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U. S. Nuclear Regulatory Commission
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Washington, D. C. 20555-0001

Duke Energy Carolinas, LLC
Oconee Nuclear Station (ONS) Unit 2
Docket Number 50-270
Renewed License Number DPR-47

Subject: Transmittal of Core Operating Limits Report (COLR) for Oconee Unit 2 Cycle 31 (Revision 1 and Revision 2)

Pursuant to Oconee Technical Specification 5.6.5.d, attached are information copies of the Core Operating Limits Report (COLR) for Oconee Unit 2, Cycle 31, Revisions 1 and 2. Revision 1 is a mid-cycle revision completed to support operation with Group 8 rods fully inserted throughout the cycle. Revision 2 is a mid-cycle revision completed to add reference for COPERNIC methodology.

Any inquiries on this submittal should be directed to Sam Adams, Oconee Regulatory Affairs, at 864-873-3348.

Sincerely,

H. Todd Grant
General Manager
Nuclear Engineering
Oconee Nuclear Station

Attachments: ONEI-0400-567 Revision 1 – Oconee Unit 2 Cycle 31 COLR
ONEI-0400-567 Revision 2 – Oconee Unit 2 Cycle 31 COLR

cc (w/attachment):

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Orr, David S	Originator	3/6/2022
Forster, Joy D	Design Verifier	3/7/2022
Daji, Vijay D	Cross Disciplinary Review	3/7/2022
Green, Eric N.	EI Inspection - site	3/7/2022
Lambert, Brad	Approver	3/7/2022

Notes :

Oconee 2 Cycle 31 Core Operating Limits Report

ONEI-0400-567
Revision 1

Reload 50.59 AR# 02415451

Prepared By:	David S. Orr	All signatures were captured via Fusion E-signature. See the Fusion cover sheet for signature dates.
Design Verified By:	Joy D. Forster	
Cross-Disciplinary Review By:	Vijay Daji, Safety Analysis	
Stakeholder Inspection By:	Eric Green, ONS RES	The CDR was limited to pages 4, 6 and 20 only.
Approved By:	Brad J. Lambert	

Revision Summary

Revision	Pages Revised	Pages Added	Pages Deleted	Comments
0	--	1 - 22	--	Original issue.
1	1-22	--	--	Revised for operation with Group 8 fully inserted throughout the cycle.

NOTES:

- The O2C31 COLR will cease to be effective during NO MODE between cycles 31 and 32.

Oconee 2 Cycle 31

Table Of Contents

Section 1.0 Error Adjusted Core Operating Limits

Section 2.0 Core Operating Limits - Not Error Adjusted (NOT FOR PLANT USE)

Oconee 2 Cycle 31

1.0 Error Adjusted Core Operating Limits

The Core Operating Limits Report for O2C31 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 12. The RPS protective limits and maximum allowable setpoints are documented in References 13 through 15. These limits are validated for use in O2C31 by References 16 and 17. The O2C31 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 (Fz) of 1.5, and an EOC (< 100 ppmB) Tavg reduction for up to 10°F provided 4 RCPs are in operation and Tavg 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 O2C31 reload core.

1.1 References

1. DPC-NE-1006-PA, Oconee Nuclear Design Methodology Using CASMO-4 / SIMULATE-3, NRC SE issued August 2, 2011.
2. DPC-NE-1002-A, Oconee Nuclear Station Reload Design Methodology II, SE dated July 21, 2011.
3. NFS-1001-A, Oconee Nuclear Station Reload Design Methodology, SE dated July 21, 2011.
4. DPC-NE-2003-PA, ONS Core Thermal Hydraulic Methodology Using VIPRE-01, SE dated July 21, 2011.
5. DPC-NE-2005-PA, Thermal Hydraulic Statistical Core Design Methodology, SE dated October 29, 2008.
6. DPC-NE-2008-PA, Fuel Mechanical Reload Analysis Methodology Using TACO3 and GDTACO, SE dated July 21, 2011.
7. DPC-NE-3005-PA, UFSAR Chapter 15 Transient Analysis Methodology, SE dated January 26, 2021.
8. DPC-NE-3000-PA, Thermal Hydraulic Transient Analysis Methodology, SE dated July 21, 2011.
9. BAW-10192P-A, Revision 0, BWNT LOCA - BWNT Loss of Coolant Accident Evaluation Model for Once-Through Steam Generator Plants, 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-10192P-A, Supplement 1P-A, Revision 0, BWNT Loss of Coolant Accident Evaluation Model for Once-Through Steam Generator Plants, SE dated November 2, 2017.
12. BAW-10227P-A, Revision 1, Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel, June 2003 (SER to BAW-10186P-A dated June 18, 2003).
13. OSC-4048, Revision 6, RPS RCS Pressure & Temperature Trip Function Uncertainty Analyses and Variable Low Pressure Safety Limit.
14. OSC-5604, Revision 5, Power Imbalance Safety Limits and Tech Spec Setpoints Using Error Adjusted Flux-Flow Ratio of 1.094.
15. OSC-7265, Revision 1, ΔTc and EOC Reduced Tavg Operation.
16. OSC-11955, Revision 2, O2C31 Maneuvering Analysis.
17. OSC-11974, Revision 1, O2C31 Reload Safety Evaluation.

Oconee 2 Cycle 31

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 **2400** ppm. The average boron concentration in the CFT's shall be less than **4000** ppm. Referred to by TS 3.5.1.

RCS and Refueling canal boron concentration shall be greater than **2400** ppm and less than **3000** 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 $\Delta\rho$ / °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 > 2125 psig
3 RCP: measured hot leg pressure > 2125 psig

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

The measured Tavg must be less than COLR limits minus instrument uncertainty. ΔTc is the setpoint value selected by the operators.

	Max Loop Tavg (Incl 2°F unc)		
ΔTc, °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	

* 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 ≥ **108.5** %df
3 RCP: Measured ≥ **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% ± 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 2 Cycle 31

Quadrant Power Tilt Setpoints

	Steady State		Transient		Maximum
Core Power Level, %FP	0 - 30	> 30	0 - 30	> 30	> 0
Full Incore	7.93	4.50	9.72	7.43	16.87
Out of Core	6.09	2.96	7.71	5.63	14.22
Backup Incore	3.86	2.46	4.81	3.62	10.06

Referred to by TS 3.2.3

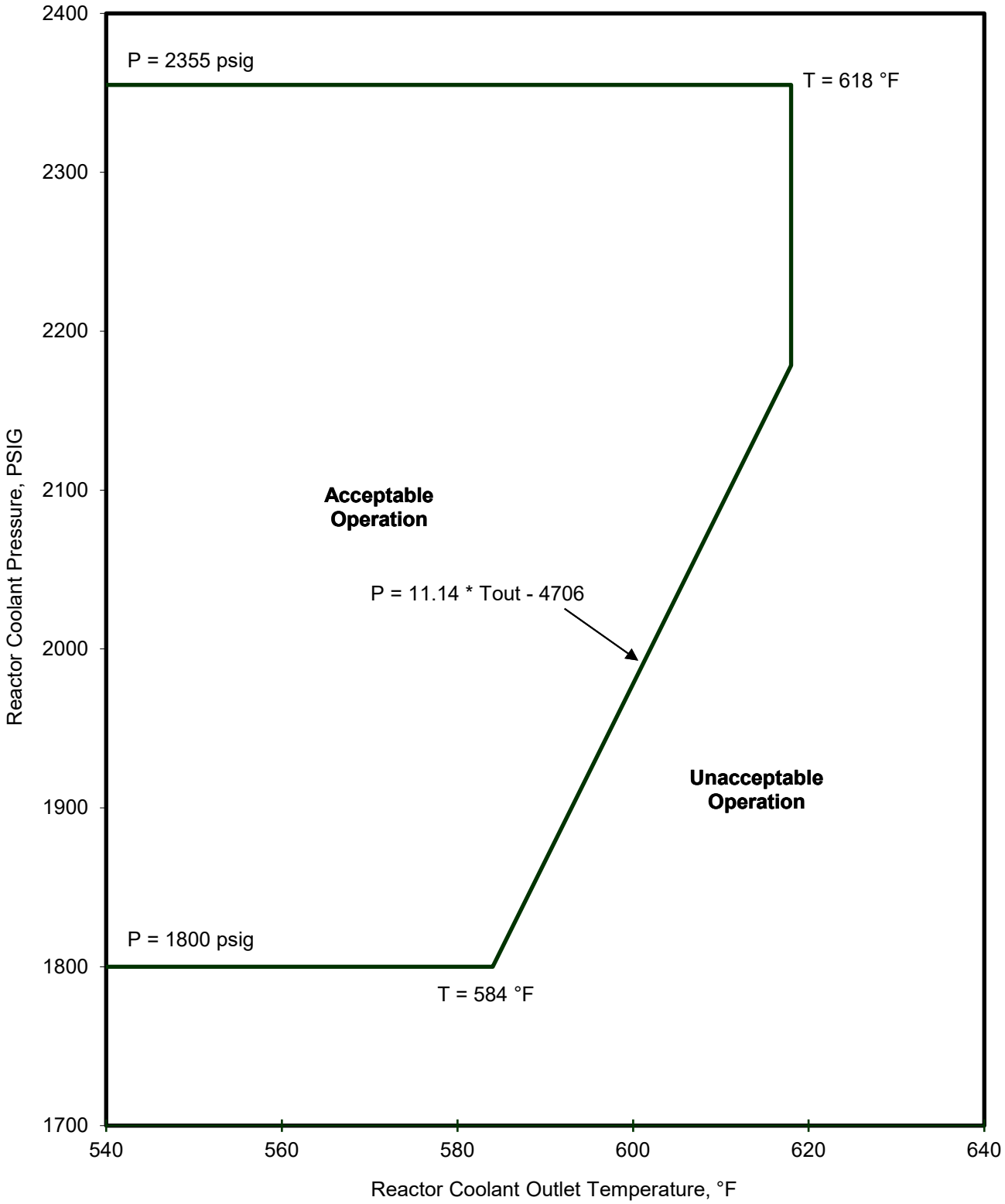
Correlation Slope (CS)

1.15

Referred to by TS 3.3.1 (SR 3.3.1.3).

Oconee 2 Cycle 31
Variable Low RCS Pressure RPS Setpoints

Referred to by TS 3.3.1



Oconee 2 Cycle 31

Referred to by TS 2.1.1 and TS Table 3.3.1-1

Maximum Allowable RPS Power Imbalance Limits

		% FP	% Imbalance
4 Pumps		0.0	-35.0
		90.0	-35.0
	Pmax =>	109.4	-14.4
	Pmax =>	109.4	14.4
		90.0	35.0
		0.0	35.0
3 Pumps		0.0	-35.0
		62.3	-35.0
	Pmax =>	81.7	-14.4
	Pmax =>	81.7	14.4
		62.3	35.0
		0.0	35.0

Oconee 2 Cycle 31

Operational Power Imbalance Setpoints

Referred to by TS 3.2.2

	%FP	Full Incore	Backup Incore	Out of Core
4 Pumps	0.0	-28.0	-27.7	-28.0
	80.0	-28.0	-27.7	-28.0
	90.0	-28.0	-22.5	-22.8
	100.0	-17.7	-15.7	-16.0
	102.0	-15.6	-14.3	-14.7
	102.0	15.6	13.8	14.2
	100.0	17.7	15.4	15.8
	90.0	28.0	23.3	23.6
	80.0	28.0	27.5	27.9
	0.0	28.0	27.5	27.9
3 Pumps	0.0	-28.0	-27.7	-28.0
	63.1	-28.0	-	-28.0
	63.3	-	-27.7	-
	77.0	-13.2	-13.2	-13.2
	77.0	13.2	13.2	13.2
	63.4	-	27.5	-
	63.1	28.0	-	27.9
	0.0	28.0	27.5	27.9

Referred to by TS 3.2.2

Oconee 2 Cycle 31

RPS / Operational Power Imbalance Setpoints

Operation with 4 RCS Pumps, BOC to EOC

Referred to by TS 3.2.2 and TS 3.3.1

% FP	RPS Trip		Full Incore Alarm		Out of Core Alarm	
107.9	-14.4	14.4				
106.0	-16.4	16.4				
105.0	-17.4	17.4				
104.0	-18.5	18.5				
103.0	-19.6	19.6				
102.0	-20.6	20.6	-15.6	15.6	-14.7	14.2
101.0	-21.7	21.7	-16.6	16.6	-15.3	15.0
100.0	-22.7	22.7	-17.7	17.7	-16.0	15.8
99.0	-23.8	23.8	-18.7	18.7	-16.6	16.5
98.0	-24.9	24.9	-19.7	19.7	-17.3	17.3
97.0	-25.9	25.9	-20.7	20.7	-18.0	18.1
96.0	-27.0	27.0	-21.8	21.8	-18.7	18.9
95.0	-28.0	28.0	-22.8	22.8	-19.4	19.7
94.0	-29.1	29.1	-23.8	23.8	-20.0	20.4
93.0	-30.2	30.2	-24.9	24.9	-20.7	21.2
92.0	-31.2	31.2	-25.9	25.9	-21.4	22.0
91.0	-32.3	32.3	-26.9	26.9	-22.1	22.8
90.4	-33.0	33.0	-27.6	27.6	-22.5	23.3
90.0	-33.0	33.0	-28.0	28.0	-22.8	23.6
89.0	-33.0	33.0	-28.0	28.0	-23.3	24.0
88.0	-33.0	33.0	-28.0	28.0	-23.8	24.4
87.0	-33.0	33.0	-28.0	28.0	-24.3	24.8
86.0	-33.0	33.0	-28.0	28.0	-24.8	25.3
85.0	-33.0	33.0	-28.0	28.0	-25.4	25.7
84.0	-33.0	33.0	-28.0	28.0	-25.9	26.1
83.0	-33.0	33.0	-28.0	28.0	-26.4	26.6
82.0	-33.0	33.0	-28.0	28.0	-26.9	27.0
81.0	-33.0	33.0	-28.0	28.0	-27.4	27.4
80.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
0.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
% FP	RPS Trip		Full Incore Alarm		Out of Core Alarm	

Oconee 2 Cycle 31

RPS / Operational Power Imbalance Setpoints

Operation with 3 RCS Pumps, BOC to EOC

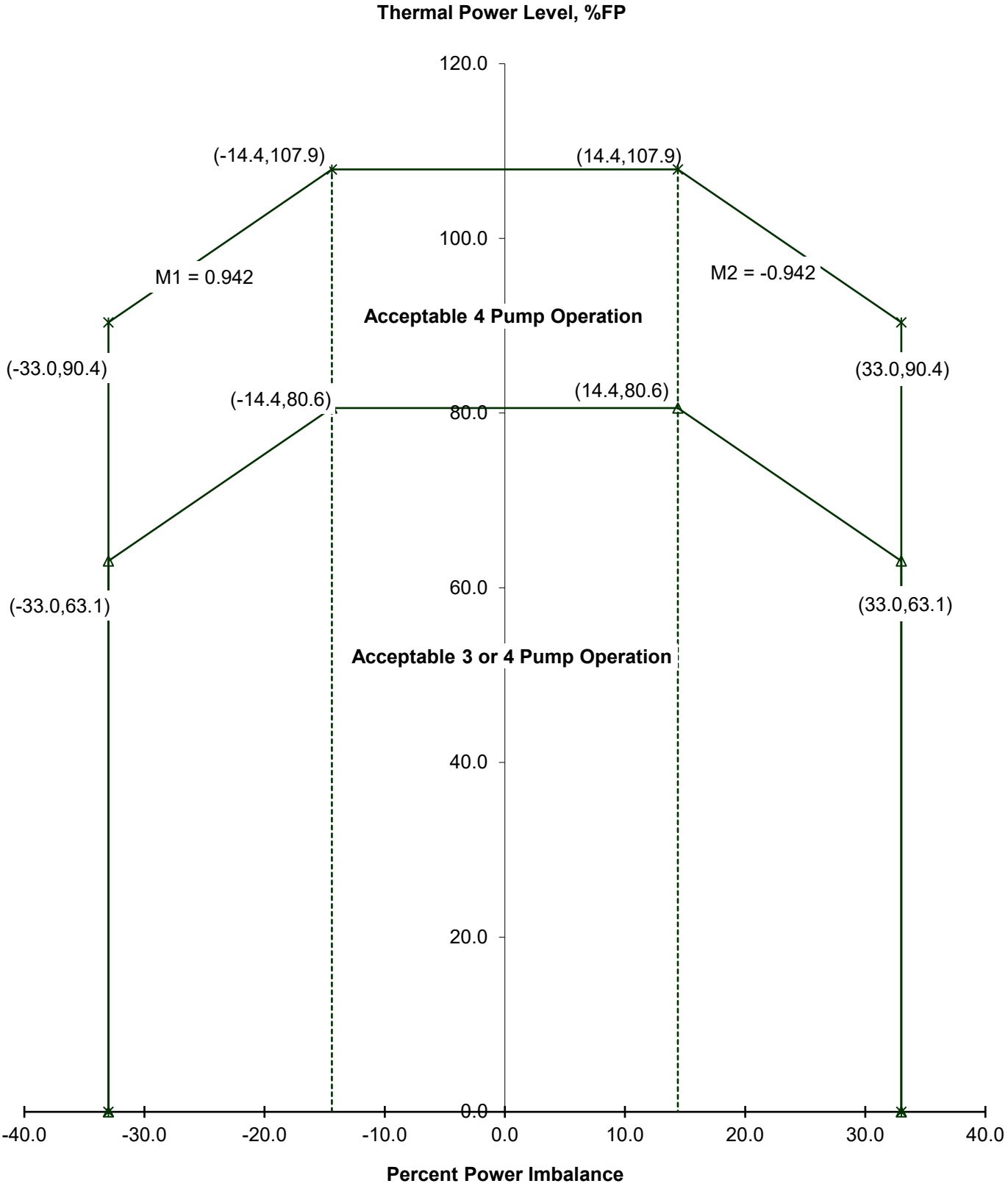
Referred to by TS 3.2.2 and TS 3.3.1

% FP	RPS Trip		Full Incore Alarm		Out of Core Alarm	
80.6	-14.4	14.4				
80.0	-15.0	15.0				
79.0	-16.0	16.0				
78.0	-17.1	17.1				
77.0	-18.2	18.2	-13.2	13.2	-13.2	13.2
76.0	-19.2	19.2	-14.2	14.2	-14.2	14.2
75.0	-20.3	20.3	-15.3	15.3	-15.3	15.3
74.0	-21.4	21.4	-16.3	16.3	-16.3	16.3
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	18.4
71.0	-24.5	24.5	-19.5	19.5	-19.5	19.5
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	21.6
68.0	-27.7	27.7	-22.7	22.7	-22.7	22.7
67.0	-28.8	28.8	-23.8	23.8	-23.8	23.7
66.0	-29.9	29.9	-24.9	24.9	-24.9	24.8
65.0	-30.9	30.9	-25.9	25.9	-25.9	25.8
64.0	-32.0	32.0	-27.0	27.0	-27.0	26.9
63.1	-33.0	33.0	-28.0	28.0	-28.0	27.9
63.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
62.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
61.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
					-28.0	27.9
60.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
0.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
% FP	RPS Trip		Full Incore Alarm		Out of Core Alarm	

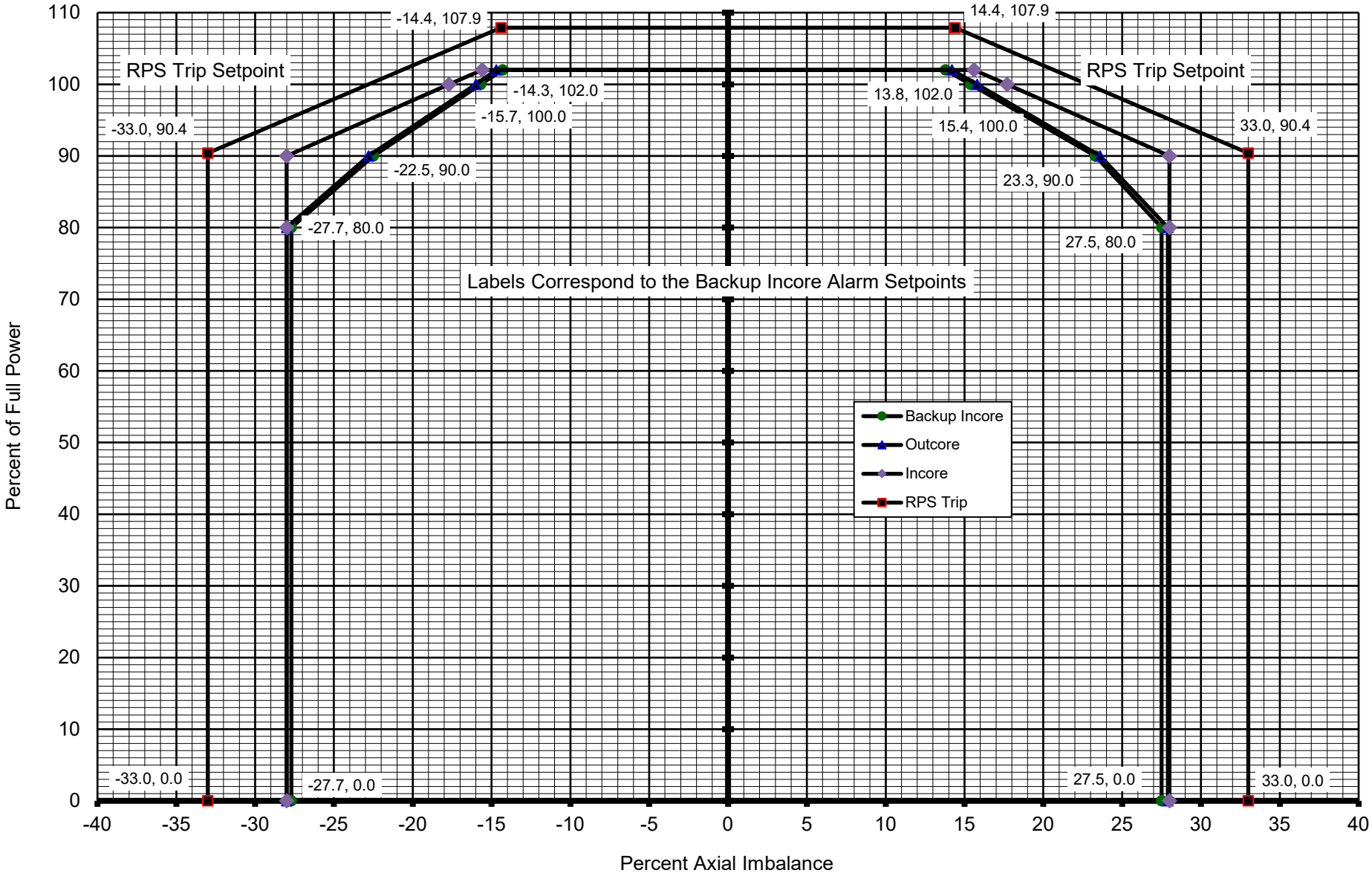
Oconee 2 Cycle 31

RPS Power Imbalance Setpoints

Referred to by TS 3.3.1 and TS Table 3.3.1-1



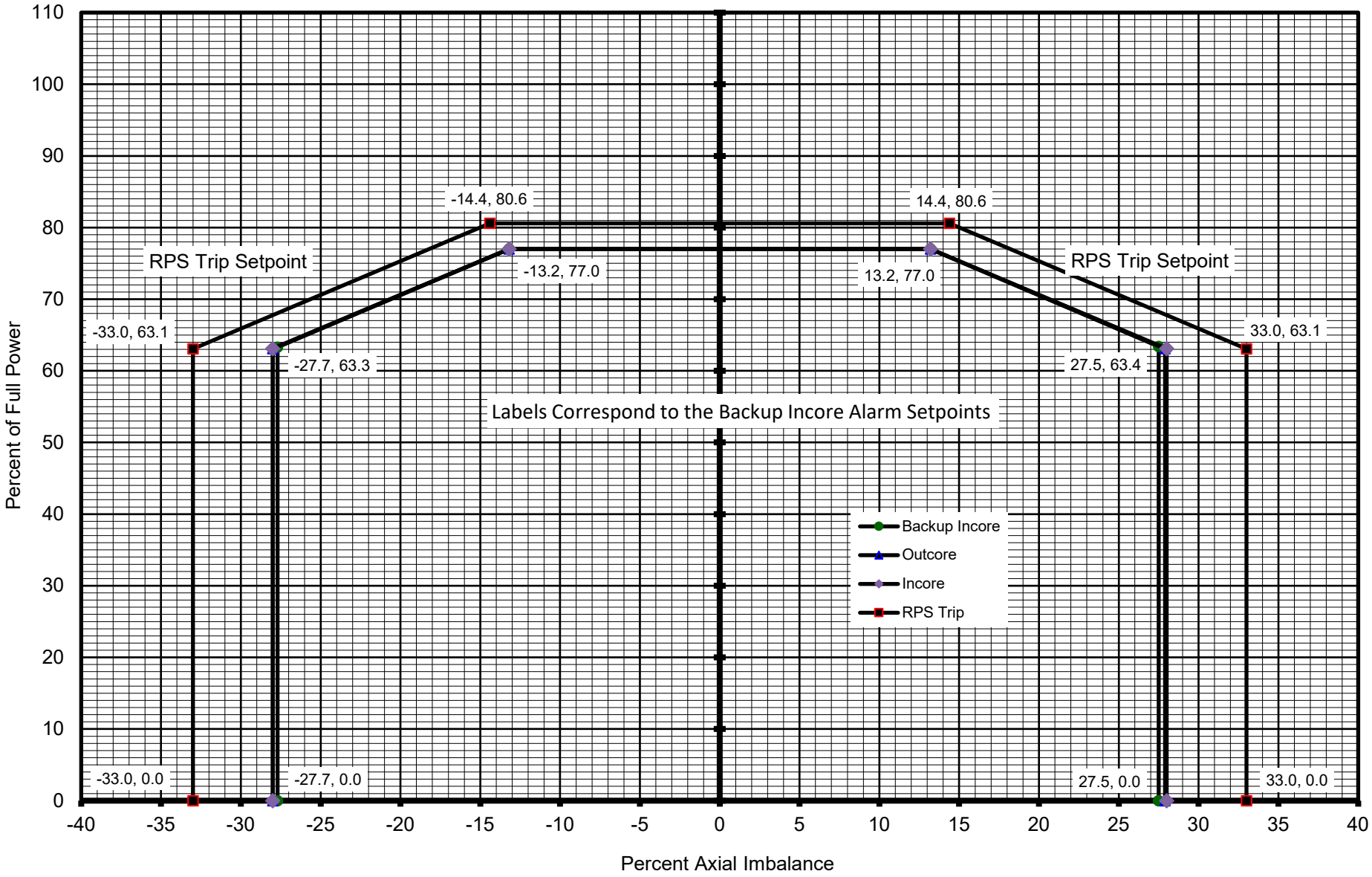
Oconee 2 Cycle 31
Imbalance Setpoints for 4 Pump Operation, BOC to EOC
Referred to by TS 3.2.2 and TS 3.3.1



Oconee 2 Cycle 31

Imbalance Setpoints for 3 Pump Operation, BOC to EOC

Referred to by TS 3.2.2 and TS 3.3.1



Oconee 2 Cycle 31

Operational Rod Index Setpoints

Referred to by TS 3.2.1

		RI Insertion Setpoint		RI Withdrawal
	%FP	No Inop Rod	1 Inop Rod	Setpoint
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 2 Cycle 31

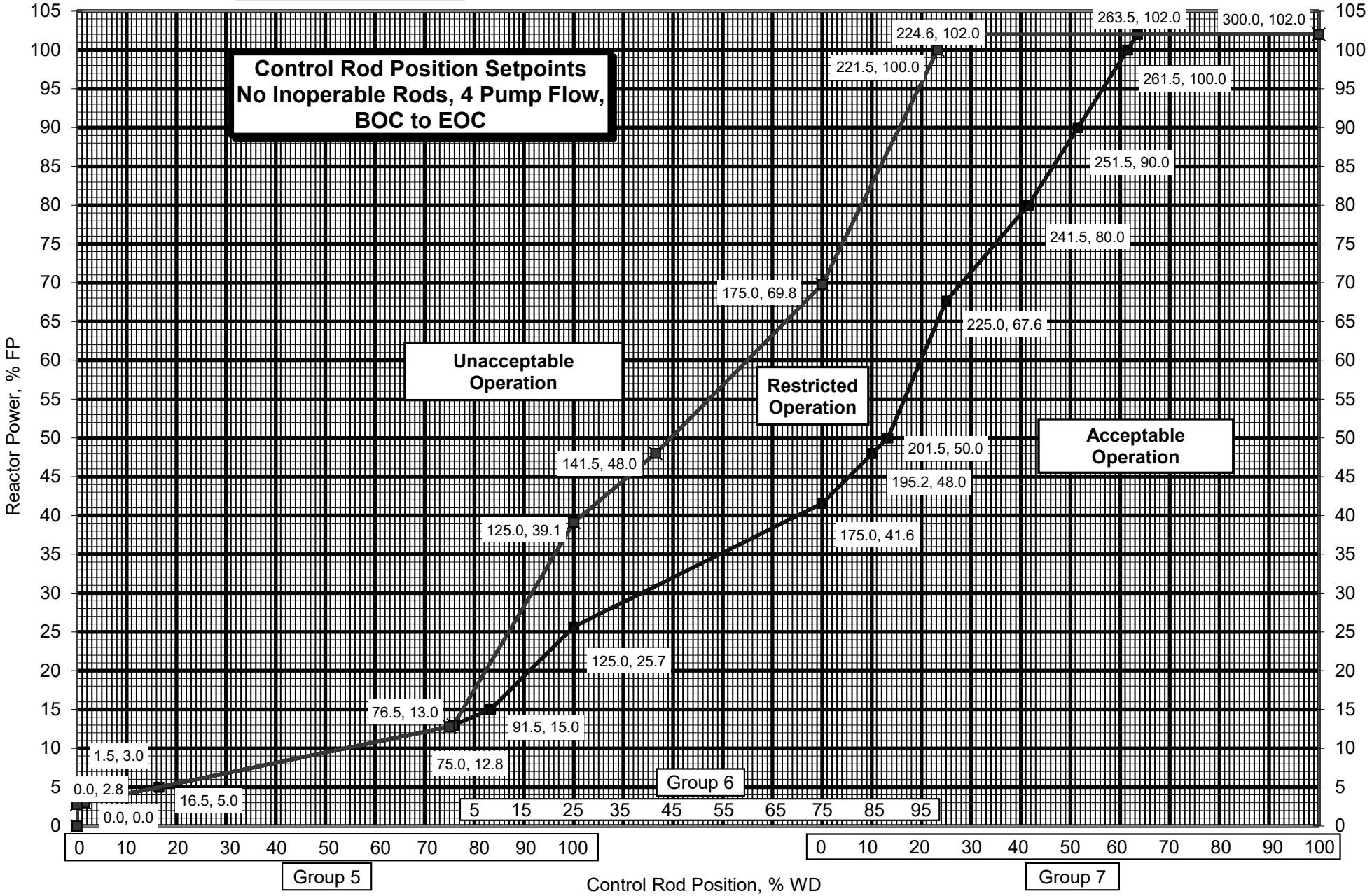
Shutdown Margin Rod Index Setpoints

Referred to by TS 3.2.1

		RI Insertion Setpoint		RI Withdrawal
	%FP	No Inop Rod	1 Inop Rod	Setpoint
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

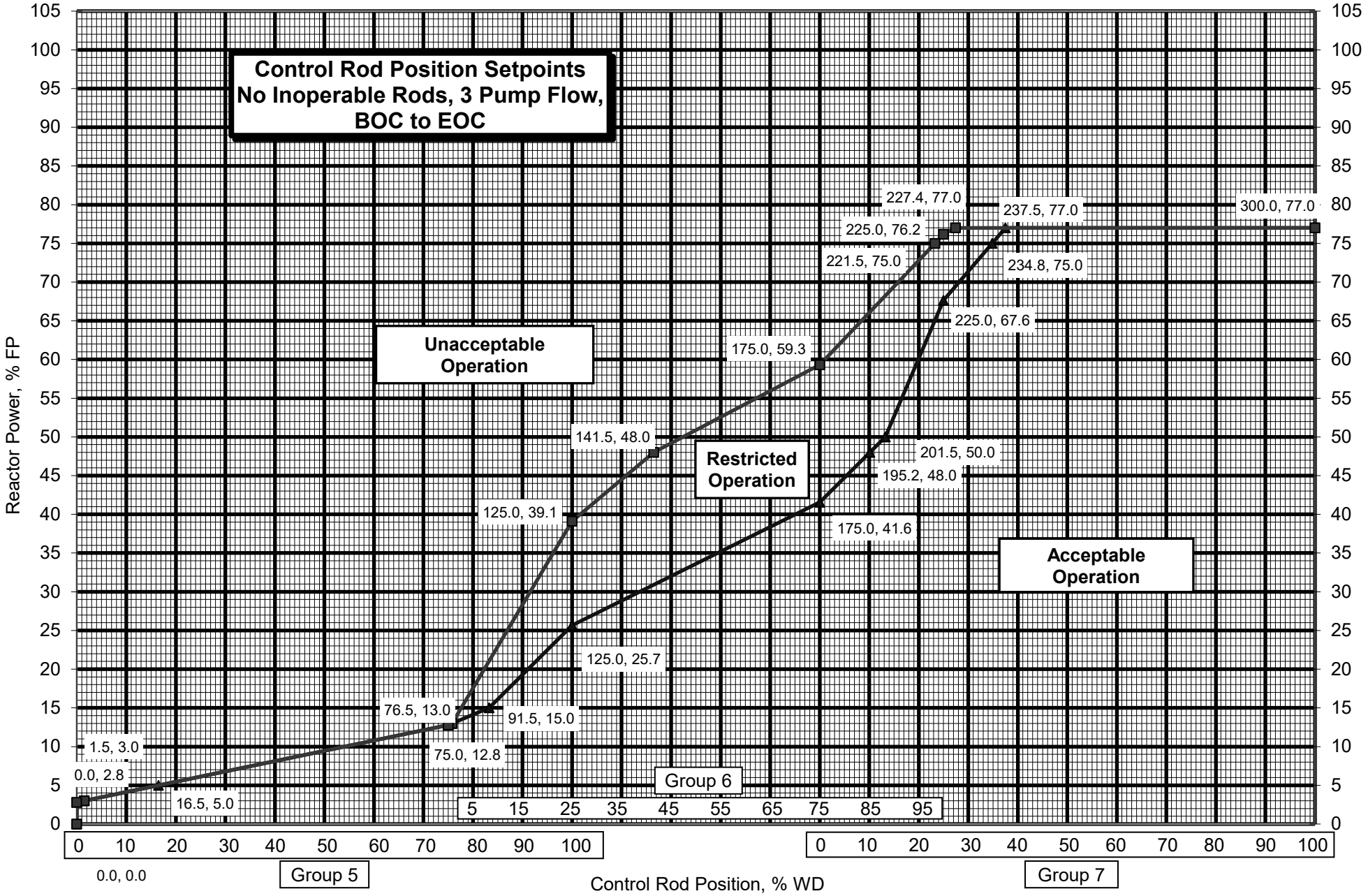
Oconee 2 Cycle 31

Referred to by TS 3.2.1



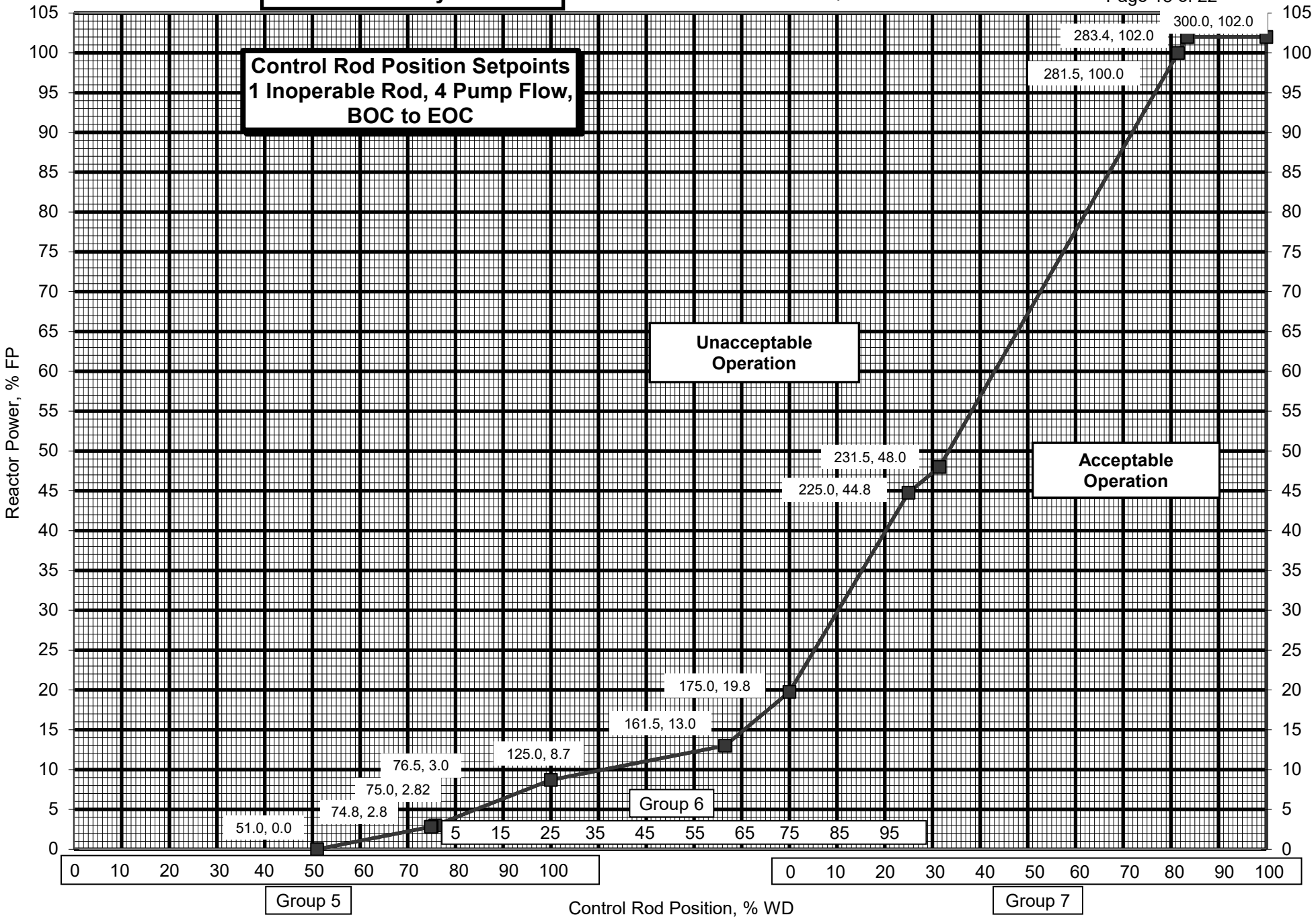
Oconee 2 Cycle 31

Referred to by TS 3.2.1

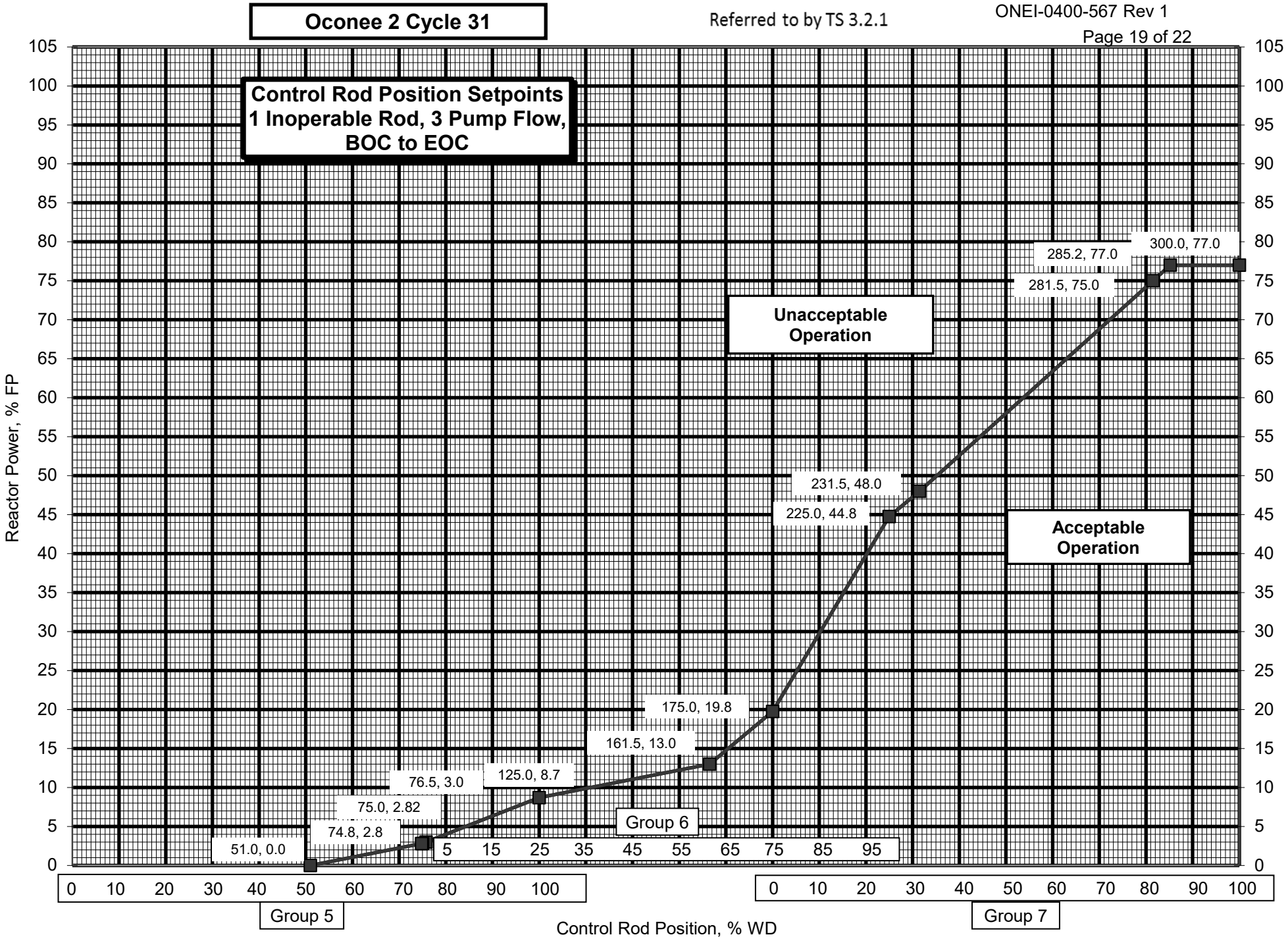


Oconee 2 Cycle 31

Referred to by TS 3.2.1



Referred to by TS 3.2.1



Oconee 2 Cycle 31

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	0 - 30	> 30	0 - 30	> 30	> 0
Quadrant Power Tilt, %	10.00	6.16	12.00	9.44	20.00

Variable Low RCS Pressure Protective Limits

Referred to by TS 2.1.1

Core Outlet Pressure	Reactor Coolant Outlet Temperature, °F	
psia	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

Oconee 2 Cycle 31

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	-33.9
	100.0	-	-26.3
	109.4	-14.4	-
	109.4	14.4	-
	100.0	-	25.9
	90.0	35.0	34.9
	80.0	-	39.4
	0.0	35.0	39.4
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	-	39.4
	62.3	35.0	-
	0.0	35.0	39.4

Oconee 2 Cycle 31

Rod Index Limits

Referred to by TS 3.2.1

Not for Plant Use

	%FP	Operational RI Insertion Limit	Shutdown Margin RI Insertion Limit No Inop Rod	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

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Facility Code :	ON
Applicable Facilities :	ON
Document Number :	ONEI-0400-567
Document Revision Number :	002
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Lambert, Brad	Approver	3/29/2022

Notes :

Oconee 2 Cycle 31 Core Operating Limits Report

ONEI-0400-567
Revision 2

Reload 50.59 AR# 02415451

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Approved By:	Brad J. Lambert	

Revision Summary

Revision	Pages Revised	Pages Added	Pages Deleted	Comments
0	--	1 - 22	--	Original issue.
1	1-22	--	--	Revised for operation with Group 8 fully inserted throughout the cycle.
2	1-22	--	--	Revised to add reference for COPERNIC methodology.

NOTES:

- The O2C31 COLR will cease to be effective during NO MODE between cycles 31 and 32.

Oconee 2 Cycle 31

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Section 1.0 Error Adjusted Core Operating Limits

Section 2.0 Core Operating Limits - Not Error Adjusted (NOT FOR PLANT USE)

Oconee 2 Cycle 31

1.0 Error Adjusted Core Operating Limits

The Core Operating Limits Report for O2C31 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 13. The RPS protective limits and maximum allowable setpoints are documented in References 14 through 16. These limits are validated for use in O2C31 by References 17 and 18. The O2C31 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 (Fz) of 1.5, and an EOC (< 100 ppmB) Tavg reduction for up to 10°F provided 4 RCPs are in operation and Tavg 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 O2C31 reload core.

1.1 References

1. DPC-NE-1006-PA, Oconee Nuclear Design Methodology Using CASMO-4 / SIMULATE-3, NRC SE issued August 2, 2011.
2. DPC-NE-1002-A, Oconee Nuclear Station Reload Design Methodology II, SE dated July 21, 2011.
3. NFS-1001-A, Oconee Nuclear Station Reload Design Methodology, SE dated July 21, 2011.
4. DPC-NE-2003-PA, ONS Core Thermal Hydraulic Methodology Using VIPRE-01, SE dated July 21, 2011.
5. DPC-NE-2005-PA, Thermal Hydraulic Statistical Core Design Methodology, SE dated October 29, 2008.
6. DPC-NE-2008-PA, Fuel Mechanical Reload Analysis Methodology Using TACO3 and GDTACO, SE dated July 21, 2011.
7. DPC-NE-3005-PA, UFSAR Chapter 15 Transient Analysis Methodology, SE dated January 26, 2021.
8. DPC-NE-3000-PA, Thermal Hydraulic Transient Analysis Methodology, SE dated July 21, 2011.
9. BAW-10192P-A, Revision 0, BWNT LOCA - BWNT Loss of Coolant Accident Evaluation Model for Once-Through Steam Generator Plants, 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-10192P-A, Supplement 1P-A, Revision 0, BWNT Loss of Coolant Accident Evaluation Model for Once-Through Steam Generator Plants, SE dated November 2, 2017.
12. BAW-10227P-A, Revision 1, Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel, June 2003 (SER to BAW-10186P-A dated June 18, 2003).
13. BAW-10231P-A, Rev. 1, COPERNIC Fuel Rod Design Computer Code, January 2004.
14. OSC-4048, Revision 6, RPS RCS Pressure & Temperature Trip Function Uncertainty Analyses and Variable Low Pressure Safety Limit.
15. OSC-5604, Revision 5, Power Imbalance Safety Limits and Tech Spec Setpoints Using Error Adjusted Flux-Flow Ratio of 1.094.
16. OSC-7265, Revision 1, ΔTc and EOC Reduced Tavg Operation.
17. OSC-11955, Revision 2, O2C31 Maneuvering Analysis.
18. OSC-11974, Revision 1, O2C31 Reload Safety Evaluation.

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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 and SLC 16.13.10.

CFT boron concentration shall be greater than **2400** ppm. The average boron concentration in the CFT's shall be less than **4000** ppm. Referred to by TS 3.5.1.

RCS and Refueling canal boron concentration shall be greater than **2400** ppm and less than **3000** 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 $\Delta\rho$ / °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 > 2125 psig
3 RCP: measured hot leg pressure > 2125 psig

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

The measured Tavg must be less than COLR limits minus instrument uncertainty. ΔTc is the setpoint value selected by the operators.

	Max Loop Tavg (Incl 2°F unc)		
ΔTc, °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	

* 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 ≥ **108.5** %df
3 RCP: Measured ≥ **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% ± 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).

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Quadrant Power Tilt Setpoints

	Steady State		Transient		Maximum
Core Power Level, %FP	0 - 30	> 30	0 - 30	> 30	> 0
Full Incore	7.93	4.50	9.72	7.43	16.87
Out of Core	6.09	2.96	7.71	5.63	14.22
Backup Incore	3.86	2.46	4.81	3.62	10.06

Referred to by TS 3.2.3

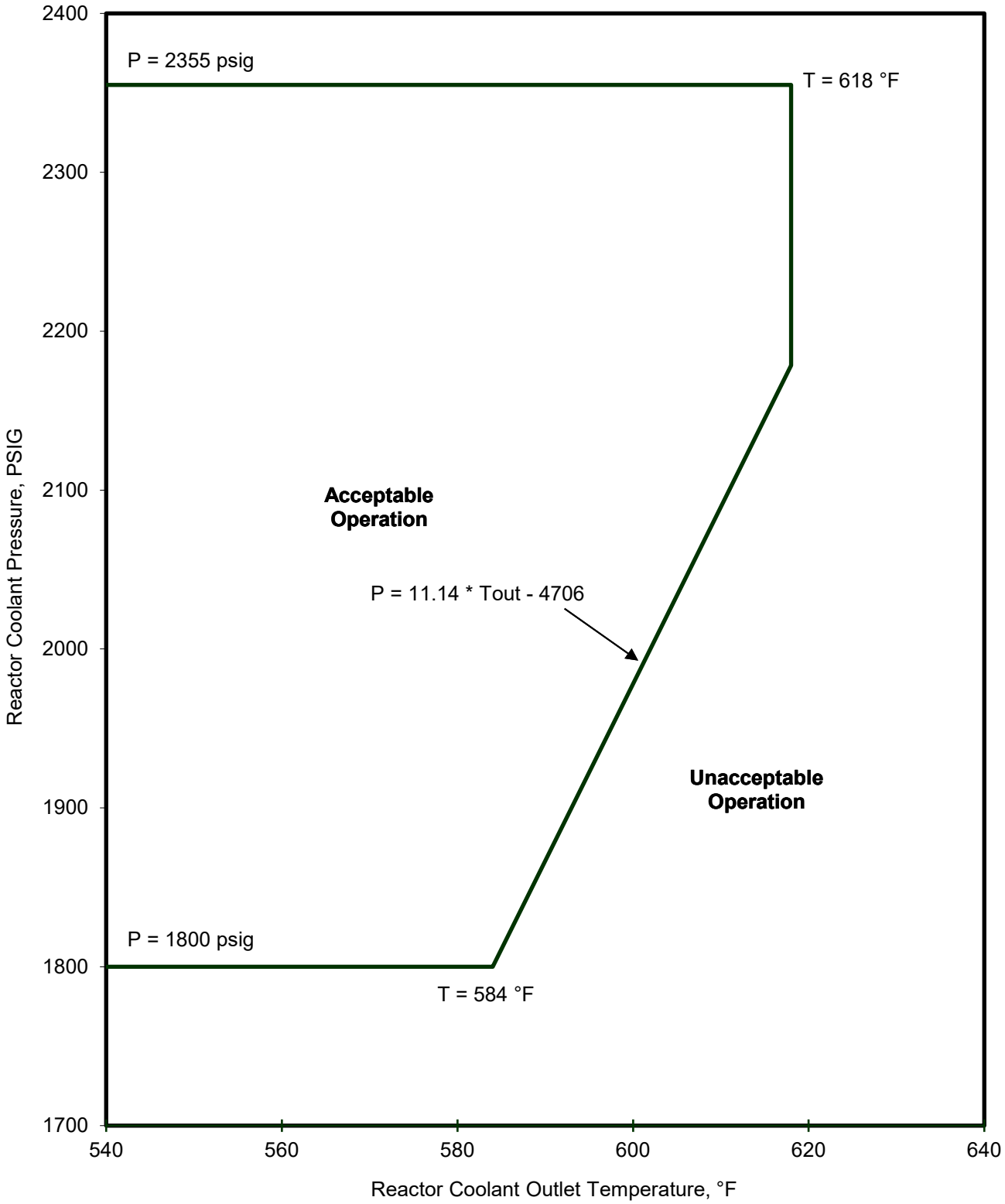
Correlation Slope (CS)

1.15

Referred to by TS 3.3.1 (SR 3.3.1.3).

Oconee 2 Cycle 31
Variable Low RCS Pressure RPS Setpoints

Referred to by TS 3.3.1



Oconee 2 Cycle 31

Referred to by TS 2.1.1 and TS Table 3.3.1-1

Maximum Allowable RPS Power Imbalance Limits

		% FP	% Imbalance
4 Pumps		0.0	-35.0
		90.0	-35.0
	Pmax =>	109.4	-14.4
	Pmax =>	109.4	14.4
		90.0	35.0
		0.0	35.0
3 Pumps		0.0	-35.0
		62.3	-35.0
	Pmax =>	81.7	-14.4
	Pmax =>	81.7	14.4
		62.3	35.0
		0.0	35.0

Oconee 2 Cycle 31

Operational Power Imbalance Setpoints

Referred to by TS 3.2.2

	%FP	Full Incore	Backup Incore	Out of Core
4 Pumps	0.0	-28.0	-27.7	-28.0
	80.0	-28.0	-27.7	-28.0
	90.0	-28.0	-22.5	-22.8
	100.0	-17.7	-15.7	-16.0
	102.0	-15.6	-14.3	-14.7
	102.0	15.6	13.8	14.2
	100.0	17.7	15.4	15.8
	90.0	28.0	23.3	23.6
	80.0	28.0	27.5	27.9
	0.0	28.0	27.5	27.9
3 Pumps	0.0	-28.0	-27.7	-28.0
	63.1	-28.0	-	-28.0
	63.3	-	-27.7	-
	77.0	-13.2	-13.2	-13.2
	77.0	13.2	13.2	13.2
	63.4	-	27.5	-
	63.1	28.0	-	27.9
	0.0	28.0	27.5	27.9

Referred to by TS 3.2.2

Oconee 2 Cycle 31

RPS / Operational Power Imbalance Setpoints

Operation with 4 RCS Pumps, BOC to EOC

Referred to by TS 3.2.2 and TS 3.3.1

% FP	RPS Trip		Full Incore Alarm		Out of Core Alarm	
107.9	-14.4	14.4				
106.0	-16.4	16.4				
105.0	-17.4	17.4				
104.0	-18.5	18.5				
103.0	-19.6	19.6				
102.0	-20.6	20.6	-15.6	15.6	-14.7	14.2
101.0	-21.7	21.7	-16.6	16.6	-15.3	15.0
100.0	-22.7	22.7	-17.7	17.7	-16.0	15.8
99.0	-23.8	23.8	-18.7	18.7	-16.6	16.5
98.0	-24.9	24.9	-19.7	19.7	-17.3	17.3
97.0	-25.9	25.9	-20.7	20.7	-18.0	18.1
96.0	-27.0	27.0	-21.8	21.8	-18.7	18.9
95.0	-28.0	28.0	-22.8	22.8	-19.4	19.7
94.0	-29.1	29.1	-23.8	23.8	-20.0	20.4
93.0	-30.2	30.2	-24.9	24.9	-20.7	21.2
92.0	-31.2	31.2	-25.9	25.9	-21.4	22.0
91.0	-32.3	32.3	-26.9	26.9	-22.1	22.8
90.4	-33.0	33.0	-27.6	27.6	-22.5	23.3
90.0	-33.0	33.0	-28.0	28.0	-22.8	23.6
89.0	-33.0	33.0	-28.0	28.0	-23.3	24.0
88.0	-33.0	33.0	-28.0	28.0	-23.8	24.4
87.0	-33.0	33.0	-28.0	28.0	-24.3	24.8
86.0	-33.0	33.0	-28.0	28.0	-24.8	25.3
85.0	-33.0	33.0	-28.0	28.0	-25.4	25.7
84.0	-33.0	33.0	-28.0	28.0	-25.9	26.1
83.0	-33.0	33.0	-28.0	28.0	-26.4	26.6
82.0	-33.0	33.0	-28.0	28.0	-26.9	27.0
81.0	-33.0	33.0	-28.0	28.0	-27.4	27.4
80.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
0.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
% FP	RPS Trip		Full Incore Alarm		Out of Core Alarm	

Oconee 2 Cycle 31

RPS / Operational Power Imbalance Setpoints

Operation with 3 RCS Pumps, BOC to EOC

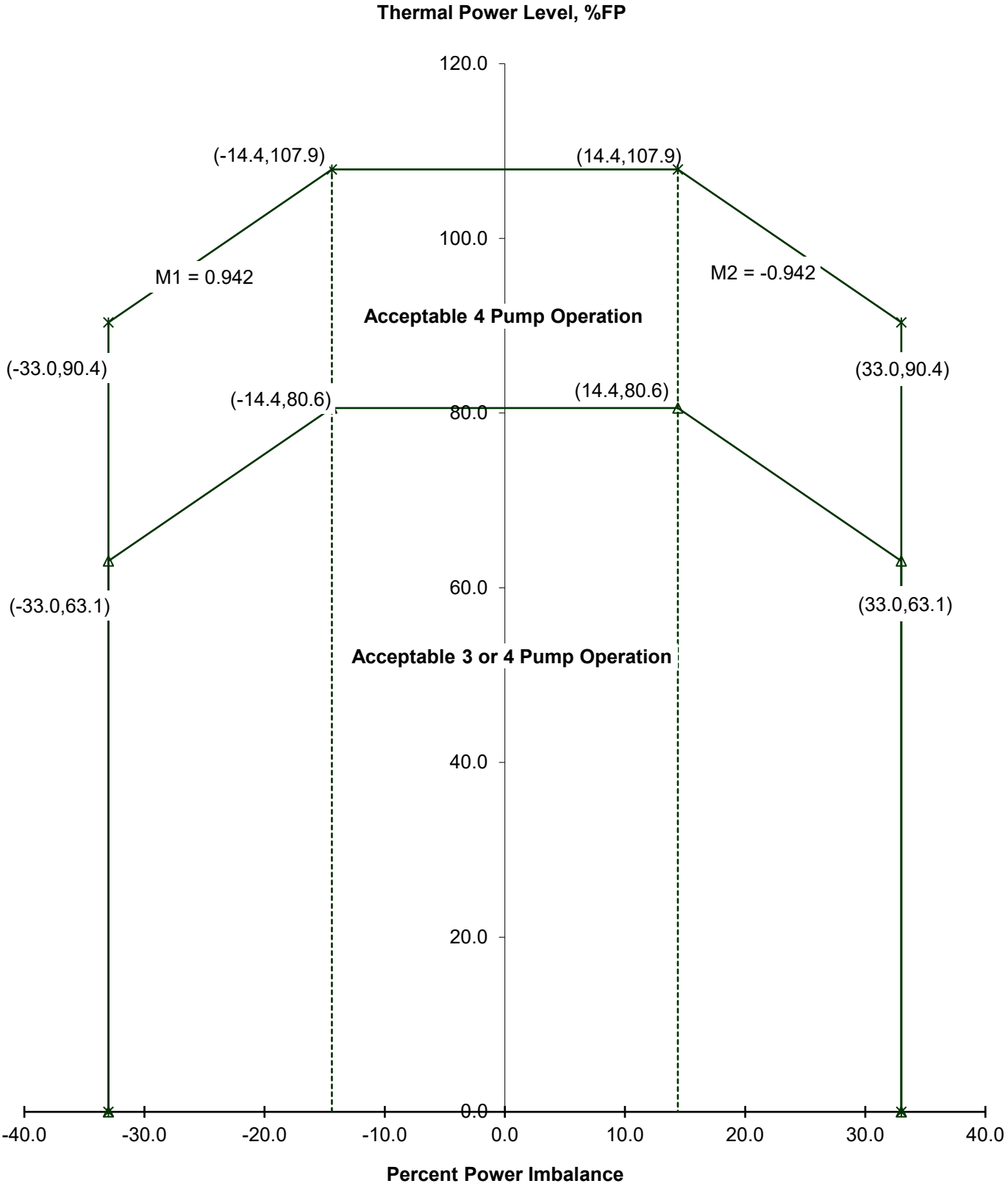
Referred to by TS 3.2.2 and TS 3.3.1

% FP	RPS Trip		Full Incore Alarm		Out of Core Alarm	
80.6	-14.4	14.4				
80.0	-15.0	15.0				
79.0	-16.0	16.0				
78.0	-17.1	17.1				
77.0	-18.2	18.2	-13.2	13.2	-13.2	13.2
76.0	-19.2	19.2	-14.2	14.2	-14.2	14.2
75.0	-20.3	20.3	-15.3	15.3	-15.3	15.3
74.0	-21.4	21.4	-16.3	16.3	-16.3	16.3
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	18.4
71.0	-24.5	24.5	-19.5	19.5	-19.5	19.5
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	21.6
68.0	-27.7	27.7	-22.7	22.7	-22.7	22.7
67.0	-28.8	28.8	-23.8	23.8	-23.8	23.7
66.0	-29.9	29.9	-24.9	24.9	-24.9	24.8
65.0	-30.9	30.9	-25.9	25.9	-25.9	25.8
64.0	-32.0	32.0	-27.0	27.0	-27.0	26.9
63.1	-33.0	33.0	-28.0	28.0	-28.0	27.9
63.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
62.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
61.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
					-28.0	27.9
60.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
0.0	-33.0	33.0	-28.0	28.0	-28.0	27.9
% FP	RPS Trip		Full Incore Alarm		Out of Core Alarm	

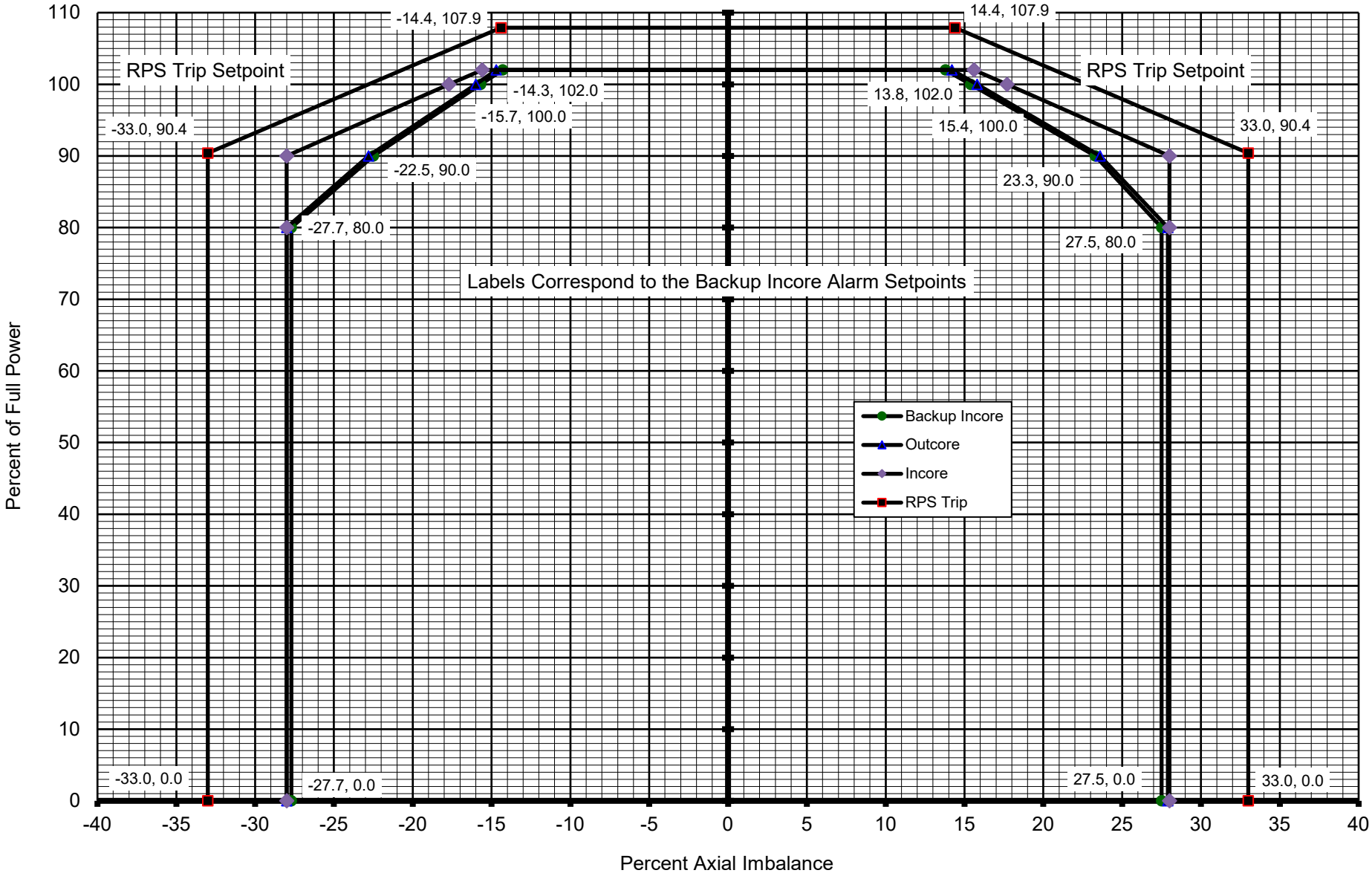
Oconee 2 Cycle 31

RPS Power Imbalance Setpoints

Referred to by TS 3.3.1 and TS Table 3.3.1-1



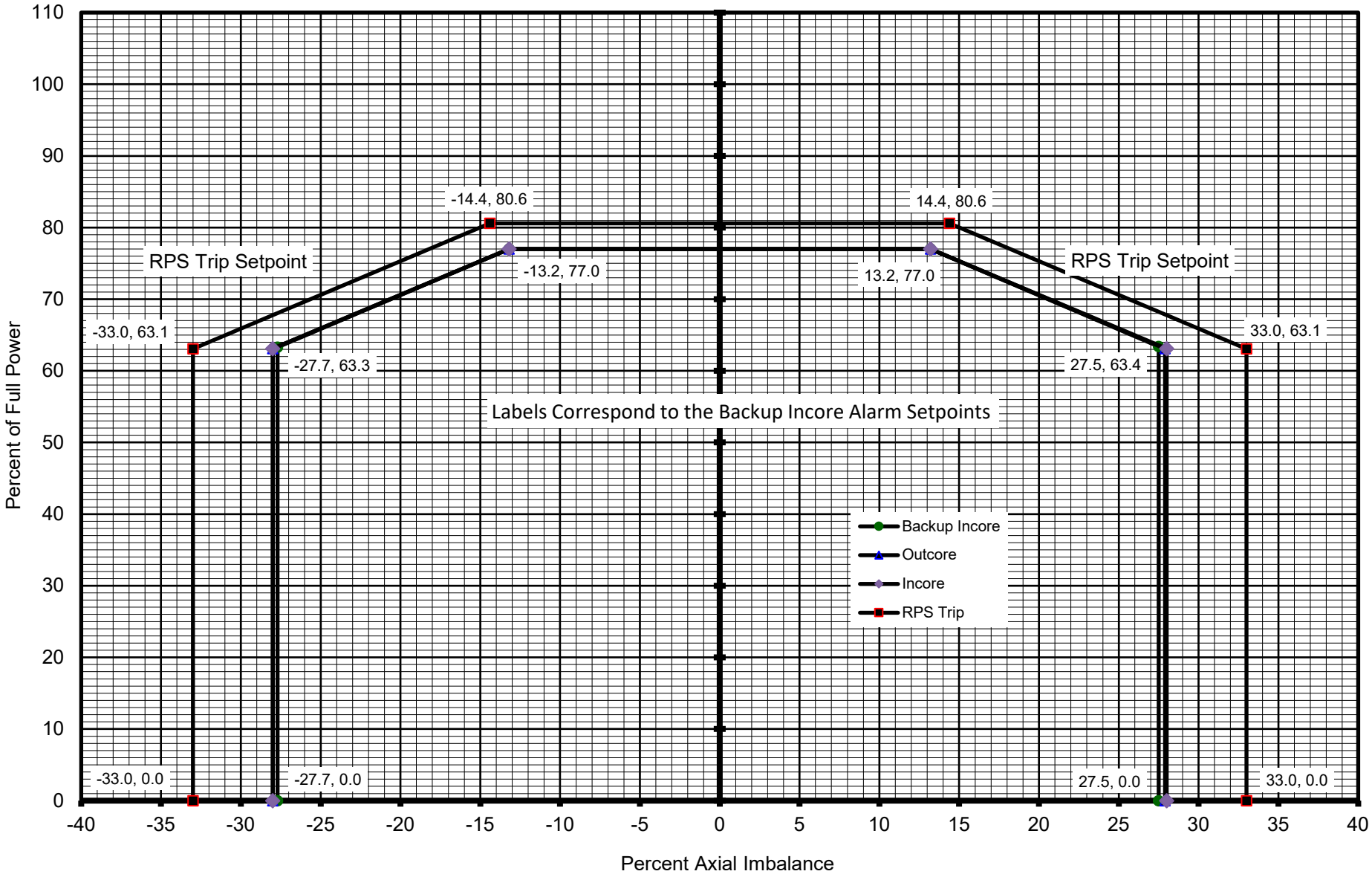
Oconee 2 Cycle 31
Imbalance Setpoints for 4 Pump Operation, BOC to EOC
Referred to by TS 3.2.2 and TS 3.3.1



Oconee 2 Cycle 31

Imbalance Setpoints for 3 Pump Operation, BOC to EOC

Referred to by TS 3.2.2 and TS 3.3.1



Oconee 2 Cycle 31

Operational Rod Index Setpoints

Referred to by TS 3.2.1

		RI Insertion Setpoint		RI Withdrawal
	%FP	No Inop Rod	1 Inop Rod	Setpoint
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 2 Cycle 31

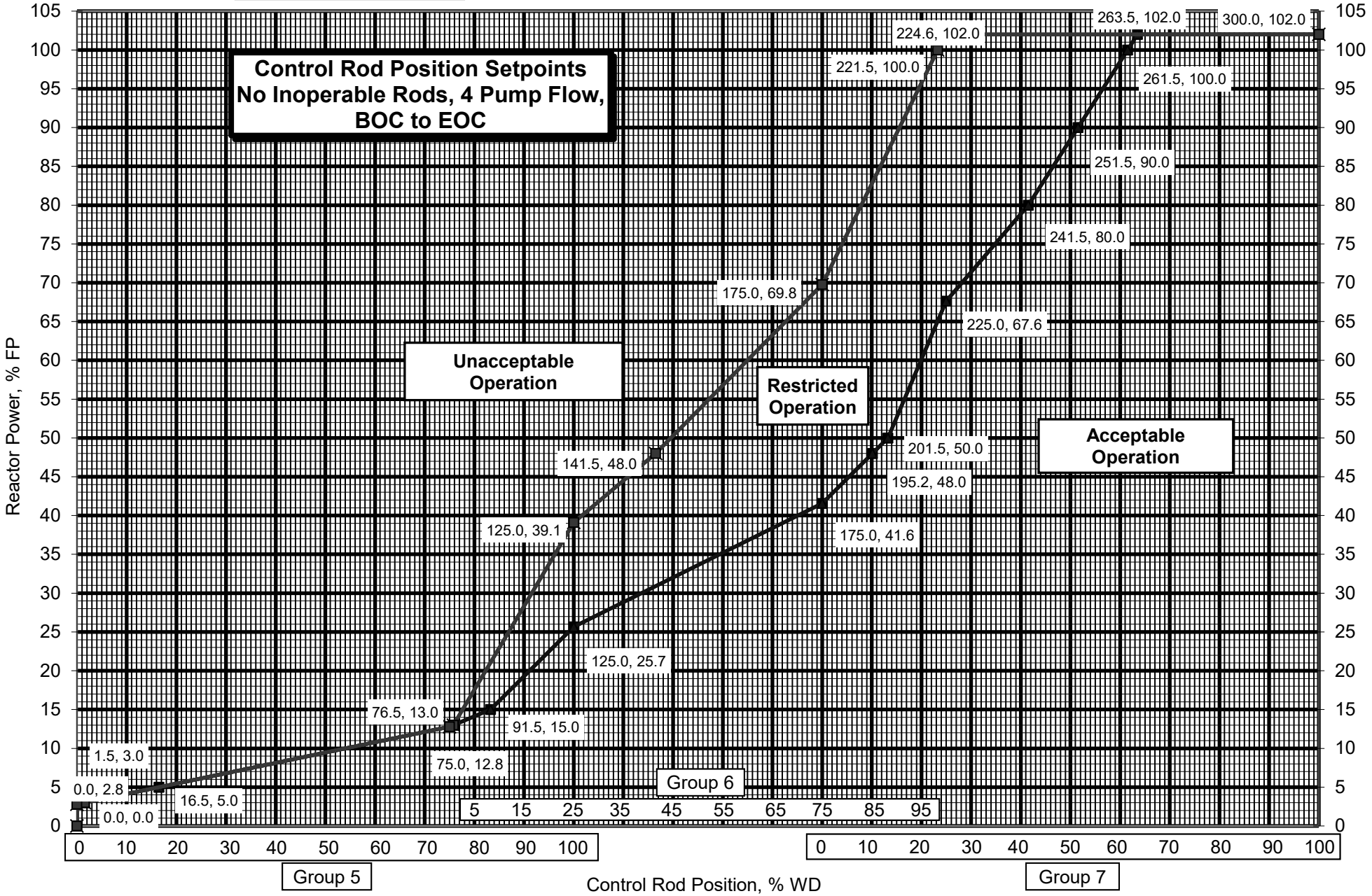
Shutdown Margin Rod Index Setpoints

Referred to by TS 3.2.1

		RI Insertion Setpoint		RI Withdrawal
	%FP	No Inop Rod	1 Inop Rod	Setpoint
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

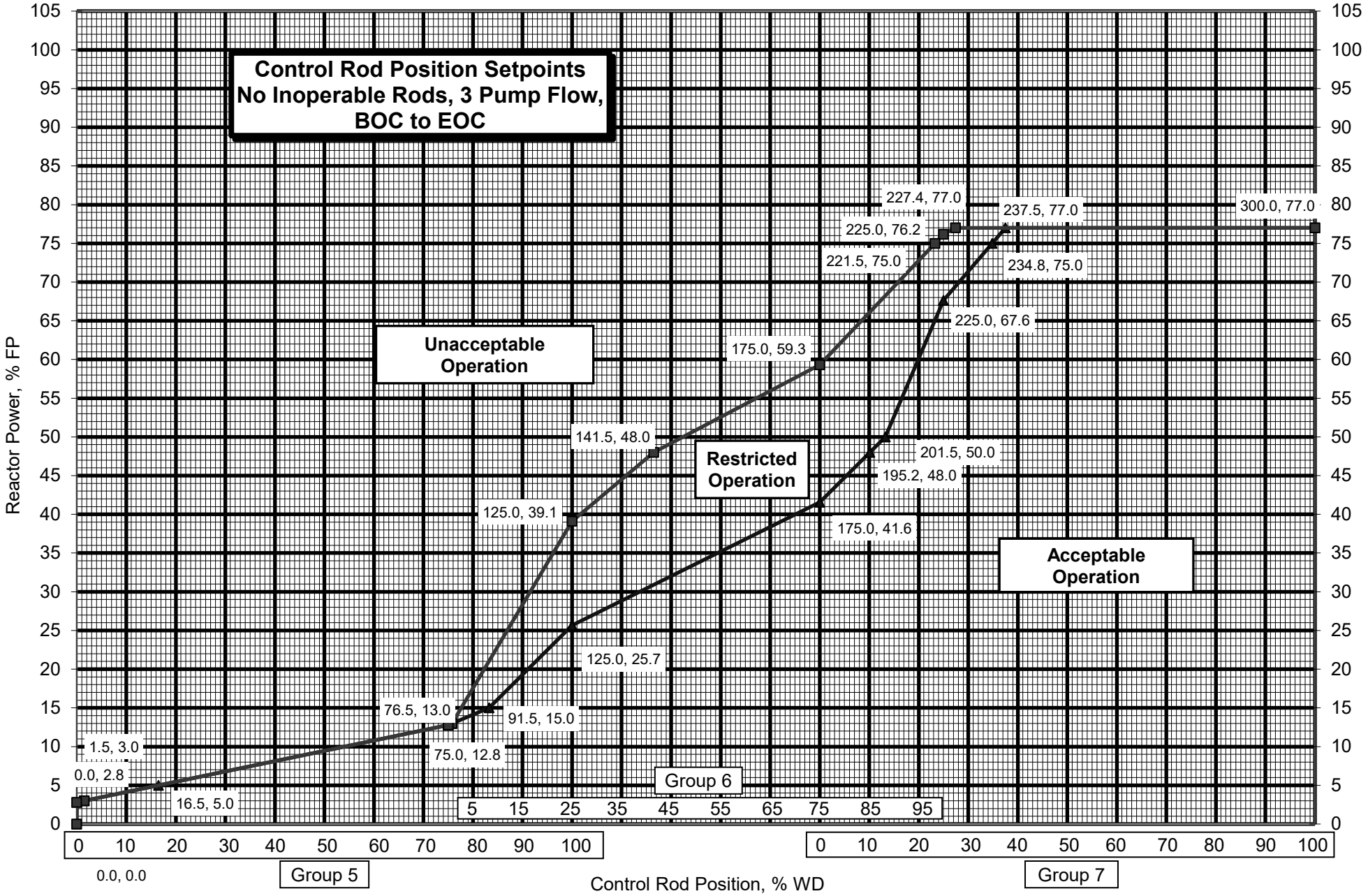
Oconee 2 Cycle 31

Referred to by TS 3.2.1

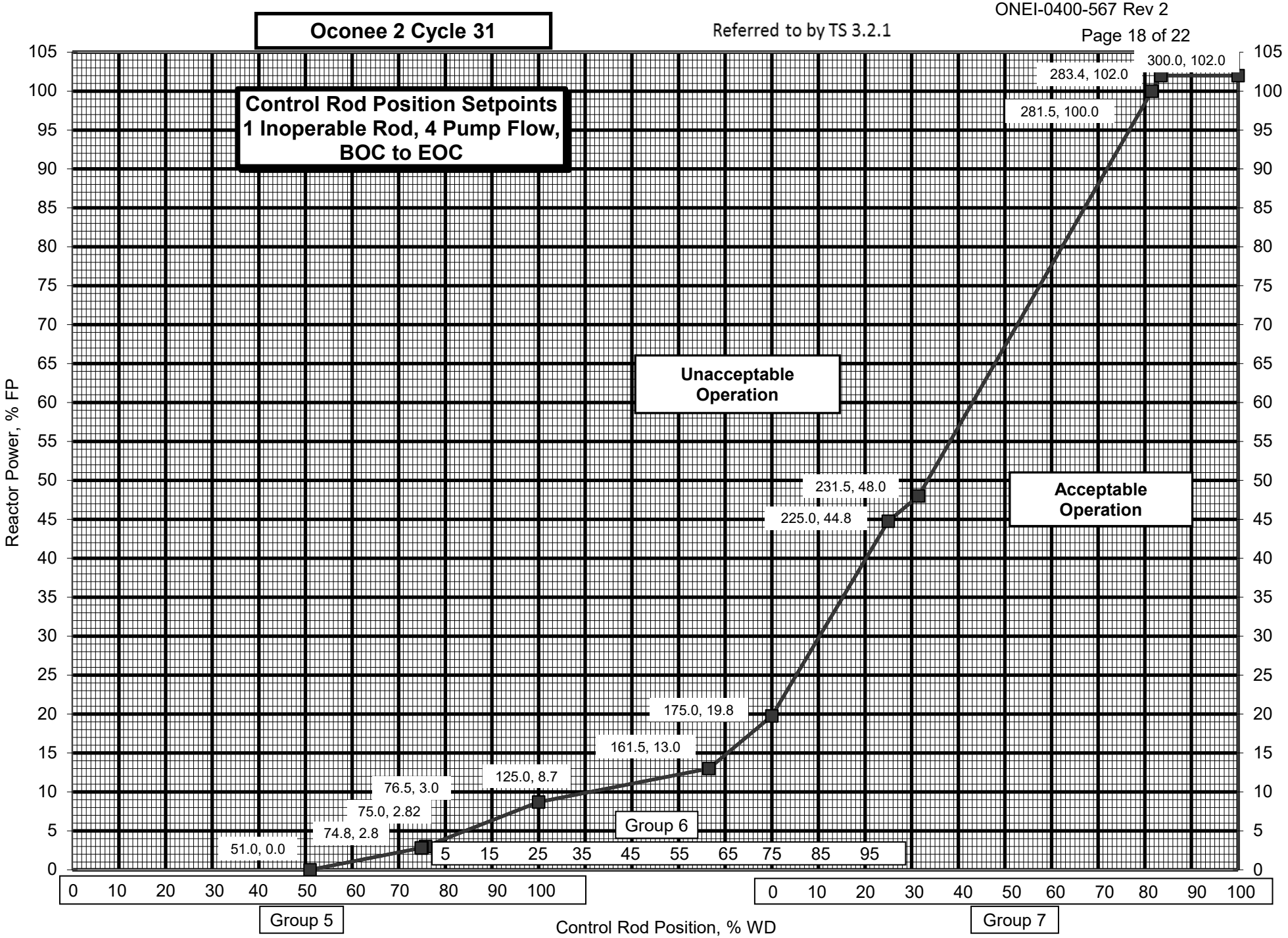


Oconee 2 Cycle 31

Referred to by TS 3.2.1



Referred to by TS 3.2.1



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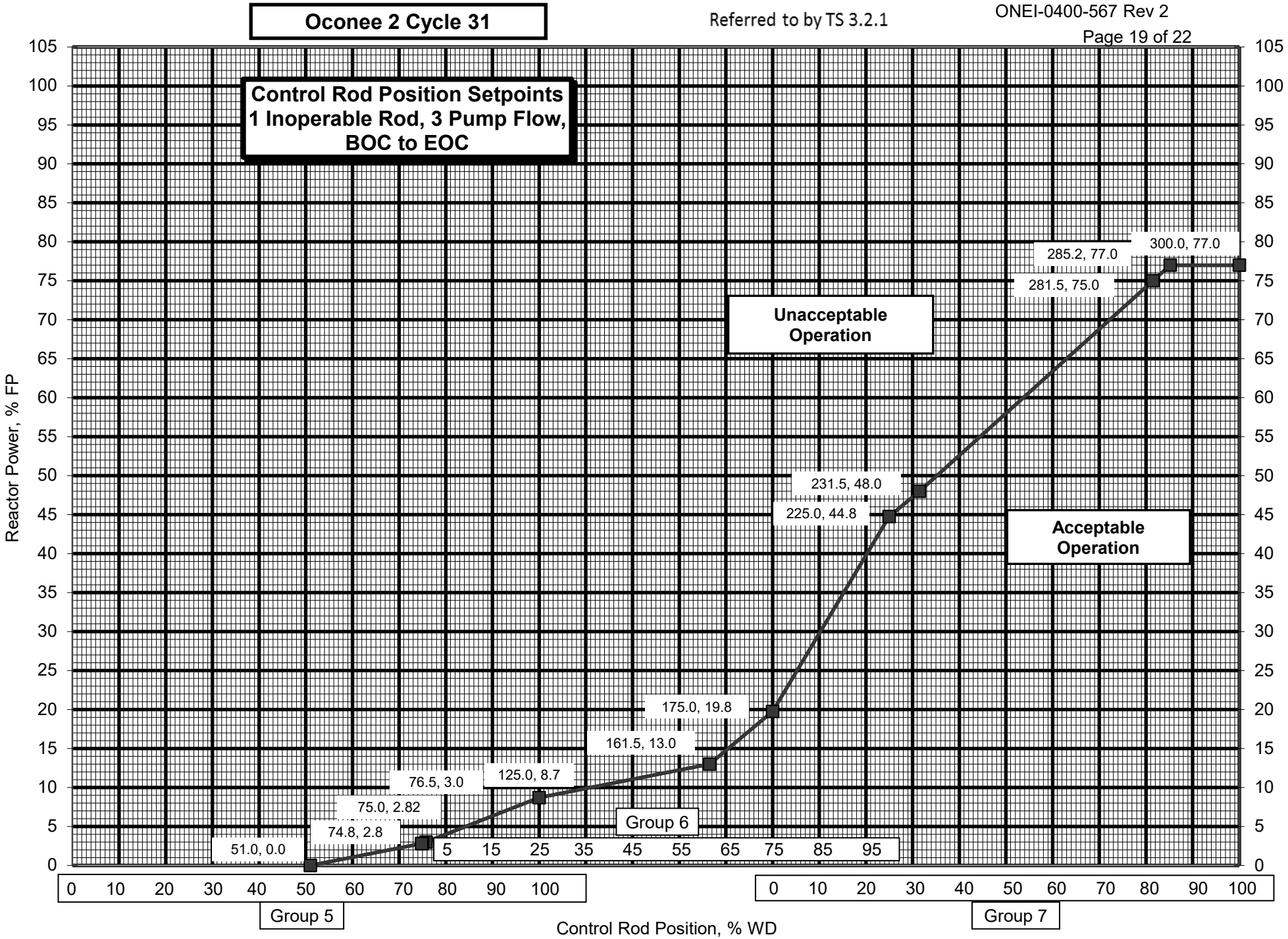

Oconee 2 Cycle 31

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	0 - 30	> 30	0 - 30	> 30	> 0
Quadrant Power Tilt, %	10.00	6.16	12.00	9.44	20.00

Variable Low RCS Pressure Protective Limits

Referred to by TS 2.1.1

Core Outlet Pressure	Reactor Coolant Outlet Temperature, °F	
psia	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

Oconee 2 Cycle 31

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	-33.9
	100.0	-	-26.3
	109.4	-14.4	-
	109.4	14.4	-
	100.0	-	25.9
	90.0	35.0	34.9
	80.0	-	39.4
	0.0	35.0	39.4
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	-	39.4
	62.3	35.0	-
	0.0	35.0	39.4

Oconee 2 Cycle 31

Rod Index Limits

Referred to by TS 3.2.1

Not for Plant Use

	%FP	Operational RI Insertion Limit	Shutdown Margin RI Insertion Limit No Inop Rod	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