UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

ARKANSAS POWER & LIGHT COMPANY

DOCKET NO. 50-313

ARKANSAS NUCLEAR ONE, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 92
License No. DPR-51

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Arkansas Power and Light Company (the licensee) dated September 26, 1984, as supplemented October 31, 1984, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.c.(2) of Facility Operating License No. DPR-51 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 92 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

John F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: December 20, 1984

ATTACHMENT TO LICENSE AMENDMENT NO. 92

FACILITY OPERATING LICENSE NO. DPR-51

DOCKET NO. 50-313

Replace the following pages of the Appendix "A" Technical Specifications with the enclosed pages. The revised pages are identified by Amendment number and contain vertical lines indicating the area of change.

Remove	Insert
iv	iv
v	v
vi	vi
8	8
9	9
9b	9b
9c	9c
12	12
14b	14b
15	15
35a	35a
47	47
--	47a
48	48
48a1	48a1
48b thru 48b3	48b
48c thru 48c7	48c
48d thru 48d3	48d
48e	48e
48f	48f
48g	48g
48h	48h
48i	--

LIST OF FIGURES

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DNBR of 1.3 corresponds to a 95 percent probability at a 95 percent confidence level that DNB will not occur; this is considered a conservative margin to DNB for all operating conditions. The difference between the actual core outlet pressure and the indicated reactor coolant system pressure has been considered in determining the core protection safety limits. The difference in these two pressures is nominally 45 psi; however, only a 30 psi drop was assumed in reducing the pressure trip set points to correspond to the elevated location where the pressure was actually measured.

The curve presented in Figure 2.1-1 represents the conditions at which a minimum DNBR greater than 1.3 is predicted. The curve is the most restrictive combination of 3 and 4 pump curves, and is based upon the maximum possible thermal power at 106.5% design flow per applicable pump status. This curve is based on the following nuclear power peaking factors (2) with potential fuel densification effects:

$$F_q^N = 2.83; \quad F_{\Delta H}^N = 1.71; \quad F_z^N = 1.65.$$

The curves of Figure 2.1-2 are based on the more restrictive of two thermal limits and include the effects of potential fuel densification:

1. The 1.3 DNBR limit produced by a nuclear power peaking factor of $F_q^N = 2.83$ or the combination of the radial peak, axial peak and position of the axial peak that yields no less than 1.3 DNBR.

2. The combination of radial and axial peak that prevents central fuel melting at the hot spot. The limit is 20.5 kW/ft.

Power peaking is not a directly observable quantity and therefore limits have been established on the basis of the reactor power imbalance produced by the power peaking.

The flow rates for curves 1, 2, and 3 of Figure 2.1-3 correspond to the expected minimum flow rates with four pumps, three pumps, and one pump in each loop, respectively.

The curve of Figure 2.1-1 is the most restrictive of all possible reactor coolant pump maximum thermal power combinations shown in Figure 2.1-3. The curves of Figure 2.1-3 represent the conditions at which a minimum DNBR greater than 1.3 is predicted at the maximum possible thermal power for the number of reactor coolant pumps in operation. The local quality at the point of minimum DNBR is less than 22 percent (1).

Using a local quality limit of 22 percent at the point of minimum DNBR as a basis for curve 3 of Figure 2.1-3 is a conservative criterion even though the quality at the exit is higher than the quality at the point of minimum DNBR.

The DNBR as calculated by the BAW-2 correlation continually increases from point of minimum DNBR, so that the exit DNBR is always higher and is a function of the pressure.

The maximum thermal power, as a function of reactor coolant pump operation is limited by the power level trip produced by the flux-flow ratio (percent flow x flux-flow ratio), plus the appropriate calibration and instrumentation errors.

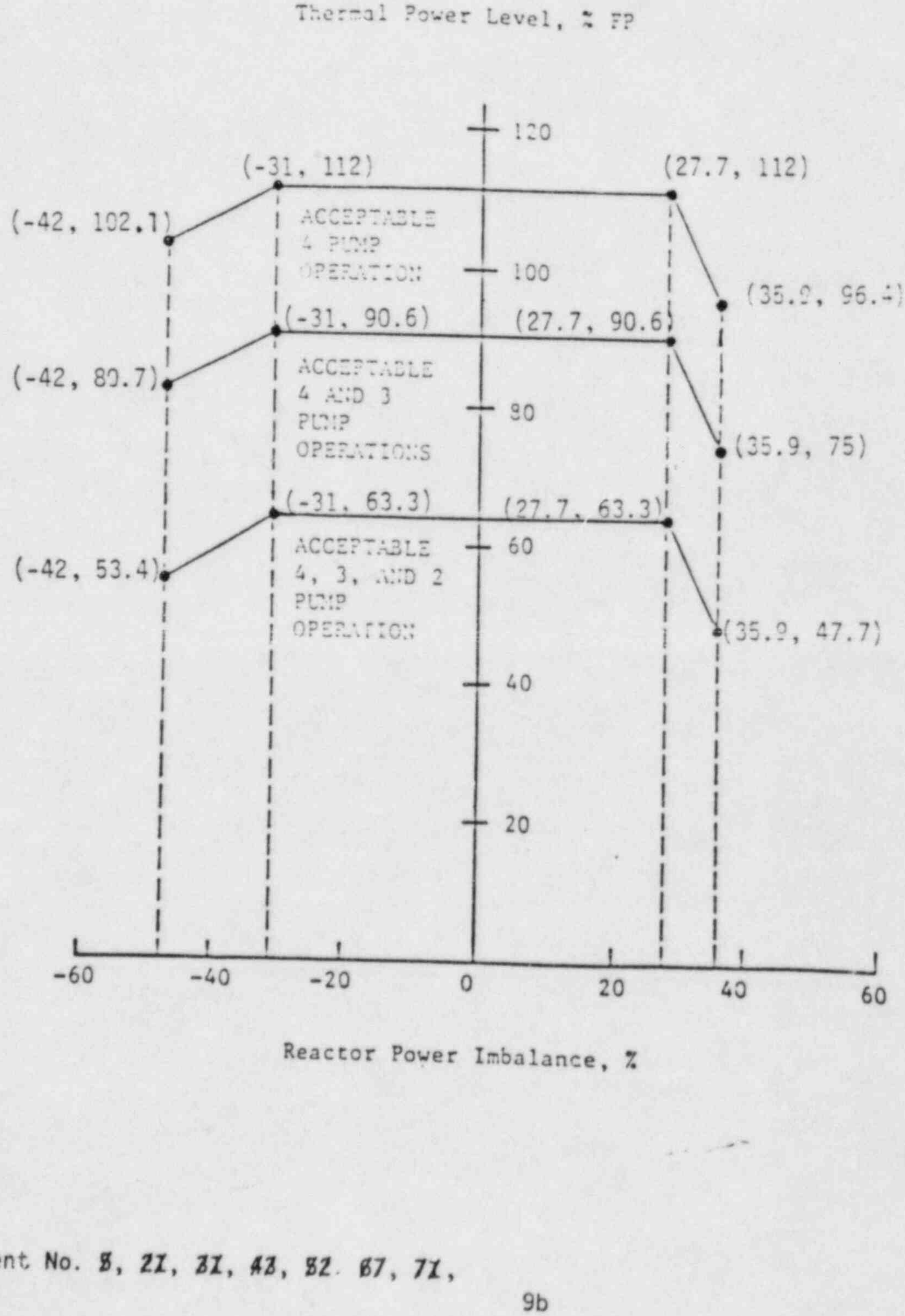
For each curve of Figure 2.1-3, a pressure-temperature point above and to the left of the curve would result in a DNBR greater than 1.3 or a local quality at the point of minimum DNBR less than 22 percent for that particular reactor coolant pump situation. Curves 1 and 2 of Figure 2.1-3 are the most restrictive because any pressure-temperature point above and to the left of this curve will be above and to the left of the other curve.

REFERENCES

(1) Correlation of Critical Heat Flux in a Bundle Cooled by Pressurized Water, BAW-10000A, May 1976.

(2) FSAR, Section 3.2.3.1.1.c

Core Protection Safety Limits - ANO-1
Figure 2.1-2



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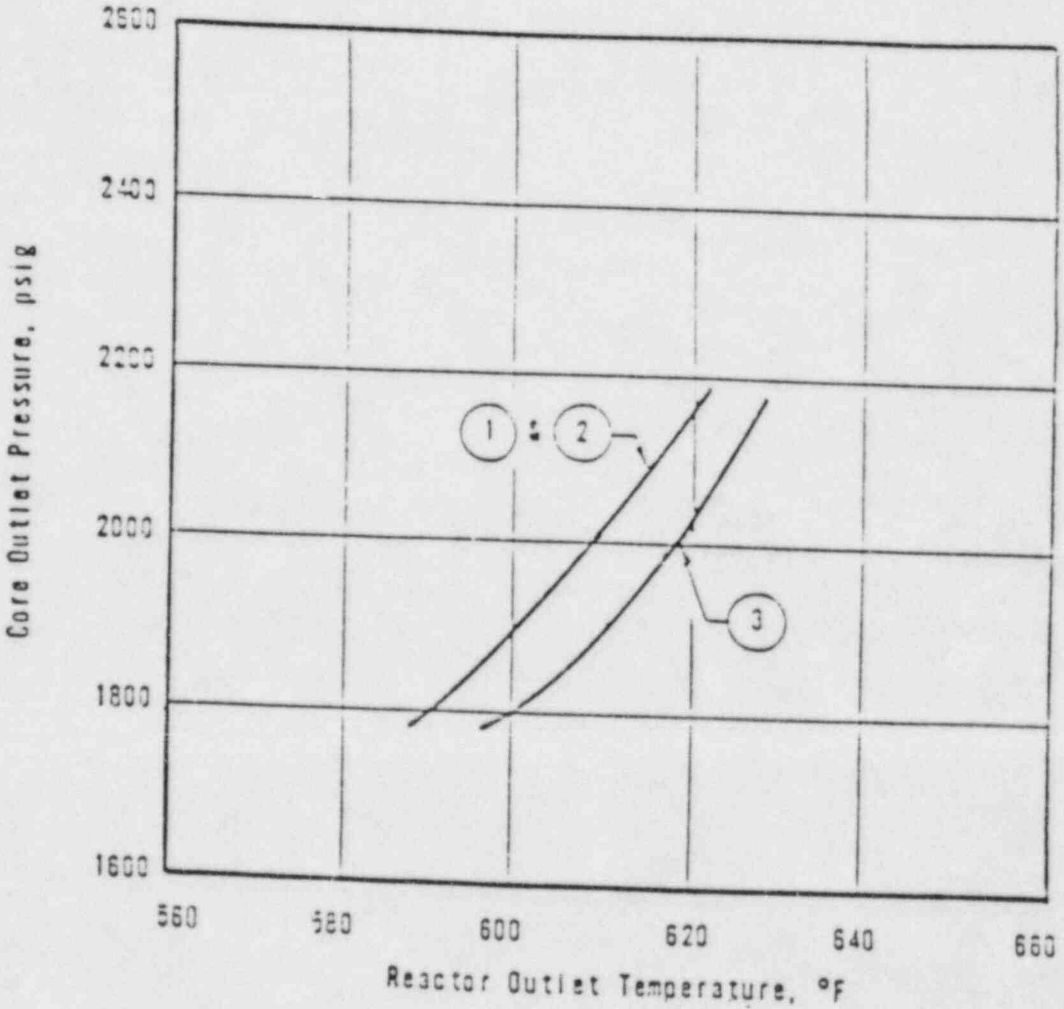
92

Core Protection Safety Limits - ANO-1
Figure 2.1-3



CURVE	GPM	POWER	PUMPS OPERATING (TYPE OF LIMIT)
1	374,880 (100%)*	112%	FOUR PUMPS (DNBR LIMIT)
2	280,035 (74.7%)	90.6%	THREE PUMPS (DNBR LIMIT)
3	184,441 (49.2%)	64.1%	ONE PUMP IN EACH LOOP (QUALITY LIMIT)

*106.5% OF DESIGN FLOW

The power level trip set point produced by the power-to-flow ratio provides both high power level and low flow protection in the event the reactor power level increases or the reactor coolant flow rate decreases. The power level trip set point produced by the power-to-flow ratio provides overpower DNB protection for all modes of pump operation. For every flow rate there is a maximum permissible power level, and for every power level there is a minimum permissible low flow rate. Typical power level and low flow rate combinations for the pump situations of Table 2.3-1 are as follows:

1. Trip would occur when four reactor coolant pumps are operating if power is 107 percent and reactor flow rate is 100 percent or flow rate is 93.5 percent and power level is 100 percent.

2. Trip would occur when three reactor coolant pumps are operating if power is 80 percent and reactor flow rate is 74.7 percent or flow rate is 70 percent and power level is 75 percent.

3. Trip would occur when one reactor coolant pump is operating in each loop (total of two pumps operating) if the power is 52 percent and reactor flow is 49.2 percent or flow rate is 45.8 percent and the power level is 49 percent.

The flux/flow ratios account for the maximum calibration and instrumentation errors and the maximum variation from the average value of the RC flow signal in such a manner that the reactor protective system receives a conservative indication of the RC flow.

No penalty in reactor coolant flow through the core was taken for an open core vent valve because of the core vent valve surveillance program during each refueling outage. For safety analysis calculations the maximum calibration and instrumentation errors for the power level were used.

The power-imbalance boundaries are established in order to prevent reactor thermal limits from being exceeded. These thermal limits are either power peaking kw/ft limits or DNBR limits. The reactor power imbalance (power in top half of core minus power in the bottom half of core) reduces the power level trip produced by the power-to-flow ratio so that the boundaries of Figure 2.3-2 are produced. The power-to-flow ratio reduces the power level trip associated with reactor power-to-reactor power imbalance boundaries by 1.07 percent for a 1 percent flow reduction.

B. Pump Monitors

In conjunction with the power imbalance/flow trip, the pump monitors prevent the minimum core DNBR from decreasing below 1.3 by tripping the reactor due to the loss of reactor coolant

Protective System Maximum Allowable Setpoints
ANO-1, Figure 2.3-2

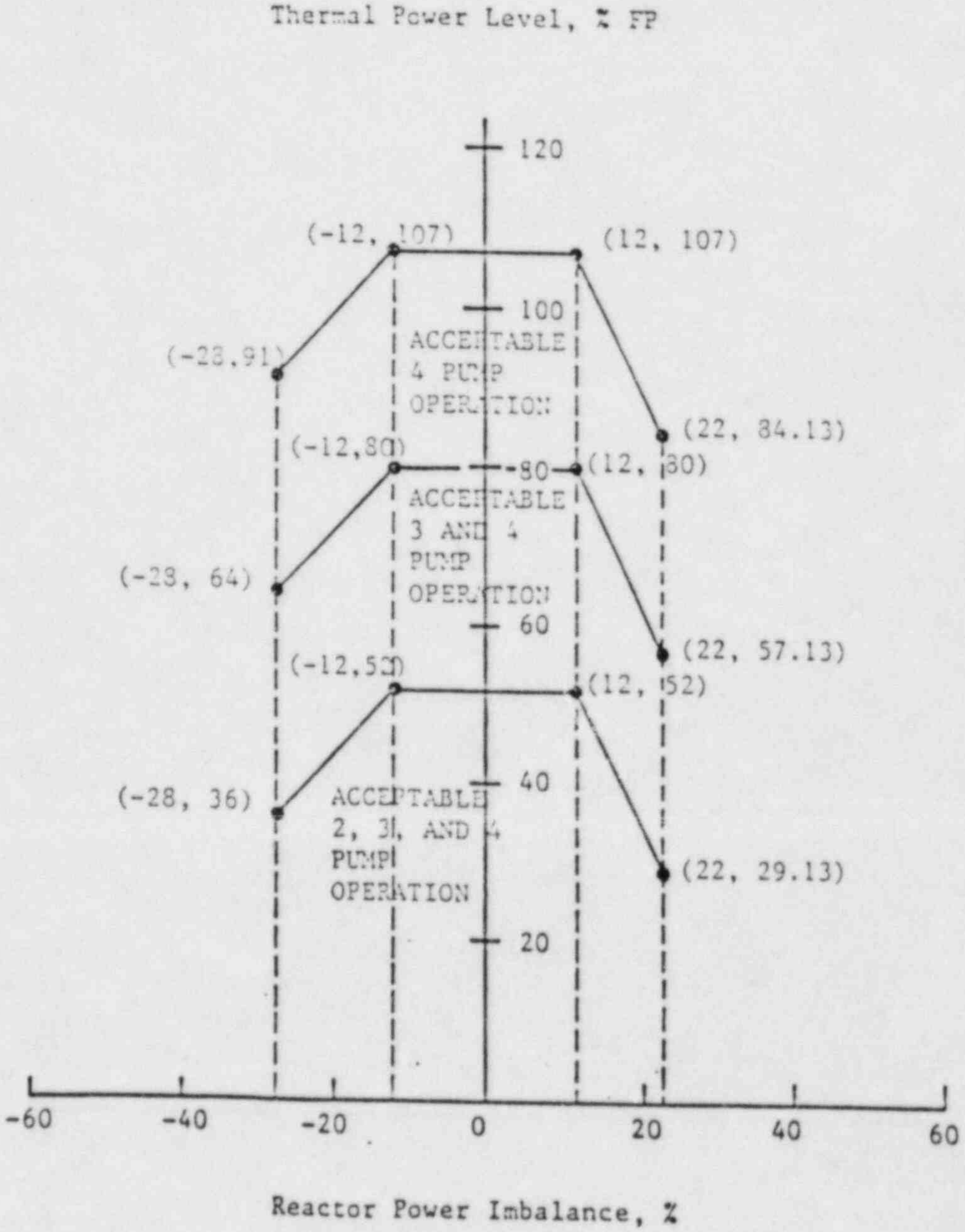


Table 2.3-1
Reactor Protection System Trip Setting Limits

	Four RC Pumps Operating (Nominal Operating Power - 100%)	Three RC Pumps Operating (Nominal Operating Power - 75%)	One RC Pump Operating in Each Loop (Nominal Operating Power - 49%)	Shutdown Bypass
Nuclear power, % of rated, max	104.9	104.9	104.9	5.0[a]
Nuclear Power based on flow[b] and imbalance, % of rated, max	1.07 times flow minus reduction due to imbalance(s)	1.07 times flow minus reduction due to imbalance(s)	1.07 times flow minus reduction due to imbalance(s)	Bypassed
Nuclear Power based on pump monitors, % of rated, max[c]	NA	NA	55	Bypassed
High RC system pressure, psig, max	2300	2300	2300	1720[a]
Low RC system pressure, psig,min	1800	1800	1800	Bypassed
Variable low RC system pressure, psig, min	11.75 T_{out}-5103[d]	11.75 T_{out}-5103[d]	11.75 T_{out}-5103[d]	Bypassed
RC temp, F, max	618	618	618	618
High reactor building pressure, psig, max	4(18.7 psia)	4(18.7 psia)	4(18.7 psia)	4(18.7 psia)

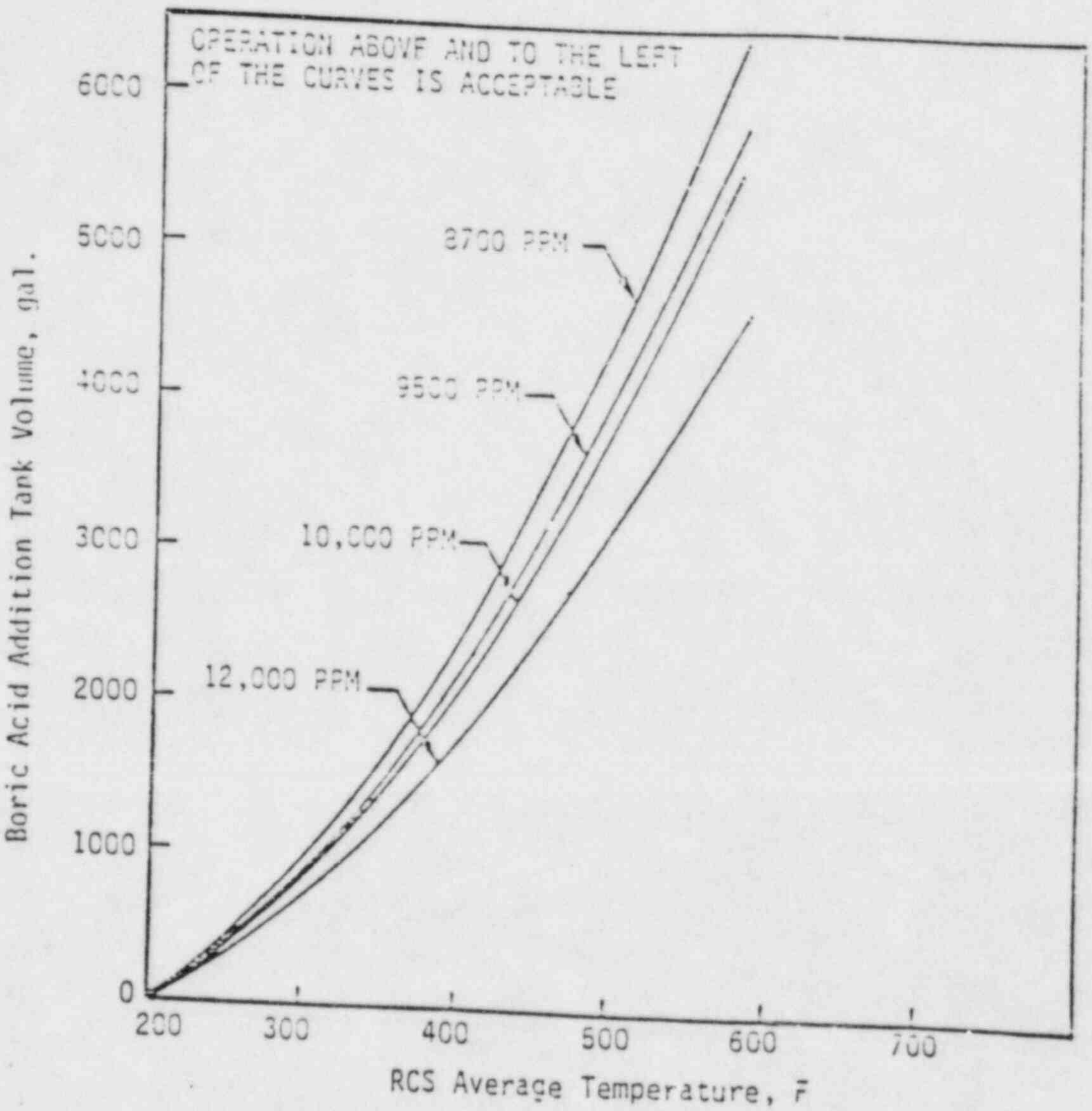
[a]Automatically set when other segments of the RPS (as specified) are bypassed.

[b]Reactor coolant system flow.

[c]The pump monitors also produce a trip on (a) loss of two RC pumps in one RC loop, and (b) loss of one or two RC pumps during two-pump operation.

[d]T_{out} is given in degrees Fahrenheit (F).

Boric Acid Addition Tank Volume and
Concentration Vs RCS Average
Temperature - ANO-1
Figure 3.2-1



TEMP. F	REQUIRED VOLUME, GAL.			
	8700PPM	9500PPM	10,000PPM	12,000PPM
579	6436	5863	5554	4589
532	5289	4817	4564	3769
500	4488	4087	3872	3199
400	2434	2218	2101	1737
300	986	898	851	705
200	0	0	0	0

6. If a control rod in the regulating or axial power shaping groups is declared inoperable per Specification 4.7.1.2 operation above 60 percent of the thermal power allowable for the reactor coolant pump combination may continue provided the rods in the group are positioned such that the rod that was declared inoperable is contained within allowable group average position limits of Specification 4.7.1.2 and the withdrawal limits of Specification 3.5.2.5.3.

3.5.2.3 The worth of single inserted control rods during criticality are limited by the restrictions of Specification 3.1.3.5 and the Control Rod Position Limits defined in Specification 3.5.2.5.

3.5.2.4 Quadrant tilt:

1. Except for physics tests, if quadrant tilt exceeds 3.1% power shall be reduced immediately to below the power level cutoff (92% FP). Moreover, the power level cutoff value shall be reduced 2% for each 1% tilt in excess of 3.1%. For less than 4 pump operation, thermal power shall be reduced 2% of the thermal power allowable for the reactor coolant pump combination for each 1% tilt in excess of 3.1%.

2. Within a period of 4 hours, the quadrant power tilt shall be reduced to less than 3.1% except for physics tests, or the following adjustments in setpoints and limits shall be made:

   a. The protection system maximum allowable setpoints (Figure 2.3-2) shall be reduced 2% in power for each 1% tilt.

   b. The control rod group and APSR withdrawal limits shall be reduced 2% in power for each 1% tilt in excess of 3.1%.

   c. The operational imbalance limits shall be reduced 2% in power for each 1% tilt in excess of 3.1%.

3. If quadrant tilt is in excess of 25%, except for physics tests or diagnostic testing, the reactor will be placed in the hot shutdown condition. Diagnostic testing during power operation with a quadrant power tilt is permitted provided the thermal power allowable for the reactor coolant pump combination is restricted as stated in 3.5.2.4.1 above.

4. Quadrant tilt shall be monitored on a minimum frequency of once every two hours during power operation above 15% of rated power.

3.5.2.5 Control rod positions:

1. Technical Specification 3.1.3.5 (safety rod withdrawal) does not prohibit the exercising of individual safety rods as required by Table 4.1-2 or apply to inoperable safety rod limits in Technical Specification 3.5.2.2.

2. Operating rod group overlap shall be 20% ± 5 between two sequential groups, except for physics tests.

3. Except for physics tests or exercising control rods, (a) the control rod withdrawal limits are specified on Figures 3.5.2-1, 3.5.2-2A and 3.5.2-2B for 4, 3 and 2 pump operation respectively; and (b) the axial power shaping control rod withdrawal limits are specified on Figures 3.5.2-4A and 3.5.2-4B. If any of these control rod position limits are exceeded, corrective measures shall be taken immediately to achieve an acceptable control rod position. Acceptable control rod positions shall be attained within 4 hours.

4. Except for physics tests, power shall not be increased above the power level cut-off of 92% of the maximum allowable power level unless one of the following conditions is satisfied:

   a. Xenon reactivity is within 10% of the equilibrium value for operation at the maximum allowable power level and asymptotically approaching stability.

   b. Except for xenon free startup, when 3.5.2.5.4a applies, the reactor has operated within a range of 87 to 92% of the maximum allowable power for a period exceeding 2 hours.

3.5.2.6 Reactor Power Imbalance shall be monitored on a frequency not to exceed 2 hours during power operation above 40% rated power. Except for physics tests, imbalance shall be maintained within the envelope defined by Figure 3.5.2-3. If the imbalance is not within the envelope defined by Figure 3.5.2-3, corrective measures shall be taken to achieve an acceptable imbalance. If an acceptable imbalance is not achieved within 4 hours, reactor power shall be reduced until imbalance limits are met.

3.5.2.7 The control rod drive patch panels shall be locked at all times with limited access to be authorized by the Superintendent

Bases

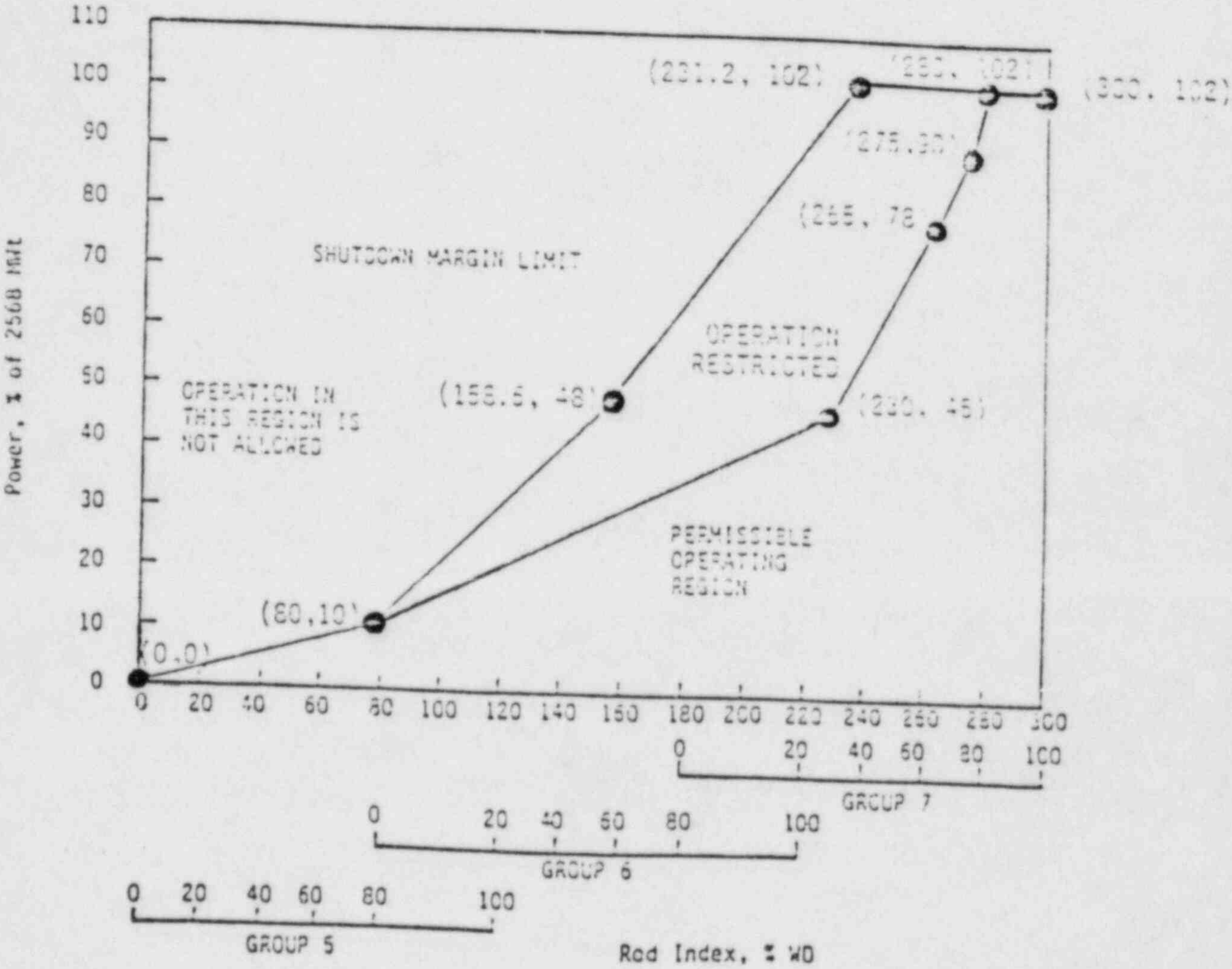
The power-imbalance envelope defined in Figure 3.5.2-3 is based on (1) LOCA analyses which have defined the maximum linear heat rate (see Figure 3.5.2-4), such that the maximum cladding temperature will not exceed the Final Acceptance Criteria and (2) the Protective System Maximum Allowable Setpoints (Figure 2.3-2). Corrective measures will be taken immediately should the indicated quadrant tilt, rod position, or imbalance be outside their specified boundaries. Operation in a situation that would cause the Final Acceptance Criteria to be approached should a LOCA occur is highly improbable because all of the power distribution parameters (quadrant tilt, rod position, and imbalance) must be at their limits while

The quadrant power tilt limits set forth in Specification 3.5.2.4 have been established within the thermal analysis design base using the definition of quadrant power tilt given in Technical Specifications, Section 1.6. These limits, in conjunction with the control rod position limits in Specification 3.5.2.5.3, ensure that design peak heat rate criteria are not exceeded during normal operation when including the effects of potential fuel densification.

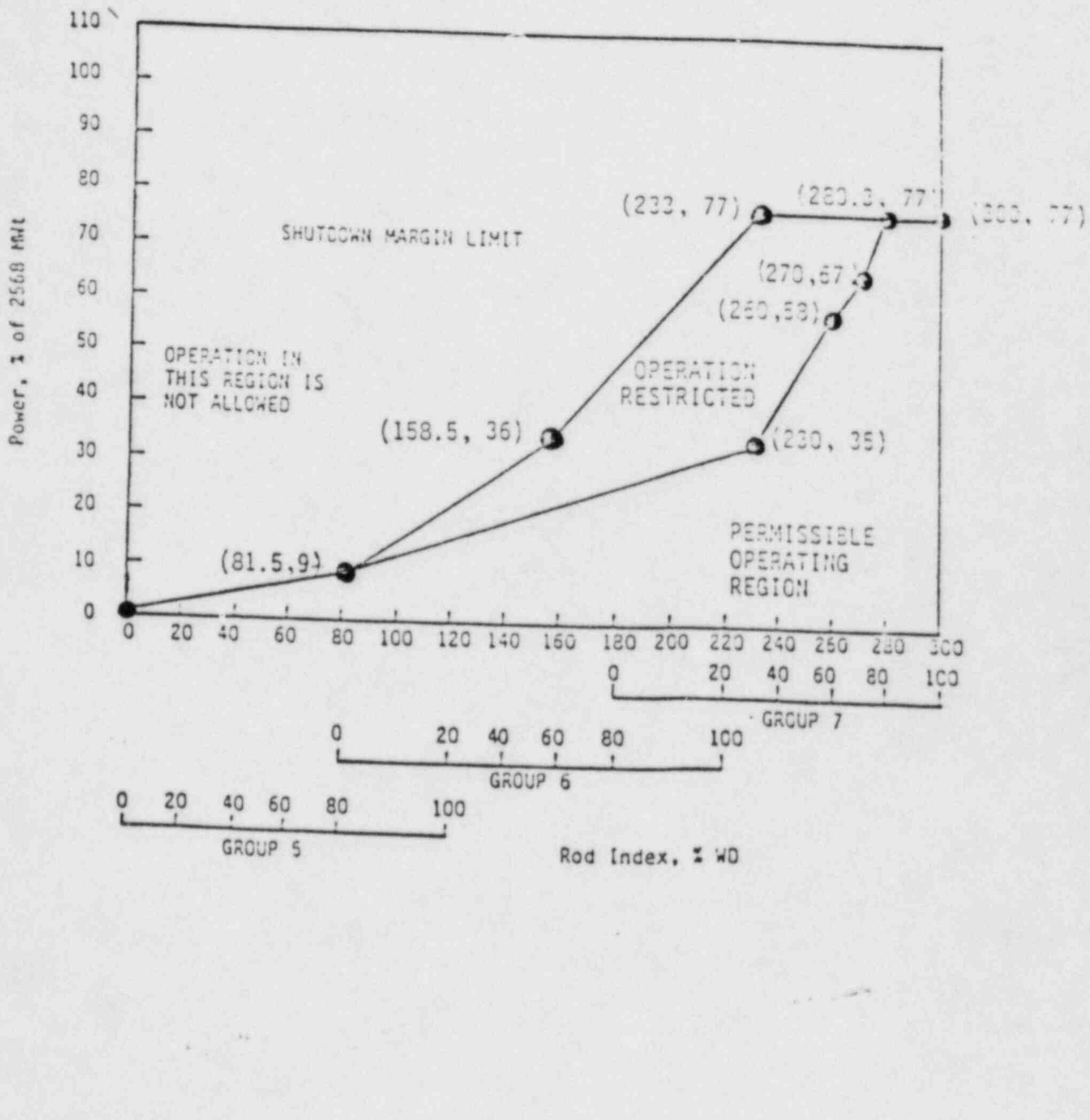
The quadrant tilt and axial imbalance limits in Specifications 3.5.2.4 and 3.5.2.6, respectively, apply when using the plant computer to monitor the limits. The 2-hour frequency for monitoring these quantities will provide adequate surveillance when the computer is out of service. Additional uncertainty is applied to the limits when other monitoring methods are used.

During the physics testing program, the high flux trip setpoints are administratively set as follows to ensure that an additional safety margin is provided.

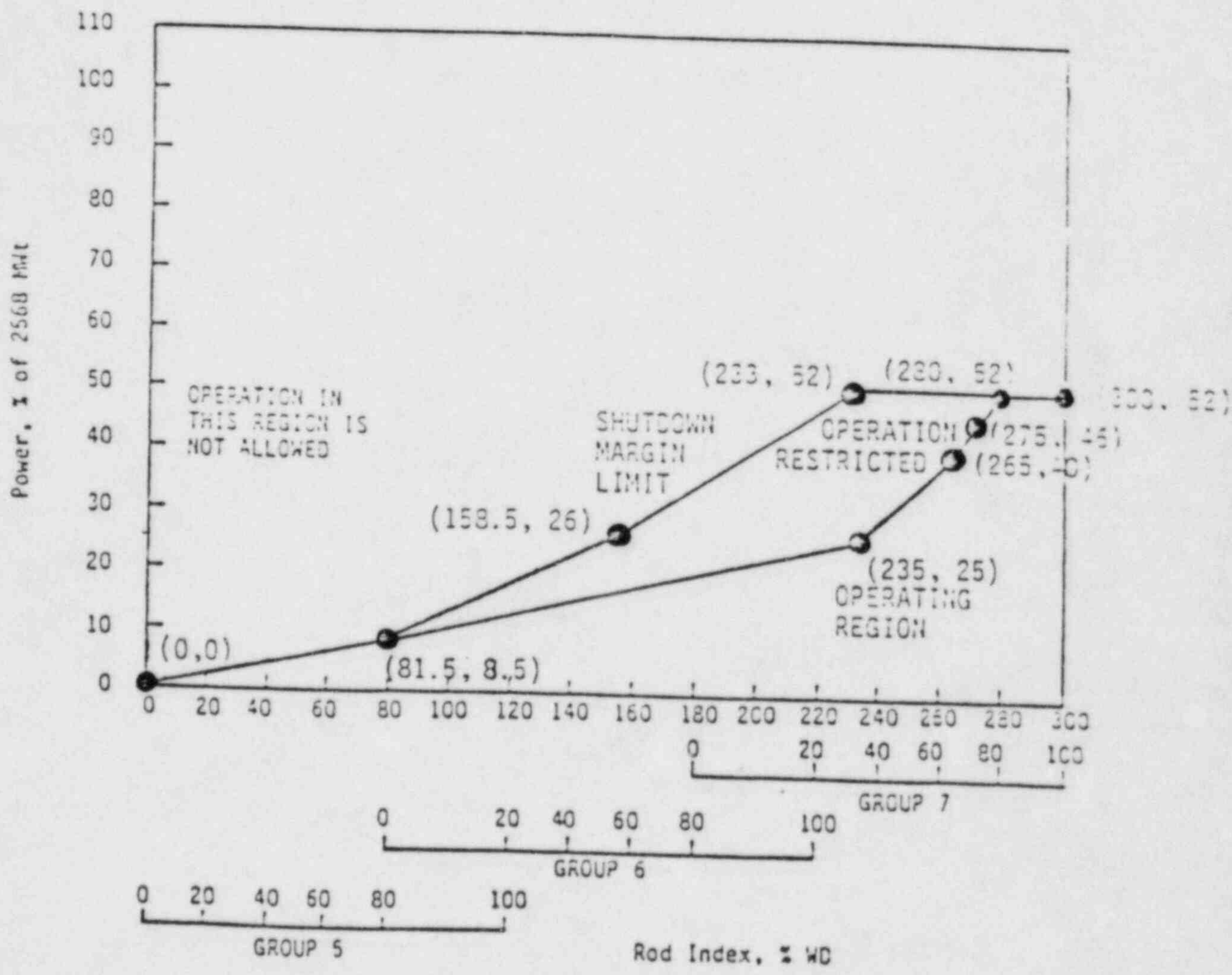
Rod Position Limits for 4-Pump Operation
From 0 EFPD TO EOC ---- ANO-1
Figure 3.5.2-1



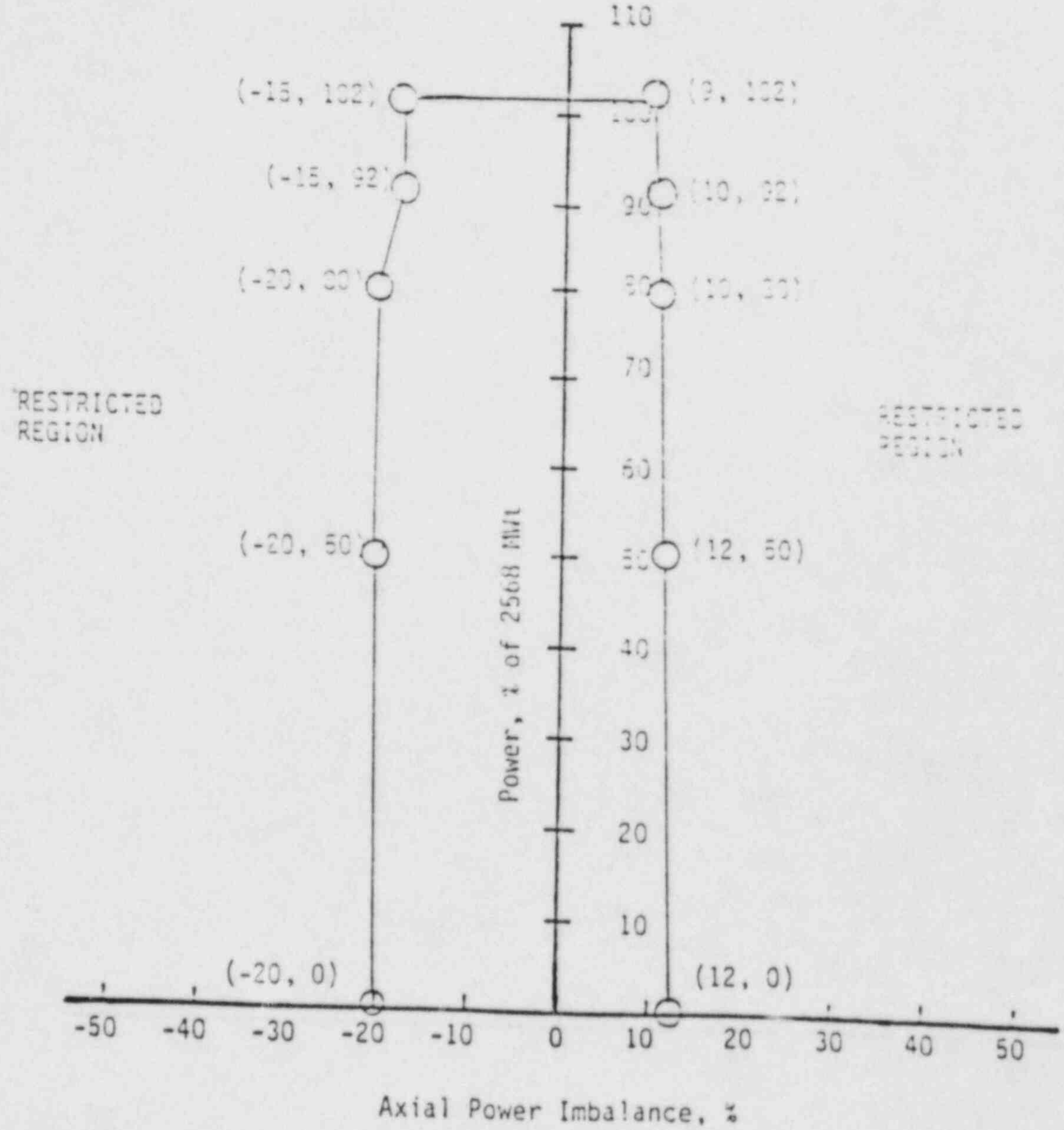
Rod Position Limits for 3-Pump Operation
From 0 EFPD TO EOC ---- ANO-1
Figure 3.5.2-2A



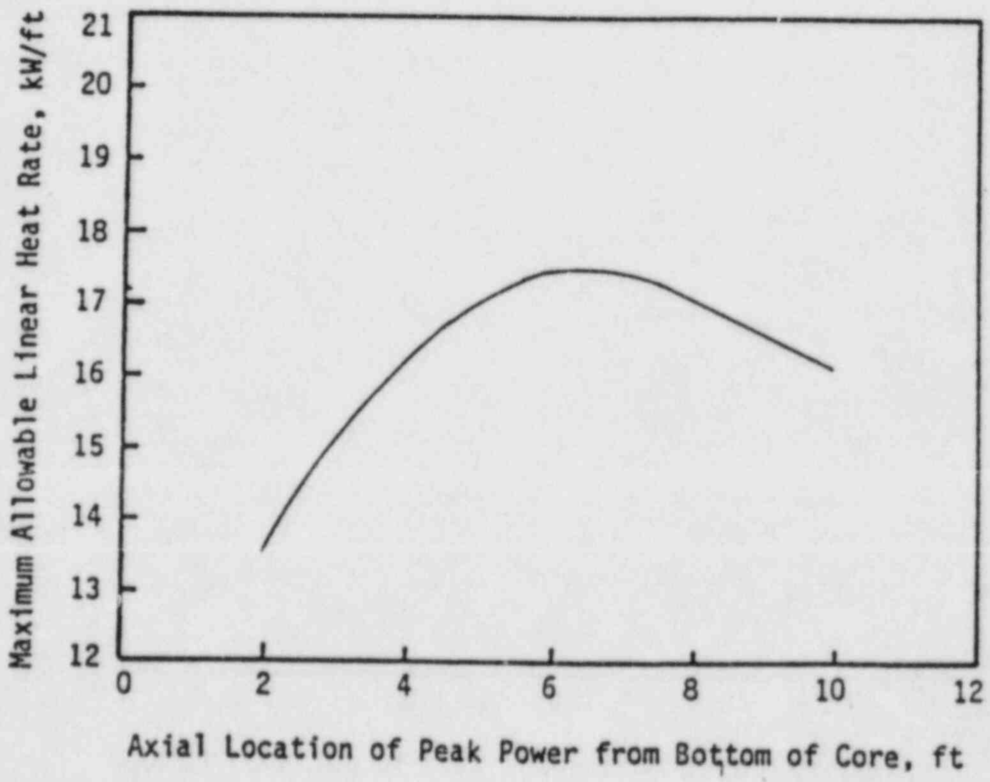
ROD POSITION LIMITS FOR 2 - PUMP OPERATION
FROM 0 EFPD TO EOC ---- ANO-1
Figure 3.5.2-2B



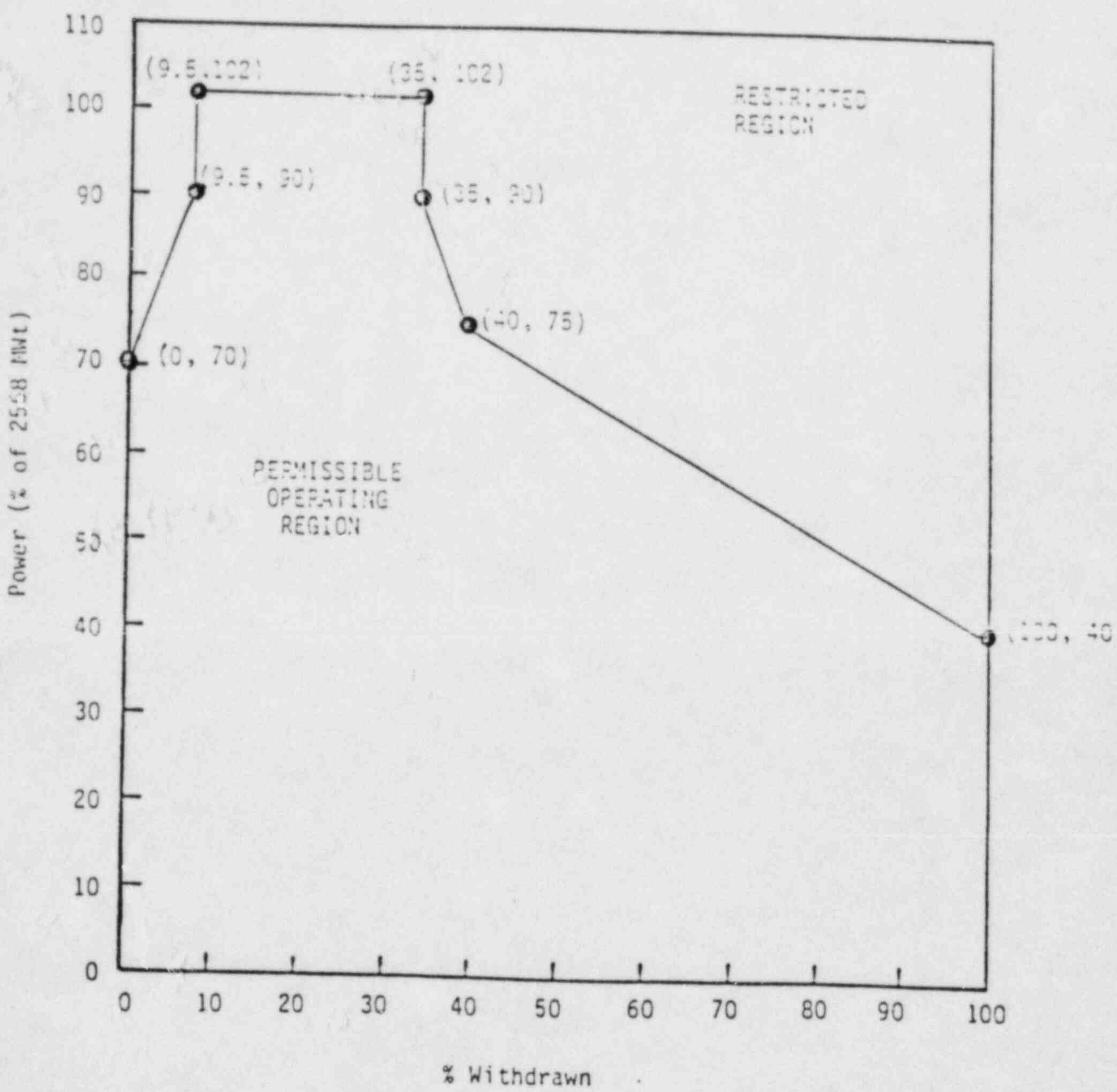
Operational Power Imbalance Envelope for Operation
From 0 EFPD TO EOC EFPD ---- ANO-1
Figure 3.5.2-3



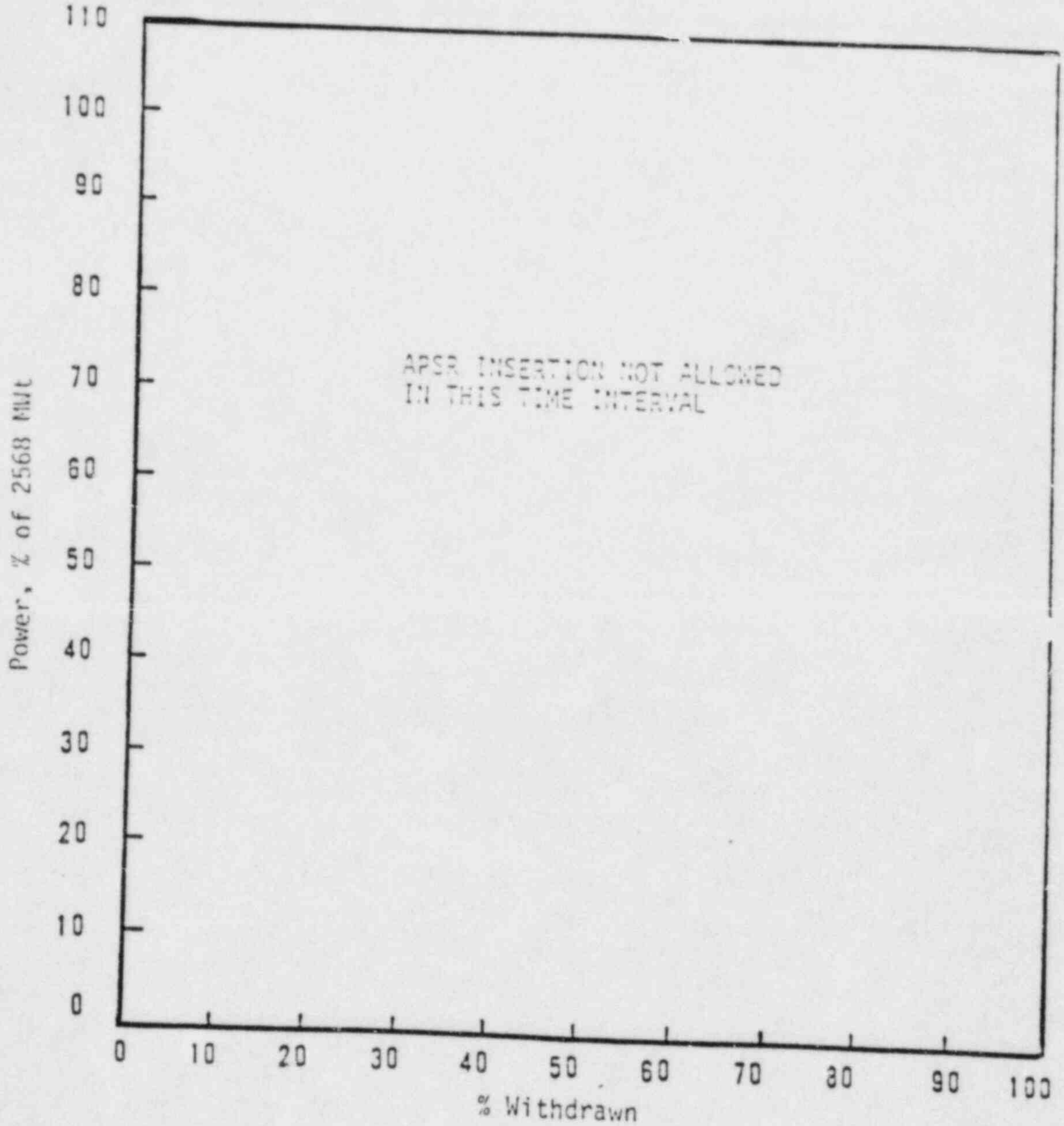
LOCA Limited Maximum Allowable Linear Heat Rate
Figure 3.5.2-4



APSR Position Limits for Operation From
0 EFPD to APSR Withdrawal ---- ANO-1
Figure 3.5.2-4A



APSR Position Limits for Operation After
APSR Withdrawal ---- ANO-1
Figure 3.5.2-4B



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