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April 21, 2004

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 1; Docket No. 50-317
Core Operating Limits Report for Unit 1, Cycle 17, Revision 0

Pursuant to Calvert Cliffs Nuclear Power Plant Technical Specification 5.6.5, the attached Core Operating Limits Report for Unit 1, Cycle 17, Revision 0 (Attachment 1) is provided for your records.

Please replace the Unit 1 Core Operating Limits Report in its entirety, with the attached Revision 0.

Should you have questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,

GV/CAN/bjd

Attachment: (1) Core Operating Limits Report for Unit 1, Cycle 17, Revision 0

cc: **(Without Attachment)**
J. Petro, Esquire
J. E. Silberg, Esquire
Director, Project Directorate I-1, NRC
G. S. Vissing, NRC
H. J. Miller, NRC
Resident Inspector, NRC
R. I. McLean, DNR

A001

ATTACHMENT (1)

CORE OPERATING LIMITS REPORT

UNIT 1, CYCLE 17, REVISION 0

Calvert Cliffs Nuclear Power Plant, Inc.
April 21, 2004

CALVERT CLIFFS NUCLEAR POWER PLANT

CORE OPERATING LIMITS REPORT

for

UNIT 1, CYCLE 17

REVISION 0

Kent A. L. Wood/ 04/03/04
RESPONSIBLE ENGINEER / DATE

J. Houston Penny/ 4/5/2004
INDEPENDENT REVIEWER / DATE

Philip I. Wengloski/ 4/14/04
PRINCIPAL ENGINEER - FOSU / DATE

CORE OPERATING LIMITS REPORT

CALVERT CLIFFS UNIT 1, CYCLE 17

The following limits are included in this Core Operating Limits Report:

The following figures are included in this Core Operating Limits Report:

UNIT 1
CORE OPERATING LIMITS REPORT
LIST OF EFFECTIVE PAGES

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1	0
2	0
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INTRODUCTION

This report provides the cycle-specific core operating limits for operation of Calvert Cliffs Unit 1, Cycle 17. It contains the limits for:

Shutdown Margin (SDM)
Moderator Temperature Coefficient (MTC)
Control Element Assembly (CEA) Alignment
Regulating Control Element Assembly (CEA) Insertion Limits
Linear Heat Rate (LHR)
Total Planar Radial Peaking Factor (F_{xy}^T)
Total Integrated Radial Peaking Factor (F_r^T)
Axial Shape Index (ASI)
Reactor Protective System (RPS) Instrumentation – Operating
Boron Concentration

In addition, this report contains a number of figures which provides limits on the parameters listed above. If any of the limits contained in this report are exceeded, corrective action will be taken as defined in the Technical Specifications.

This report has been prepared in accordance with the requirements of the Technical Specifications. The cycle specific limits have been developed using the NRC-approved methodologies given in the "List of Approved Methodologies" section of this report and the Technical Specifications.

COLR Revision 0

COLR Revision 0 is the initial issue for Unit 1 Cycle 17, it is limited to operation in Modes 5 and 6.

DEFINITIONS

Axial Shape Index (ASI)

ASI shall be the power generated in the lower half of the core less the power generated in the upper half of the core, divided by the sum of the power generated in the lower and upper halves of the core.

$$ASI = \frac{\text{lower} - \text{upper}}{\text{lower} + \text{upper}} = Y_E$$

The Axial Shape Index (Y_I) used for the trip and pretrip signals in the Reactor Protection System (RPS) is the above value (Y_E) modified by an appropriate multiplier (A) and a constant (B) to determine the true core axial power distribution for that channel.

$$Y_I = AY_E + B$$

Total Integrated Radial Peaking Factor - F_r^T

The Total Integrated Radial Peaking Factor is the ratio of the peak pin power to the average pin power in an unrodded core.

Total Planar Radial Peaking Factor - F_{xy}^T

The Total Planar Radial Peaking Factor is the maximum ratio of the peak to average power density of the individual fuel rods in any of the unrodded horizontal planes.

CYCLE SPECIFIC LIMITS FOR UNIT 1, CYCLE 17

3.1.1 Shutdown Margin (SDM) (SR 3.1.1.1)

Tavg > 200 °F - Modes 3 and 4:

Not applicable in Modes 5 and 6.

Tavg ≤ 200 °F - Mode 5:

The shutdown margin shall be ≥ 3.0% Δρ.

3.1.3 Moderator Temperature Coefficient (MTC) (SR 3.1.3.2)

Not applicable in Modes 5 and 6.

3.1.4 Control Element Assembly (CEA) Alignment (Action 3.1.4.B.1)

Not applicable in Modes 5 and 6.

3.1.6 Regulating Control Element Assembly (CEA) Insertion Limits (SR 3.1.6.1 and SR 3.1.6.2)

Not applicable in Modes 5 and 6.

3.2.1 Linear Heat Rate (LHR) (SR 3.2.1.2 and SR 3.2.1.4)

Not applicable in Modes 5 and 6.

CYCLE SPECIFIC LIMITS FOR UNIT 1, CYCLE 17

3.2.2 Total Planar Radial Peaking Factor (F_{xy}^T) (SR 3.2.1.1 and SR 3.2.2.1)

Not applicable in Modes 5 and 6.

3.2.3 Total Integrated Radial Peaking Factor (F_r^T) (SR 3.2.3.1)

Not applicable in Modes 5 and 6.

3.2.5 Axial Shape Index (ASI) (SR 3.2.5.1)

Not applicable in Modes 5 and 6.

3.3.1 Reactor Protective System (RPS) Instrumentation - Operating (Reactor Trip Setpoints) (TS Table 3.3.1-1)

Not applicable in Modes 5 and 6.

3.9.1 Boron Concentration (SR 3.9.1.1)

The refueling boron concentration will maintain the K_{eff} at 0.95 or less (including a 1% $\Delta K/K$ conservative allowance for uncertainties). The refueling boron concentration shall be maintained uniform. For Mode 6 operation the RCS temperature must be maintained $\leq$ 140 °F. The '0 Credited CEA' requirements shall apply for a Post-Refueling Upper Guide Structure or Reactor Vessel Head Lift of more than 12 inches.

Refueling Boron Concentration Limits

	U1C17 52 Credited CEAs	U1C17 0 Credited CEAs
Post-Refueling UGS or RV Head lift height restrictions:	≤12 inches	No restriction
COLR/Tech Spec Limit	2264 ppm	2556 ppm
Chemistry Sampling	23 ppm	26 ppm
Boron-10 Depletion	47 ppm	53 ppm
Refueling Boron Concentration Limit including Chemistry Sampling uncertainty and Boron-10 Depletion	≥ 2334 ppm	≥ 2635 ppm
Dilution of the Refueling Pool between Low and High Level Alarms with Refueling Pool Flooded	73 ppm	82 ppm
Any number of Temporary Rotations of Fuel Assemblies	(an allowance of 20 ppm is already included in the above COLR/TS limit)	(an allowance of 20 ppm is already included in the above COLR/TS limit)
U1C17 In-Core Shuffle Allowance	(an allowance of 50 ppm is already included in the above COLR/TS limit)	Not required post-refueling.
Refueling Boron Concentration Administrative Limit	≥ 2407 ppm	≥ 2717 ppm

Not Applicable in Modes 5 and 6

Figure 3.1.1

Shutdown Margin vs. Time in Cycle

Not Applicable in Modes 5 and 6

Figure 3.1.4

Allowable Time to Realign CEA Versus
Initial Total Integrated Radial Peaking Factor (F_r^T)

Not Applicable in Modes 5 and 6

Figure 3.1.6

CEA Group Insertion Limits vs. Fraction of Rated Thermal Power

Not Applicable in Modes 5 and 6

Figure 3.2.1-1

Allowable Peak Linear Heat Rate vs. Time in Cycle

Not Applicable in Modes 5 and 6

Figure 3.2.1-2

Linear Heat Rate Axial Flux Offset Control Limits

(LCO Limits are not needed below 20% thermal power)

(See NEOP-13 for Administrative Limits)

Not Applicable in Modes 5 and 6

Figure 3.2.1-3

Total Planar Radial Peaking Factor (F_{xy}^T) vs. Scaling Factor (N-Factor)

(See NEOP-13 for Administrative Limits)

Not Applicable in Modes 5 and 6

Figure 3.2.2

**Total Planar Radial Peaking Factor (F_{xy}^T) vs.
Allowable Fraction of Rated Thermal Power**

Not Applicable in Modes 5 and 6

Figure 3.2.3

**Total Integrated Radial Peaking Factor (F_r^T) vs.
Allowable Fraction of Rated Thermal Power**

Not Applicable in Modes 5 and 6

Figure 3.2.5

DNB Axial Flux Offset Control Limits

(See NEOP-13 for Administrative Limits)

Not Applicable in Modes 5 and 6

Figure 3.3.1-1

Axial Power Distribution - High Trip Setpoint
Peripheral Axial Shape Index vs. Fraction of Rated Thermal Power

Not Applicable in Modes 5 and 6

Figure 3.3.1-2

Thermal Margin/Low Pressure Trip Setpoint - Part 1
(ASI vs. A_1)

Not Applicable in Modes 5 and 6

Figure 3.3.1-3

Thermal Margin/Low Pressure Trip Setpoint - Part 2
(Fraction of Rated Thermal Power vs. QR_1)

LIST OF APPROVED METHODOLOGIES

(1) CENPD-199-P, Rev 1-P-A, "C-E Setpoint Methodology: C-E Local Power Density and DNB LSSS and LCO Setpoint Methodology for Analog Protection Systems," January 1986 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.1, 3.2.2, 3.2.3, 3.2.5)

(2) CEN-124(B)-P, "Statistical Combination of Uncertainties Methodology Part 1: C-E Calculated Local Power Density and Thermal Margin/Low Pressure LSSS for Calvert Cliffs Units I and II," December 1979 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.2, 3.2.3)

(3) CEN-124(B)-P, "Statistical Combination of Uncertainties Methodology Part 2: Combination of System Parameter Uncertainties in Thermal Margin Analyses for Calvert Cliffs Units 1 and 2," January 1980 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.3, 3.2.5)

(4) CEN-124(B)-P, "Statistical Combination of Uncertainties Methodology Part 3: C-E Calculated Departure from Nucleate Boiling and Linear Heat Rate Limiting Conditions for Operation for Calvert Cliffs Units 1 and 2," March 1980 (Methodology for Specifications 3.1.6, 3.2.1, 3.2.2, 3.2.3, 3.2.5)

(5) CEN-191(B)-P, "CETOP-D Code Structure and Modeling Methods for Calvert Cliffs Units 1 and 2," December 1981 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.3, 3.2.5)

(6) Letter from Mr. D. H. Jaffe (NRC) to Mr. A. E. Lundvall, Jr. (BG&E), dated June 24, 1982, Unit 1 Cycle 6 License Approval (Amendment No. 71 to DPR-53 and SER) [Approval to CEN-124(B)-P (three parts) and CEN-191(B)-P)]

(7) CEN-348(B)-P, "Extended Statistical Combination of Uncertainties," January 1987 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.3, 3.2.5)

(8) Letter from Mr. S. A. McNeil, Jr. (NRC) to Mr. J. A. Tiernan (BG&E), dated October 21, 1987, Docket Nos. 50-317 and 50-318, "Safety Evaluation of Topical Report CEN-348(B)-P, Extended Statistical Combination of Uncertainties"

(9) CENPD-161-P-A, "TORC Code, A Computer Code for Determining the Thermal Margin of a Reactor Core," April 1986 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.3, 3.2.5)

(10) CENPD-162-P-A, "Critical Heat Flux Correlation of C-E Fuel Assemblies with Standard Spacer Grids Part 1, Uniform Axial Power Distribution," April 1975 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.3, 3.2.5)

(11) 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 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.3, 3.2.5)

(12) CENPD-206-P-A, "TORC Code, Verification and Simplified Modeling Methods," June 1981 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.3, 3.2.5)

(13) CENPD-225-P-A, "Fuel and Poison Rod Bowing," June 1983 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.3, 3.2.5)

(14) CENPD-266-P-A, "The ROCS and DIT Computer Code for Nuclear Design," April 1983 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.1, 3.2.2, 3.2.3, 3.2.5)

(15) CENPD-275-P-A, "C-E Methodology for Core Designs Containing Gadolinia - Urania Burnable Absorbers," May 1988 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.1, 3.2.2, 3.2.3, 3.2.5)

(16) CENPD-382-P-A, "Methodology for Core Designs Containing Erbium Burnable Absorbers," August 1993 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.1, 3.2.2, 3.2.3, 3.2.5)

(17) CENPD-139-P-A, "C-E Fuel Evaluation Model Topical Report," July 1974 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.1, 3.2.2)

(18) CEN-161-(B)-P-A, "Improvements to Fuel Evaluation Model," August 1989 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.1, 3.2.2)

(19) CEN-161-(B)-P, Supplement 1-P, "Improvements to Fuel Evaluation Model," April 1986 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.1, 3.2.2)

(20) Letter from Mr. S. A. McNeil, Jr. (NRC) to Mr. J. A. Tiernan (BG&E), dated February 4, 1987, Docket Nos. 50-317 and 50-318, "Safety Evaluation of Topical Report CEN-161-(B)-P, Supplement 1-P, Improvements to Fuel Evaluation Model" (Approval of CEN-161(B), Supplement 1-P)

(21) CEN-372-P-A, "Fuel Rod Maximum Allowable Gas Pressure," May 1990 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.1, 3.2.2)

(22) Letter from Mr. A. E. Scherer (CE) to Mr. J. R. Miller (NRC) dated December 15, 1981, LD-81-095, Enclosure 1-P, "C-E ECCS Evaluation Model Flow Blockage Analysis" (Methodology for Specifications 3.2.1, 3.2.2)

(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 (Methodology for Specifications 3.2.1, 3.2.2 and approval of Letter LD-81-095, dated December 15, 1981)

(24) CENPD-133, Supplement 5, "CEFLASH-4A, a FORTRAN77 Digital Computer Program for Reactor Blowdown Analysis," June 1985 (Methodology for Specifications 3.2.1, 3.2.2)

(25) CENPD-134, Supplement 2, "COMPERC-II, a Program for Emergency Refill-Reflood of the Core," June 1985 (Methodology for Specifications 3.2.1, 3.2.2)

(26) Letter from Mr. D. M. Crutchfield (NRC) to Mr. A. E. Scherer (CE), dated July 31, 1986, "Safety Evaluation of Combustion Engineering ECCS Large Break Evaluation Model and Acceptance for Referencing of Related Licensing Topical Reports (Approval of CENPD-133, Supplement 5 and CENPD-134, Supplement 2)

(27) CENPD-135, Supplement 5-P, "STRIKIN-II, A Cylindrical Geometry Fuel Rod Heat Transfer Program," April 1977 (Methodology for Specifications 3.2.1, 3.2.2)

(28) Letter from Mr. R. L. Baer (NRC) to Mr. A. E. Scherer (CE) dated September 6, 1978, "Evaluation of Topical Report CENPD-135, Supplement 5"

(29) CENPD-137, Supplement 1-P, "Calculative Methods for the C-E Small Break LOCA Evaluation Model," January 1977 (Methodology for Specifications 3.2.1, 3.2.2)

(30) 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 (Methodology for Specifications 3.2.1, 3.2.2)

(31) Letter from Mr. K. Kniel (NRC) to Mr. A. E. Scherer (CE), dated September 27, 1977, "Evaluation of Topical Reports CENPD-133, Supplement 3-P and CENPD-137, Supplement 1-P"

(32) CENPD-138, Supplement 2-P, "PARCH, A FORTRAN-IV Digital Program to Evaluate Pool Boiling, Axial Rod and Coolant Heatup," January 1977 (Methodology for Specifications 3.2.1, 3.2.2)

(33) Letter from Mr. C. Aniel (NRC) to Mr. A. E. Scherer, dated April 10, 1978. "Evaluation of Topical Report CENPD-138, Supplement 2-P"

(34) Letter from Mr. A. E. Lundvall, Jr. (BG&E) to Mr. J. R. Miller (NRC) dated February 22, 1985, "Calvert Cliffs Nuclear Power Plant Unit 1; Docket No. 50-317, Amendment to Operating License DPR-53, Eighth Cycle License Application" (Section 7.3.2 contains Methodology for Specifications 3.1.1 and 3.1.3 and 3.1.6)

(35) Letter from Mr. D. H. Jaffe (NRC) to Mr. A. E. Lundvall, Jr. (BG&E), dated May 20, 1985, "Safety Evaluation Report Approving Unit 1 Cycle 8 License Application"

(36) Letter from Mr. A. E. Lundvall, Jr. (BG&E) to Mr. R. A. Clark (NRC), dated September 22, 1980, "Amendment to Operating License No. 50-317, Fifth Cycle License Application" (Section 7.1.2 contains Methodology for Specifications 3.1.1, 3.9.1)

(37) Letter from Mr. R. A. Clark (NRC) to Mr. A. E. Lundvall, Jr. (BG&E), dated December 12, 1980, "Safety Evaluation Report Approving Unit 1, Cycle 5 License Application"

(38) Letter from Mr. J. A. Tiernan (BG&E) to Mr. A. C. Thadani (NRC), dated October 1, 1986, "Calvert Cliffs Nuclear Power Plant Unit Nos. 1 & 2, Docket Nos. 50-317 & 50-318, Request for Amendment" (Methodology for Specifications 3.1.4)

(39) Letter from S. A. McNeil, Jr. (NRC) to Mr. J. A. Tiernan (BG&E), dated July 7, 1987, Docket Nos. 50-317 and 50-318, Approval of Amendments 127 (Unit 1) and 109 (Unit 2) (Support for Specification 3.1.4)

(40) CENPD-188-A, "HERMITE: A Multi-Dimensional Space-Time Kinetics Code for PWR Transients," July 1976 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.1, 3.2.2, 3.2.3, 3.2.5)

(41) The power distribution monitoring system referenced in various specifications and the BASES, is described in the following documents:

i. CENPD-153-P, Revision 1-P-A, "Evaluation of Uncertainty in the Nuclear Power Peaking Measured by the Self-Powered, Fixed Incore Detector System," May 1980 (Methodology for Specifications 3.3.1, 3.1.6, 3.2.1, 3.2.2, 3.2.3, 3.2.5)

ii. CEN-119(B)-P, "BASSS, Use of the Incore Detector System to Monitor the DNB-LCO on Calvert Cliffs Unit 1 and Unit 2," November 1979 (Referenced in Appendix B of Unit 2 Cycle 9 License Application)

iii. Letter from Mr. G. C. Creel (BG&E) to NRC Document Control Desk, dated February 7, 1989, "Calvert Cliffs Nuclear Power Plant Unit No. 2; Docket No. 50-318, Request for Amendment, Unit 2 Ninth Cycle License Application" (Appendix B contains Methodologies for Specifications 3.1.4, 3.2.2, 3.2.3, 3.2.5)

iv. Letter from Mr. S. A. McNeil, Jr. (NRC) to Mr. G. C. Creel (BG&E), dated January 10, 1990, "Safety Evaluation Report Approving Unit 2 Cycle 9 License Application"

(42) Letter from Mr. D. G. McDonald, Jr. (NRC) to Mr. R. E. Denton (BGE), dated May 11, 1995, "Approval to Use Convolution Technique in Main Steam Line Break Analysis - Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (TAC Nos. M90897 and M90898)" (Methodology for Specification 3.2.3).

(43) CENPD-387-P-A, Latest Approved Revision, "ABB Critical Heat Flux Correlations for PWR Fuel".

(44) CENPD-199-P, Supplement 2-P-A, Appendix A, Latest Approved Revision, "CE Setpoint Methodology, " June 1998.

(45) CENPD-404-P-A, Latest Approved Revision, "Implementation of ZIRLO™ Cladding Material in CE Nuclear Power Fuel Assembly Designs"

(46) CENPD-132, Supplement 4-P-A, Latest Approved Revision, "Calculative Methods for the CE Nuclear Power Large Break LOCA Evaluation Model"

(47) CENPD-137, Supplement 2-P-A, Latest Approved Revision, "Calculative Methods for the ABB CE Small Break LOCA Evaluation Model"