

Attachment 1

Cycle 9 Core Operating Limits Report, Revision 1

Florida Power Corporation
Crystal River Unit 3

Cycle 9
Core Operating Limits Report
Revision 1

Referencing Revised
Standard Technical Specifications

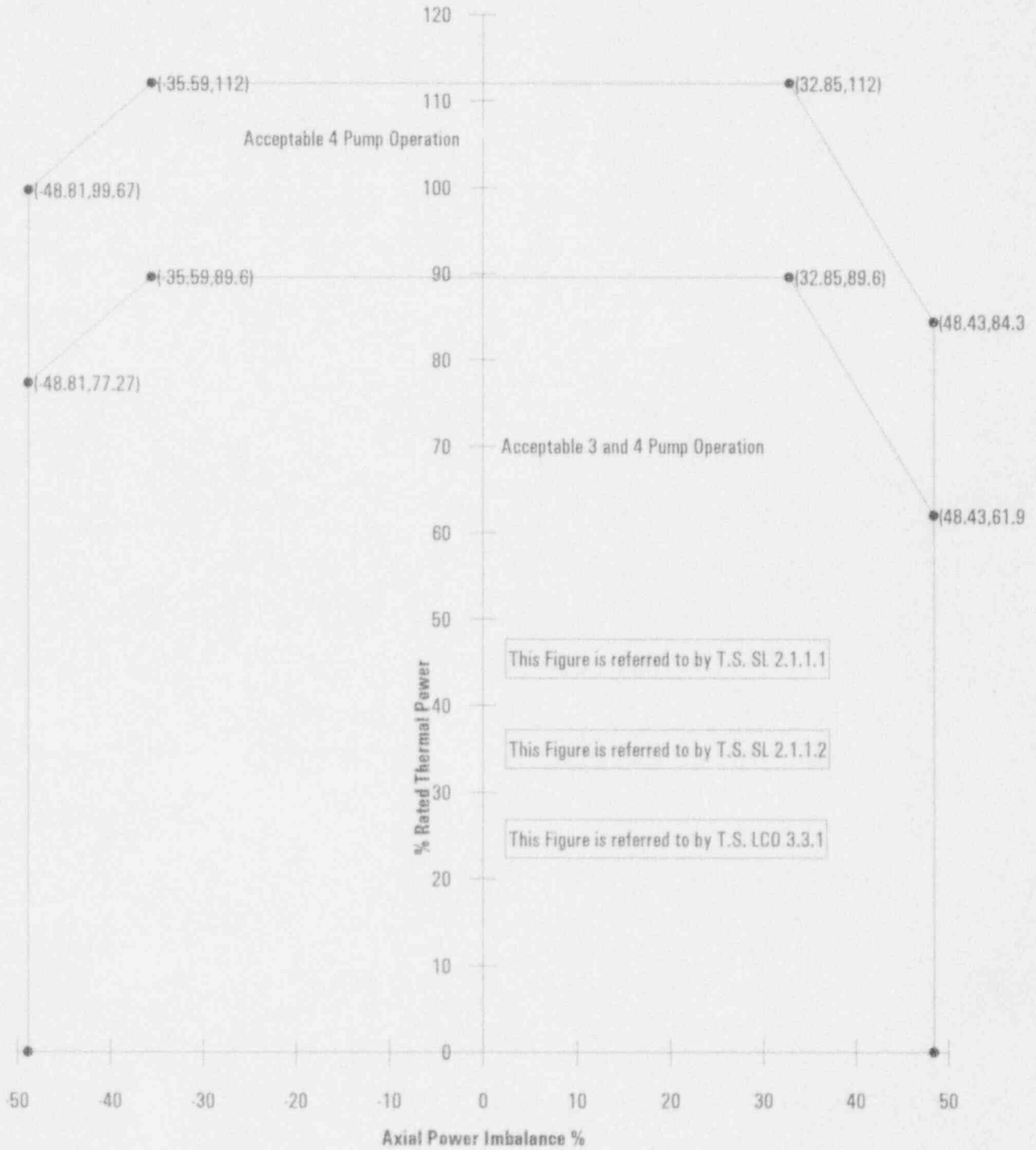
1.0 Core Operating Limits

This Core Operating Limits Report for CR3 Cycle 9 has been prepared in accordance with the requirements of Technical Specification Section 1.1 and 5.6.2.18. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC. These methods are documented in BAW-10179PA, "Safety Criteria and Methodology for Acceptable Cycle Reload Analyses", SER dated 3/16/93. Application of the methodology for API and RPI position indication agreement was approved in SER dated June 25, 1992.

The following limits are included in this report.

SL 2.1.1.1	AXIAL POWER IMBALANCE PROTECTIVE LIMITS
SL 2.1.1.2	AXIAL POWER IMBALANCE PROTECTIVE LIMITS
LCO 3.1.1	SHUTDOWN MARGIN
LCO 3.1.3	MODERATOR TEMPERATURE COEFFICIENT
SR 3.1.7.1	API/RPI POSITION INDICATION AGREEMENT
LCO 3.2.1	REGULATING ROD INSERTION LIMITS
LCO 3.2.2	AXIAL POWER SHAPING ROD INSERTION LIMITS
LCO 3.2.3	AXIAL POWER IMBALANCE OPERATING LIMITS
LCO 3.2.4	QUADRANT POWER TILT
LCO 3.2.5	POWER PEAKING FACTORS
LCO 3.3.1	REACTOR PROTECTION SYSTEM INSTRUMENTATION
LCO 3.9.1	REFUELING BORON CONCENTRATION

Axial Power Imbalance Protective Limits



Shutdown Margin (SDM)

No special Evolutions are expected during Cycle 9 therefore
SDM \geq 1.0% $\Delta k/k$

These limits are
referred to by
Technical
Specification
LCO 3.i.1

Moderator Temperature Coefficient Limit

Lower Limit

MTC at HFP $> -3.278 \times 10^{-4} \Delta k/k/^{\circ}F$

Upper Limit

MTC $\leq 0.9 \times 10^{-4} \Delta k/k/^{\circ}F$ when Thermal Power $< 95\%$ RTP

MTC ≤ 0.0 when Thermal Power $\geq 95\%$ RTP

These limits are
referred to by
Technical
Specification
LCO 3.1.3

Absolute Position Indicator / Relative Position Indicator Agreement Limits

2.7% when the comparison is performed using the plant computer, or

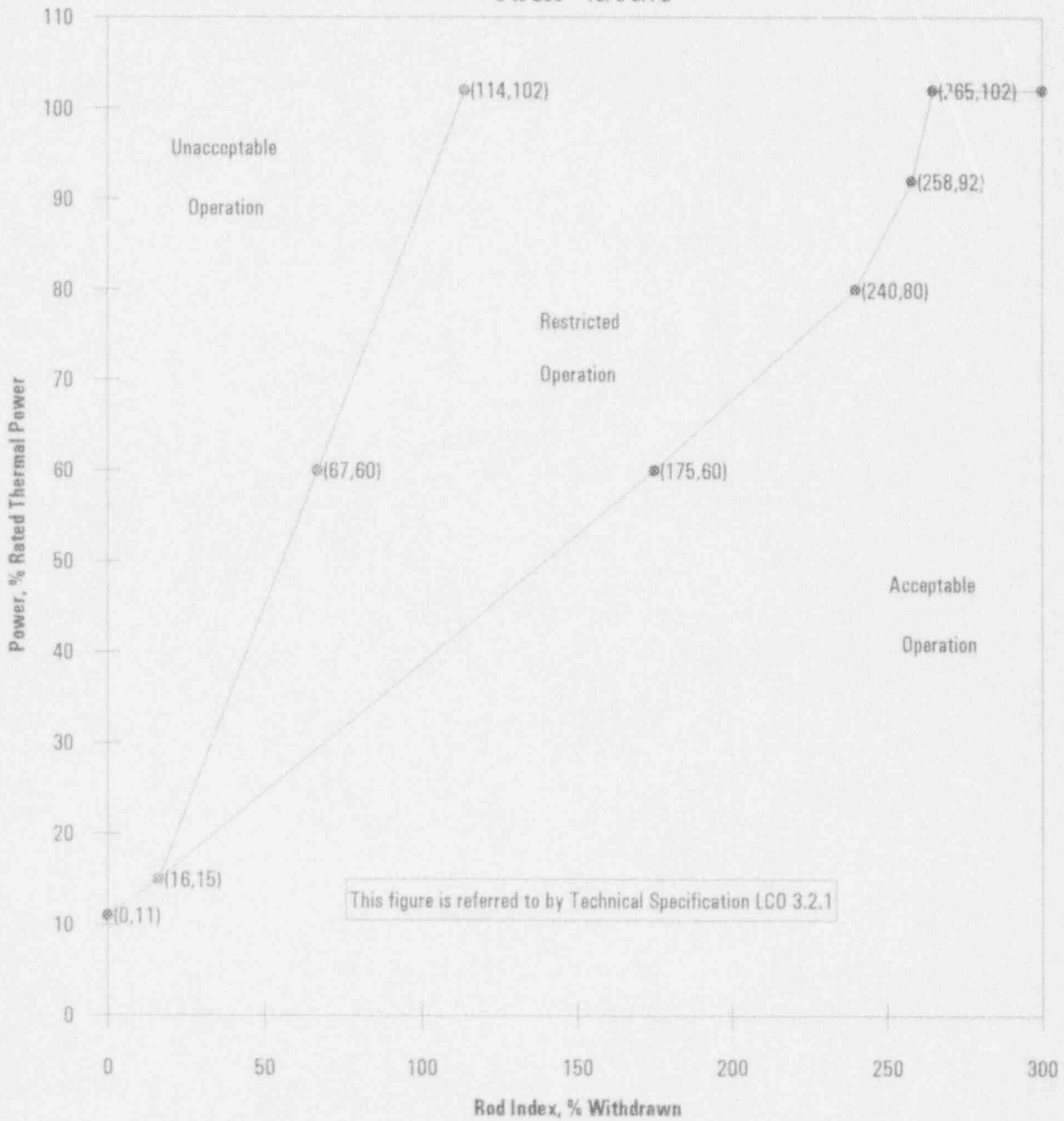
3.5% when the comparison is performed using the panel meters on the main control board.

These limits are
referred to by
Technical
Specification
SR 3.1.7.1

Regulating Rod Group Insertion Limits

Four Pump Operation

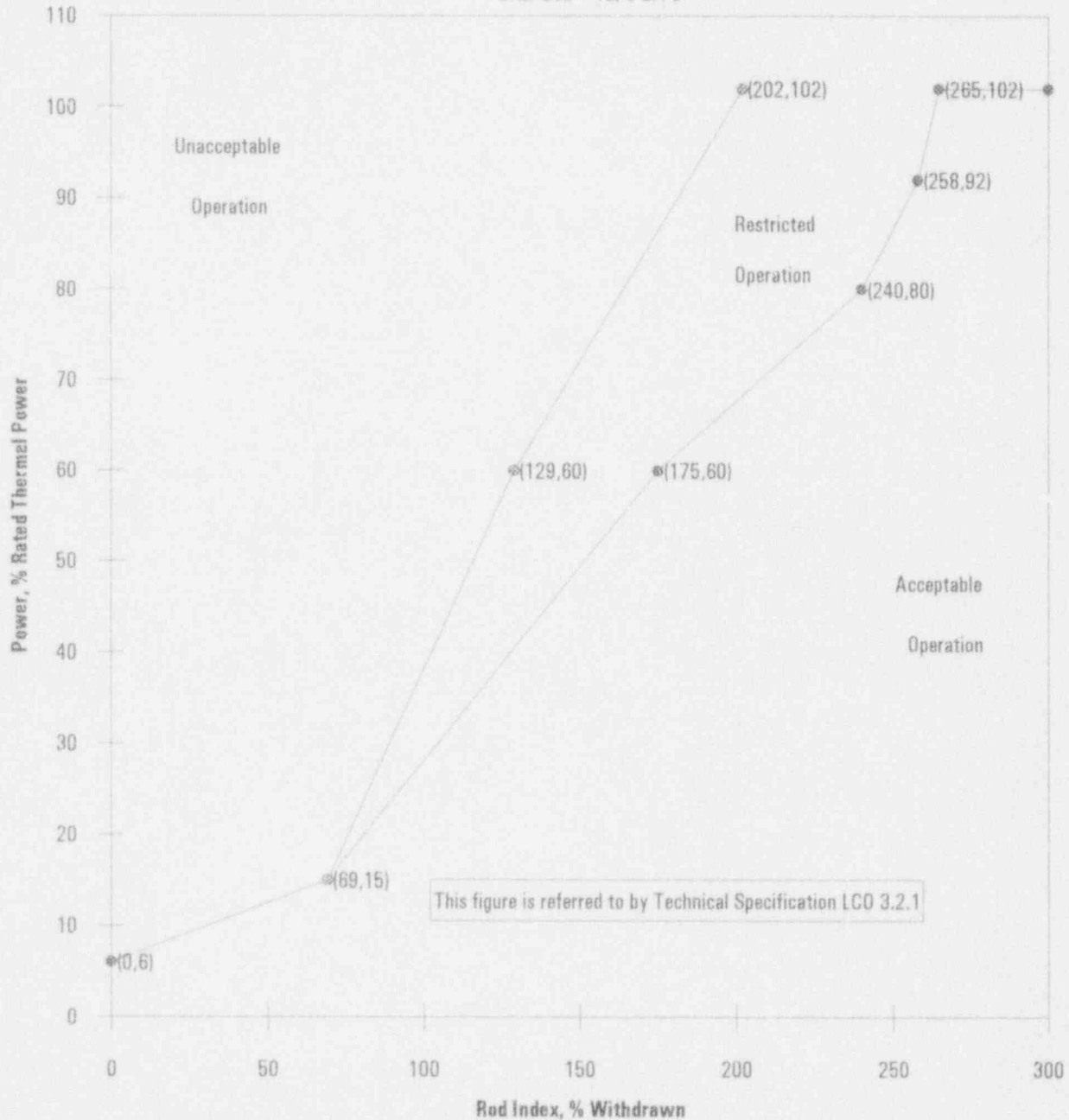
0 to 200 +10/-0 EFPD



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

Regulating Rod Group Insertion Limits

Four Pump Operation
after 200 + 10/-0 EFPD

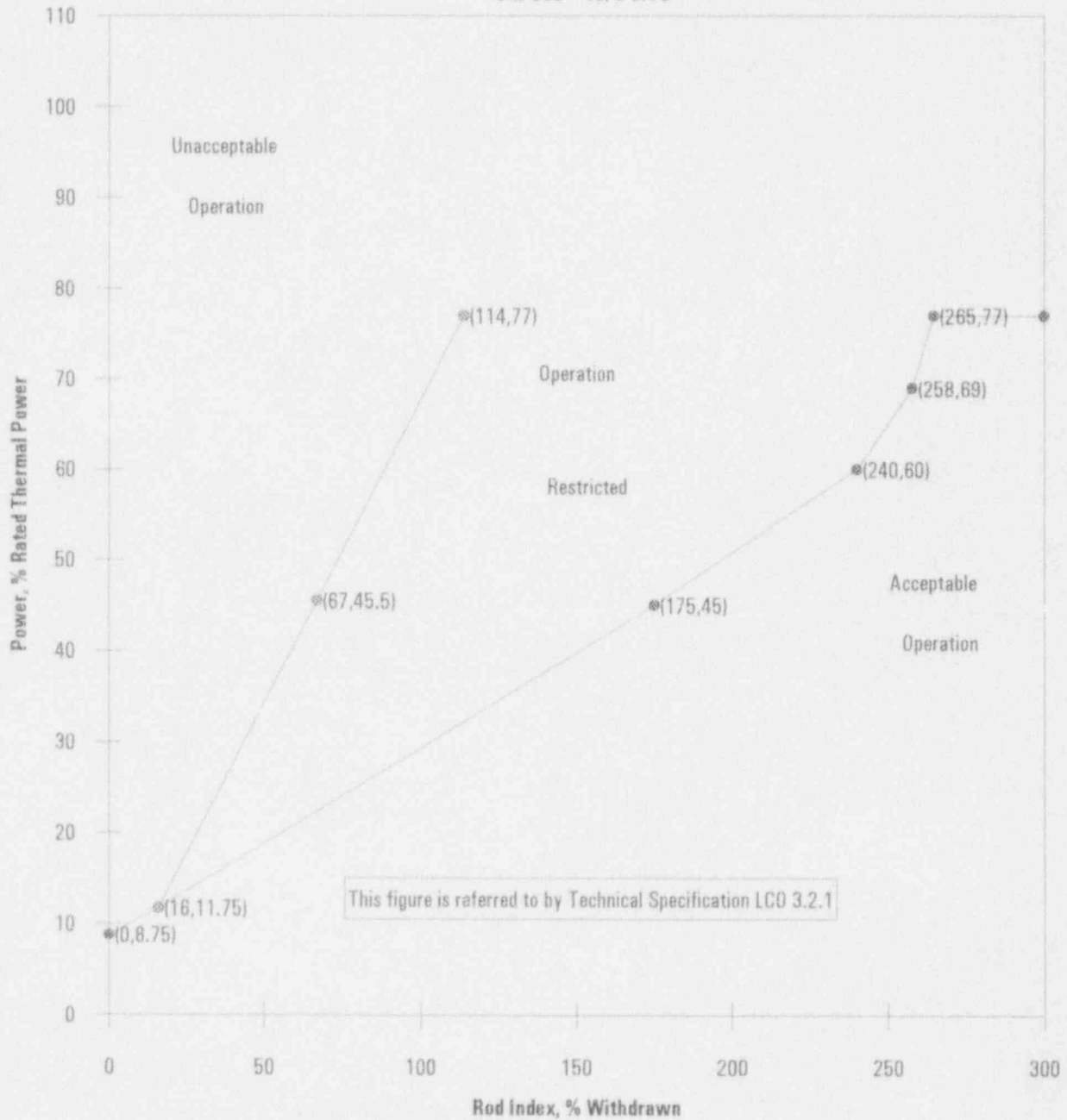


Note 1: A rod group overlap of $25 \pm 5\%$ between sequential withdrawn groups 5 and 6, and 6 and 7 shall be maintained

Regulating Rod Group Insertion Limits

Three Pump Operation

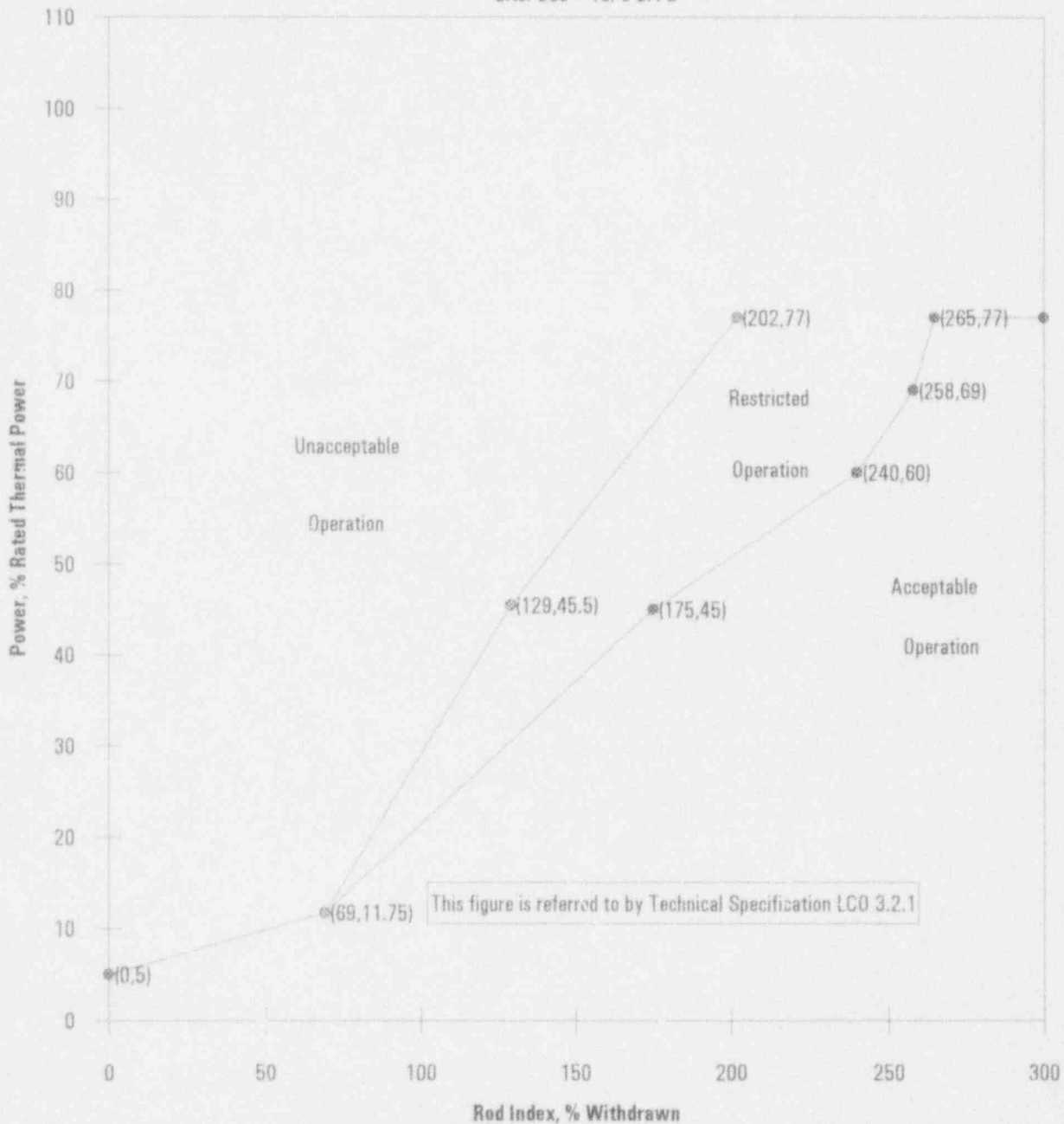
0 to 200 + 10/-0 EFPD



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

Regulating Rod Group Insertion Limits

Three Pump Operation
after 200 + 10/-0 EFPD

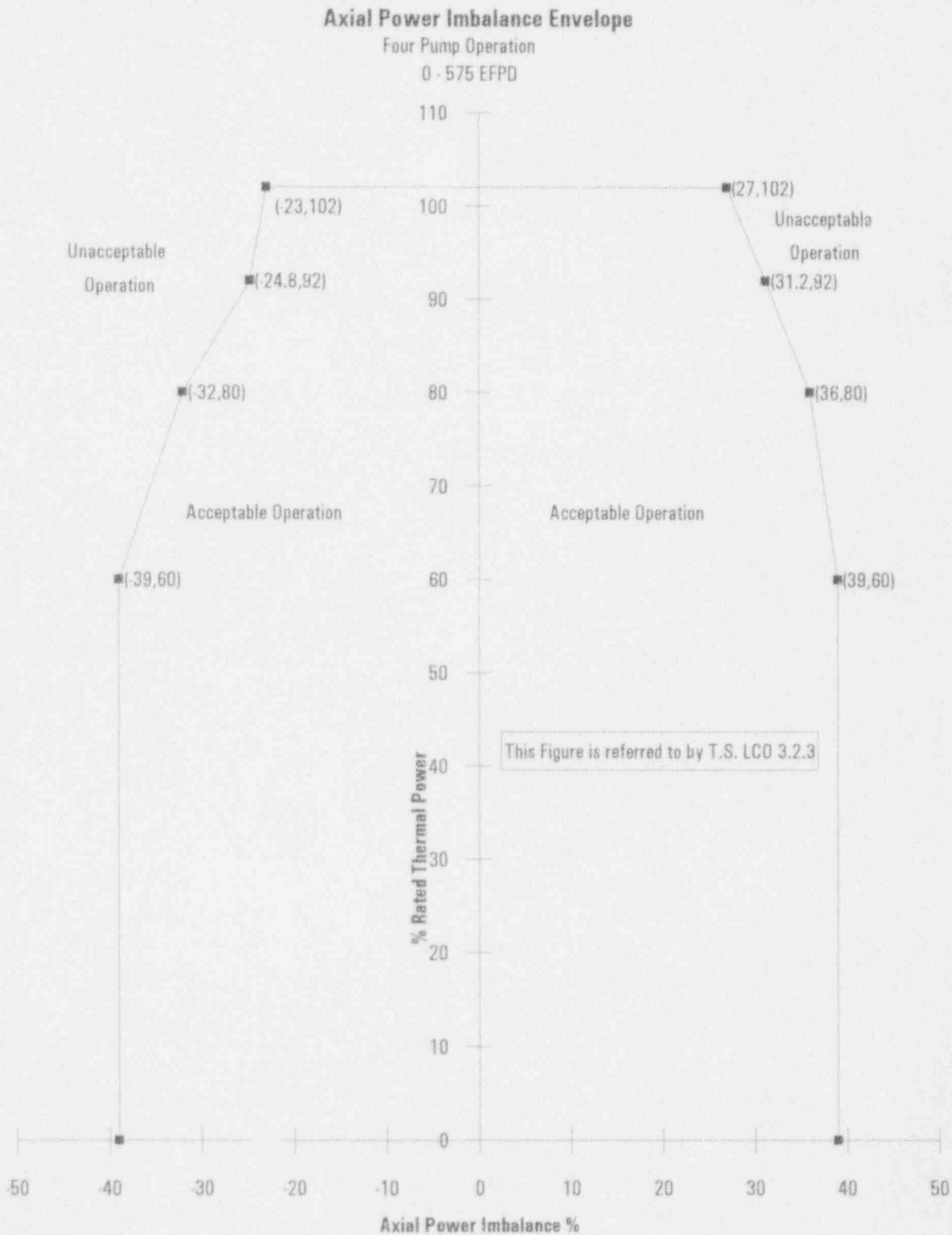


Note 1: A rod group overlap of $25 \pm 5\%$ between sequential withdrawn groups 5 and 6, and 6 and 7 shall be maintained

Axial Power Shaping Rod Insertion Limits

Up to 575 EFPD the APSRs may be positioned as necessary. The APSRs shall not be completely withdrawn for extended periods of operation since long-term APSR withdrawal for cycle 9 is unanalyzed.

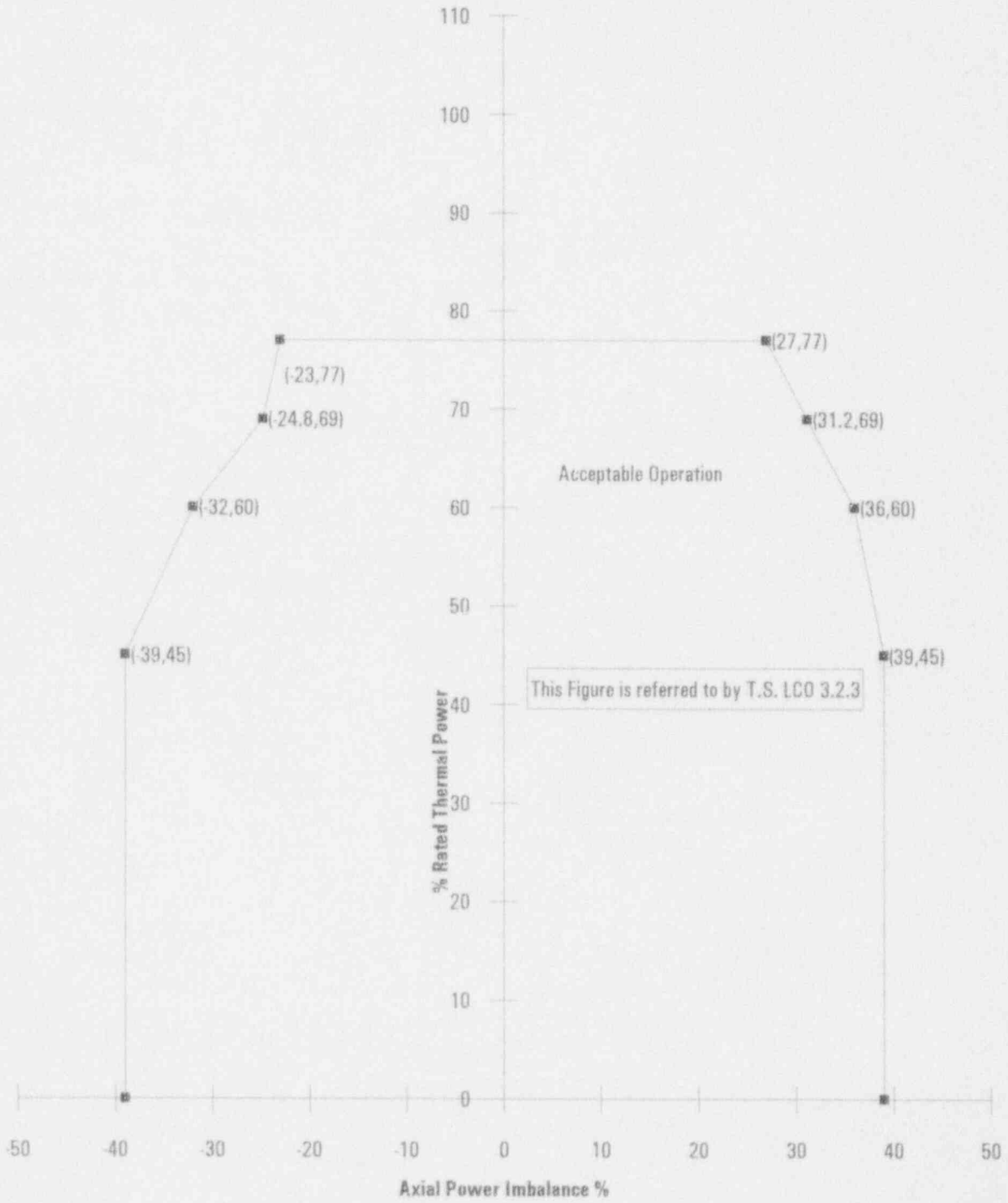
These limits are
referred to by
Technical
Specification
LCO 3.2.2



Axial Power Imbalance Envelope

Three Pump Operation

0 - 575 EFPD



Quadrant Power Tilt Limits

Thermal Power \leq 60% RTP

	Steady State	Transient	Maximum
Symmetrical Incore Detector System	7.50	10.03	20.00
Power Range Channels	4.94	6.96	20.00
Minimum Incore Detector System	3.07	4.40	20.00
Measurement System Independent	8.58	11.07	20.00

Thermal Power $>$ 60% RTP

	Steady State	Transient	Maximum
Symmetrical Incore Detector System	4.15	10.03	20.00
Power Range Channels	1.96	6.96	20.00
Minimum Incore Detector System	1.90	4.40	20.00
Measurement System Independent	4.92	11.07	20.00

<p>These limits are referred to by Technical Specification LCO 3.2.4</p>
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Power Peaking Factors

This Limit is referred to by Technical Specification LCO 3.2.5

Heat Flux Hot Channel Factor FQ

FQ shall be limited by the following relationships:

$$FQ \leq LHR^{allow} (Bu) / [LHR^{avg} * P] \quad (\text{for } P \leq 1.0)$$

$LHR^{allow}(Bu)$ = See the following Table

LHR^{avg} = 5.74 kW/ft for Mk-B9 fuel

LHR^{avg} = 5.69 kW/ft for Mk-B4Z fuel

LHR^{avg} = 5.60 kW/ft for Mk-B3 fuel

P = ratio of THERMAL POWER/ RATED THERMAL POWER

Bu = Fuel Burnup (MWd/mtU)

Mk-B9 LHR^{allow}

Core Elevation, ft	0-10650	10650-39000
	MWd/mtU	MWd/mtU
2	16.7	16.7
4	17.5	16.5
6	17.0	16.3
8	17.0	16.5
10	17.0	16.5

Mk-B4Z/Mk-B3 LHR^{allow}

Core Elevation, ft	0-36375	36375-38125	38125-40313	40313-40750	40750-42938	42938-45125
	MWd/mtU	MWd/mtU	MWd/mtU	MWd/mtU	MWd/mtU	MWd/mtU
2	15.5	15.5	15.5	15.5	15.5	15.0
4	16.6	16.6	16.1	16.0	15.5	15.0
6	16.1	16.1	16.1	16.0	15.5	15.0
8	17.0	16.6	16.1	16.0	15.5	15.0
10	16.0	16.0	16.0	16.0	15.5	15.0

Power Peaking Factors

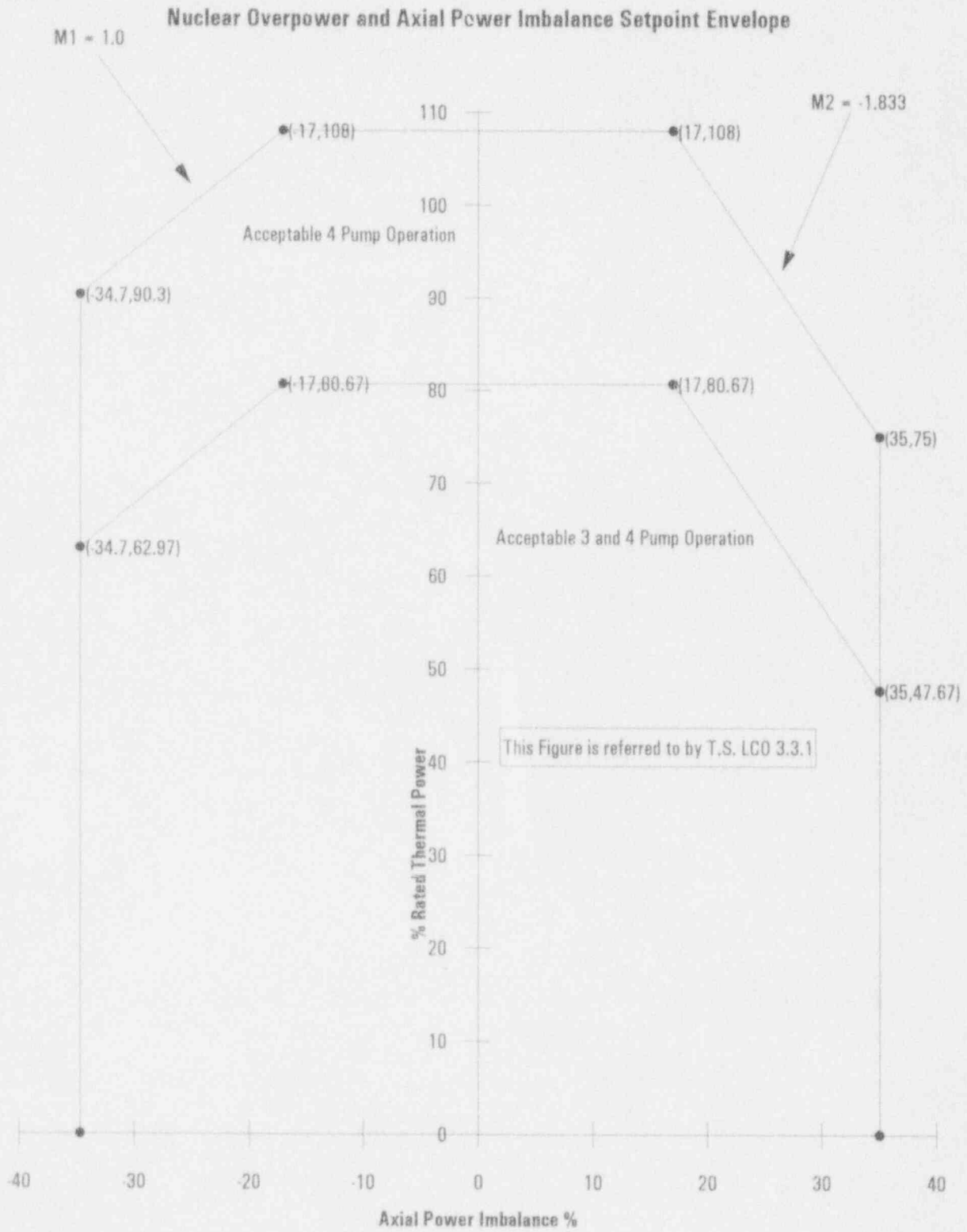
This Limit is referred to by Technical Specification LCO 3.2.5

Enthalpy Rise Hot Channel Factor $F_{\Delta H}^N$

$$F_{\Delta H}^N \leq 1.71 [1 + 0.3(1-P)]$$

P = Thermal Power/RTP and P ≤ 1.0

RH = 3.3



Refueling Boron Concentration

The boron concentration must be greater than 2775 ppmb

Note: The refueling boron concentration must be increased by 2 ppmb for every EFPD the final Cycle 8 burnup is less than 555 EFPD. The refueling boron concentration can be reduced 2 ppmb for every EFPD that the final Cycle 8 burnup exceeds 555 EFPD.

This limit is
referred to by
Technical
Specification
LCO 3.9.1