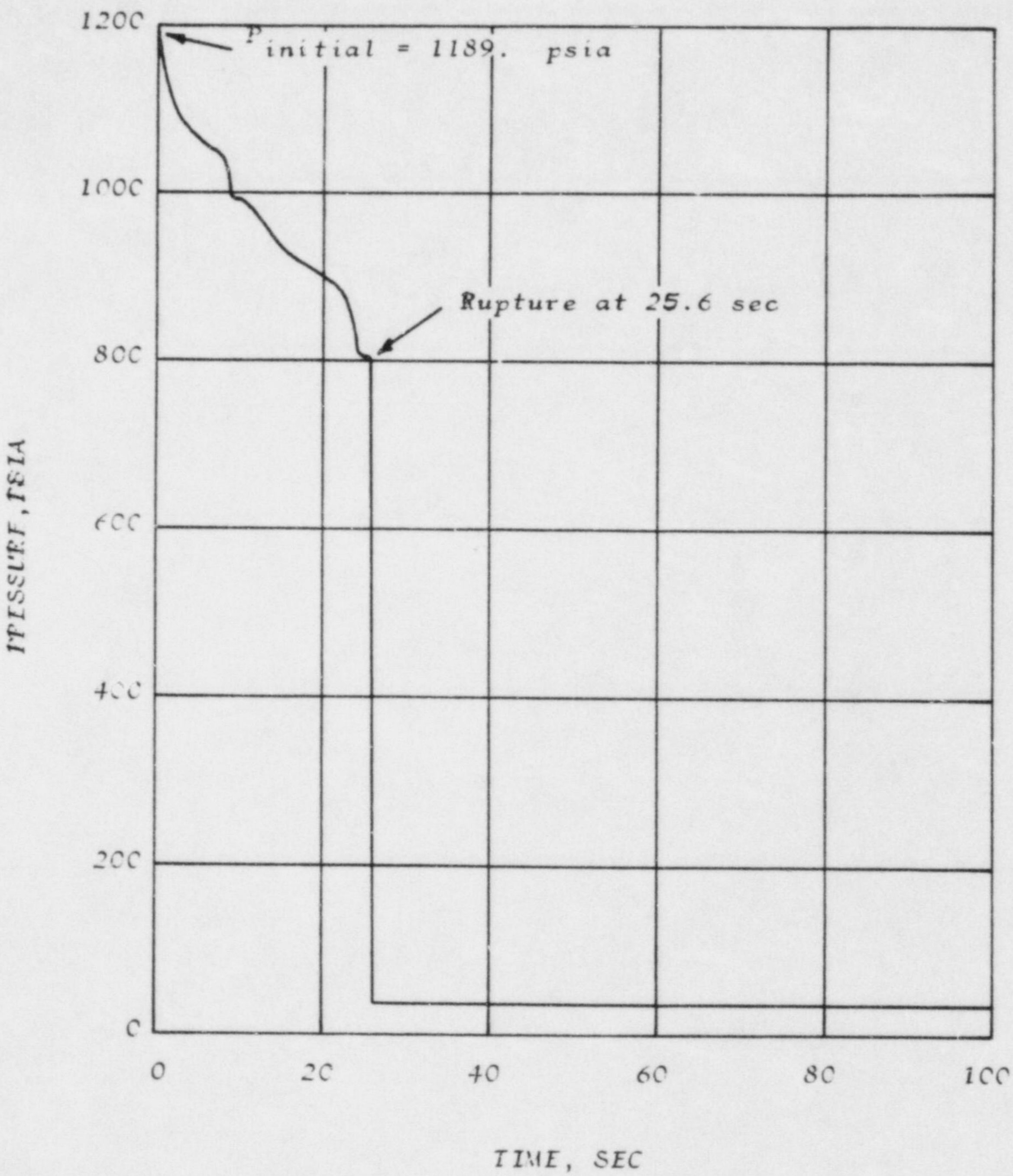
Figure 8.1-14

CALVERT CLIFFS UNIT 2 CYCLE 8

0.6 x DOUBLE ENDED GUILLOTINE BREAK IN PUMP DISCHARGE LEG

HOT ROD INTERNAL GAS PRESSURE



9.0 TECHNICAL SPECIFICATIONS

The Technical Specification changes which are being requested in order to make the Calvert Cliffs Unit 2 Technical Specifications consistent with the analyses discussed herein are presented in this section. Table 9-1 presents a summary of the Technical Specification changes in the form of: 1) an action statement for each change, 2) the reason for each change and 3) a reference to the supporting analyses which demonstrate acceptable safety analyses results for each change. Following Table 9-1 the existing Technical Specification page with the intended modification is provided for each Technical Specification for which a change is being requested.

TABLE 9-1

CALVERT CLIFFS UNIT 2 CYCLE 8
TECHNICAL SPECIFICATION CHANGES

Tech. Spec. No. and Page	Action	Explanation	Support/Use
Figure 2.2-1 page 2-11	Modify Figure 2.2-1 as indicated to reduce the Acceptable Operation Region (AOR) between 70 and 100% power.	The AOR is being reduced to accommodate the implementation of 24-month, low-leakage cycles.	The setpoint analysis takes credit for this modification in demonstrating acceptable results for Unit 2 Cycle 8.
3/4.1.1.1 page 3/4 1-1	Change shutdown margin, T_{avg} >200°F, from 3.5%Δk/k to 4.5%Δk/k	The shutdown margin is being increased to support a revised Steam Line Rupture analysis. This increase is possible due to the additional scram worth available for low-leakage cores.	1) The increase in shutdown margin is supported by the zero power scram worth demonstrated to be available in Table 5-2. 2) The results of the revised Steam Line Rupture analysis were less limiting than those previously reported due to the increased scram worth available for low leakage cores. Consequently, this analysis was not reported (see Section 7).

TABLE 9-1 (Cont'd)

CALVERT CLIFFS UNIT 2 CYCLE 8
TECHNICAL SPECIFICATION CHANGES

Tech. Spec. No. and Page	Action	Explanation	Support/Use
3.1.1.4 page 3/4 1-5	1) Condense Subsections "a" and "b" to a new Subsection "a" which simply refers to Figure 3.1-1a (new). 2) Change Subsection "a" to Subsection "b" without modifying the contents of this subsection.	The positive MTC limit above 70% power is being raised from $+.2\times10^{-4}\ \Delta\rho/°F$ to a value which varies linearly from $+.3\times10^{-4}\ \Delta\rho/°F$ at 100% power to $+.7\times10^{-4}\ \Delta\rho/°F$ at 70% power. This change is being made to accommodate the implementation of 24-month cycles, to eliminate startup delays and to facilitate a rapid power ascension program (see Section 10.0).	1) The results of a revised Feedline Break (FLB) analysis which accounts for this change in MTC limit were less limiting than those previously reported. Since the results are less limiting than those previously reported, this revised FLB analysis is not contained herein. 2) The rapid power ascension program described in Section 10.0 takes credit for this change in MTC limit.
3.1.1.4 page 3/4 1-5a (new)	Insert enclosed new Figure 3.1-1a after Page 3/4 1-5.	See change for page 3/4 1-5.	See change for Page 3/4 1-5
B 3/4.1.1.1 and B 3/4.1.1.2 page B 3/4 1-1	Change EOC shutdown margin, T_{avg} > 200°F, from 3.5%Δk/k to 4.5%Δk/k	See change for Tech. Spec. 3/4.1.1.1	See change for Tech. Spec. 3/4.1.1.1.

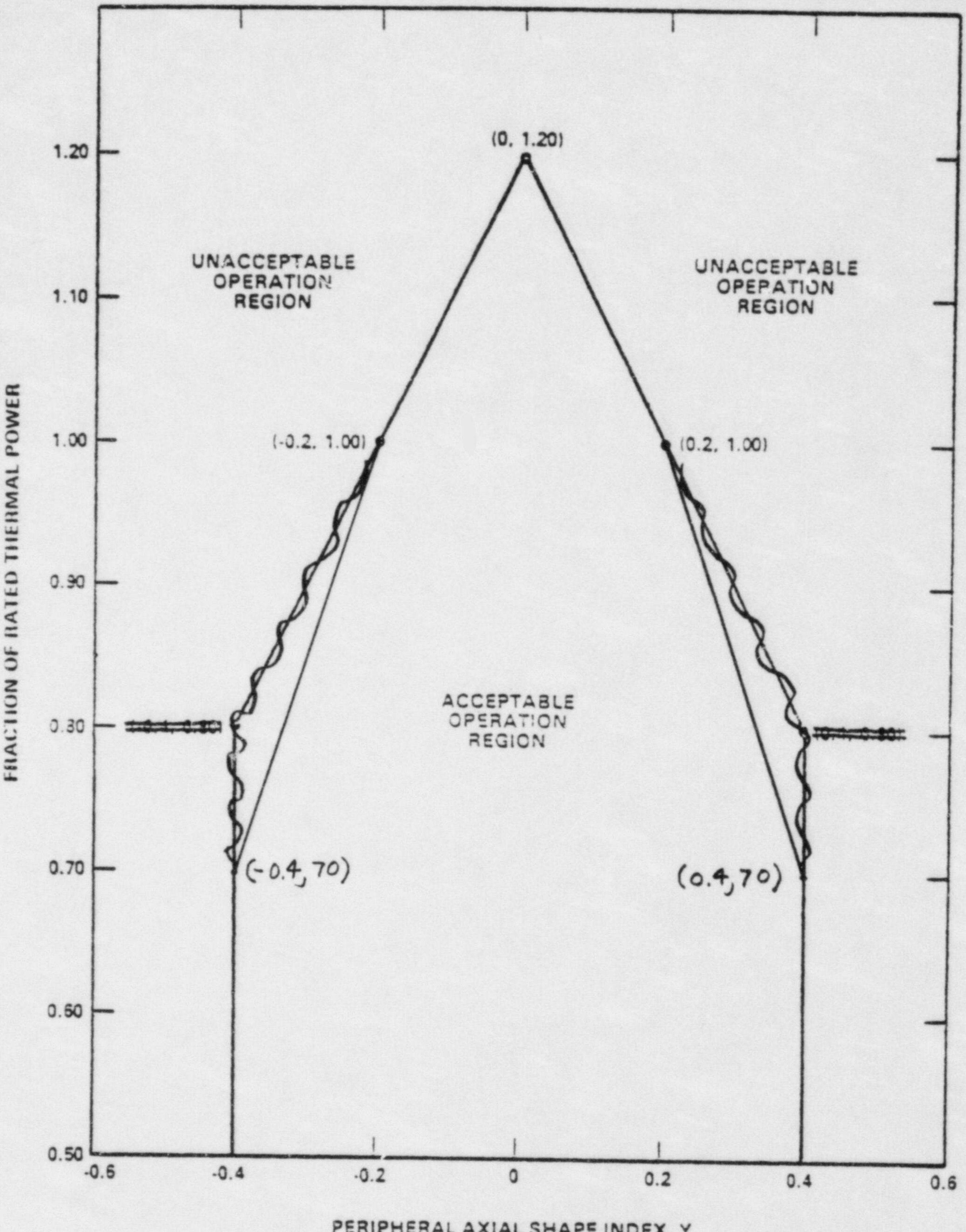


Figure 2.2-1
Peripheral Axial Shape Index, Y_I vs Fraction of Rated Thermal Power

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN - T_{avg} > 200°F

LIMITING CONDITION FOR OPERATION

4.5

3.1.1.1 The SHUTDOWN MARGIN shall be ≥ 3.5%* Δk/k.

APPLICABILITY: MODES 1, 2**, 3 and 4.

ACTION:

4.5

With the SHUTDOWN MARGIN < 3.5%* Δk/k, immediately initiate and continue boration at ≥ 40 gpm of 2300 ppm boric acid solution or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.5

4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be ≥ 3.5%* Δk/k:

a. Within one hour after detection of an inoperable CEA(s) and at least once per 12 hours thereafter while the CEA(s) is inoperable. If the inoperable CEA is immovable or untrippable, the above required SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable CEA(s).

b. When in MODES 1 or 2#, at least once per 12 hours by verifying that CEA group withdrawal is within the Transient Insertion Limits of Specification 3.1.3.6.

c. When in MODE 2##, within 4 hours prior to achieving reactor criticality by verifying that the predicted critical CEA position is within the limits of Specification 3.1.3.6.

d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading, by consideration of the factors of e below, with the CEA groups at the Transient Insertion Limits of Specification 3.1.3.6.

---

* Adherence to Technical Specification 3.1.3.6 as specified in Surveillance Requirements 4.1.1.1.1 assures that there is sufficient available shutdown margin to match the shutdown margin requirements of the safety analyses.

** See Special Test Exception 3.10.1.

\# With K_{eff} ≥ 1.0.

\#\# With K_{eff} < 1.0.

→ a. Less positive than the limit line of Figure 3.1-1a, and

REACTIVITY CONTROL SYSTEMS

MODERATOR TEMPERATURE COEFFICIENT

LIMITING CONDITION FOR OPERATION

3.1.1.4 The moderator temperature coefficient (MTC) shall be:

a. ~~Less positive than 0.7 x 10^{-4} Δk/k/°F whenever THERMAL POWER is ≤ 70% of RATED THERMAL POWER,~~

b. ~~Less positive than 0.2 x 10^{-4} Δk/k/°F whenever THERMAL POWER is > 70% of RATED THERMAL POWER, and~~

c. (b) Less negative than -2.7 x 10^{-4} Δk/k/°F at RATED THERMAL POWER.

APPLICABILITY: MODES 1 and 2*#

ACTION:

With the moderator temperature coefficient outside any one of the above limits, be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.1.1.4.1 The MTC shall be determined to be within its limits by confirmatory measurements. MTC measured values shall be extrapolated and/or compensated to permit direct comparison with the above limits.

*With K_{eff} ≥ 1.0.

#See Special Test Exception 3.10.2.

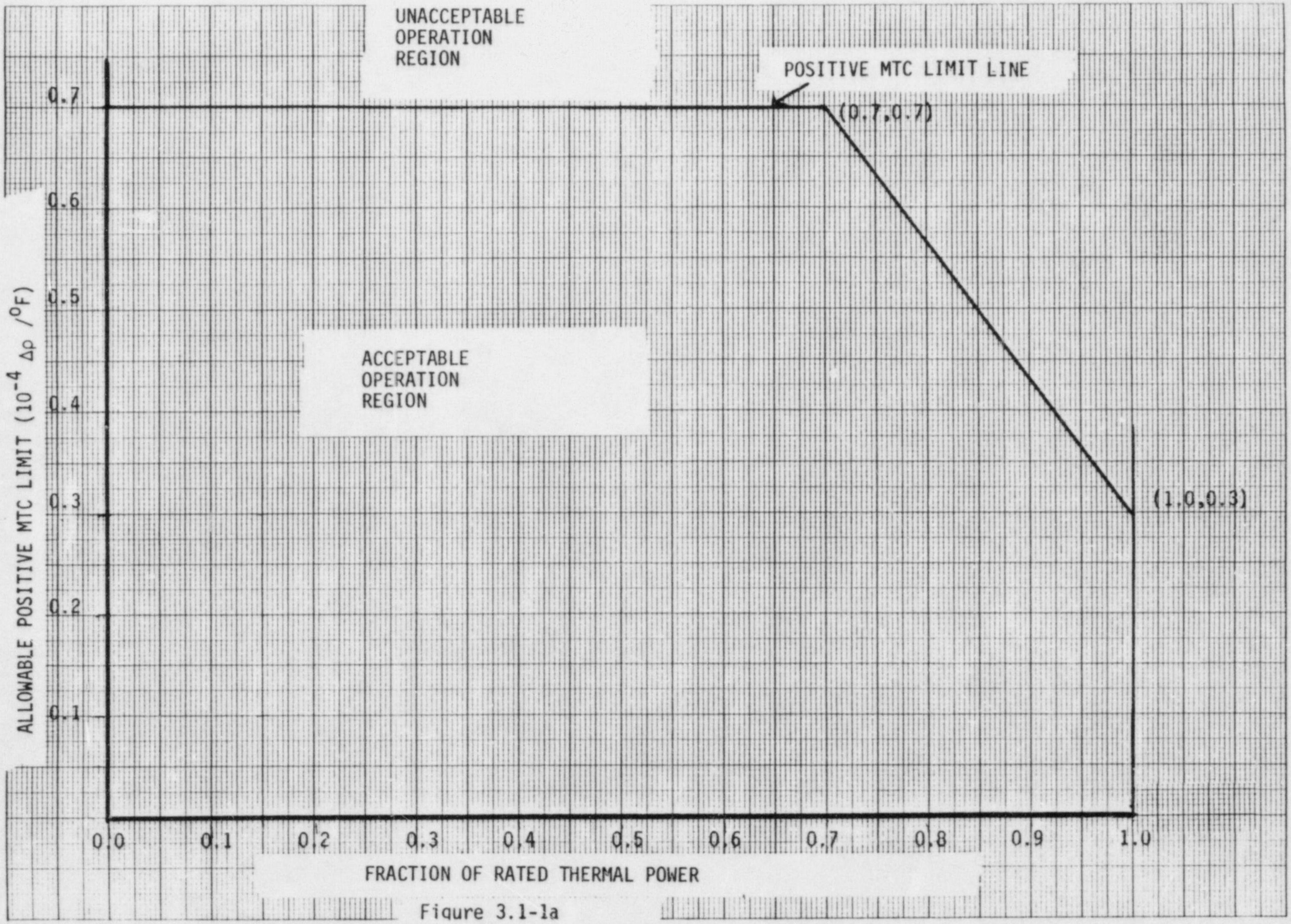

UNACCEPTABLE
OPERATION
REGION
POSITIVE MTC LIMIT LINE
(0.7,0.7)
(1.0,0.3)
ACCEPTABLE
OPERATION
REGION
ALLOWABLE POSITIVE MTC LIMIT (10^{-4} Δρ /°F)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
FRACTION OF RATED THERMAL POWER

Figure 3.1-1a

BASES

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN

A sufficient SHUTDOWN MARGIN ensures that 1) the reactor can be made subcritical from all operating conditions, 2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and 3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

SHUTDOWN MARGIN requirements vary throughout core life as a function of fuel depletion, RCS boron concentration and RCS T_{avg}. The minimum available SHUTDOWN MARGIN for no load operating conditions at beginning of life is 3.5% $\Delta k/k$ and at end of life is 3.5% $\Delta k/k$. The SHUTDOWN MARGIN is based on the safety analyses performed for a steam line rupture event initiated at no load conditions. The most restrictive steam line rupture event occurs at EOC conditions. For the steam line rupture event at beginning of cycle conditions, a minimum SHUTDOWN MARGIN of less than 3.5% $\Delta k/k$ is required to control the reactivity transient, and end of cycle conditions require 3.5% $\Delta k/k$. Accordingly, the SHUTDOWN MARGIN requirement is based upon this limiting condition and is consistent with FSAR safety analysis assumptions. With $T_{avg} \leq 200^{\circ}F$, the reactivity transients resulting from any postulated accident are minimal and a 3% $\Delta k/k$ shutdown margin provides adequate protection. With the pressurizer level less than 90 inches, the sources of non-borated water are restricted to increase the time to criticality during a boron dilution event.

3/4.1.1.3 BORON DILUTION

A minimum flow rate of at least 3000 GPM provides adequate mixing, prevents stratification and ensures that reactivity changes will be gradual during boron concentration reductions in the Reactor Coolant System. A flow rate of at least 3000 GPM will circulate an equivalent Reactor Coolant System volume of 9,601 cubic feet in approximately 24 minutes. The reactivity change rate associated with boron concentration reductions will therefore be within the capability of operator recognition and control.

3/4.1.1.4 MODERATOR TEMPERATURE COEFFICIENT (MTC)

The limitations on MTC are provided to ensure that the assumptions used in the accident and transient analyses remain valid through each fuel cycle. The surveillance requirements for measurement of the MTC during each fuel cycle are adequate to confirm the MTC value since this coefficient changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup. The confirmation that the measured MTC value is within its limit provides assurances that the coefficient will be maintained within acceptable values throughout each fuel cycle.

10.0 STARTUP TESTING

Significant changes in the power ascension phase of the startup testing program are being implemented for Cycle 8 relative to the reference cycle program (Reference 1). These modifications entail the elimination of 50% power measurements, which will reduce startup testing time significantly by eliminating the need to equilibrate xenon at the 50% power level, and the implementation of supplemental power distribution measurements at various power levels. The changes in testing procedure described herein are supported by the change in the MTC Technical Specification described in Section 9.

It is anticipated that measurements will be made from a power ascension program which will proceed in the following manner. First, power will be increased at the rate of 10% per hour between 0 and 50% power with a hold at 15% power to bring the turbine on line and a hold at 30% for chemistry control and radial power distribution (RPD) comparisons. Second, above 50% power, reactor power will be increased at the rate of 3% per hour with a hold at 60% power for RPD comparisons and a hold at 85% power for ex-core detector and calorimetric power calibration and for RPD comparisons.

The following sections discuss the major startup tests, revised per the above discussion, that are proposed for Calvert Cliffs Unit 2 Cycle 8. Sufficient data will be obtained from these tests to verify that the plant, by being within the bounds of the applicable acceptance criteria and, therefore, the safety analysis, is operating in a safe condition.

10.1 HOT FUNCTIONAL TESTING

10.1.1 CEDM Performance Testing

The proper functioning of the CEAs, CEDMs, and CEA position indicator will be verified through the insertion and withdrawal of the CEAs. Rod drop times will be measured and evaluated. Any irregularities shall be analyzed.

10.1.2 RCS Flow Verification

RCS flow rates will be verified based upon differential pressure measurements obtained across the RCPs and RV. These values will be compared for consistency to those obtained during previous testing.

10.2 INITIAL CRITICALITY

Approach to criticality will commence with the withdrawal of the Shutdown CEA Groups, followed by the withdrawal, in sequence, of the Regulating CEA Groups, concluding with Group 5 at mid-core. Criticality will be established through boron dilution. The plant will be allowed to stabilize following criticality and will then proceed to the Low Physics Tests to verify physics design parameters.

10.3 LOW POWER PHYSICS TESTING

10.3.1 CEA Symmetry Check

CEAs will be partially inserted into the core and then withdrawn from the core to confirm proper latching to their respective CEA extension shafts. A qualitative reactivity change will be apparent for single CEAs and a quantitative reactivity change for dual CEAs will be determined for the purpose of confirming core symmetry.

10.3.2 Critical Boron Concentration

Critical Boron Concentrations will be determined for ARO and Groups 5 through 1 inserted.

10.3.3 Isothermal Temperature Coefficient

By varying the RCS temperature, the Isothermal Temperature Coefficient will be determined. CEA Regulating Group 5 will be used to control and maintain flux and reactivity within a defined operating band.

10.3.4 CEA Group Worth Measurements

The RCS will be diluted/borated while the CEAs are inserted/withdrawn to compensate for a change in reactivity. These changes will be monitored via the reactivity computer.

10.4 POWER ASCENSION TESTING

As discussed previously, power ascension testing is being substantially revised for Cycle 8. It will consist of frequent monitoring of the radial power distribution during power ascension, with specific acceptance and review criteria being established at or near the 30, 60 and 85% power levels. Equilibrium testing at the 50% power level will no longer be needed. Testing at or near the 100% power level remains unchanged.

10.4.1 Radial Power Distribution Comparison at the 30, 60 and 85% Power Plateaus

The integrated radial power distribution will be monitored frequently to assure that the core is performing as expected. Specific milestone comparisons will be made with predictions at the 30, 60 and 85% power plateaus to verify acceptable core performance.

10.4.2 100% Power Plateau Testing

Upon reaching 100% power xenon equilibrium will be established with Bank 5 withdrawn approximately 105 inches. The Isothermal Temperature Coefficient (ITC) and Power Coefficient (PC) will then be measured. The measured critical boron concentration, integrated radial power distribution, ITC and PC will be compared to corresponding predictions to verify that the core is performing as expected.

10.5 ACCEPTANCE AND REVIEW CRITERIA

Acceptance and review criteria for the above startup testing are listed below.

Parameter	Acceptance Criteria	Review Criteria
CEA Drop Time	3.1 seconds	3.1 seconds
CEA Symmetry Check	None	<10% tilt [A tilt of >10% will be resolved prior to exceeding 20% power]
Critical Boron Concentration	± 100 ppm	± 50 ppm
Isothermal Temp. Coefficient		
a) 0% power	Within MTC Tech.	$\pm 0.3 \times 10^{-4} \Delta\rho/°F$
b) 100% power	Spec. limits	$\pm 0.3 \times 10^{-4} \Delta\rho/°F$
CEA Worth		
a) Bank	Greater of: ±15% ±0.1%$\Delta\rho$	Greater of: ±15% ±0.1%$\Delta\rho$
b) Total	±10%	±10%
Power Distribution		Box Powers (Interior/Peripheral Assemblies)
a) 30% power	F_r^T, F_{xy}^T and T_q	±15%/±20%
b) 60% power	within Technical	±10%/±15%
c) 85% power	Specification	±10%/±15%
d) 100% power	Limits	±10%/±15%
Power Coefficient	$\pm 0.3 \times 10^{-4} \Delta\rho$/% power	$\pm 0.2 \times 10^{-4} \Delta\rho$/% power

10.6 ACTION AND REVIEW PLAN

The Principal Engineer, Fuel Cycle Management, shall review the comparison of measurements with review/acceptance criteria.

If any review criteria are exceeded, an evaluation shall be made to determine, first, the applicability of the prediction to the precise plant conditions under which the measurement was performed and, second, the accuracy of the measurement. As a result of this review the measurement may be repeated.

If any measurement from the low power physics tests exceeds its review criterion, the Plant Operations and Review Committee shall review results of the low power physics tests and ensure that acceptance criteria are met prior to recommending operation above 5% of Rated Thermal Power. If, as a result of this review, it is determined that a Technical Specification limit has been exceeded, then appropriate action, as required by Technical Specifications, shall be taken. A similar action plan for power ascension testing shall be followed prior to increasing power beyond the 60 and 85% power plateaus.

If any acceptance criteria are exceeded, except those for bank worths (see below), the validity of the physics data input to the safety analyses for the entire cycle shall be determined. If it can be demonstrated that the measured value of the particular parameter in question when combined with the values of the other safety related parameters does not increase the severity or consequences of accidents or anticipated operational occurrence, the test results shall be deemed acceptable. Additional measurements of safety related parameters may be performed in order to support this demonstration.

If any regulating bank worth measurement falls outside of its acceptance criterion or if the total worth of the regulating banks falls outside of its acceptance criterion, shutdown Bank C shall be measured and compared with its acceptance criterion. If shutdown Bank C worth falls outside of its acceptance criterion or if the accumulated total worth of all the banks measured falls below their total worth acceptance criterion (after appropriate corrections and adjustments), then an evaluation shall be made of the validity of the safety analyses for the entire cycle, similar to the procedure discussed above for other measurement data.

If the combination of safety parameters determined above fall outside of the range of safety parameters used to support the proposed operation of the plant, the plant operating limits shall be adjusted to prevent conditions which could result in exceeding the Specified Acceptable Fuel Design Limits.

A summary report of the results of this testing shall be submitted to the NRC within 90 days of the completion of the startup test program. The report shall include a comparison of the measured and predicted value(s) for each test. If the difference between a measured and predicted value(s) exceeds its review and/or acceptance criteria, the report will discuss the actions taken and also substantiate the adequacy of those actions.

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