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ONS-2014-055

April 24, 2014

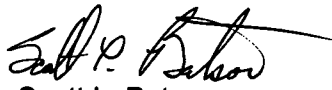
U. S. Nuclear Regulatory Commission
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Subject: Duke Energy Carolinas, LLC
Oconee Nuclear Site Docket Number 50-287
Core Operating Limits Report (COLR)

Attached, pursuant to Oconee Technical Specification 5.6.5.d, is an information copy of the Core Operating Limits Report for Oconee Unit 3, Cycle 27, ONEI-0400-70, Revision 35.

If you have any questions, please direct them to Judy Smith at 864-873-4309.

Sincerely,


Scott L. Batson
Vice President
Oconee Nuclear Station

Attachment

ADD 1
NRR

U.S. Nuclear Regulatory Commission
April 24, 2014
Page 2

xc w/att: Mr. Victor McCree, Regional Administrator
U.S. Nuclear Regulatory Commission, Region II
Marquis One Tower
245 Peachtree Center Ave., NE, Suite 1200
Atlanta, GA 30303-1257

Mr. James R. Hall
(By electronic mail only)
U.S. Nuclear Regulatory Commission
One White Flint North, M/S O-8B1
11555 Rockville Pike
Rockville, MD 20852-2746

Mr. Eddy Crowe
Senior Resident Inspector
Oconee Nuclear Site

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- 3) 06700 ONS MANUAL MASTER FILE ON03DM
- 4) 06937 R R ST CLAIR EC08G

Duke Energy
DOCUMENT TRANSMITTAL FORM

REFERENCE

NUCLEAR GENERAL OFFICE
OCONEE NUCLEAR STATION
UNIT 3
RETENTION 421734

OCONEE 3 CYCLE 27 CORE OPERATING
LIMITS REPORT

Page 1 of 1

Date: 04/01/14

Document Transmittal #: DUK140910037

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☒ Yes ☐ No

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ONEI-0400-070	1	035 04/01/14	NOMD-27	X	V1	V1	V1												3

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DAVID A BAXTER

VICE PRESIDENT

NUCLEAR ENGINEERING

BY:

J D FORSTER JDF/ZLA EC08G

Duke Energy

Oconee 3 Cycle 27

Core Operating Limits Report

QA Condition 1

Prepared By: J. D. Forster *J. D. Forster*

Date: 01 APR 2014

Reviewed By: L. D. Mc Clain *L. D. Mc Clain*

Date: 01 Apr 2014

CDR By: A.R. Bingham *A.R. Bingham*

Date: 4-1-14

Approved By: R.R. St.Clair *R.R. St.Clair*

Date: 4-1-2014

INSPECTION OF ENGINEERING INSTRUCTIONS

Inspection Waived By: R.R. St. Clair *R.R. St. Clair*
(Sponsor)

Date: 4/1/2014

<u>CATAWBA</u>		
	Inspection Waived	
MCE (Mechanical & Civil)	<input type="checkbox"/>	Inspected By/Date: _____
RES (Electrical Only)	<input type="checkbox"/>	Inspected By/Date: _____
RES (Reactor)	<input type="checkbox"/>	Inspected By/Date: _____
MOD	<input type="checkbox"/>	Inspected By/Date: _____
Other (_____)	<input type="checkbox"/>	Inspected By/Date: _____

<u>OCONEE</u>		
	Inspection Waived	
MCE (Mechanical & Civil)	<input checked="" type="checkbox"/>	Inspected By/Date: _____
RES (Electrical Only)	<input checked="" type="checkbox"/>	Inspected By/Date: _____
RES (Reactor)	<input checked="" type="checkbox"/>	Inspected By/Date: _____
MOD	<input checked="" type="checkbox"/>	Inspected By/Date: _____
Other (_____)	<input type="checkbox"/>	Inspected By/Date: _____

<u>MCGUIRE</u>		
	Inspection Waived	
MCE (Mechanical & Civil)	<input type="checkbox"/>	Inspected By/Date: _____
RES (Electrical Only)	<input type="checkbox"/>	Inspected By/Date: _____
RES (Reactor)	<input type="checkbox"/>	Inspected By/Date: _____
MOD	<input type="checkbox"/>	Inspected By/Date: _____
Other (_____)	<input type="checkbox"/>	Inspected By/Date: _____

Oconee 3 Cycle 27 Core Operating Limits Report

Insertion Sheet for Revision 35

This revision is not valid until the end of operation for Oconee 3 Cycle 26.

Remove these Revision 34 pages

1 - 33

Insert these Revision 35 pages

1 - 33

Revision Log					
Revision	Effective Date	Pages Revised	Pages Added	Pages Deleted	Total Effective Pages
Oconee 3 Cycle 27 revisions below					
35	Apr 2014	1 - 33		-	33
34	Apr 2013	1 - 33		-	33
33	Oct 2012	1 - 33		-	33
32	May 2012	1 - 33		-	33
Oconee 3 Cycle 26 revisions below					
31	Oct 2010	1 - 33		-	33
Oconee 3 Cycle 25 revisions below					
30	May 2009	1 - 33			33
29	May 2009	1 - 33			33
28	Apr 2009	1 - 33		-	33
Oconee 3 Cycle 24 revisions below					
27	Mar 2009	1 - 33		-	33
26	Nov 2007	1 - 33		-	33
25	Nov 2007	1 - 33			33
Oconee 3 Cycle 23 revisions below					
24	May 2006	1 - 33		-	33
Oconee 3 Cycle 22 revisions below					
23	Mar 2006	1 - 4, 6, 15 - 16, 21, 27, 31		-	33
22	Mar 2005	1 - 5		-	33
21	Nov 2004	1 - 33		-	33

Oconee 3 Cycle 27

1.0 Error Adjusted Core Operating Limits

The Core Operating Limits Report for O3C27 has been prepared in accordance with the requirements of TS 5.6.5. The core operating limits within this report have been developed using NRC approved methodology identified in References 1 through 11. The RPS protective limits and maximum allowable setpoints are documented in References 12 through 14. These limits are validated for use in O3C27 by References 15 through 17. The O3C27 analyses assume a design flow of 108.5% of 88,000 gpm per RCS pump, radial local peaking ($F_{\Delta h}$) of 1.714, an axial peaking factor (F_z) of 1.5, and an EOC (< 100 ppmB) Tavgr reduction for up to 10°F provided 4 RCPs are in operation and Tavgr does not decrease below 569°F.

The error adjusted core operating limits included in Section 1 of the report incorporate all necessary uncertainties and margins required for operation of the O3C27 reload core.

1.1 References

1. Oconee Nuclear Design Methodology Using CASMO-4 / SIMULATE-3, DPC-NE-1006-PA, SE dated August 2, 2011.
2. Oconee Nuclear Station Reload Design Methodology II, DPC-NE-1002-A, SE dated July 21, 2011.
3. Oconee Nuclear Station Reload Design Methodology, NFS-1001-A, SE dated July 21, 2011.
4. ONS Core Thermal Hydraulic Methodology Using VIPRE-01, DPC-NE-2003-PA, SE dated July 21, 2011.
5. Thermal Hydraulic Statistical Core Design Methodology, DPC-NE-2005-PA, Revision 4a, December 2008.
6. Fuel Mechanical Reload Analysis Methodology Using TACO3 and GDTACO, DPC-NE-2008-PA, SE dated July 21, 2011.
7. UFSAR Chapter 15 Transient Analysis Methodology, DPC-NE-3005-PA, SE dated July 21, 2011.
8. Thermal Hydraulic Transient Analysis Methodology, DPC-NE-3000-PA, SE dated July 21, 2011.
9. BAW-10192P-A, BWNT LOCA - BWNT Loss of Coolant Accident Evaluation Model for Once-Through Steam Generator Plants, Revision 0, SER dated February 18, 1997.
10. BAW-10164P-A, Rev. 4 and 6, RELAP5/MOD2-B&W - An Advanced Computer Program for Light Water Reactor LOCA and Non-LOCA Transient Analysis, SERs dated April 9, 2002 and June 25, 2007, respectively.
11. BAW-10227P-A, Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel, Rev. 1, June 2003 (SER to BAW-10186P-A dated June 18, 2003).
12. Digital RPS RCS Pressure & Temperature Trip Function Uncertainties and Variable Low RCS Pressure Safety Limit, OSC-8828, Revision 3, October 2010.
13. Power Imbalance Safety Limits and Tech Spec Setpoints Using Error Adjusted Flux-Flow Ratio of 1.094, OSC-5604, Revision 4, April 2011.
14. ΔT_c and EOC Reduced Tavgr Operation, OSC-7265, Revision 1, June 2002.
15. O3C27 Maneuvering Analysis, OSC-10517, Revision 4, April 2014.
16. O3C27 Specific DNB Analysis, OSC-10526, Revision 0, January 2012.
17. O3C27 Reload Safety Evaluation, OSC-10535, Revision 2, April 2014.

Oconee 3 Cycle 27

Miscellaneous Setpoints

BWST boron concentration shall be greater than 2500 ppm and less than 3000 ppm.
Referred to by TS 3.5.4.

Spent fuel pool boron concentration shall be greater than 2500 ppm.
Referred to by TS 3.7.12.

The equivalent of at least 1100 cubic feet of 11,000 ppm boron shall be maintained in the CBAST.
Referred to by TS SLC 16.5.13.

CFT boron concentration shall be greater than 2300 ppm. The average boron concentration in the CFTs shall be less than 4000 ppm. Referred to by TS 3.5.1.

RCS and Refueling canal boron concentration shall be greater than 2220 ppm.
Referred to by TS 3.9.1.

Shutdown Margin (SDM) shall be greater than 1% $\Delta k/k$.
Referred to by TS 3.1.1.

Moderator Temperature Coefficient (MTC) shall be less than:
Linear interpolation is valid within the table provided.
Referred to by TS 3.1.3.

MTC x 10 ⁻⁴	
$\Delta p / ^\circ F$	% FP
+0.70	0
+0.525	20
0.00	80
0.00	100
0.00	120

Departure from Nucleate Boiling (DNB) parameter for RCS loop pressure shall be
Referred to by TS 3.4.1.

4 RCP:	measured hot leg pressure \geq 2125 psig
3 RCP:	measured hot leg pressure \geq 2125 psig

DNB parameter for RCS loop average temperature shall be:
Referred to by TS 3.4.1.

	Max Loop Tavg (Incl 2°F unc)		
	$\Delta T_c, ^\circ F$	4 RCP Op	3 RCP Op
	0	581.0	581.0 *
	1	581.4	581.2
	2	581.8	581.4
	3	582.1	581.7
	4	582.5	581.9
	5	582.9	582.1

The measured Tavg must be less than COLR limits minus
Instrument uncertainty. ΔT_c is the setpoint value selected by
the operators. Values are expanded by linear interpolation on
page 33 of this document without instrument uncertainty.

* This limit is applied to the loop with the lowest loop average temperature consistent with
the NOTE in SR 3.4.1.2. All other temperature limits apply to the maximum loop Tavg.

DNB parameter for RCS loop total flow shall be:
Referred to by TS 3.4.1.

4 RCP:	Measured \geq 108.5 %df
3 RCP:	Measured \geq 74.7 % of 4 RCP min flow

Regulating rod groups shall be withdrawn in sequence starting with group 5, group 6, and finally group 7.
Referred to by TS 3.2.1.

Regulating rod group overlap shall be 25% \pm 5% between two sequential groups.
Referred to by TS 3.2.1.

Misaligned, dropped, or inoperable rods may be excluded from control rod group average calculations
when determining if overlap requirements are met as these situations are explicitly addressed by
TS 3.1.4 (Control Rod Group Alignment Limits), TS 3.1.5 (Safety Rod Position Limits), and TS 3.2.3
(Quadrant Power Tilt).

Oconee 3 Cycle 27

Steady State Operating Band

EFPD	Rod Index		APSR %WD	
	Min	Max	Min	Max
0 to 595	292 ± 5	300	30	40
595 to EOC	292 ± 5	300	100	100

Quadrant Power Tilt Setpoints

Core Power Level, %FP	Steady State		Transient		Maximum
	30 - 100	0 - 30	30 - 100	0 - 30	
Full Incore	3.50	7.61	7.11	9.40	16.55
Out of Core	2.35	6.09	5.63	7.72	14.22
Backup Incore	2.25	3.87	3.63	4.81	10.07

Referred to by TS 3.2.3

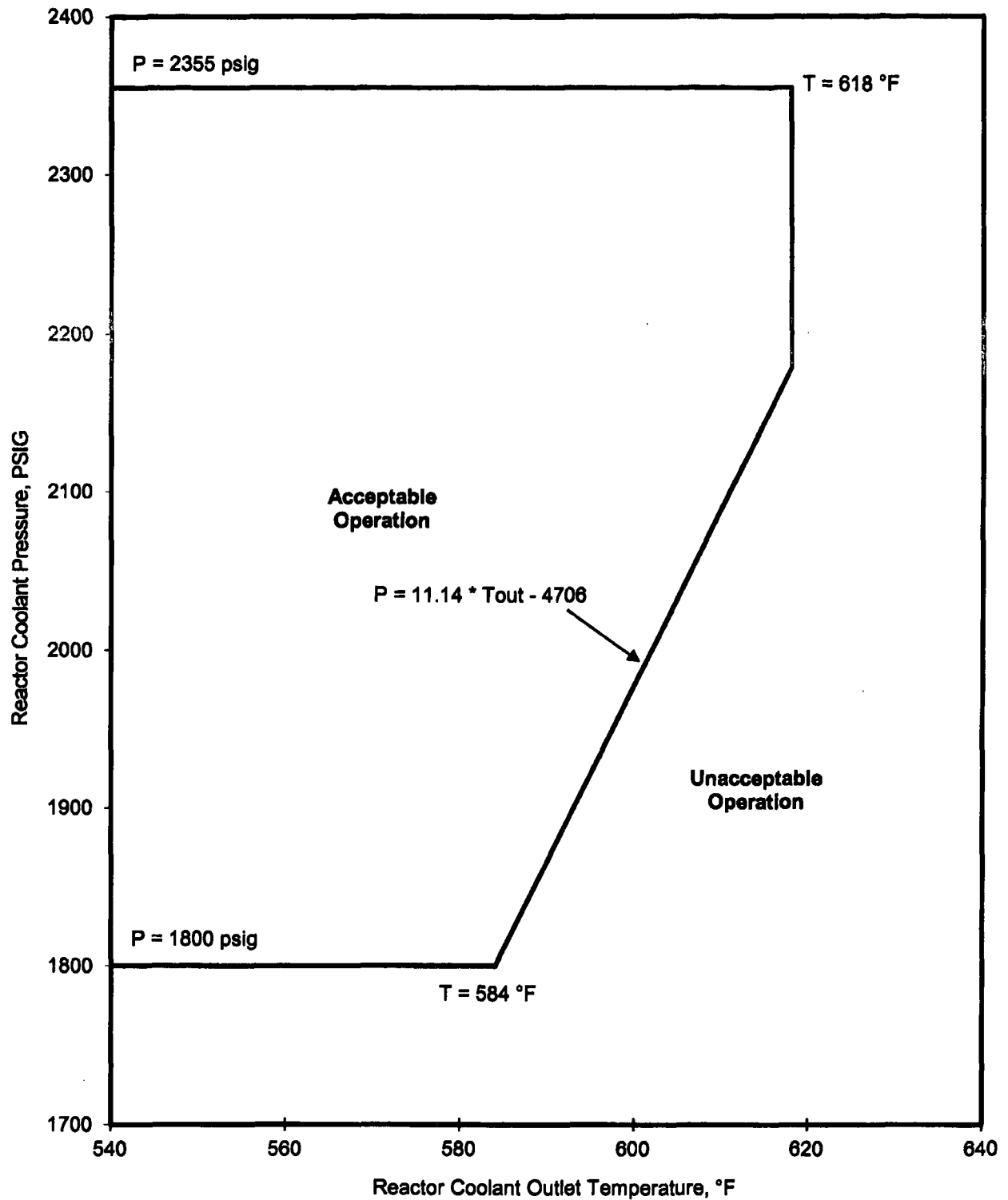
Correlation Slope (CS)

1.15

Referred to by TS 3.3.1 (SR 3.3.1.3).

Oconee 3 Cycle 27
Variable Low RCS Pressure RPS Setpoints

Referred to by TS 3.3.1



Oconee 3 Cycle 27

RPS Power Imbalance Setpoints

	% FP	% Imbalance
4 Pumps	0.0	-33.0
	90.4	-33.0
	107.9	-14.4
	107.9	14.4
	90.4	33.0
	0.0	33.0
3 Pumps	0.0	-33.0
	63.1	-33.0
	80.6	-14.4
	80.6	14.4
	63.1	33.0
	0.0	33.0

Maximum Allowable RPS Power Imbalance Limits

	% FP	% Imbalance
4 Pumps	0.0	-35.0
	90.0	-35.0
	<i>P_{max} =></i> 109.4	-14.4
	<i>P_{max} =></i> 109.4	14.4
	90.0	35.0
	0.0	35.0
3 Pumps	0.0	-35.0
	62.3	-35.0
	<i>P_{max} =></i> 81.7	-14.4
	<i>P_{max} =></i> 81.7	14.4
	62.3	35.0
	0.0	35.0

Oconee 3 Cycle 27

Operational Power Imbalance Setpoints

	%FP	Full Incore	Backup Incore	Out of Core
4 Pumps	0.0	-28.0	-27.3	-28.0
	80.0	-28.0	-27.3	-28.0
	90.0	-28.0	-27.3	-28.0
	100.0	-17.8	-17.8	-17.8
	102.0	-15.7	-15.7	-15.7
	102.0	15.7	11.1	11.7
	100.0	17.8	14.3	14.9
	90.0	28.0	28.0	28.0
	80.0	28.0	28.0	28.0
	0.0	28.0	28.0	28.0
3 Pumps	0.0	-28.0	-27.3	-28.0
	63.1	-28.0	-	-28.0
	63.7	-	-27.3	-
	77.0	-13.2	-13.2	-13.2
	77.0	13.2	13.2	13.2
	63.1	-	28.0	-
	63.1	28.0	-	28.0
	0.0	28.0	28.0	28.0

Oconee 3 Cycle 27
Operational Power Imbalance Setpoints

Operation with 4 RCS Pumps, BOC to EOC

% FP	RPS Trip		Full Incore Alarm		Out of Core Alarm	
107.9	-14.4	14.4				
107.0	-15.4	15.4				
106.0	-16.4	16.4				
105.0	-17.5	17.5				
104.0	-18.5	18.5				
103.0	-19.6	19.6				
102.0	-20.7	20.7	-15.7	15.7	-15.7	11.7
101.0	-21.7	21.7	-16.7	16.7	-16.7	13.3
100.0	-22.8	22.8	-17.8	17.8	-17.8	14.9
99.0	-23.9	23.9	-18.8	18.8	-18.8	16.2
98.0	-24.9	24.9	-19.8	19.8	-19.8	17.5
97.0	-26.0	26.0	-20.9	20.9	-20.9	18.8
96.0	-27.0	27.0	-21.9	21.9	-21.9	20.2
95.0	-28.1	28.1	-22.9	22.9	-22.9	21.5
94.0	-29.2	29.2	-23.9	23.9	-23.9	22.8
93.0	-30.2	30.2	-24.9	24.9	-24.9	24.1
92.0	-31.3	31.3	-26.0	26.0	-26.0	25.4
91.0	-32.3	32.3	-27.0	27.0	-27.0	26.7
90.4	-33.0	33.0	-27.6	27.6	-27.6	27.5
90.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
89.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
88.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
87.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
86.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
85.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
84.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
83.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
82.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
81.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
80.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
0.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
% FP	RPS Trip		Full Incore Alarm		Out of Core Alarm	

Oconee 3 Cycle 27
Operational Power Imbalance Setpoints
Operation with 3 RCS Pumps, BOC to EOC

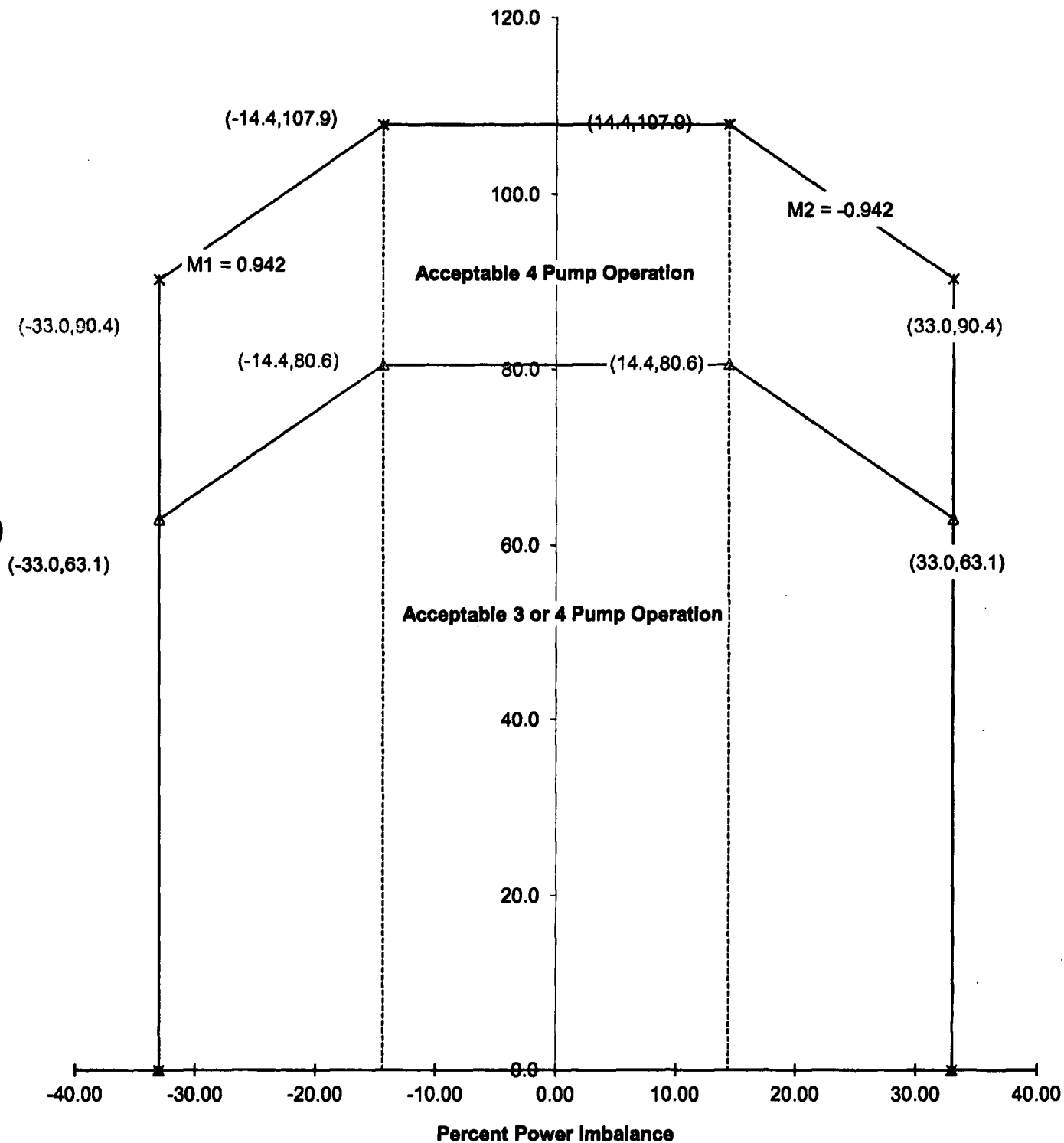
% FP	RPS Trip		Full Incore Alarm		Out of Core Alarm	
80.6	-14.4	14.4				
80.0	-15.0	15.0				
79.0	-16.1	16.1				
78.0	-17.1	17.1				
77.0	-18.2	18.2	-13.2	13.2	-13.2	13.2
76.0	-19.3	19.3	-14.3	14.3	-14.3	14.3
75.0	-20.3	20.3	-15.3	15.3	-15.3	15.3
74.0	-21.4	21.4	-16.4	16.4	-16.4	16.4
73.0	-22.4	22.4	-17.4	17.4	-17.4	17.4
72.0	-23.5	23.5	-18.5	18.5	-18.5	18.5
71.0	-24.6	24.6	-19.6	19.6	-19.6	19.6
70.0	-25.6	25.6	-20.6	20.6	-20.6	20.6
69.0	-26.7	26.7	-21.7	21.7	-21.7	21.7
68.0	-27.8	27.8	-22.8	22.8	-22.8	22.8
67.0	-28.8	28.8	-23.8	23.8	-23.8	23.8
66.0	-29.9	29.9	-24.9	24.9	-24.9	24.9
65.0	-30.9	30.9	-25.9	25.9	-25.9	25.9
64.0	-32.0	32.0	-27.0	27.0	-27.0	27.0
63.1	-33.0	33.0	-28.0	28.0	-28.0	28.0
63.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
62.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
61.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
60.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
0.0	-33.0	33.0	-28.0	28.0	-28.0	28.0
% FP	RPS Trip		Full Incore Alarm		Out of Core Alarm	

Oconee 3 Cycle 27

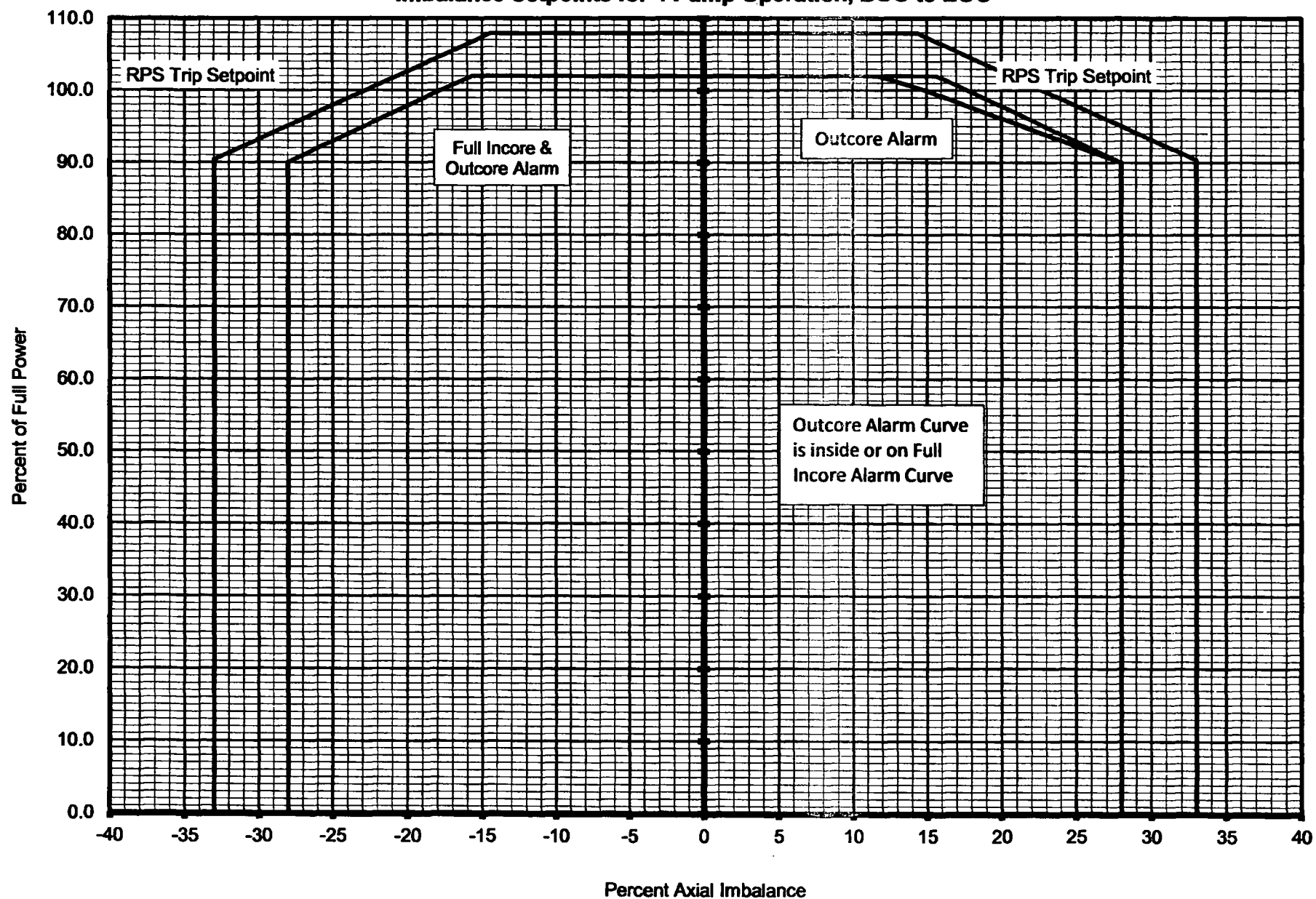
RPS Power Imbalance Setpoints

Referred to by TS 3.3.1

Thermal Power Level, %FP

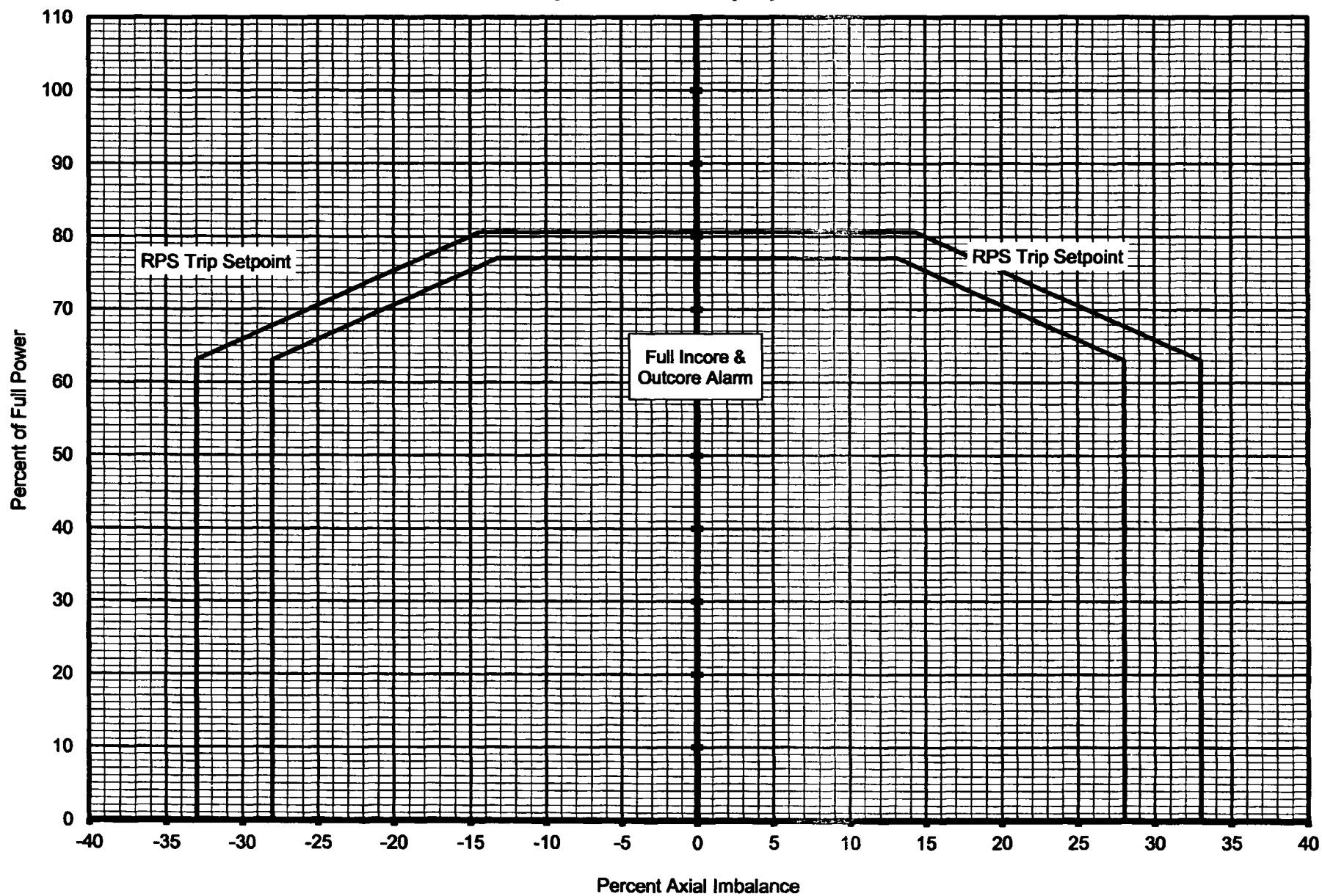


Oconee 3 Cycle 27
Imbalance Setpoints for 4 Pump Operation, BOC to EOC



Oconee 3 Cycle 27

Imbalance Setpoints for 3 Pump Operation, BOC to EOC



Oconee 3 Cycle 27

Operational Rod Index Setpoints

	%FP	RI Insertion Setpoint		RI Withdrawal Setpoint
		No Inop Rod	1 Inop Rod	
4 Pumps	102.0	263.5	283.4	300
	100.0	261.5	281.5	300
	90.0	251.5	271.9	300
	80.0	241.5	262.3	300
	50.0	201.5	233.4	300
	48.0	195.2	231.5	300
	15.0	91.5	165.5	300
	13.0	76.5	161.5	300
	5.0	16.5	93.5	300
	3.0	1.5	76.5	300
	2.8	0.0	74.8	300
	0.0	0.0	51.0	300
3 Pumps	77.0	237.5	285.2	300
	75.0	234.8	281.5	300
	50.0	201.5	235.2	300
	48.0	195.2	231.5	300
	15.0	91.5	165.5	300
	13.0	76.5	161.5	300
	5.0	16.5	93.5	300
	3.0	1.5	76.5	300
	2.8	0.0	74.8	300
	0.0	0.0	51.0	300

Oconee 3 Cycle 27

Shutdown Margin Rod Index Setpoints

	%FP	RI Insertion Setpoint		RI Withdrawal Setpoint
		No Inop Rod	1 Inop Rod	
4 Pumps	102.0	224.6	283.4	300
	100.0	221.5	281.5	300
	48.0	141.5	231.5	300
	13.0	76.5	161.5	300
	3.0	1.5	76.5	300
	2.8	0.0	74.8	300
	0.0	0.0	51.0	300
3 Pumps	77.0	227.4	285.2	300
	75.0	221.5	281.5	300
	48.0	141.5	231.5	300
	13.0	76.5	161.5	300
	3.0	1.5	76.5	300
	2.8	0.0	74.8	300
	0.0	0.0	51.0	300

Oconee 3 Cycle 27
Rod Index Setpoints
4 Pump Operation, No Inoperable Rods, BOC to EOC

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% FP	Shutdown Margin Setpoint			Operational Alarm Setpoint		
	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
102	100	99.8	24.8	100	100	63.5
101	100	99.0	24.0	100	100	62.5
100	100	98.2	23.2	100	100	61.5
99	100	97.5	22.5	100	100	60.5
98	100	96.7	21.7	100	100	59.5
97	100	95.9	20.9	100	100	58.5
96	100	95.2	20.2	100	100	57.5
95	100	94.4	19.4	100	100	56.5
94	100	93.6	18.6	100	100	55.5
93	100	92.9	17.9	100	100	54.5
92	100	92.1	17.1	100	100	53.5
91	100	91.3	16.3	100	100	52.5
90	100	90.6	15.6	100	100	51.5
89	100	89.8	14.8	100	100	50.5
88	100	89.0	14.0	100	100	49.5
87	100	88.2	13.2	100	100	48.5
86	100	87.5	12.5	100	100	47.5
85	100	86.7	11.7	100	100	46.5
84	100	85.9	10.9	100	100	45.5
83	100	85.2	10.2	100	100	44.5
82	100	84.4	9.4	100	100	43.5
81	100	83.6	8.6	100	100	42.5
80	100	82.9	7.9	100	100	41.5
79	100	82.1	7.1	100	100	40.2
78	100	81.3	6.3	100	100	38.8
77	100	80.6	5.6	100	100	37.5
76	100	79.8	4.8	100	100	36.2
75	100	79.0	4.0	100	100	34.8
74	100	78.2	3.2	100	100	33.5
73	100	77.5	2.5	100	100	32.2
72	100	76.7	1.7	100	100	30.8
71	100	75.9	0.9	100	100	29.5
70	100	75.2	0.2	100	100	28.2
69.8	100	75.0	0	100	100	27.9
69	100	73.8	0	100	100	26.8
68	100	72.3	0	100	100	25.5
67.6	100	71.7	0	100	100	25.0
67	100	70.7	0	100	99.6	24.6
66	100	69.2	0	100	98.9	23.9
65	100	67.7	0	100	98.2	23.2
64	100	66.1	0	100	97.6	22.6
63	100	64.6	0	100	96.9	21.9
62	100	63.0	0	100	96.2	21.2
61	100	61.5	0	100	95.6	20.6
60	100	60.0	0	100	94.9	19.9
59	100	58.4	0	100	94.2	19.2
58	100	56.9	0	100	93.6	18.6
57	100	55.3	0	100	92.9	17.9
56	100	53.8	0	100	92.2	17.2
55	100	52.3	0	100	91.6	16.6
54	100	50.7	0	100	90.9	15.9
53	100	49.2	0	100	90.2	15.2
52	100	47.7	0	100	89.6	14.6
51	100	46.1	0	100	88.9	13.9
50	100	44.6	0	100	88.2	13.2
% FP	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	Shutdown Margin Setpoint			Operational Alarm Setpoint		

RI = 300 is withdrawal limit at all power levels.

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Rod Index Setpoints
4 Pump Operation, No Inoperable Rods, BOC to EOC

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% FP	Shutdown Margin Setpoint			Operational Alarm Setpoint		
	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
49	100	43.0	0	100	86.7	11.7
48	100	41.5	0	100	85.1	10.1
47	100	39.6	0	100	83.5	8.5
46	100	37.8	0	100	82.0	7.0
45	100	35.9	0	100	80.4	5.4
44	100	34.1	0	100	78.8	3.8
43	100	32.2	0	100	77.2	2.2
42	100	30.4	0	100	75.7	0.7
41.6	100	29.6	0	100	75.0	0
41	100	28.5	0	100	73.2	0
40	100	26.6	0	100	70.1	0
39.1	100	25.0	0	100	67.3	0
39	99.9	24.9	0	100	66.9	0
38	99.0	24.0	0	100	63.8	0
37	98.0	23.0	0	100	60.6	0
36	97.1	22.1	0	100	57.5	0
35	96.2	21.2	0	100	54.3	0
34	95.2	20.2	0	100	51.2	0
33	94.3	19.3	0	100	48.1	0
32	93.4	18.4	0	100	44.9	0
31	92.5	17.5	0	100	41.8	0
30	91.5	16.5	0	100	38.6	0
29	90.6	15.6	0	100	35.5	0
28	89.7	14.7	0	100	32.4	0
27	88.8	13.8	0	100	29.2	0
26	87.8	12.8	0	100	26.1	0
25.7	87.5	12.5	0	100	25.0	0
25	86.9	11.9	0	99.0	24.0	0
24	86.0	11.0	0	97.4	22.4	0
23	85.0	10.0	0	95.8	20.8	0
22	84.1	9.1	0	94.2	19.2	0
21	83.2	8.2	0	92.7	17.7	0
20	82.2	7.2	0	91.1	16.1	0
19	81.3	6.3	0	89.5	14.5	0
18	80.4	5.4	0	88.0	13.0	0
17	79.5	4.5	0	86.4	11.4	0
16	78.5	3.5	0	84.8	9.8	0
15	77.6	2.6	0	83.2	8.2	0
14	76.7	1.7	0	79.5	4.5	0
13	75.8	0.8	0	75.8	0.8	0
12.8	75.0	0	0	75.0	0	0
12	69.0	0	0	69.0	0	0
11	61.5	0	0	61.5	0	0
10	54.0	0	0	54.0	0	0
9	46.5	0	0	46.5	0	0
8	39.0	0	0	39.0	0	0
7	31.5	0	0	31.5	0	0
6	24.0	0	0	24.0	0	0
5	16.5	0	0	16.5	0	0
4	9.0	0	0	9.0	0	0
3	1.5	0	0	1.5	0	0
2.8	0	0	0	0	0	0
2	0	0	0	0	0	0
1	0	0	0	0	0	0
0	0	0	0	0	0	0
% FP	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	Shutdown Margin Setpoint			Operational Alarm Setpoint		

RI = 300 is withdrawal limit at all power levels.

Oconee 3 Cycle 27
Rod Index Setpoints
3 Pump Operation, No Inoperable Rods, BOC to EOC

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% FP	Shutdown Margin Setpoint			Operational Alarm Setpoint		
	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
77	100	100	27.4	100	100	37.5
76.2	100	100	25.0	100	100	36.4
76	100	99.7	24.7	100	100	36.1
75	100	98.2	23.2	100	100	34.8
74	100	96.8	21.8	100	100	33.5
73	100	95.3	20.3	100	100	32.1
72	100	93.8	18.8	100	100	30.8
71	100	92.3	17.3	100	100	29.5
70	100	90.8	15.8	100	100	28.1
69	100	89.4	14.4	100	100	26.8
68	100	87.9	12.9	100	100	25.5
67.6	100	87.4	12.4	100	100	25.0
67	100	86.4	11.4	100	99.6	24.6
66	100	84.9	9.9	100	98.9	23.9
65	100	83.4	8.4	100	98.2	23.2
64	100	82.0	7.0	100	97.6	22.6
63	100	80.5	5.5	100	96.9	21.9
62	100	79.0	4.0	100	96.2	21.2
61	100	77.5	2.5	100	95.6	20.6
60	100	76.0	1.0	100	94.9	19.9
59.3	100	75.0	0	100	94.4	19.4
59	100	74.1	0	100	94.2	19.2
58	100	71.1	0	100	93.6	18.6
57	100	68.2	0	100	92.9	17.9
56	100	65.2	0	100	92.2	17.2
55	100	62.2	0	100	91.6	16.6
54	100	59.3	0	100	90.9	15.9
53	100	56.3	0	100	90.2	15.2
52	100	53.4	0	100	89.6	14.6
51	100	50.4	0	100	88.9	13.9
50	100	47.4	0	100	88.2	13.2
49	100	44.5	0	100	86.7	11.7
48	100	41.5	0	100	85.1	10.1
47	100	39.6	0	100	83.5	8.5
46	100	37.8	0	100	82.0	7.0
45	100	35.9	0	100	80.4	5.4
44	100	34.1	0	100	78.8	3.8
43	100	32.2	0	100	77.2	2.2
42	100	30.4	0	100	75.7	0.7
41.6	100	29.6	0	100	75.0	0
41	100	28.5	0	100	73.2	0
40	100	26.6	0	100	70.1	0
39.1	100	25.0	0	100	67.3	0
39	99.9	24.9	0	100	66.9	0
38	99	24.0	0	100	63.8	0
37	98	23.0	0	100	60.6	0
36	97.1	22.1	0	100	57.5	0
35	96.2	21.2	0	100	54.3	0
34	95.2	20.2	0	100	51.2	0
33	94.3	19.3	0	100	48.1	0
32	93.4	18.4	0	100	44.9	0
31	92.5	17.5	0	100	41.8	0
30	91.5	16.5	0	100	38.6	0
29	90.6	15.6	0	100	35.5	0
28	89.7	14.7	0	100	32.4	0
% FP	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	Shutdown Margin Setpoint			Operational Alarm Setpoint		

RI = 300 is withdrawal limit at all power levels.

Continued on next page.

RI = 300 is withdrawal limit at all power levels.

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Rod Index Setpoints
4 Pump Operation, 1 Inoperable Rod, BOC to EOC

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% FP	Shutdown Margin Setpoint			Operational Alarm Setpoint		
	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
102	100	100	83.4	100	100	83.4
101	100	100	82.5	100	100	82.5
100	100	100	81.5	100	100	81.5
99	100	100	80.5	100	100	80.5
98	100	100	79.6	100	100	79.6
97	100	100	78.6	100	100	78.6
96	100	100	77.7	100	100	77.7
95	100	100	76.7	100	100	76.7
94	100	100	75.7	100	100	75.7
93	100	100	74.8	100	100	74.8
92	100	100	73.8	100	100	73.8
91	100	100	72.8	100	100	72.9
90	100	100	71.9	100	100	71.9
89	100	100	70.9	100	100	70.9
88	100	100	70.0	100	100	70.0
87	100	100	69.0	100	100	69.0
86	100	100	68.0	100	100	68.1
85	100	100	67.1	100	100	67.1
84	100	100	66.1	100	100	66.1
83	100	100	65.2	100	100	65.2
82	100	100	64.2	100	100	64.2
81	100	100	63.2	100	100	63.3
80	100	100	62.3	100	100	62.3
79	100	100	61.3	100	100	61.3
78	100	100	60.3	100	100	60.4
77	100	100	59.4	100	100	59.4
76	100	100	58.4	100	100	58.4
75	100	100	57.5	100	100	57.5
74	100	100	56.5	100	100	56.5
73	100	100	55.5	100	100	55.6
72	100	100	54.6	100	100	54.6
71	100	100	53.6	100	100	53.6
70	100	100	52.7	100	100	52.7
69	100	100	51.7	100	100	51.7
68	100	100	50.7	100	100	50.7
67	100	100	49.8	100	100	49.8
66	100	100	48.8	100	100	48.8
65	100	100	47.8	100	100	47.8
64	100	100	46.9	100	100	46.9
63	100	100	45.9	100	100	45.9
62	100	100	45.0	100	100	45.0
61	100	100	44.0	100	100	44.0
60	100	100	43.0	100	100	43.0
59	100	100	42.1	100	100	42.1
58	100	100	41.1	100	100	41.1
57	100	100	40.2	100	100	40.2
56	100	100	39.2	100	100	39.2
55	100	100	38.2	100	100	38.2
54	100	100	37.3	100	100	37.3
53	100	100	36.3	100	100	36.3
52	100	100	35.3	100	100	35.3
51	100	100	34.4	100	100	34.4
50	100	100	33.4	100	100	33.4
49	100	100	32.5	100	100	32.5
48	100	100	31.5	100	100	31.5
% FP	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	Shutdown Margin Setpoint			Operational Alarm Setpoint		

RI = 300 is withdrawal limit at all power levels.

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Rod Index Setpoints
4 Pump Operation, 1 Inoperable Rod, BOC to EOC

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% FP	Shutdown Margin Setpoint			Operational Alarm Setpoint		
	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
47	100	100	29.5	100	100	29.5
46	100	100	27.5	100	100	27.5
45	100	100	25.5	100	100	25.5
44.8	100	100	25.0	100	100	25.0
44	100	99.2	24.2	100	99.2	24.2
43	100	98.2	23.2	100	98.2	23.2
42	100	97.2	22.2	100	97.2	22.2
41	100	96.2	21.2	100	96.2	21.2
40	100	95.2	20.2	100	95.2	20.2
39	100	94.2	19.2	100	94.2	19.2
38	100	93.2	18.2	100	93.2	18.2
37	100	92.2	17.2	100	92.2	17.2
36	100	91.2	16.2	100	91.2	16.2
35	100	90.2	15.2	100	90.2	15.2
34	100	89.2	14.2	100	89.2	14.2
33	100	88.2	13.2	100	88.2	13.2
32	100	87.2	12.2	100	87.2	12.2
31	100	86.2	11.2	100	86.2	11.2
30	100	85.2	10.2	100	85.2	10.2
29	100	84.2	9.2	100	84.2	9.2
28	100	83.2	8.2	100	83.2	8.2
27	100	82.2	7.2	100	82.2	7.2
26	100	81.2	6.2	100	81.2	6.2
25	100	80.2	5.2	100	80.2	5.2
24	100	79.2	4.2	100	79.2	4.2
23	100	78.2	3.2	100	78.2	3.2
22	100	77.2	2.2	100	77.2	2.2
21	100	76.2	1.2	100	76.2	1.2
20	100	75.2	0.2	100	75.2	0.2
19.8	100	75.0	0	100	75.0	0
19	100	73.5	0	100	73.5	0
18	100	71.5	0	100	71.5	0
17	100	69.5	0	100	69.5	0
16	100	67.5	0	100	67.5	0
15	100	65.5	0	100	65.5	0
14	100	63.5	0	100	63.5	0
13	100	61.5	0	100	61.5	0
12	100	53.0	0	100	53.0	0
11	100	44.5	0	100	44.5	0
10	100	36.0	0	100	36.0	0
9	100	27.5	0	100	27.5	0
8.7	100	25.0	0	100	25.0	0
8	97.0	22.0	0	97.0	22.0	0
7	92.8	17.8	0	92.8	17.8	0
6	88.5	13.5	0	88.5	13.5	0
5	84.2	9.2	0	84.2	9.2	0
4	80.0	5.0	0	80.0	5.0	0
3	75.8	0.8	0	75.8	0.8	0
2.8	75	0	0	75	0	0
2	68	0	0	68	0	0
1	59.5	0	0	59.5	0	0
0	51	0	0	51	0	0
% FP	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	Shutdown Margin Setpoint			Operational Alarm Setpoint		

RI = 300 is withdrawal limit at all power levels.

Oconee 3 Cycle 27
Rod Index Setpoints
3 Pump Operation, 1 Inoperable Rod, BOC to EOC

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% FP	Shutdown Margin Setpoint			Operational Alarm Setpoint		
	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
77	100	100	85.2	100	100	85.2
76	100	100	83.4	100	100	83.4
75	100	100	81.5	100	100	81.5
74	100	100	79.6	100	100	79.6
73	100	100	77.8	100	100	77.8
72	100	100	75.9	100	100	75.9
71	100	100	74.1	100	100	74.1
70	100	100	72.2	100	100	72.2
69	100	100	70.4	100	100	70.4
68	100	100	68.5	100	100	68.5
67	100	100	66.7	100	100	66.7
66	100	100	64.8	100	100	64.8
65	100	100	63.0	100	100	63.0
64	100	100	61.1	100	100	61.1
63	100	100	59.3	100	100	59.3
62	100	100	57.4	100	100	57.4
61	100	100	55.6	100	100	55.6
60	100	100	53.7	100	100	53.7
59	100	100	51.9	100	100	51.9
58	100	100	50.0	100	100	50.0
57	100	100	48.2	100	100	48.2
56	100	100	46.3	100	100	46.3
55	100	100	44.5	100	100	44.5
54	100	100	42.6	100	100	42.6
53	100	100	40.8	100	100	40.8
52	100	100	38.9	100	100	38.9
51	100	100	37.1	100	100	37.1
50	100	100	35.2	100	100	35.2
49	100	100	33.4	100	100	33.4
48	100	100	31.5	100	100	31.5
47	100	100	29.5	100	100	29.5
46	100	100	27.5	100	100	27.5
45	100	100	25.5	100	100	25.5
44.8	100	100	25.0	100	100	25.0
44	100	99.2	24.2	100	99.2	24.2
43	100	98.2	23.2	100	98.2	23.2
42	100	97.2	22.2	100	97.2	22.2
41	100	96.2	21.2	100	96.2	21.2
40	100	95.2	20.2	100	95.2	20.2
39	100	94.2	19.2	100	94.2	19.2
38	100	93.2	18.2	100	93.2	18.2
37	100	92.2	17.2	100	92.2	17.2
36	100	91.2	16.2	100	91.2	16.2
35	100	90.2	15.2	100	90.2	15.2
34	100	89.2	14.2	100	89.2	14.2
33	100	88.2	13.2	100	88.2	13.2
32	100	87.2	12.2	100	87.2	12.2
31	100	86.2	11.2	100	86.2	11.2
30	100	85.2	10.2	100	85.2	10.2
29	100	84.2	9.2	100	84.2	9.2
28	100	83.2	8.2	100	83.2	8.2
27	100	82.2	7.2	100	82.2	7.2
26	100	81.2	6.2	100	81.2	6.2
25	100	80.2	5.2	100	80.2	5.2
24	100	79.2	4.2	100	79.2	4.2
% FP	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	Shutdown Margin Setpoint			Operational Alarm Setpoint		

RI = 300 is withdrawal limit at all power levels.

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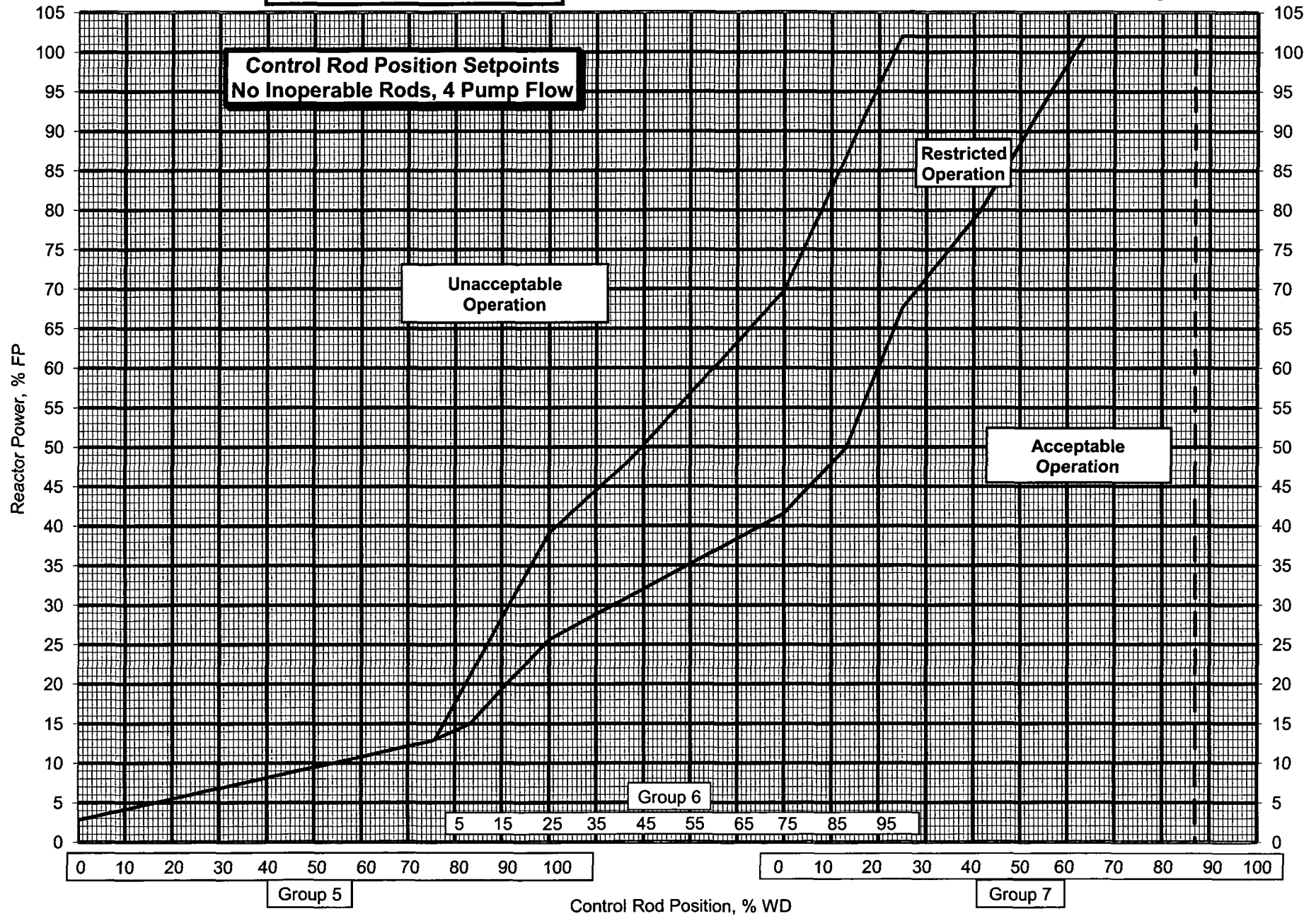
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RI = 300 is withdrawal limit at all power levels.

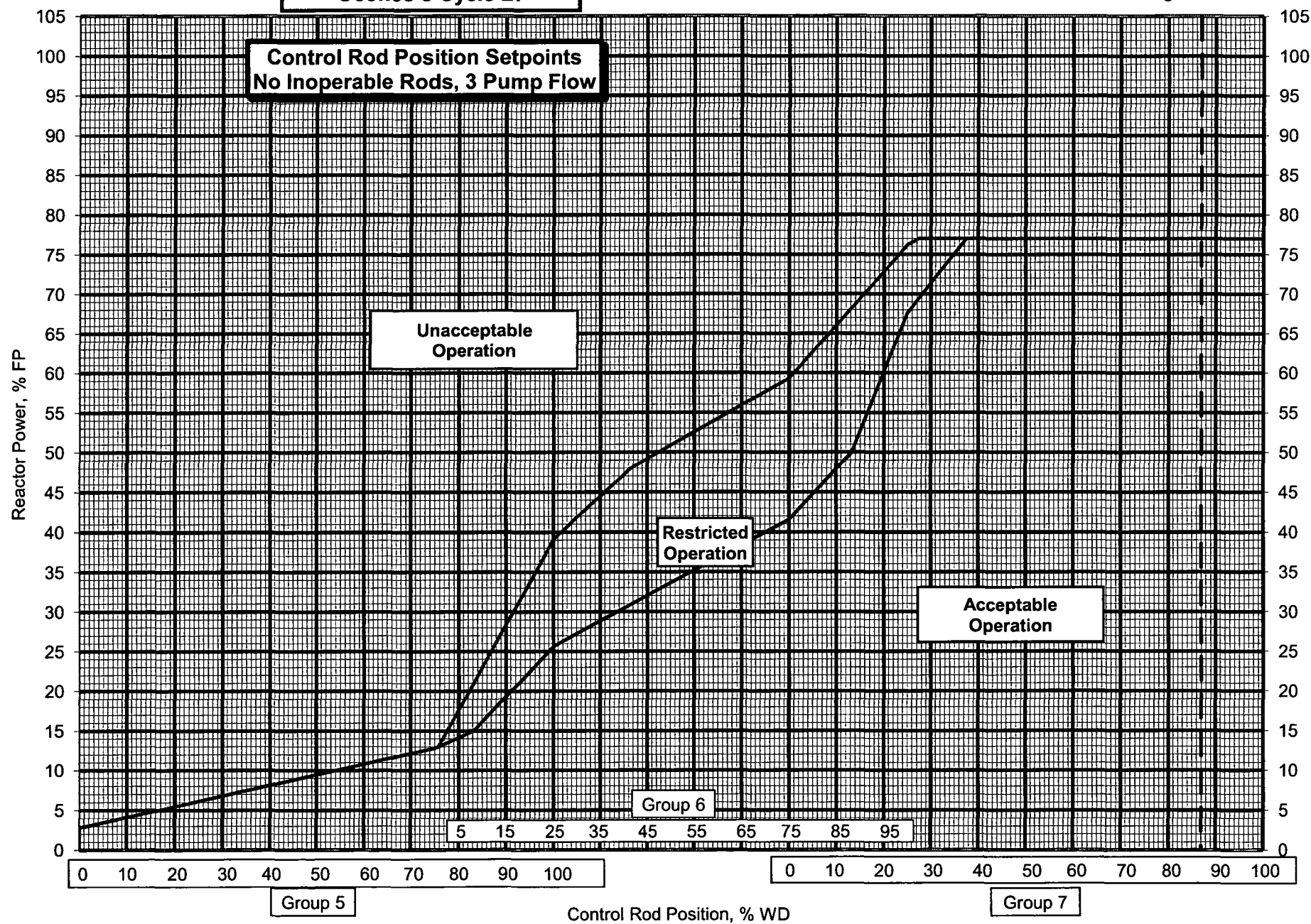
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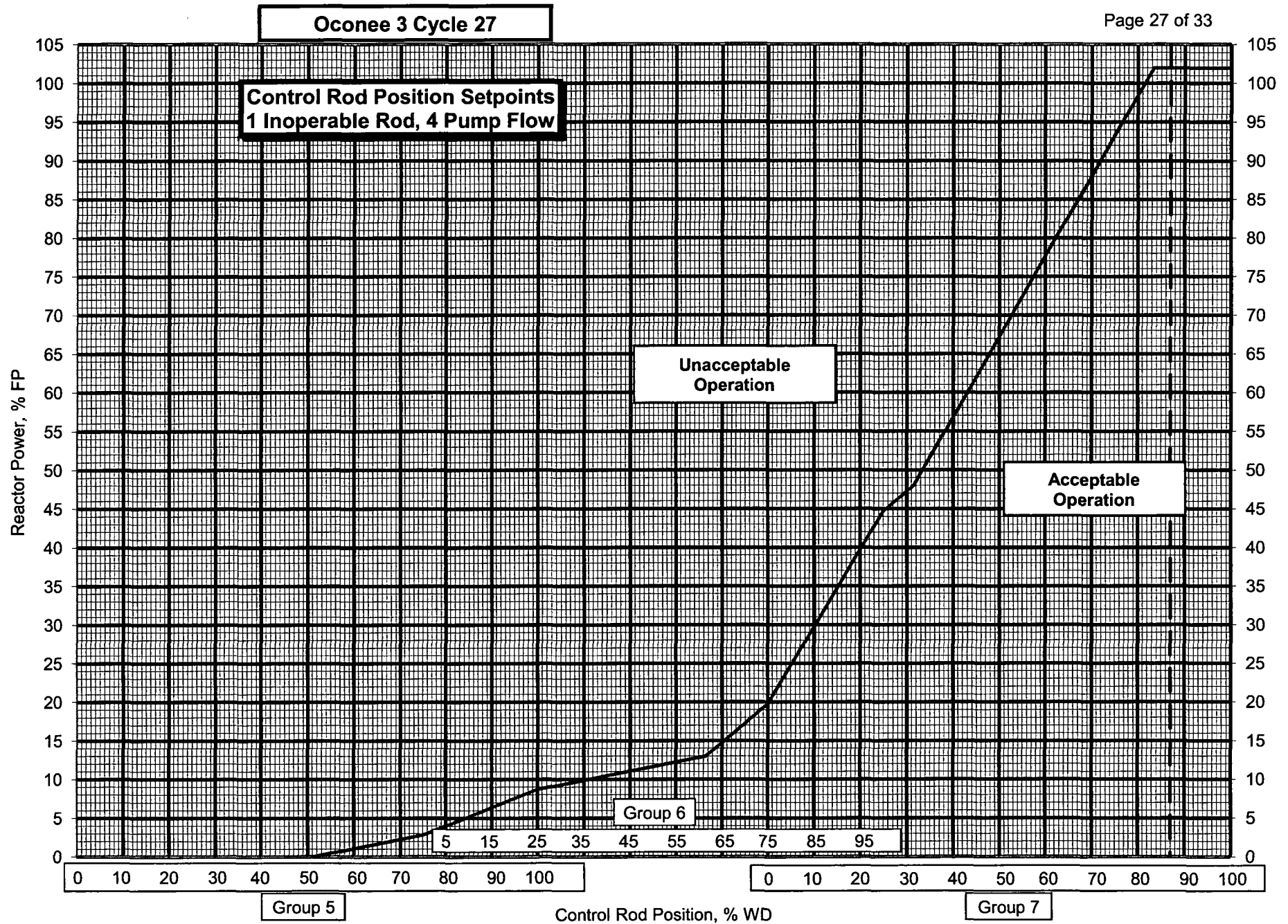
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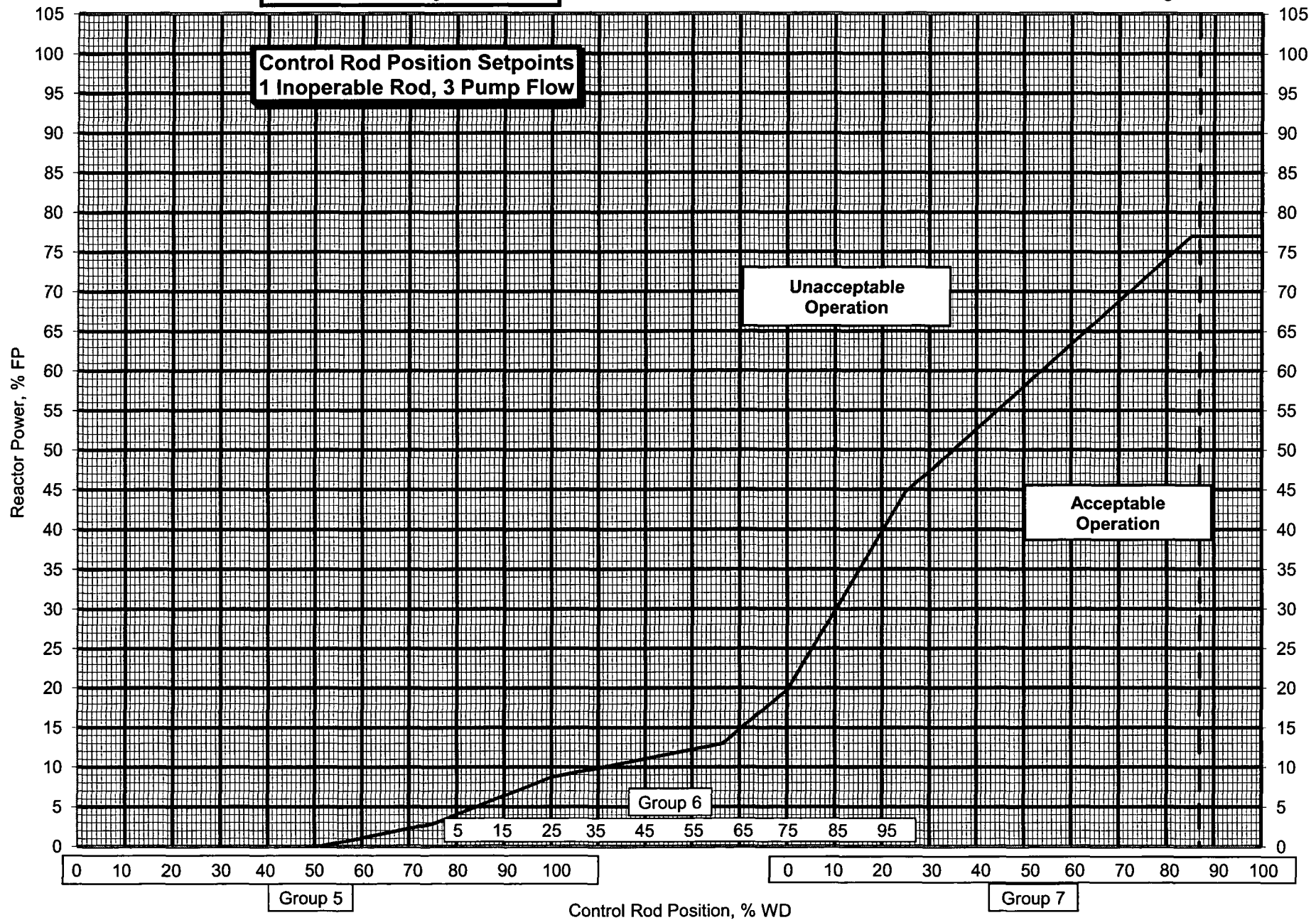


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2.0 Core Operating Limits -- Not Error Adjusted

The data provided on the following pages satisfies a licensing commitment to identify specific parameters before instrumentation uncertainties are incorporated.

References provided in section 1 of this COLR identify the sources for the data which follows.

Information provided in this section should not be used in plant procedures.

Quadrant Power Tilt Limits

Referred to by TS 3.2.3

	Steady State		Transient		Maximum
Core Power Level, %FP	30 - 100	0 - 30	30 - 100	0 - 30	0 - 100
Quadrant Power Tilt, %	5.40	10.00	9.44	12.00	20.00

Variable Low RCS Pressure Protective Limits

Referred to by TS 2.1.1

Core Outlet Pressure psia	Reactor Coolant Outlet Temperature, °F	
	3 RCS Pumps	4 RCS Pumps
1800	581.0	578.3
1900	590.0	587.3
2000	598.9	596.3
2100	607.9	605.2
2200	616.9	614.2
2300	625.9	623.2

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Axial Power Imbalance Protective Limits

Referred to by TS 2.1.1

Not for Plant Use

	%FP	RPS	Operational
4 Pumps	0.0	-35.0	-39.5
	80.0	-	-39.5
	90.0	-35.0	-39.5
	100.0	-	-28.4
	109.4	-14.4	-
	109.4	14.4	-
	100.0	-	24.9
	90.0	35.0	39.5
	80.0	-	39.5
	0.0	35.0	39.5
3 Pumps	0.0	-35.0	-39.5
	62.3	-35.0	-
	77.0	-	-39.5
	81.7	-14.4	-
	81.7	14.4	-
	77.0	-	39.5
	62.3	35.0	-
	0.0	35.0	39.5

Oconee 3 Cycle 27

Rod Index Limits

Referred to by TS 3.2.1

Not for Plant Use

	%FP	Operational RI Insertion Limit	Shutdown Margin No Inop Rod	RI Insertion Limit 1 Inop Rod	RI Withdrawal Limit
4 Pumps	102	262	220	280	300
	100	260	-	-	300
	90	250	-	-	300
	80	240	-	-	300
	50	200	140	230	300
	15	90	75	160	300
	5	0	0	75	300
3 Pumps	77	236	220	280	300
	50	200	140	230	300
	15	90	75	160	300
	5	0	0	75	300

Oconee 3 Cycle 27

LOCA Limits

Not for Plant Use

Core Elevation Feet	LOCA LHR kw/ft Limit Versus Burnup Mk-B-HTP w/0% Gad rods		
	0 GWd/mtU	34 GWd/mtU	62 GWd/mtU
0	16.9	16.9	12.3
2.506	17.8	17.8	12.3
4.264	17.8	17.8	12.3
6.021	17.8	17.8	12.3
7.779	17.8	17.8	12.3
9.536	17.3	17.3	12.3
12	16.4	16.4	12.3

Core Elevation Feet	LOCA LHR kw/ft Limit Versus Burnup Mk-B-HTP w/2% Gad rods		
	0 GWd/mtU	34 GWd/mtU	62 GWd/mtU
0	16.0	16.0	11.6
2.506	16.9	16.9	11.6
4.264	16.9	16.9	11.6
6.021	16.9	16.9	11.6
7.779	16.9	16.9	11.6
9.536	16.4	16.4	11.6
12	15.5	15.5	11.6

Core Elevation Feet	LOCA LHR kw/ft Limit Versus Burnup Mk-B-HTP w/4% Gad rods		
	0 GWd/mtU	34 GWd/mtU	62 GWd/mtU
0	15.2	15.2	11.1
2.506	16.1	16.1	11.1
4.264	16.1	16.1	11.1
6.021	16.1	16.1	11.1
7.779	16.1	16.1	11.1
9.536	15.7	15.7	11.1
12	14.9	14.9	11.1

Core Elevation Feet	LOCA LHR kw/ft Limit Versus Burnup Mk-B-HTP w/6% Gad rods		
	0 GWd/mtU	34 GWd/mtU	62 GWd/mtU
0	14.8	14.8	10.8
2.506	15.6	15.6	10.8
4.264	15.6	15.6	10.8
6.021	15.6	15.6	10.8
7.779	15.6	15.6	10.8
9.536	15.2	15.2	10.8
12	14.4	14.4	10.8

Core Elevation Feet	LOCA LHR kw/ft Limit Versus Burnup Mk-B-HTP w/8% Gad rods		
	0 GWd/mtU	34 GWd/mtU	62 GWd/mtU
0	14.3	14.3	10.4
2.506	15.1	15.1	10.4
4.264	15.1	15.1	10.4
6.021	15.1	15.1	10.4
7.779	15.1	15.1	10.4
9.536	14.7	14.7	10.4
12	13.9	13.9	10.4

Oconee 3 Cycle 27

Not for Plant Use
Instrument uncertainties are not included in the values shown.

ΔT_{cold} , °F	4 RCP Operation - Loop Average Temp., °F	3 RCP Operation - Loop Average Temp., °F
	Tavg (Analytical)	Tavg (Analytical)
0.0	<581.0	<581.0
0.1	<581.0	<581.0
0.2	<581.1	<581.0
0.3	<581.1	<581.1
0.4	<581.2	<581.1
0.5	<581.2	<581.1
0.6	<581.2	<581.1
0.7	<581.3	<581.2
0.8	<581.3	<581.2
0.9	<581.3	<581.2
1.0	<581.4	<581.2
1.1	<581.4	<581.2
1.2	<581.5	<581.3
1.3	<581.5	<581.3
1.4	<581.5	<581.3
1.5	<581.6	<581.3
1.6	<581.6	<581.4
1.7	<581.6	<581.4
1.8	<581.7	<581.4
1.9	<581.7	<581.4
2.0	<581.8	<581.4
2.1	<581.8	<581.5
2.2	<581.8	<581.5
2.3	<581.9	<581.5
2.4	<581.9	<581.5
2.5	<582.0	<581.6
2.6	<582.0	<581.6
2.7	<582.0	<581.6
2.8	<582.1	<581.6
2.9	<582.1	<581.6
3.0	<582.1	<581.7
3.1	<582.2	<581.7
3.2	<582.2	<581.7
3.3	<582.3	<581.7
3.4	<582.3	<581.7
3.5	<582.3	<581.8
3.6	<582.4	<581.8
3.7	<582.4	<581.8
3.8	<582.4	<581.8
3.9	<582.5	<581.9
4.0	<582.5	<581.9
4.1	<582.6	<581.9
4.2	<582.6	<581.9
4.3	<582.6	<581.9
4.4	<582.7	<582.0
4.5	<582.7	<582.0
4.6	<582.7	<582.0
4.7	<582.8	<582.0
4.8	<582.8	<582.1
4.9	<582.9	<582.1
5.0	<582.9	<582.1