.1A to assist in determining DNBR limits in the sloped portions of the plots.



NOTE: This figure is applicable only to Cycle 16 burnups up to 400 EFPD

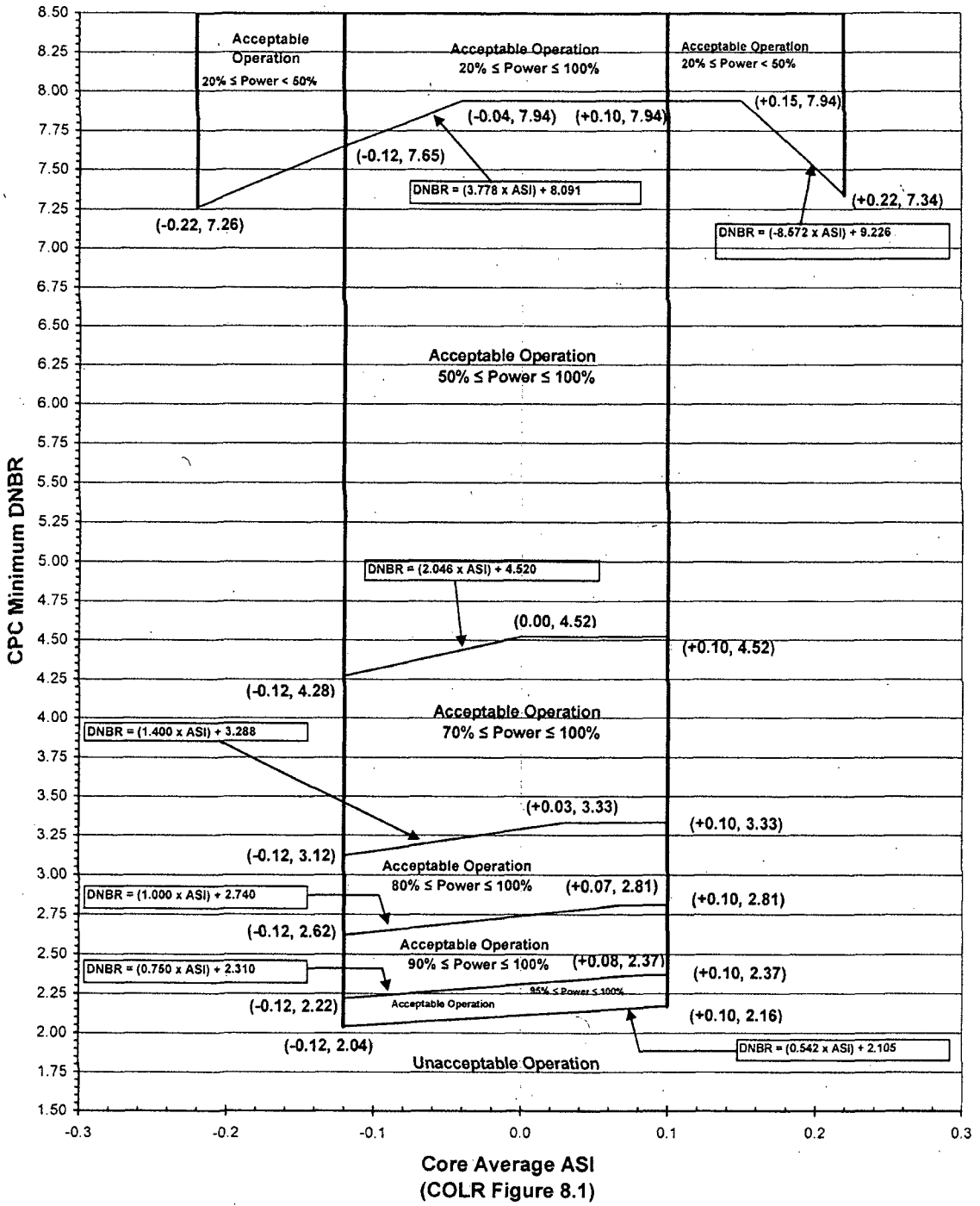
Subset of Allowable DNBR with Any CEAC Operable
(COLSS Out of Service)



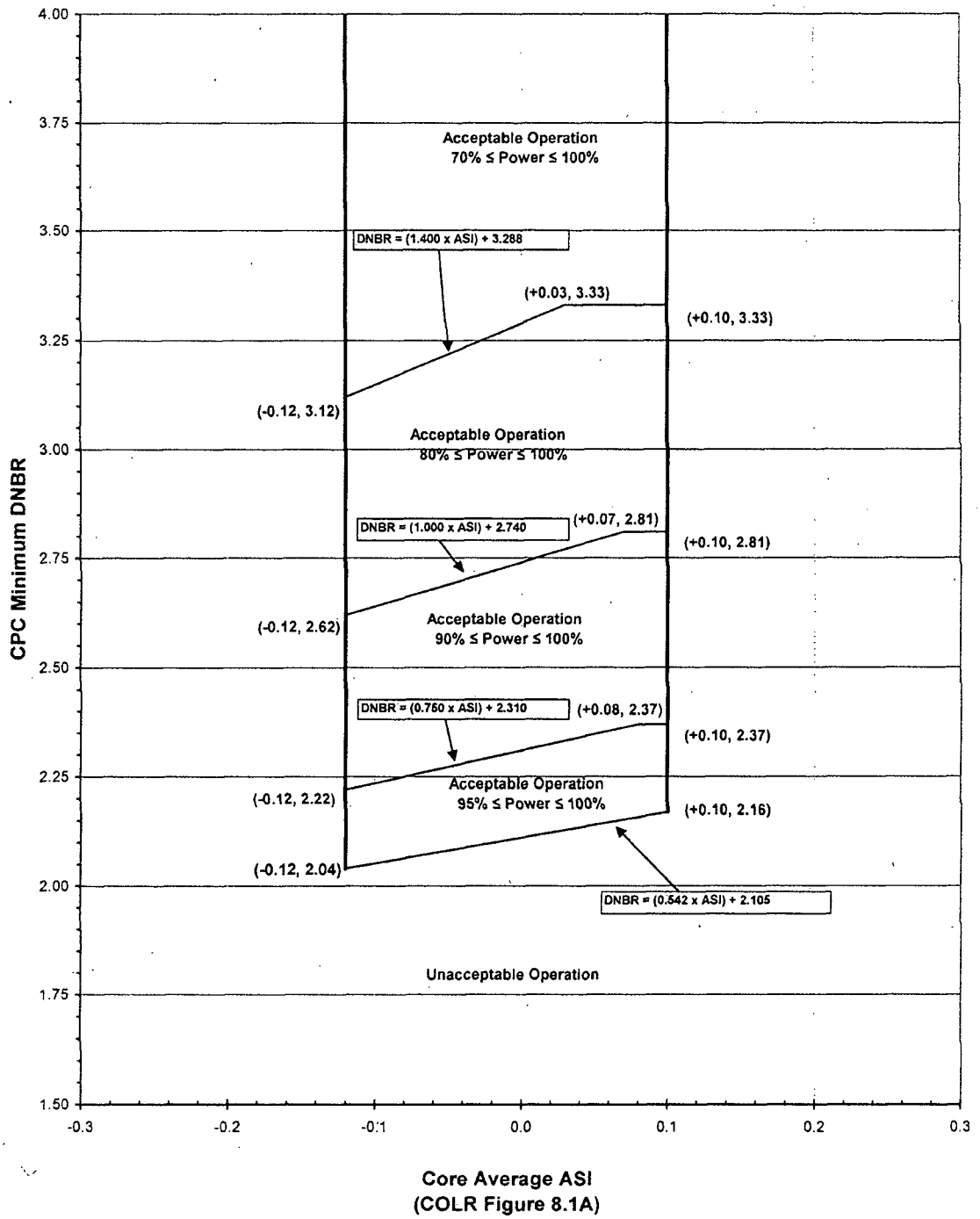
Core Average ASI
(COLR Figure 8A)

NOTE: This figure is applicable only to Cycle 16 burnups up to 400 EFPD

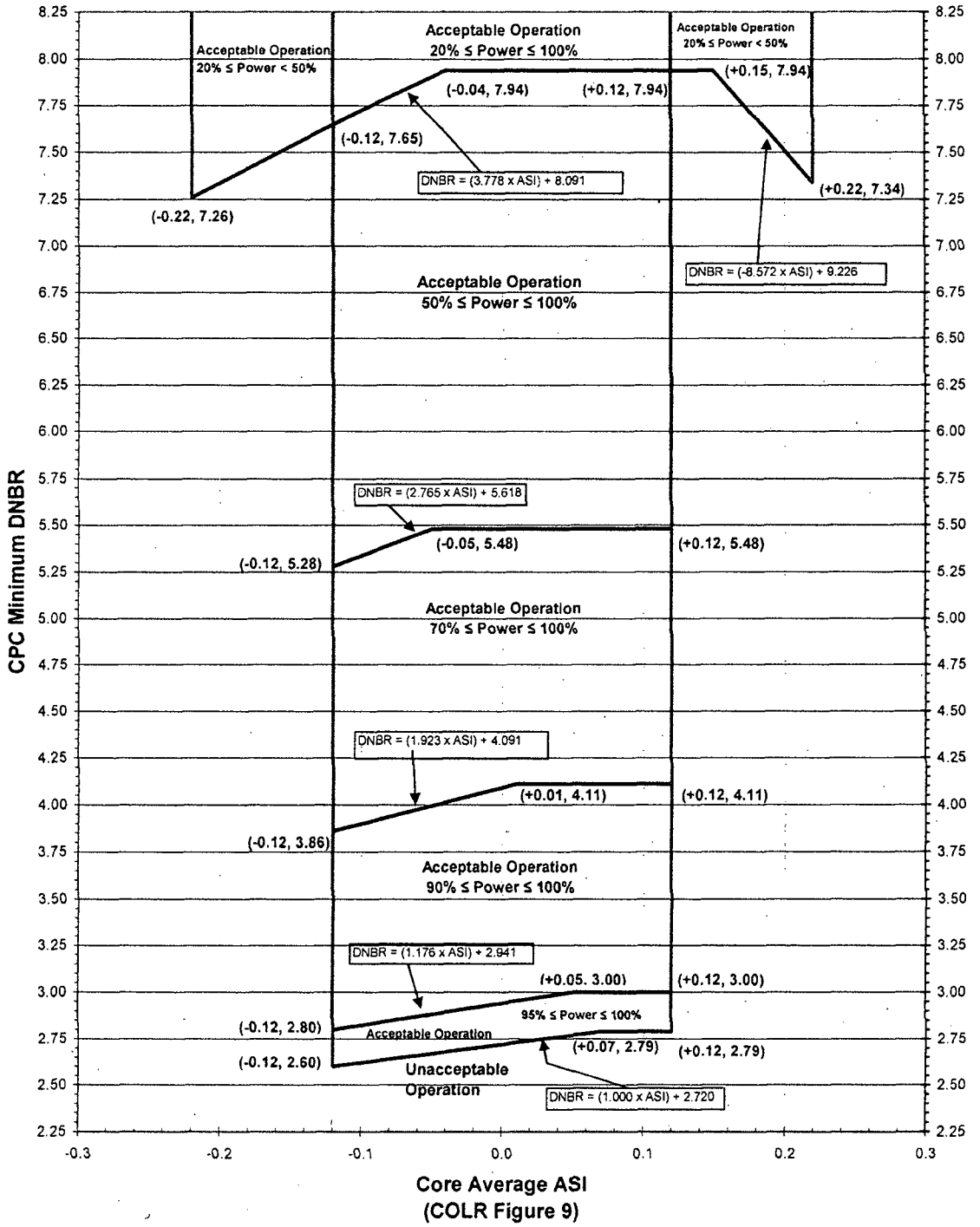
Allowable DNBR with Any CEAC Operable
(COLSS Out of Service)



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

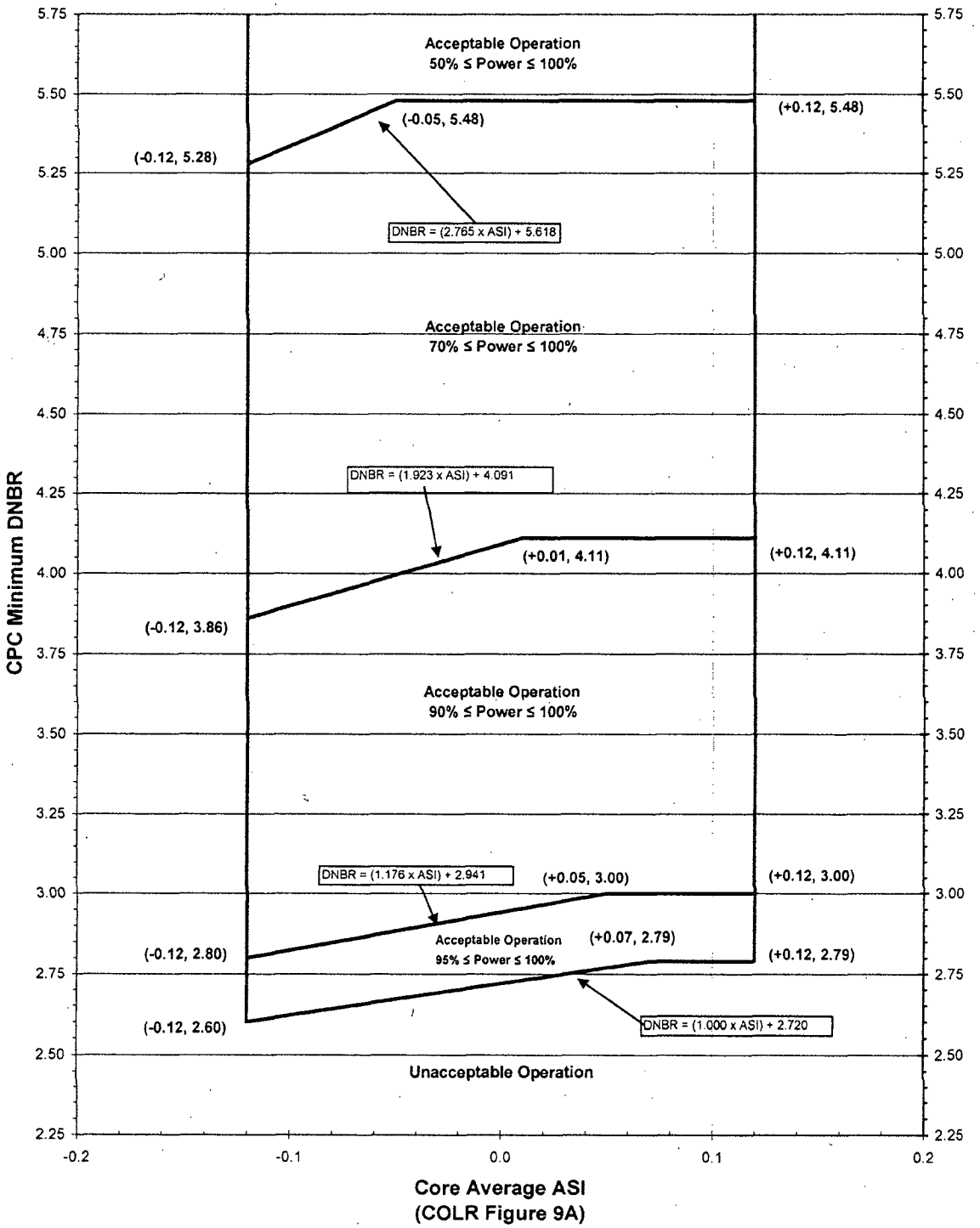


Allowable DNBR with No CEAC(s) Operable
(COLSS Out of Service)



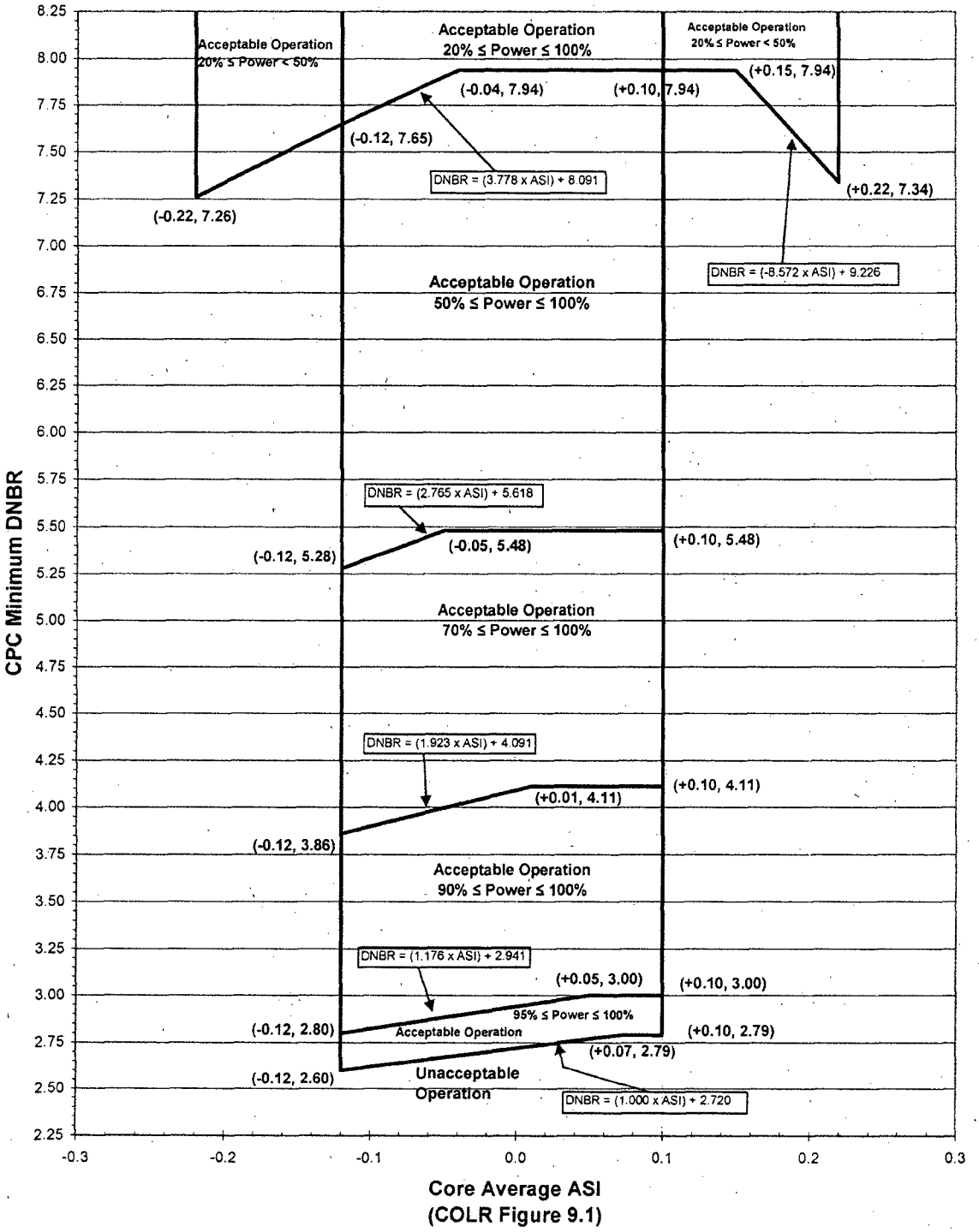
NOTE: This figure is applicable only to Cycle 16 burnups up to 400 EFPD

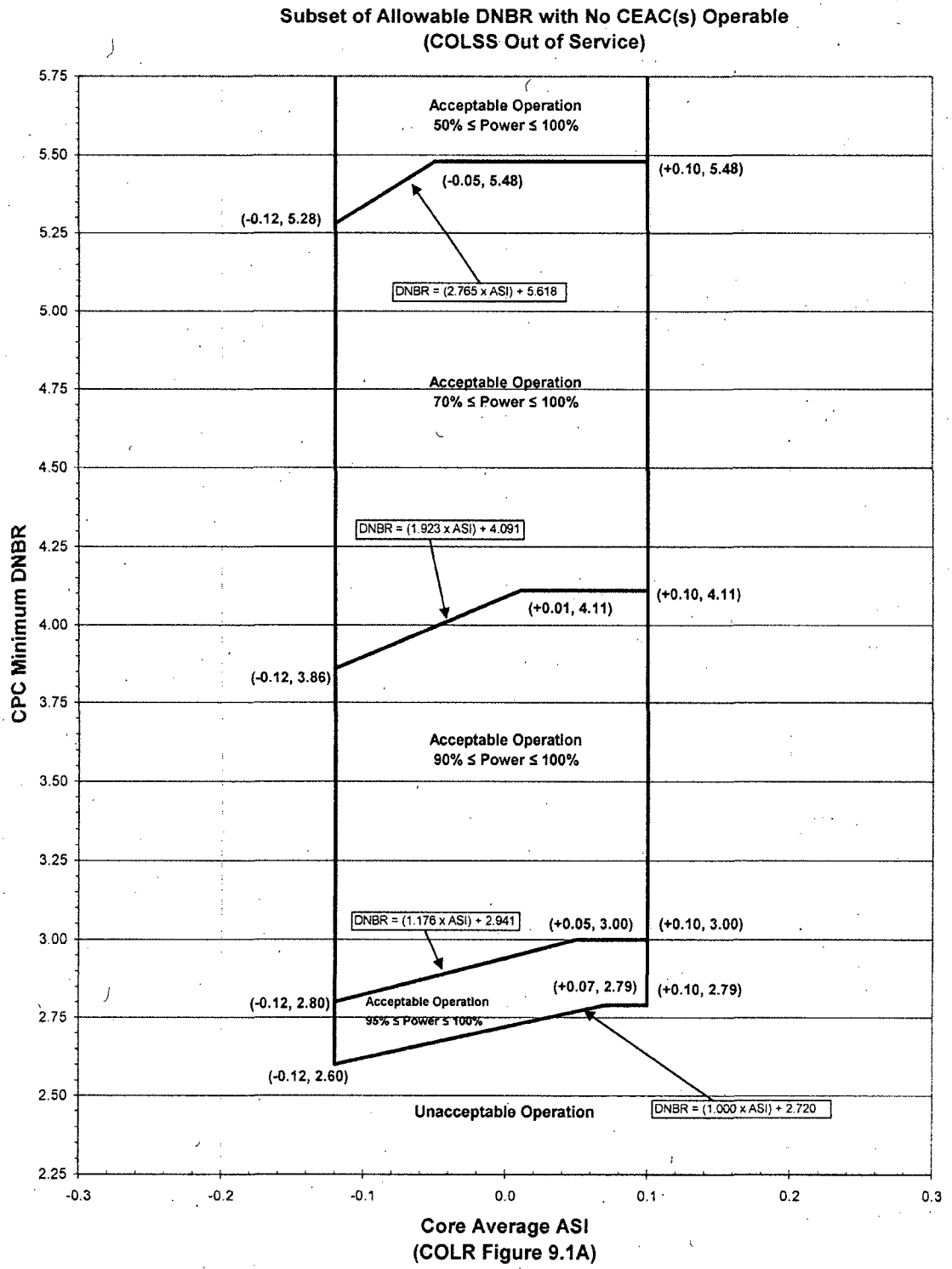
Subset of Allowable DNBR with No CEAC(s) Operable
(COLSS Out of Service)



NOTE: This figure is applicable only to Cycle 16 burnups up to 400 EFPD

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




Subset of Allowable DNBR with No CEAC(s) Operable
(COLSS Out of Service)
Acceptable Operation
50% ≤ Power ≤ 100%
(-0.05, 5.48)
(+0.10, 5.48)
(-0.12, 5.28)
DNBR = (2.765 x ASI) + 5.618
Acceptable Operation
70% ≤ Power ≤ 100%
DNBR = (1.923 x ASI) + 4.091
(+0.01, 4.11)
(+0.10, 4.11)
(-0.12, 3.86)
Acceptable Operation
90% ≤ Power ≤ 100%
DNBR = (1.176 x ASI) + 2.941
(+0.05, 3.00)
(+0.10, 3.00)
(+0.07, 2.79)
(+0.10, 2.79)
(-0.12, 2.80)
Acceptable Operation
95% ≤ Power ≤ 100%
(-0.12, 2.60)
Unacceptable Operation
DNBR = (1.000 x ASI) + 2.720
CPC Minimum DNBR
5.75
5.50
5.25
5.00
4.75
4.50
4.25
4.00
3.75
3.50
3.25
3.00
2.75
2.50
2.25
-0.3
-0.2
-0.1
0.0
0.1
0.2
0.3
Core Average ASI
(COLR Figure 9.1A)

CORE OPERATING LIMITS REPORT

AXIAL SHAPE INDEX

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

COLSS Operable, valid through 400 EFPD

$-0.16 \leq ASI \leq +0.16$	for THERMAL POWERS ≥ 50% of RATED THERMAL POWER
$-0.26 \leq ASI \leq +0.26$	for THERMAL POWERS from 20% to <50% of RATED THERMAL POWER

COLSS Out of Service, valid through 400 EFPD

$-0.12 \leq ASI \leq +0.12$	for THERMAL POWERS ≥ 50% of RATED THERMAL POWER
$-0.22 \leq ASI \leq +0.22$	for THERMAL POWERS from 20% to <50% of RATED THERMAL POWER

COLSS Operable, valid for the entire cycle

$-0.16 \leq ASI < +0.14$	for THERMAL POWERS ≥ 50% of RATED THERMAL POWER
$-0.26 \leq ASI \leq +0.26$	for THERMAL POWERS from 20% to <50% of RATED THERMAL POWER

COLSS Out of Service, valid for the entire cycle

$-0.12 \leq ASI \leq +0.10$	for THERMAL POWERS ≥ 50% of RATED THERMAL POWER
$-0.22 \leq ASI \leq +0.22$	for THERMAL POWERS from 20% to <50% 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).

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