DUKE POWER COMPANY

OCONEE 2 CYCLE 16

CORE OPERATING LIMITS REPORT

REVISION 5

QA CONDITION 1

REFERENCE OSC-6215

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Oconee Nuclear Station

Unit 2 Cycle 16

Core Operating Limits Report

Insertion Sheet for Revision 5

This revision is not valid until the end of operation for Unit 2 Cycle 15.

Remove these Revision 4 pages	**Insert these Revision 5 pages**
1-34	1-38

Oconee Nuclear Station

Unit 2 Cycle 16

Core Operating Limits Report

Revision Log

Revision	Effective Date	Pages Revised	Pages Added	Pages Deleted	Total Effective Pages
5	March 1996	1-34	35-38	-	38

Oconee 2 Cycle 15 Revisions Below					
4	January 5, 1996	1-5, 16	-	-	34
3	September 22, 1995	1-3, 12	-	-	34
2	March 9, 1995	1-3, 13, 20, 23-26	-	-	34
1	January 30, 1995	1-3, 13, 20, 23-26	-	-	34
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1.0 ERROR-ADJUSTED CORE OPERATING LIMITS

This Core Operating Limits Report for O2C16 has been prepared in accordance with the requirements of Technical Specification 6.9. The core operating limits within this report have been developed using NRC-approved methodology (References 1, 2, 3, and 4). The RPS protective limits and maximum allowable setpoints are documented in References 6 and 7, and validated in References 5 and 8 for O2C16. Operational limits and requirements are documented in Reference 5. The reactor coolant system design flow used in References 5 and 8 for O2C16 is 107.5 % (of 88,000 gpm per pump). The core operating limits have been developed with a radial local peaking factor ($F^N_{\Delta H}$) of 1.714 and an axial peaking factor (F^N_Z) of 1.5.

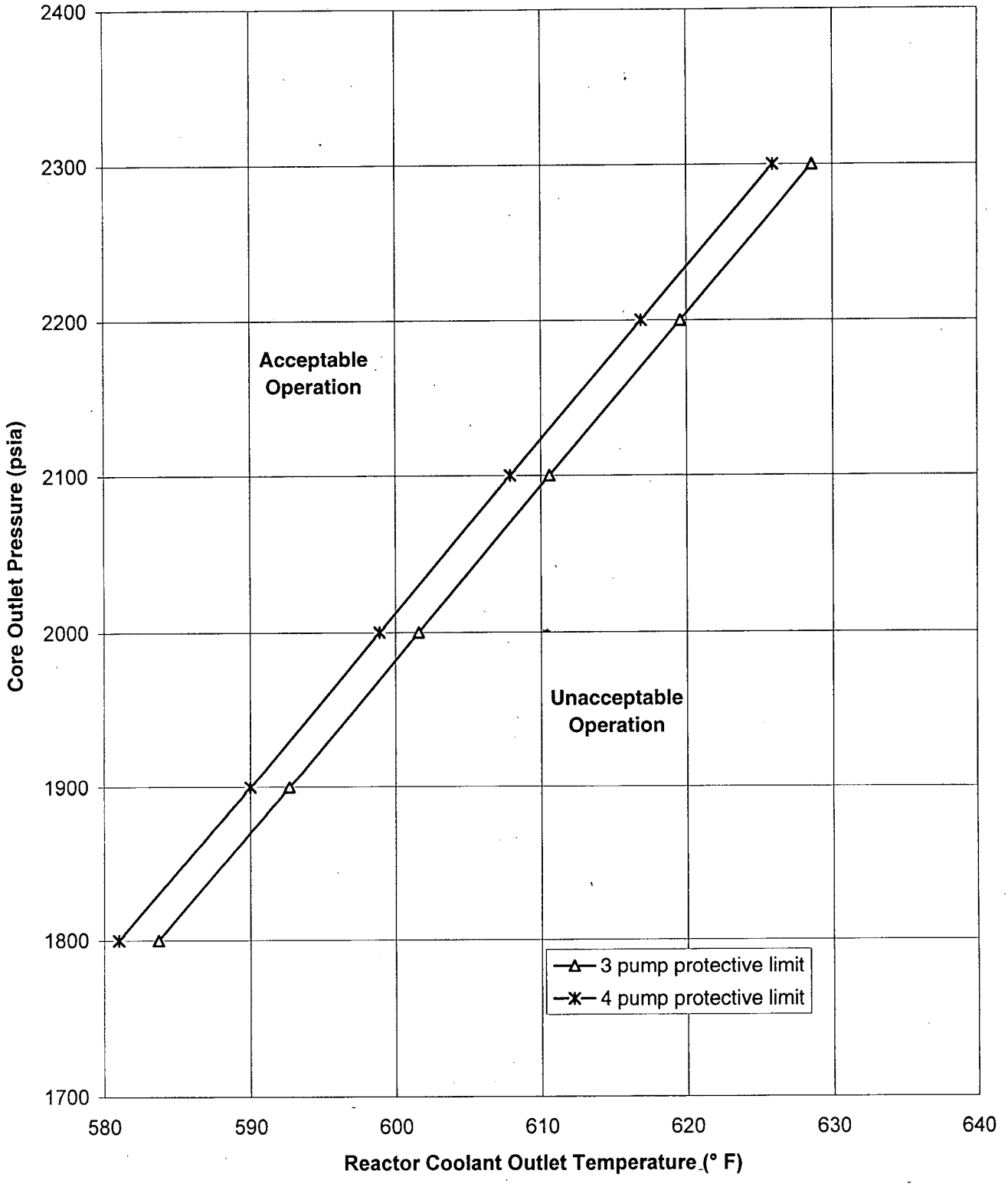
The error-adjusted core operating limits (i.e., setpoints) have been determined for O2C16, with all necessary uncertainties and margins applied. The calculations that support these setpoints are documented in Reference 5. The following cycle specific error-adjusted setpoints are included in this report:

1) RPS protective limits (Figures 1.1 and 2.1), and RPS maximum allowable setpoints (Figures 1.2 and 1.3),
2) Steady state operating band,
3) BWST, SFP, CBAST, and CFT boron requirements,
4) Quadrant power tilt operational setpoints,
5) RPS power-imbalance trip setpoints,
6) Power-imbalance operational setpoints and,
7) Rod index operational alarm and shutdown margin-restricted setpoints.

1.1 REFERENCES

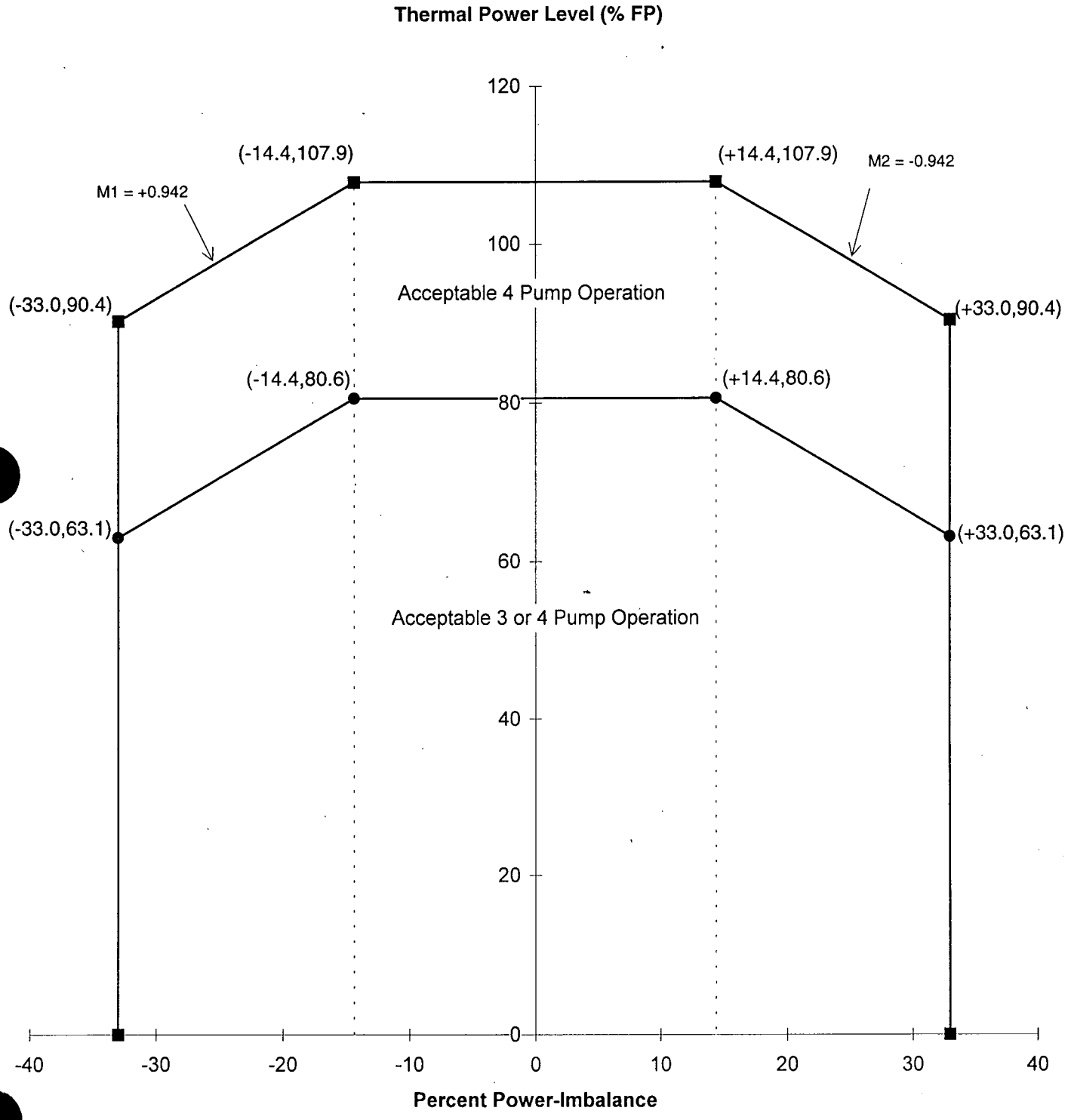
1) DPCo, Nuclear Design Methodology Using CASMO-3 / SIMULATE-3P, DPC-NE-1004A, November 1992.
2) DPCo, Oconee Nuclear Station, Reload Design Methodology II, DPC-NE-1002A, October 1985.
3) DPCo, Oconee Nuclear Station, Reload Design Methodology, NFS-1001A, April 1984.
4) DPC-NE-2003A, Oconee Nuclear Station Core Thermal Hydraulic Methodology Using VIPRE-01, July 1989.
5) O2C16 Maneuvering Analysis, DPCo calculational file, OSC-6215, Rev. 1, March 1996.
6) Variable Low Pressure Safety Limit, DPCo calculational file, OSC-4048, Revision 0, July 1990.
7) Power-Imbalance Safety Limits and Tech. Spec. Setpoints Using Error-Adjusted Flux-Flow Ratio of 1.094, DPCo calculational file, OSC-5604, Revision 0, November 1993.
8) Oconee 2 Cycle 16 Specific DNB Analysis, DPCo calculational file, OSC-6498, Revision 0, January 1996.

Figure 1.1. Variable Low RCS Pressure RPS Protective Limits



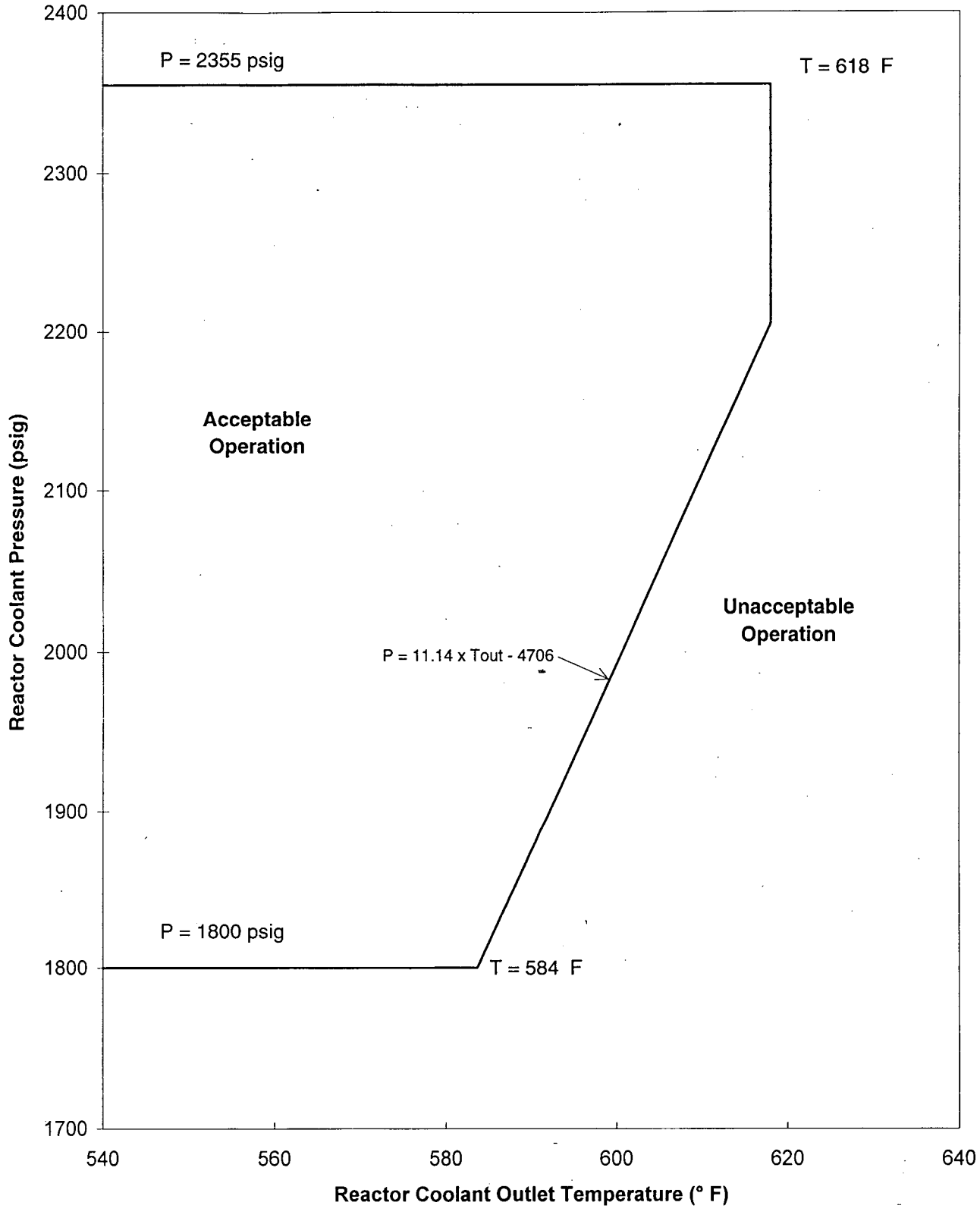
Referred to by Tech Spec 2.1

Figure 1.2. RPS Power-Imbalance Setpoints



Referred to by Tech Spec 2.3

Figure 1.3. Variable Low RCS Pressure RPS Maximum Allowable Setpoints



Referred to by Tech Spec 2.3

Oconee 2 Cycle 16

STEADY STATE OPERATING BAND

	Rod Index		APSR % withdrawn	
	Min	Max	Min	Max
0 to 460 EFPD	292 ± 5	300	30	40
460 EFPD to EOC	292 ± 5	300	100	100

Oconee 2 Cycle 16

BWST, SFP, CBAST, and CFT BORON REQUIREMENTS

0 EFPD to EOC

1) The BWST boron concentration shall be greater than 2210 ppm[1] and less than 3000 ppm[2] (referred to by Tech Spec 3.3.4).

2) The Spent Fuel Pool boron concentration shall be greater than 2210 ppm[1] and less than 3000 ppm[2] (referred to by Tech Spec 3.8.15).

3) The equivalent of at least 1100 cubic feet of 11,000 ppm boron[3] shall be maintained in the CBAST (referred to by Tech Spec 3.2.2).

4) The boron concentration in each CFT shall be greater than 1835 ppm[4] (referred to by Tech Spec 3.3.3).

5) The refueling canal boron concentration shall be greater than 2210 ppm[1] (referred to by the bases to Tech Spec 3.8.4). This concentration is large enough to maintain 1% $\Delta k/k$ shutdown margin with all control rods out of the core at temperatures down to 33 °F, and with no credit for xenon worth. There is no upper limit on the refueling canal boron concentration.

Note that in the event that the refueling boron should fall below 2210 ppm, the criticality calculations would need to be re-evaluated.

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[1] Oconee Nuclear Station Technical Specifications Bases 3.3.4.b, Through Amendment Number 200/200/197, May 1993.
[2] BORCON Code Certification and Post-LOCA Core Boron Concentration Calculation, OSC-4040, July 1990.
[3] O2C16 10 CFR 50.59 Reload Safety Evaluation, OSC-6216, DPCo, January 1996.
[4] Post-LOCA Subcriticality Analysis and O3C15 Reload Safety Evaluation and 50.59, OSC-5643, January 1994.

Oconee 2 Cycle 16

ERROR-ADJUSTED QUADRANT POWER TILT OPERATIONAL SETPOINTS

	CONDITION 1 (STEADY STATE)		CONDITION 2 (TRANSIENT)		CONDITION 3 (MAXIMUM)
	30 - 100 % FP	**0 - 30 % FP**	**30 - 100 % FP**	**0 - 30 % FP**	**0 - 100 % FP**
Full Incore Alarm *	3.50	7.85	7.35	9.64	16.79
Outcore Alarm	2.13	6.09	5.63	7.72	14.22
Backup Incore	2.04	3.94	3.64	5.03	9.58

* BASED UPON q (fraction of incore detector initial charge consumed) = 0.452
(See Reference 1 for more details on this calculation)

Note that the above limits will be used in the following order of priority:

1) Full Incore
2) Outcore
3) Backup Incore

The **backup incore** limits will be used in the event that the Operator Aid Computer is out of service. For normal operation with a working Operator Aid Computer, the **full incore** limits will be used as long as sufficient incore detector strings are operational. In the event that sufficient incore strings are not operational, the **outcore** limits will be used.

The Steady State, Transient, and Maximum Limits tabulated above define quadrant tilt ranges that impose different restrictions on power operation, and time intervals within which specific action may be required. In brief, Condition 1 applies to all power operation above 15% power excluding physics testing. For Conditions 2 and 3, steps are taken to reduce the tilt to within Condition 1 limits or a power reduction is required. If tilt is in excess of Condition 3 limits, reactor shutdown is required. Refer to the Technical Specification Sections listed below for more detailed information.

Referred to by Tech. Spec.
3.5.2.4.a
3.5.2.4.b
3.5.2.4.d
3.5.2.4.e
3.5.2.4.f

Oconee 2 Cycle 16

ERROR ADJUSTED RPS POWER-IMBALANCE TRIP SETPOINTS

	POWER % OF 2568 MW	IMBALANCE SETPOINT
4 PUMP	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 PUMP	0.00	-33.0
	63.1	-33.0
	80.6	-14.4
	80.6	14.4
	63.1	33.0
	0.00	33.0

Oconee 2 Cycle 16

ERROR ADJUSTED POWER-IMBALANCE OPERATIONAL SETPOINTS

0 EFPD to EOC

	POWER % OF 2568 MW	P-I OPERATIONAL LIMIT	FULL INCORE ALARM SETPOINT	BACKUP INCORE SETPOINT	OUTCORE ALARM SETPOINT
4 PUMP	0	-43.8	-31.5	-31.0	-31.5
	80	-43.8	-31.5	-31.0	-31.5
	90	-42.3	-29.7	-29.3	-29.7
	100	-30.0	-19.1	-18.7	-19.1
	102	-	-17.0	-16.5	-17.0
	102	-	+17.0	+17.0	+17.0
	100	+30.0	+19.1	+18.7	+19.1
	90	+37.1	+29.7	+24.9	+25.5
	80	+36.8	+31.5	+25.1	+25.8
	0	+36.8	+31.5	+25.1	+25.8
3 PUMP	0.0	-43.8	-31.5	-31.0	-31.5
	63.3	-	-31.5	-	-31.5
	63.77	-	-	-31.0	-
	77.0	-43.8	-17.0	-17.0	-17.0
	77.0	+36.8	+17.0	+17.0	+17.0
	69.35	-	-	+25.1	-
	68.69	-	-	-	+25.8
	63.3	-	+31.5	-	-
	0.0	+36.8	+31.5	+25.1	+25.8

Oconee 2 Cycle 16

ERROR ADJUSTED ROD INDEX OPERATIONAL ALARM SETPOINTS

0 EFPD to EOC

	POWER % OF 2568 MW	RI, %WD		
		MIN		MAX
		0 INOP ROD	1 INOP ROD	
4 PUMP	102	263.5	283.4	300
	100	261.5	281.5	300
	90	251.5	271.9	300
	80	241.5	262.3	300
	50	201.5	233.4	300
	48	195.2	231.5	300
	15	91.5	165.5	300
	13	76.5	161.5	300
	5	16.5	93.5	300
	3	1.5	76.5	300
	2.8	0.0	-	300
	0.0	-	51.0	300
3 PUMP	77	237.5	285.2	300
	75	234.8	281.5	300
	50	201.5	235.2	300
	48	195.2	231.5	300
	15	91.5	165.5	300
	13	76.5	161.5	300
	5	16.5	93.5	300
	3	1.5	76.5	300
	2.8	0.0	-	300
	0.0	-	51.0	300

Oconee 2 Cycle 16

ERROR ADJUSTED ROD INDEX SHUTDOWN MARGIN SETPOINTS

0 EFPD to EOC

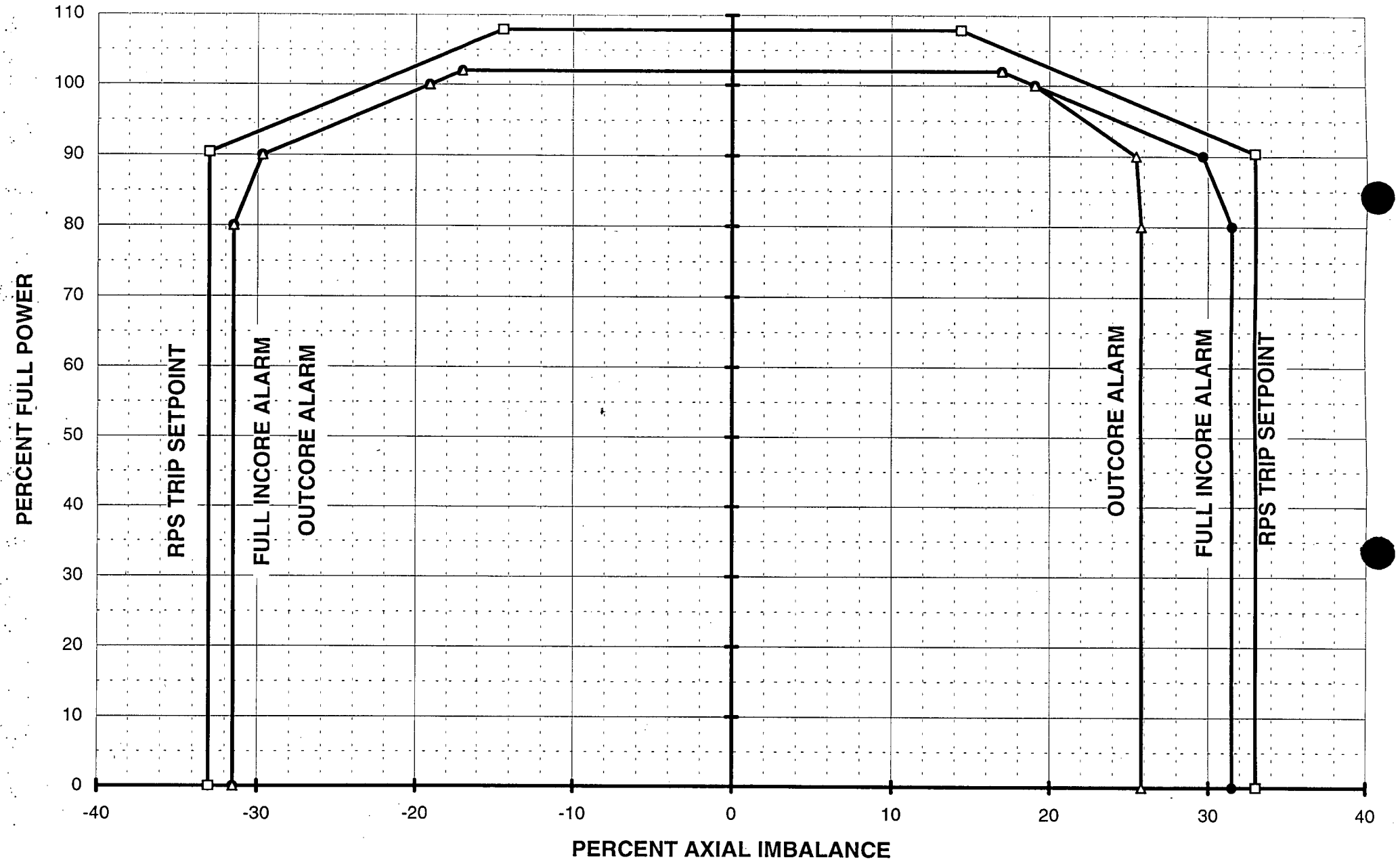
	POWER % OF 2568 MW	RI, %WD		
		MIN		MAX
		0 INOP ROD	1 INOP ROD	
4 PUMP	102	224.6	283.4	300
	100	221.5	281.5	300
	48	141.5	231.5	300
	13	76.5	161.5	300
	3.0	1.5	76.5	300
	2.8	0.0	-	300
	0.0	-	51.0	300
3 PUMP	77	227.4	285.2	300
	75	221.5	281.5	300
	48	141.5	231.5	300
	13	76.5	161.5	300
	3.0	1.5	76.5	300
	2.8	0.0	-	300
	0.0	-	51.0	300

OCONEE 2 CYCLE 16 IMBALANCE SETPOINTS

4 PUMP OPERATION BOC TO EOC

PERCENT OF FULL POWER	R P S TRIP		FULL INCORE ALARM		OUTCORE ALARM	
107.9	-14.40	14.40				
107	-15.36	15.36				
106	-16.42	16.42				
105	-17.48	17.48				
104	-18.55	18.55				
103	-19.61	19.61				
102	-20.67	20.67	-17.00	17.00	-17.00	17.00
101	-21.73	21.73	-18.05	18.05	-18.05	18.05
100	-22.80	22.80	-19.10	19.10	-19.10	19.10
99	-23.86	23.86	-20.16	20.16	-20.16	19.74
98	-24.92	24.92	-21.22	21.22	-21.22	20.38
97	-25.99	25.99	-22.28	22.28	-22.28	21.02
96	-27.05	27.05	-23.34	23.34	-23.34	21.66
95	-28.11	28.11	-24.40	24.40	-24.40	22.30
94	-29.17	29.17	-25.46	25.46	-25.46	22.94
93	-30.24	30.24	-26.52	26.52	-26.52	23.58
92	-31.30	31.30	-27.58	27.58	-27.58	24.22
91	-32.36	32.36	-28.64	28.64	-28.64	24.86
90.4	-33.00	33.00	-29.28	29.28	-29.28	25.24
90	-33.00	33.00	-29.70	29.70	-29.70	25.50
89	-33.00	33.00	-29.88	29.88	-29.88	25.53
88	-33.00	33.00	-30.06	30.06	-30.06	25.56
87	-33.00	33.00	-30.24	30.24	-30.24	25.59
86	-33.00	33.00	-30.42	30.42	-30.42	25.62
85	-33.00	33.00	-30.60	30.60	-30.60	25.65
84	-33.00	33.00	-30.78	30.78	-30.78	25.68
83	-33.00	33.00	-30.96	30.96	-30.96	25.71
82	-33.00	33.00	-31.14	31.14	-31.14	25.74
81	-33.00	33.00	-31.32	31.32	-31.32	25.77
80	-33.00	33.00	-31.50	31.50	-31.50	25.80
0	-33.00	33.00	-31.50	31.50	-31.50	25.80
PERCENT OF FULL POWER	R P S TRIP		FULL INCORE ALARM		OUTCORE ALARM	

OCONEE 2 CYCLE 16 I[illegible]ALANCE SETPOINTS
4 PUMP OPERATION -- BOC TO EOC

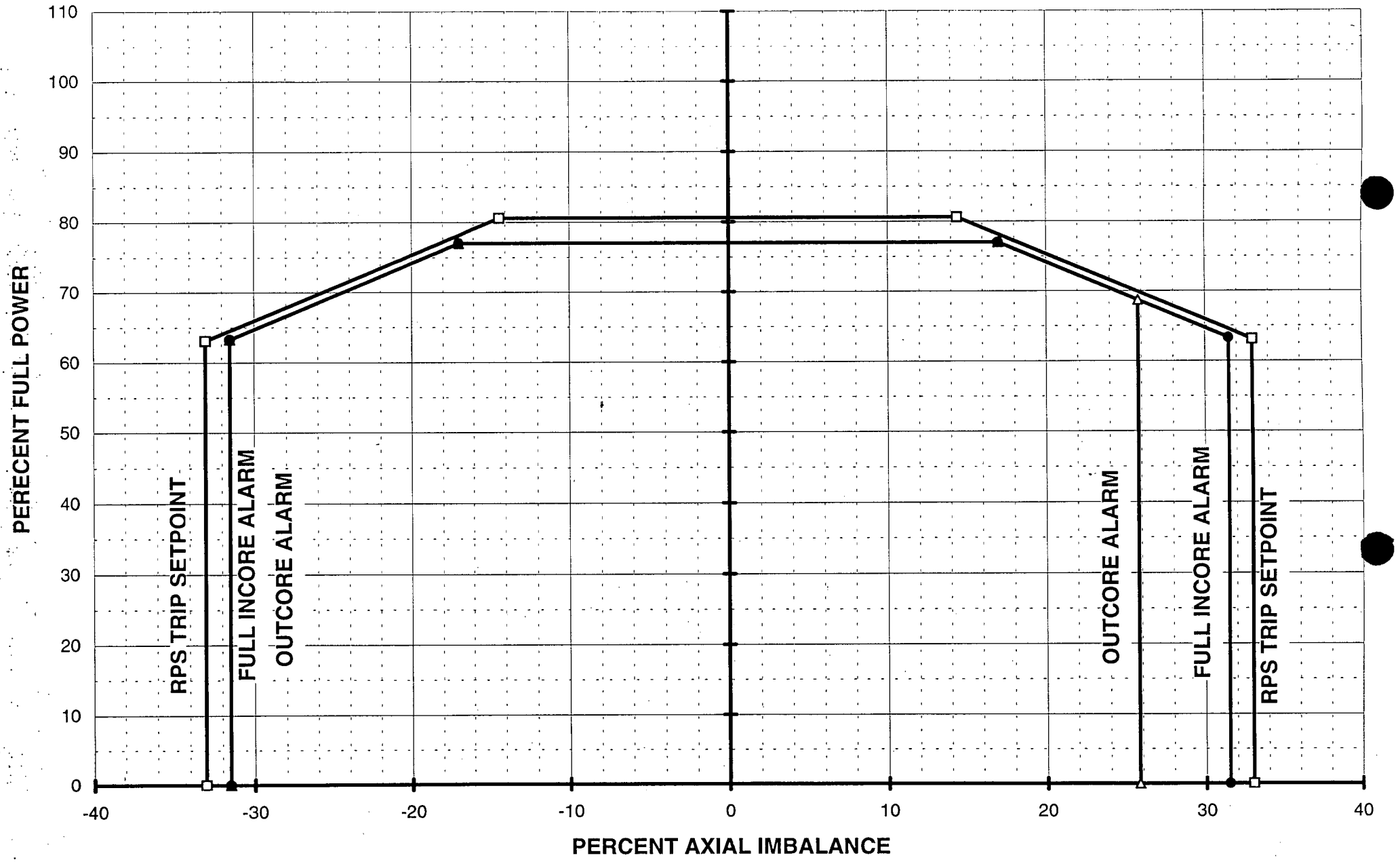


OCONEE 2 CYCLE 16 IMBALANCE SETPOINTS

3 PUMP OPERATION BOC TO EOC

PERCENT OF FULL POWER	R P S TRIP		FULL INCORE ALARM		OUTCORE ALARM	
80.6	-14.40	14.40				
80	-15.04	15.04				
79	-16.10	16.10				
78	-17.16	17.16				
77	-18.23	18.23	-17.00	17.00	-17.00	17.00
76	-19.29	19.29	-18.06	18.06	-18.06	18.06
75	-20.35	20.35	-19.12	19.12	-19.12	19.12
74	-21.41	21.41	-20.18	20.18	-20.18	20.18
73	-22.48	22.48	-21.23	21.23	-21.23	21.23
72	-23.54	23.54	-22.29	22.29	-22.29	22.29
71	-24.60	24.60	-23.35	23.35	-23.35	23.35
70	-25.67	25.67	-24.41	24.41	-24.41	24.41
69	-26.73	26.73	-25.47	25.47	-25.47	25.47
68.69	-27.06	27.06	-25.80	25.80	-25.80	25.80
68	-27.79	27.79	-26.53	26.53	-26.53	26.53
67	-28.85	28.85	-27.58	27.58	-27.58	27.58
66	-29.92	29.92	-28.64	28.64	-28.64	25.80
65	-30.98	30.98	-29.70	29.70	-29.70	25.80
64	-32.04	32.04	-30.76	30.76	-30.76	25.80
63.3	-32.79	32.79	-31.50	31.50	-31.50	25.80
63.1	-33.00	33.00	-31.50	31.50	-31.50	25.80
63	-33.00	33.00	-31.50	31.50	-31.50	25.80
62	-33.00	33.00	-31.50	31.50	-31.50	25.80
61	-33.00	33.00	-31.50	31.50	-31.50	25.80
60	-33.00	33.00	-31.50	31.50	-31.50	25.80
0	-33.00	33.00	-31.50	31.50	-31.50	25.80
PERCENT OF FULL POWER	R P S TRIP		FULL INCORE ALARM		OUTCORE ALARM	

OCONEE 2 CYCLE 16 I[illegible]ALANCE SETPOINTS
3 PUMP OPERATION -- BOC TO EOC



PERCENT OF FULL POWER	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION 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	24	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	14	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	4	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	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
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	100	96.2	21.2
61	100	61.5	0	100	95.6	20.6
60	100	60	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
PERCENT OF FULL POWER	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION SETPOINT		

RI = 300 is withdrawal limit at all power levels.

(Continued on next page.)

OCONEE 2 CYCLE 16

4 Pump Operation
0 Inoperable Control Rods

ERROR-ADJUSTED ROD INDEX SETPOINTS
(BOC to EOC)

PERCENT OF FULL POWER	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION SETPOINT		
	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
49	100	43	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	7
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
41	100	28.5	0	100	73.2	0
40	100	26.6	0	100	70.1	0
39.1	100	25	0	100	67.3	0
39	99.9	24.9	0	100	66.9	0
38	99	24	0	100	63.8	0
37	98	23	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
25	86.9	11.9	0	99	24	0
24	86	11	0	97.4	22.4	0
23	85	10	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	13	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	75	0	0
12	69	0	0	69	0	0
11	61.5	0	0	61.5	0	0
10	54	0	0	54	0	0
9	46.5	0	0	46.5	0	0
8	39	0	0	39	0	0
7	31.5	0	0	31.5	0	0
6	24	0	0	24	0	0
5	16.5	0	0	16.5	0	0
4	9	0	0	9	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
PERCENT OF FULL POWER	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION SETPOINT		

RI = 300 is withdrawal limit at all power levels.

PERCENT OF FULL POWER	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION 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	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
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	7	100	97.6	22.6
63	100	80.5	5.5	100	96.9	21.9
62	100	79	4	100	96.2	21.2
61	100	77.5	2.5	100	95.6	20.6
60	100	76	1	100	94.9	19.9
59.3	100	75	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	7
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
41	100	28.5	0	100	73.2	0
40	100	26.6	0	100	70.1	0
39.1	100	25	0	100	67.3	0
39	99.9	24.9	0	100	66.9	0
38	99	24	0	100	63.8	0
37	98	23	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
PERCENT OF FULL POWER	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION SETPOINT		

RI = 300 is withdrawal limit at all power levels.

(Continued on next page.)

OCONEE 2 CYCLE 16

3 Pump Operation
0 Inoperable Control Rods

ERROR-ADJUSTED ROD INDEX SETPOINTS
(BOC to EOC)

PERCENT OF FULL POWER	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION SETPOINT		
	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
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
25	86.9	11.9	0	99	24	0
24	86	11	0	97.4	22.4	0
23	85	10	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	13	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	75	0	0
12	69	0	0	69	0	0
11	61.5	0	0	61.5	0	0
10	54	0	0	54	0	0
9	46.5	0	0	46.5	0	0
8	39	0	0	39	0	0
7	31.5	0	0	31.5	0	0
6	24	0	0	24	0	0
5	16.5	0	0	16.5	0	0
4	9	0	0	9	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
PERCENT OF FULL POWER	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION SETPOINT		

RI = 300 is withdrawal limit at all power levels.

OCONEE 2 CYCLE 16

4 Pump Operation
1 Inoperable Control Rod

ERROR-ADJUSTED ROD INDEX SETPOINTS
(BOC to EOC)

PERCENT OF FULL POWER	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION 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	100	100	70
87	100	100	69	100	100	69
86	100	100	68	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	100	100	45
61	100	100	44	100	100	44
60	100	100	43	100	100	43
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
PERCENT OF FULL POWER	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION SETPOINT		

RI = 300 is withdrawal limit at all power levels.

(Continued on next page.)

OCONEE 2 CYCLE 16
ERROR-ADJUSTED ROD INDEX SETPOINTS
(BOC to EOC)

4 Pump Operation
1 Inoperable Control Rod

PERCENT OF FULL POWER	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION 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	100	100	25
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	100	75	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	100	53	0
11	100	44.5	0	100	44.5	0
10	100	36	0	100	36	0
9	100	27.5	0	100	27.5	0
8.7	100	25	0	100	25	0
8	97	22	0	97	22	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	5	0	80	5	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
PERCENT OF FULL POWER	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION SETPOINT		

RI = 300 is withdrawal limit at all power levels.

OCONEE 2 CYCLE 16

3 Pump Operation
1 Inoperable Control Rod

ERROR-ADJUSTED ROD INDEX SETPOINTS
(BOC to EOC)

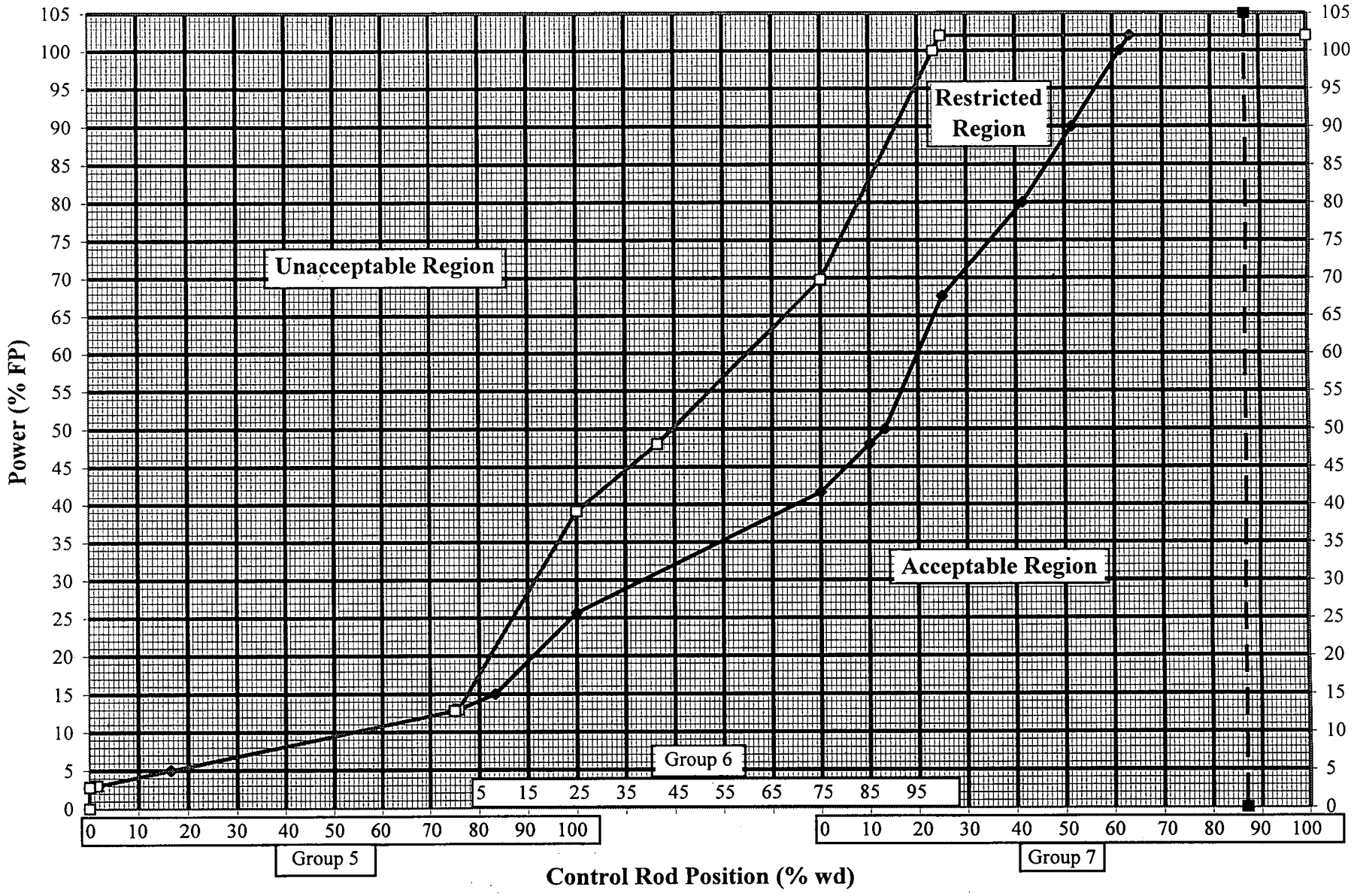
PERCENT OF FULL POWER	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION SETPOINT		
	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
77	100	100	85.2	100	100	85.2
76	100	100	83.4	100	100	83.4
75	100	100	81.5	100	100	81.5
74	100	100	79.6	100	100	79.6
73	100	100	77.8	100	100	77.8
72	100	100	75.9	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	100	100	63
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	100	100	50
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	100	100	25
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
PERCENT OF FULL POWER	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION SETPOINT		

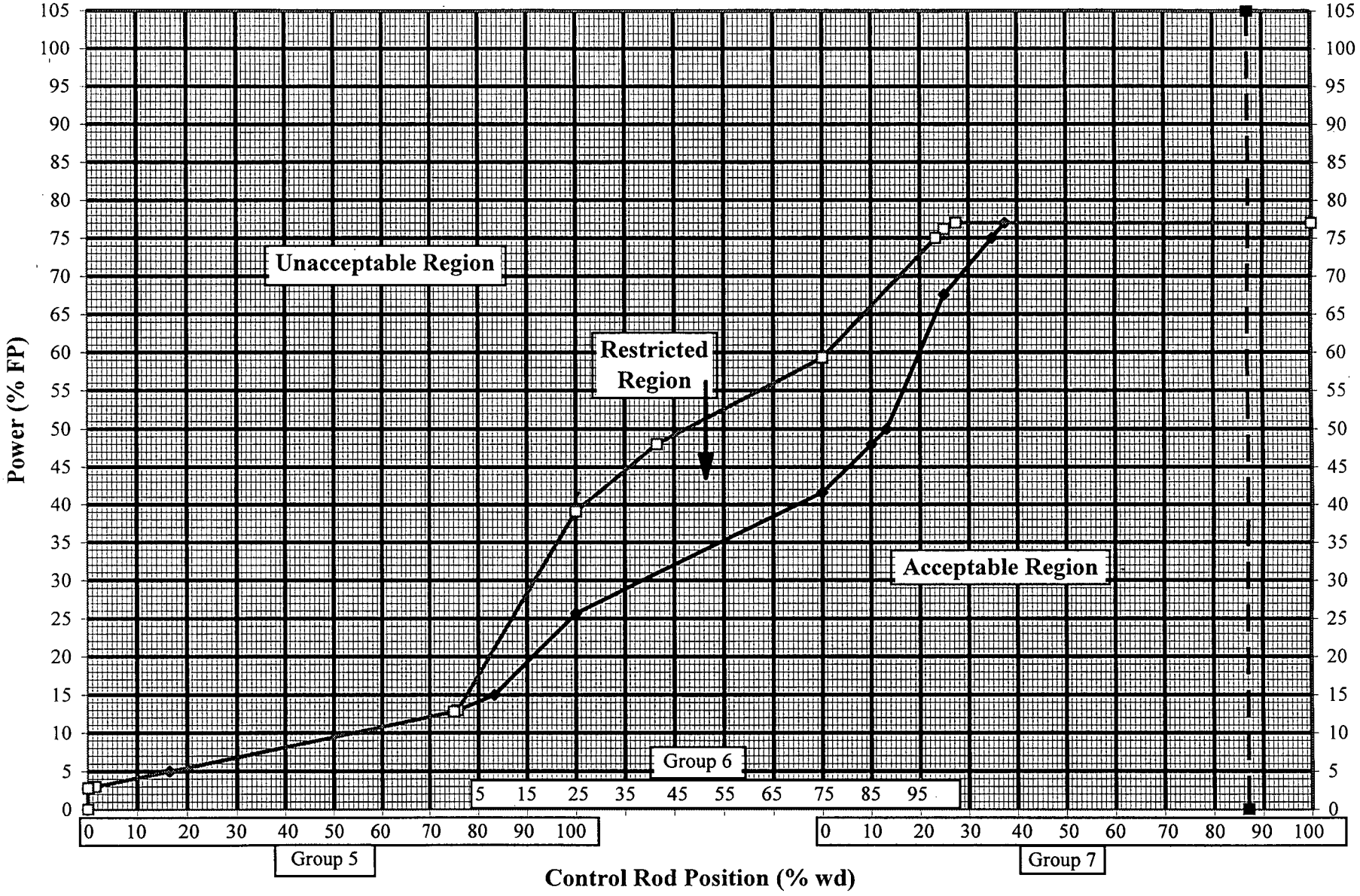
RI = 300 is withdrawal limit at all power levels.

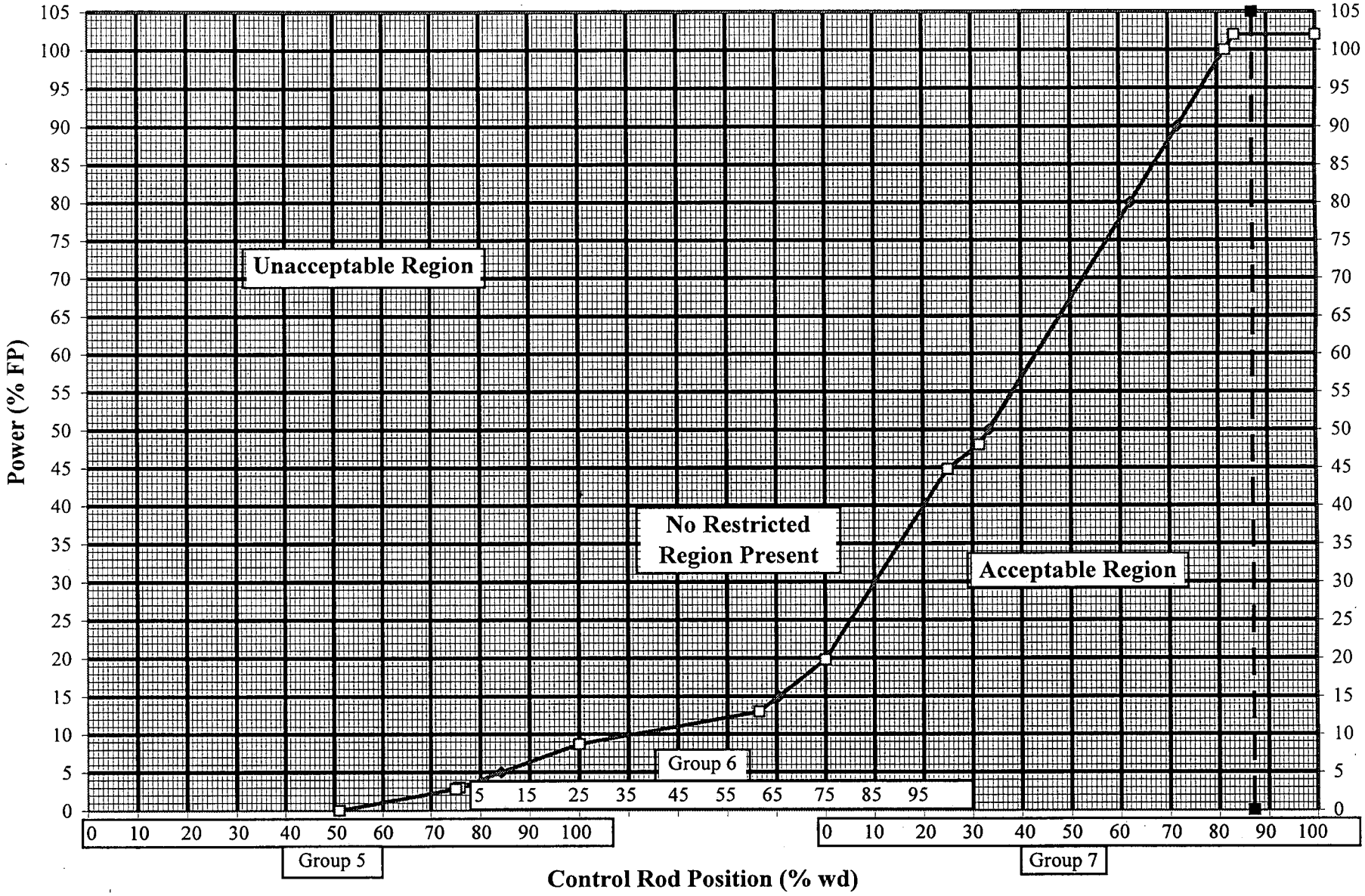
(Continued on next page.)

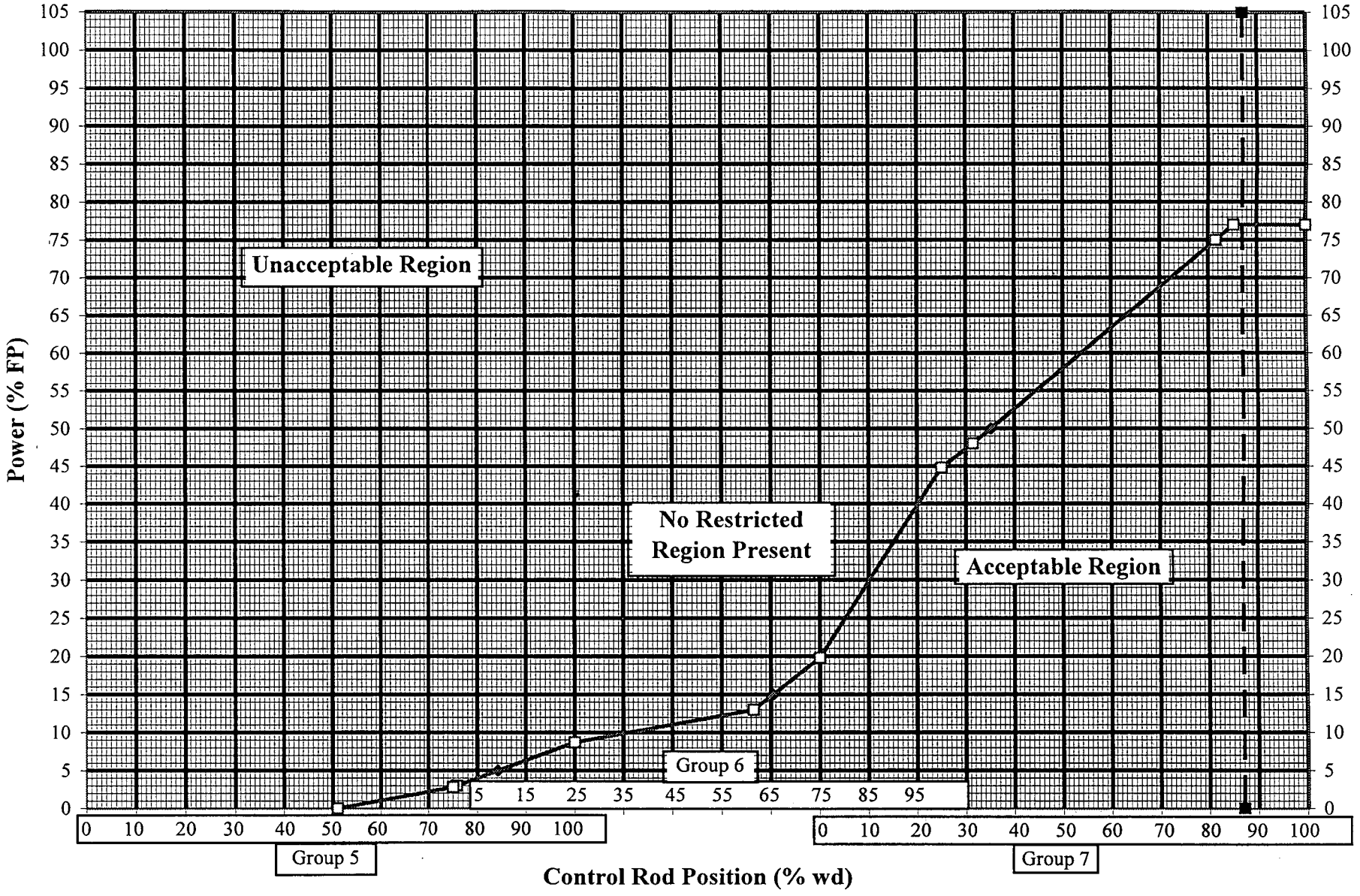
PERCENT OF FULL POWER	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION SETPOINT		
	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
23	100	78.2	3.2	100	78.2	3.2
22	100	77.2	2.2	100	77.2	2.2
21	100	76.2	1.2	100	76.2	1.2
20	100	75.2	0.2	100	75.2	0.2
19.8	100	75	0	100	75	0
19	100	73.5	0	100	73.5	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	100	53	0
11	100	44.5	0	100	44.5	0
10	100	36	0	100	36	0
9	100	27.5	0	100	27.5	0
8.7	100	25	0	100	25	0
8	97	22	0	97	22	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	5	0	80	5	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
PERCENT OF FULL POWER	CRGP 5	CRGP 6	CRGP 7	CRGP 5	CRGP 6	CRGP 7
	SHUTDOWN MARGIN INSERTION SETPOINT			OPERATIONAL ALARM INSERTION SETPOINT		

RI = 300 is withdrawal limit at all power levels.


Power (% FP)
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Unacceptable Region
Restricted Region
Acceptable Region
Group 6
5 15 25 35 45 55 65 75 85 95
0 10 20 30 40 50 60 70 80 90 100
Group 5
0 10 20 30 40 50 60 70 80 90 100
Group 7
Control Rod Position (% wd)


Unacceptable Region
Restricted Region
Acceptable Region
Power (% FP)
Control Rod Position (% wd)
Group 5
Group 6
Group 7
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0 10 20 30 40 50 60 70 80 90 100
5 15 25 35 45 55 65 75 85 95


Unacceptable Region
No Restricted Region Present
Acceptable Region
Group 6
Group 5
Group 7
Power (% FP)
Control Rod Position (% wd)
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0 10 20 30 40 50 60 70 80 90 100
5 15 25 35 45 55 65 75 85 95


Power (% FP)
Unacceptable Region
No Restricted Region Present
Acceptable Region
Group 6
Group 5
Group 7
Control Rod Position (% wd)

2.0 CORE OPERATING LIMITS (NOT ERROR-ADJUSTED)

The following cycle-specific core operating limits are included in this report. All computations performed in setting these limits used the approved SIMULATE methodology.

1) RPS protective limits (Figure 2.1 and table),

2) Quadrant power tilt operational limits,

3) Power-imbalance operational limits and,

4) Rod index operational alarm and shutdown margin-restricted limits.

2.1 REFERENCES

1) DPCo, Nuclear Design Methodology Using CASMO-3 / SIMULATE-3P, DPC-NE-1004A, November 1992.

2) DPCo, Oconee Nuclear Station, Reload Design Methodology II, DPC-NE-1002A, October 1985.

3) DPCo, Oconee Nuclear Station, Reload Design Methodology, NFS-1001A, April 1984.

4) DPC-NE-2003A, Oconee Nuclear Station Core Thermal Hydraulic Methodology Using VIPRE-01, July 1989.

5) O2C16 Maneuvering Analysis, DPCo calculational file, OSC-6215, Revision 1, March 1996.

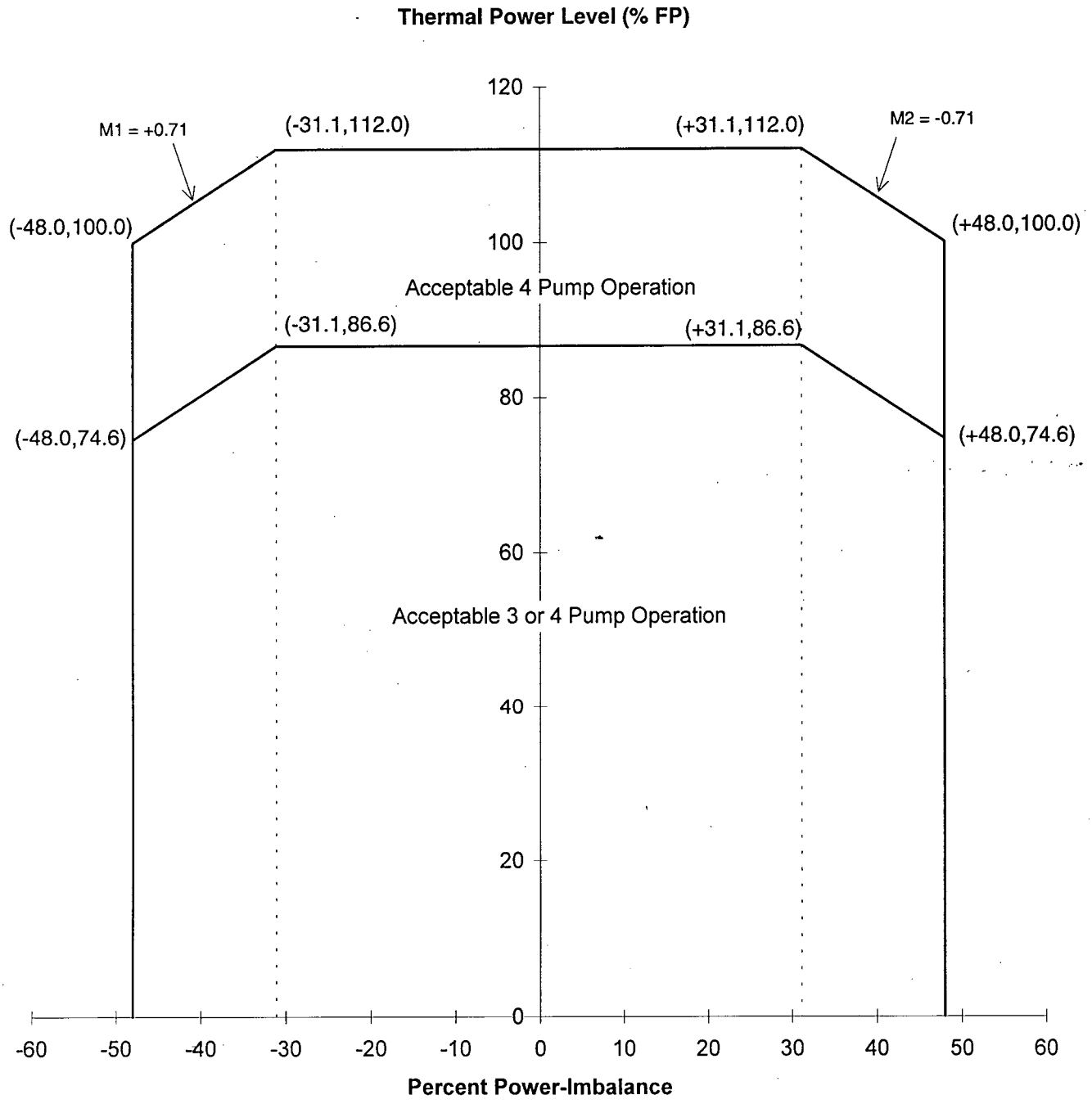
6) Variable Low Pressure Safety Limit, DPCo calculational file, OSC-4048, Revision 0, July 1990.

7) Power-Imbalance Safety Limits and Tech. Spec. Setpoints Using Error-Adjusted Flux-Flow Ratio of 1.094, DPCo calculational file, OSC-5604, Revision 0, November 1993.

8) Oconee 2 Cycle 16 Specific DNB Analysis, DPCo calculational file, OSC-6498, Revision 0, January 1996.

Figure 2.1. Axial Power Imbalance RPS Protective Limits

NOT FOR PLANT USE -- SEE PAGE 7



Referred to by Tech Spec 2.1

Oconee 2 Cycle 16

RPS POWER-IMBALANCE PROTECTIVE LIMITS*

***NOT FOR PLANT USE -- SEE PAGE 12**

	POWER % OF 2568 MW	IMBALANCE LIMITS
4 PUMP	0.0	-48.0
	100.0	-48.0
	112.0	-31.1
	112.0	31.1
	100.0	48.0
	0.0	48.0
3 PUMP	0.0	-48.0
	74.6	-48.0
	86.6	-31.1
	86.6	31.1
	74.6	48.0
	0.0	48.0

* -- These limits have **not** been error-adjusted and **are not for plant use**. Refer to Section 1, page 12 of this Report for the error-adjusted setpoints.

Referred to by Tech. Spec. 2.1

Oconee 2 Cycle 16

QUADRANT POWER TILT OPERATIONAL LIMITS*

***NOT FOR PLANT USE -- SEE PAGE 11**

STEADY STATE		TRANSIENT		MAXIMUM
30 - 100 % FP	0 - 30 % FP	30 - 100 % FP	0 - 30 % FP	0 - 100 % FP
5.13	10.00	9.44	12.00	20.00

The Steady State, Transient, and Maximum Limits tabulated above define quadrant tilt ranges that impose different restrictions on power operation, and time intervals within which specific action may be required. Refer to the Technical Specification Sections listed below for more detailed information.

Referred to by Tech. Spec.
3.5.2.4.a
3.5.2.4.b
3.5.2.4.d
3.5.2.4.e
3.5.2.4.f

Oconee 2 Cycle 16

POWER-IMBALANCE OPERATIONAL LIMITS*

***NOT FOR PLANT USE -- SEE PAGE 13**

	POWER % OF 2568 MW	IMBALANCE LIMITS
4 PUMP	0.0	-43.8
	80.0	-43.8
	90.0	-42.3
	100.0	-30.0
	100.0	+30.0
	90.0	+37.1
	80.0	+36.8
	0.0	+36.8
3 PUMP	0.0	-43.8
	77.0	-43.8
	77.0	+36.8
	0.0	+36.8

* -- These limits have not been error-adjusted and **are not for plant use**. Refer to Section 1 of this Report for the error-adjusted setpoints.

Referred to by Tech. Spec. 3.5.2.6

Oconee 2 Cycle 16

ROD INDEX OPERATIONAL LIMITS*

***NOT FOR PLANT USE -- SEE PAGE 14**

0 EFPD to EOC

	POWER % OF 2568 MW	RI, %WD		
		MIN		MAX
		0 INOP ROD	1 INOP ROD	
4 PUMP	102	262.0	280.0	300
	100	260.0	278.1	300
	90	250.0	268.5	300
	80	240.0	258.8	300
	50	200.0	230.0	300
	15	90.0	160.0	300
	5	0.0	75.0	300
3 PUMP	77	236.0	280.0	300
	50	200.0	230.0	300
	15	90.0	160.0	300
	5	0.0	75.0	300

* -- These limits have not been error-adjusted and **are not for plant use**. Refer to Section 1 of this Report for the error-adjusted setpoints.

Referred to by Tech. Spec.
3.1.3.5
3.1.11
3.5.2.1.b
3.5.2.2.d.2.c
3.5.2.3
3.5.2.5.c

Oconee 2 Cycle 16

ROD INDEX SHUTDOWN MARGIN LIMITS*

***NOT FOR PLANT USE -- SEE PAGE 15**

0 EFPD to EOC

	POWER % OF 2568 MW	RI, %WD		
		MIN		MAX
		0 INOP ROD	1 INOP ROD	
4 PUMP	102	220	280	300
	50	140	230	300
	15	75	160	300
	5	0	75	300
3 PUMP	77	220	280	300
	50	140	230	300
	15	75	160	300
	5	0	75	300

* -- These limits have not been error-adjusted and **are not for plant use**. Refer to Section 1 of this Report for the error-adjusted setpoints.

Referred to by Tech. Spec.:
3.1.3.5
3.1.11
3.5.2.1.b
3.5.2.2.d.2.c
3.5.2.3
3.5.2.5.c