BEAVER VALLEY UNIT 1

CYCLE 11

CORE OPERATING LIMITS REPORT

This Core Operating Limits Report provides the cycle specific parameter limits developed in accordance with the NRC approved methodologies specified in Technical Specification Administrative Control 6.9.1.14.

Specification 3.1.3.5 Shutdown Rod Insertion Limits

The shutdown rods shall be withdrawn to at least 225 steps.

Specification 3.1.3.6 Control Rod Insertion Limits

Control Banks A and B shall be withdrawn to at least 225 steps.

Control Banks C and D shall be limited in physical insertion as shown in Figure 1.

Specification 3.2.1 Axial Flux Difference

NOTE: The target band is $\pm$7% about the target flux from 0% to 100% RATED THERMAL POWER.

The indicated Axial Flux Difference:

a. Above 90% RATED THERMAL POWER shall be maintained within the $\pm$7% target band about the target flux difference.

b. Between 50% and 90% RATED THERMAL POWER is within the limits shown on Figure 2.

c. Below 50% RATED THERMAL POWER may deviate outside the target band.

Specification 3.2.2 $F_Q(Z)$ and F_{xy} Limits

$$F_Q(Z) \leq \frac{CFQ}{P} * K(Z) \qquad \text{for } P > 0.5$$

$$F_Q(Z) \leq \frac{CFQ}{0.5} * K(Z) \qquad \text{for } P \leq 0.5$$

Where: CFQ = 2.4 $\qquad P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

K(Z) = the function obtained from Figure 3.

The F_{xy} limits [$F_{xy}(L)$] for RATED THERMAL POWER within specific core planes shall be:

$F_{xy}(L) = F_{xy}(RTP) \quad (1 + PFXY * (1-P))$

Where: For all core planes containing D-BANK:

$F_{xy}(RTP) \leq 1.71$

For unrodded core planes:

$F_{xy}(RTP) \leq 1.75$ from 1.8 ft. elevation to 2.70 ft. elevation

$F_{xy}(RTP) \leq 1.82$ from 2.70 ft. elevation to 7.40 ft. elevation

$F_{xy}(RTP) \leq 1.76$ from 7.40 ft. elevation to 9.40 ft. elevation

$F_{xy}(RTP) \leq 1.69$ from 9.40 ft. elevation to 10.20 ft. elevation

PFXY = 0.2

$P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

Figure 4 provides the maximum total peaking factor times relative power ($F_Q^T * P_{rel}$) as a function of axial core height during normal core operation.

<u>Specification 3.2.3 FNDH</u>

FNDH $\leq$ CFDH *(1 + PFDH *(1-P))

Where: CFDH = 1.62

PFDH = 0.3

$P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

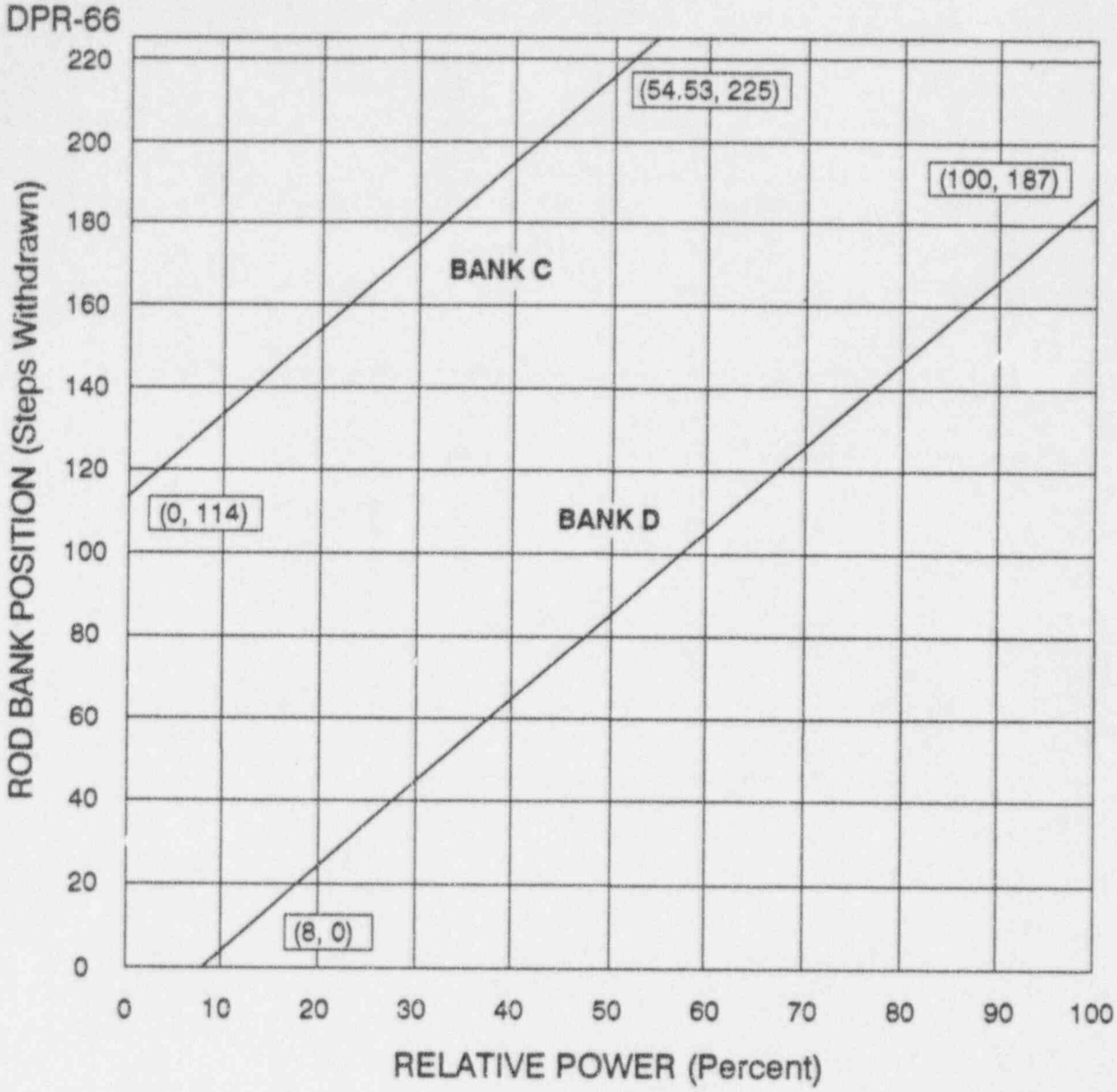

FIGURE 1

CONTROL ROD INSERTION LIMITS AS A FUNCTION OF POWER LEVEL

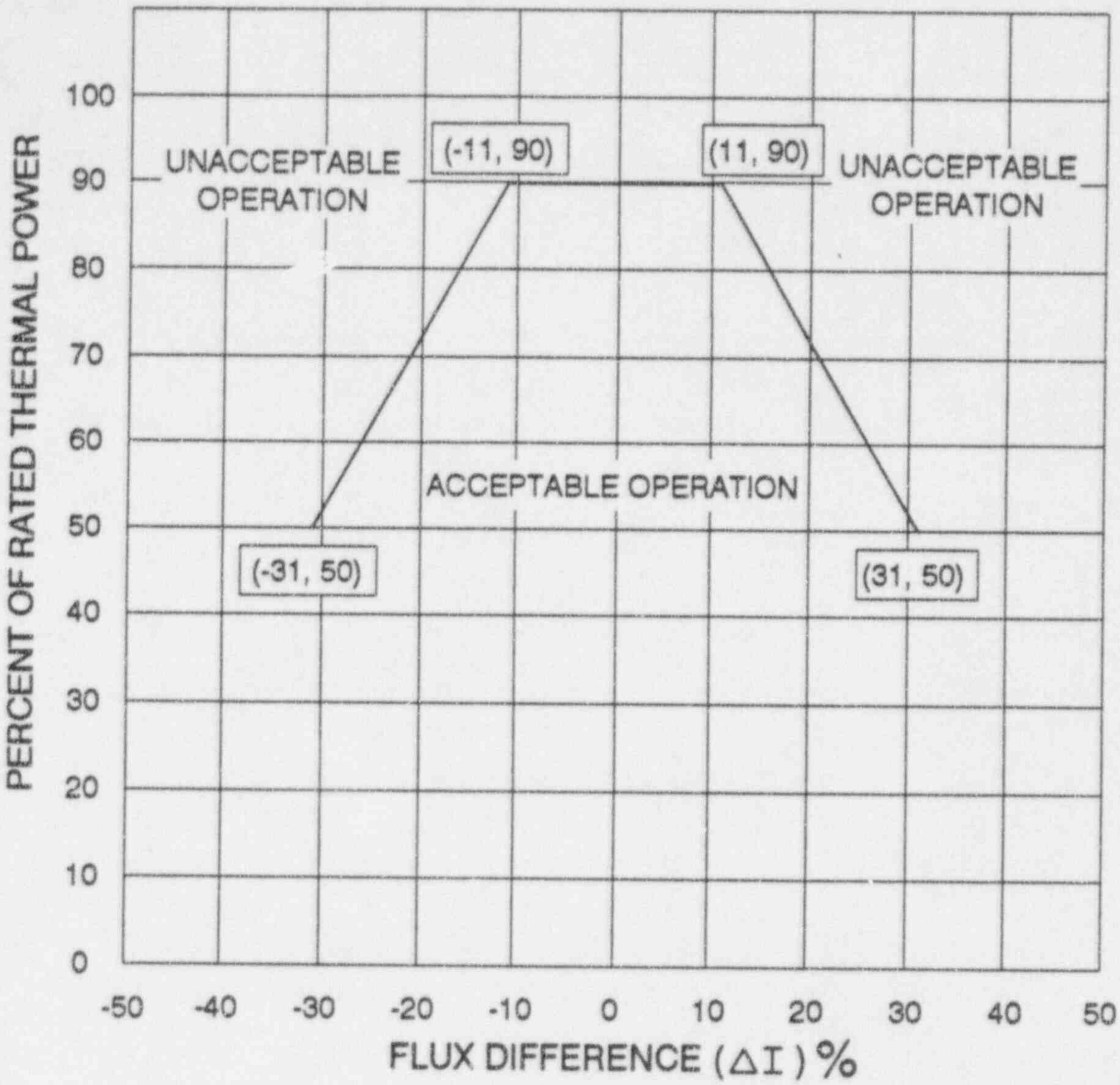

FIGURE 2

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF RATED THERMAL POWER

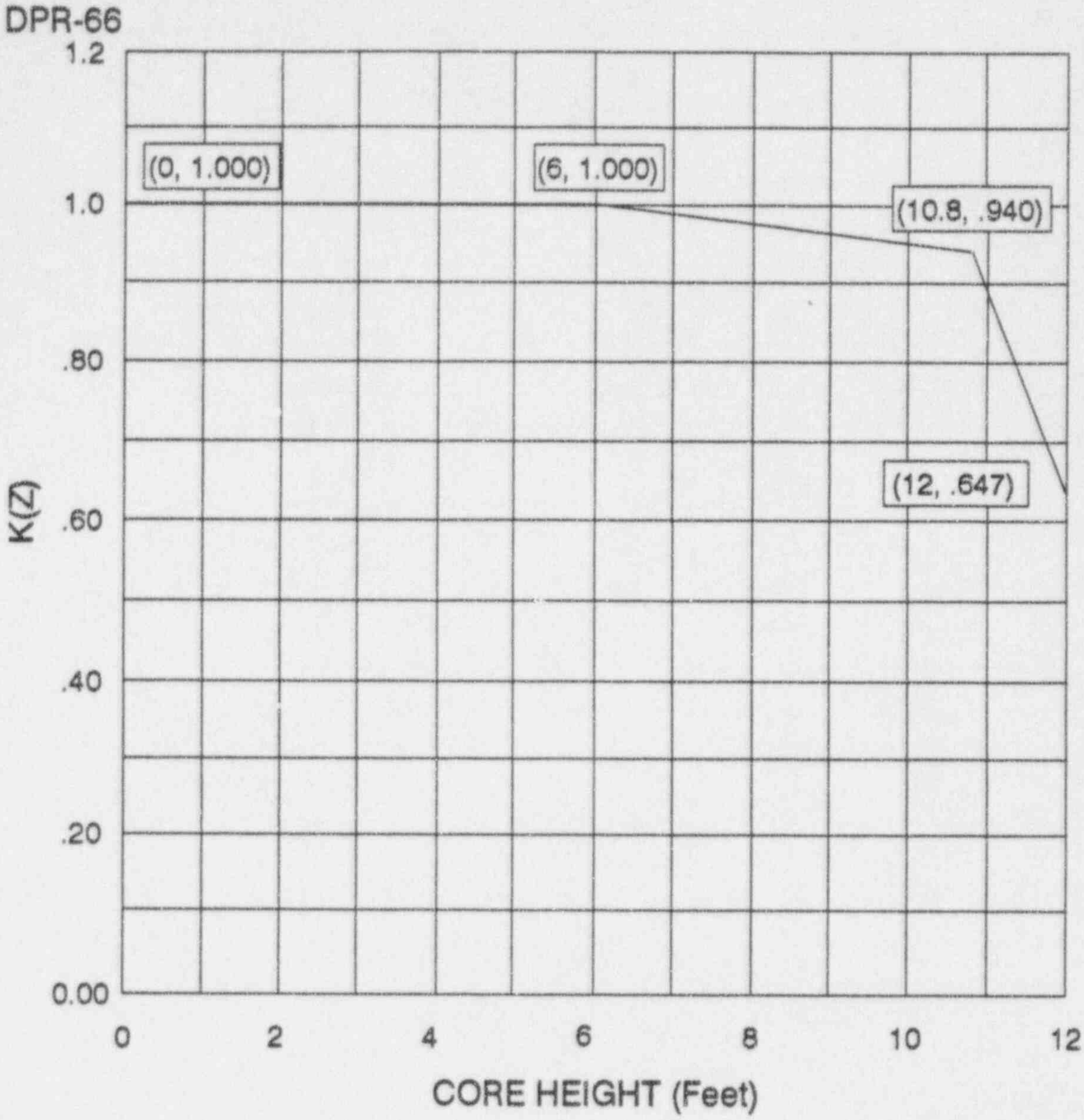

FIGURE 3

F_Q^T NORMALIZED OPERATING ENVELOPE, K(Z)

DPR-66

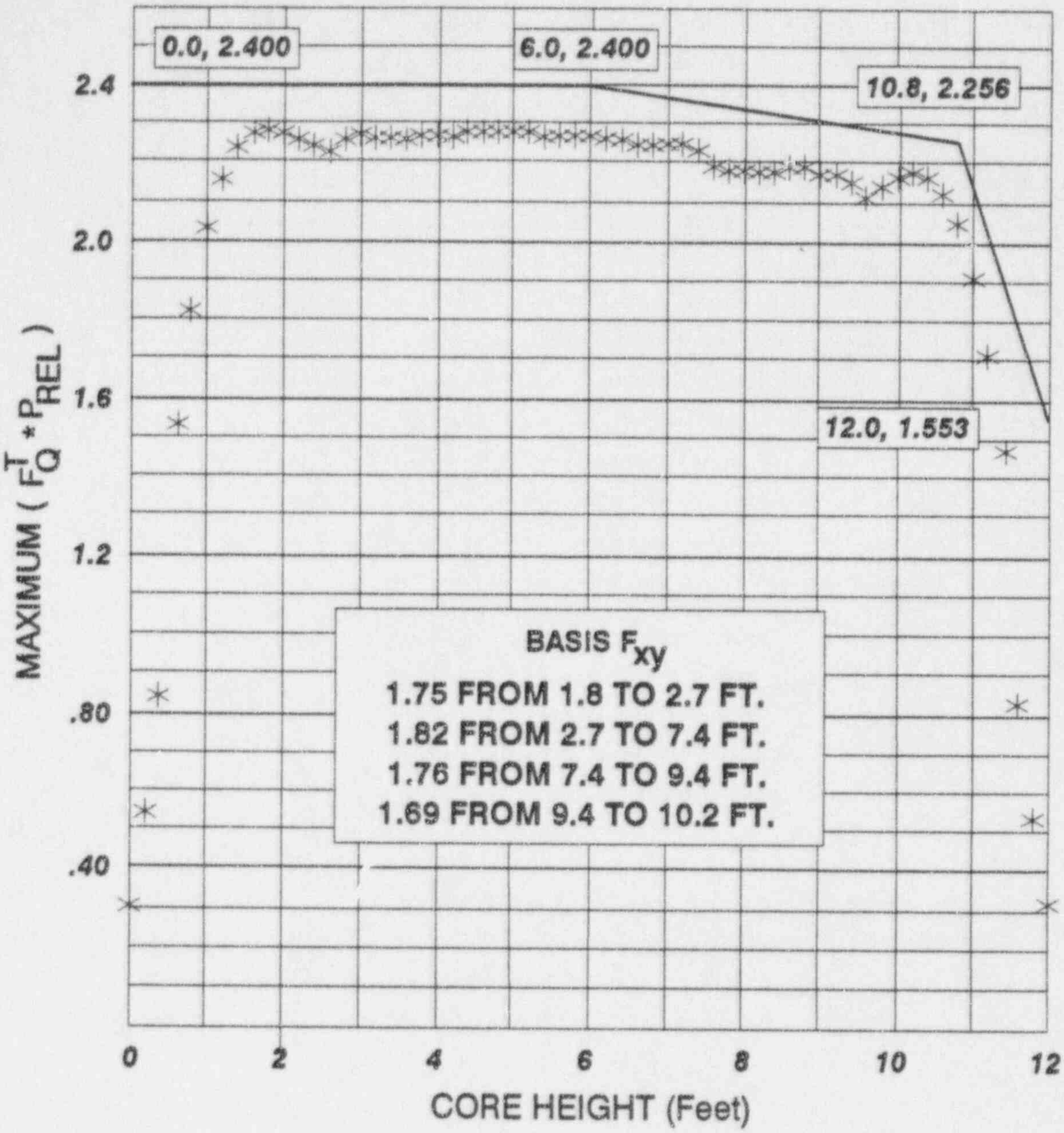

FIGURE 4

MAXIMUM ($F_Q^T \cdot P_{REL}$) VS. AXIAL CORE HEIGHT DURING NORMAL CORE OPERATION

ATTACHMENT A

Beaver Valley Power Station, Unit No. 1
Cycle 11 Reload and Core Operating Limits Report
Technical Specification Bases Change

This change modifies Bases 3/4.1.2, Boration Systems, to address a change in methodology and assumptions for calculating boration requirements.

Remove	Insert
B 3/4 1-3	B 3/4 1-3

3/4.1.2 BORATION SYSTEMS (Continued)

The boration capability of either system is sufficient to provide a SHUTDOWN MARGIN from all operating conditions of 1.0% Δk/k after xenon decay and cooldown to 200°F. The maximum boration capability requirements occur at BOL from full power peak xenon conditions and requires 11,336 gallons of 7000 ppm borated water from the boric acid storage tanks or 65,000 gallons of 2000 ppm borated water from the refueling water storage tank.

With the RCS temperature below 200°F, one injection system is acceptable without single failure consideration on the basis of the stable reactivity condition of the reactor and the additional restrictions prohibiting CORE ALTERATIONS and positive reactivity change in the event the single injection system becomes inoperable.

The boration capability required below 200°F is sufficient to provide a SHUTDOWN MARGIN of 1% Δk/k after xenon decay and cooldown from 200°F to 140°F. This condition requires either 5000 gallons of 7000 ppm borated water from the boric acid storage tanks or 175,000 gallons of 2000 ppm borated water from the refueling water storage tank.

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section ensure that (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) the potential effects of rod misalignment on associated accident analyses are limited. OPERABILITY of the movable control assemblies is established by observing rod motion and determining that rods are positioned within ± 12 steps (indicated position), of the respective group demand counter position. The OPERABILITY of the rod position indication system is established by appropriate periodic CHANNEL CHECKS, CHANNEL FUNCTIONAL TESTS and CHANNEL CALIBRATIONS. OPERABILITY of the control rod position indicators is required to determine control rod position and thereby ensure compliance with the control rod alignment and insertion limits. The OPERABLE condition for the analog rod position indicators is defined as being capable of indicating rod position within ± 12 steps of the associated group demand indicator. For power levels below 50 percent, the specifications of this section permit a one hour stabilization period to permit stabilization of known thermal drift in the analog rod position indicator channels. During this stabilization period, greater reliance is placed upon the group demand position indicators to determine rod position. Above 50 percent power, rod motion is not expected to induce thermal transients of sufficient magnitude to exceed the rod position indicator instrument accuracy of ± 12 steps. Limited use of rod position indication primary detector voltages is allowed as a backup method of determining control rod positions. Comparison of the group demand indicator to the calibration curve is sufficient to allow determination that a control rod is indeed misaligned from its bank when primary voltage measurements are used. Comparison of the group demand counters to the bank insertion limits with verification of rod position with the analog rod