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

ARKANSAS POWER & LIGHT COMPANY

DOCKET NO. 50-313

ARKANSAS NUCLEAR ONE - UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 31
License No. DPR-51

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

   A. The application for amendment by Arkansas Power & Light Company (the licensee) dated December 28, 1977, as supplemented by letters dated January 17 and 30, 1978, and March 3, 1978, 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:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 31 , 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 the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

Attachment:
Changes to the Technical Specifications

Date of Issuance: March 17, 1978

ATTACHMENT TO LICENSE AMENDMENT NO. 31

FACILITY OPERATING LICENSE NO. DPR-51

DOCKET NO. 50-313

Revise the Appendix A Technical Specifications as follows:

Remove Pages	Insert Pages
9	9
9b	9b
12	12
14b	14b
30 & 30a	30
47 & 48	47 & 48
48b	48b
48bb	48bb
48bbb	48bbb
48c	48c
48cc	48cc
48ccc	48ccc
48d	48d
48dd	48dd
48ddd	48ddd
-	48f - 48h

New pages and changes in the revised pages are identified by marginal lines.

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.

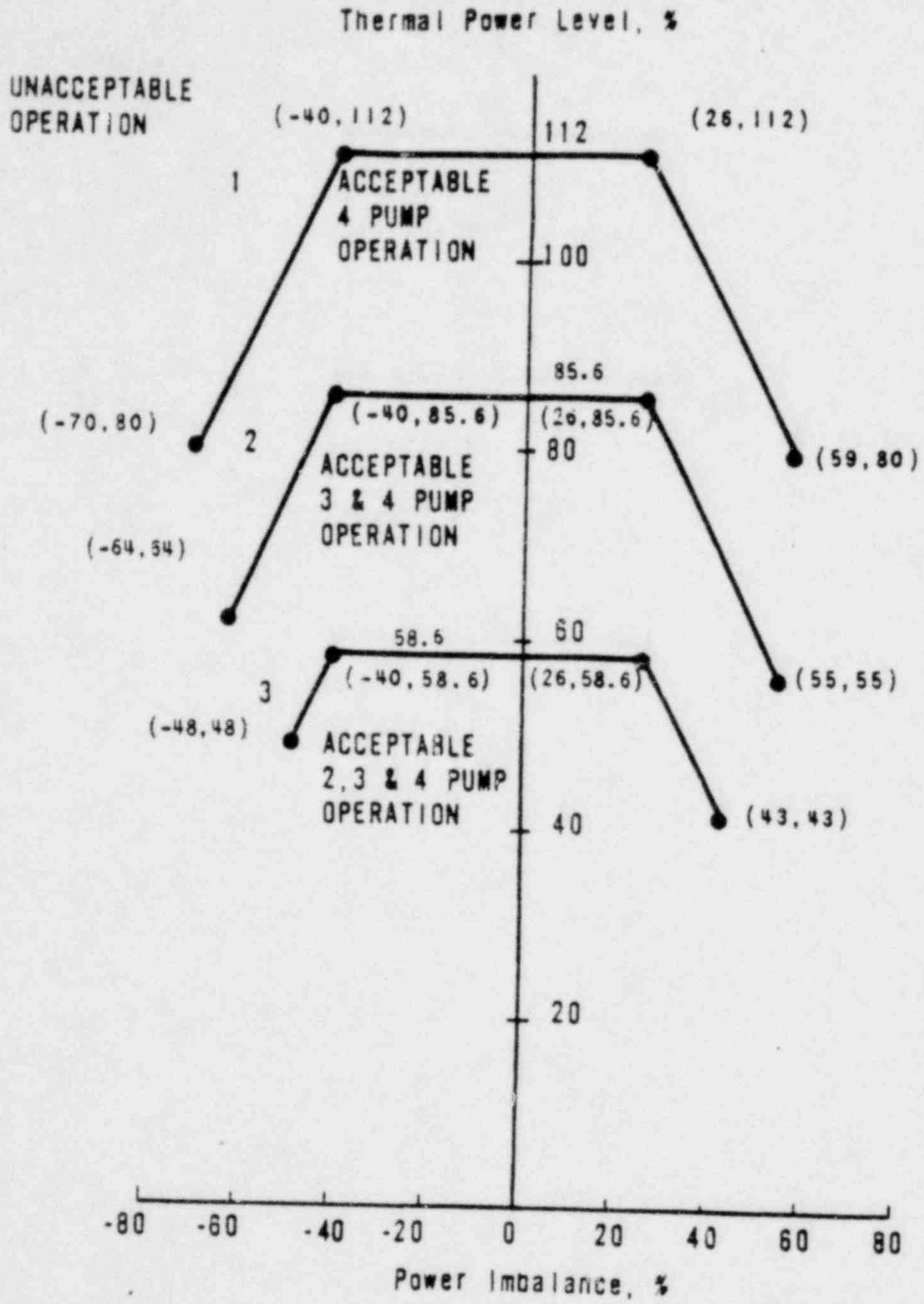
The maximum thermal power for three pump operation is 85.6 percent due to a power level trip produced by the flux-flow ratio (74.7 percent flow x 1.060 79.1 percent power) plus the maximum calibration and instrumentation error. The maximum thermal power for other reactor coolant pump conditions is produced in a similar manner.

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 & 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



CURVE	REACTOR COOLANT FLOW (GPM)
1	374,880
2	280,035
3	184,441

ARKANSAS POWER AND LIGHT
CORE PROTECTION SAFETY LIMITS

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Figure 2.1-2

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 106.0 percent and reactor flow rate is 100 percent or flow rate is 94.3 percent and power level is 100 percent.

2. Trip would occur when three reactor coolant pumps are operating if power is 79.1 percent and reactor flow rate is 74.7 percent or flow rate is 70.7 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 52.3 percent and reactor flow rate is 49.2 percent or flow rate is 46.2 percent and the power level is 49.0 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.

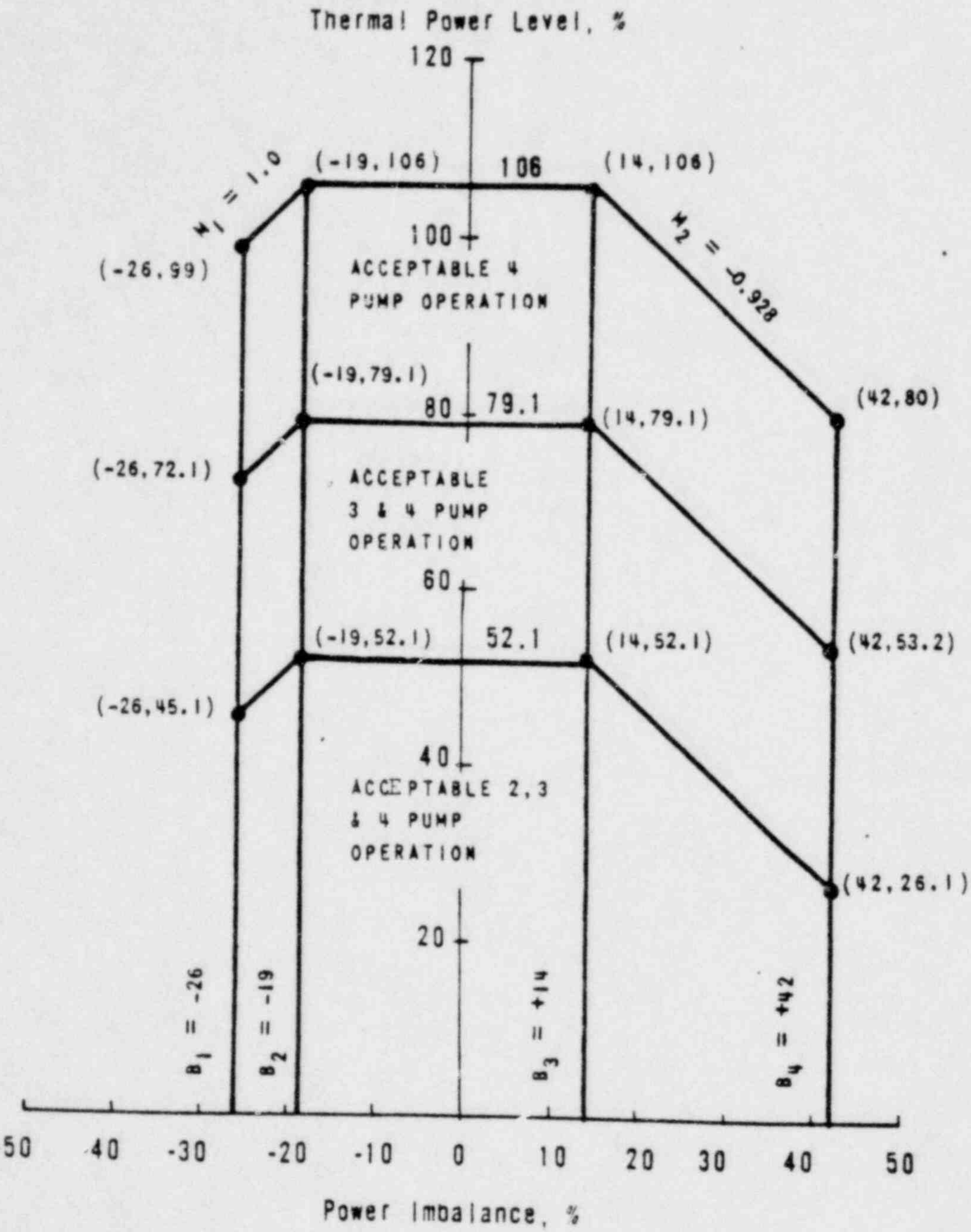
The power-imbalance boundaries are established in order to prevent reactor thermal limits from being exceeded. These thermal limits are either power peaking kW/ft limits or DNBR limits. The reactor power imbalance (power in top half of core minus power in the bottom half of core) reduces the power level 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 reactor power-to-reactor power imbalance boundaries by 1.060 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 pump(s). The pump monitors also restrict the power level for the number of pumps in operation.

C. RCS Pressure

During a startup accident from low power or a slow rod withdrawal from high power, the system high pressure trip set point is reached before the nuclear overpower trip set point. The trip setting limit



ARKANSAS POWER AND LIGHT COMPANY-UNIT 1
PROTECTIVE SYSTEM MAXIMUM ALLOWABLE
SETPOINTS

Figure 2.3-2

3.1.7 Moderator Temperature Coefficient of Reactivity

Specification

3.1.7.1 The moderator temperature coefficient (MTC) shall be non-positive whenever thermal power is >95% of rated thermal power and shall be less positive than 0.5×10^{-4} $\Delta k/k/°F$ whenever thermal power is <95% of rated thermal power and the reactor is not shutdown.

3.1.7.2 The MTC shall be determined to be within its limits by confirmatory measurements prior to initial operation above 5% of rated thermal power after each fuel loading. MTC measured values shall be extrapolated and/or compensated to permit direct comparison with the limits in 3.1.7.1 above.

Bases

A non-positive moderator coefficeint at power levels above 95% of rated power is specified such that the maximum clad temperatures will not exceed the Final Acceptance Criteria based on LOCA analyses. Below 95% of rated power the Final Acceptance Criteria will not be exceeded with a positive moderator temperature coefficient of $+0.5 \times 10^{-4}$ $\Delta k/k/°F$ corrected to 95% of rated power. All other accident analyses as reported in the FSAR have been performed for a range of moderator temperature coefficients including $+0.5 \times 10^{-4}$ $\Delta k/k/°F$.

Amendment No. 21, [illegible]

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 4.92% power shall be reduced immediately to below the power level cutoff (see Figures 3.5.2-1A and 3.5.2-1B). Moreover, the power level cutoff value shall be reduced 2% for each 1% tilt in excess of 4.92% tilt. 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 4.92%.

2. Within a period of 4 hours, the quadrant power tilt shall be reduced to less than 4.92% 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 4.92%.

   c. The operational imbalance limits shall be reduced 2% in power for each 1% tilt in excess of 4.92%.

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 25% ±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 3.5.2-1A, 3.5.2-1B and 3.5.2-1C for four pump operation and on Figures 3.5.2-2A, 3.5.2-2B and 3.5.2-2C for three or two pump operation and b) the axial power shaping control rod withdrawal limits are specified on Figures 3.5.2-4A, 3.5.2-4B and 3.5.2-4C. 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 four hours.

4. Except for physics tests, power shall not be increased above the power level cutoff (see Figures 3.5.2-1) unless the xenon reactivity is within 10 percent of the equilibrium value for operation at rated power and asymptotically approaching stability.

3.5.2.6 Reactor Power Imbalance shall be monitored on a frequency not to exceed two hours during power operation above 40 percent rated power. Except for physics tests, imbalance shall be maintained within the envelopes defined by Figures 3.5.2-3A, 3.5.2-3B and 3.5.2-3C. If the imbalance is not within the envelopes defined by Figures 3.5.2-3A, 3.5.2-3B and 3.5.2-3C corrective measures shall be taken to achieve an acceptable imbalance. If an acceptable imbalance is not achieved within four 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.

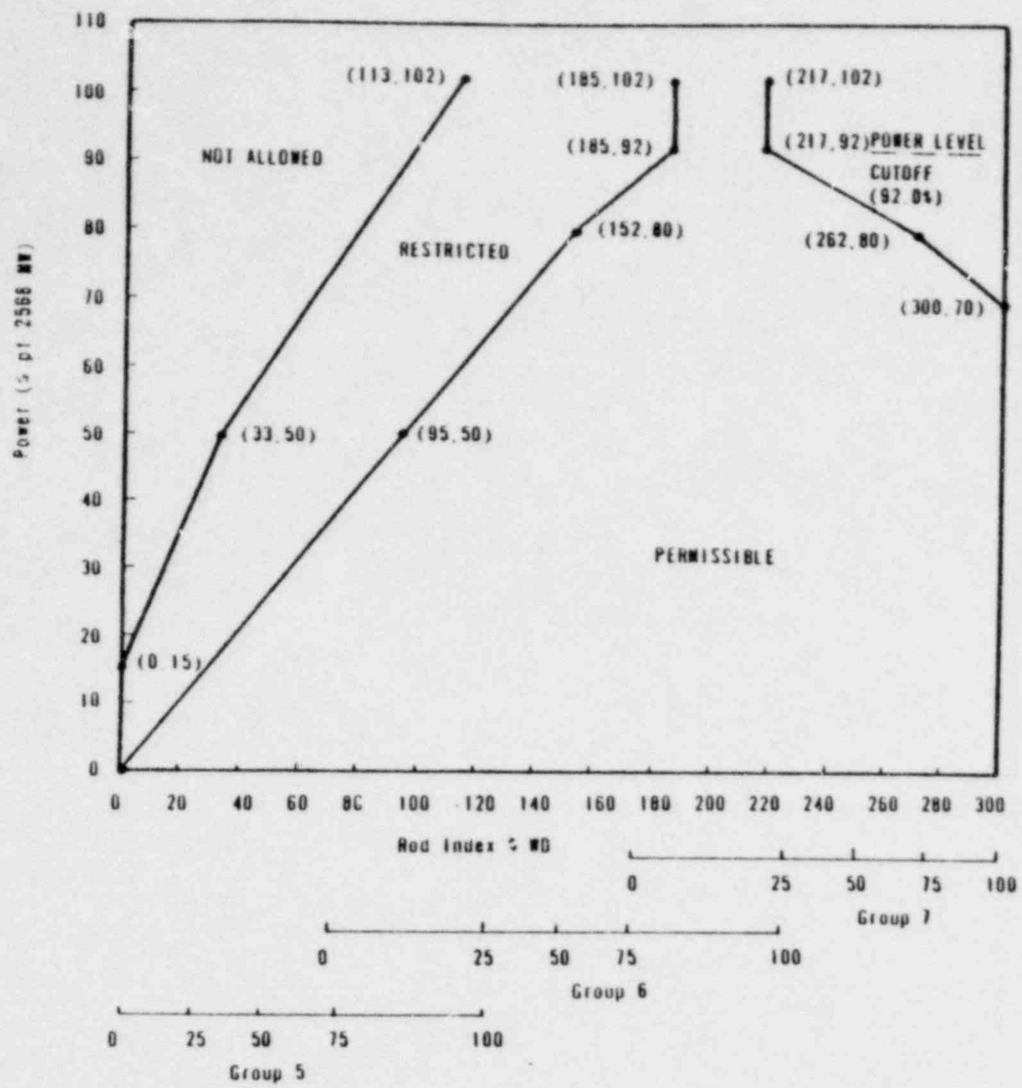
Bases

The power-imbalance envelopes defined in Figures 3.5.2-3A, 3.5.2-3B and 3.5.2-3C are based on 1) LOCA analyses which have defined the maximum linear heat rate (See Fig. 3.5.2-4) such that the maximum clad 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 boundary. 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 simultaneously all other engineering and uncertainty factors are also at their limits.* Conservatism is introduced by application of:

a. Nuclear uncertainty factors
b. Thermal calibration
c. Fuel densification effects
d. Hot rod manufacturing tolerance factors
e. Fuel rod bowing

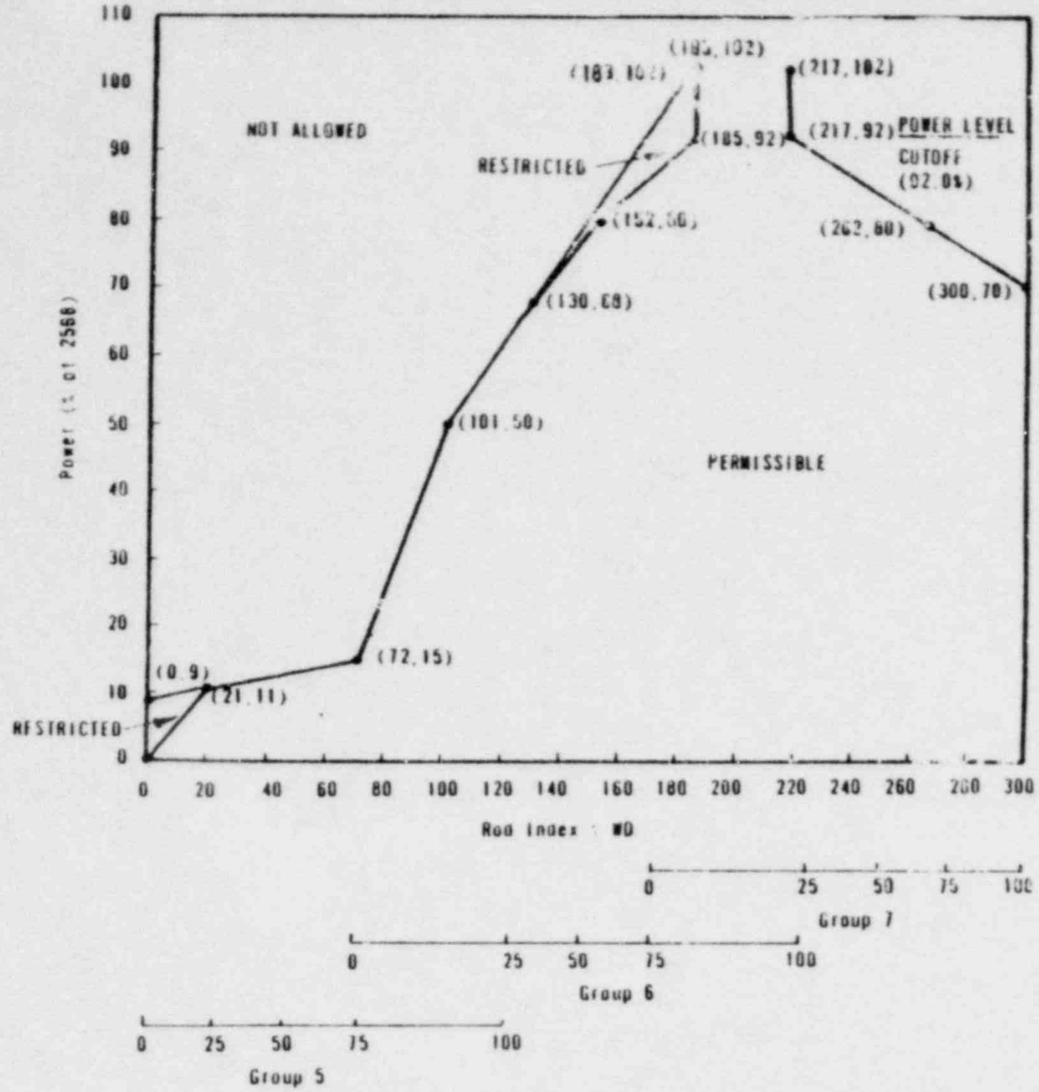
The 25 ±5 percent overlap between successive control rod groups is allowed since the worth of a rod is lower at the upper and lower part of the stroke. Control rods are arranged in groups or banks defined as follows:

*Actual operating limits depend on whether or not incore or excore detectors are used and their respective instrument and calibration errors. The method used to define the operating limits is defined in plant operating procedures.



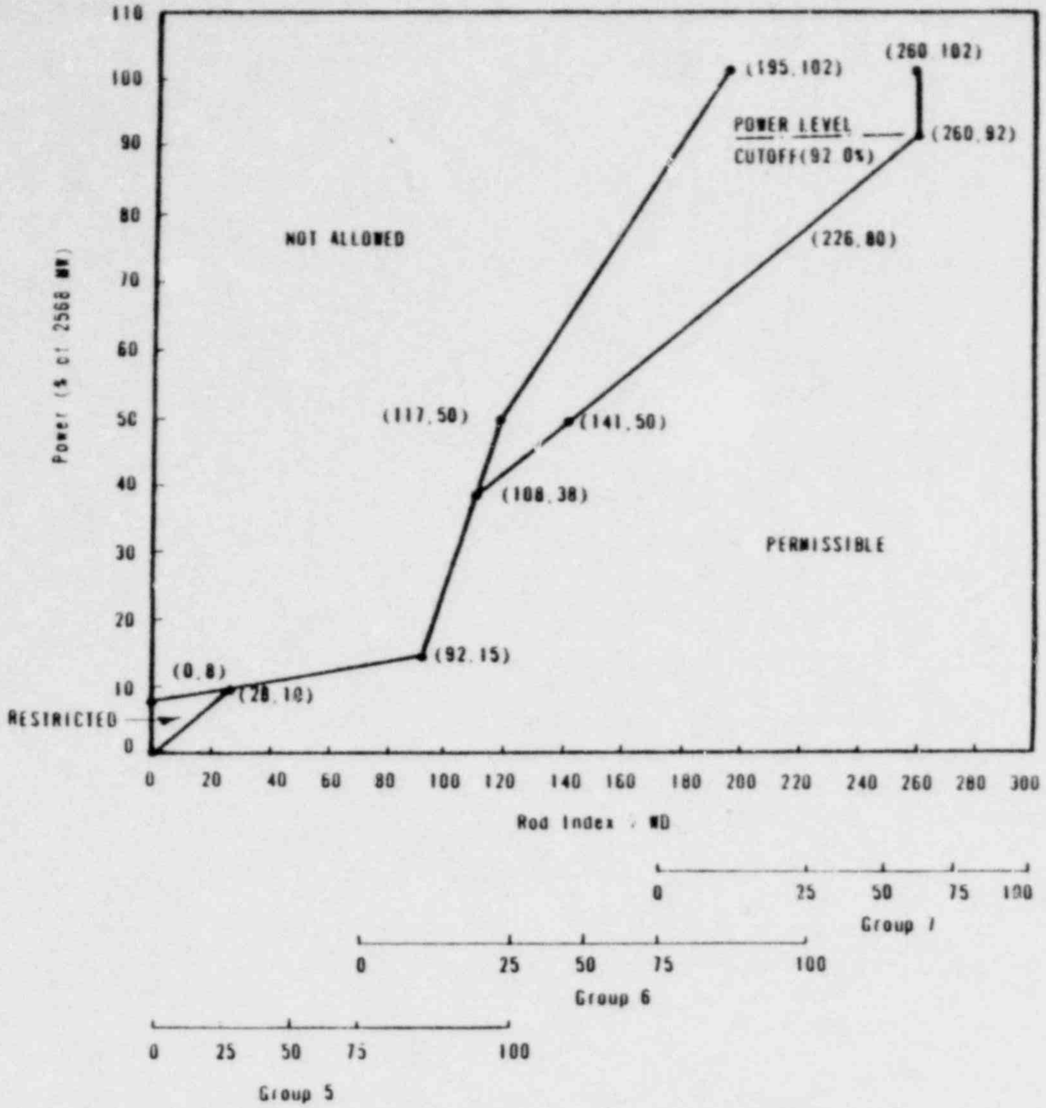
ROD POSITION LIMITS FOR 4 PUMP OPERATION FROM 0 TO 100 ± 10 EFPD ARKANSAS CYCLE 3

Figure 3.5.2-1A



ROD POSITION LIMITS FOR 4 PUMP OPERATION
FROM 100 ± 10 TO 250 ± 10 EFPD ARKANSAS
CYCLE 3

Figure 3.5.2-1B



ROD POSITION LIMITS FOR 4 PUMP OPERATION AFTER 250 ± 10 EFPD ARKANSAS CYCLE 3

Figure 3.5.2-1C

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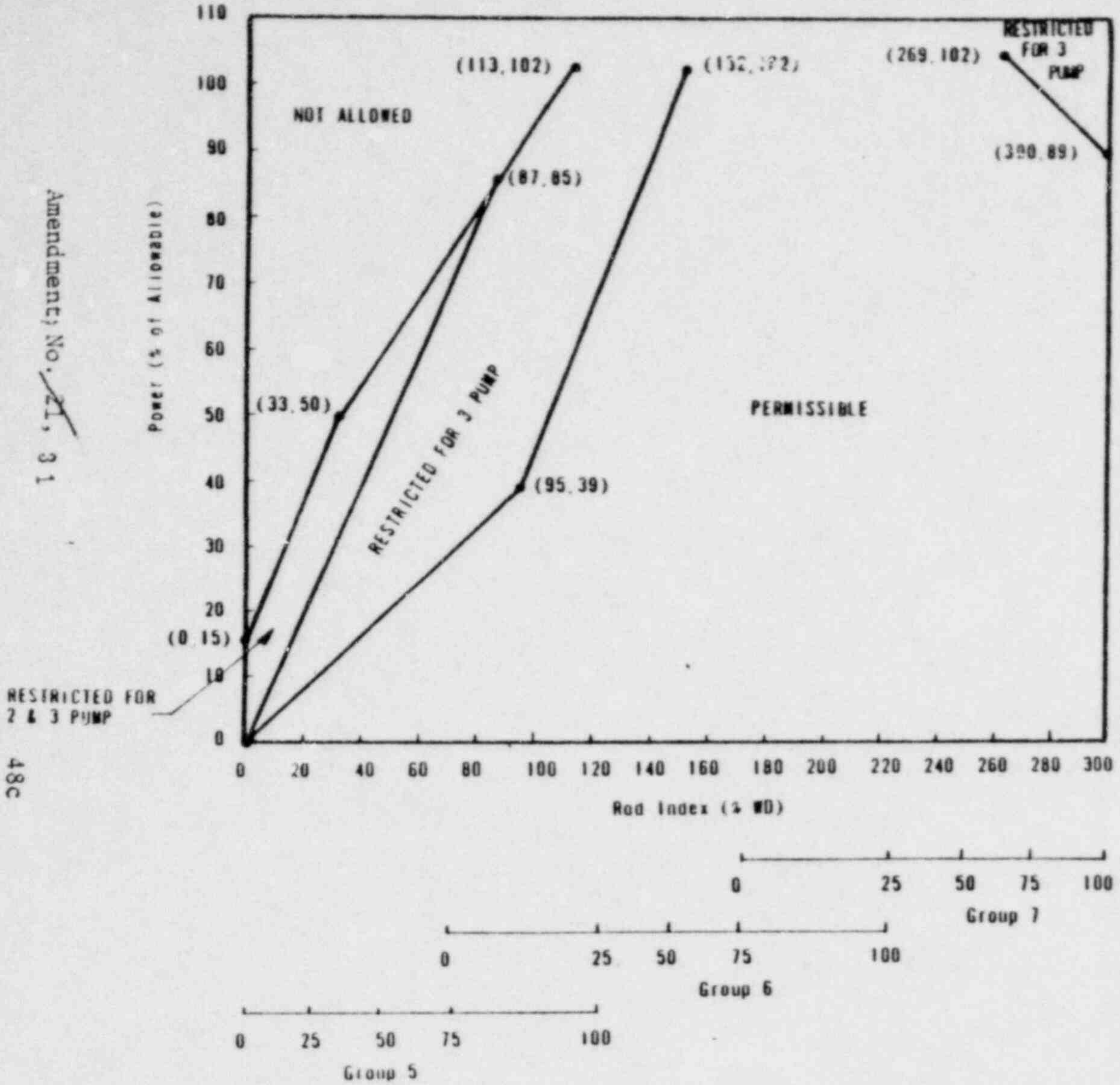
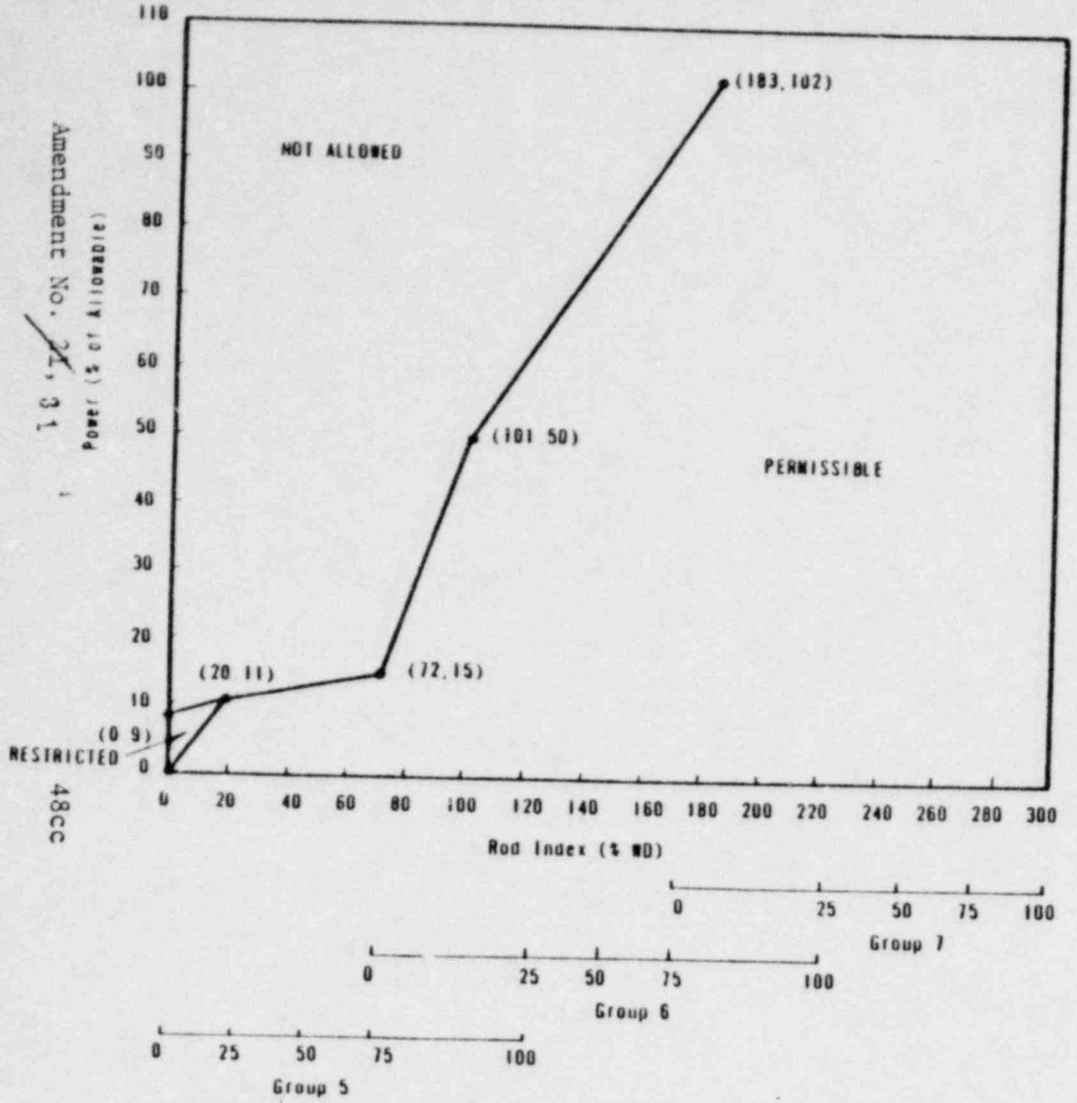


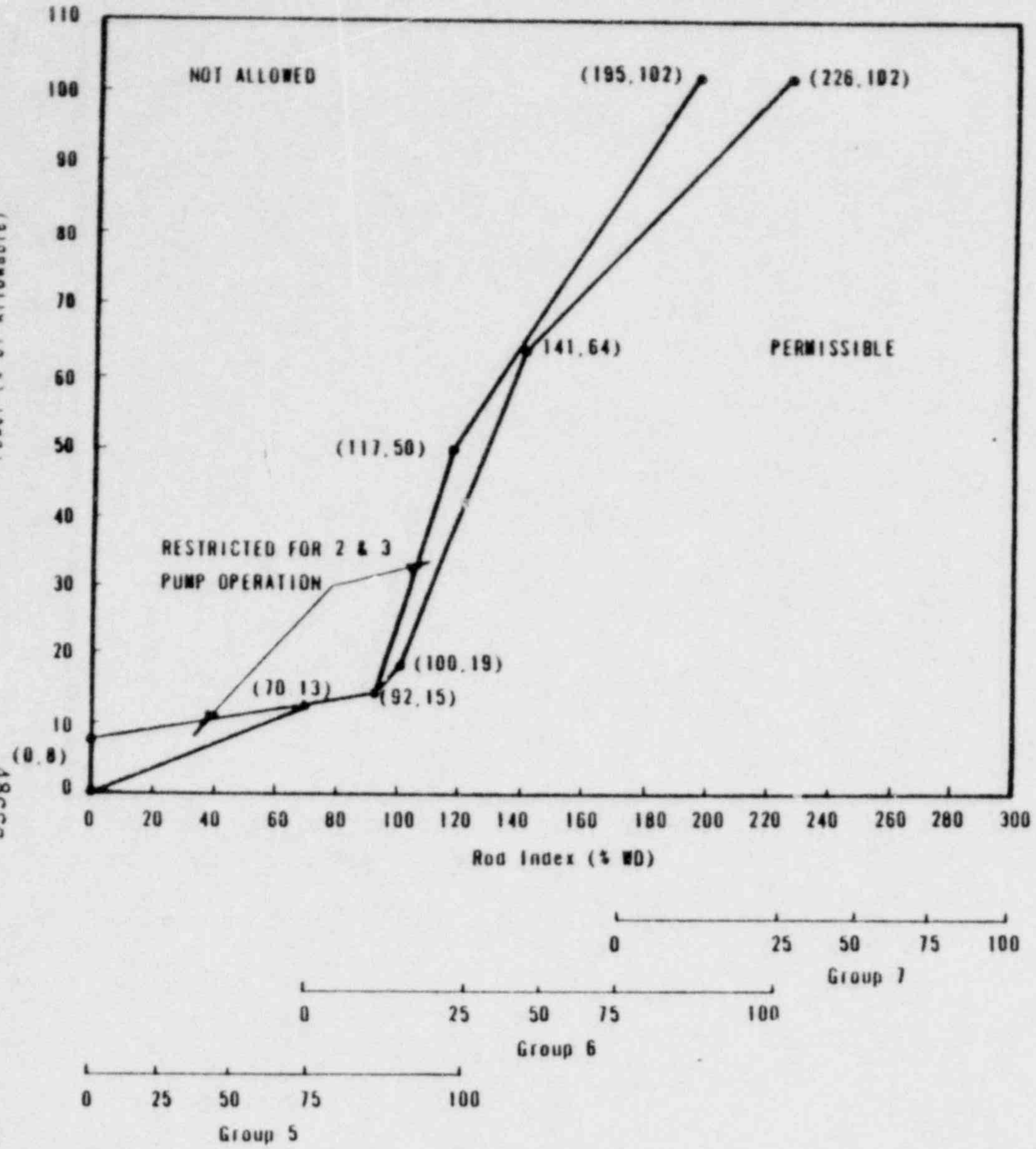
ROD POSITION LIMITS FOR 2 & 3 PUMP OPERATION FROM 0 TO 100 ± 10 EFPD ARKANSAS CYCLE 3

Figure 3.5.2-2A



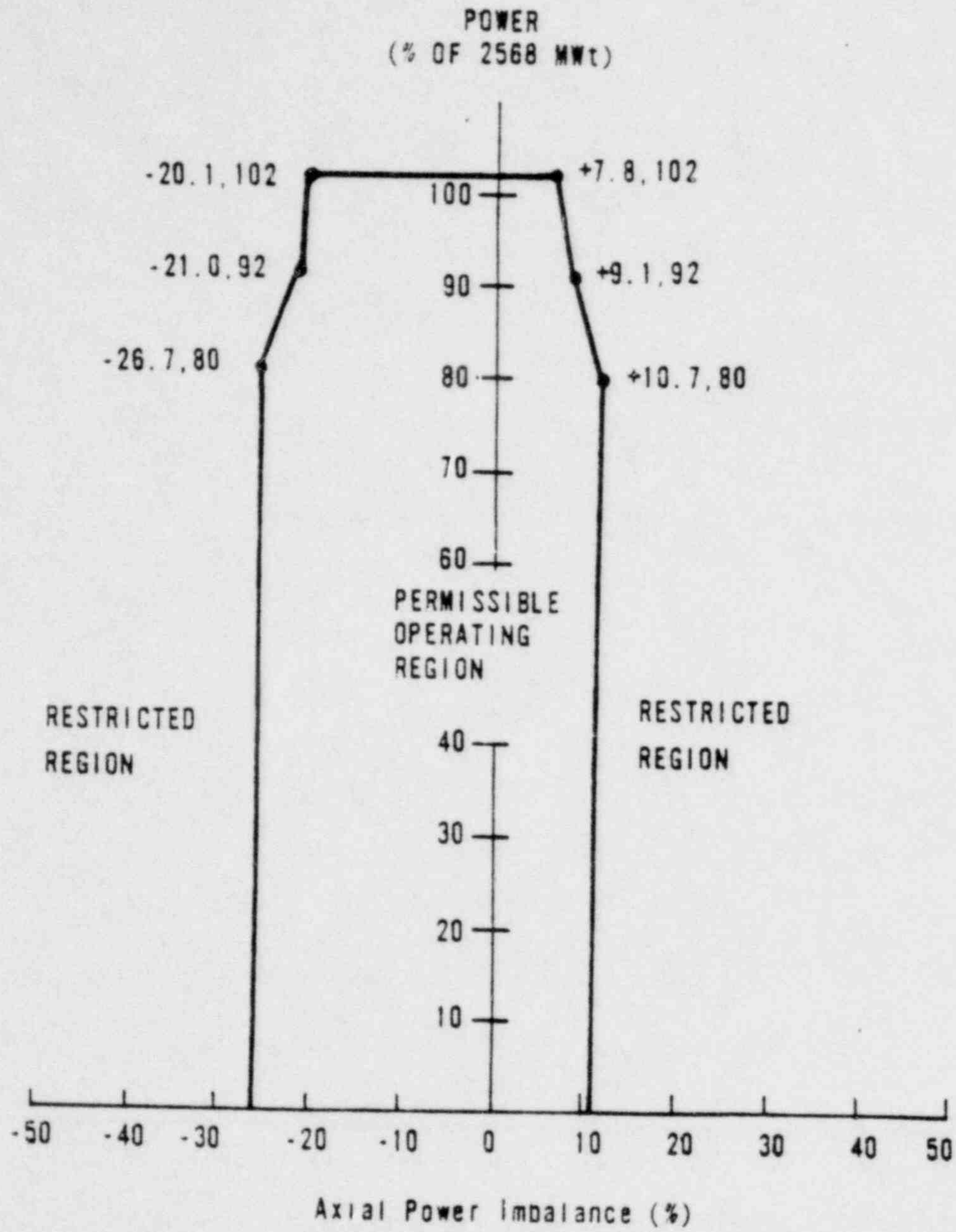
POSITION LIMITS FOR 2 & 3 PUMP OPERATION FROM 50 ± 10 TO 250 ± 10 EFPD ARKANSAS CYCLE 3

Figure 3.5.2-2B



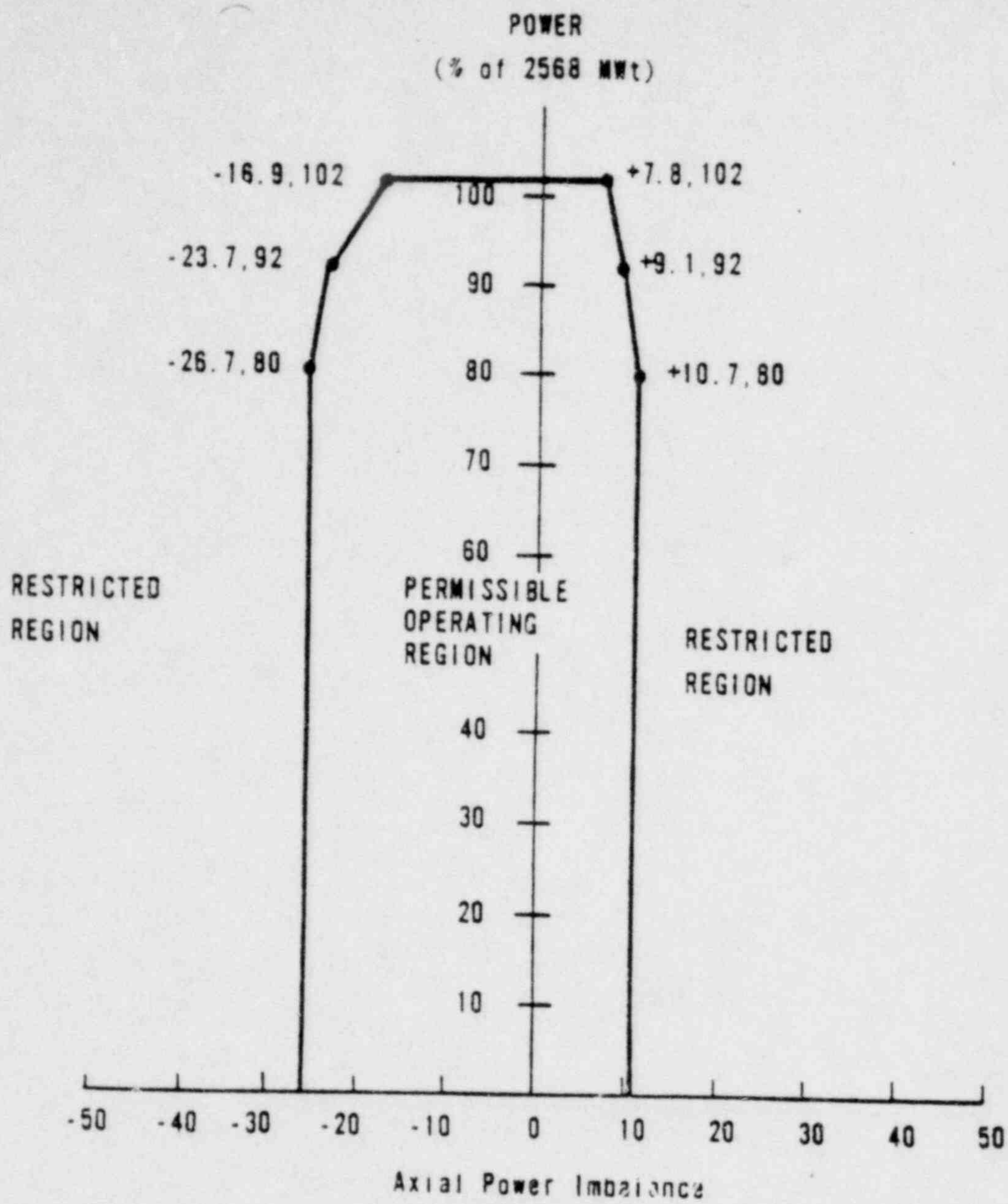
ROD POSITION LIMITS FOR 2 & 3 PUMP OPERATION
AFTER 250 ± 10 EFPD ARKANSAS CYCLE 3

Figure 3.5.2-2C



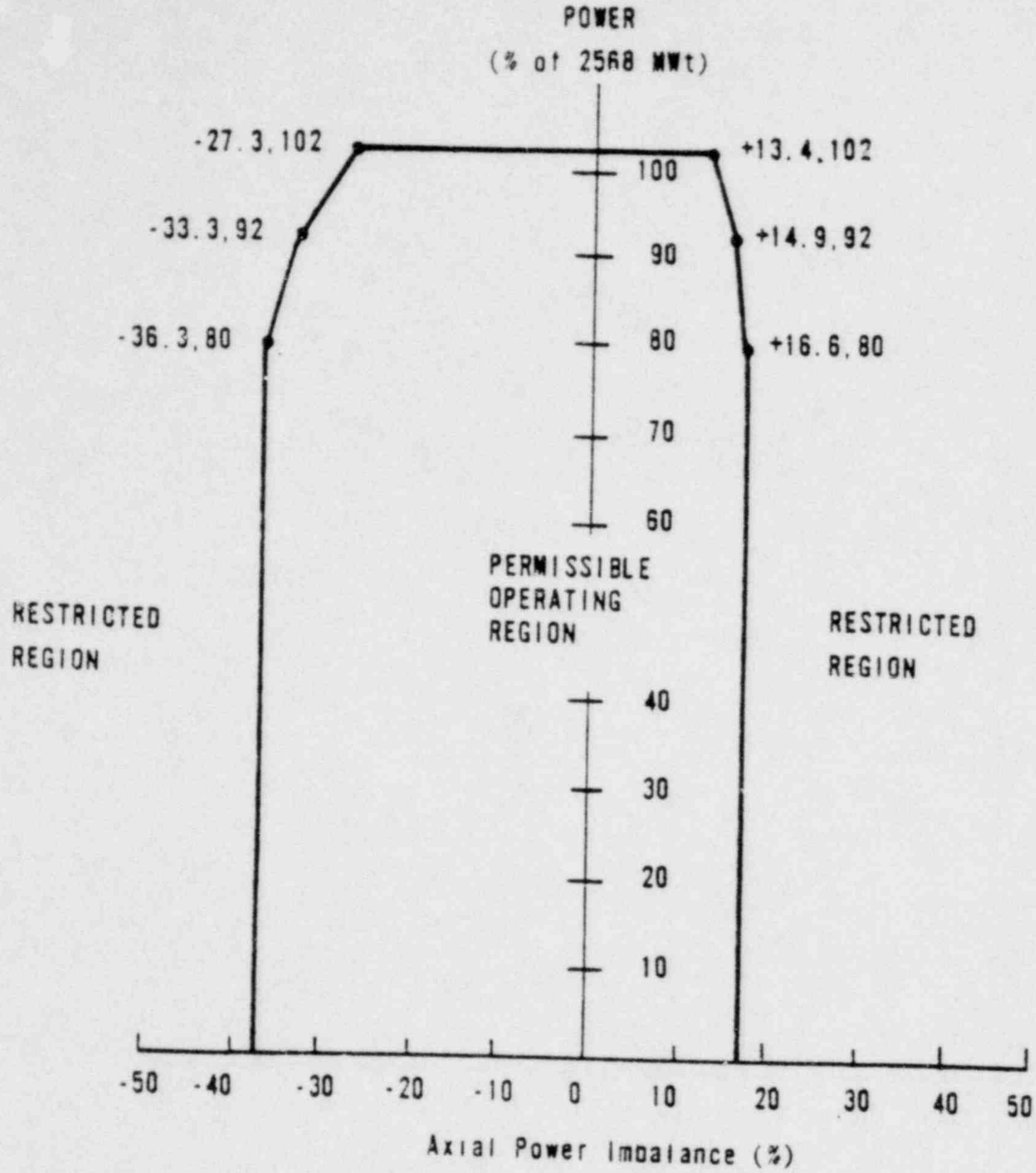
OPERATION POWER IMBALANCE ENVELOPE
FOR OPERATION FROM 0 TO 100 ± 10 EFPD
ARKANSAS CYCLE 3

Figure 3.5.2-3A



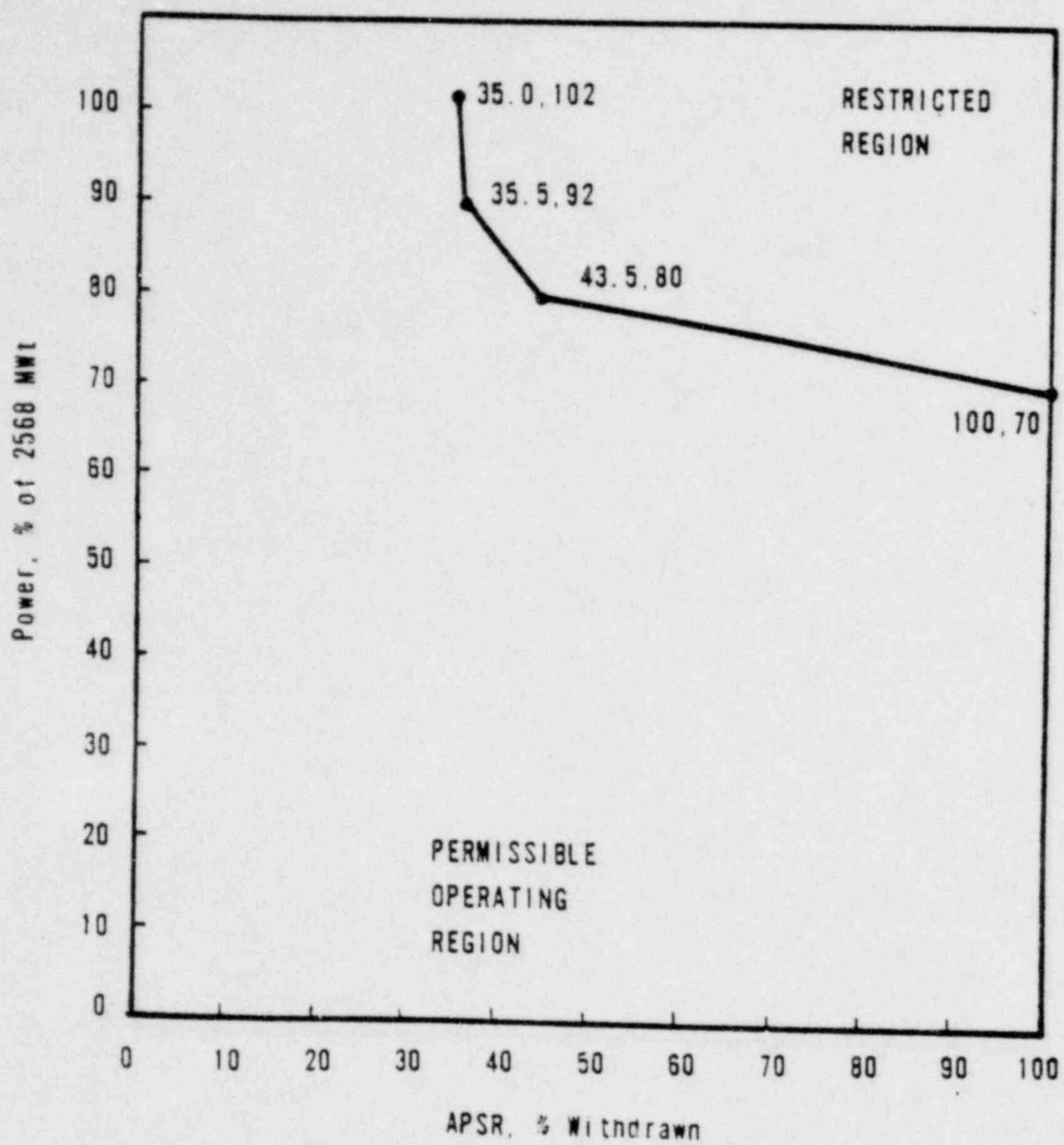
OPERATIONAL POWER IMBALANCE ENVELOPE
FOR OPERATION FROM 100 ± 10 TO 250 ± 10 EFPD
ARKANSAS CYCLE 3

Figure 3.5.2-3B



OPERATIONAL POWER IMBALANCE ENVELOPE
FOR OPERATION AFTER 250 ± 10 EFPD
ARKANSAS, CYCLE 3

Figure 3.5.2-3C



APSR POSITION LIMITS FOR OPERATION FROM 0 TO 100 ± 10 EFPD ANO, CYCLE 3

Figure 3.5.2-4A

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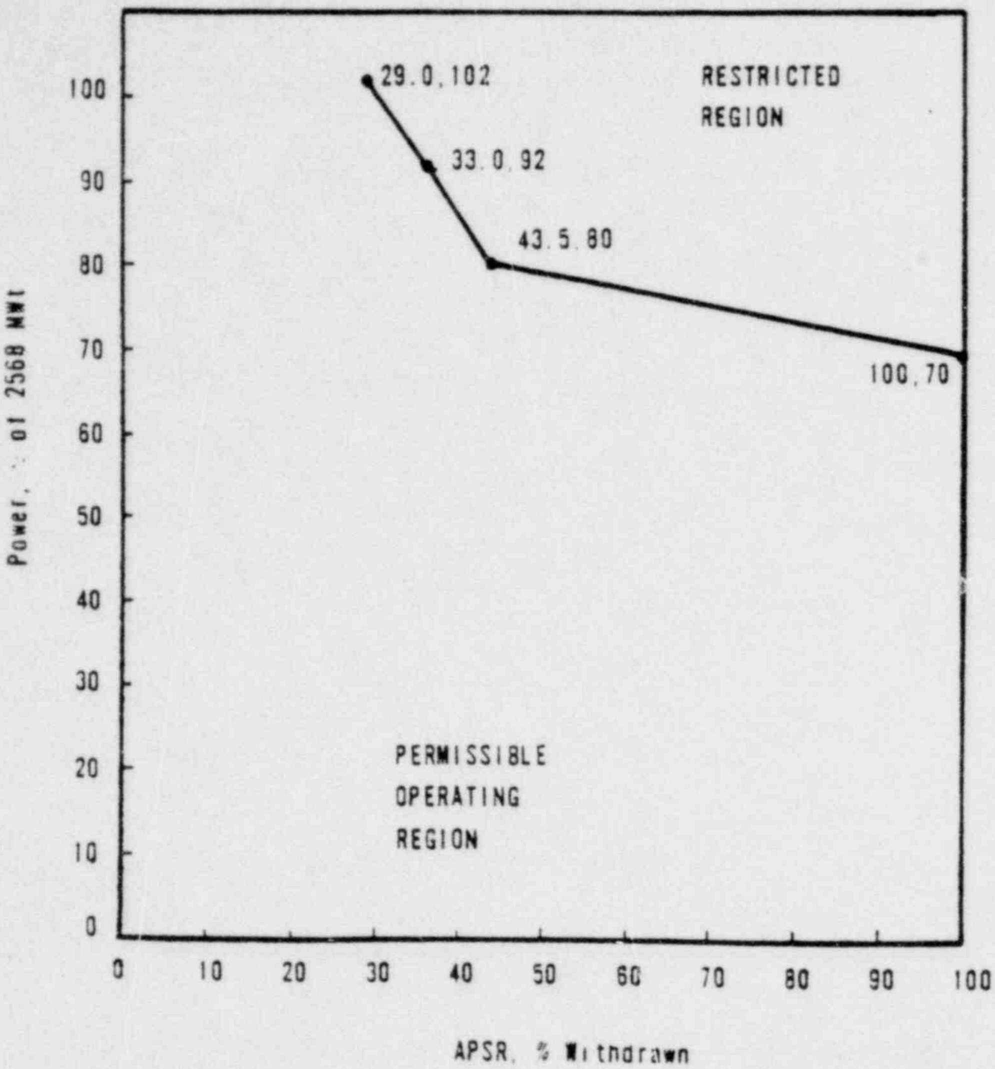
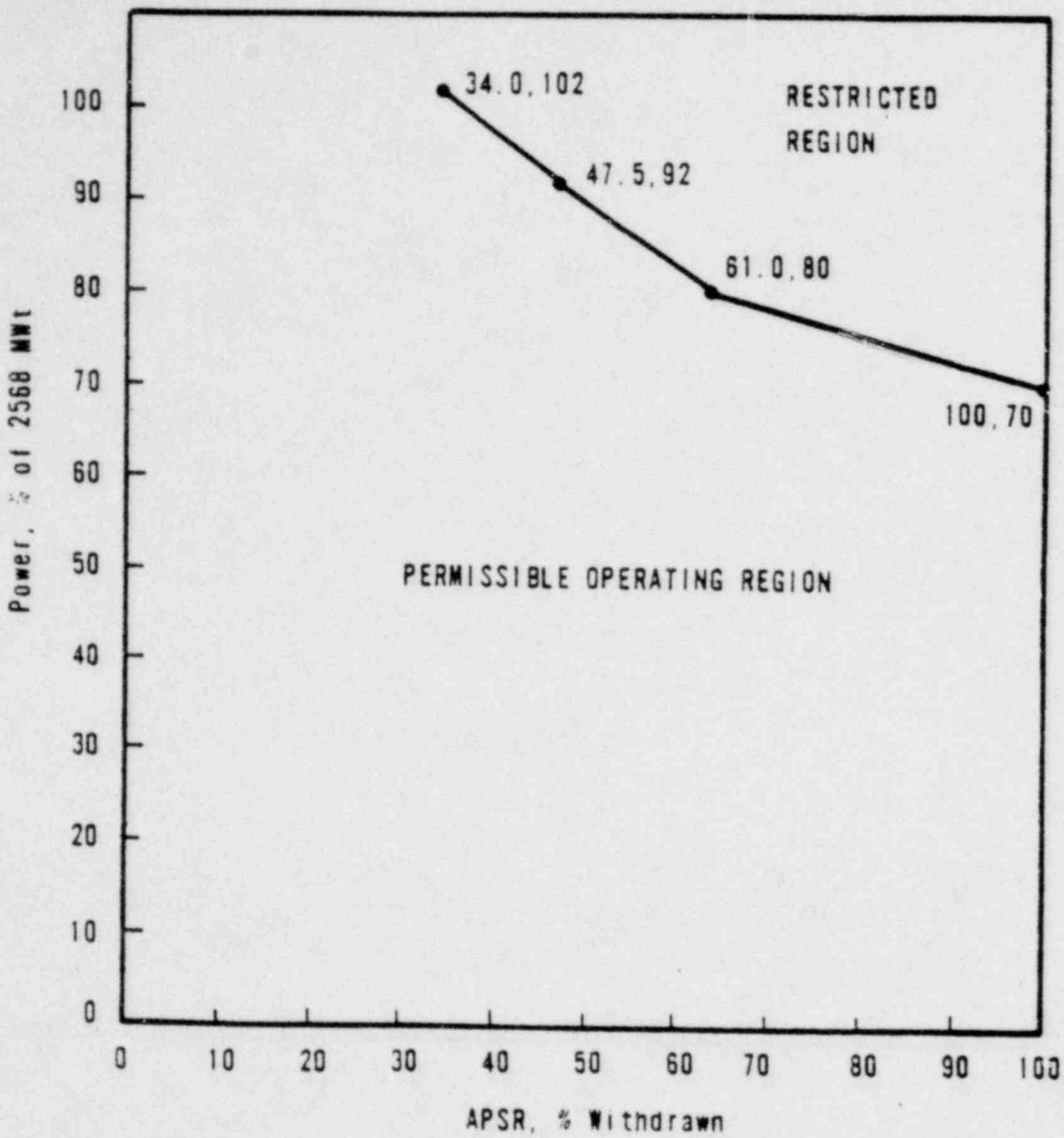


APSR POSITION LIMITS FOR OPERATION
FROM 100 ± 10 TO 250 ± 10 EFPD ANO, CYCLE 3

Figure 3.5.2-4B



APSR POSITION LIMITS FOR OPERATION
AFTER 250 ± 10 EFPD - ANO, CYCLE 3

Figure 3.5.2-4C