



April 6, 2000

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555

Re: St. Lucie Unit 2  
Docket No. 50-389  
Cycle 12 Core Operating Limits Report

Pursuant to Florida Power & Light Company (FPL) Facility Operating License NPF-16 for St. Lucie Unit 2, the Core Operating Limits Report (COLR) for operating cycle 12 is submitted herewith.

Technical Specification 6.9.1.11.d requires the COLR to be provided to the NRC upon issuance for each reload cycle. Reactor operations for cycle 12 are scheduled to commence in May 2000. Accordingly, the enclosure with this letter is a copy of the *St. Lucie Unit 2, Cycle 12 Core Operating Limits Report*, Revision 0. The header shown on each page of the COLR identifies the attachment number and revision level of the issuing document, i.e., reload Plant Change/Modification (PCM) No. 99163. Compared to the previous operating cycle, Sections 2.9 and 2.10 were added to specify shutdown margin (SDM) (License Amendment 105). Under the provisions of 10 CFR 50.59, the COLR limit for SDM for  $T_{avg}$  greater than 200 °F is changed from 5000 pcm to 4500 pcm and the COLR limit for the maximum negative moderator temperature coefficient has been increased. In addition, the list of approved analytical methods has been revised consistent with license amendment 105.

Please contact us if there are any questions about this submittal.

Very truly yours,

Rajiv S. Kundalkar  
Vice President  
St. Lucie Plant

RSK/GRM

Enclosure

cc: Regional Administrator, Region II, USNRC  
Senior Resident Inspector, USNRC, St. Lucie Plant

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**ST. LUCIE UNIT 2, CYCLE 12**  
**CORE OPERATING LIMITS REPORT**

**Revision 0**

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### Table of Contents

<u>Description</u>	<u>Page</u>
1.0 Introduction	3
2.0 Core Operating Limits	
2.1 Moderator Temperature Coefficient	4
2.2 CEA Position - Misalignment > 15 inches	4
2.3 Regulating CEA Insertion Limits	4
2.4 Linear Heat Rate	4
2.5 TOTAL PLANAR RADIAL PEAKING FACTORS	5
2.6 TOTAL INTEGRATED RADIAL PEAKING FACTOR	5
2.7 DNB Parameters - AXIAL SHAPE INDEX	5
2.8 Refueling Operations - Boron Concentration	5
2.9 SHUTDOWN MARGIN - $T_{avg}$ Greater Than 200 °F	5
2.10 SHUTDOWN MARGIN - $T_{avg}$ Less Than or Equal To 200 °F	5
3.0 List of Approved Methods	12

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### List of Figures

<u>Figure</u>	<u>Title</u>	<u>Page</u>
3.1-1a	Allowable Time To Realign CEA vs. Initial $F_r^T$	6
3.1-2	CEA Insertion Limits vs. THERMAL POWER	7
3.2-1	Allowable Peak Linear Heat Rate vs. Burnup	8
3.2-2	AXIAL SHAPE INDEX vs. Maximum Allowable Power Level	9
3.2-3	Allowable Combinations of THERMAL POWER and $F_r^T$ , $F_{xy}^T$	10
3.2-4	AXIAL SHAPE INDEX Operating Limits vs. THERMAL POWER	11

## 1.0 INTRODUCTION

This Core Operating Limits Report (COLR) describes the cycle-specific parameter limits for operation of St. Lucie Unit 2 Cycle 12. It contains the limits for the following as provided in Section 2.

Moderator Temperature Coefficient

CEA Position - Misalignment > 15 Inches

Regulating CEA Insertion Limits

Linear Heat Rate

TOTAL PLANAR RADIAL PEAKING FACTORS -  $F_{xy}^T$

TOTAL INTEGRATED RADIAL PEAKING FACTOR -  $F_r^T$

DNB Parameter - AXIAL SHAPE INDEX

Refueling Operations - Boron Concentration

SHUTDOWN MARGIN -  $T_{avg}$  Greater Than 200 °F

SHUTDOWN MARGIN -  $T_{avg}$  Less Than or Equal To 200 °F

This report also contains the necessary figures, which give the limits for the above listed parameters.

Terms appearing in capitalized type are DEFINED TERMS as defined in Section 1.0 of the Technical Specifications.

This report is prepared in accordance with the requirements of Technical Specification 6.9.1.11.

## 2.0 CORE OPERATING LIMITS

### 2.1 Moderator Temperature Coefficient (TS 3.1.1.4)

The moderator temperature coefficient (MTC) shall be less negative than -32 pcm/<sup>0</sup>F at RATED THERMAL POWER.

### 2.2 CEA Position - Misalignment > 15 Inches (TS 3.1.3.1)

The time constraints for full power operation with one full-length CEA misaligned from any other CEA in its group by more than 15 inches are shown in Figure 3.1-1a.

### 2.3 Regulating CEA Insertion Limits (TS 3.1.3.6)

The regulating CEA groups shall be limited to the withdrawal sequence and to the insertion limits shown on Figure 3.1-2, with CEA insertion between the Long Term Steady State Insertion Limits and the Power Dependent Insertion Limits restricted to:

- a. Less than or equal to 4 hours per 24 hour interval,
- b. Less than or equal to 5 Effective Full Power Days per 30 Effective Full Power Days, and
- c. Less than or equal to 14 Effective Full Power Days per calendar year.

### 2.4 Linear Heat Rate (TS 3.2.1)

The linear heat rate shall not exceed the limits shown on Figure 3.2-1.

The AXIAL SHAPE INDEX power dependent control limits are shown on Figure 3.2-2.

During operation, with the linear heat rate being monitored by the Excore Detector Monitoring System, the AXIAL SHAPE INDEX shall be maintained within the limits of Figure 3.2-2.

During operation, with the linear heat rate being monitored by the Incore Detector Monitoring System, the Local Power Density alarm setpoints shall be adjusted to less than or equal to the limits shown on Figure 3.2-1.

2.5 TOTAL PLANAR RADIAL PEAKING FACTORS -  $F_{xy}^T$  (TS 3.2.2)

The calculated value of  $F_{xy}^T$  shall be limited to  $\leq 1.75$ .

The power dependent  $F_{xy}^T$  limits are shown on Figure 3.2-3.

2.6 TOTAL INTEGRATED RADIAL PEAKING FACTOR -  $F_r^T$  (TS 3.2.3)

The calculated value of  $F_r^T$  shall be limited to  $\leq 1.70$ .

The power dependent  $F_r^T$  limits are shown on Figure 3.2-3.

2.7 DNB Parameters - AXIAL SHAPE INDEX (TS 3.2.5)

The AXIAL SHAPE INDEX shall be maintained within the limits specified in Figure 3.2-4.

2.8 Refueling Operations - Boron Concentration (TS 3.9.1)

With the reactor vessel head closure bolts less than fully tensioned or with the head removed, the boron concentration of all filled portions of the Reactor Coolant System and the refueling canal shall be maintained uniform and sufficient to ensure that the more restrictive of the following reactivity conditions is met:

- a. Either a  $K_{eff}$  of 0.95 or less, or
- b. A boron concentration of greater than or equal to 1720 ppm.

2.9 SHUTDOWN MARGIN -  $T_{avg}$  Greater Than 200 °F (TS 3.1.1.1)

The SHUTDOWN MARGIN shall be greater than or equal to 4500 pcm.

2.10 SHUTDOWN MARGIN -  $T_{avg}$  Less Than or Equal To 200 °F (TS 3.1.1.2)

The SHUTDOWN MARGIN shall be greater than or equal to 3000 pcm.

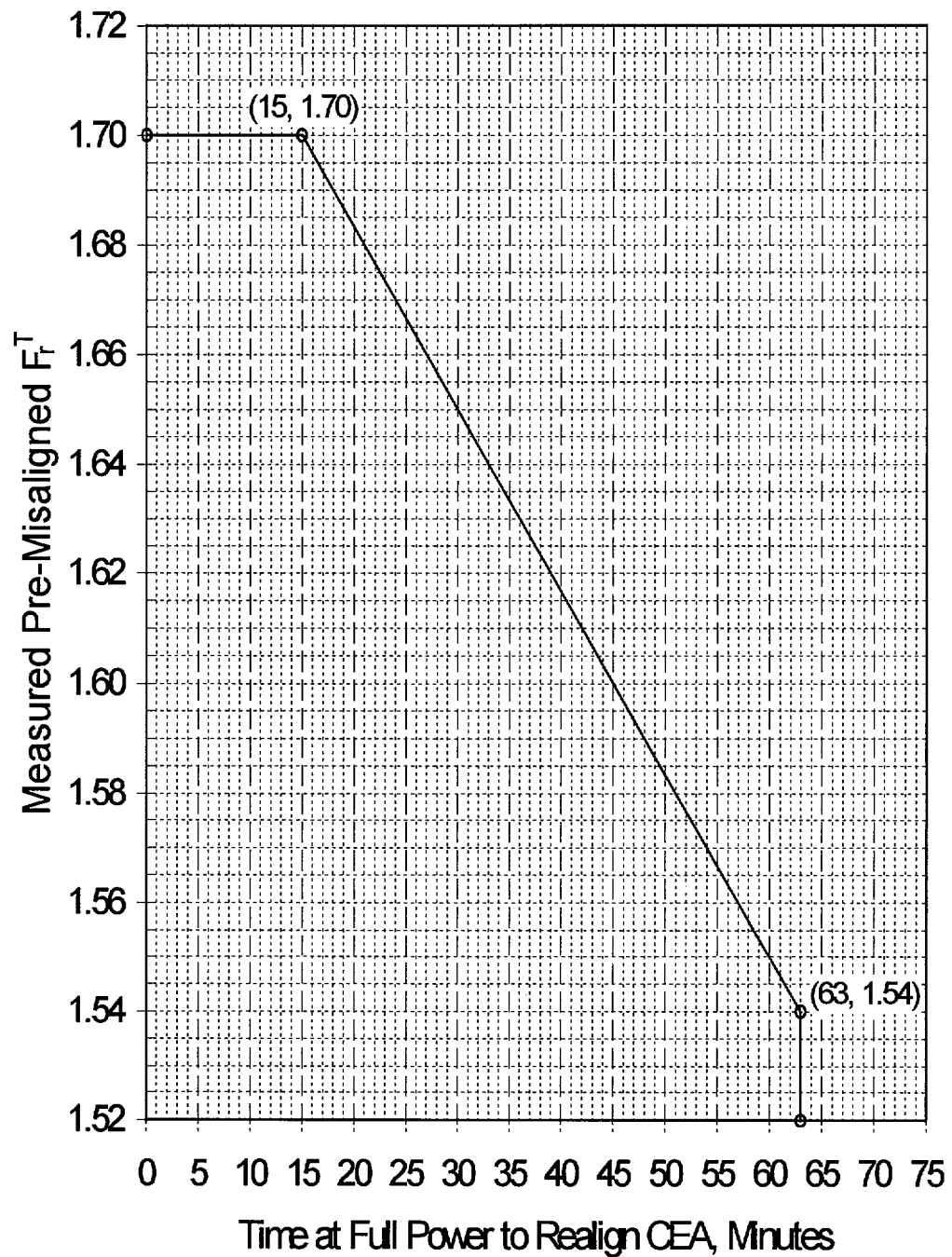
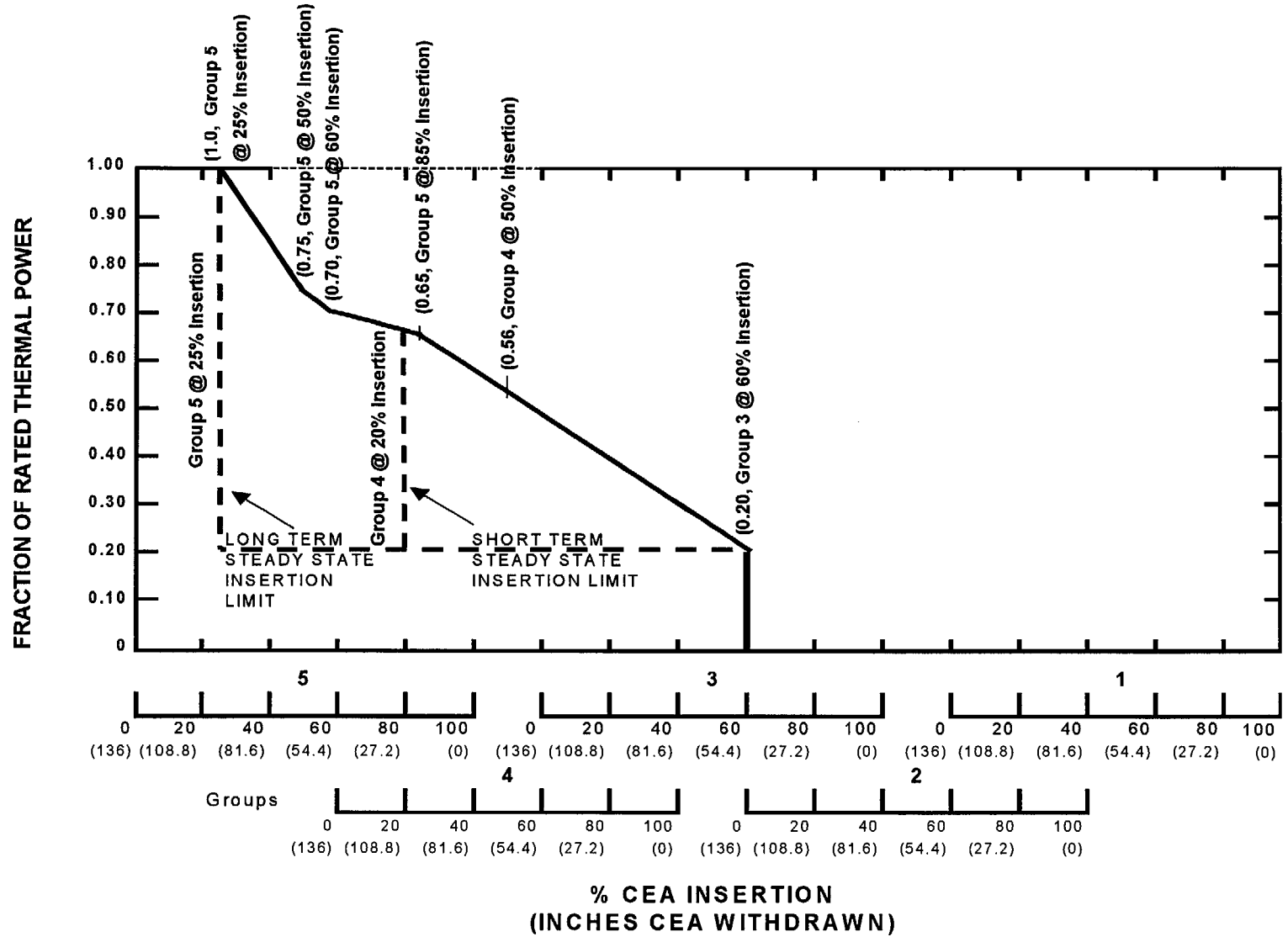


FIGURE 3.1-1a  
Allowable Time to Realign CEA vs. Initial  $F_r^T$



**FIGURE 3.1-2**  
**CEA Group Insertion Limits vs. THERMAL POWER**



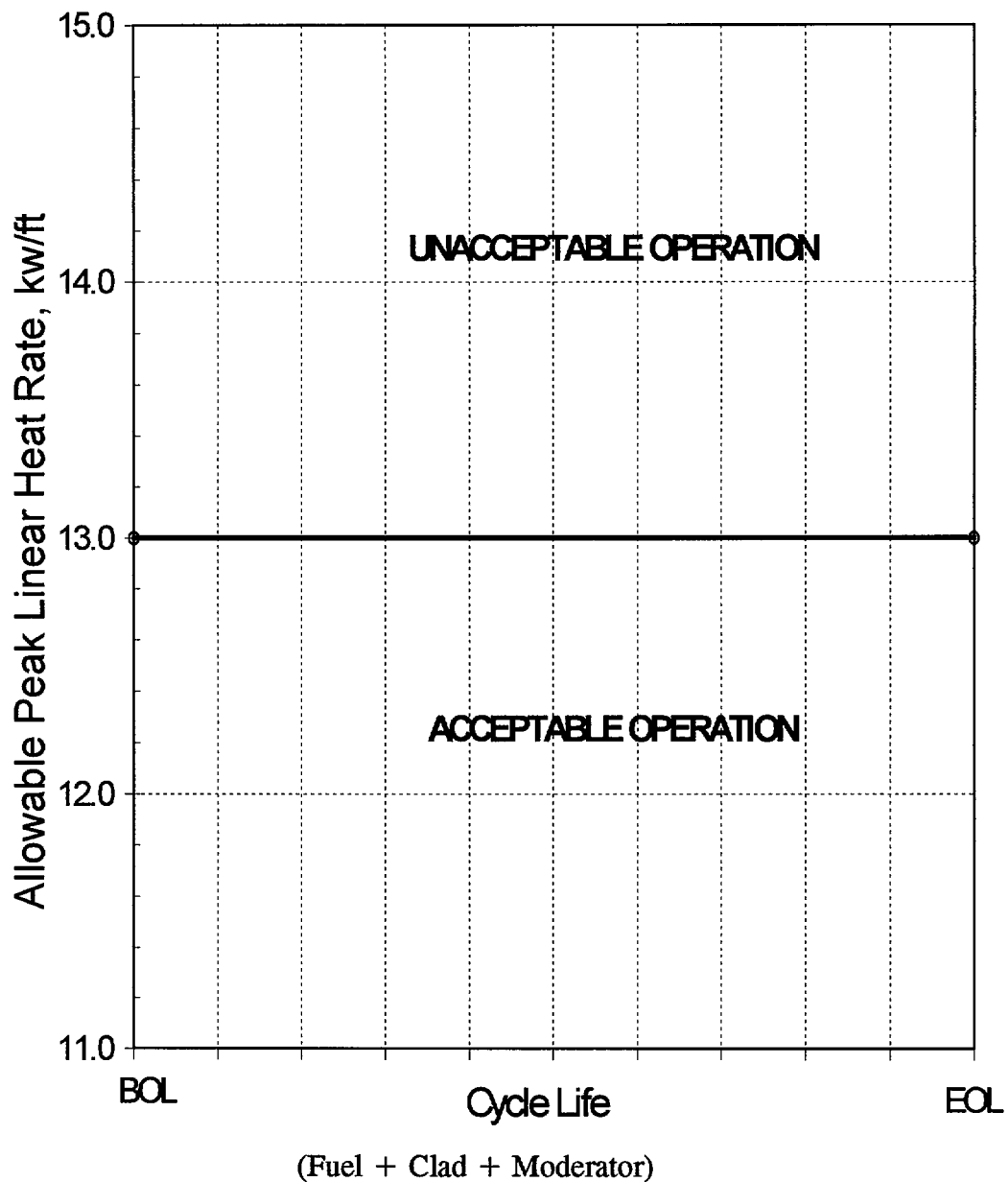
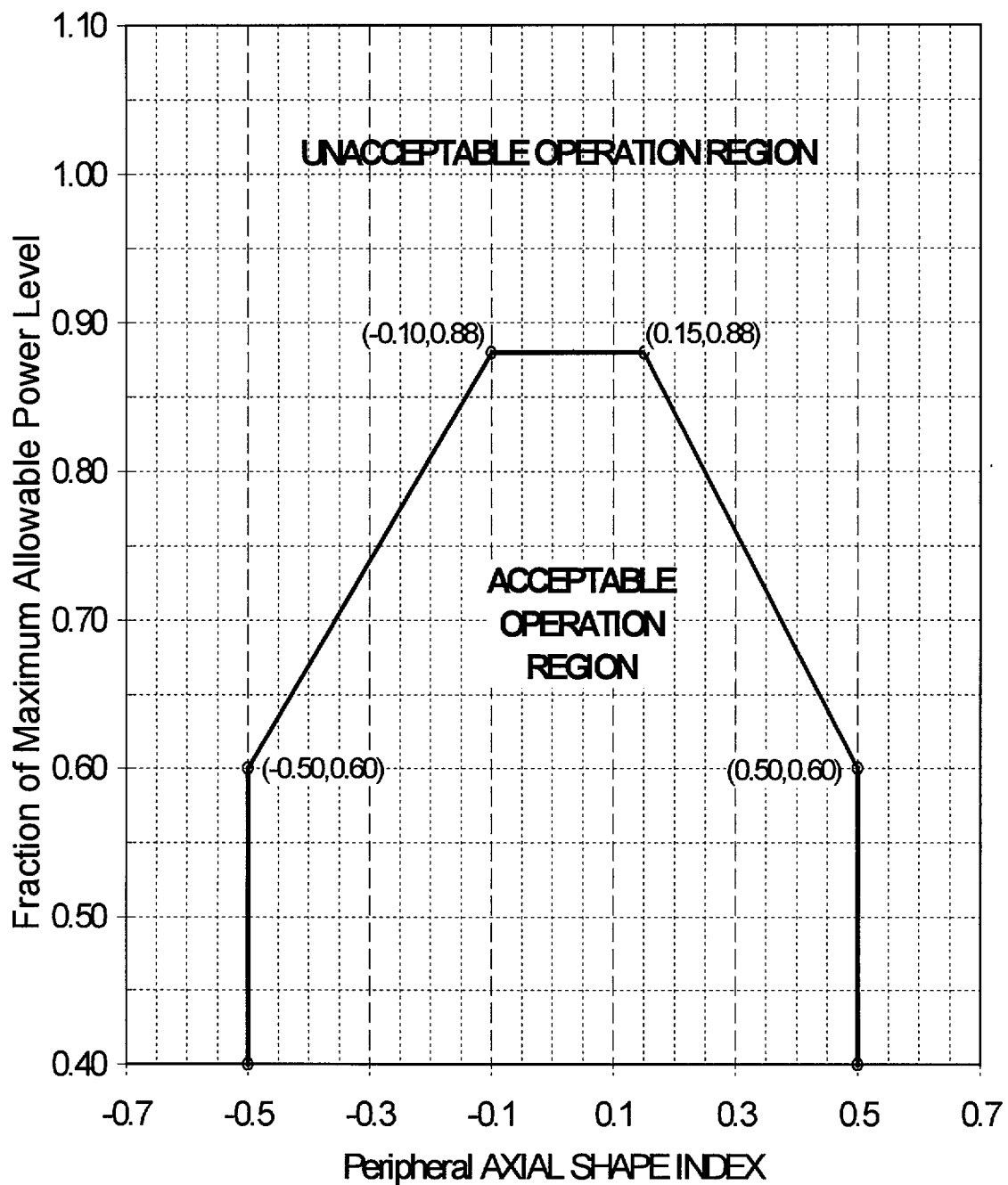


FIGURE 3.2-1  
Allowable Peak Linear Heat Rate vs. Burnup



(Not Applicable Below 40% Power)

FIGURE 3.2-2  
AXIAL SHAPE INDEX vs. Maximum Allowable Power Level

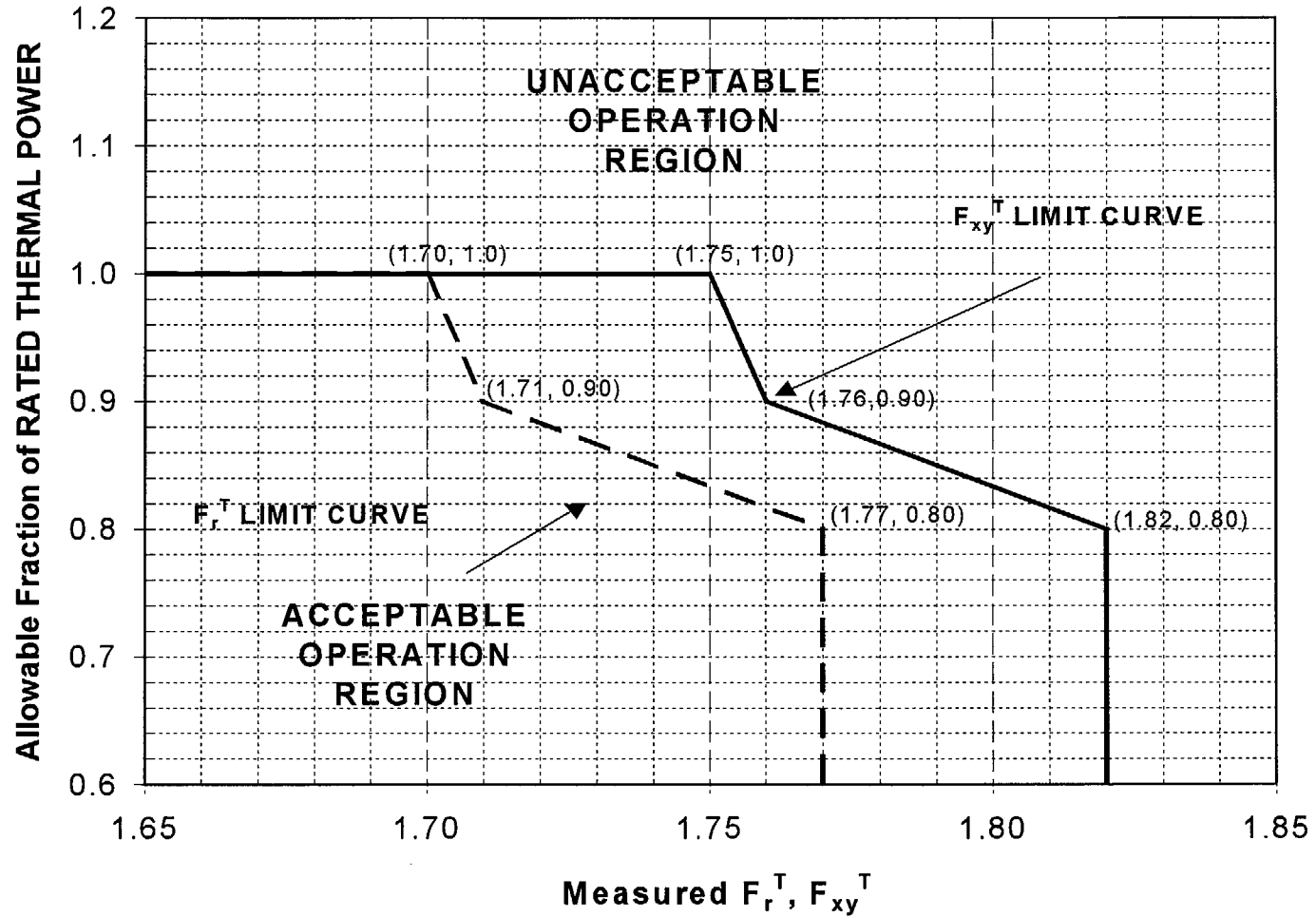


FIGURE 3.2-3  
Allowable Combinations of THERMAL POWER and  $F_r^T, F_{xy}^T$

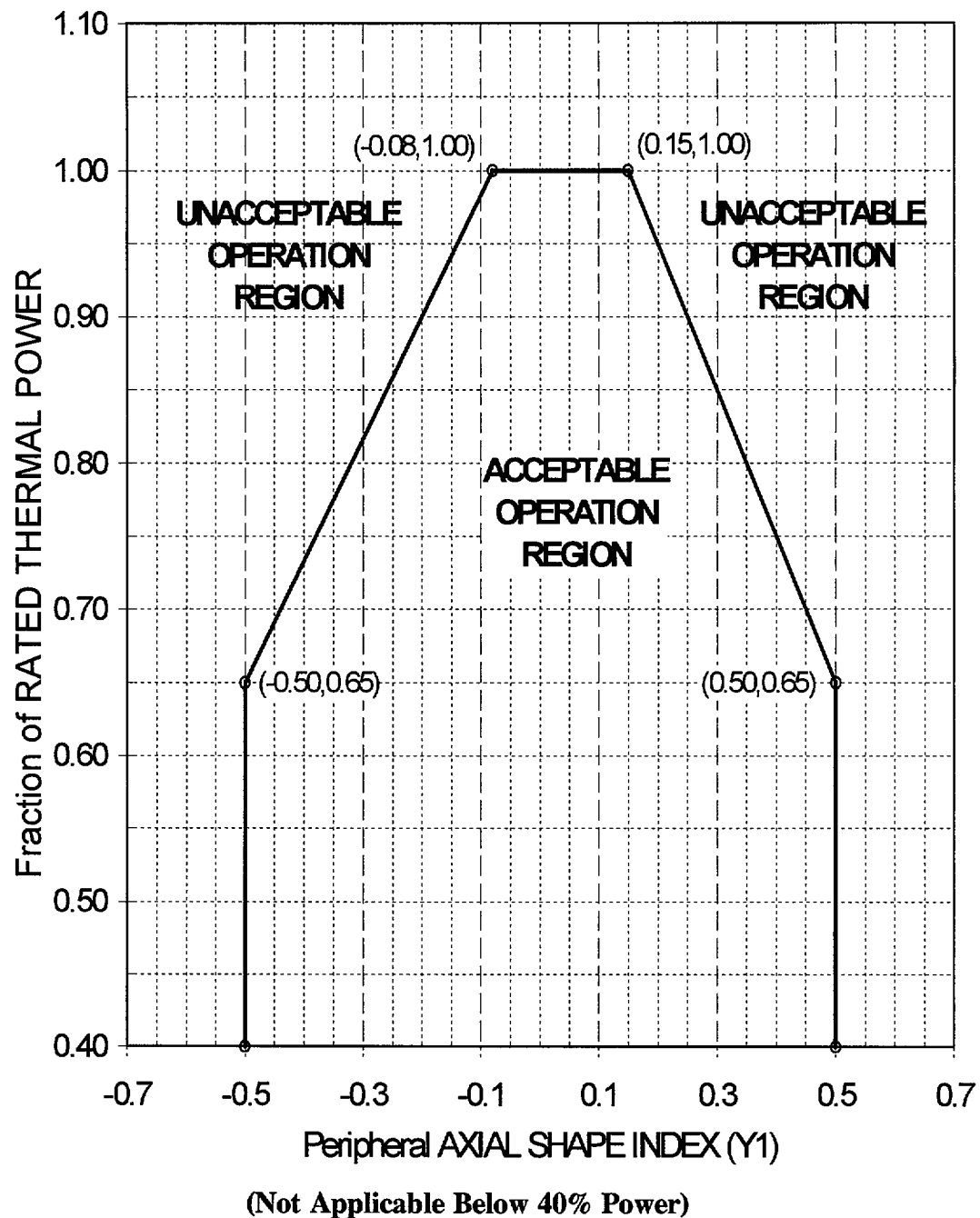


FIGURE 3.2-4  
AXIAL SHAPE INDEX Operating Limits vs. THERMAL POWER  
(Four Reactor Coolant Pumps Operating)

### 3.0 LIST OF APPROVED METHODS

The analytical methods used to determine the core operating limits are those previously approved by the NRC, and are listed below.

1. WCAP-11596-P-A, "Qualification of the PHOENIX-P/ANC Nuclear Design System for Pressurized Water Reactor Cores," June 1988 (Westinghouse Proprietary)
2. NF-TR-95-01, "Nuclear Physics Methodology for Reload Design of Turkey Point & St. Lucie Nuclear Plants," Florida Power & Light Company, January 1995 (NRC SER dated June 9, 1995), & Supplement 1, August 1997
3. CENPD-199-P, Rev. 1-P-A, "C-E Setpoint Methodology: CE Local Power Density and DNB LSSS and LCO Setpoint Methodology for Analog Protection Systems," January 1986
4. CENPD-266-P-A, "The ROCS and DIT Computer Code for Nuclear Design," April 1983
5. CENPD-275-P, Revision 1-P-A, "C-E Methodology for Core Designs Containing Gadolinia-Urania Burnable Absorbers," May 1988, & Revision 1-P Supplement 1-P-A, April 1999
6. CENPD-188-A, "HERMITE: A Multi-Dimensional Space - Time Kinetics Code for PWR Transients," July 1976
7. CENPD-153-P, Rev. 1-P-A, "Evaluation of Uncertainty in the Nuclear Power Peaking Measured by the Self-Powered, Fixed Incore Detector System," May 1980
8. CEN-123(F)-P, "Statistical Combination of Uncertainties Methodology Part 1: C-E Calculated Local Power Density and Thermal Margin/Low Pressure LSSS for St. Lucie Unit 1," December 1979
9. CEN-123(F)-P, "Statistical Combination of Uncertainties Methodology Part 2: Combination of System Parameter Uncertainties in Thermal Margin Analyses for St. Lucie Unit 1," January 1980
10. CEN-123(F)-P, "Statistical Combination of Uncertainties Methodology Part 3: C-E Calculated Departure from Nucleate Boiling and Linear Heat Rate Limiting Conditions for Operation for St. Lucie Unit 1," February 1980
11. CEN-191(B)-P, "CETOP-D Code Structure and Modeling Methods for Calvert Cliffs Units 1 and 2," December 1981

12. Letter, J. W. Miller (NRC) to J. R. Williams, Jr. (FPL), Docket No. 50-389, Regarding Unit 2 Cycle 2 License Approval (Amendment No. 8 to NPF-16 and SER), November 9, 1984 (Approval of CEN-123(F)-P (three parts) and CEN-191(B)-P)
13. CEN-371(F)-P, "Extended Statistical Combination of Uncertainties," July 1989
14. Letter, J. A. Norris (NRC) to J. H. Goldberg (FPL), Docket No. 50-389, "St. Lucie Unit 2 - Change to Technical Specification Bases Sections '2.1.1 Reactor Core' and '3/4.2.5 DNB Parameters' (TAC No. M87722)," March 14, 1994 (Approval of CEN-371(F)-P)
15. CENPD-161-P-A, "TORC Code, A Computer Code for Determining the Thermal Margin of a Reactor Core," April 1986
16. CENPD-162-P-A, "Critical Heat Flux Correlation for C-E Fuel Assemblies with Standard Spacer Grids Part 1, Uniform Axial Power Distribution," April 1975
17. CENPD-207-P-A, "Critical Heat Flux Correlation for C-E Fuel Assemblies with Standard Spacer Grids Part 2, Non-uniform Axial Power Distribution," December 1984
18. CENPD-206-P-A, "TORC Code, Verification and Simplified Modeling Methods," June 1981
19. CENPD-225-P-A, "Fuel and Poison Rod Bowing," June 1983
20. CENPD-139-P-A, "C-E Fuel Evaluation Model Topical Report," July 1974
21. CEN-161(B)-P-A, "Improvements to Fuel Evaluation Model," August 1989
22. CEN-161(B)-P, Supplement 1-P-A, "Improvements to Fuel Evaluation Model," January 1992
23. CENPD-132, Supplement 3-P-A, "Calculative Methods for the C-E Large Break LOCA Evaluation Model for the Analysis of C-E and W Designed NSSS," June 1985
24. CENPD-133, Supplement 5-A, "CEFLASH-4A, A FORTRAN77 Digital Computer Program for Reactor Blowdown Analysis," June 1985
25. CENPD-134, Supplement 2-A, "COMPERC-II, a Program for Emergency Refill-Reflood of the Core," June 1985
26. CENPD-135-P, Supplement 5, "STRIKIN-II, A Cylindrical Geometry Fuel Rod Heat Transfer Program," April 1977

27. Letter, R. L. Baer (NRC) to A. E. Scherer (CE), "Evaluation of Topical Report CENPD-135, Supplement #5," September 6, 1978
28. CENPD-137, Supplement 1-P, "Calculative Methods for the C-E Small Break LOCA Evaluation Model," January 1977
29. CENPD-133, Supplement 3-P, "CEFLASH-4AS, A Computer Program for the Reactor Blowdown Analysis of the Small Break Loss of Coolant Accident," January 1977
30. Letter, K. Kniel (NRC) to A. E. Scherer (CE), "Evaluation of Topical Reports CENPD-133, Supplement 3-P and CENPD-137, Supplement 1-P," September 27, 1977
31. CENPD-138, Supplement 2-P, "PARCH, A FORTRAN-IV Digital Program to Evaluate Pool Boiling, Axial Rod and Coolant Heatup," January 1977
32. Letter, C. Aniel (NRC) to A. E. Scherer (CE), "Evaluation of Topical Report CENPD-138, Supplement 2-P," April 10, 1978
33. Letter, W. H. Bohlke (FPL) to Document Control Desk (NRC), "St. Lucie Unit 2, Docket No. 50-389, Proposed License Amendment, MTC Change from -27 pcm to -30 pcm," L-91-325, December 17, 1991
34. Letter, J. A. Norris (NRC) to J. H. Goldberg (FPL), "St. Lucie Unit 2 - Issuance of Amendment Re: Moderator Temperature Coefficient (TAC No. M82517)," July 15, 1992
35. Letter, J. W. Williams, Jr. (FPL) to D. G. Eisenhower (NRC), "St. Lucie Unit No. 2, Docket No. 50-389, Proposed License Amendment, Cycle 2 Reload," L-84-148, June 4, 1984
36. Letter, J. R. Miller (NRC) to J. W. Williams, Jr. (FPL), Docket No. 50-389, Regarding Unit 2 Cycle 2 License Approval (Amendment No. 8 to NPF-16 and SER), November 9, 1984 (Approval of Methodology contained in L-84-148)
37. Letter, A. E. Scherer Enclosure 1-P to LD-82-001, "CESEC-Digital Simulation of a Combustion Engineering Nuclear Steam Supply System," December 1981
38. Safety Evaluation Report, "CESEC Digital Simulation of a Combustion Engineering Steam Supply System (TAC No.: 01142)," October 27, 1983
39. CENPD-282-P-A, Volumes 1, 2, and 3, and Supplement 1, "Technical Manual for the CENTS Code," February 1991, February 1991, October 1991, and June 1993, respectively

40. CEN-121(B)-P, "CEAW, Method of Analyzing Sequential Control Element Assembly Group Withdrawal Event for Analog Protected Systems," November 1979 (NRC SER dated December 21, 1999, Letter K. N. Jabbour (NRC) to T. F. Plunkett (FPL), TAC No. MA4523)
41. CEN-133(B), "FIESTA, A One Dimensional, Two Group Space-Time Kinetics Code for Calculating PWR Scram Reactivities," November 1979 (NRC SER dated December 21, 1999, Letter K. N. Jabbour (NRC) to T. F. Plunkett (FPL), TAC No. MA4523)
42. CEN-348(B)-P-A, Supplement 1-P-A, "Extended Statistical Combination of Uncertainties," January 1997
43. CEN-372-P-A, "Fuel Rod Maximum Allowable Gas Pressure," May 1990
44. CENPD-183-A, "C-E Methods for Loss of Flow Analysis," June 1984
45. CENPD-190-A, "C-E Method for Control Element Assembly Ejection Analysis," July 1976
46. CENPD-199-P, Rev. 1-P-A, Supplement 2-P-A, "CE Setpoint Methodology," June 1998
47. CENPD-382-P-A, "Methodology for Core Designs Containing Erbium Burnable Absorbers," August 1993
48. CEN-396(L)-P, "Verification of the Acceptability of a 1-Pin Burnup Limit of 60 MWD/KG for St. Lucie Unit 2," November 1989 (NRC SER dated October 18, 1991, Letter J. A. Norris (NRC) to J. H. Goldberg (FPL), TAC No. 75947)
49. CENPD-269-P, Rev. 1-P, "Extended Burnup Operation of Combustion Engineering PWR Fuel," July 1984
50. CEN-289(A)-P, "Revised Rod Bow Penalties for Arkansas Nuclear One Unit 2," December 1984 (NRC SER dated December 21, 1999, Letter K. N. Jabbour (NRC) to T. F. Plunkett (FPL), TAC No. MA4523)
51. CENPD-137, Supplement 2-P-A, "Calculative Methods for the ABB CE Small Break LOCA Evaluation Model," April 1998
52. CENPD-140-A, "Description of the CONTRANS Digital Computer Code for Containment Pressure and Temperature Transient Analysis," June 1976
53. CEN-365(L), "Boric Acid Concentration Reduction Effort, Technical Bases and Operational Analysis," June 1988 (NRC SER dated March 13, 1989, Letter J. A. Norris (NRC) to W. F. Conway (FPL), TAC No. 69325)



54. DP-456, F. M. Stern (CE) to E. Case (NRC), dated August 19, 1974, Appendix 6B to CESSAR System 80 PSAR (NRC SER, NUREG-75/112, Docket No. STN 50-470, "NRC SER - Standard Reference System, CESSAR System 80," December 1975)