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R. E. DENTON
GENERAL MANAGER
CALVERT CLIFFS

October 22, 1990

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Docket No. 50-317
License No. DPR 53

Dear Sirs:

The attached LER 90-026, Revision 0, is being sent to you as required under 10 CFR 50.73 guidelines.

Should you have any questions regarding this report, we would be pleased to discuss them with you.

Very truly yours,

DWM/bjd
Attachment

cc: Mr. T. T. Martin
Director, Office of Management Information
and Program Control
Messrs: G. C. Creel
R. E. Denton
C. H. Cruse
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NRC FORM 366 (5-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Calvert Cliffs, Unit 1	0 5 0 0 0 3 1 7	1 OF 0 8

TITLE (4)

Tilted Excore Detectors Caused by Inadequate Procedural Guidance

EVENT DATE (5)			LER NUMBER (6)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 8	2 4	9 0	9 0	0 2 6	0 0		1 0	2 2	9 0	Calvert Cliffs, Unit 2	0 5 0 0 0 3 1 8
											0 5 0 0 0

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)					
POWER LEVEL (10)	0 0 0	20.402(b)		20.405(c)		50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
Daniel W. Muth, Compliance Engineer	3 0 1 — 2 6 0 - 3 5 9 2

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)

	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)				
X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On August 24, 1990, it was discovered that two Excore Nuclear Instrumentation (NI) detector wells on Unit 1 were tilted six degrees. On September 20, 1990, it was determined that these detectors would be considered not OPERABLE for the Axial Power Distribution (APD) trip while tilted. This constitutes a violation of Technical Specification (TS) 3.3.1.1.

The root cause of this event was inadequate procedural guidance.

To correct this condition, the tilted detectors were correctly positioned. The procedures for installing the detectors are being revised and appropriate personnel will be trained.

Power ascension for Unit 1 was held at 30 percent power to perform excore ASI calibrations. We also stopped to calibrate excore ASI between 85 and 90 percent power as part of our normal startup process following an extended outage. This process will be repeated during Unit 2 startup.

This issue was found during the development of routine training. It was also independently identified during a procedure review as part of the Procedure Upgrade Project underway as part of our Performance Improvement Plan. Similar deficiencies, if they exist, will be found as this project continues.

I. DESCRIPTION

On August 24, 1990, it was discovered that two Excore Nuclear Instrumentation (NI) detector wells on Unit 1 were tilted six degrees. On September 20, 1990, it was determined that these detectors would be considered not OPERABLE for the Axial Power Distribution (APD) trip while tilted. This constitutes a violation of Technical Specification (TS) 3.3.1.1, which requires three channels of input to the APD be OPERABLE.

There are four Excore Power Range NI channels (A, B, C, and D) that provide input to the Reactor Protection System (RPS). The detectors for channels A and B are fixed in place. The detectors for channels C and D are mounted in swing wells. As shown in Figure 1, there are four swing wells (1, 4, 8, and 12) for each Calvert Cliffs Unit. Wells 1 and 4 are spares which contain no detectors. The detectors for channels C and D are mounted in wells 8 and 12, respectively.

These detectors cannot be inserted or removed vertically since they are located under pipes entering the reactor vessel. Therefore, these detectors are each mounted on a hinge-type expansion joint (see Figure 2). A locking mechanism holds the detector well vertical. When released, the detector (see Figure 1), is tilted using its latching lever arm which attaches to a catch plate to hold the detector in the tilted position.

On August 24, 1990, while developing a training course on NIs, an Instrument Maintenance Instructor noticed that Maintenance Procedure RV-24B, "Out-of-Core Neutron Detector Installation" did not provide explicit instructions for positioning the NI detectors in the swing wells. The Instructor consulted with the NI System Engineer, who had been working on a revision to the procedure. The two then interviewed Instrument Maintenance technicians, who were unsure of the proper interpretation of the procedure. A subsequent inspection of Unit 1 found both susceptible detector wells tilted and unlatched. An inspection of Unit 2 on October 4, 1990 found the Channel C detector well tilted. During the time this event was discovered, Unit 1 was in MODE 5 and Unit 2 was defueled.

The System Engineer contacted the Nuclear Engineering Unit (NEU) who requested that the vendor, Combustion Engineering (CE), investigate the operability of the tilted detectors. On September 20, 1990, CE informed NEU that the detectors should be considered inoperable for the APD trip in the tilted position. TS Table 3.3-1.8 requires that three channels of input to the APD trip be OPERABLE. The ACTION requirement of this TS requires that the inoperable channels be placed in the tripped condition within an hour. The inoperability of the two channels in Unit 1 without the ACTION requirements being met constitutes a violation of this TS Table, which is referenced in TS 3.3.1.1. We have not been able to determine exactly when the detector wells became tilted. We have determined that both units operated with tilted detector wells.

II. CAUSE OF EVENT

The root cause of this event was inadequate procedural guidance. Procedures RV-24A, "Out-of-Core Neutron Detector Removal," and RV-24B, which together govern installation and removal of the detectors, did not provide explicit guidance on the use of the locking mechanism or catch plate. The procedures contained no drawings of the mechanism and no description of how it works. Instrument Maintenance personnel were trained on these procedures and hence, did not have an adequate understanding of how the locking mechanism works.

Contributing to this event was the fact that the locking mechanism and catch plate are located eight feet apart in a high radiation area. This made it very difficult to determine how the mechanism works based on observation.

III. ANALYSIS OF EVENT

The Excore NI channels provide input to RPS for the Variable Over Power Trip (VOPT), the Thermal Margin/Low Pressure (TM/LP) trip and the APD trip. The VOPT was unaffected by this event since power indications from each channel are calibrated daily to a secondary plant calorimetric. Operator logs are taken during each shift and the NI-delta T Power Alarm provides continuous monitoring of NI output. Calibration performed when an unsatisfactory condition is noted would correct for the inaccuracies caused by the six degree tilt of the C and D channels. The TM/LP trip was determined not to be very sensitive to the inaccuracies in measuring Axial Shape Index (ASI) due to the detectors being tilted. The APD trip was affected by the tilted NI detectors. The excore NI detectors measure ASI for input to the APD and TM/LP trips. CE determined that the ASI value could change in a non-conservative direction, depending on the actual core power distribution.

The APD setpoints are intended to assure compliance with safety analysis limiting conditions. The purpose of these trips is to ensure that excessive axial peaking caused by xenon oscillations or Control Element Assembly movement will not result in operation outside the analyzed operating space for the safety analysis. Neither APD trip nor an ASI generated TM/LP trip is credited in any Updated Final Safety Analysis Report Chapter 14 safety analysis scenarios as the primary trip.

ASI is measured by incore detectors to assure operation within TS Limiting Condition for Operation (LCO) for Linear Heat Rate and Departure from Nucleate Boiling. The limits of these LCOs are more conservative than the setpoint for the APD Trip, specified in TS Figure 2.2-1 (Figure 3).

Although channels C and D were potentially non-conservative for the APD and TM/LP trips for an extended period of time, channels A and B were not affected by this event. Each channel is taken out of service for about an hour for TS required monthly and quarterly surveillances. These surveillances are performed with the

plant in steady state operation, when the plant is less susceptible to an APD trip than it is during startup. It is unlikely that ASI would exceed the LCO limits at the same time either channel A or B was out of service.

In addition to the measurement of ASI, CE investigated the effect of the tilted detectors on the shape annealing factors. During initial startup of the plant, the shape annealing factors, which are used to determine the actual incore ASI based on readings from the excore detectors, were determined. Had any of the excore NI detectors been tilted during initial startup, the shape annealing factors used during the life of the plant would not have been accurate. However, CE review of the initial startup test data concluded that the Channel C detectors were vertical during initial startup of both units, when the shape annealing factors were determined.

It is not possible to confirm the orientation of Channel D in Unit 1 based on our review of initial startup data. However, it is reasonable to assume that, consistent with Channel C, Channel D was properly aligned. This is consistent with the recollection of the NSSS Startup Staff who have stated their belief that the detectors were properly aligned.

Had channel D been tilted, the effect would be to overestimate the shape annealing factor. This would result in the ASI trip always being conservative. It would also result in the TM/LP trip being conservative over most of the ASI range, including both extremes. In the remaining ASI range, a too high shape annealing factor for the TM/LP trip can be readily accommodated by conservatisms in CE's analysis. CE has confirmed that sufficient margin exists to accommodate the possibility that the Channel D shape annealing factor was determined with the detector tilted.

Based on the above, it is concluded that there are no safety consequences associated with this event.

IV. CORRECTIVE ACTION

A. The tilted detectors in both units were placed in a vertical position and correctly locked in place using the locking mechanism.

B. Power ascension for Unit 1 was held at 30 percent power to perform excore ASI calibrations. We also stopped to calibrate excore ASI between 85 and 90 percent power as part of our normal startup process following an extended outage. This process will be repeated during Unit 2 startup.

C. Procedures RV-24A/B are being revised to provide explicit guidance on the operation of the swing wells.

D. Instrument Maintenance personnel will be instructed on the correct operation of the swing well locking and catch plate mechanisms.

E. Training lessons for maintenance personnel will be updated to include the details of this LER.

F. This issue was found during the development of routine training. It was also independently identified during a procedure review as part of the Procedure Upgrade Project underway as part of our Performance Improvement Plan. These processes are effectively designed and appropriately prioritized to detect similar deficiencies if they exist.

V. ADDITIONAL INFORMATION

A. Affected Component Identification

Component	IEEE 805 System ID	IEEE 803 Component ID
Excore NI detector	IG	DET

B. Similar Events

LER 90-18, Docket 50-317, documented the unavailability of the Y channel excore power range detector for a similarly long period of time The Y channel is used to measure ASI for the LCOs when the incore detectors are unavailable due to the plant computer being out of service. This detector does not input to the APD trip.

LER 90-13, Docket 50-317, documented the inoperability of channels A, B, and D due to overly restrictive tolerances defining inoperability for a channel.

C. This condition was discovered on August 24, 1990 but was not determined to be reportable until September 20, 1990, when CE had completed its initial evaluation of the effects of the tilted detector wells on the APD Trip. This LER was determined to be due 30 days from the latter date.

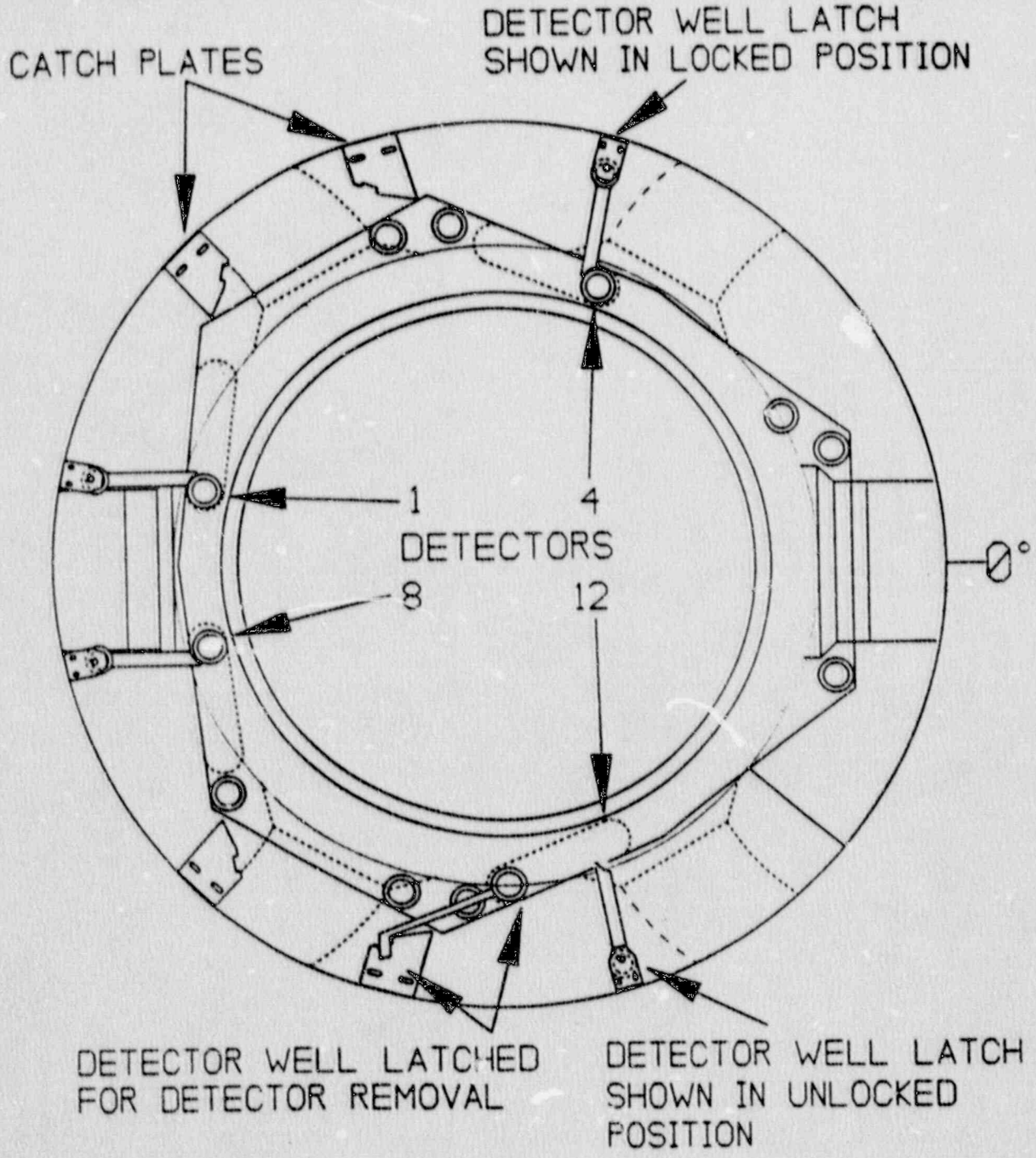
CATCH PLATES
DETECTOR WELL LATCH
SHOWN IN LOCKED POSITION
1
4
DETECTORS
8
12
0°
DETECTOR WELL LATCHED
FOR DETECTOR REMOVAL
DETECTOR WELL LATCH
SHOWN IN UNLOCKED
POSITION

FIGURE 1

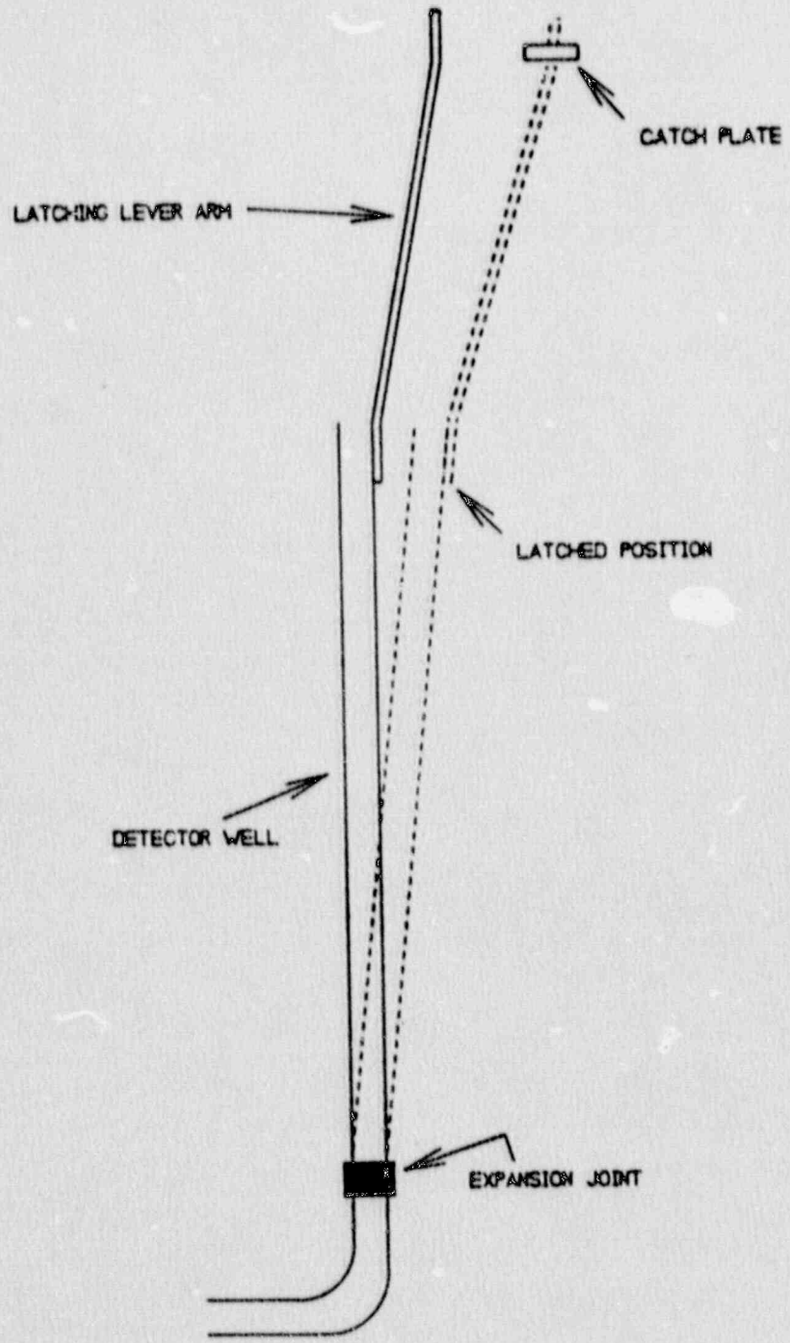
CATCH PLATE
LATCHING LEVER ARM
LATCHED POSITION
DETECTOR WELL
EXPANSION JOINT

FIGURE 2

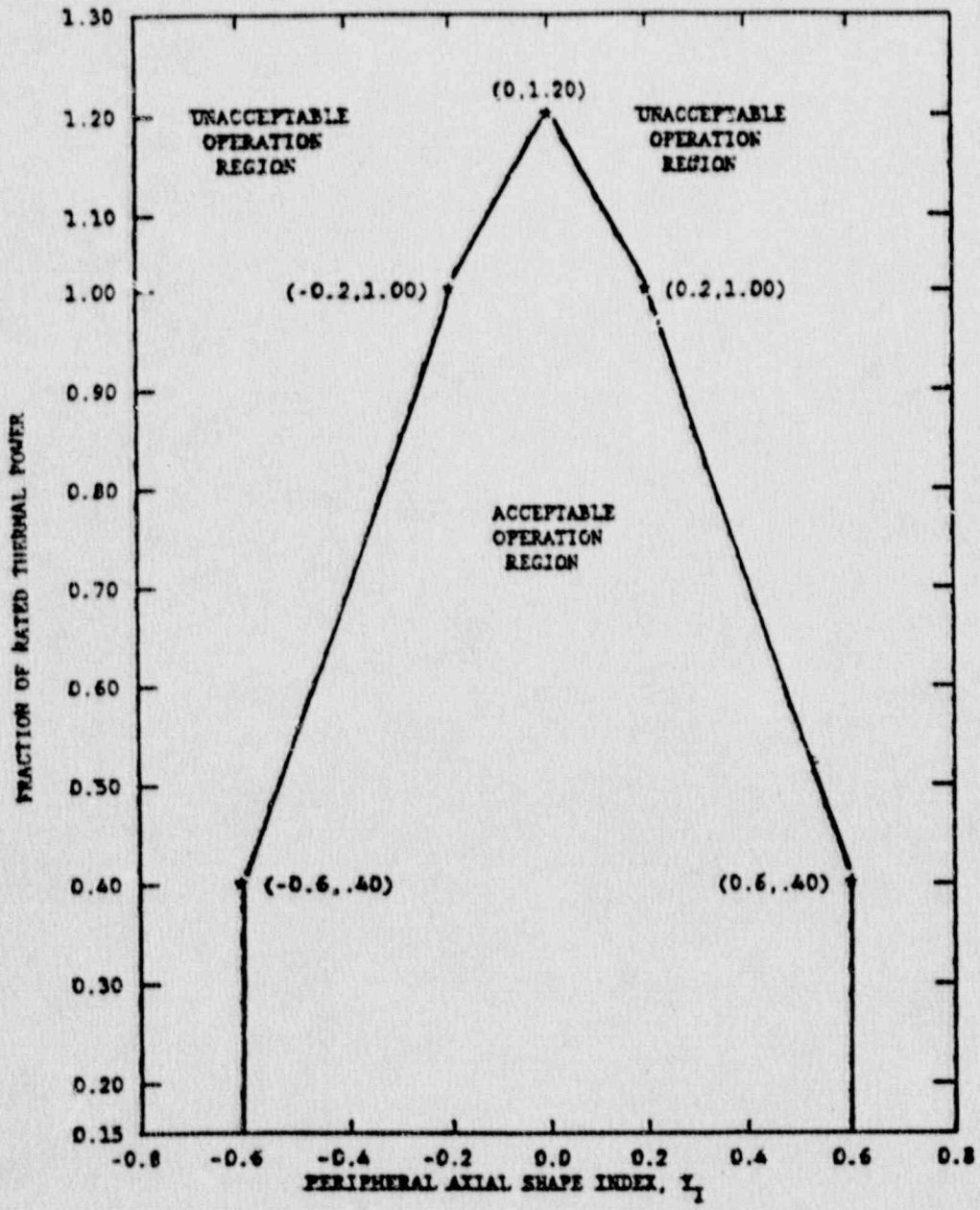

Figure 2.2-1
Peripheral Axial Shape Index, Y_I vs Fraction of Rated Thermal Power

FIGURE 3