

TOLEDO EDISON COMPANY

DAVIS-BESSE UNIT 1

CYCLE 9

CORE OPERATING LIMITS REPORT

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Rev. 0

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TOLEDO EDISON

DAVIS-BESSE UNIT 1

CYCLE 9

CORE OPERATING LIMITS REPORT

1.0 Core Operating Limits

This CORE OPERATING LIMITS REPORT for DB-1 Cycle 9 has been prepared in accordance with the requirements of Technical Specification 6.9.1.7. The core operating limits have been developed using the methodology provided in the references.

The following cycle-specific core operating limits are included in this report:

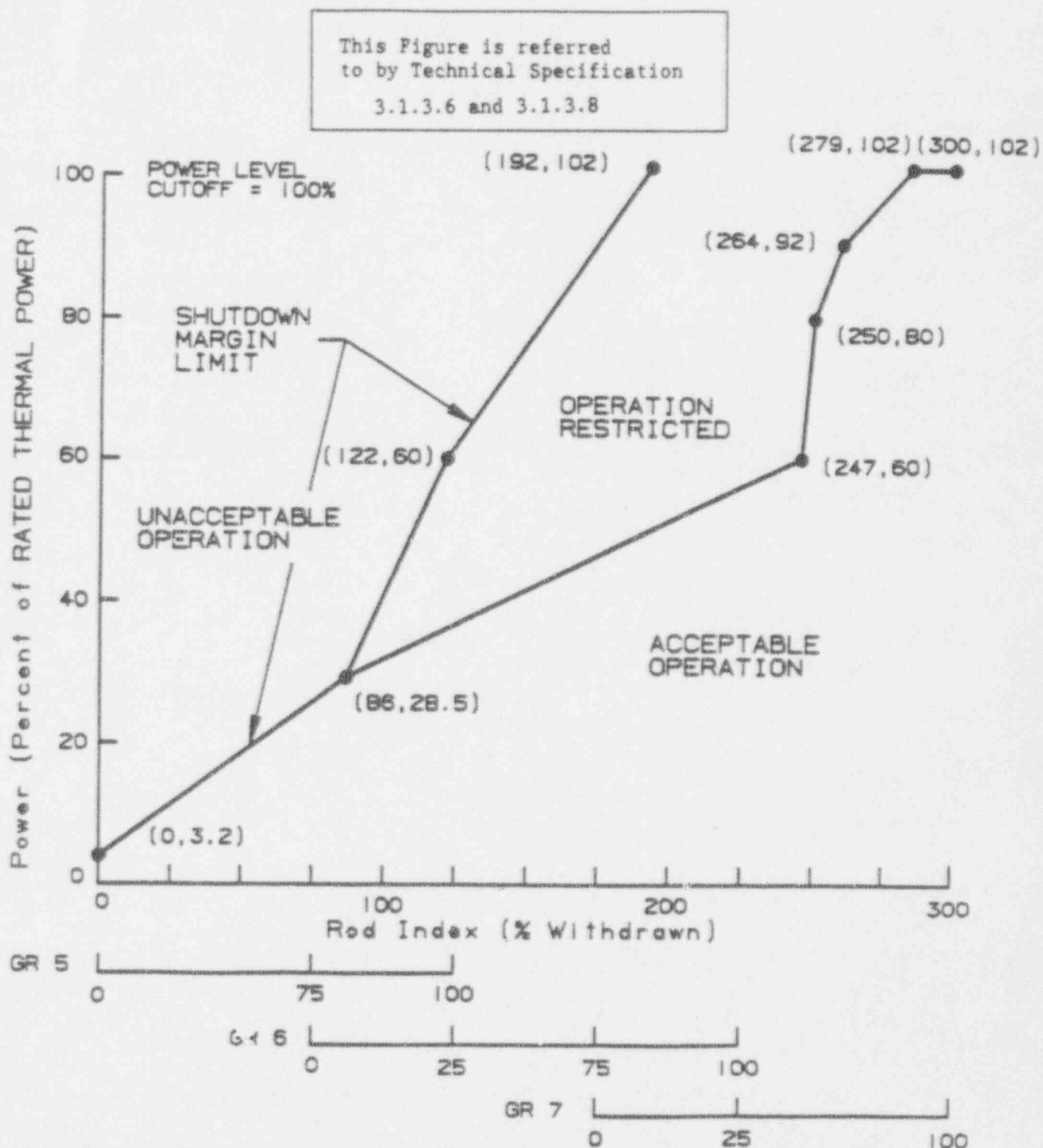
- 1) Regulating rod insertion limits and Xenon reactivity - "power level cutoff".
- 2) Rod program group positions
- 3) Axial Power Shaping Rod insertion limits
- 4) AXIAL POWER IMBALANCE operating limits and
- 5) QUADRANT POWER TILT limits
- 6) Negative Moderator Temperature Coefficient limit

2.0 References

- 1) B&W Fuel Company, Topical Report BAW-10122A Rev. 1, "Normal Operating Controls", May 1984
- 2) B&W Fuel Company, Topical Report BAW-10116A, "Assembly Calculations and Fitted Nuclear Data", May 1977
- 3) B&W Fuel Company, Topical Report BAW-10117P-A, "Babcock & Wilcox Version of PDQ User's Manual", January 1977
- 4) B&W Fuel Company, Topical Report BAW-10118A, "Core Computational Techniques and Procedures", December 1979.
- 5) B&W Fuel Company, Topical Report BAW-10124A, "FLAME 3 - A Three-Dimensional Nodal Code for Calculating Core Reactivity and Power Distributions", August 1976

- 6) B&W Fuel Company, Topical Report BAW-10125A, "Verification of the Three-Dimensional FLAME Code", August 1976
- 7) B&W Fuel Company, Topical Report BAW-10152A, "NOODLE - A Multi-Dimensional Two-Group Reactor Simulator", June 1985
- 8) B&W Fuel Company, Topical Report BAW-10119 P-A, "Power Peaking Nuclear Reliability Factors", February 1979
- 9) B&W Fuel Company, Topical Report BAW-10180-A, "NEMO. Nodal Expansion Method Optimized," December 1992.
- 10) B&W Fuel Company, Topical Report BAW-10162 P-A, "TAC03: Fuel Pin Thermal Analysis Computer Code," November 1989.
- 11) Log Number 3139, dated January 11, 1990 (T. V. Wambach (NRC) to D. C. Shelton (TE)). (NRC SER for Rod Program)
- 12) Log Number 3441, dated April 10, 1991 (J. R. Hall, Sr. (NRC) to D. C. Shelton (TE)). (NRC's SER for Negative Moderator Temperature Coefficient Limit)
- 13) Log Number 3609, dated October 29, 1991, (J. B. Hopkins (NRC) to D. C. Shelton (TE)). (NRC's SER for change to Technical Specification 5.3.1)
- 14) BAW-2180, "Davis-Besse Nuclear Power Station Unit 1, Cycle 9 -- Reload Report", December 1992.

Figure 1a Regulating Group Position Limits,  
0 to 75±10 EFPD, Four RC Pumps --  
Davis-Besse 1, Cycle 9

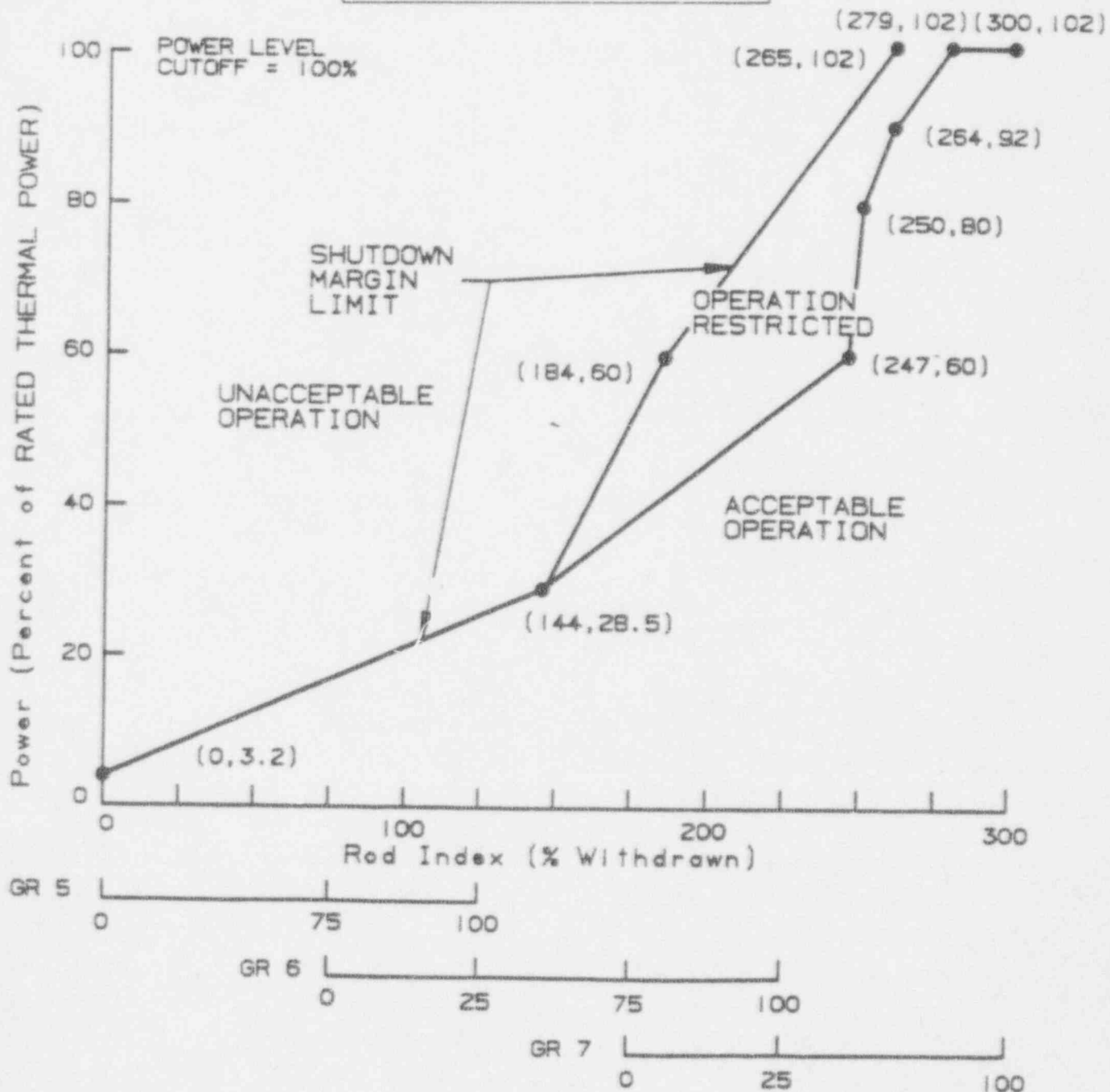


Note 1: A Rod Group overlap of 25±5% between sequential withdrawn groups 5 and 6, and 6 and 7 shall be maintained.

Note 2: Instrument error is not accounted for in these limits

Figure 1b Regulating Group Position Limits,  
75±10 to 300±10 EFPD, Four RC Pumps --  
Davis-Besse 1, Cycle 9

This Figure is referred  
to by Technical Specification  
3.1.3.6 and 3.1.3.8



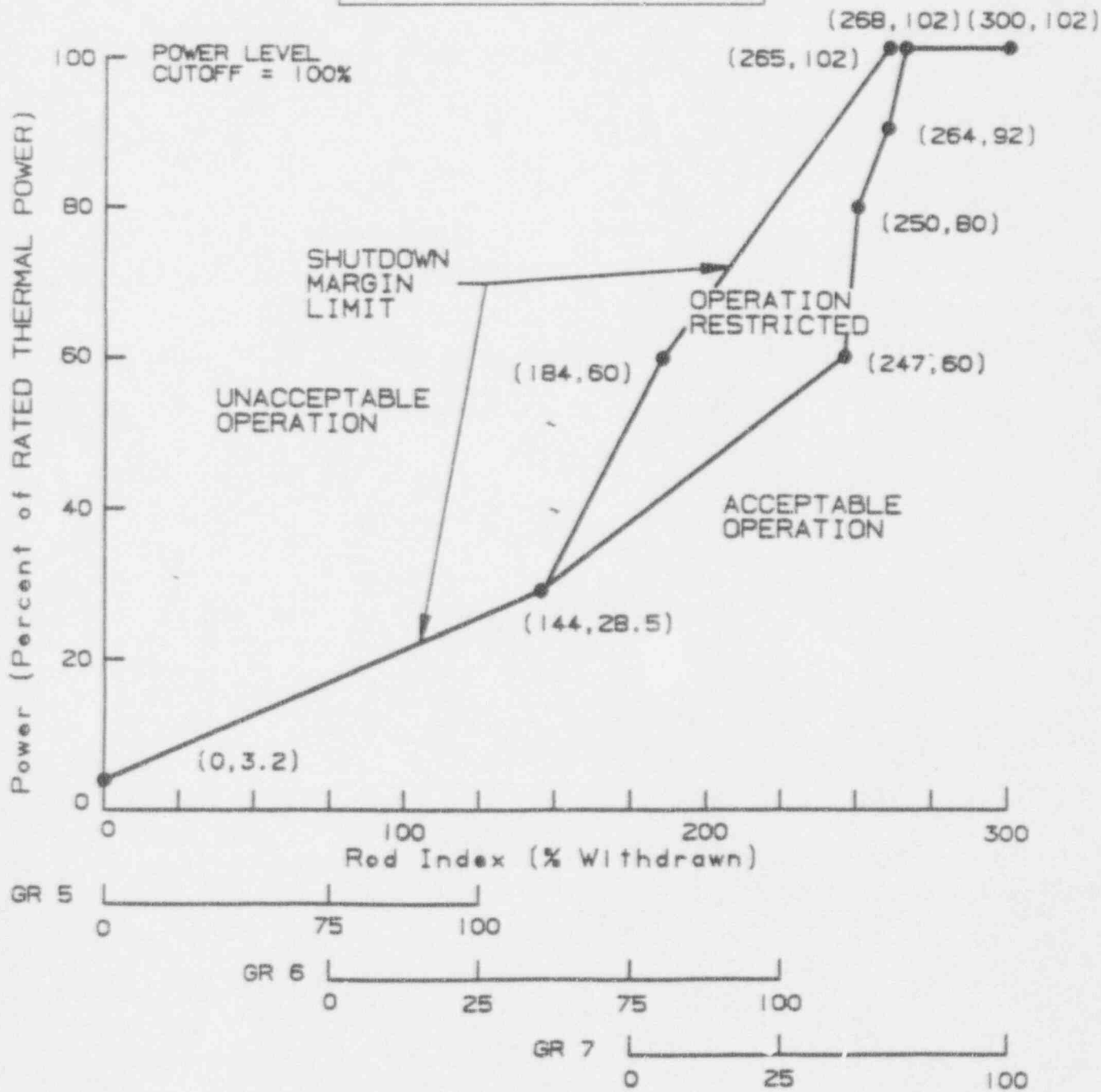
Note 1: A Rod Group overlap of 25±5% between sequential withdrawn groups 5 and 6, and 6 and 7 shall be maintained.

Note 2: Instrument error is not accounted for in these limits



Figure 1c Regulating Group Position Limits.

This Figure is referred to by Technical Specification 3.1.3.6 and 3.1.3.8



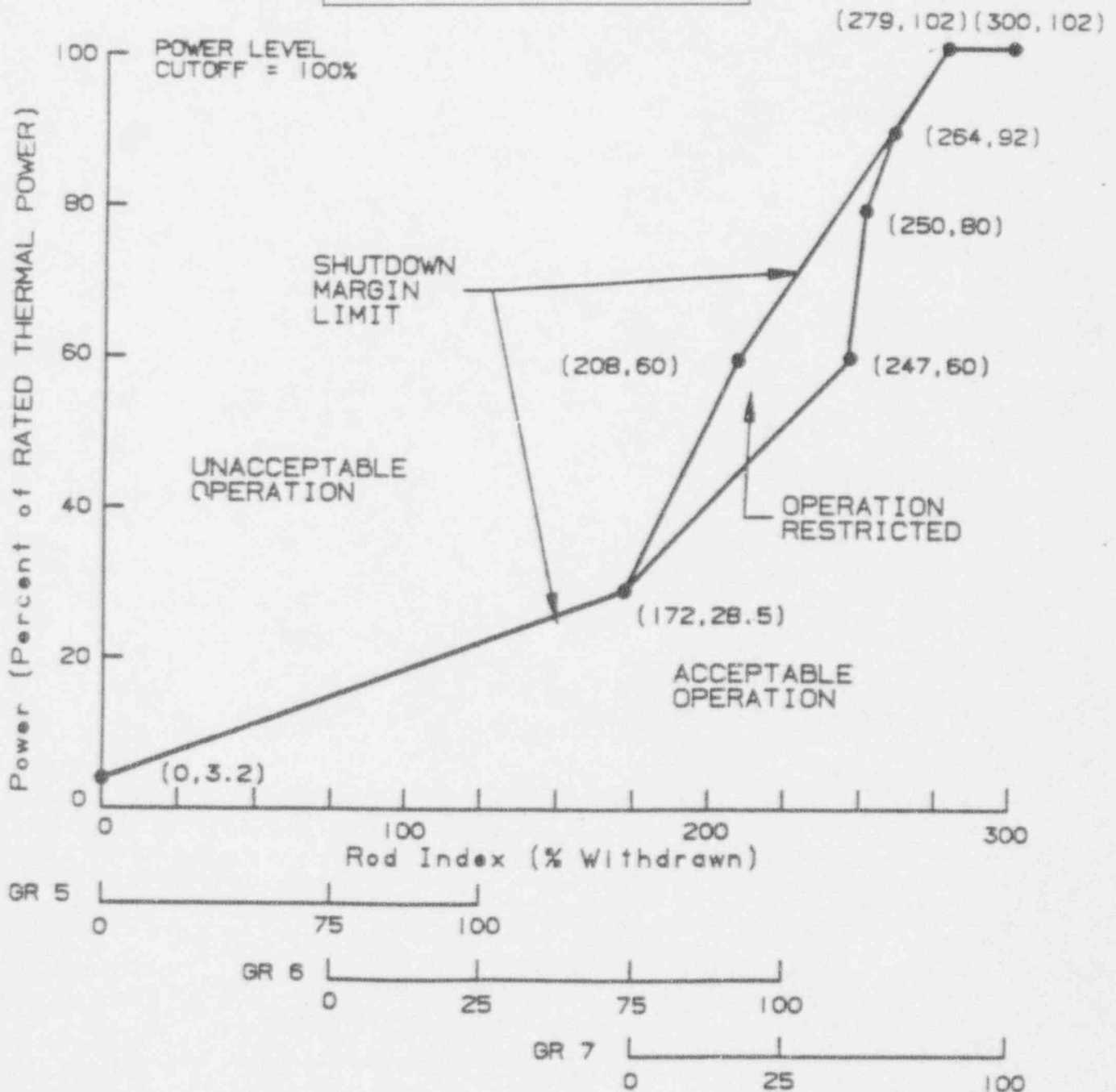
Note 1: A Rod Group overlap of 25+5% between sequential withdrawn groups 5 and 6, and 6 and 7 shall be maintained.

Note 2: Instrument error is not accounted for in these limits



Figure 1d Regulating Group Position Limits,  
After  $425 \pm 10$  EFPD, Four RC Pumps --  
Davis-Besse 1, Cycle 9

This Figure is referred  
to by Technical Specification  
3.1.3.6 and 3.1.3.8

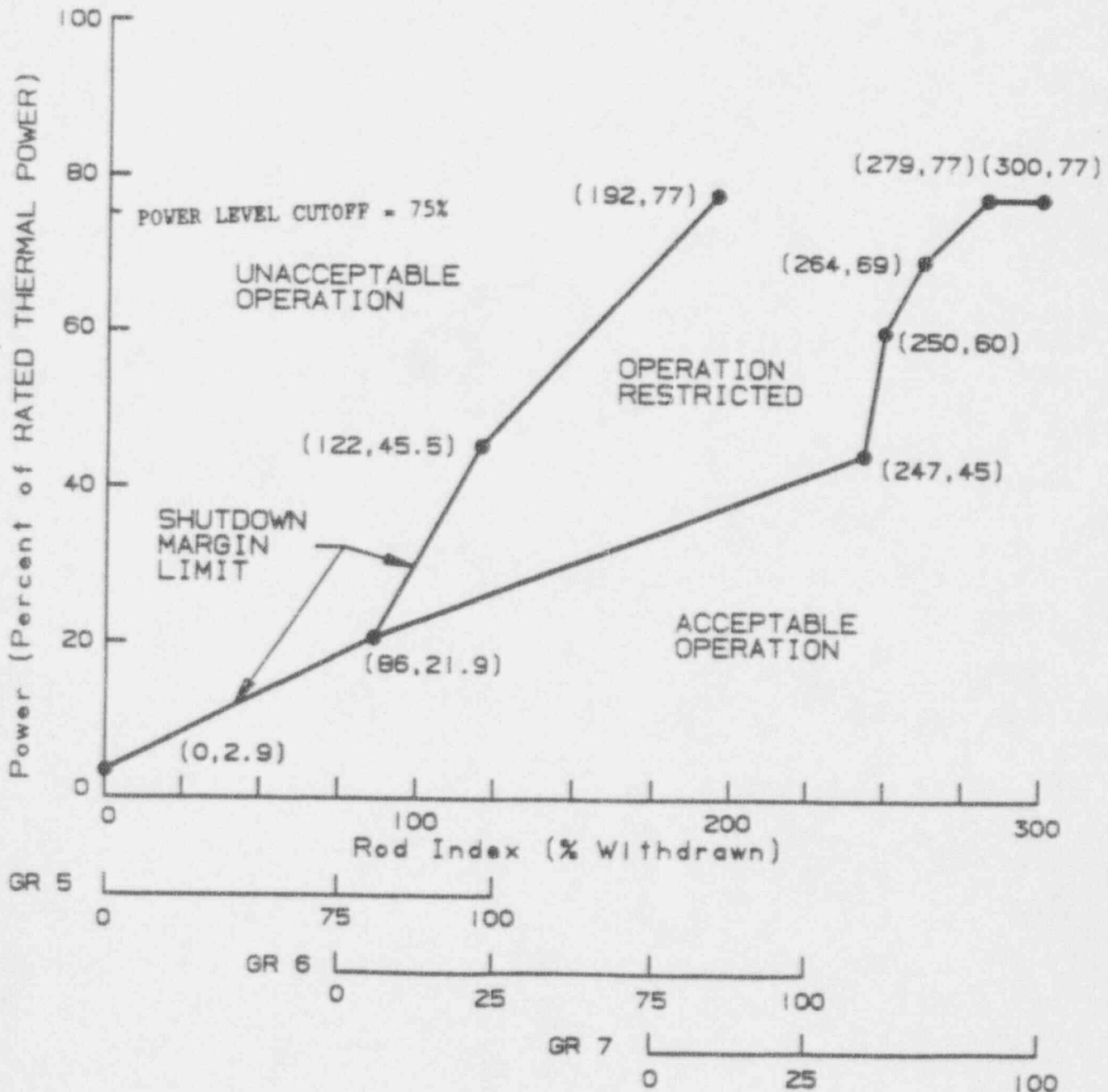


Note 1: A Rod Group overlap of  $25 \pm 5\%$  between sequential withdrawn groups 5 and 6, and 6 and 7 shall be maintained.

Note 2: Instrument error is not accounted for in these limits

Figure 2a Regulating Group Position Limits,  
0 to 75±10 EFPD, Three RC Pumps --  
Davis-Besse 1, Cycle 9

This Figure is referred  
to by Technical Specification  
3.1.3.6 and 3.1.3.8

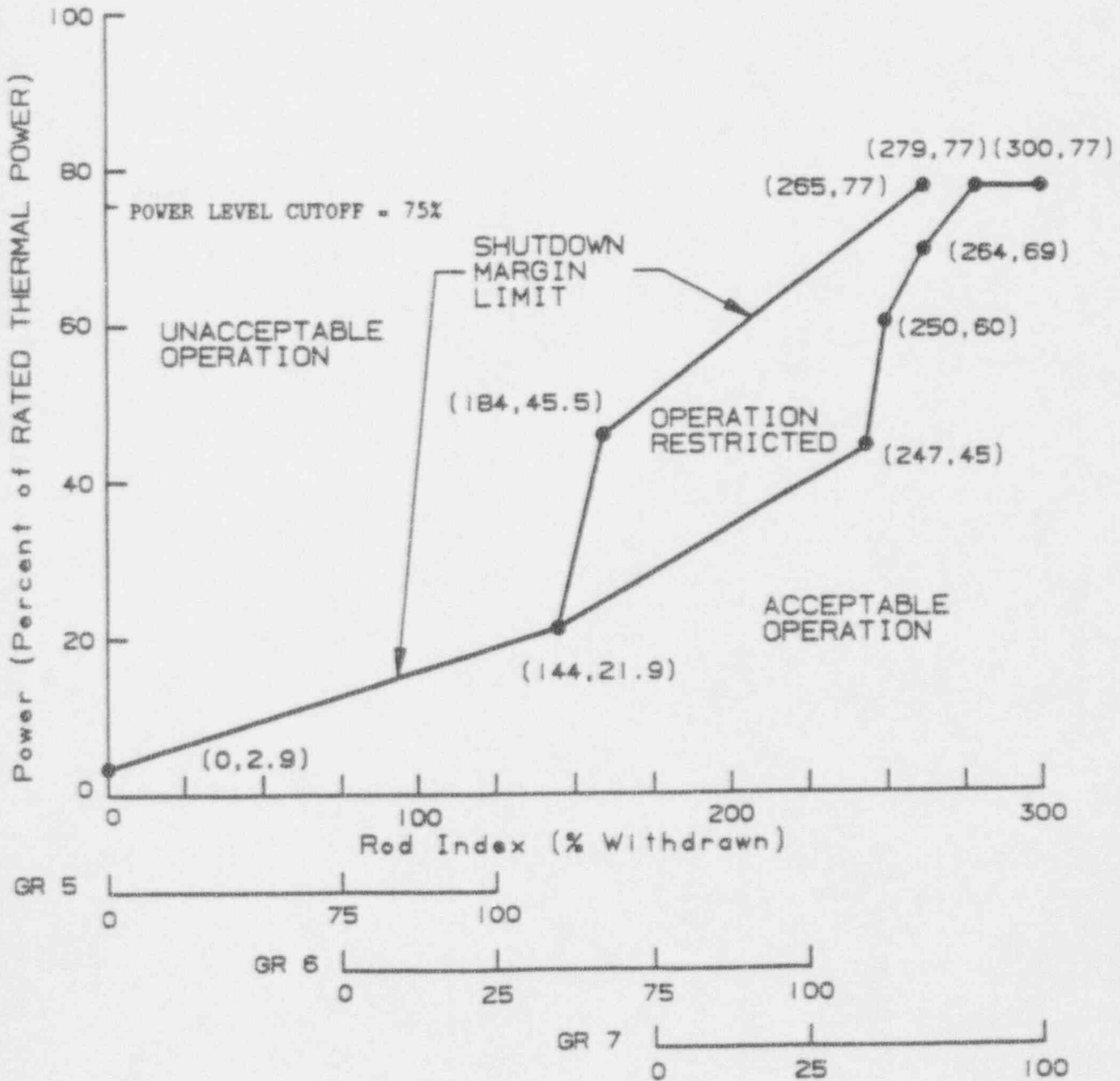


Note 1: A Rod Group overlap of 25±5% between sequential withdrawn groups 5 and 6, and 6 and 7 shall be maintained.

Note 2: Instrument error is not accounted for in these limits

Figure 2b Regulating Group Position Limits,  
75±10 to 300±10 EFPD, Three RC Pumps --  
Davis-Besse 1, Cycle 9

This Figure is referred  
to by Technical Specification  
3.1.3.6 and 3.1.3.8



Note 1: A Rod Group overlap of 25±5% between sequential withdrawn groups 5 and 6, and 6 and 7 shall be maintained.

Note 2: Instrument error is not accounted for in these limits

Power (Percent of Rated Thermal Power)

POWER LEVEL CUTOFF = 75%

SHUTDOWN MARGIN LIMIT

UNACCEPTABLE OPERATION

OPERATION RESTRICTED

ACCEPTABLE OPERATION

Red Index (% Withdrawn)

GR 5

GR 6

GR 7

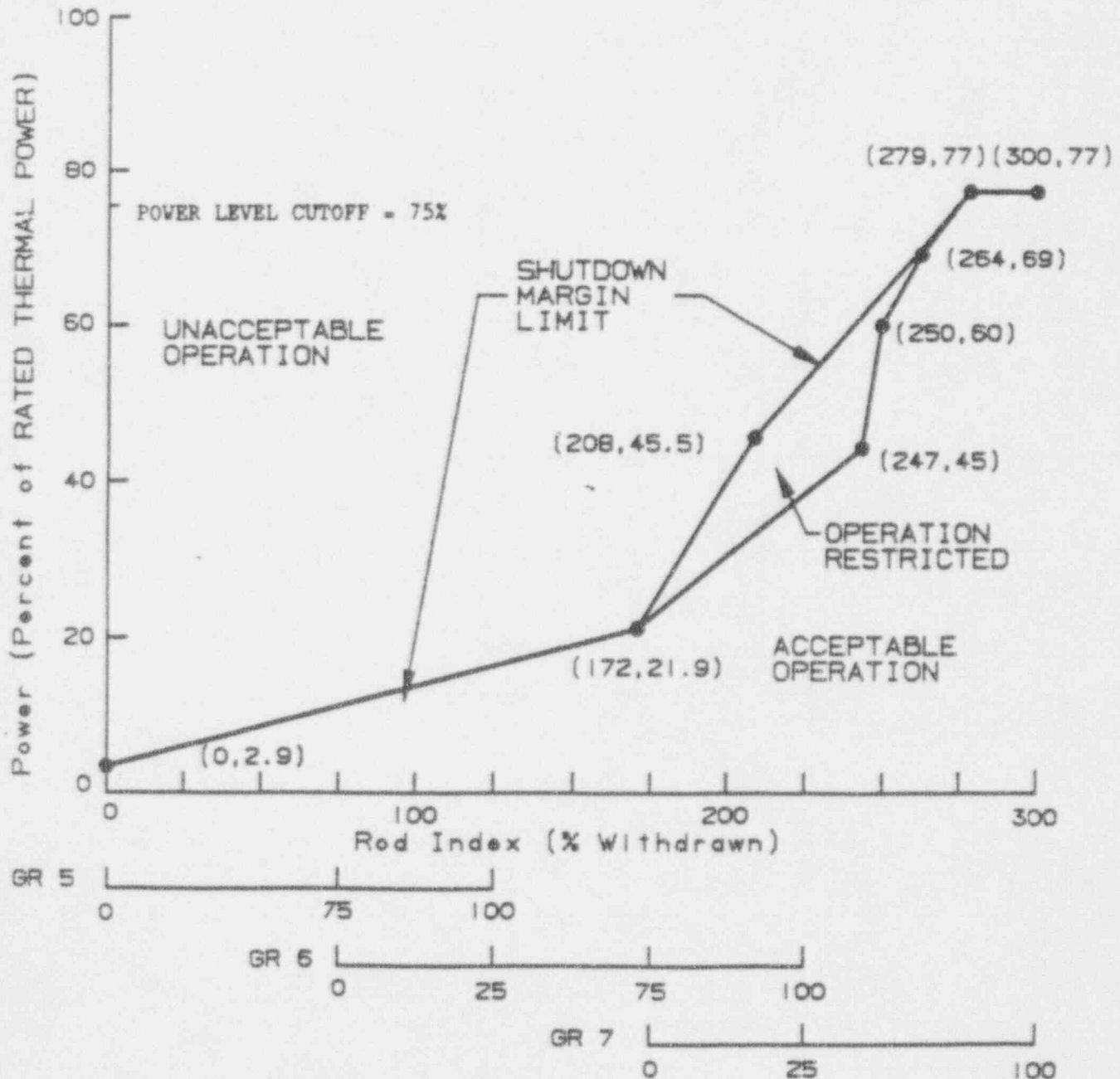
Key Data Points:

- (0, 2.9)
- (144, 21.9)
- (184, 45.5)
- (247, 45)
- (250, 60)
- (264, 69)
- (265, 77)
- (268, 77)
- (300, 77)

Note 2: Instrument error is not accounted for in these limits

Figure 2d Regulating Group Position Limits,  
After 425±10 EFPD, Three RC Pumps --  
Davis-Besse 1, Cycle 9

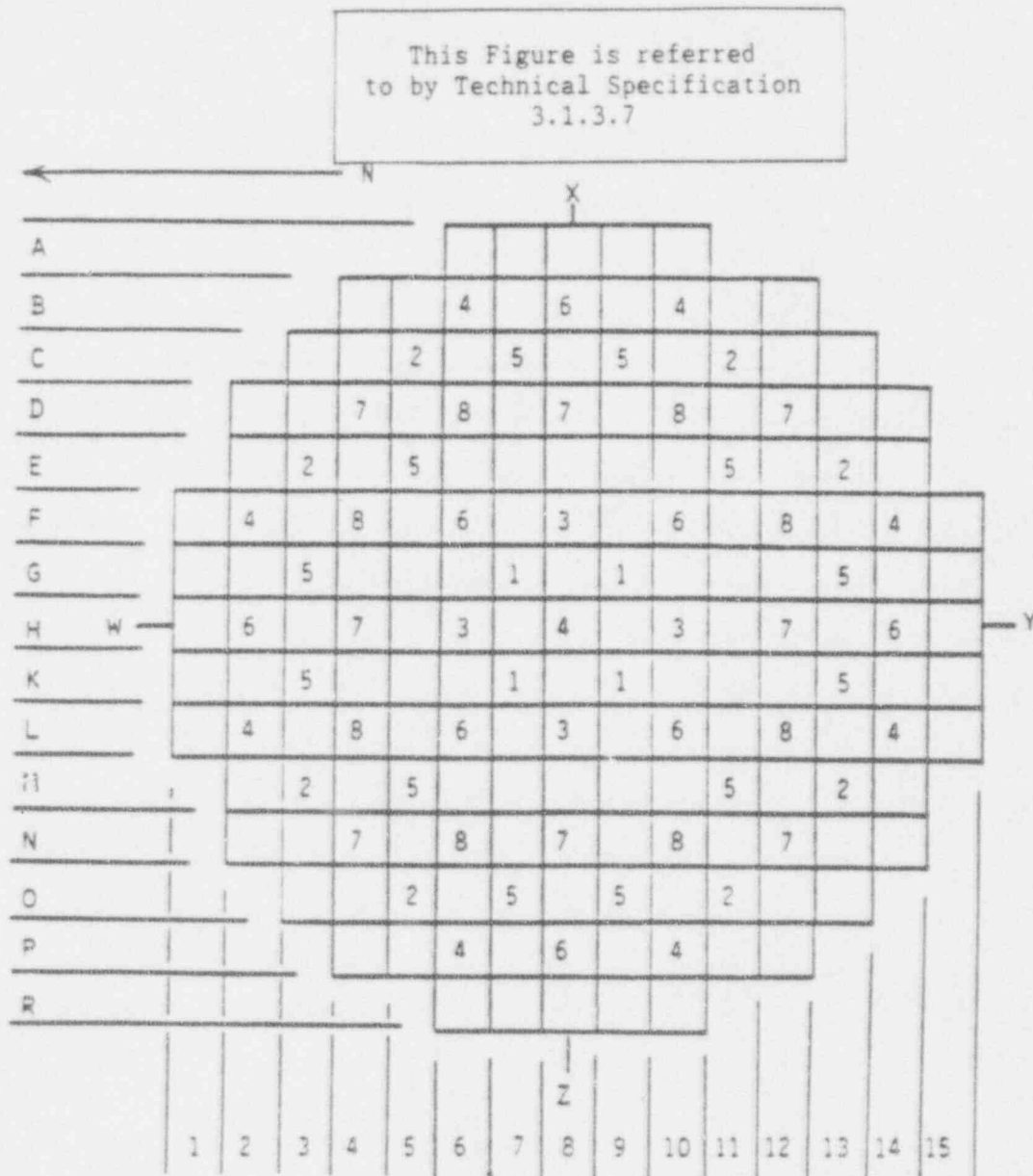
This Figure is referred  
to by Technical Specification  
3.1.3.6 and 3.1.3.8



Note 1: A Rod Group overlap of 25±5% between sequential withdrawn groups 5 and 6, and 6 and 7 shall be maintained.

Note 2: Instrument error is not accounted for in these limits

Figure 3 Control Rod Core Locations  
and Group Assignments --  
Davis-Besse 1, Cycle 9

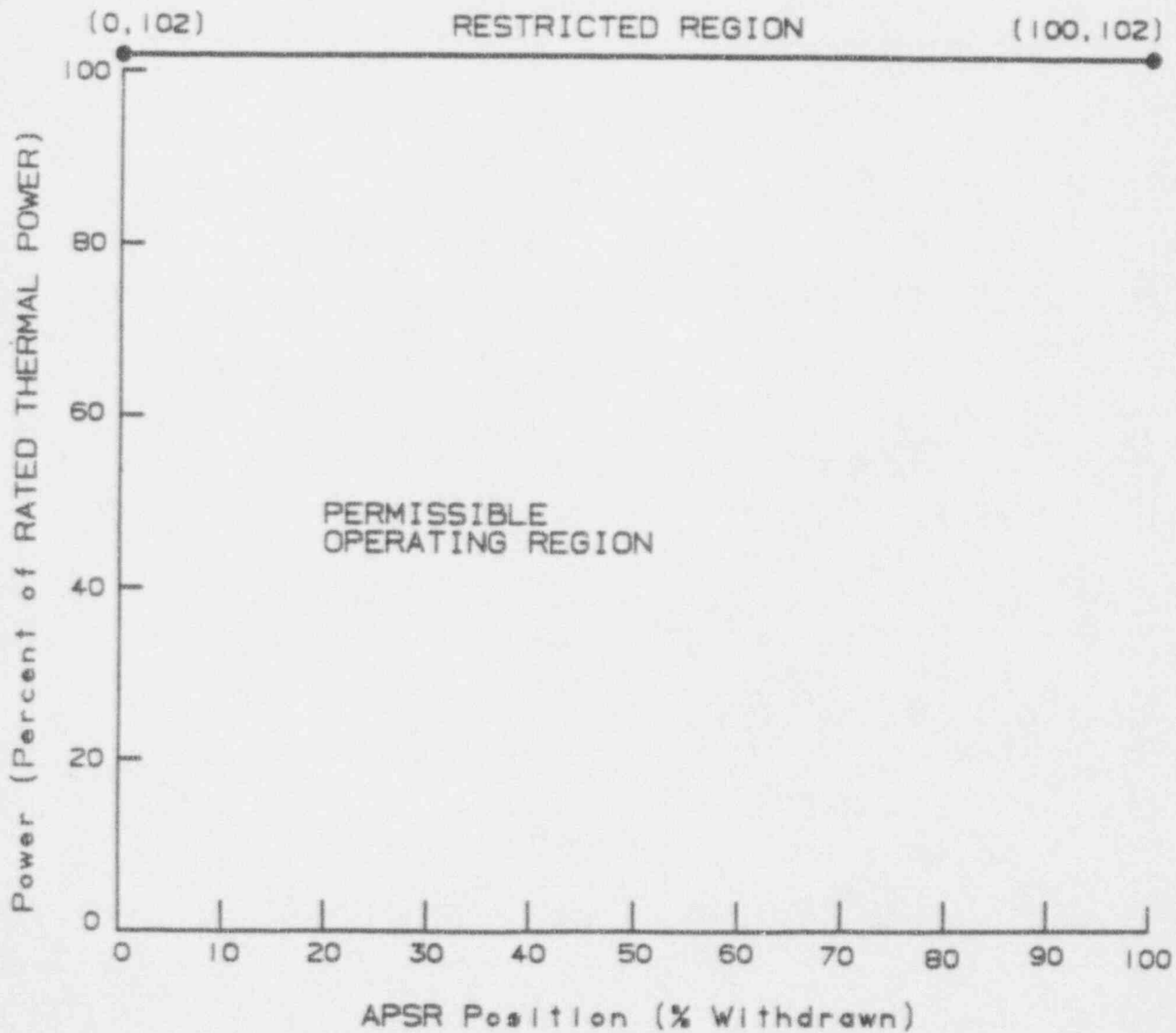


X Group Number

Group	No. of Rods	Function
1	4	Safety
2	8	Safety
3	4	Safety
4	9	Safety
5	12	Control
6	8	Control
7	8	Control
8	8	APSRs
Total	61	

Figure 4a APSR Position Limits,  
0 to 425+10 EFPD, Four RC Pumps --  
Davis-Besse 1, Cycle 9

This Figure is referred  
to by Technical Specification  
3.1.3.9

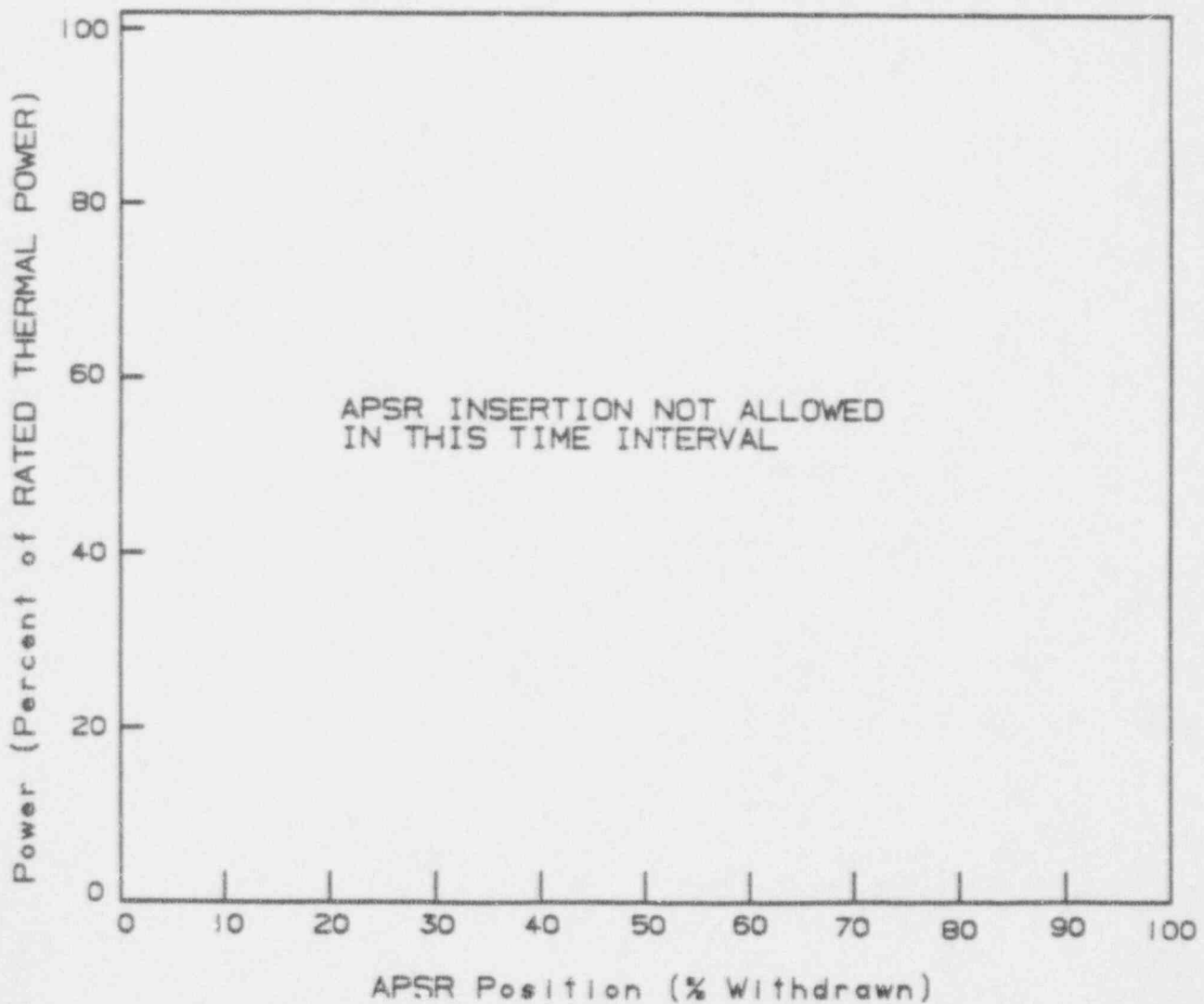


Note 1: Instrument error is not accounted for in these limits



Figure 4b APSR Position Limits, After  
425-10 EFPD, Three or Four RC Pumps,  
APSRs Withdrawn -- Davis-Besse 1, Cycle 9

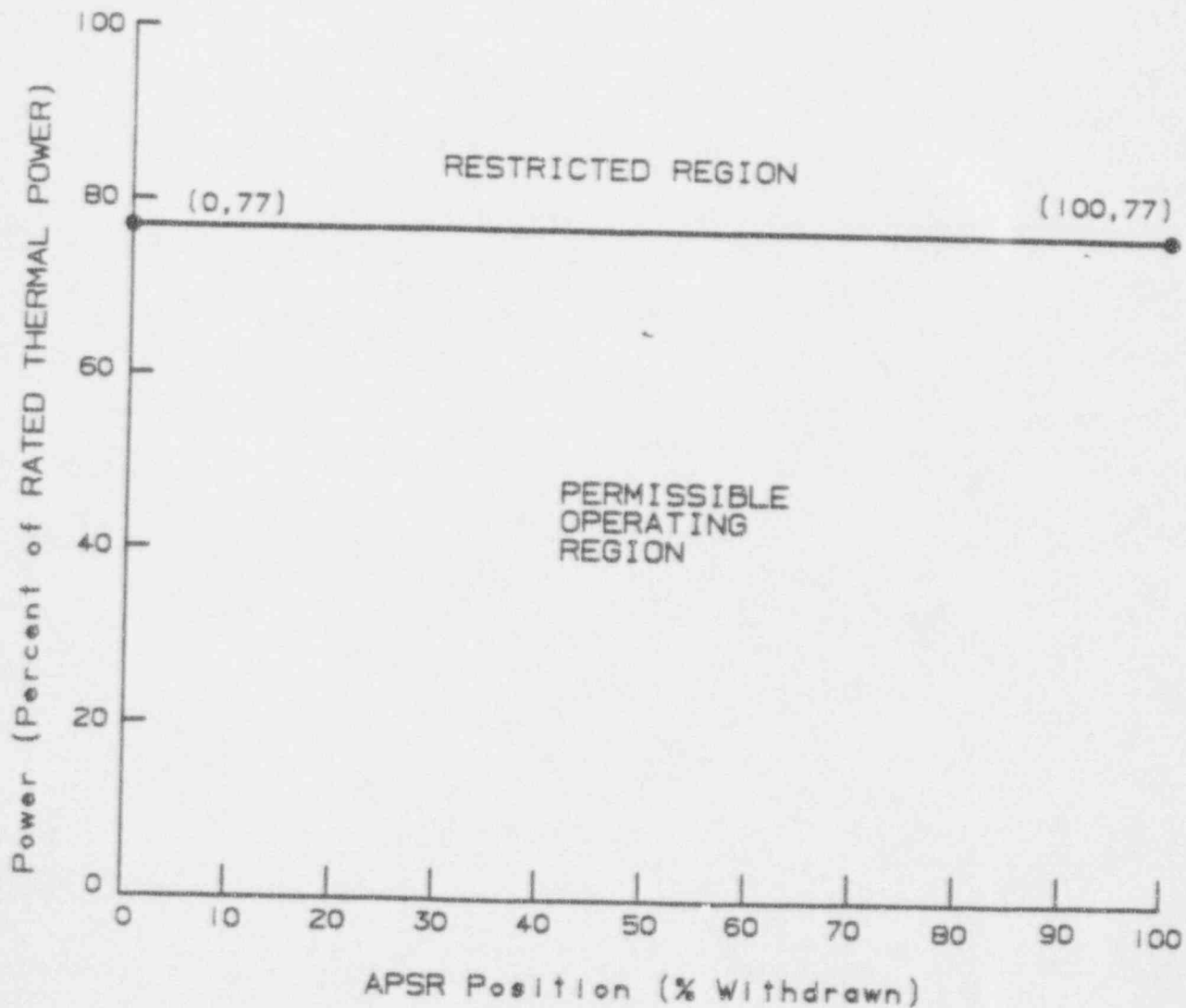
This Figure is referred  
to by Technical Specification  
3.1.3.9



Note 1: Instrument error is not accounted for in these limits

Figure 4c APSR Position Limits,  
0 to 425+10 EFPD, Three RC Pumps --  
Davis-Besse 1, Cycle 9

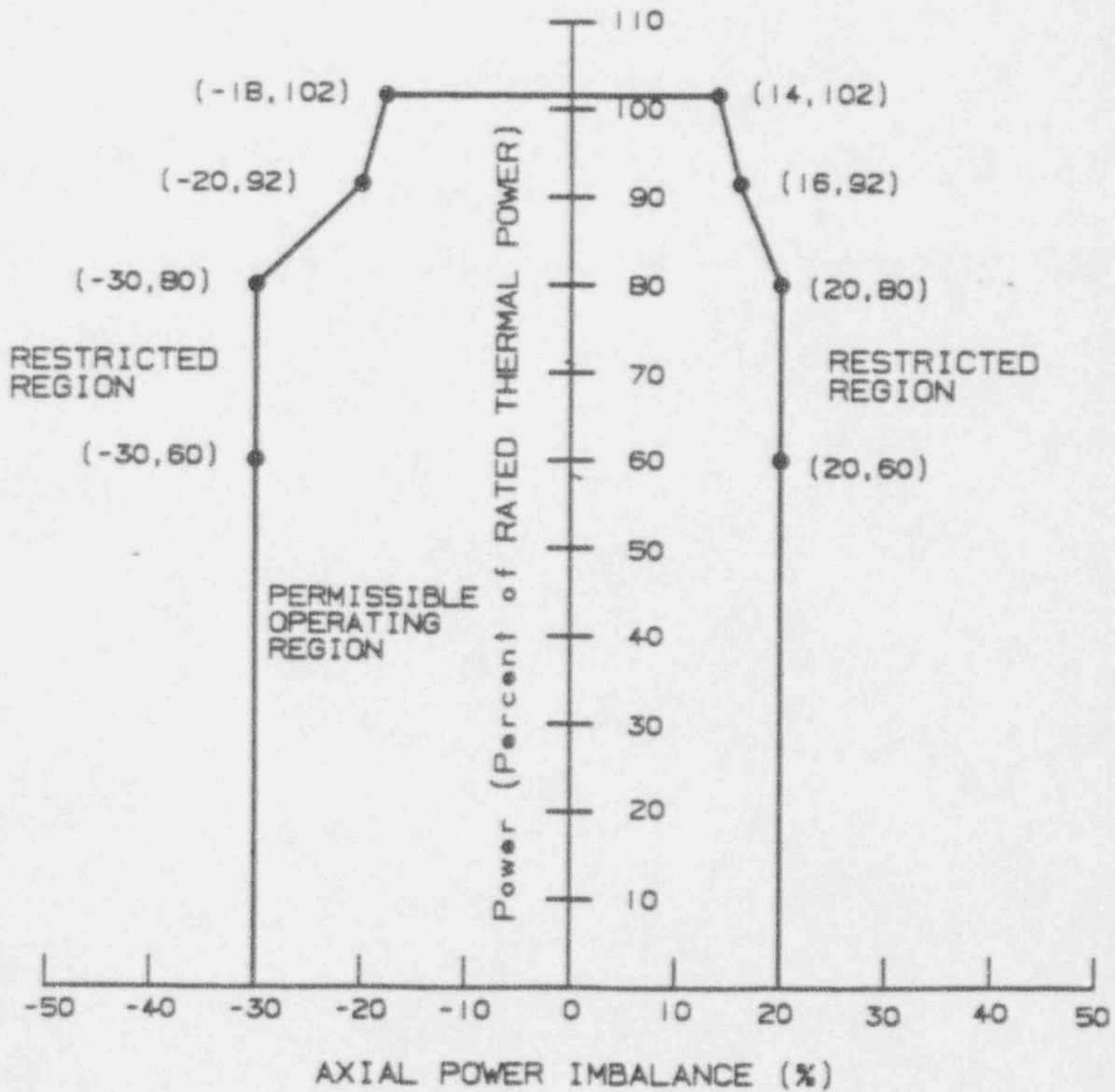
This Figure is referred  
to by Technical Specification  
3.1.3.9



Note 1: Instrument error is not accounted for in these limits

Figure 5a AXIAL POWER IMBALANCE Limits,  
0 to 75±10 EFPD, Four RC Pumps --  
Davis-Besse 1, Cycle 9

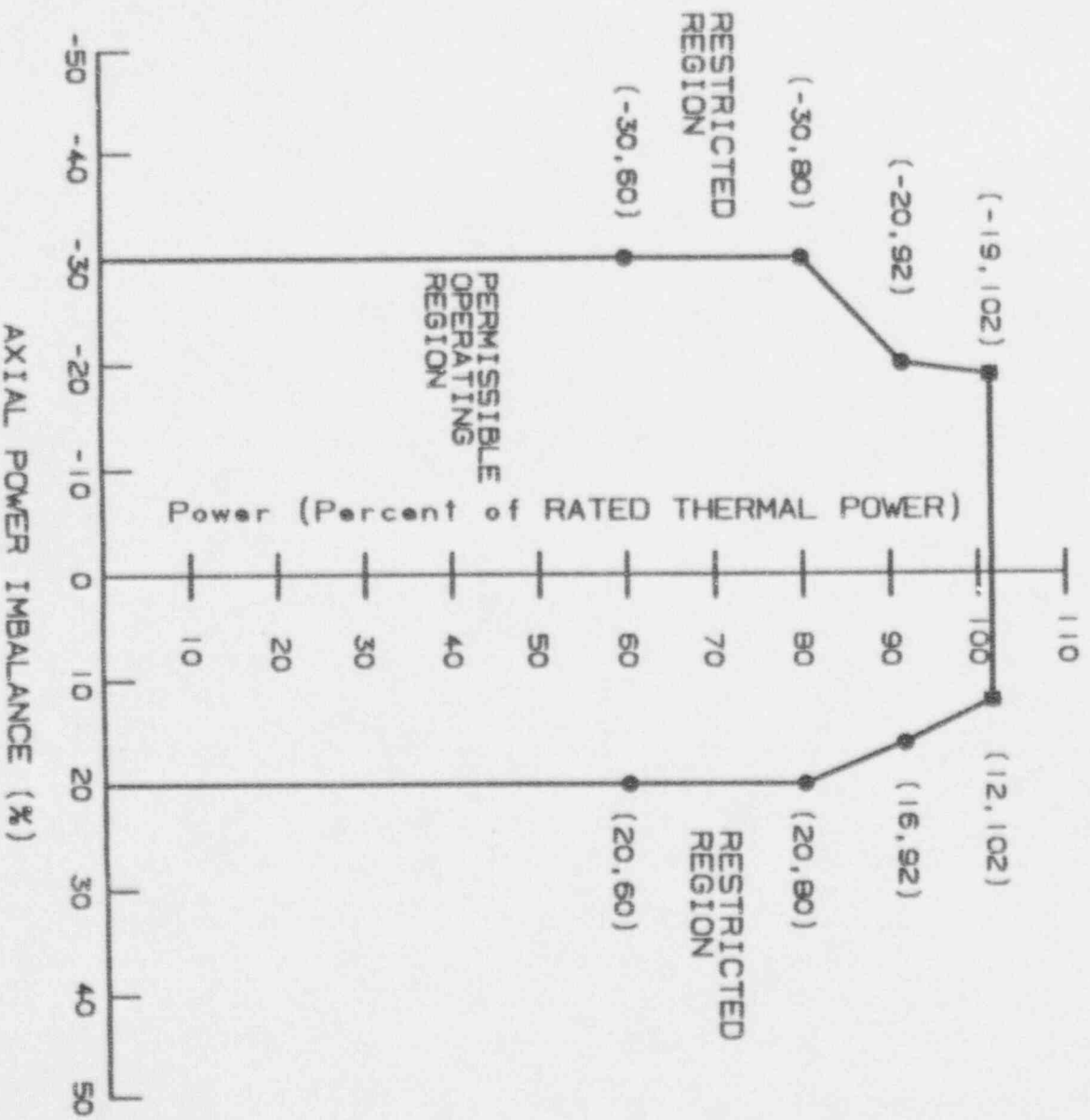
This Figure is referred  
to by Technical Specification  
3.2.1



Note 1: Instrument error is not accounted for in these limits

Figure 5b AXIAL POWER IMBALANCE Limits,  
75±10 to 300±10 EFPPD, Four RC Pumps --  
Davis-Besse 1, Cycle 9

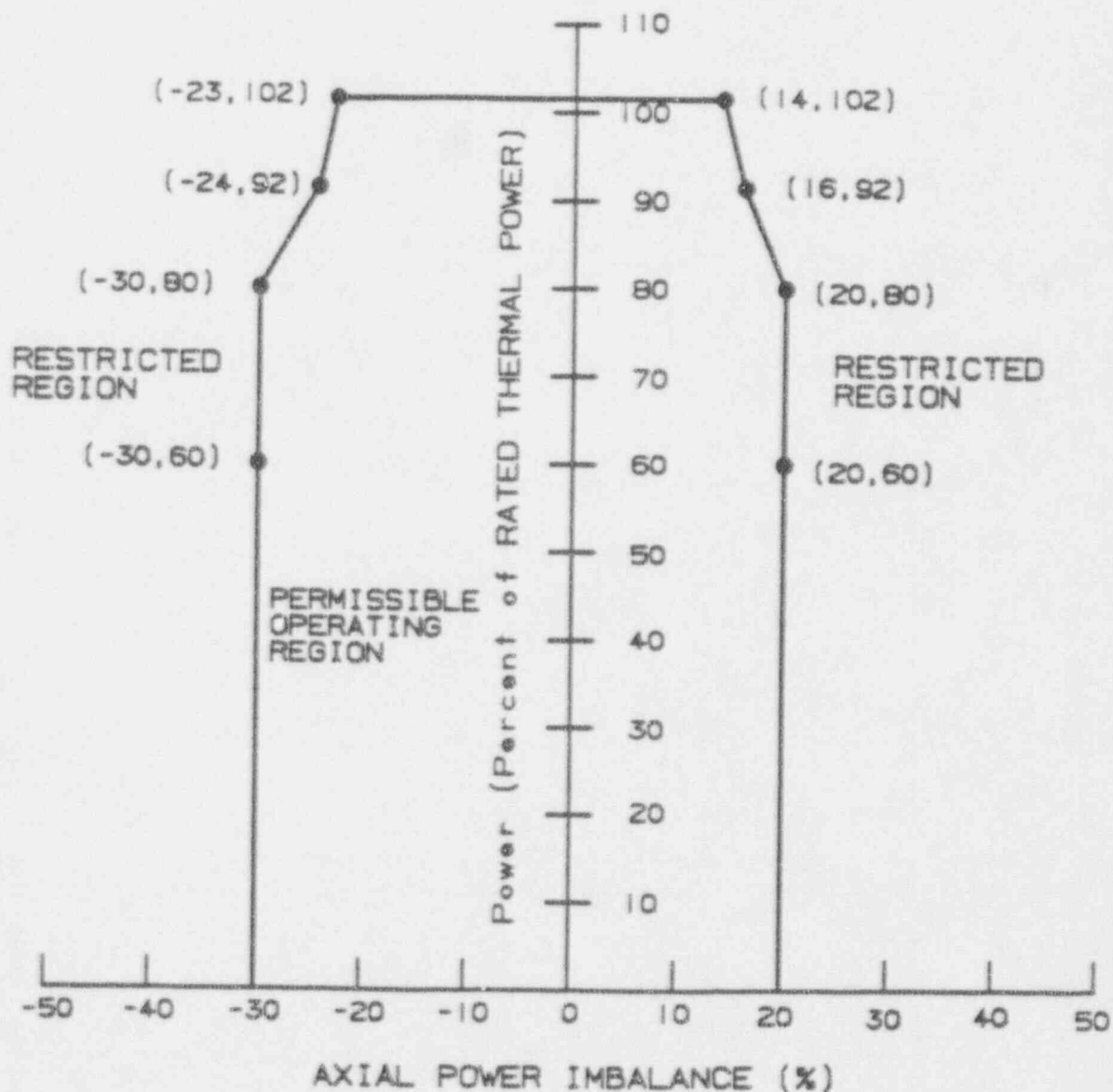
This Figure is referred  
to by Technical Specification  
3.2.1



Note 1: Instrument error is not accounted for in these limits

Figure 5c AXIAL POWER IMBALANCE Limits,  
300 $\pm$ 10 to 425 $\pm$ 10 EFPD, Four RC Pumps --  
Davis-Besse 1, Cycle 9

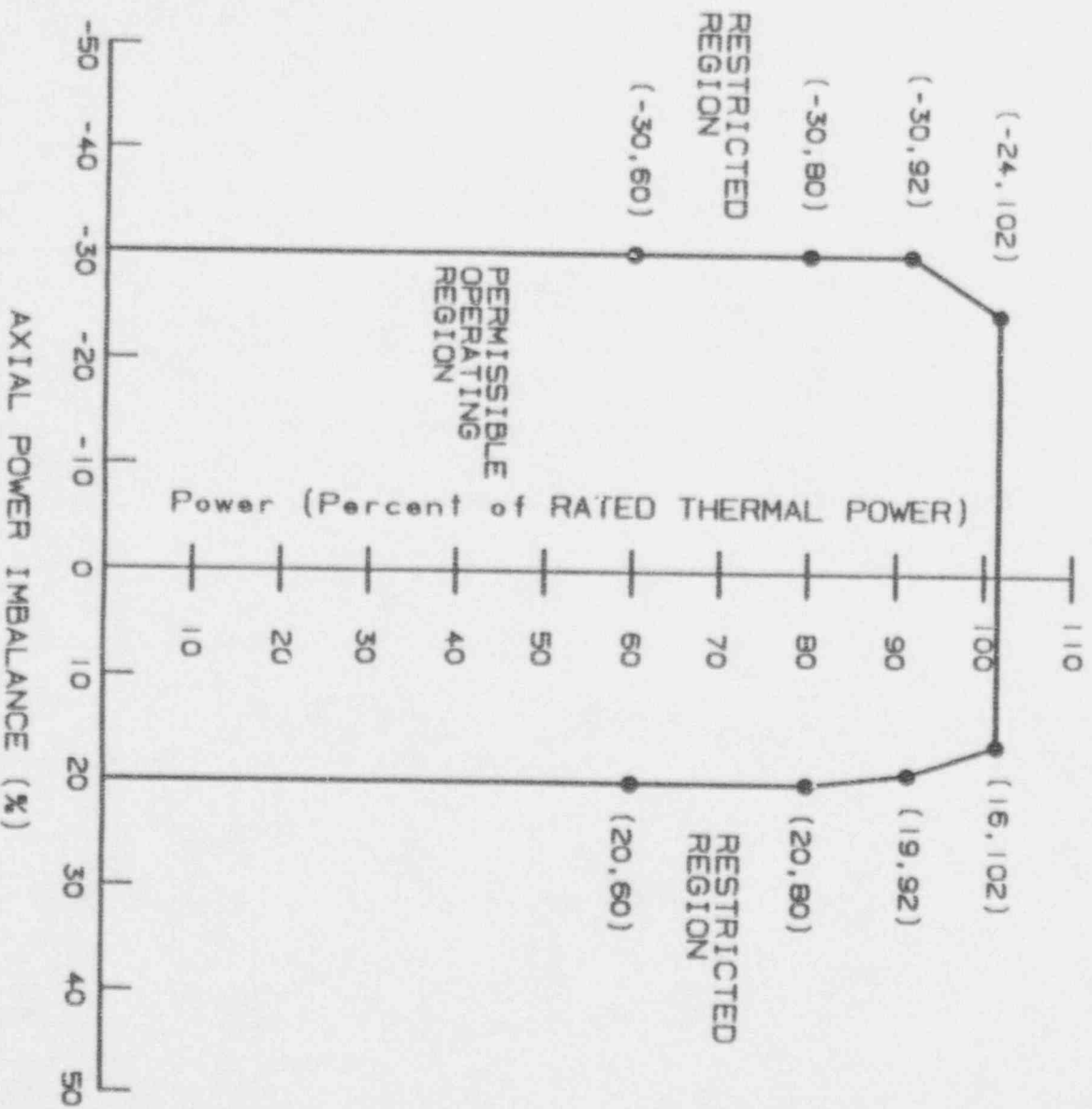
This Figure is referred  
to by Technical Specification  
3.2.1



Note 1: Instrument error is not accounted for in these limits

Figure 5d AXIAL POWER IMBALANCE Limits,  
After 425±10 EFPD, Four RC Pumps --  
Davis-Besse 1, Cycle 9

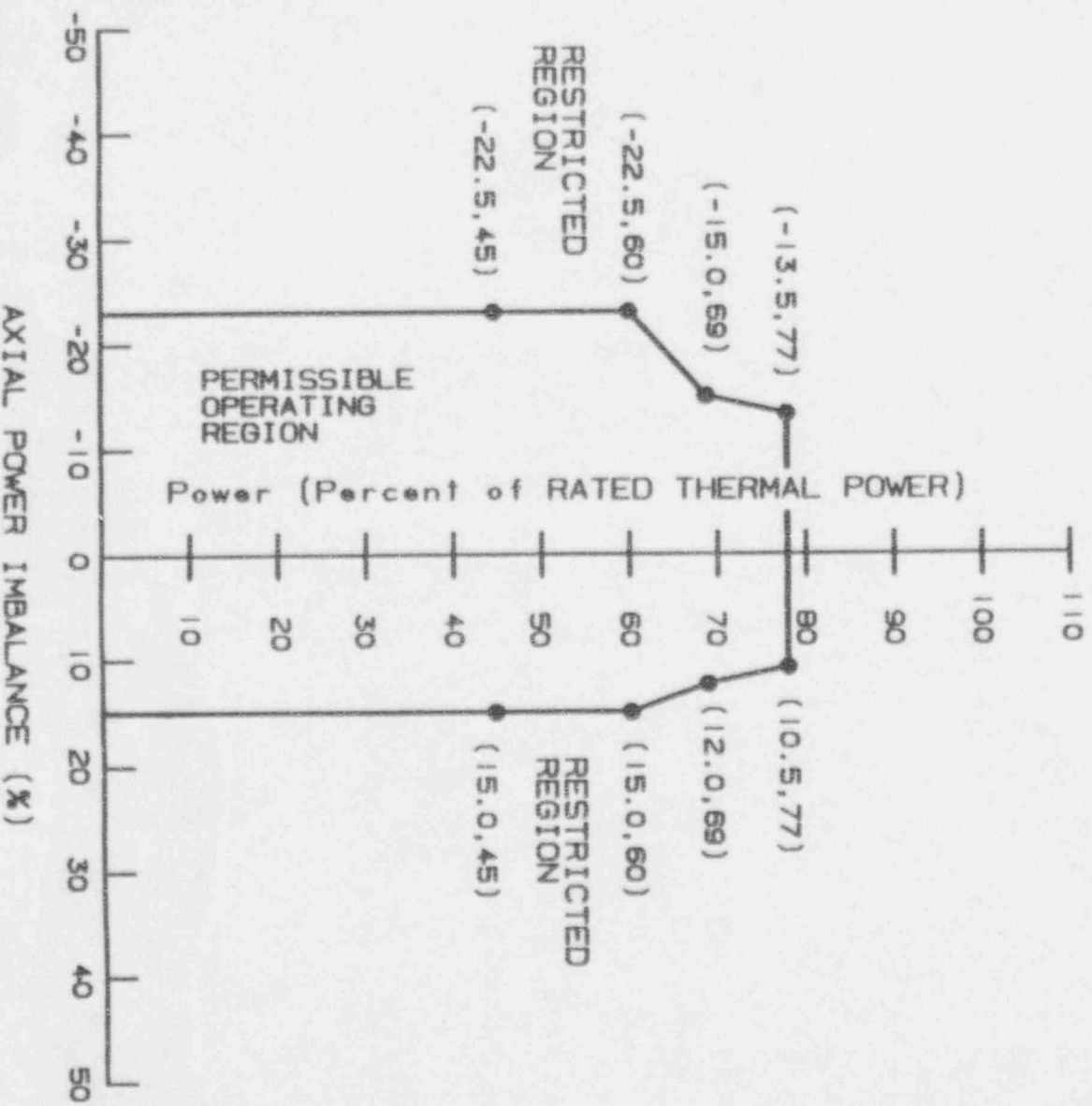
This Figure is referred  
to by Technical Specification  
3.2.1



Note 1: Instrument error is not accounted for in these limits

Figure 6a AXIAL POWER IMBALANCE Limits,  
0 to 75±10 EFPD, Three RC Pumps ---  
Davis-Besse 1, Cycle 9

This Figure is referred  
to by Technical Specification  
3.2.1

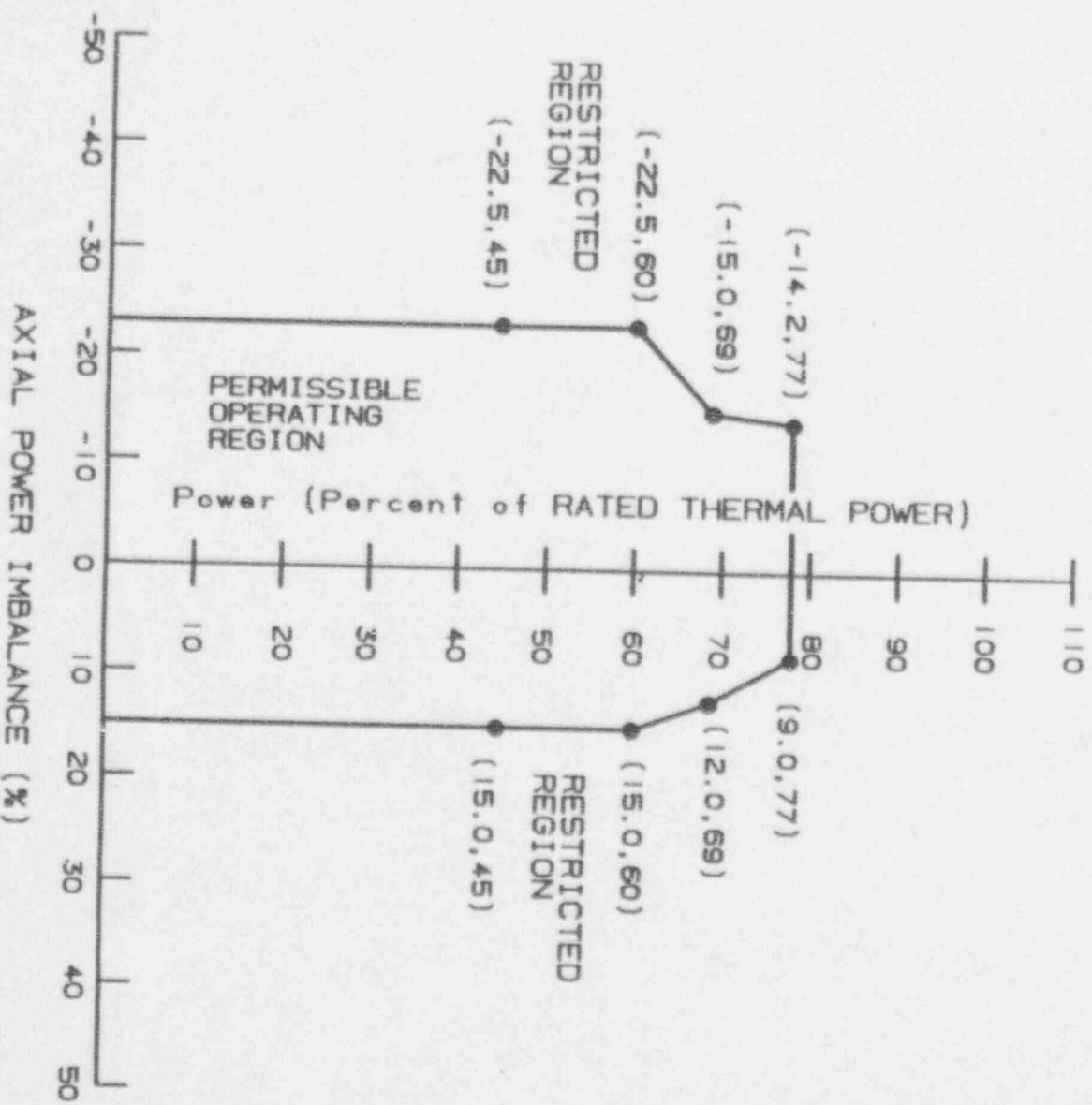


Note 1: Instrument error is not accounted for in these limits



Figure 6b AXIAL POWER IMBALANCE Limits,  
75±10 to 300±10 EFPD, Three RC Pumps --  
Davis-Besse 1, Cycle 9

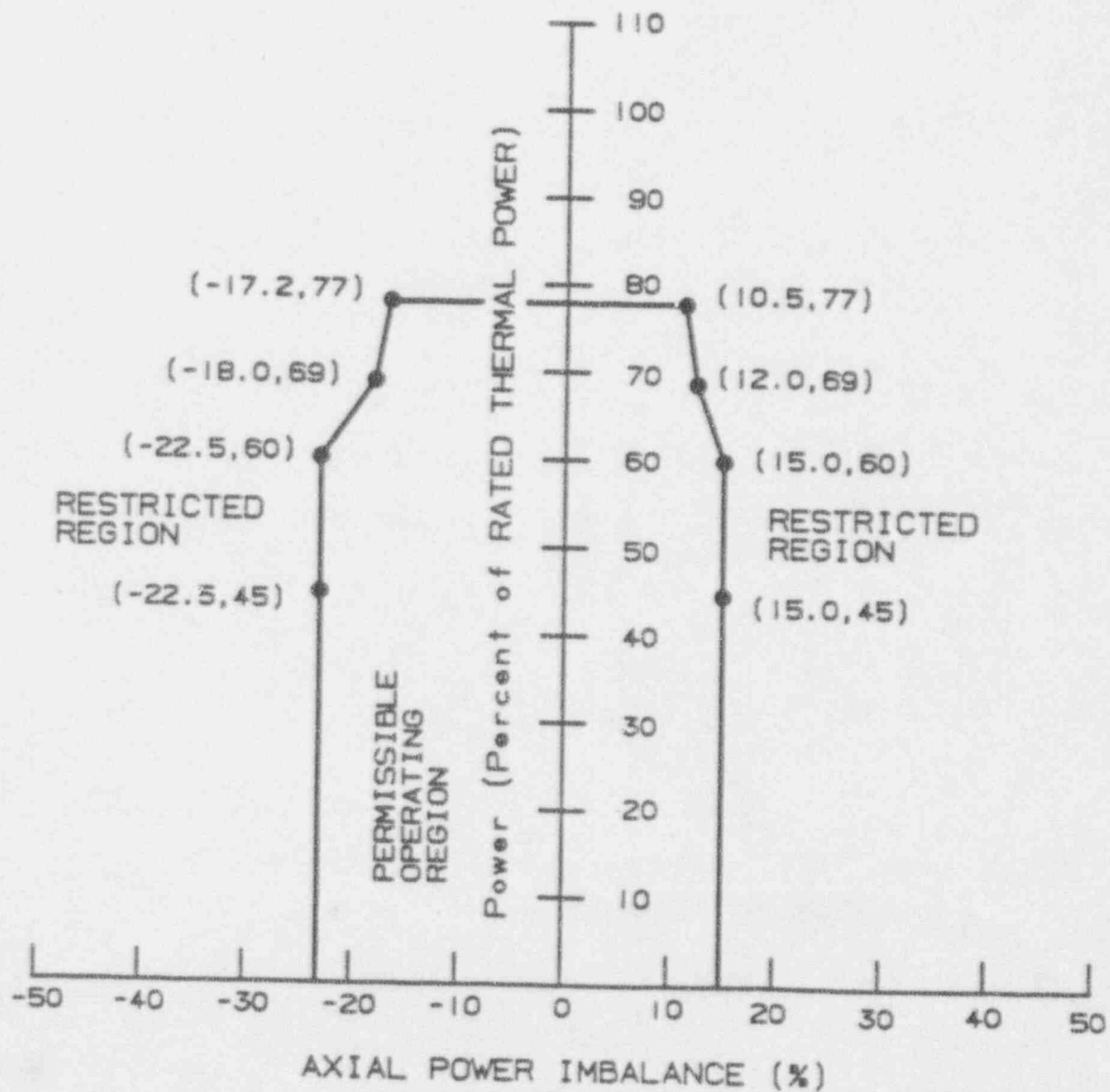
This Figure is referred  
to by Technical Specification  
3.2.1



Note 1: Instrument error is not accounted for in these limits

Figure 6c AXIAL POWER IMBALANCE Limits,  
300±10 to 425±10 EFPD, Three RC Pumps --  
Davis-Besse 1, Cycle 9

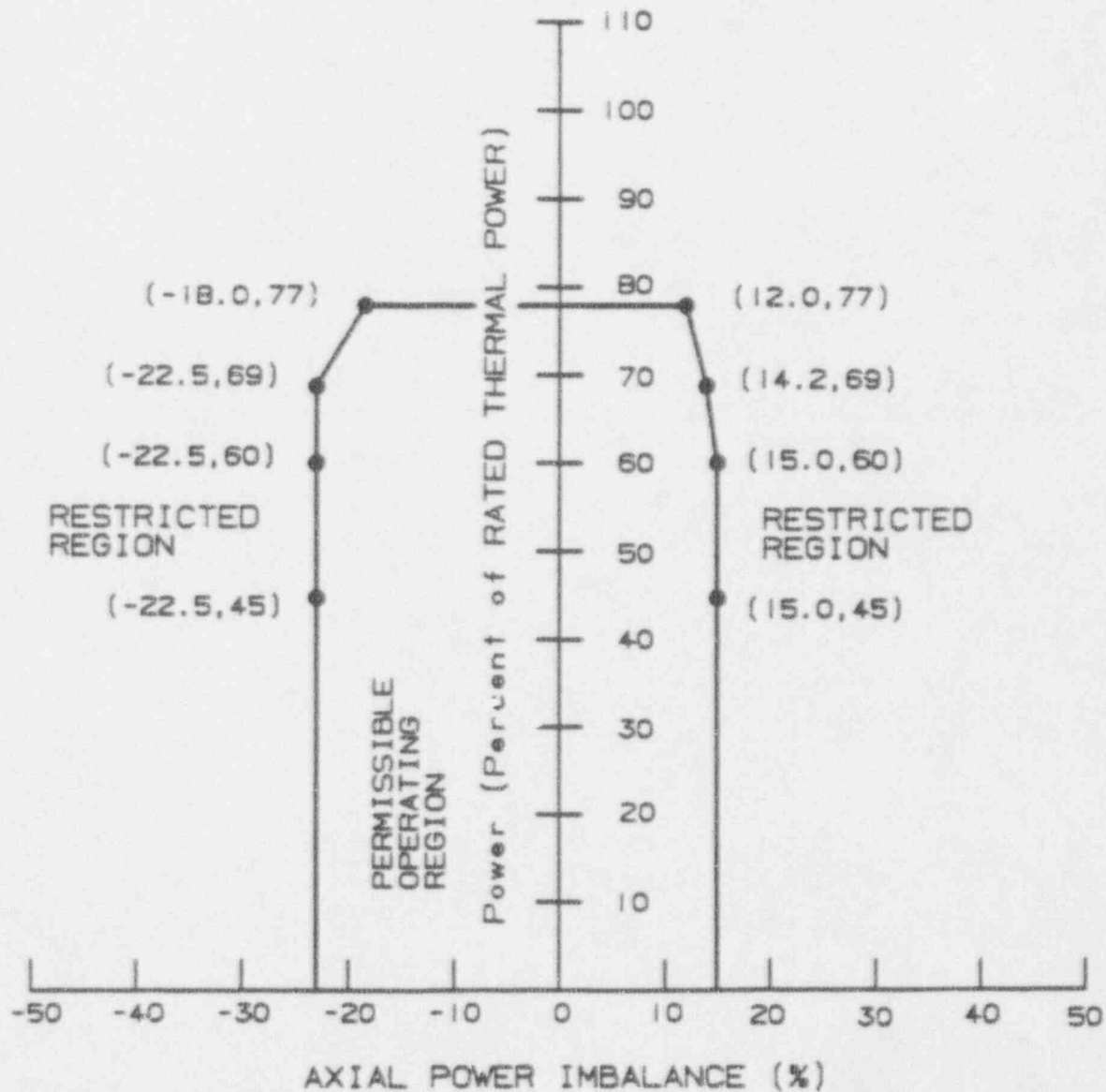
This Figure is referred  
to by Technical Specification  
3.2.1



Note 1: Instrument error is not accounted for in these limits

Figure 6d AXIAL POWER IMBALANCE Limits,  
After  $425 \pm 10$  EFPD, Three RC Pumps --  
Davis-Besse 1, Cycle 9

This Figure is referred  
to by Technical Specification  
3.2.1



Note 1: Instrument error is not accounted for in these limits

Table 1 QUADRANT POWER TILT Limits

This Table is referred  
to by Technical Specification  
3.2.4

Quadrant Power Tilt as measured by:	Steady-state Limit for Thermal Power $\leq$ 60%	Steady-state Limit for Thermal Power $>$ 60%	Transient Limit	Maximum Limit
Symmetrical incore detector system	6.7	3.1	10.03	20.0
Power Range channels	4.0**	1.6**	6.96**	20.0**
Minimum incore detector system	2.80*	1.8*	4.40*	20.0*

\* Assumes detector strings with  $>60\%$  depletion are excluded from the minimum incore system configuration.

\*\* Due to the NI calibration methodology these numbers are not to be used.  
(For guidance see DB-NE-03220)

Table 2 Negative Moderator Temperature Coefficient Limit

This Table is referred  
to by Technical Specification  
3.1.1.3c

Negative Moderator Temperature Coefficient Limit  
(at RATED THERMAL POWER)

$-3.79 \times 10^{-4} \Delta k/k/^{\circ}F$