DMB-016

December 27, 1984

Docket No. 50-313

LICENSEE: Arkansas Power & Light Company

FACILITY: Arkansas Nuclear One, Unit No. 1

SUBJECT: SUMMARY OF MEETING OF NOVEMBER 27, 1984, WITH ARKANSAS POWER AND LIGHT COMPANY (AP&L) CONCERNING THE TECHNICAL SPECIFICATIONS (TS) FOR ARKANSAS NUCLEAR ONE, UNIT NO. 1 (ANO-1) CYCLE 7 OPERATION AND FUTURE CYCLE OPERATION

INTRODUCTION

In order to gain a better understanding of how the TS for Cycle 7 operation are determined, the staff requested a meeting with AP&L for November 27, 1984, at the NRC offices in Bethesda, Maryland. The attendees of the meeting are identified in Enclosure 1. As a beginning, the staff presented specific questions, Enclosure 2. The licensee, through the Babcock and Wilcox Company (B&W), the licensee's vendor, presented the rational for determining the limits of operation and the proposed TS for operation (Enclosure 3).

DISCUSSION

The staff was aware that the TS limits for operation were developed through the use of analysis techniques and practices which were reviewed and accepted for the operating license and subsequent reload reviews. However, since those reviews were completed, time has passed such that the staff thought that it would be well for the staff to refresh their minds on the specific methods currently used by the licensee.

B&W generated the operating limits for four periods during the operating cycle. For this cycle of operation, the licensee determined the most conservative set of TS limits for the total operating period which would bound the limits which were determined by B&W. The licensee believes that the proposed limits will be acceptable for future cycle operation. However, Figure 3.5.2-4, LOCA Limits - Linear Heat Rate Limits, would not apply to future cycles of operation. The licensee has requested that this figure be deleted from the TS in order that future cycle of operation would need no TS changes and thus the licensee could do the future cycle reload modifications under 10 CFR 50.59. The staff determined that Figure 3.5.2-4 is necessary. However, the staff indicated that there may be a way to accommodate the licensee's desire to do future reload reviews under 10 CFR 50.59. The licensee could propose a TS change which would require a specific report to be submitted to the NRC at least 60 - 90 days prior to startup following refueling. The report would contain the specific operating limits for the cycle and the Safety Analyses to support the limits. The TS would require operation in accordance with the report. This method is illustrated by Enclosure 4. In this manner, Figure 3.5.2-4 and other limits could be identified in the specific report and would not appear in the TS but would be requirements for operation. The proposed TS change would need to be submitted at least 90 days prior to startup after the next refueling.

It should be noted that the above methodology has not been implemented for B&W plants, is not yet an approved methodology for B&W plants, and will need the NRC acceptance through the normal review process.

"ORIGINAL SIGNED BY:"

Guy S. Vissing, Project Manager
Operating Reactor Branch #4
Division of Licensing

Enclosures:
As Stated

ORB#4:DL
GVissing;cf
12/17/84

MEETING SUMMARY DISTRIBUTION

Licensee: Arkansas Power & Light Company

*Copies also sent to those people on service (cc) list for subject plant(s).

Docket File
NRC PDR
L PDR
ORB#4 Rdg
Project Manager-GVissing
JStolz
BGrimes (Emerg. Preparedness only)
OELD
NSIC
EJordan, IE
PMcKee, IE
ACRS-10

NRC Meeting Participants:
YHsii
MDunenfeld
RLobel
LPhillips
WBrooks

ENCLOSURE 1

ATTENDANCE LIST
FOR
MEETING WITH AP&L
CONCERNING
THE TECHNICAL SPECIFICATIONS FOR ANO-1 CYCLE 7 OPERATION
NOVEMBER 27, 1984

NAME	ORGANIZATION
John F. Carew	Brookhaven National Lab.
Partha Neogy	Brookhaven National Lab
John Willse	B&W
Frank McPhatter	B&W
Brian J. Delano	B&W
David Baxter	AP&L
Mark A. Smith	AP&L
Dan Howard	AP&L
Guy S. Vissing	NRC/NRR/DR/ORB#4
Y. Hsii	NRC/NRR/CPB
Marvin Dunenfeld	NRC/NRR/CPB
R. Lobel	NRC/NRR/CPB
L. Phillips	NRC/NRR/CPB
W. L. Brooks	NRC/NRR/CPB

QUESTIONS FOR ANO-1
MEETING NOVEMBER 27, 1984

1. Explain in detail how the shutdown margin, ejected rod worth and power distribution limits (LOCA limit) are used in determining the rod insertion, imbalance, ASPR and safety limit curves for the Technical Specifications. There is no reference for this in BAW-1840. Are there any other limiting parameters involved?

2. The submittal letter dated September 26, 1984 states "These proposed Technical Specification changes result partially from the low leakage fuel cycle design and the implementation of revised analytical methods to account for the effects of cross-flow." How is this done?

3. Letter of September 26, 1984 says "the proposed Technical Specifications have been simplified by the combination of certain burnup dependent limits into a single limit applicable to the entire cycle." What are these limits? How is it done? How could this eliminate need for Technical Specification changes in future cycles?

4. How does the "short stack" design of the burnable poison create "effective maneuvering room" at the beginning of the cycle?

B&W METHODOLOGY FOR GENERATION OF CORE SAFETY & OPERATING LIMITS

- CRITERIA
- COMPUTER CODES
- POWER DISTRIBUTION ANALYSIS
- MARGIN CALCULATIONS
- GENERATION OF TECH SPEC LIMITS

REFERENCE: BAW-10122A, REV.1, NORMAL OPERATING CONTROLS

B.J. DELANO
B&W NUCLEAR FUEL SERVICES
NOVEMBER, 1984

Core Protection Philosophy

- **RPS Safety Limits**

  (Fuel damage criteria)
  - Centerline fuel melt
  - DNB

  Protection:

  Tech spec limiting safety system settings (LSSS)
  RPS flux/flow/imbalance trip

- **Core Operating Limits**

  (Accident analysis initial conditions)
  - LOCA LHR limit
  - Initial condition DNB
  - Ejected rod worth
  - Shutdown margin

  Protection:

  Tech spec limiting conditions for operation (LCO)
  Administrative control

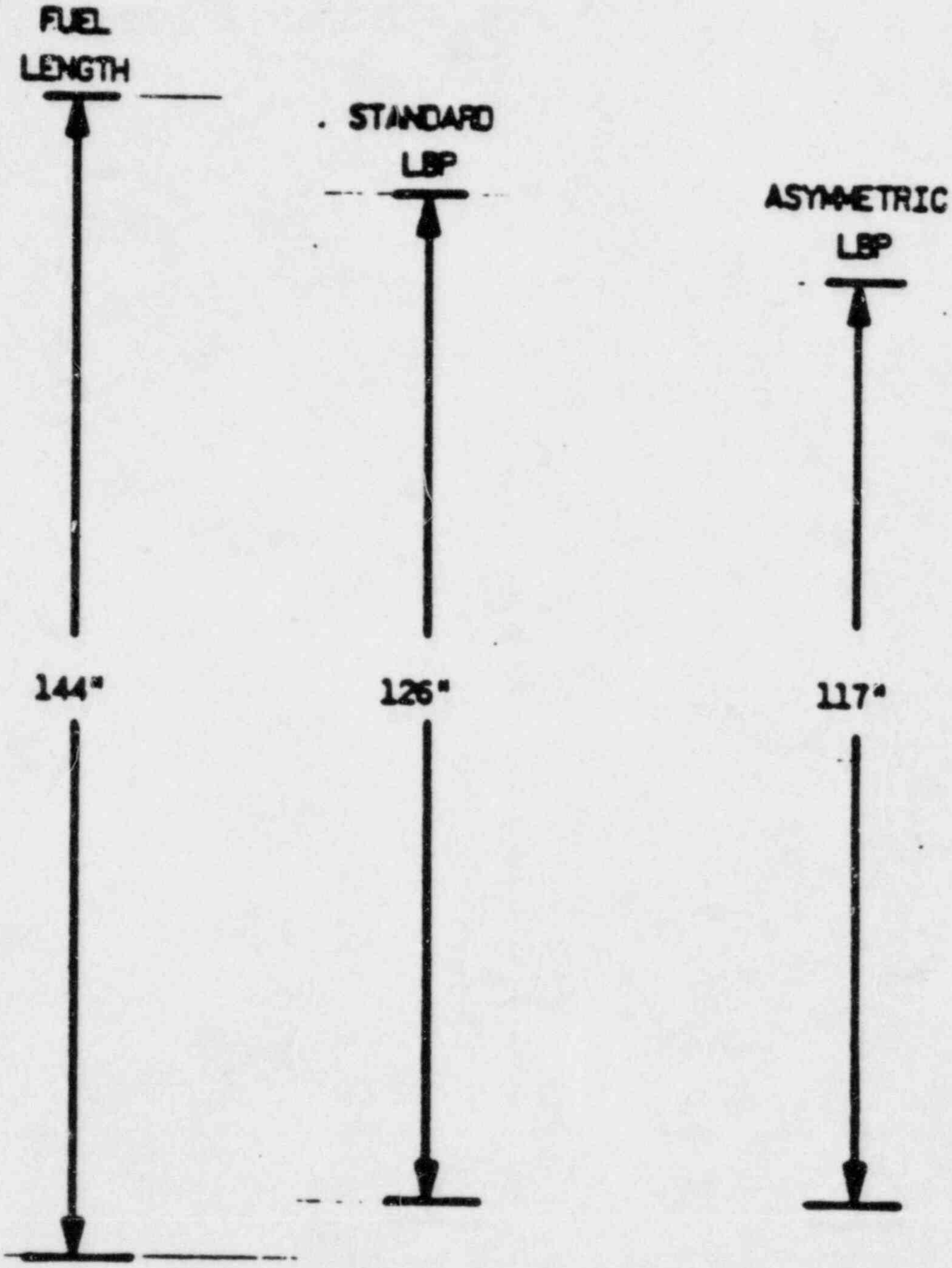
FINAL FUEL CYCLE DESIGN
(FFCD)

- Fuel Shuffle
- Burnup History
- Feed Batch Information
- Fuel Cycle Features
  - VLL Fuel Cycle Design
  - Asymmetric LBP
  - Mark BEB LTAs
- LBP Concentrations
- Control Rod Groupings

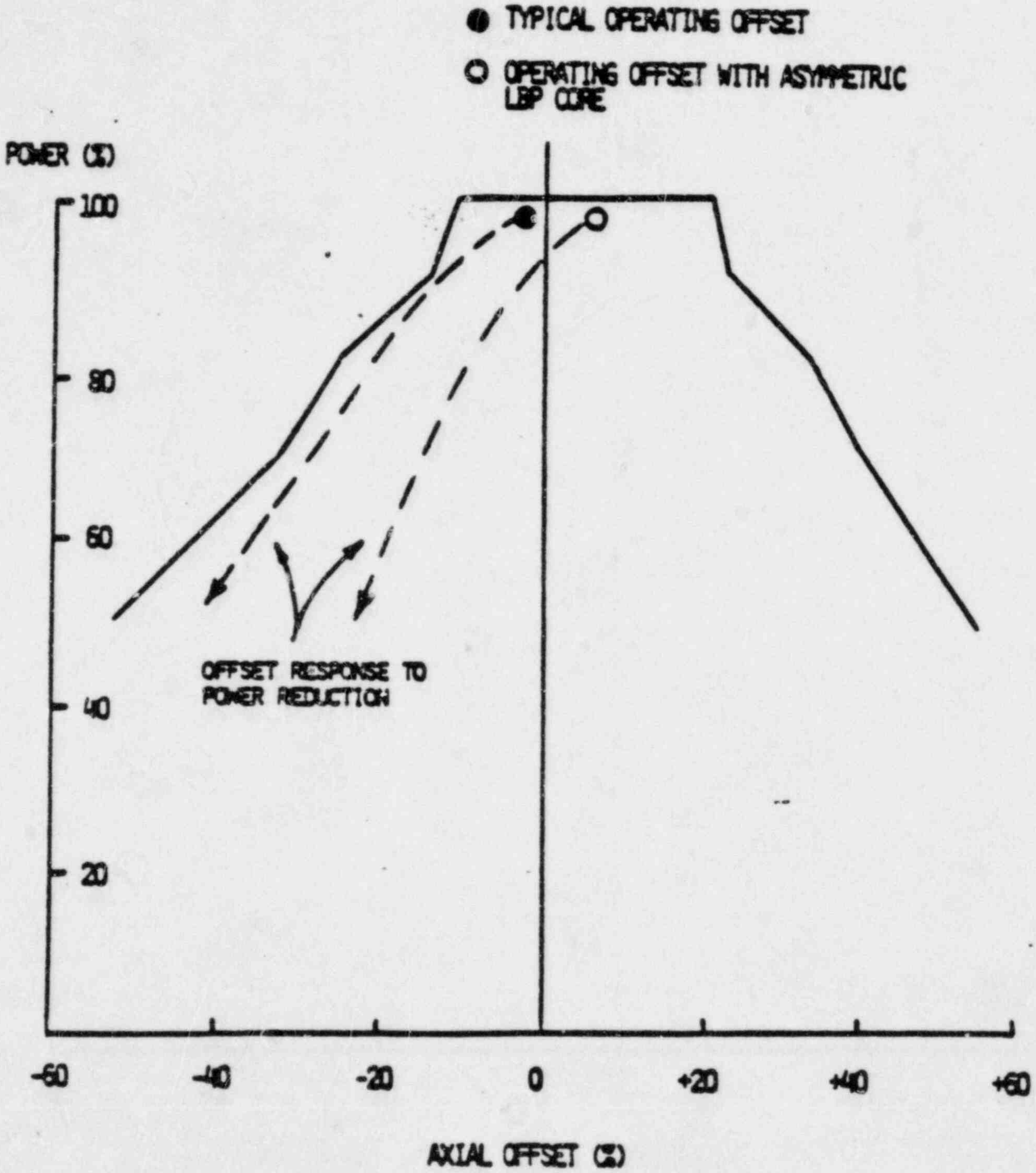
Asymmetric LBP Benefits

- o 3 to 5% additional operating margin to the negative imbalance limit
- o Assists implementation of fuel cycle improvements with an associated peaking increase

ASYMMETRIC LBP ARRANGEMENT



TYPICAL LCO OFFSET ENVELOPE



EFFECT OF ASYMMETRIC LBP IN ANO-1 CY-7

	Steady-State Imbalance	
Burnup (EFPD)	Symmetric LBP	Asymmetric LBP
4	-1.81%	+3.72%
100	-1.83	-1.45
200	-1.80	-3.46
300	-1.55	-3.49
400	-1.32	-3.03

3 DIMENSIONAL POWER

DISTRIBUTION ANALYSIS

- FLAME - 3D NODAL CODE
  - MODELS EACH ASSEMBLY AS ONE RADIAL NODE
  - MODELS ASSEMBLY IN 32 AXIAL NODES
- FLAME CAN:
  - SHOW EFFECTS ON AXIAL AND RADIAL POWER DISTRIBUTION OF XE, FLCRs, ARSRs, AND POWER LEVEL
  - MODEL THERMAL-HYDRAULIC FEEDBACK
  - CALCULATE XE DISTRIBUTION
  - CALCULATE INDIVIDUAL ASSEMBLY BURNUP HISTORIES
  - ACCOUNT FOR PU ISOTOPE DISTRIBUTIONS DUE TO CONTROL RODS, FUEL TEMP, AND MODERATOR TEMP
- FLAME CANNOT:
  - CALCULATE INDIVIDUAL PIN POWERS
  - MODEL SMALL LOCAL EFFECTS (E.G., SPACER GRIDS)

TOPICAL REPORTS: BAW-10124A, AUGUST, 1976
BAW-10125P-A, AUGUST, 1976

FLAME INPUT

- FUEL LOADING
- LBP LOADING
- CONTROL ROD LOCATIONS
- POWER LEVEL
- BORON CONCENTRATIONS
- T_{IN}
- CONTROL ROD % WD
- RECOVERS FROM HISTORY TAPE GIVING:
  - 3D BURNUP DISTRIBUTION
  - 3D XENON AND IODINE DISTRIBUTIONS
  - 3D HISTORY EFFECTS (E.G., LBP, T_{MOD})

FLAME OUTPUT

AT BEGINNING OF TIMESTEP:

- 3D POWER DISTRIBUTION
- POWER OFFSET AND IMBALANCE

AT END OF TIMESTEP:

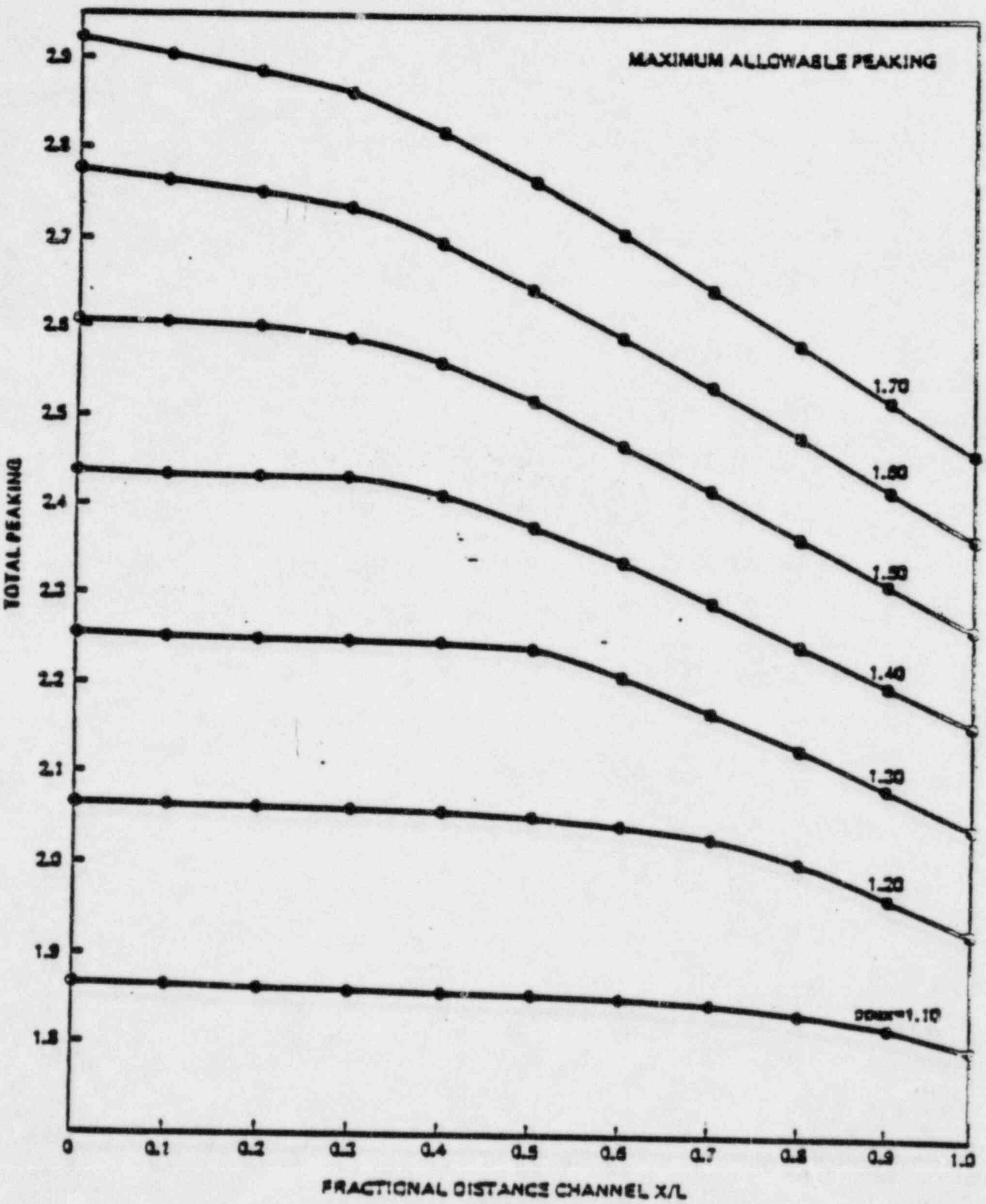
- XENON DISTRIBUTION
- IODINE DISTRIBUTION
- BURNUP DISTRIBUTION

RPS SAFETY LIMITS

PREVENT VIOLATION OF CRITERIA ON:

- CENTERLINE FUEL MELT (CFM)
  20.5 KW/FT

- DNBR
  1.3
  BASED ON DESIGN PEAK OF 1.71 RADIAL X 1.65 AXIAL OR COMBINATION OF RADIAL, AXIAL, AND ELEVATION OF AXIAL WHICH YIELDS DNBR = 1.3


MAXIMUM ALLOWABLE PEAKING
TOTAL PEAKING
FRACTIONAL DISTANCE CHANNEL X/L
1.70
1.60
1.50
1.40
1.30
1.20
=1.10

CONSIDERATIONS IN GENERATING
CORE SAFETY & OPERATING LIMITS

- Normalization of FLAME to PDQ07
- Fuel Cycle Depletion
- Xenon Transients
- Control Rod Scans
- APSR Scans
- Burnup
- Power Level
- Peaking Augmentation Factors

NUCLEAR CALCULATIONS

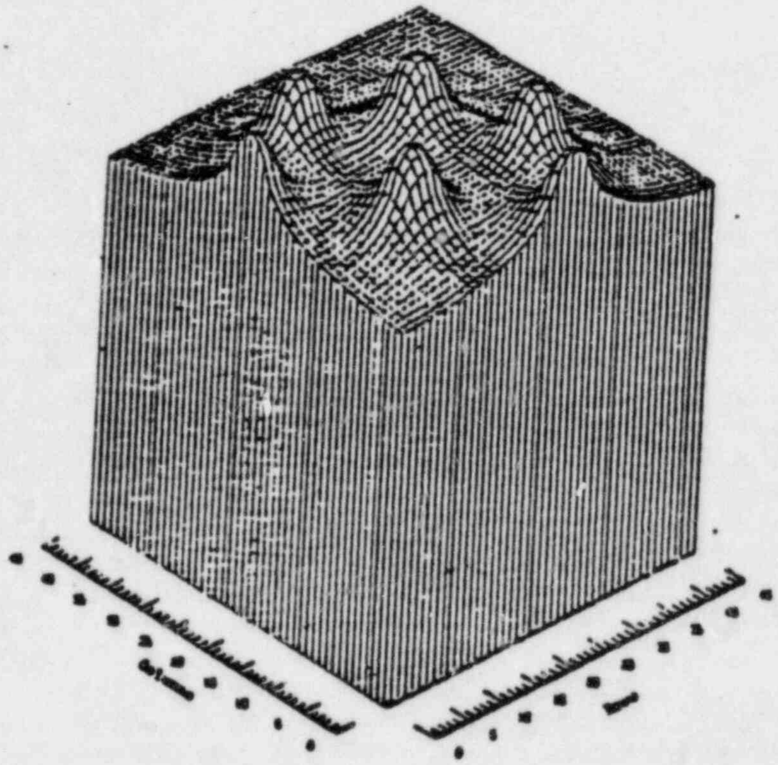
100%FP

4 EFPD

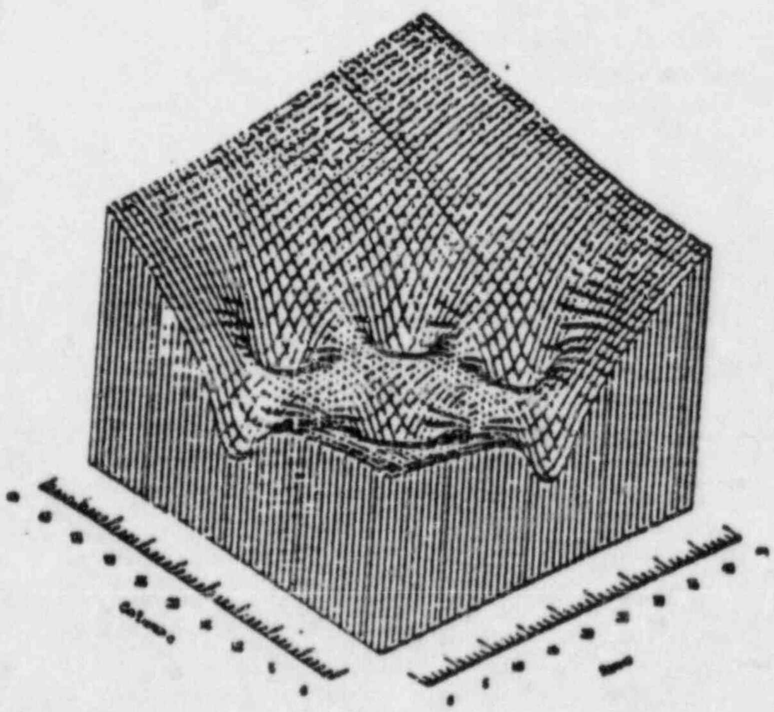
FILE	ROD	APSR	PEAK	LOC	OFFSET	CFM MARGIN	LOC	DNBR MARGIN	LOC	LOCA MARGIN	LOC
56	300.0	41.7	1.640	(2 5 9)	-7.13	35.34	(4 510)	19.45	(2 3 9)	15.40	(4 5 8)
57	300.0	25.5	1.628	(2 5 24)	10.65	32.82	(4 524)	16.42	(2 325)	21.66	(4 515)
58	300.0	12.6	1.712	(4 5 22)	17.37	29.72	(4 523)	16.35	(4 522)	18.87	(4 524)
59	300.0	0.0	1.682	(4 5 18)	13.65	31.62	(4 519)	18.07	(2 519)	22.32	(4 523)
60	287.1	0.0	1.749	(4 5 17)	7.10	29.19	(4 517)	17.83	(2 517)	19.59	(4 515)
61	287.1	12.6	1.726	(4 5 20)	10.28	29.55	(4 520)	16.75	(2 520)	20.20	(4 520)
62	287.1	25.5	1.581	(2 5 22)	2.85	35.34	(4 523)	16.81	(2 522)	24.98	(2 5 7)
63	287.1	41.7	1.775	(2 5 9)	-15.77	30.10	(4 5 9)	19.19	(2 5 9)	8.21	(4 5 8)
64	270.9	41.7	2.025	(2 5 9)	-31.57	20.26	(4 5 9)	17.42	(2 5 9)	-5.48	(4 5 7)
65	270.9	25.5	1.689	(2 5 7)	-13.16	33.95	(1 6 8)	18.40	(2 5 7)	10.49	(2 5 6)
66	270.9	12.6	1.777	(4 5 17)	-3.98	28.04	(4 517)	16.80	(2 517)	18.68	(4 517)
67	270.9	0.0	1.895	(4 5 15)	-6.44	23.70	(4 515)	16.38	(2 515)	11.16	(4 514)

QUARTER FUEL ASSEMBLY FLUX DISTRIBUTIONS

UNRODDED



RODDED



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***************************
* PEAK PIN POWER          *
* AVERAGE ASSEMBLY POWER  *
* PEAK TO AVERAGE POWER   *
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	8	9	10	11	12	13	14	15
H	1.066 1.014 1.052	1.224 1.158 1.057	1.372 1.225 1.120	1.042 .945 1.102	1.470 1.355 1.085	1.003 .923 1.086	1.070 1.013 1.056	1.195 .953 1.254
K	1.232 1.167 1.056	1.427 1.306 1.093	1.123 1.052 1.067	1.044 .948 1.101	.988 .871 1.134	1.161 1.076 1.079	1.021 .959 1.165	1.165 .911 1.280
L	1.379 1.229 1.122	1.142 1.052 1.085	1.399 1.298 1.078	1.372 1.232 1.114	.892 .768 1.168	1.005 .922 1.091	1.224 1.076 1.138	1.054 .731 1.441
M	1.040 .944 1.101	1.031 .945 1.091	1.363 1.226 1.111	1.131 1.061 1.066	1.274 1.140 1.118	1.037 .970 1.069	1.262 1.025 1.231	
N	1.467 1.352 1.085	.985 .869 1.134	.889 .766 1.161	1.269 1.134 1.119	1.087 1.028 1.057	1.393 1.191 1.170	1.140 .750 1.519	
O	1.000 .921 1.086	1.158 1.073 1.079	1.002 .918 1.091	1.025 .965 1.062	1.381 1.184 1.167	.876 .542 1.618		
P	1.067 1.011 1.056	1.019 .956 1.065	1.221 1.073 1.138	1.257 1.021 1.231	1.134 .747 1.518			
R	1.193 .951 1.254	1.163 .909 1.280	1.051 .729 1.442					

PEAK PIN POWER FOR THIS QUADRANT IS 1.470 AT ASSEMBLY H12

MARGIN DEFINITIONS

$$\text{CFM Margin} = \frac{\text{MALHR} - (\text{PK}*\text{RL}*\text{AVLHR}*\text{FOP})(\text{NUC}*\text{GRID}*\text{SPK})}{\text{MALHR}} (100)$$

MALHR = MAXIMUM ALLOWABLE LINEAR HEAT RATE FOR CFM

PK = CALCULATED ASSEMBLY NODAL PEAK (PEAK ASSEMBLY NODE TO CORE AVERAGE LHR)

RL = RADIAL LOCAL PEAK (PEAK PIN-TO-ASSEMBLY AVERAGE LHR)

AVLHR = CORE AVERAGE LHR AT 100%FP

FOP = FRACTION OF POWER

NUC = STATISTICAL UNCERTAINTY (NUCLEAR MODEL, ROD BOW, TOLERANCES)

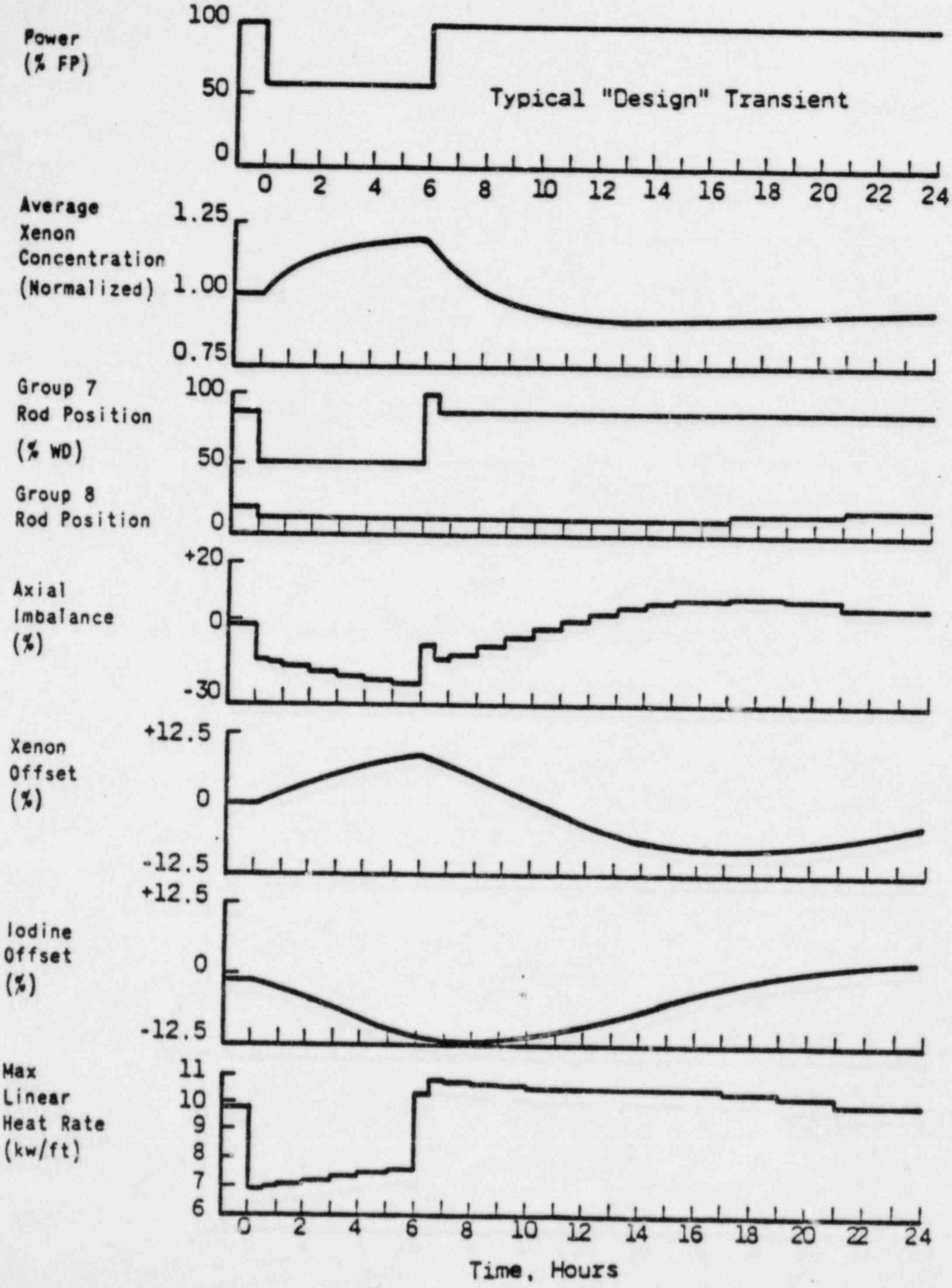
GRID = AXIAL SPACER GRID FACTOR

SPK = DENSIFICATION SPIKE FACTOR

$$\text{DNB Margin} = \frac{\text{MAP} - (\text{PK}*\text{RL})(\text{RADU})}{\text{MAP}} (100)$$

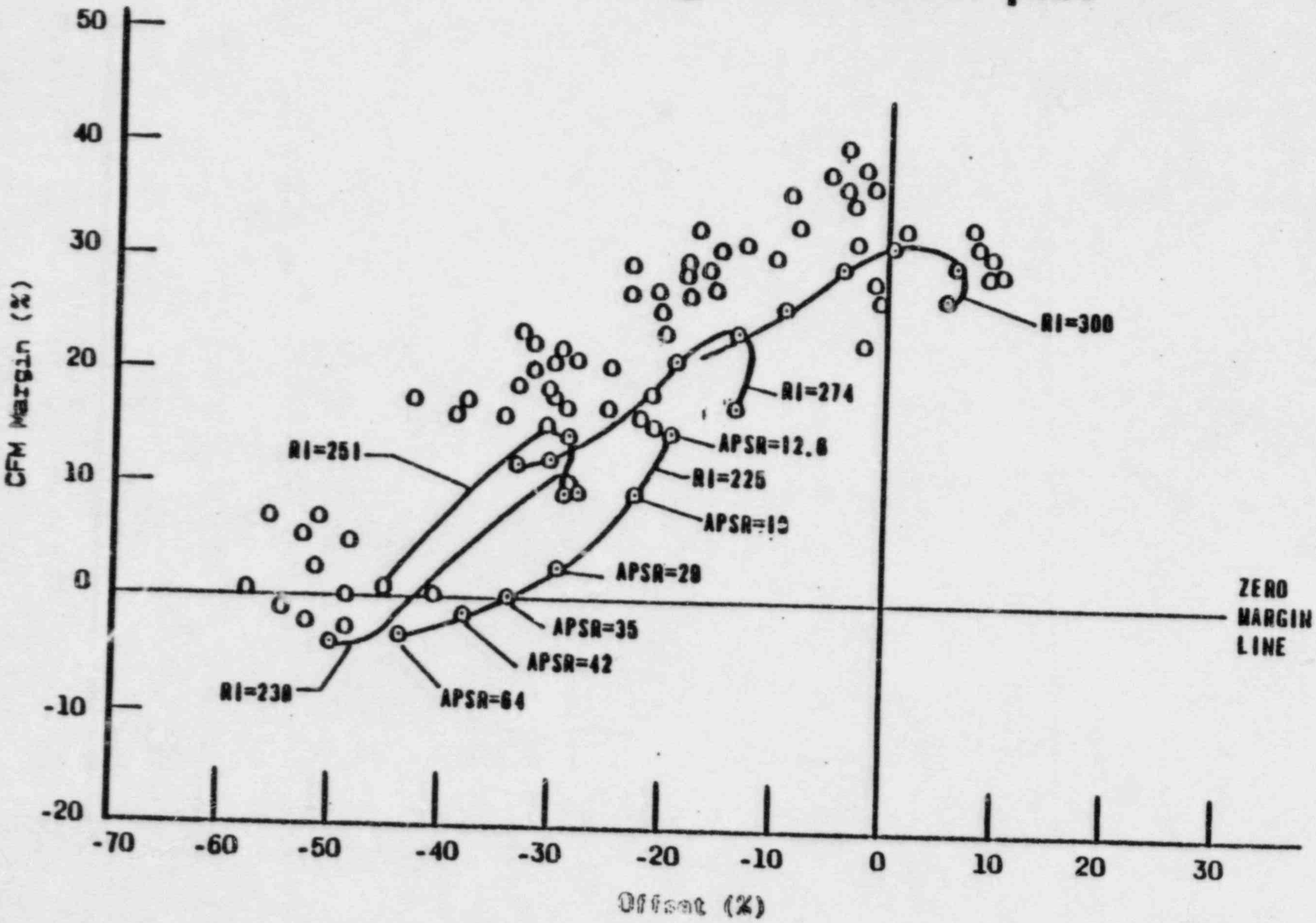
MAP = MAXIMUM ALLOWABLE PEAK TO MAINTAIN DNBR = 1.3

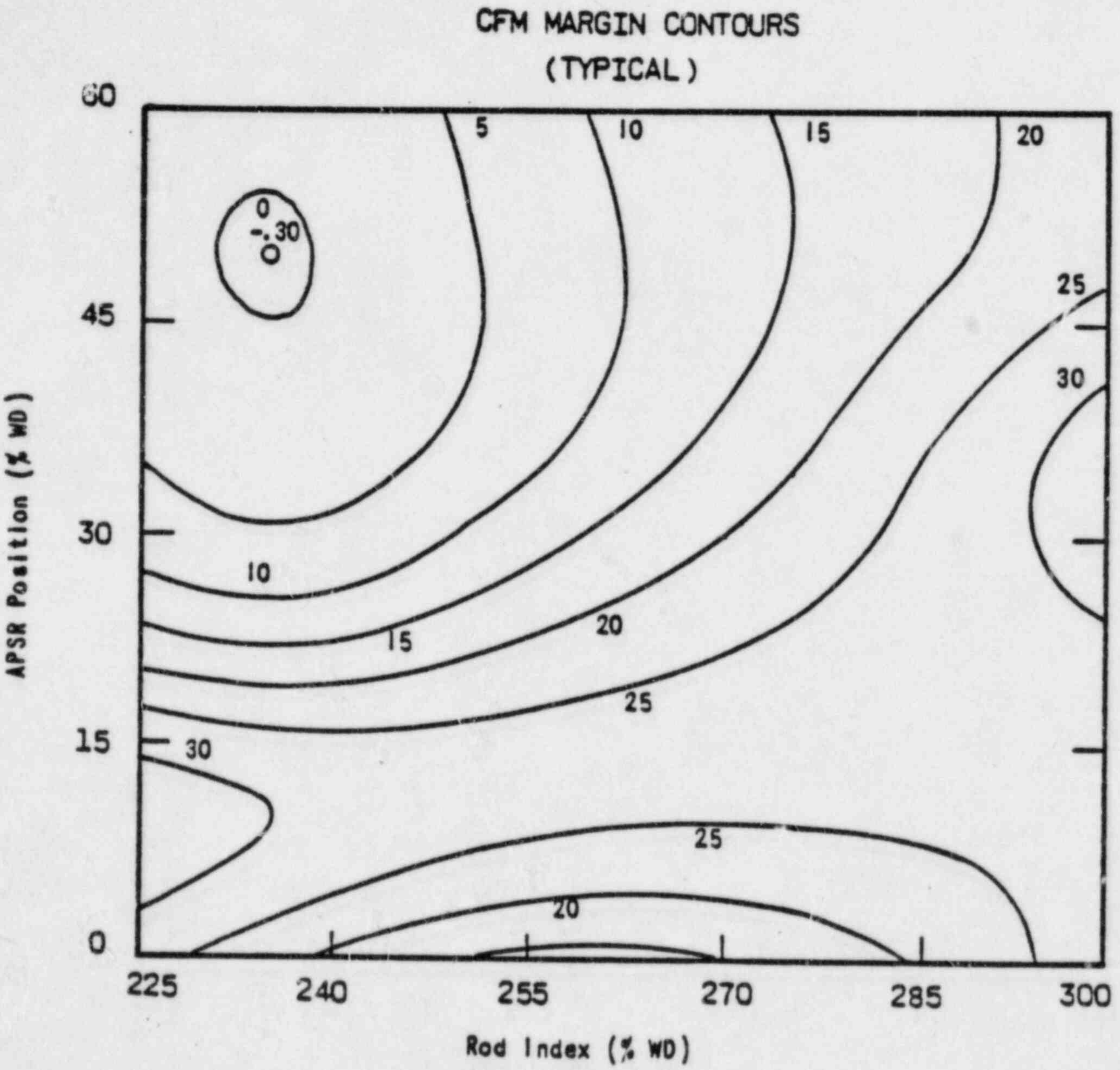
RADU = RADIAL UNCERTAINTY FACTOR



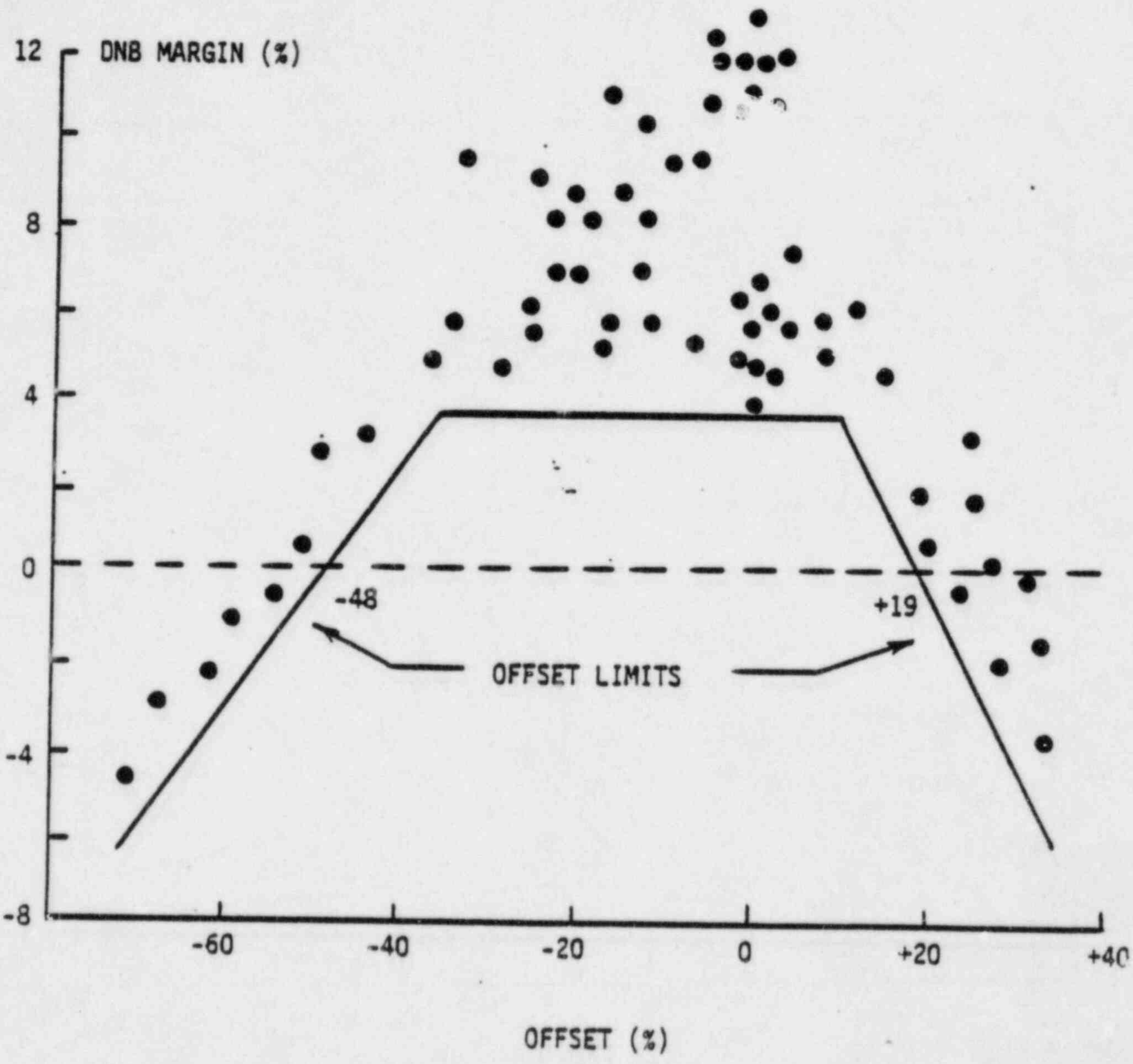
Typical "Design" Transient
Power (% FP)
100
50
0
Average Xenon Concentration (Normalized)
1.25
1.00
0.75
Group 7 Rod Position (% WD)
100
50
Group 8 Rod Position
0
Axial Imbalance (%)
+20
0
-30
Xenon Offset (%)
+12.5
0
-12.5
Iodine Offset (%)
+12.5
0
-12.5
Max Linear Heat Rate (kw/ft)
11
10
9
8
7
6
0 2 4 6 8 10 12 14 16 18 20 22 24
Time, Hours

Typical CFM margin vs. offset plot

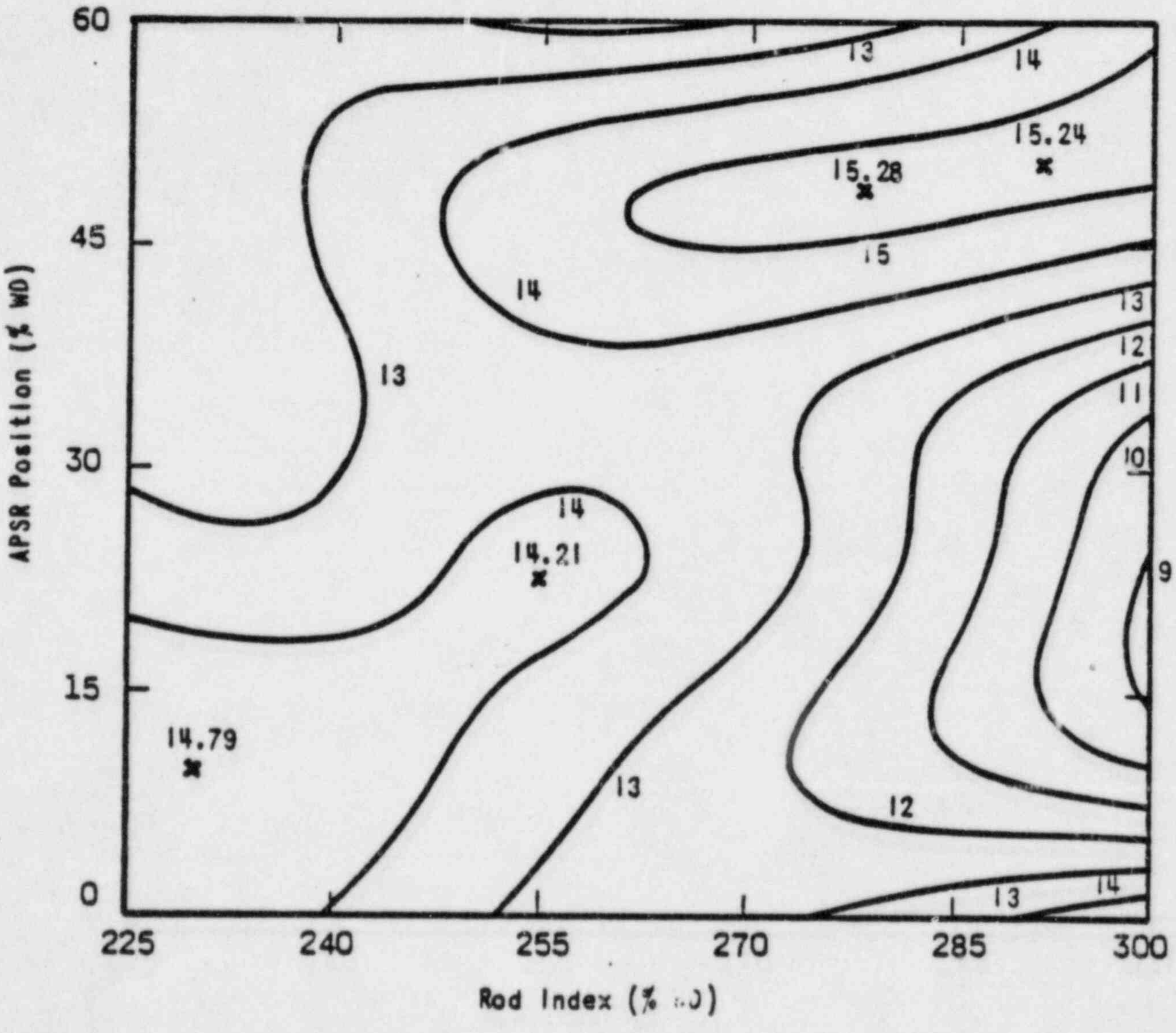



CFM MARGIN CONTOURS
(TYPICAL)
60
45
30
15
0
APSR Position (% WD)
5
10
15
20
25
30
0
-.30
10
15
20
25
30
25
20
225
240
255
270
285
300
Rod Index (% WD)

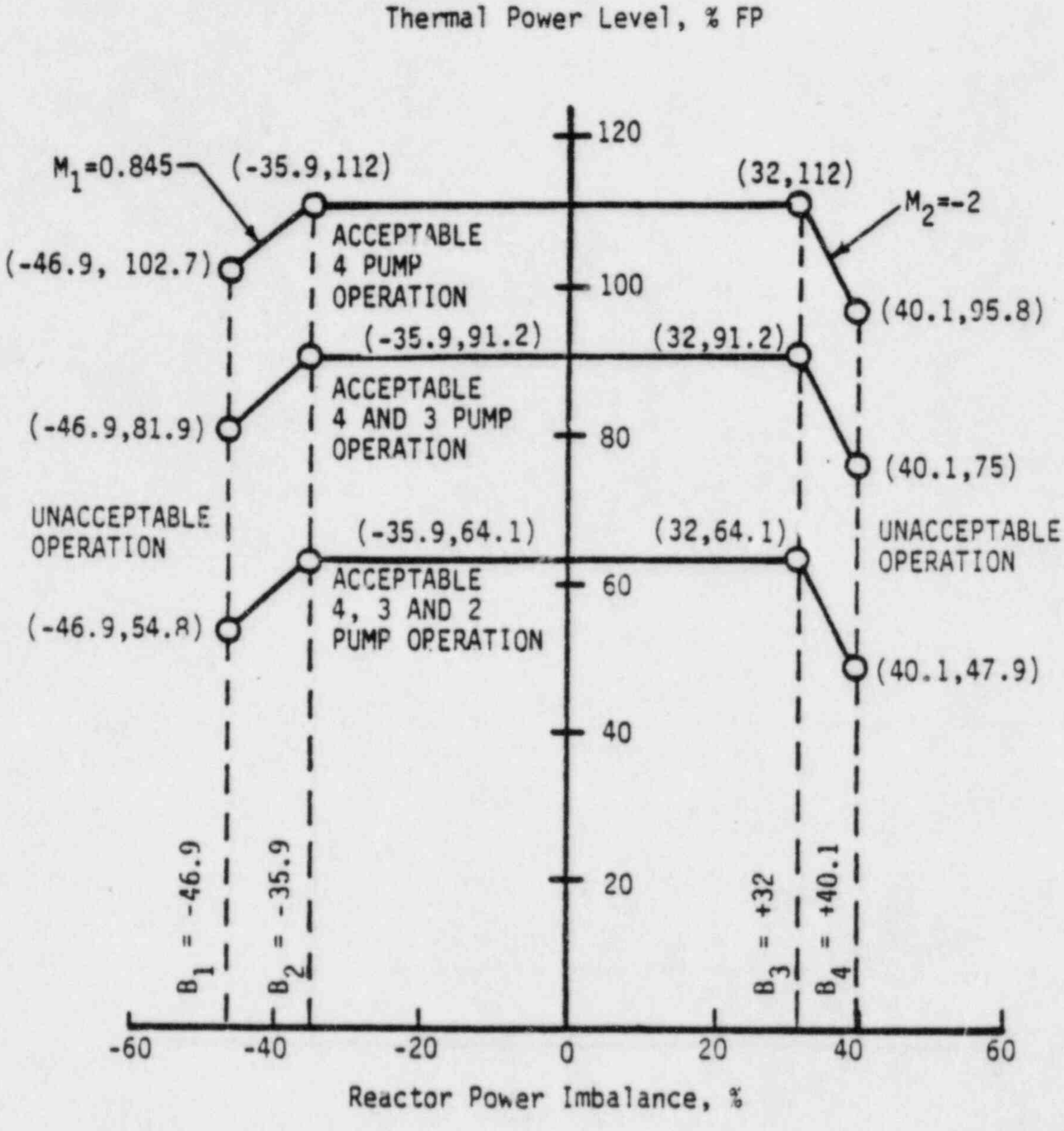
TYPICAL DNB MARGIN VS. OFFSET
(FOR RPS SAFETY LIMITS)



DNB MARGIN CONTOURS
(TYPICAL)

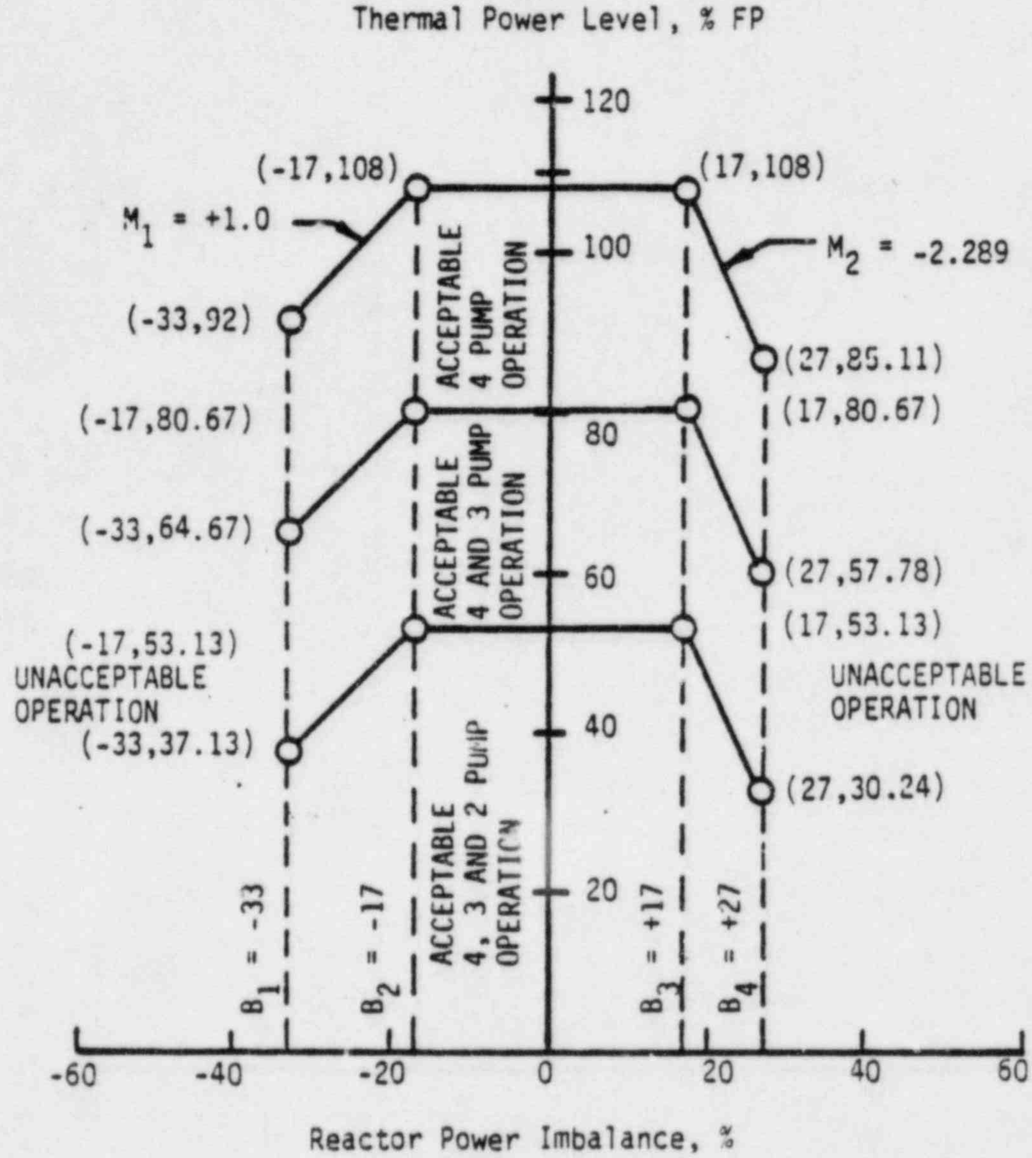


Core Protection Safety Limits -- ANO-1, Cycle 7
(Tech Spec Figure 2.1-2)



Babcock & Wilcox
a McDermott company

Protective System Maximum Allowable Setpoints -- ANO-1, Cycle 7 (Tech Spec Figure 2.3-2)



OPERATING LIMITS

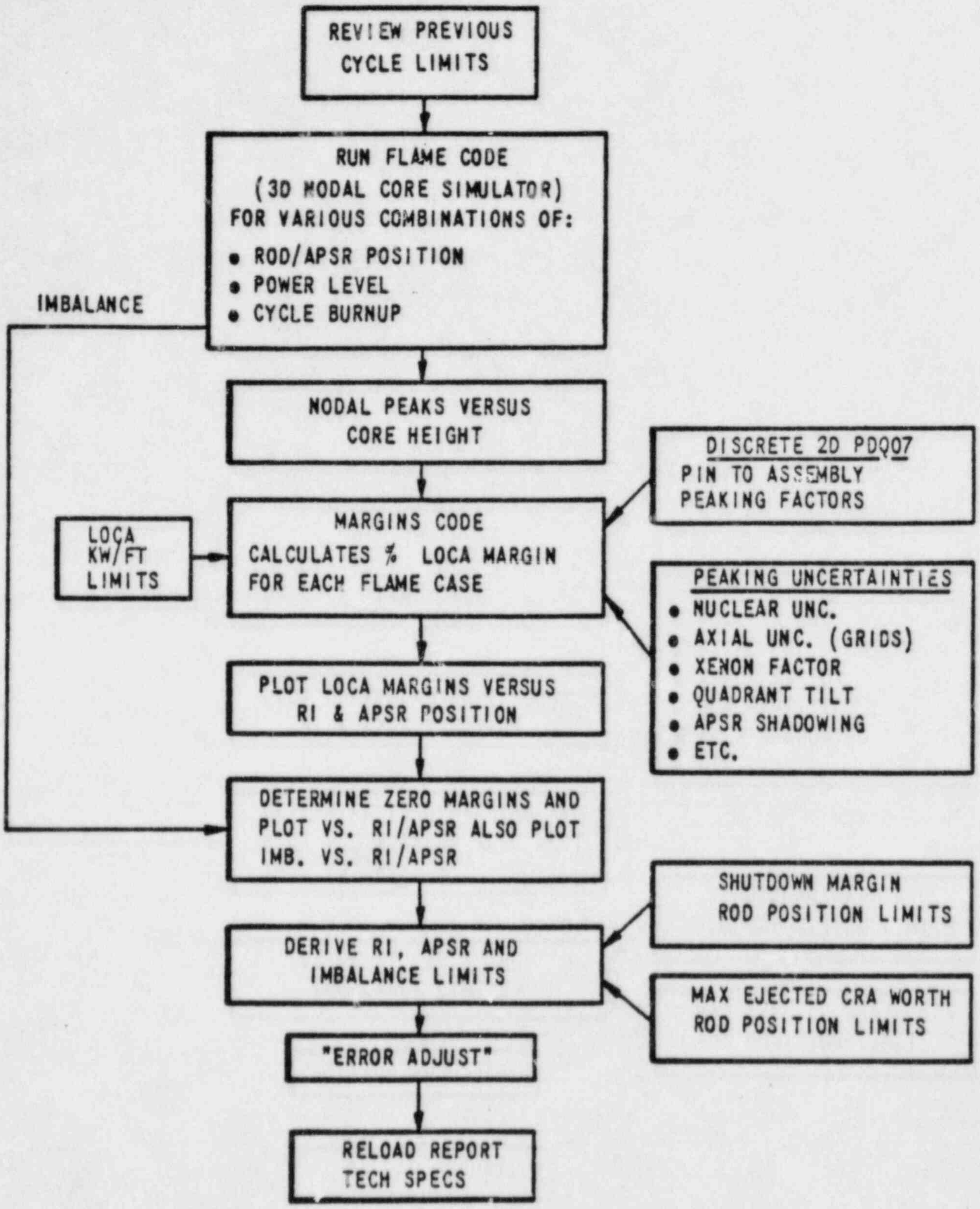
OPERATING LIMITS ARE APPLIED TO:

- ROD INDEX
- APSR POSITION
- AXIAL IMBALANCE

CRITERIA APPLIED TO DETERMINATION OF THE OPERATING LIMITS ARE:

- LOCA LINEAR HEAT RATE LIMIT BASED ON 10CFR50/APPENDIX K ANALYSIS
- ENSURE 1%ΔK/K SHUTDOWN MARGIN AT HZP WITH HIGHEST WORTH STUCK CRA
- LIMIT EJECTED ROD WORTH TO .65%ΔK/K(HFP)
  1.00%ΔK/K(HZP)
- PEAKING LIMIT TO PRESERVE INITIAL CONDITION DNBR FOR ACCIDENT ANALYSIS

Flowchart for generation of operational limits



10 CFR 50.46

FINAL ACCEPTANCE CRITERIA (FAC) FOR ECCS

(JANUARY, 1974)

(1) PEAK CLADDING TEMPERATURE $\leq$ 2200 ^{o}F

(2) LOCAL CLADDING THICKNESS LOSS $\leq$ 17% DUE TO OXIDATION

(3) HYDROGEN GENERATED MUST NOT EXCEED THAT GENERATED BY OXIDATION OF 1% OF CLADDING ($ZR-H_2$) REACTION)

(4) COOLABLE GEOMETRY MUST BE MAINTAINED AFTER LOCA

(5) SUSTAINED (LONG-TERM) COOLING MUST BE ESTABLISHED AFTER LOCA (DECAY HEAT REMOVAL CONTINUED)

ANO-1 CYCLE-7
LOCA LINEAR HEAT RATE LIMITS

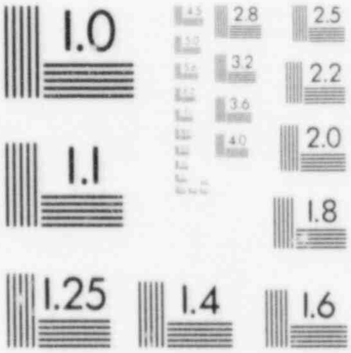
(WITH FLECSET)

ELEVATION	0-1000 MWD/MTU	AFTER 1000 MWD/MTU
2 FT	14.0 KW/FT	15.5 KW/FT
4	16.6	16.6
6	17.5	18.0
8	17.0	17.0
10	16.0	16.0

(WITHOUT FLECSET)

ELEVATION	0-1000 MWD/MTU	1000-2600 MWD/MTU	AFTER 2600 MWD/MTU
2 FT	13.5 KW/FT	15.0 KW/FT	15.5 KW/FT
4	16.[illegible]	16.6	16.6
6	17.5	18.0	18.0
8	17.0	17.0	17.0
10	16.0	16.0	16.0

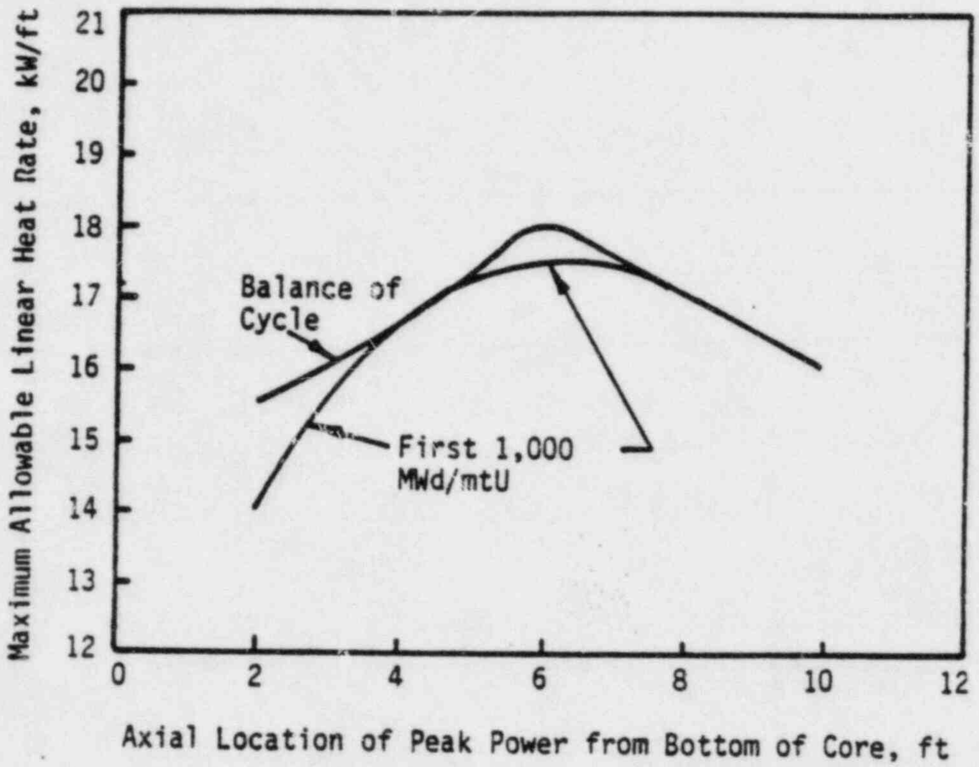
IMAGE EVALUATION TEST TARGET (MT-3)



150mm

6"

LOCA Limited Maximum Allowable Linear Heat Rate
(Tech Spec Figure 3.5.2.4)



LOCA MARGIN

$$\text{LOCA Margin} = \frac{\text{MALHR} - (\text{PK*RL*AVLHR*FOP})(\text{NUC*GRID*XE*QT})}{\text{MALHR}} (100)$$

MALHR = MAXIMUM ALLOWABLE LHR FOR LOCA

PK = CALCULATED ASSEMBLY NODAL PEAK (PEAK ASSEMBLY TO CORE AVERAGE LHR)

RL = RADIAL LOCAL PEAK (PEAK PIN-TO-ASSEMBLY AVERAGE LHR)

AVLHR - CORE AVERAGE LHR

FOP = FRACTION OF POWER

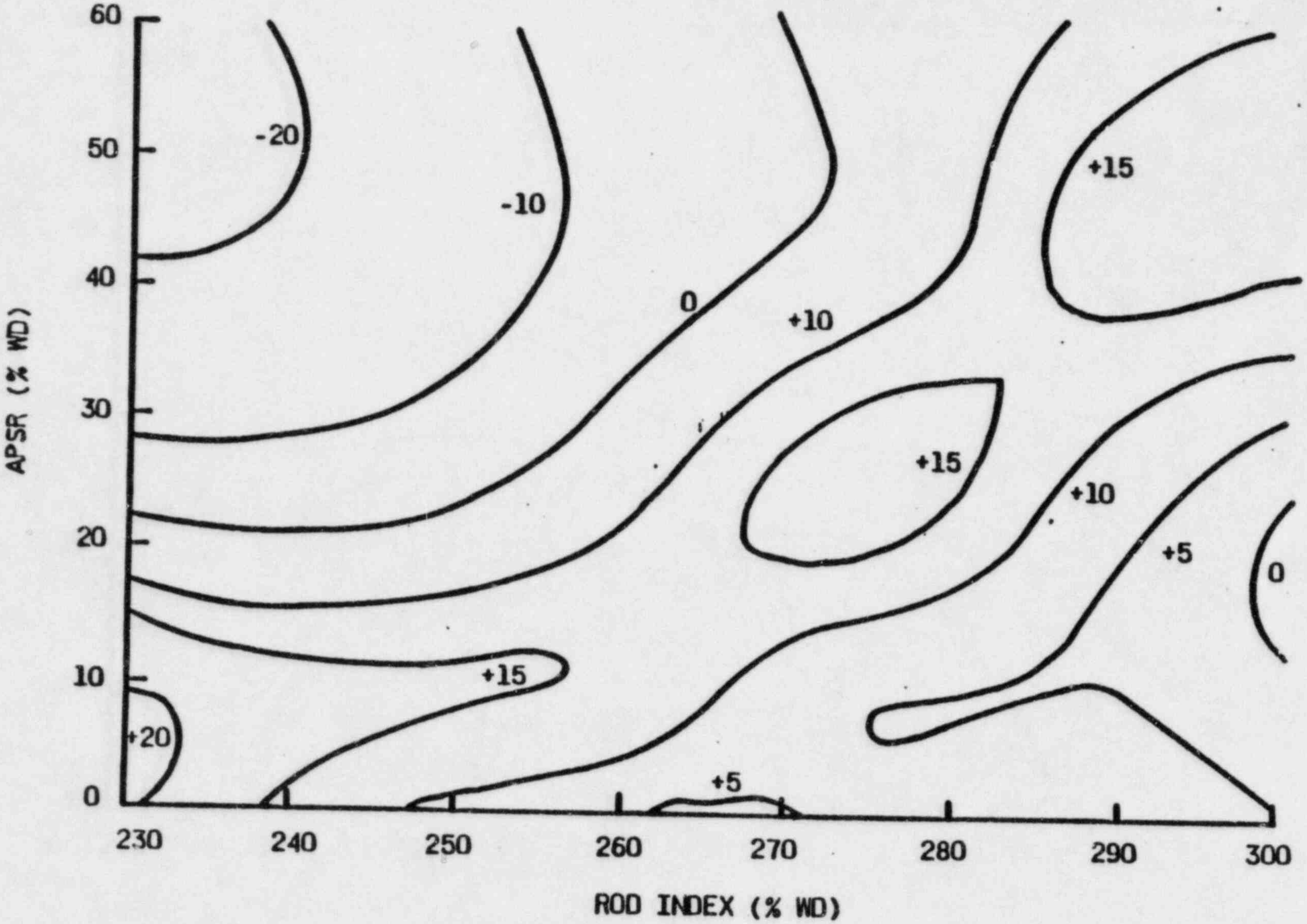
NUC = STATISTICAL UNCERTAINTY (NUCLEAR MODEL, ROD BOW, TOLERANCES) (1.09)

GRID = AXIAL SPACER GRID FACTOR (1.026)

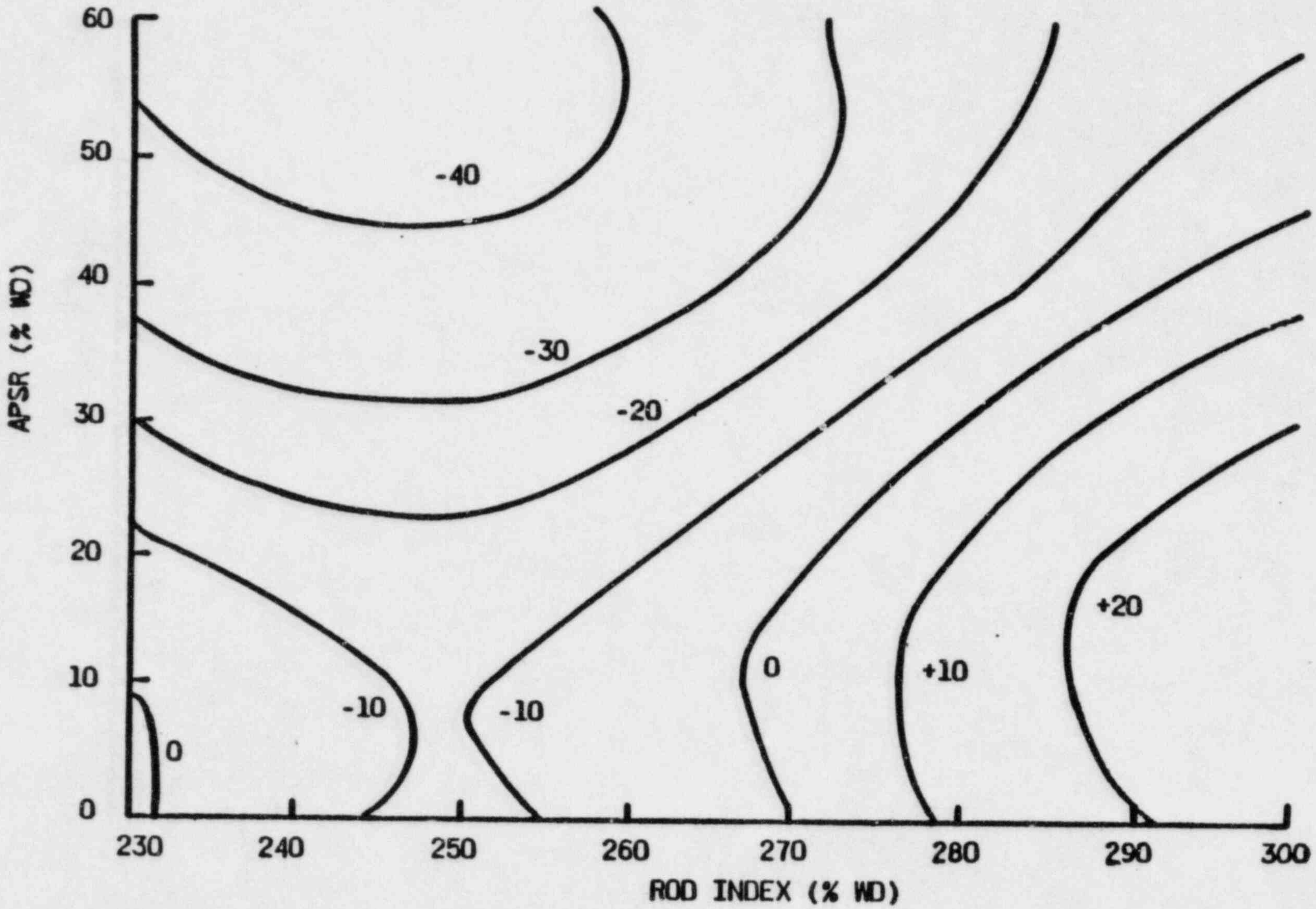
XE = XENON PENALTY FACTOR (1.05)

QT = QUADRANT TILT PENALTY FACTOR (1.0736)

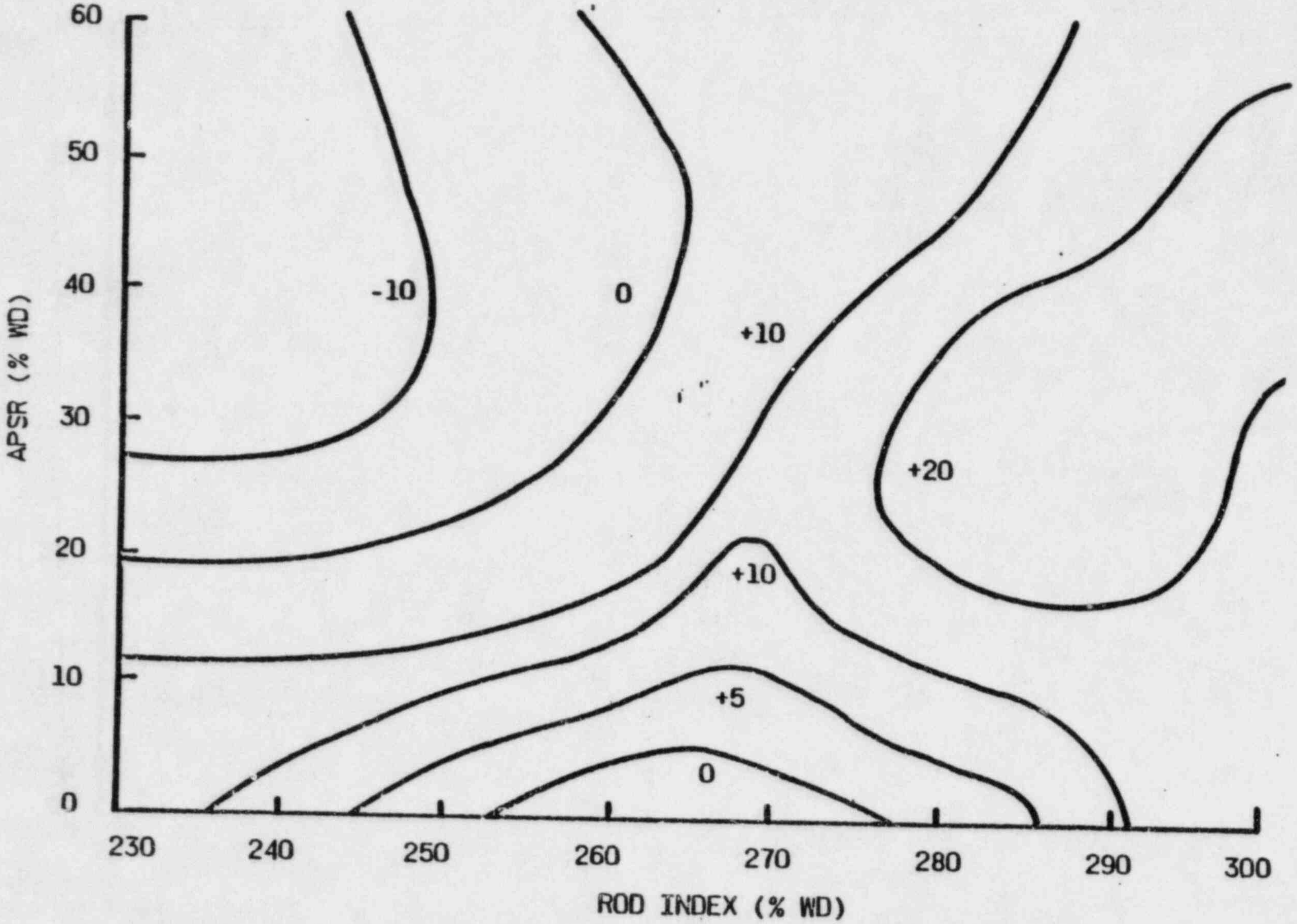
LOCA margin contours (BOC)



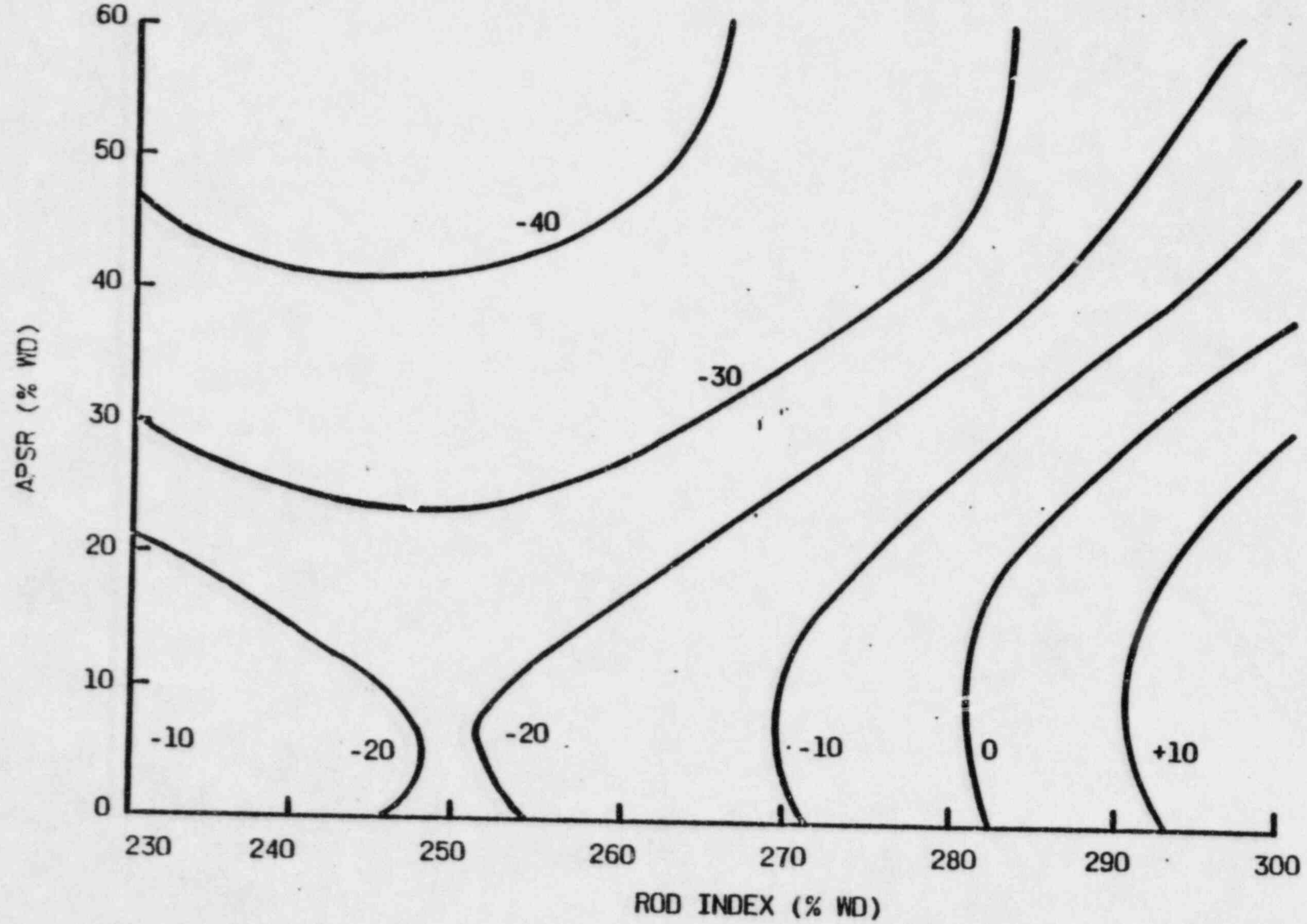
Offset contours
(BOC)



LOCA margin contours
(EOC)



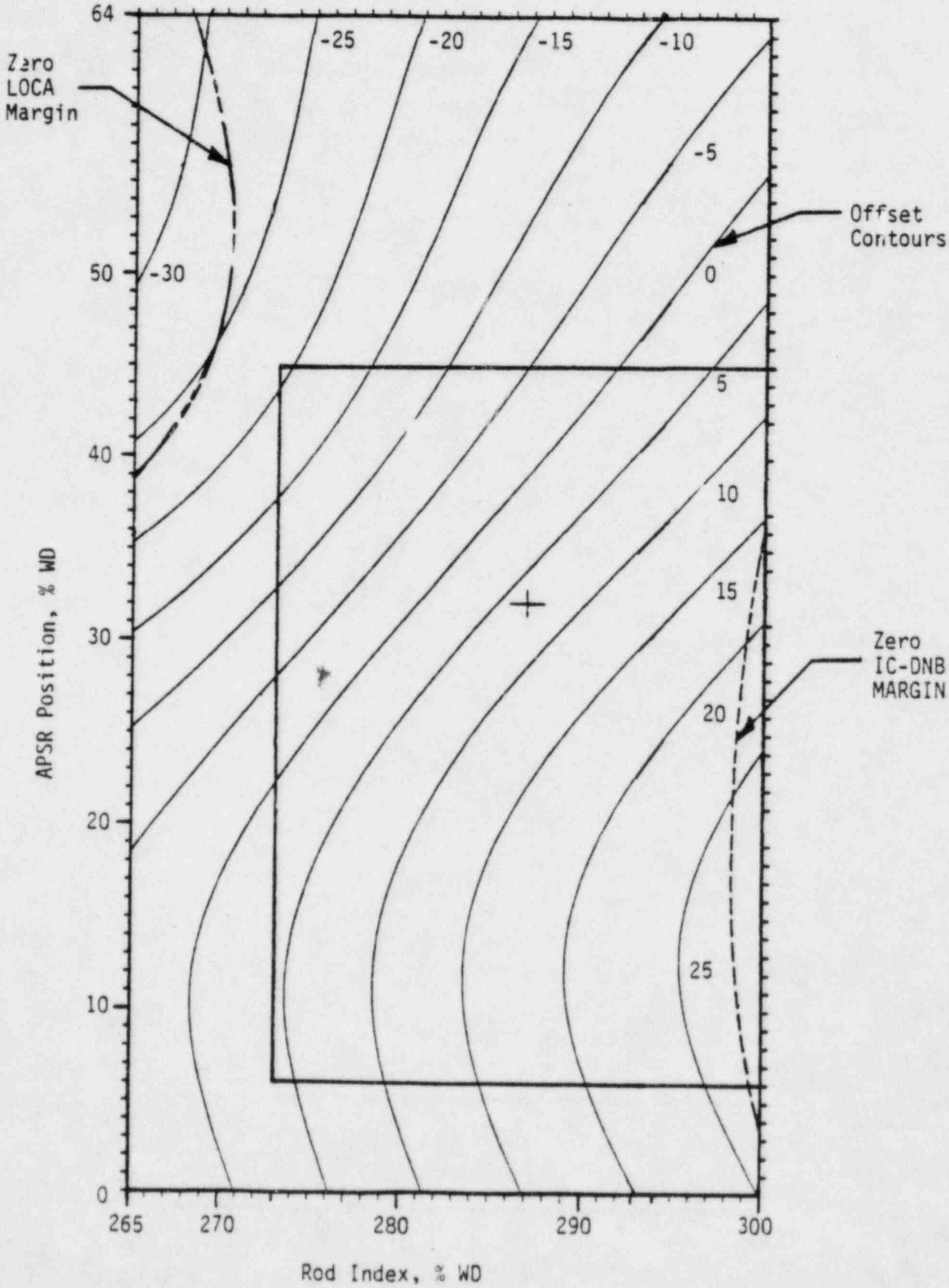
Offset contours (EOC)



102%FP LCO Limits

ANO-1 Cy-7

0-28 EFPD



ROD INSERTION LIMITS BASED ON SHUTDOWN MARGIN

(1) <u>TOTAL AVAILABLE WORTH (TAW)</u>

<u>BASE</u>: TOTAL ROD WORTH AT HZP (GRP 1-7)

<u>SUBTRACTORS</u>: MAXIMUM HZP STUCK ROD WORTH

CONTROL POISON BURNUP

CALCULATIONAL UNCERTAINTY (10%)

(2) <u>TOTAL REQUIRED WORTH (TRW)</u>

<u>BASE</u>: POWER DEFICIT (2D)

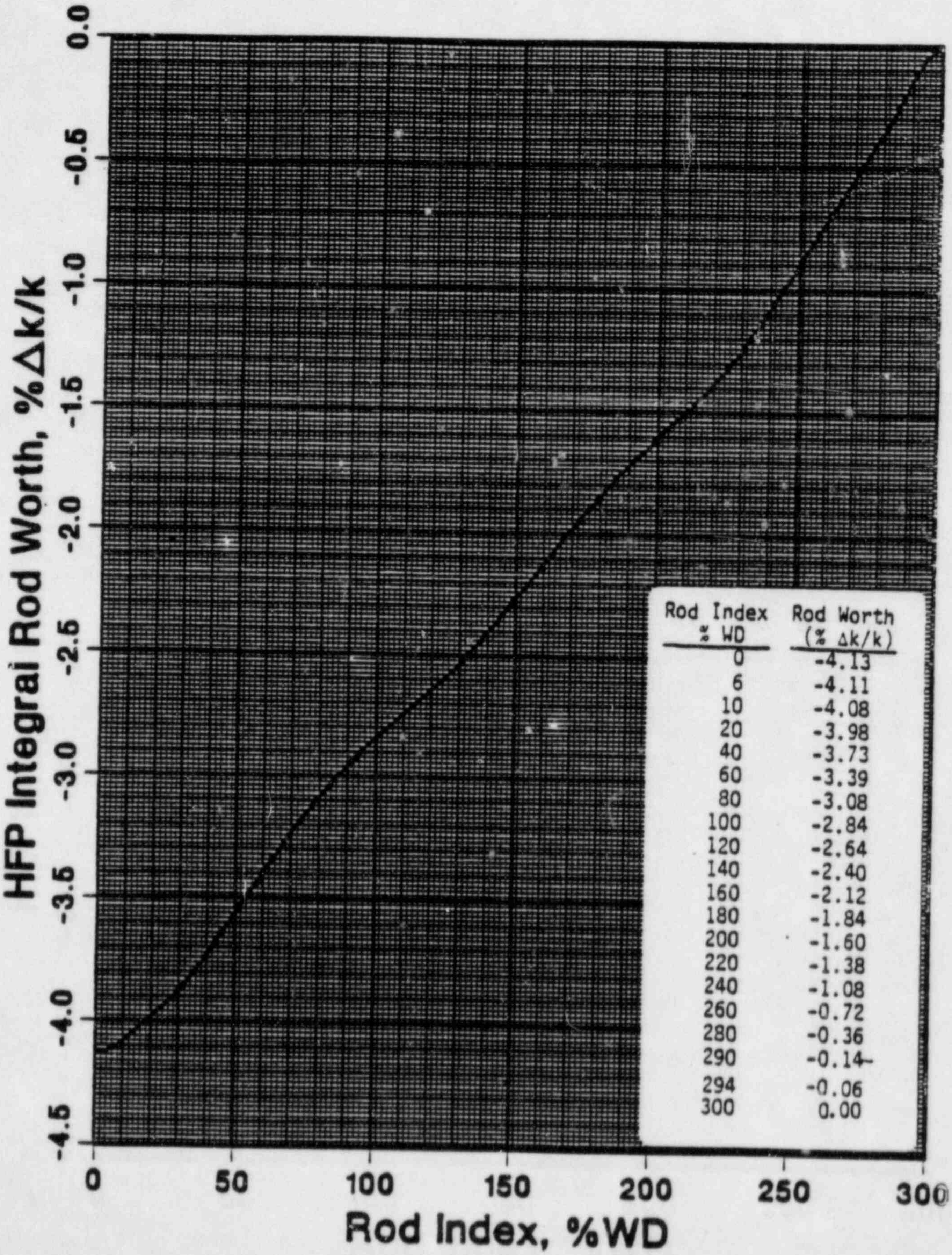
<u>ADDERS</u>: 3D COMPONENT (FLUX REDISTRIBUTION)

SHUTDOWN MARGIN REQMT. (1% $\Delta k/k$)

(3) <u>ALLOWABLE INSERTED WORTH</u> = TAW - TRW

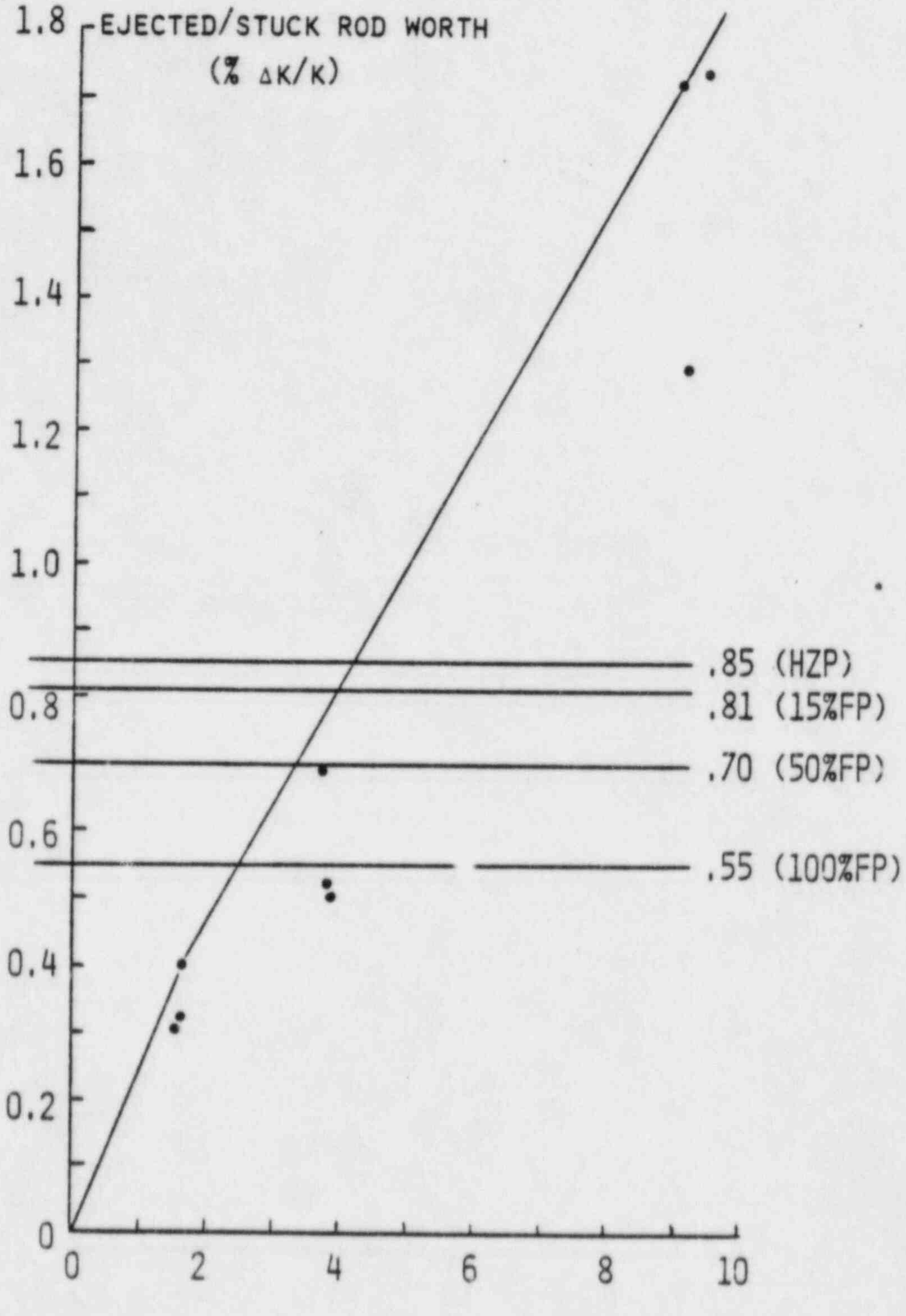
(4) <u>ALLOWABLE ROD INDEX</u> (FROM INTEGRAL ROD WORTH CURVE)

Integral Rod Worth for CRG 5-7, Hot Full Power, 420 EFPD, CRG 8 at 100% WD, Equilibrium Xenon

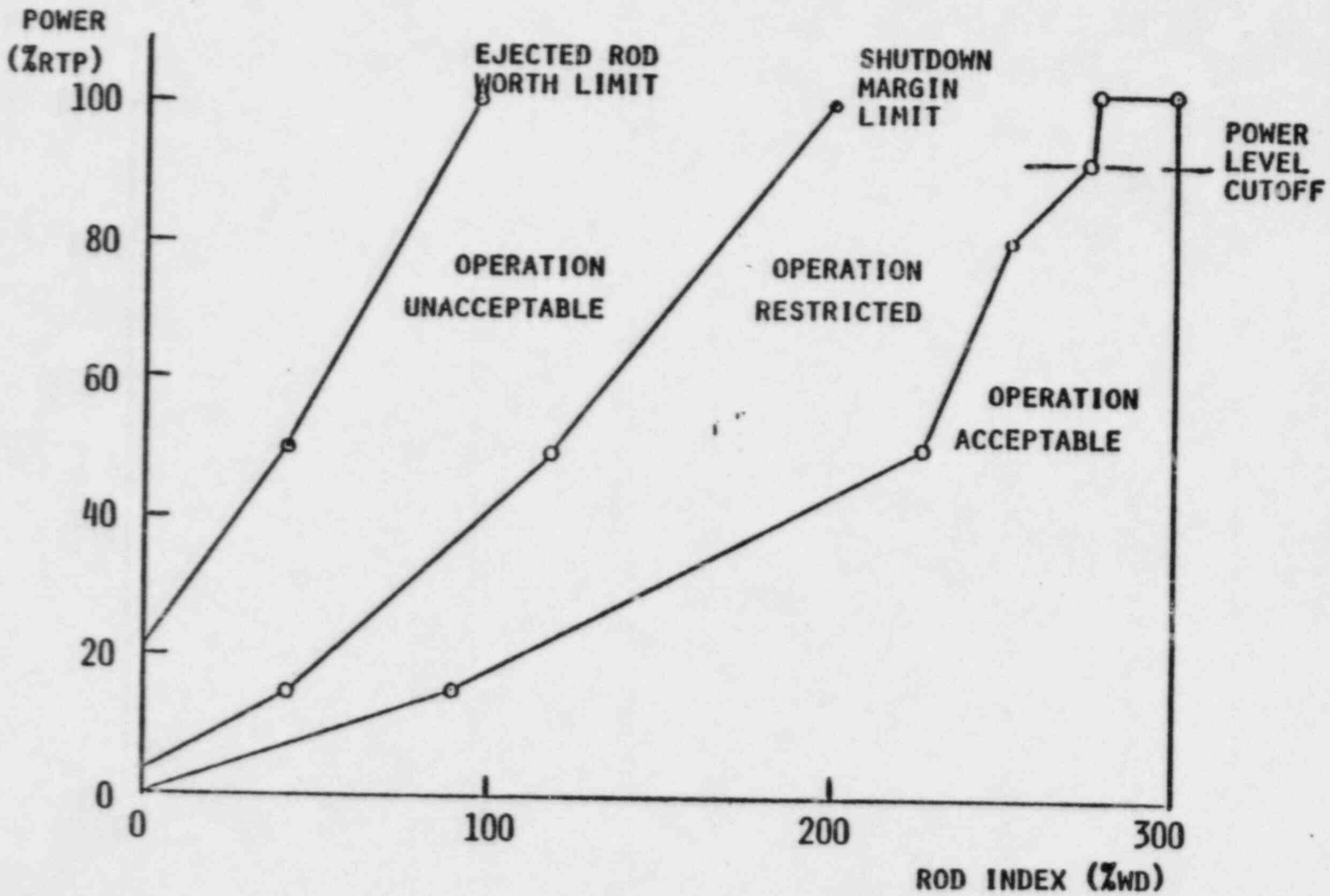


Rod Index % WD	Rod Worth (% Δk/k)
0	-4.13
6	-4.11
10	-4.08
20	-3.98
40	-3.73
60	-3.39
80	-3.08
100	-2.84
120	-2.64
140	-2.40
160	-2.12
180	-1.84
200	-1.60
220	-1.38
240	-1.08
260	-0.72
280	-0.36
290	-0.14
294	-0.06
300	0.00

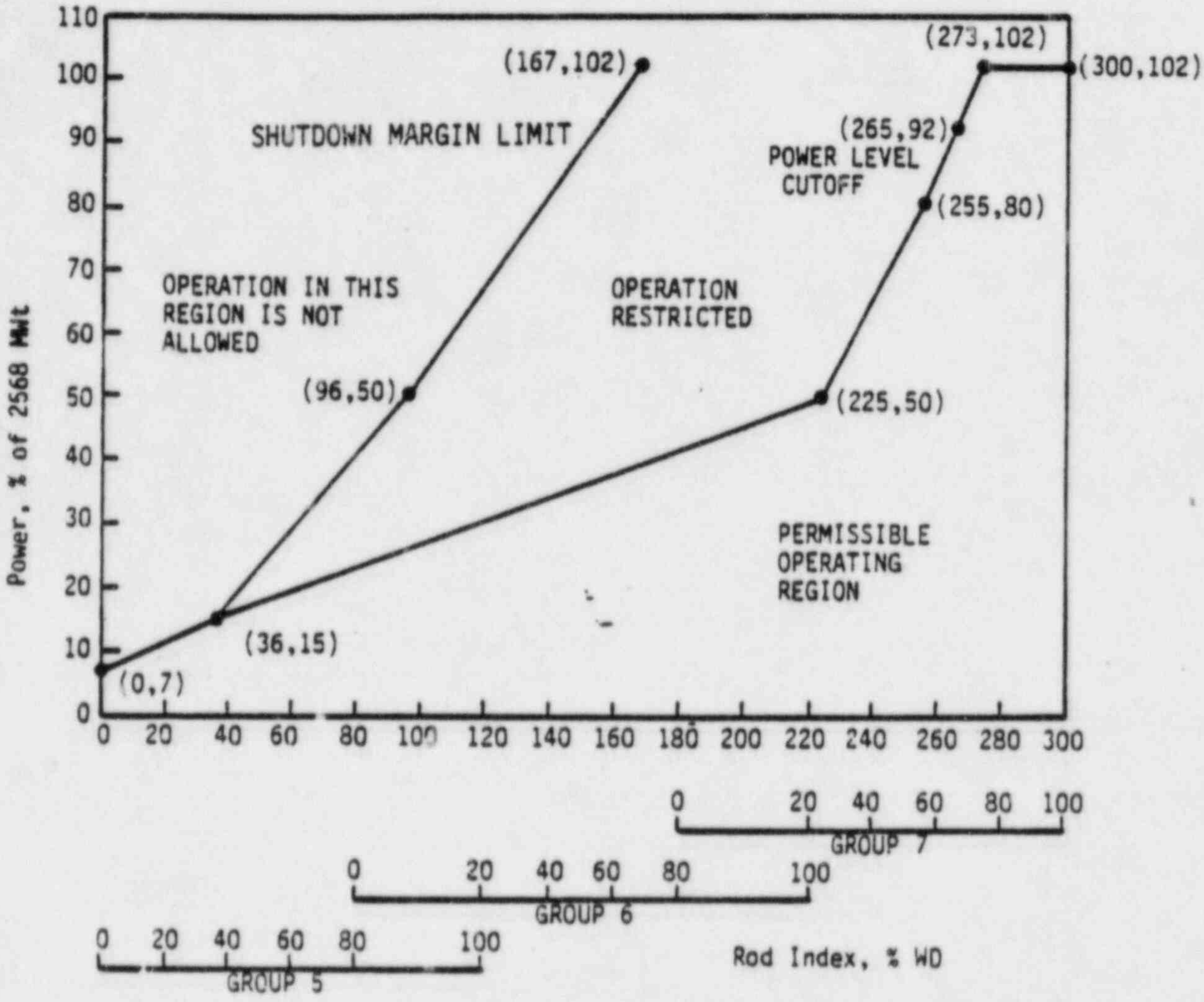
EJECTED ROD WORTH LIMITS



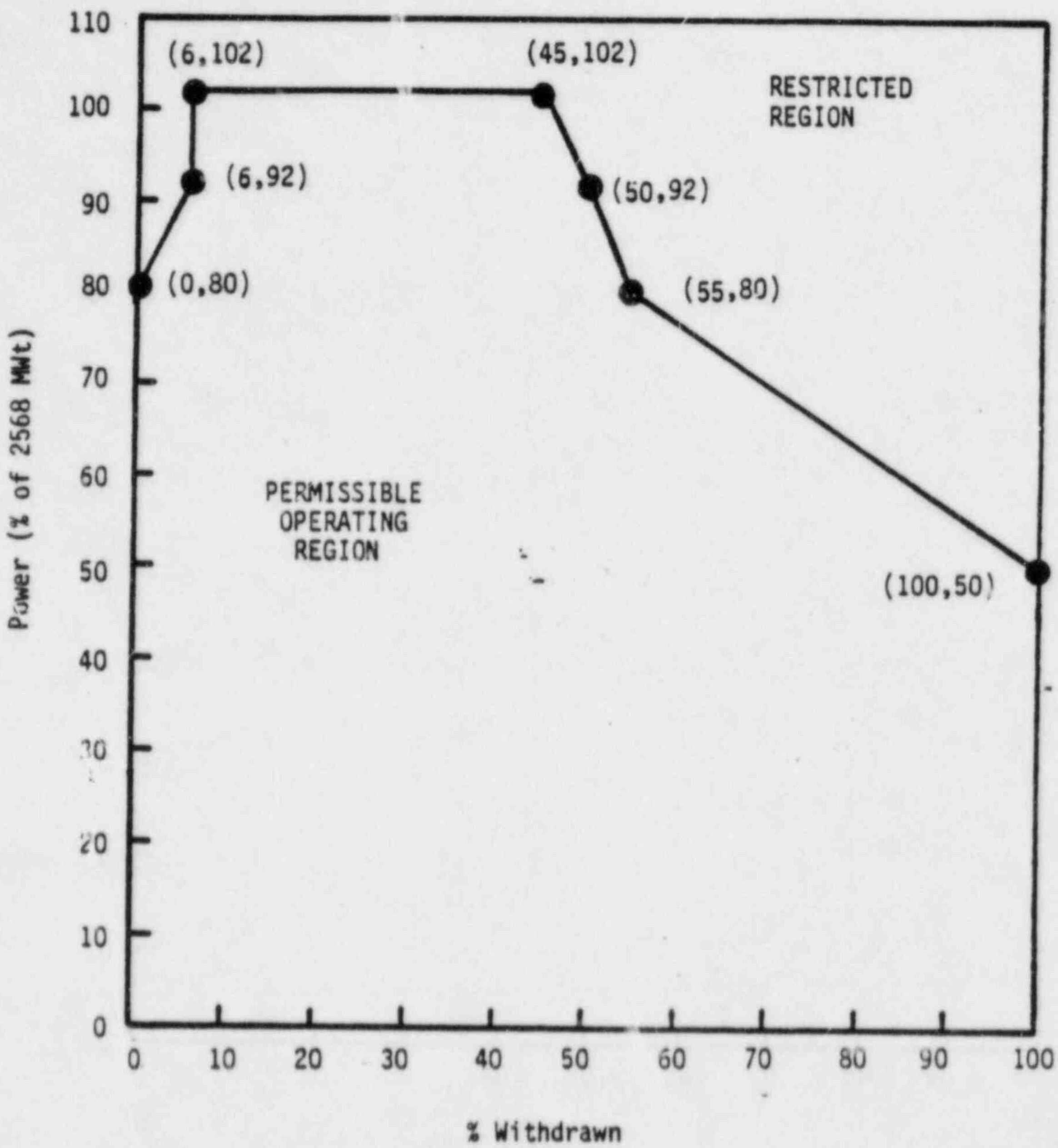
REGULATING GROUP POSITION LIMITS



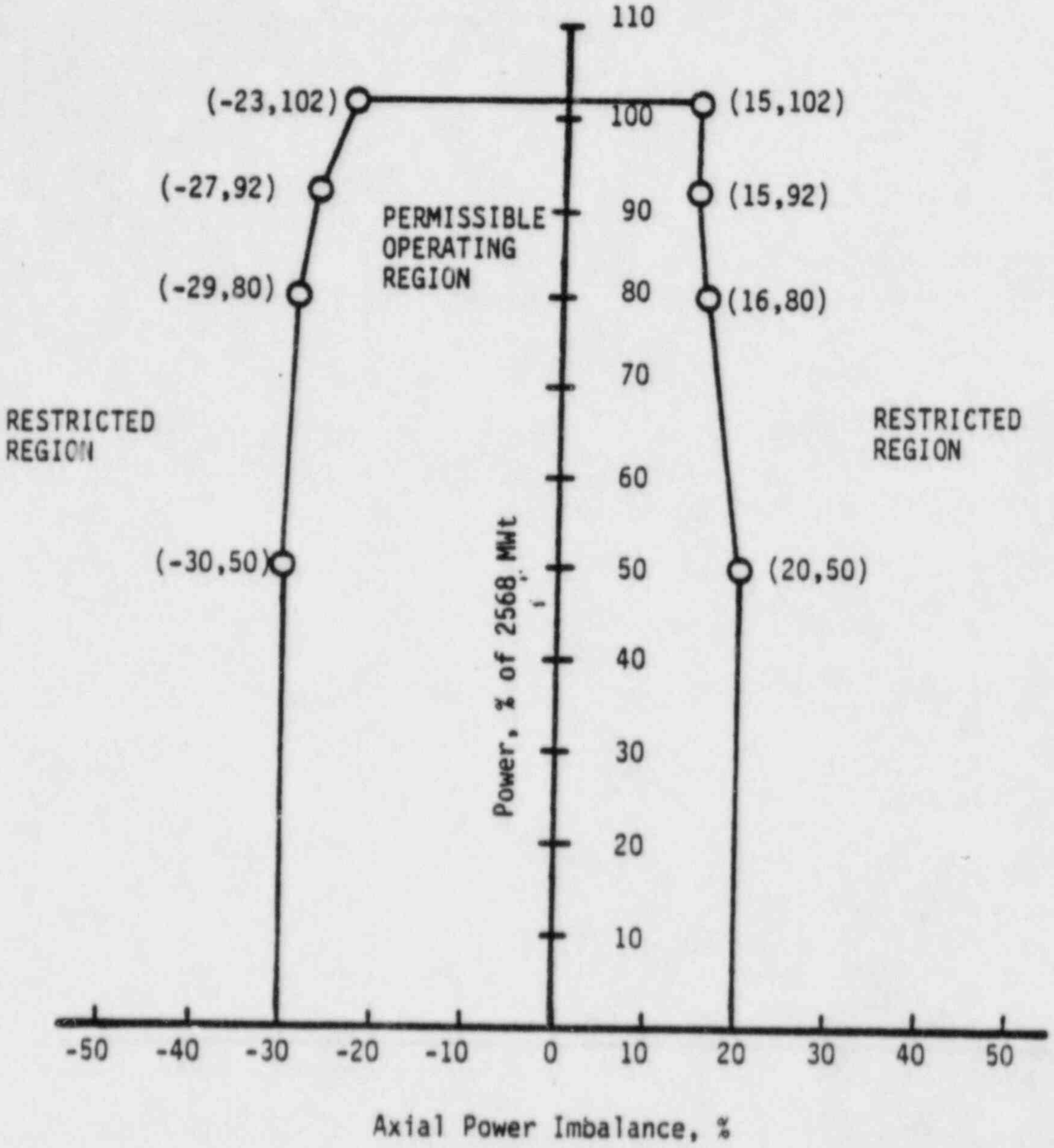
Rod Position Limits for Four-Pump Operation
From 0 to 38 EFPD -- ANO-1, Cycle 7
(Tech Spec Figure 3.5.2-1A)



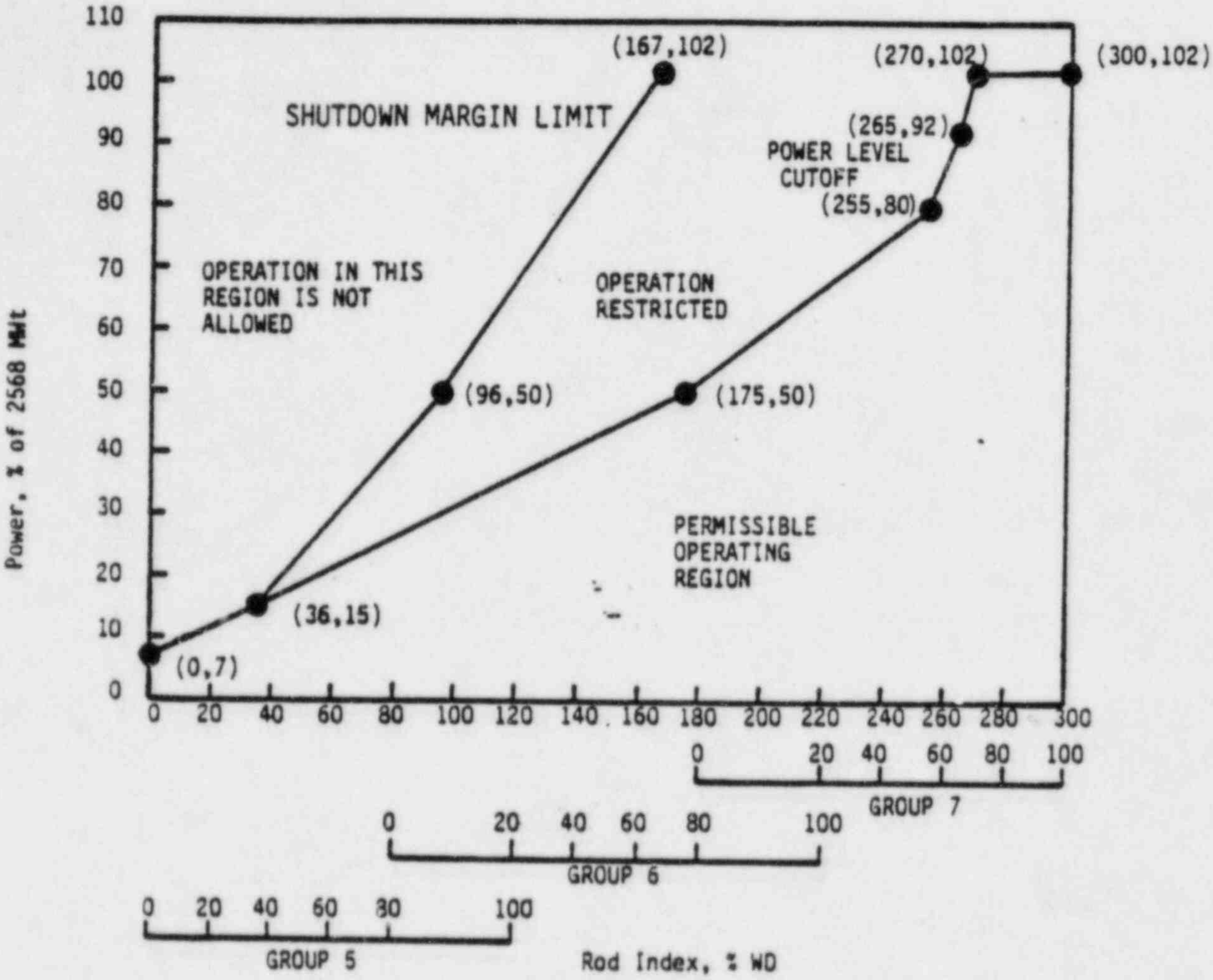
APSR Position Limits for Operation From 0 to 38 EFPD -- ANO-1, Cycle 7 (Tech Spec Figure 3.5.2-4A)



Operational Power Imbalance Envelope for Operation From 0 to 38 EFPD -- ANO-1, Cycle 7 (Tech Spec Figure 3.5.2-3A)



Rod Position Limits for Four-Pump Operation
From 28 to 200 ± 10 EFPD -- ANO-1, Cycle 7
(Tech Spec Figure 3.5.2-1B)



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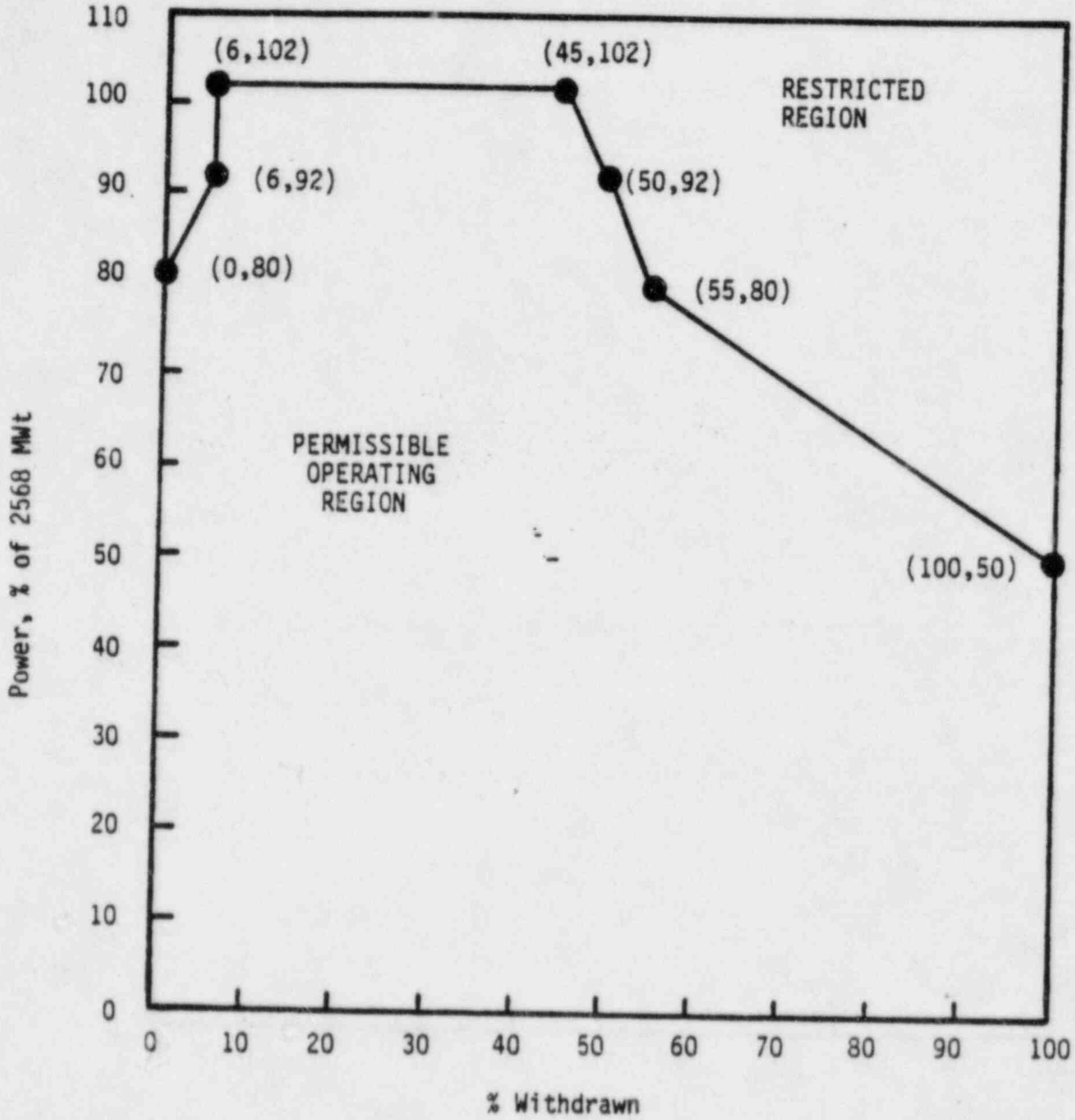
a McDermott company

APSR Position Limits for Operation From 28 to 200 ± 10 EFPD -- ANO-1, Cycle 7 (Tech Spec Figure 3.5.2-4B)



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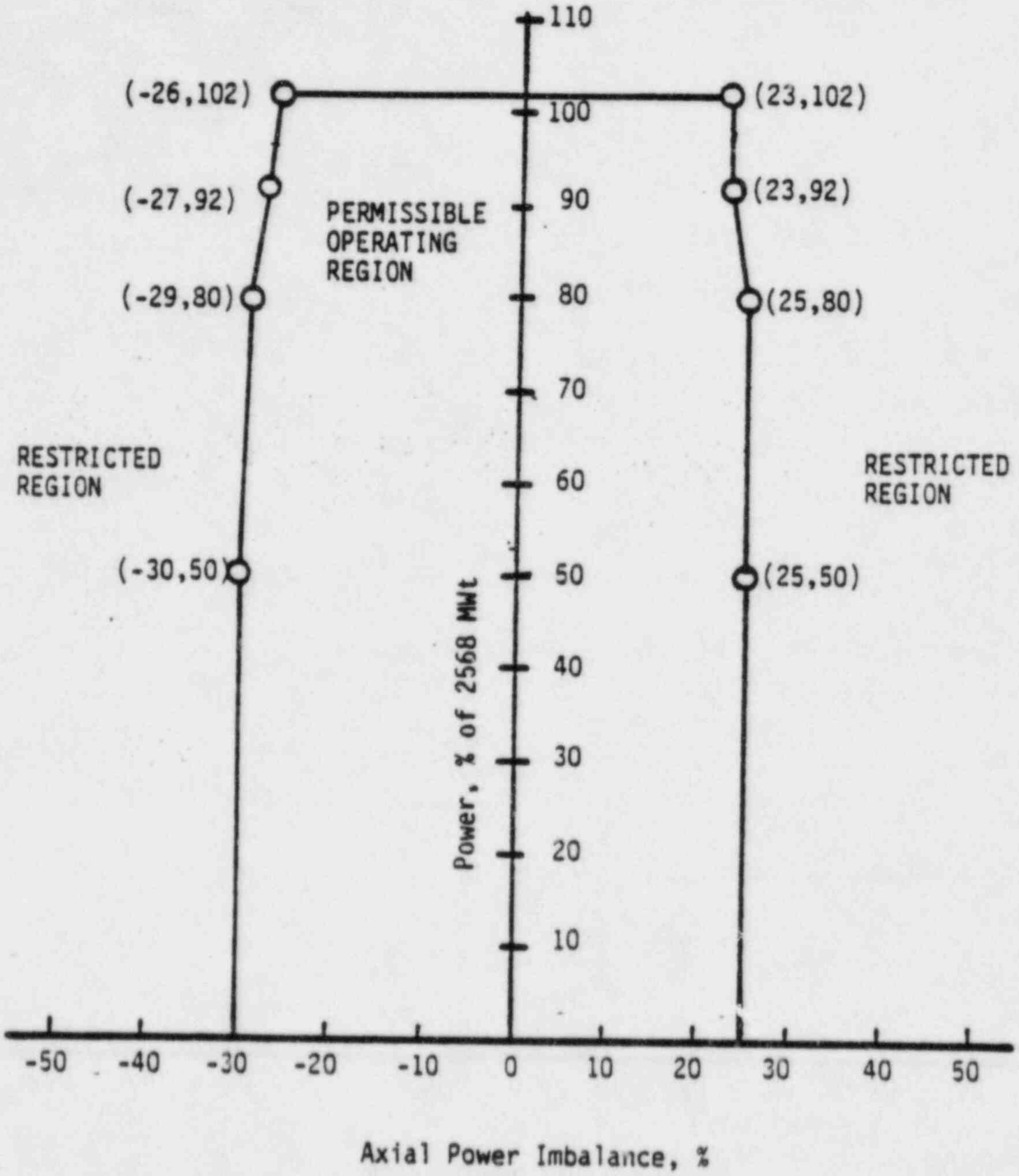
Operational Power Imbalance Envelope for Operation
From 28 to 200 ± 10 EFPD -- ANO-1, Cycle 7
(Tech Spec Figure 3.5.2-3B)



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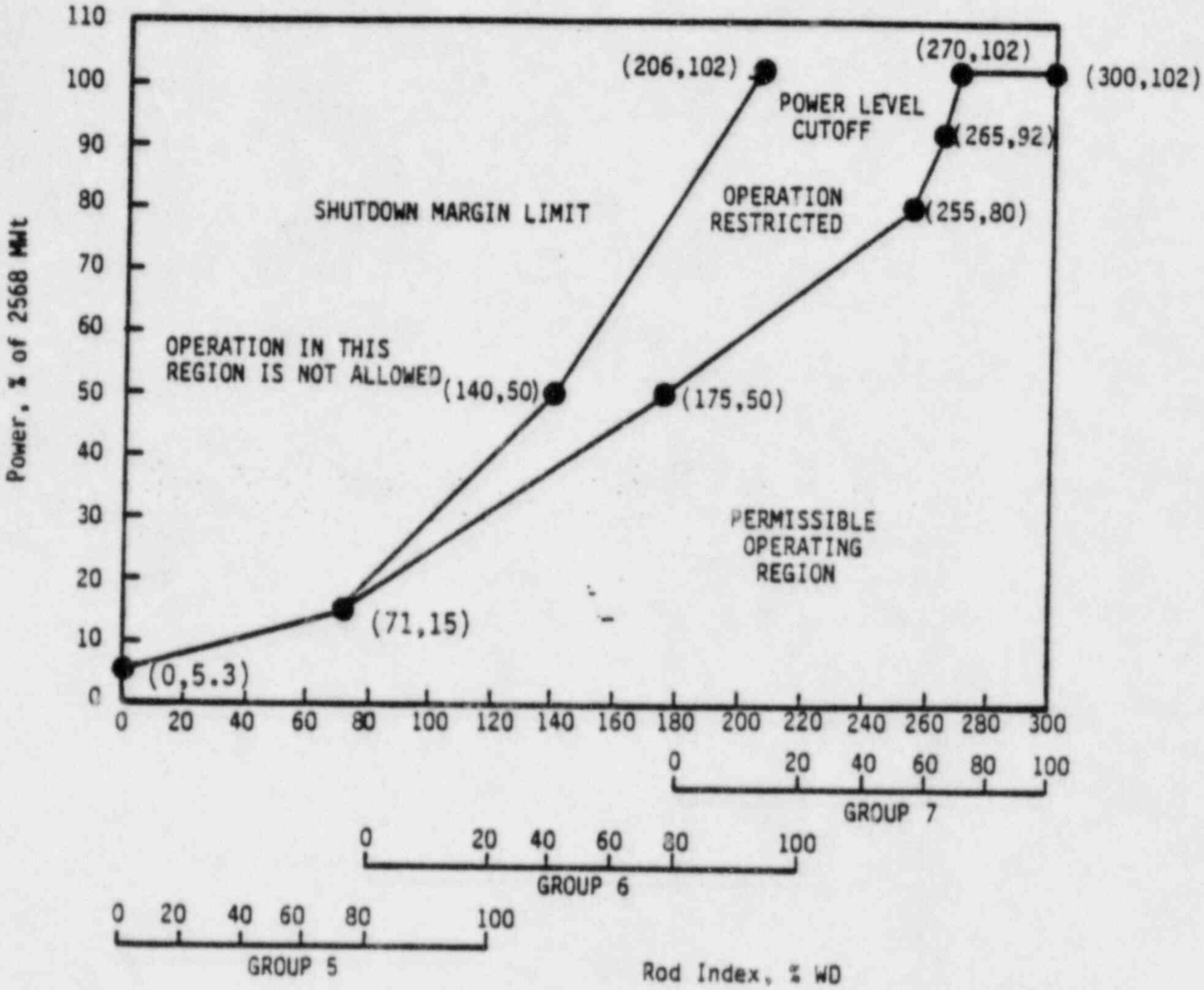
Rod Position Limits for Four-Pump Operation From 200 ± 10 to 400 ± 10 EFPD -- ANO-1, Cycle 7 (Tech Spec Figure 3.5.2-1C)



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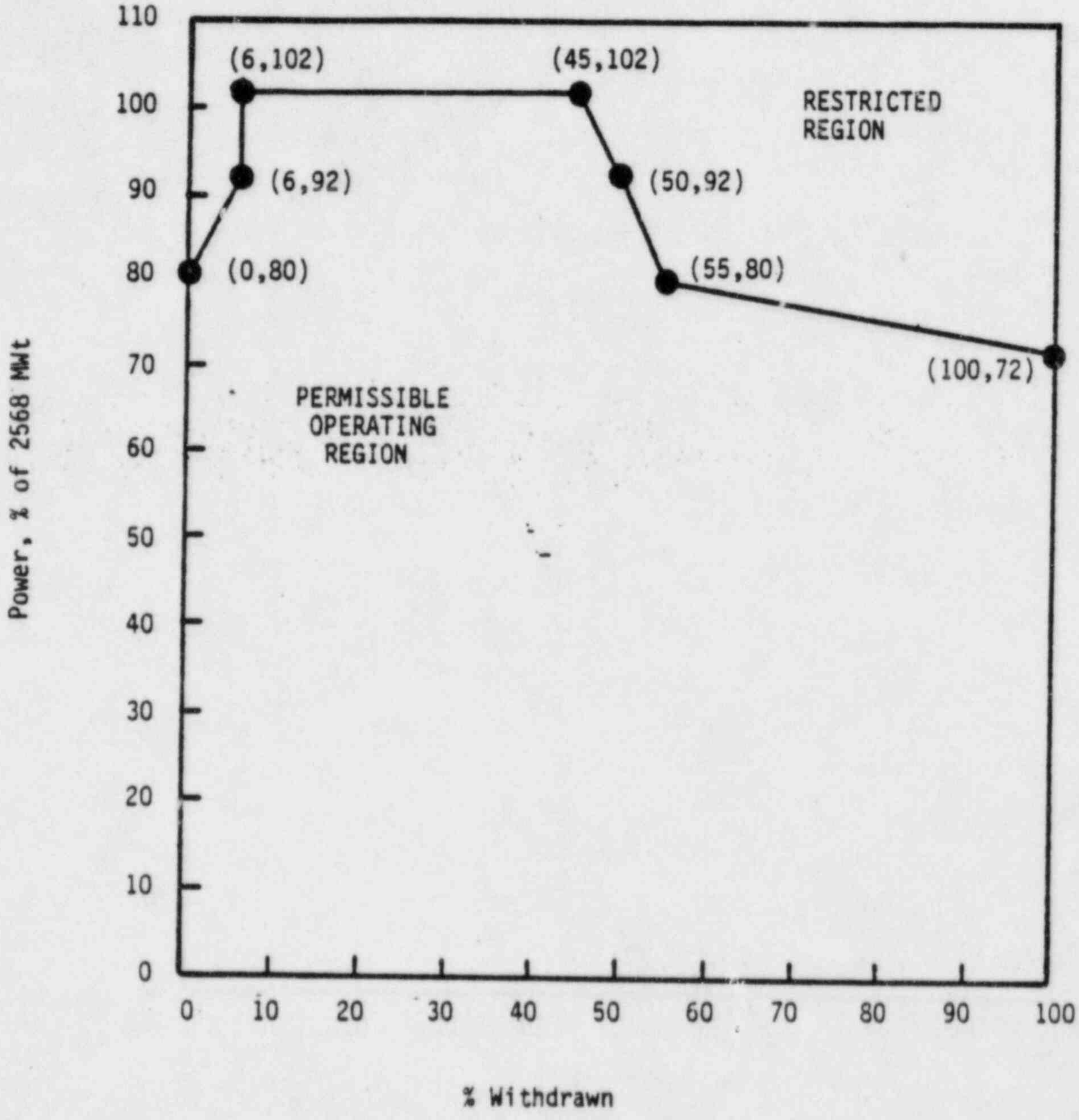
APSR Position Limits for Operation From 200 ± 10 to 400 ± 10 EFPD -- ANO-1, Cycle 7 (Tech Spec Figure 3.5.2-4C)



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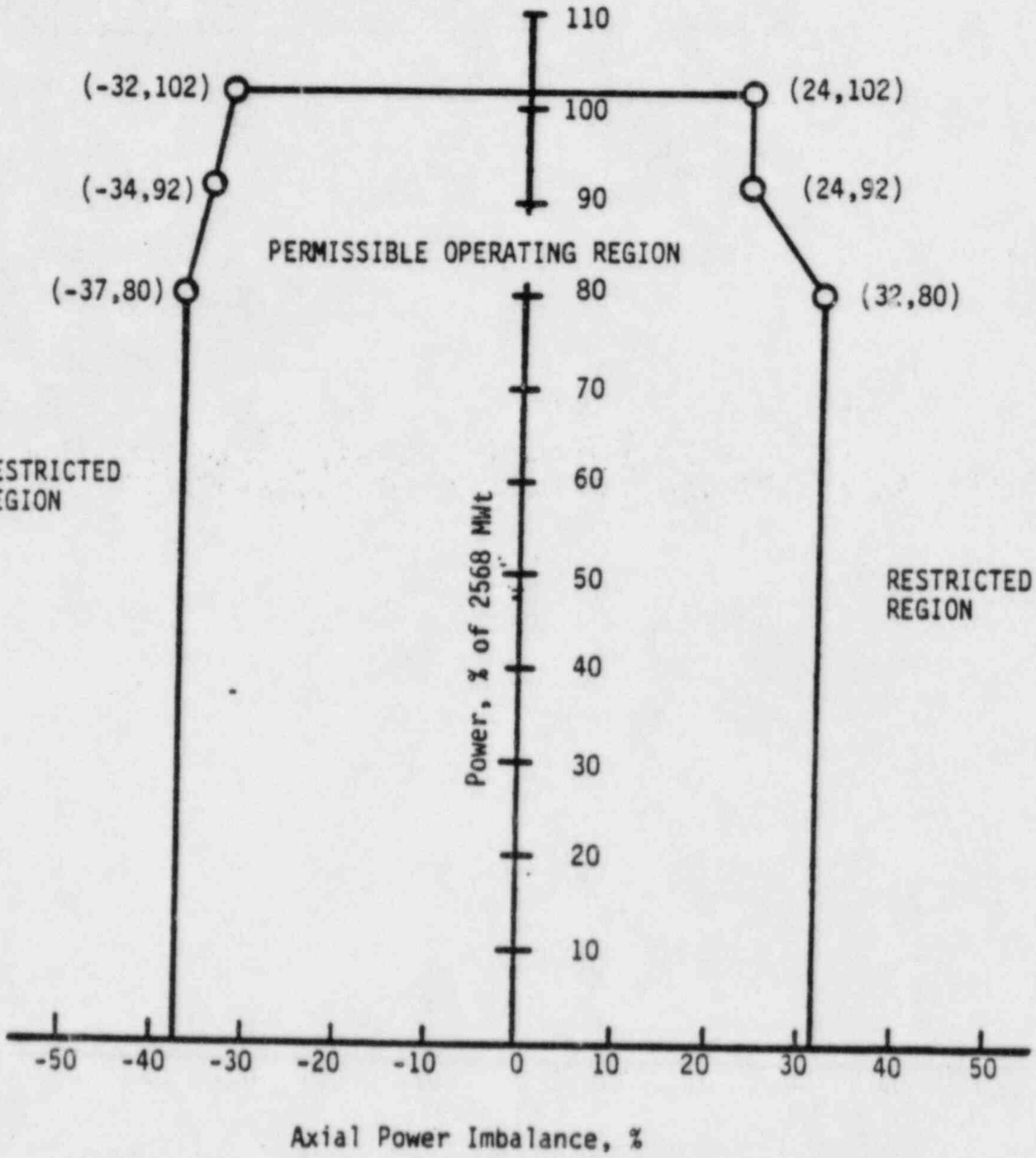
Operational Power Imbalance Envelope for Operation
From 200 ± 10 to 400 ± 10 EFPD -- ANO-1, Cycle 7
(Tech Spec Figure 3.5.2-3C)



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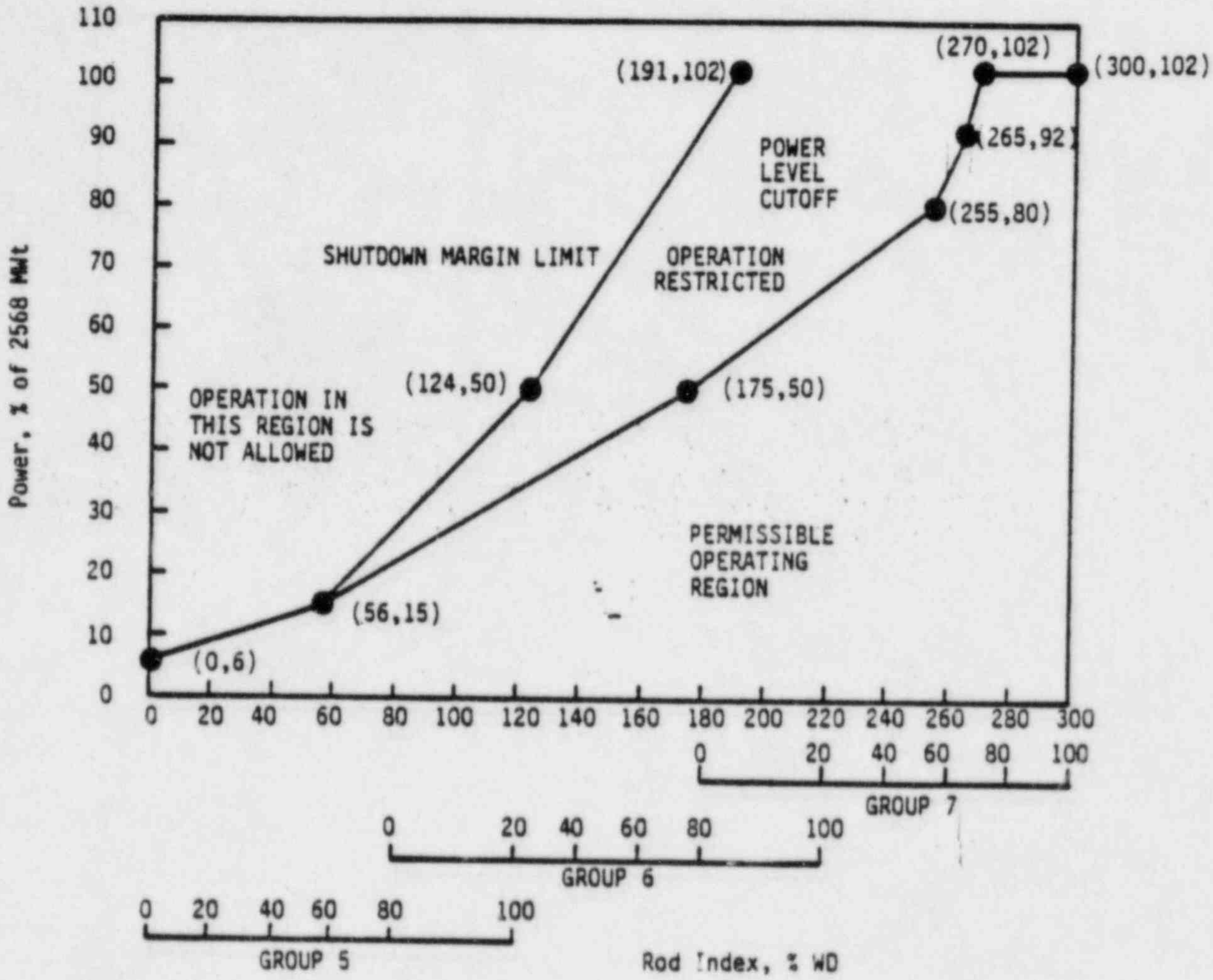
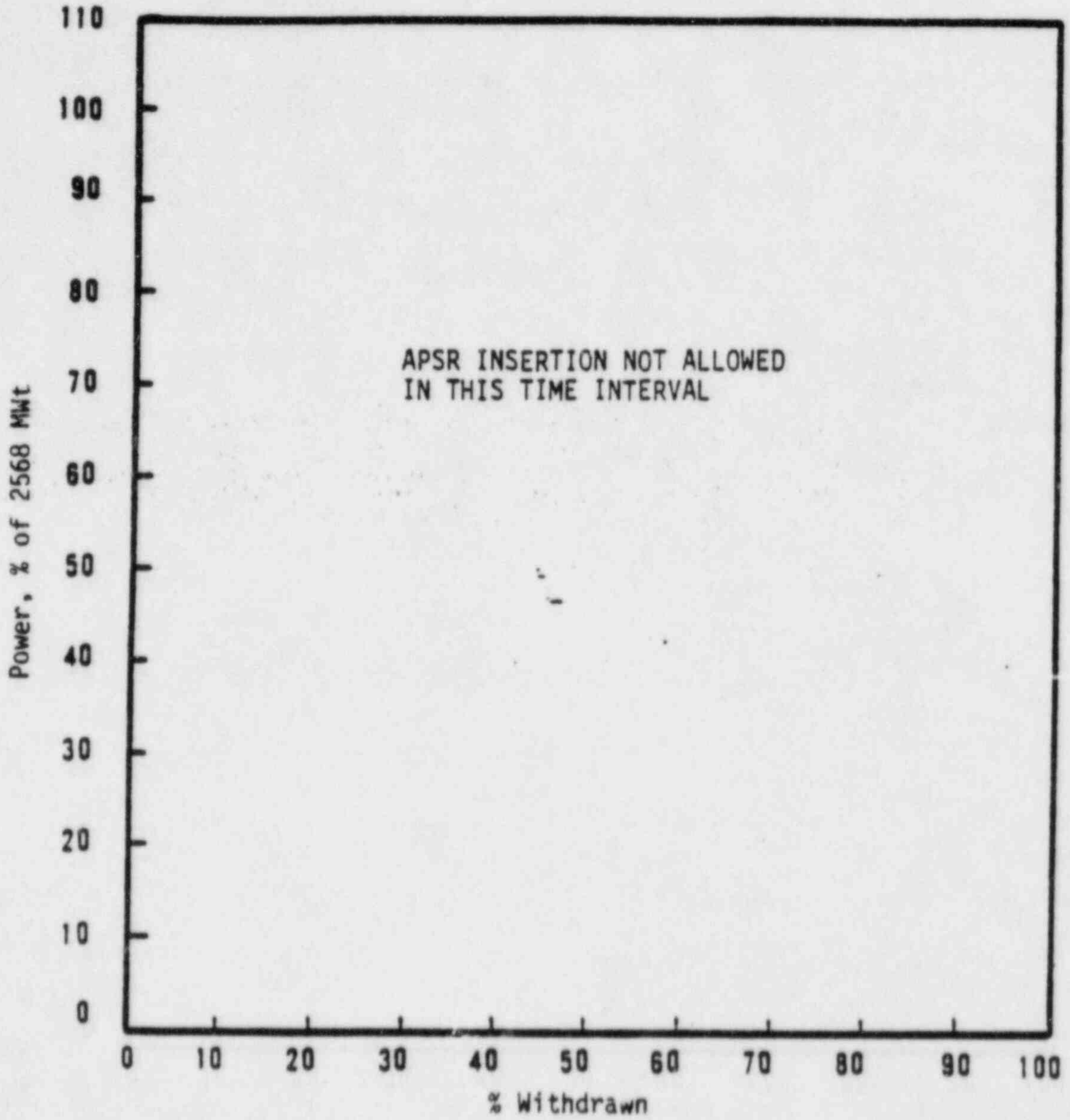
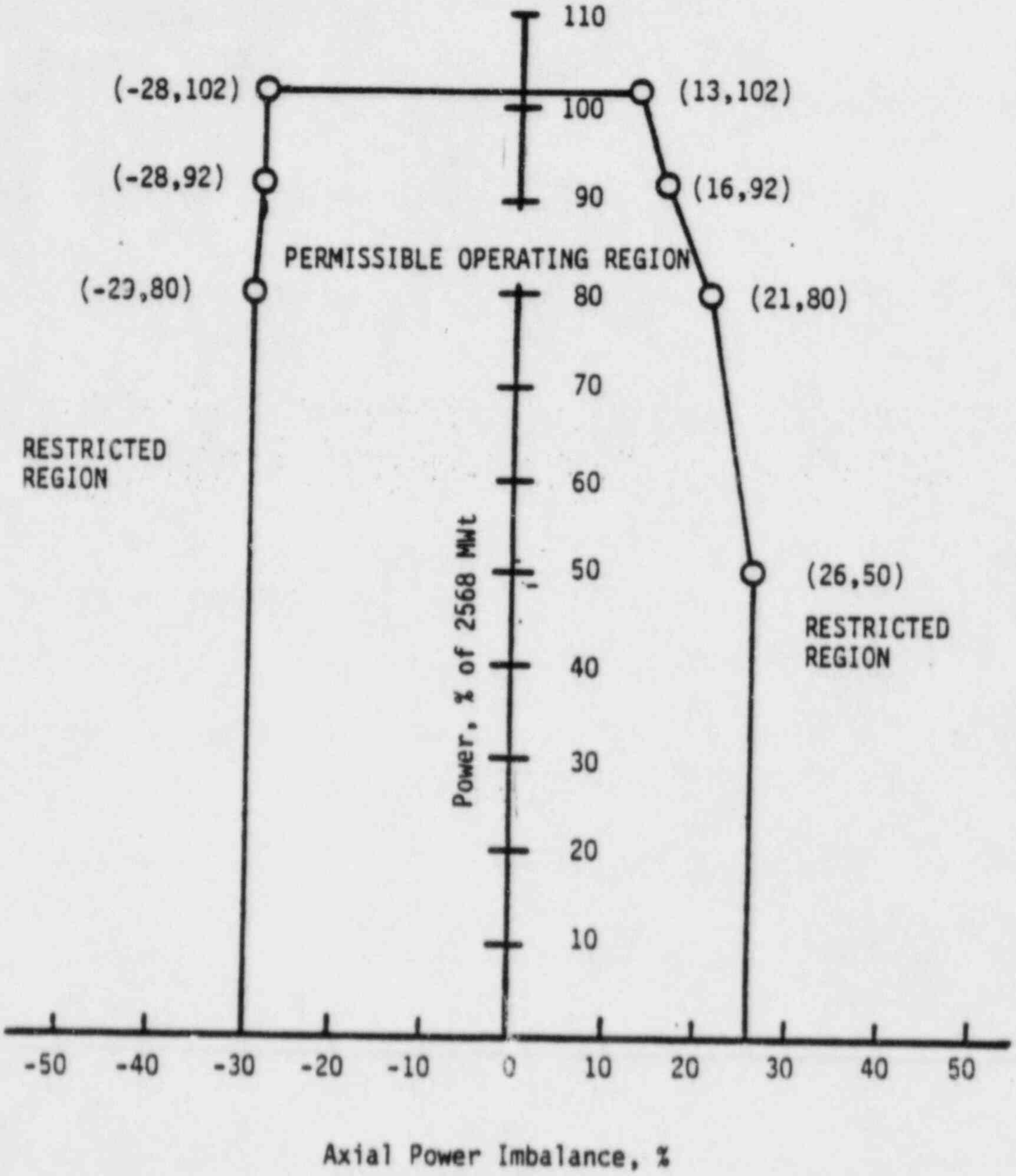
Rod Position Limits for Four-Pump Operation
After 400 ± 10 EFPD -- ANO-1, Cycle 7
(Tech Spec Figure 3.5.2-1D)



APSR Position Limits for Operation After 400 ± 10 EFPD -- ANO-1, Cycle 7 (Tech Spec Figure 3.5.2-4D)



Operational Power Imbalance Envelope for Operation After 400 ± 10 EFPD -- ANO-1, Cycle 7 (Tech Spec Figure 3.5.2-3D)



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SUMMARY

CORE SAFETY & OPERATING LIMITS

- CORE SAFETY LIMITS ARE ESTABLISHED BY IMMEDIATE FUEL DAMAGE CRITERIA (CENTERLINE FUEL MELT AND DNB)
- CORE OPERATING LIMITS ARE ESTABLISHED BY ACCIDENT INITIAL CONDITION ASSUMPTIONS USED IN THE PLANT SAFETY ANALYSIS (LOCA LINEAR HEAT RATE, INITIAL CONDITION DNB, SHUTDOWN MARGIN, EJECTED ROD WORTH)
- THE SAFETY AND OPERATING LIMIT CRITERIA ARE ESTABLISHED IN THE FORM OF POWER PEAKING OR LINEAR HEAT RATE LIMITS
- THE SAFETY AND OPERATING LIMITS ARE GENERATED BY COMPARING ACTUAL CORE POWER DISTRIBUTIONS TO THE POWER PEAKING CRITERIA (MARGIN CLACULATION)
- CORRELATIONS BETWEEN IMBALANCE AND POWER PEAKING ARE USED TO DERIVE THE RPS IMBALANCE TRIP SAFETY LIMIT.
- LOCA MARGIN AND I.C. DNB CONTOURS ARE USED TO SET ROD INDEX, APSR, AND IMBALANCE LIMITS FOR NORMAL OPERATION
- ROD INDEX LIMITS ARE ALSO GENERATED TO PROTECT EXCEEDING THE EJECTED ROD WORTH AND SHUTDOWN MARGIN CRITERIA

POWER DISTRIBUTION LIMITS

SURVEILLANCE REQUIREMENTS (Continued)

2. When the F_{xy}^{C} is less than or equal to the F_{xy}^{RTP} limit for the appropriate measured core plane, additional power distribution maps shall be taken and F_{xy}^{C} compared to F_{xy}^{RTP} and F_{xy}^{L} at least once per 31 EFPD.

e. The F_{xy} limits for RATED THERMAL POWER (F_{xy}^{RTP}) shall be provided for all core planes containing bank "D" control rods and all unrodded core planes in a Radial Peaking Factor Limit Report per Specification 6.9.1.10.

f. The F_{xy} limits of e, above, are not applicable in the following core planes regions as measured in percent of core height from the bottom of the fuel:

1. Lower core region from 0 to 15%, inclusive.

2. Upper core region from 85 to 100%, inclusive.

3. Grid plane regions at 17.8 ± 2%, 32.1 ± 2%, 46.4 ± 2%, 60.6 ± 2% and 74.9 ± 2%, inclusive (17 x 17 fuel elements).

4. Core plane regions within ± 2% of core height (± 2.88 inches) about the bank demand position of the bank "D" or part length control rods.

g. With F_{xy}^{C} exceeding F_{xy}^{L}:

1. The $F_Q(Z)$ limit shall be reduced at least 1% for each 1% F_{xy}^{C} exceeds F_{xy}, and (for plants with $F_Q(Z)$ less than 2.32 and using APDMS)

2. The effects of F_{xy} on $F_Q(Z)$ shall be evaluated to determine if $F_Q(Z)$ is within its limits.

4.2.2.3 When $F_Q(Z)$ is measured for other than F_{xy} determinations, an overall measured $F_Q(Z)$ shall be obtained from a power distribution map and increased by 3% to account for manufacturing tolerances and further increased by 5% to account for measurement uncertainty.

6.9

(SPECIFICATION 6.9.1.10)

RADIAL PEAKING FACTOR LIMIT REPORT

The F_{xy} limits for Rated Thermal Power (F_{xy}^{RPT}) for all core planes containing bank "D" control rods and all unrodded core planes and the plot of predicted ($F_q^T \cdot P_{Rel}$) vs Axial Core Height with the limit envelope shall be provided to the NRC Regional Administrator with a copy to:

Director of Nuclear Reactor Regulation
ATTENTION: Chief, Core Performance Branch
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

at least 60 days prior to each cycle initial criticality unless otherwise approved by the Commission by letter.

In addition in the event that the limit should change requiring a new submittal or an amended submittal to the Peaking Factor Limit Report, it will be submitted 60 days prior to the date the limit would become effective unless otherwise approved by the Commission by letter.

Any information needed to support F_{xy}^{RPT} will be by request from the NRC and need not be included in this report.