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

**SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT
DOCKET NO. 50-445
CORE OPERATING LIMITS REPORT**

Dear Sir or Madam:

Enclosed is the Core Operating Limits Report for Comanche Peak Nuclear Power Plant (CPNPP) Unit 1, Cycle 16. This report is prepared and submitted pursuant to Technical Specification 5.6.5.

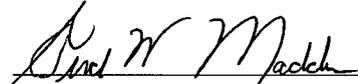
This communication contains no new licensing basis commitments regarding CPNPP Units 1 and 2.

Should you have any questions, please contact Mr. J. D. Seawright at (254) 897-0140.

Sincerely,

Luminant Generation Company LLC

Rafael Flores

By: 
Fred W. Madden
Director, Oversight & Regulatory Affairs

Enclosure - Unit 1 Cycle 16 Core Operating Limits Report

c - E. E. Collins, Region IV
B. K. Singal, NRR
Resident Inspectors, Comanche Peak

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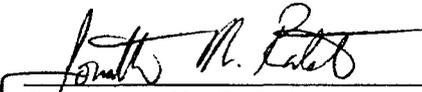
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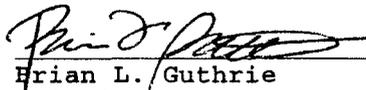
CPNPP UNIT 1 CYCLE 16

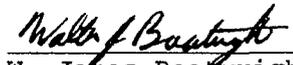
CORE OPERATING LIMITS REPORT

September 2011

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COLR for CPNPP Unit 1 Cycle 16

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COLR for CPNPP Unit 1 Cycle 16

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for CPNPP UNIT 1 CYCLE 16 has been prepared in accordance with the requirements of Technical Specification 5.6.5.

The Technical Specifications affected by this report are listed below:

SL 2.1	SAFETY LIMITS
LCO 3.1.1	SHUTDOWN MARGIN
LCO 3.1.3	MODERATOR TEMPERATURE COEFFICIENT
LCO 3.1.4	ROD GROUP ALIGNMENT LIMITS
LCO 3.1.5	SHUTDOWN BANK INSERTION LIMITS
LCO 3.1.6	CONTROL BANK INSERTION LIMITS
LCO 3.1.8	PHYSICS TESTS EXCEPTIONS - MODE 2
LCO 3.2.1	HEAT FLUX HOT CHANNEL FACTOR
LCO 3.2.2	NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR
LCO 3.2.3	AXIAL FLUX DIFFERENCE
LCO 3.3.1	REACTOR TRIP SYSTEM INSTRUMENTATION
LCO 3.4.1	RCS PRESSURE, TEMPERATURE, AND FLOW DEPARTURE FROM NUCLEATE BOILING LIMITS
LCO 3.9.1	BORON CONCENTRATION

2.0 OPERATING LIMITS

The cycle-specific parameter limits for the specifications listed in Section 1.0 are presented in the following subsections. These limits have been developed using the NRC-approved methodologies specified in Technical Specification 5.6.5b, Items 1 through 4 and 7 through 15. These limits have been determined such that all applicable limits of the safety analysis are met.

2.1 SAFETY LIMITS (SL 2.1)

2.1.1 In MODES 1 and 2, the combination of thermal power, reactor coolant system highest loop average temperature, and pressurizer pressure shall not exceed the safety limits specified in Figure 1.

2.2 SHUTDOWN MARGIN (SDM) (LCO 3.1.1)

2.2.1 The SDM shall be greater than or equal to 1.3% $\Delta k/k$ in MODE 2 with $K_{eff} < 1.0$, and in MODES 3, 4, and 5.

2.3 MODERATOR TEMPERATURE COEFFICIENT (MTC) (LCO 3.1.3)

2.3.1 The MTC upper and lower limits, respectively, are:

The BOL/ARO/HZP-MTC shall be less positive than +5 pcm/°F.

The EOL/ARO/RTP-MTC shall be less negative than -40 pcm/°F.

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2.3.2 SR 3.1.3.2

The MTC surveillance limit is:

The 300 ppm/ARO/RTP-MTC shall be less negative than or equal to -31 pcm/F.

The 60 ppm/ARO/RTP-MTC shall be less negative than or equal to -38 pcm/F.

where: BOL stands for Beginning of Cycle Life

ARO stands for All Rods Out

HZP stands for Hot Zero THERMAL POWER

EOL stands for End of Cycle Life

RTP stands for RATED THERMAL POWER

2.4 ROD GROUP ALIGNMENT LIMITS (LCO 3.1.4)

2.4.1 The SDM shall be greater than or equal to 1.3% $\Delta k/k$ in MODES 1 and 2.

2.5 SHUTDOWN BANK INSERTION LIMITS (LCO 3.1.5)

2.5.1 The shutdown rods shall be fully withdrawn. Fully withdrawn shall be the condition where shutdown rods are at a position within the interval of 218 and 231 steps withdrawn, inclusive.

2.6 CONTROL BANK INSERTION LIMITS (LCO 3.1.6)

2.6.1 The control banks shall be limited in physical insertion as shown in Figure 2.

2.6.2 The control banks shall always be withdrawn and inserted in the prescribed sequence. For withdrawal, the sequence is control bank A, control bank B, control bank C, and control bank D. The insertion sequence is the reverse of the withdrawal sequence.

2.6.3 A 115 step Tip-to-Tip relationship between each sequential control bank shall be maintained.

2.7 PHYSICS TESTS EXCEPTIONS - MODE 2 (LCO 3.1.8)

2.7.1 The SDM shall be greater than or equal to 1.3% $\Delta k/k$ in MODE 2 during PHYSICS TESTS.

2.8 HEAT FLUX HOT CHANNEL FACTOR ($F_0(Z)$) (LCO 3.2.1)

$$2.8.1 \quad F_0(Z) \leq \frac{F_0^{RTP}}{P} [K(Z)] \text{ for } P > 0.5$$

$$F_0(Z) \leq \frac{F_0^{RTP}}{0.5} [K(Z)] \text{ for } P \leq 0.5$$

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

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2.8.2 $F_0^{RTP} = 2.50$

2.8.3 $K(Z)$ is provided in Figure 3.

2.8.4 Elevation and burnup dependent $W(Z)$ values are provided in Figures 4, 5, 6, 7 and 8. For $W(Z)$ data at a desired burnup not listed in the figures, but less than the maximum listed burnup, values at 3 or more burnup steps should be used to interpolate the $W(Z)$ data to the desired burnup with a polynomial type fit that uses the nearest three burnup steps. For $W(Z)$ data at a desired burnup outside of the listed burnup steps, a linear extrapolation of the $W(Z)$ data for the nearest two burnup steps can be used.

2.8.5 SR 3.2.1.2

If the two most recent $F_0(Z)$ evaluations show an increase in the expression

maximum over Z $[F_0^c(Z) / K(Z)]$,

the burnup dependent values in Table 1 shall be used instead of a constant 2% to increase $F_0^w(Z)$ per Surveillance Requirement 3.2.1.2.a. A constant factor of 2% shall be used for all cycle burnups that are outside the range of Table 1.

2.9 NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR ($F_{\Delta H}^N$) (LCO 3.2.2)

$$2.9.1 \quad F_{\Delta H}^N \leq F_{\Delta H}^{RTP} [1 + PF_{\Delta H} (1-P)]$$

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

$$2.9.2 \quad F_{\Delta H}^{RTP} = 1.60 \text{ for all Fuel Assembly Regions}$$

$$2.9.3 \quad PF_{\Delta H} = 0.3$$

2.10 AXIAL FLUX DIFFERENCE (AFD) (LCO 3.2.3)

2.10.1 The AFD Acceptable Operation Limits are provided in Figure 9.

2.11 REACTOR TRIP SYSTEM (RTS) INSTRUMENTATION (LCO 3.3.1)

2.11.1 The numerical values pertaining to the Overtemperature N-16 reactor trip setpoint are listed below;

$$K_1 = 1.15$$

$$K_2 = 0.0139 / ^\circ\text{F}$$

$$K_3 = 0.00071 / \text{psig}$$

$$T_c^\circ = \text{indicated loop specific } T_c \text{ at Rated Thermal Power, } ^\circ\text{F}$$

$$P^1 \geq 2235 \text{ psig}$$

$$\tau_1 \geq 10 \text{ sec}$$

$$\tau_2 \leq 3 \text{ sec}$$

$$f_1(\Delta q) = -2.78 \cdot \{(q_t - q_b) + 18\% \} \text{ when } (q_t - q_b) \leq -18\% \text{ RTP}$$

$$= 0\% \text{ when } -18\% \text{ RTP} < (q_t - q_b) < +10.0\% \text{ RTP}$$

$$= 2.34 \cdot \{(q_t - q_b) - 10.0\% \} \text{ when } (q_t - q_b) \geq +10.0\% \text{ RTP}$$

2.12 RCS PRESSURE, TEMPERATURE, AND FLOW DEPARTURE FROM
NUCLEATE BOILING (DNB) LIMITS (LCO 3.4.1)

2.12.1 RCS DNB parameters for pressurizer pressure, RCS average temperature, and RCS total flow rate shall be within the surveillance limits specified below:

2.12.2 SR 3.4.1.1

Pressurizer pressure \geq 2220 psig (4 channels)
 \geq 2222 psig (3 channels)

The pressurizer pressure limits correspond to the analytical limit of 2205 psig used in the safety analysis with allowance for measurement uncertainty. These uncertainties are based on the use of control board indications and the number of available channels.

2.12.3 SR 3.4.1.2

RCS average temperature \leq 588 °F (4 channels)
 \leq 588 °F (3 channels)

The RCS average temperature limits correspond to the analytical limit of 591.9 °F which is bounded by that used in the safety analysis with allowance for measurement uncertainty. These uncertainties are based on the use of control board indications and the number of available channels.

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2.12.4 SR 3.4.1.3

The RCS total flow rate shall be $\geq 403,700$ gpm.

2.12.5 SR 3.4.1.4

The RCS total flow rate based on precision heat balance shall be $\geq 403,700$ gpm.

The required RCS flow, based on an elbow tap differential pressure instrument measurement prior to MODE 1 after the refueling outage, shall be greater than 327,000 gpm.

2.13 BORON CONCENTRATION (LCO 3.9.1)

2.13.1 The required refueling boron concentration is ≥ 1894 ppm.

3.0 REFERENCES

Technical Specification 5.6.5.

COLR for CPNPP Unit 1 Cycle 16

Table 1
 $F_0(Z)$ MARGIN DECREASES IN EXCESS OF 2% PER 31 EFPD

Cycle Burnup (MWD/MTU)	Maximum Decrease In $F_0(Z)$ MARGIN (Percent)
4873	2.00
5088	2.27
5302	2.49
5517	2.37
5732	2.04
5947	2.00

Note: All cycle burnups outside the range of the table shall use a constant 2% decrease in $F_0(Z)$ margin for compliance with the 3.2.1.2.a Surveillance Requirements. Linear interpolation is acceptable to determine the $F_0(Z)$ margin decrease for cycle burnups which fall between the specified burnups.

Figure 1
Reactor Core Safety Limits

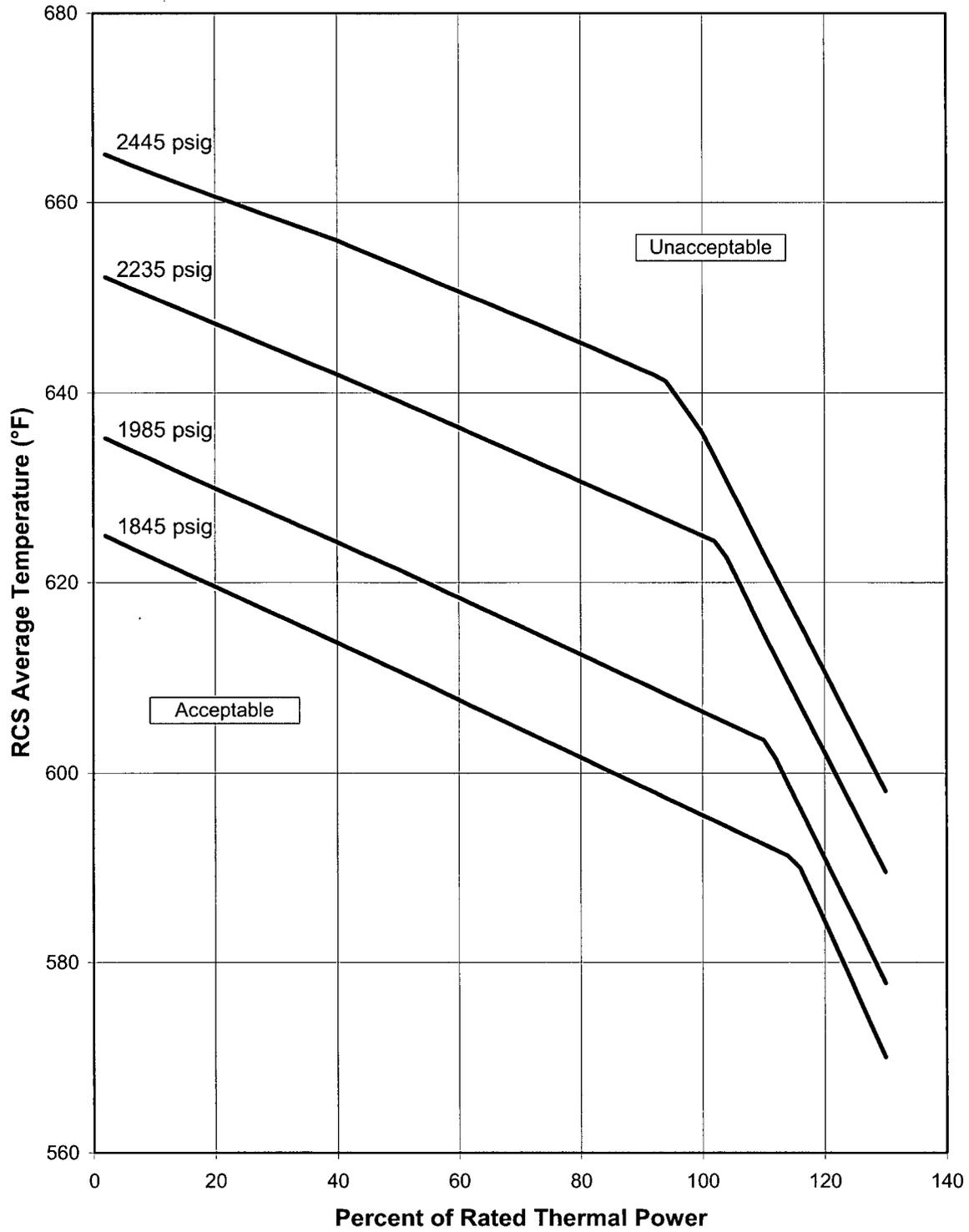
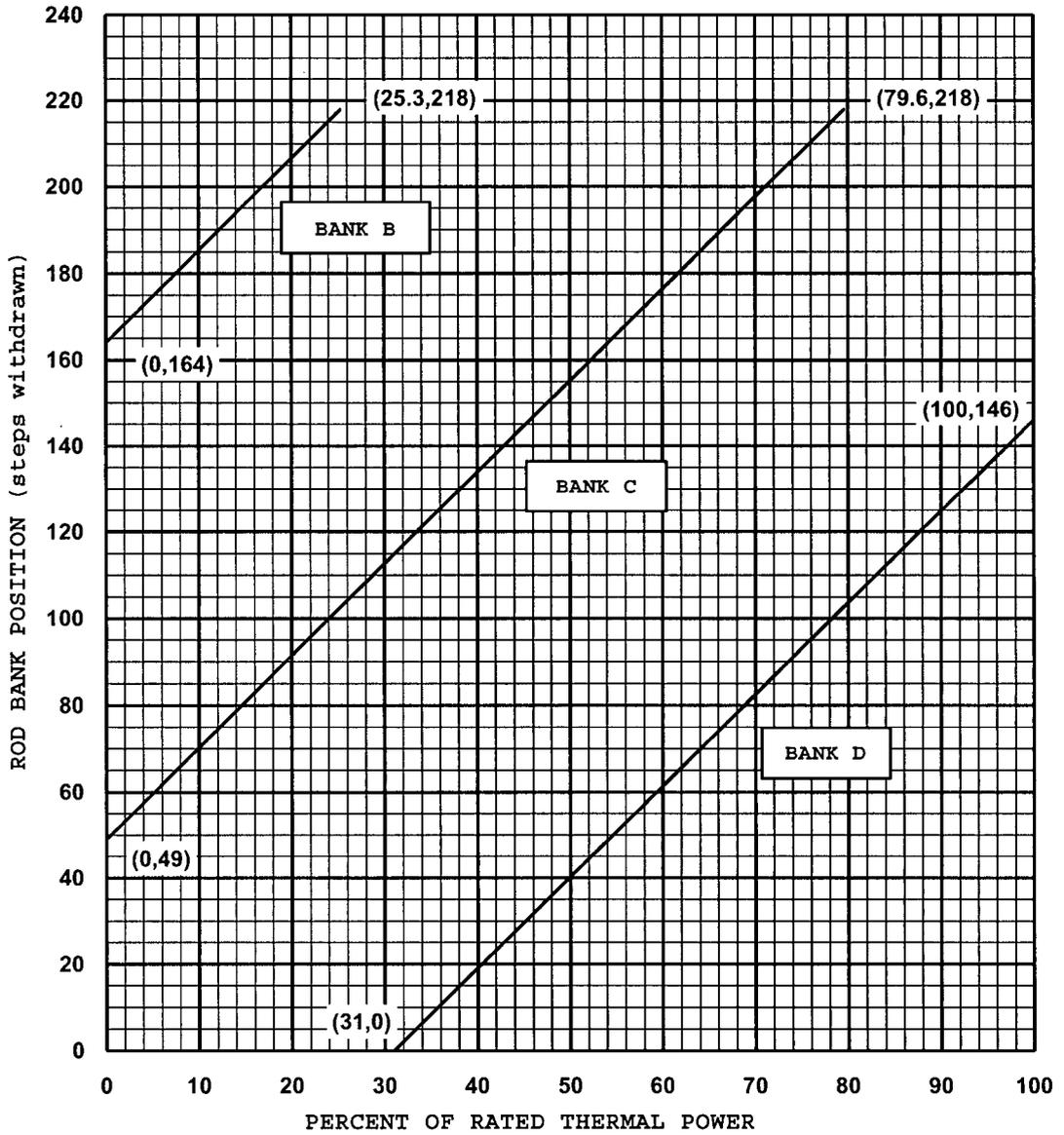


FIGURE 2

ROD BANK INSERTION LIMITS VERSUS THERMAL POWER

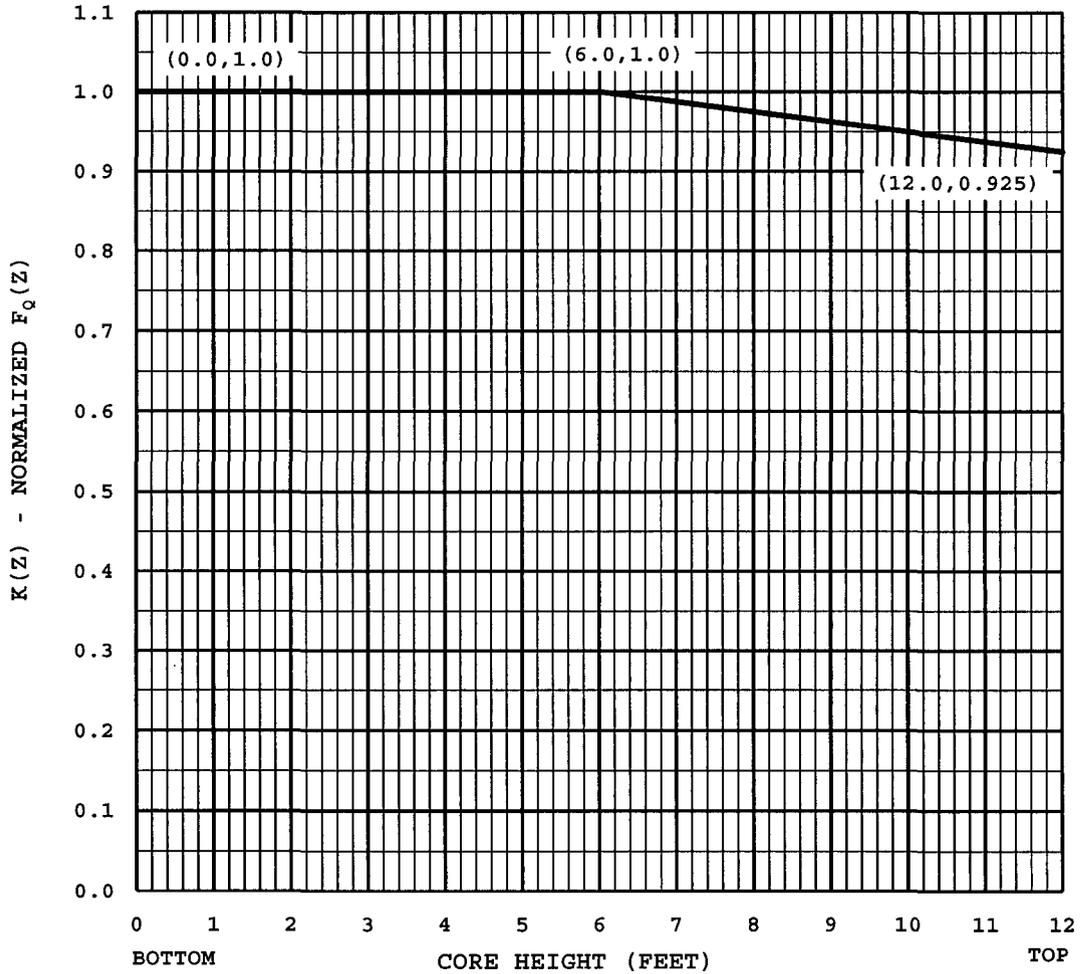


- NOTES:
1. Fully withdrawn shall be the condition where control rods are at a position within the interval of 218 and 231 steps withdrawn, inclusive.
 2. Control Bank A shall be fully withdrawn.

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FIGURE 3

K(Z) - NORMALIZED $F_Q(Z)$ AS A FUNCTION OF CORE HEIGHT

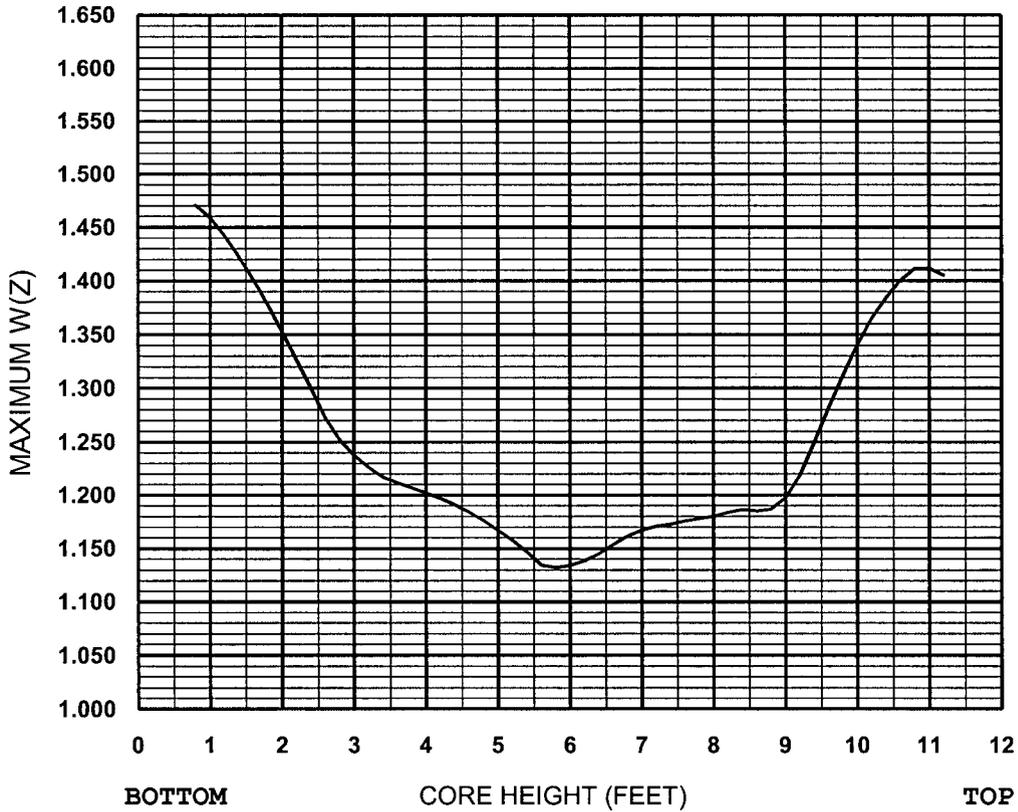


Axial Node	K(Z)						
61	0.9250	53	0.9450	45	0.9650	37	0.9850
60	0.9275	52	0.9475	44	0.9675	36	0.9875
59	0.9300	51	0.9500	43	0.9700	35	0.9900
58	0.9325	50	0.9525	42	0.9725	34	0.9925
57	0.9350	49	0.9550	41	0.9750	33	0.9950
56	0.9375	48	0.9575	40	0.9775	32	0.9975
55	0.9400	47	0.9600	39	0.9800	1 - 31	1.0000
54	0.9425	46	0.9625	38	0.9825		

Core Height (ft) = (Node - 1) * 0.2

FIGURE 4

W(Z) AS A FUNCTION OF CORE HEIGHT
(150 MWD/MTU)



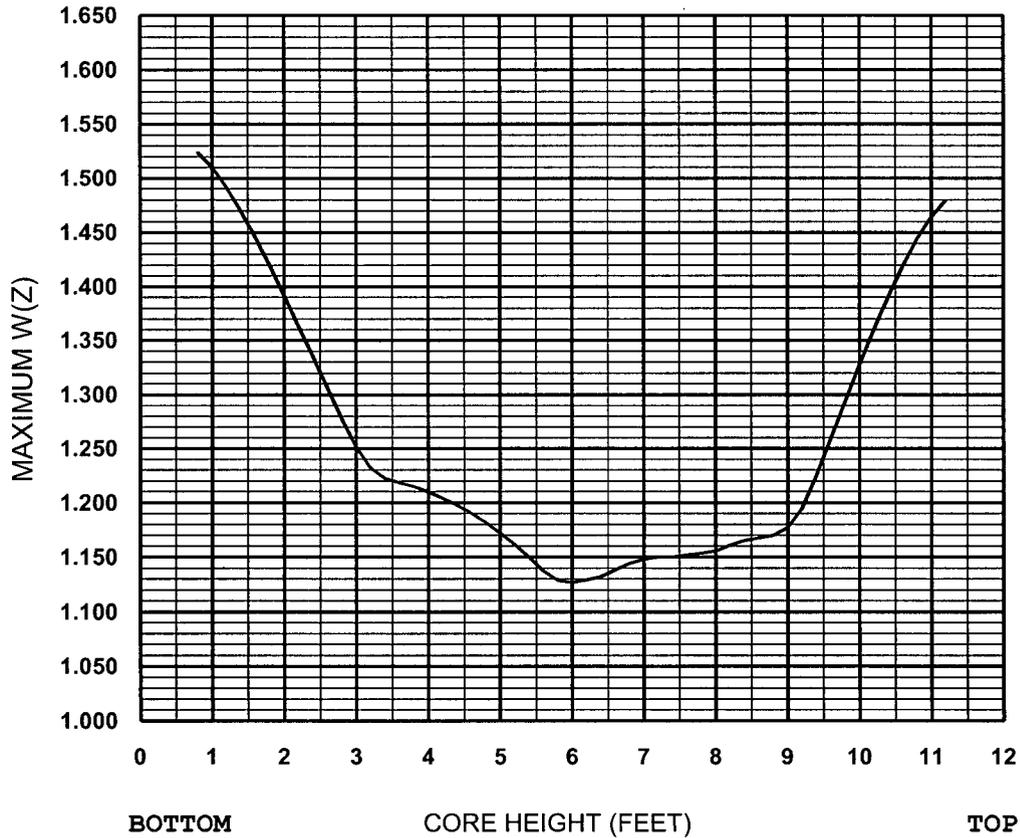
Axial Node	W(Z)						
58 - 61	---	44	1.1853	30	1.1324	16	1.2377
57	1.4055	43	1.1866	29	1.1347	15	1.2522
56	1.4119	42	1.1837	28	1.1473	14	1.2728
55	1.4118	41	1.1800	27	1.1578	13	1.3000
54	1.4005	40	1.1781	26	1.1673	12	1.3269
53	1.3841	39	1.1758	25	1.1761	11	1.3529
52	1.3651	38	1.1725	24	1.1840	10	1.3781
51	1.3404	37	1.1709	23	1.1909	9	1.4016
50	1.3121	36	1.1672	22	1.1970	8	1.4233
49	1.2820	35	1.1615	21	1.2021	7	1.4428
48	1.2498	34	1.1538	20	1.2069	6	1.4591
47	1.2186	33	1.1452	19	1.2118	5	1.4707
46	1.1975	32	1.1386	18	1.2173	1 - 4	---
45	1.1870	31	1.1342	17	1.2263		

$$\text{Core Height (ft)} = (\text{Node} - 1) * 0.2$$

COLR for CPNPP Unit 1 Cycle 16

FIGURE 5

W(Z) AS A FUNCTION OF CORE HEIGHT
(2,000 MWD/MTU)



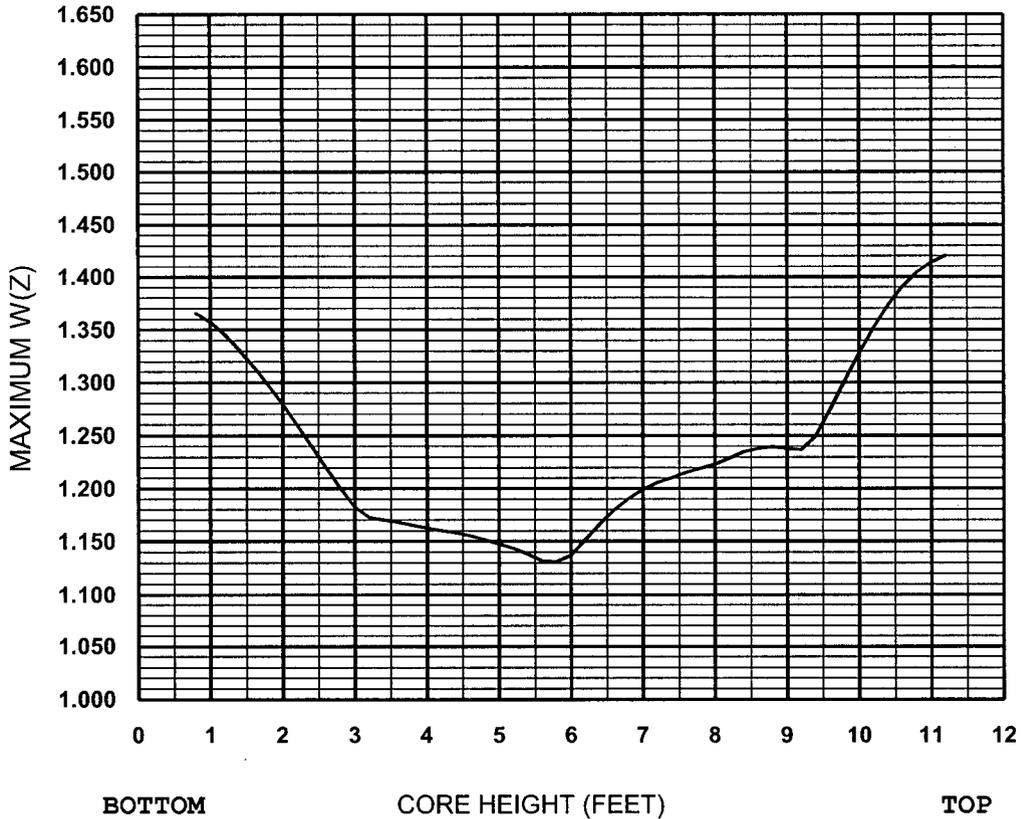
Axial Node	W(Z)						
58 - 61	---	44	1.1675	30	1.1286	16	1.2511
57	1.4794	43	1.1651	29	1.1371	15	1.2775
56	1.4643	42	1.1607	28	1.1501	14	1.3064
55	1.4441	41	1.1558	27	1.1616	13	1.3349
54	1.4186	40	1.1535	26	1.1719	12	1.3630
53	1.3901	39	1.1520	25	1.1815	11	1.3916
52	1.3602	38	1.1501	24	1.1900	10	1.4196
51	1.3277	37	1.1500	23	1.1975	9	1.4458
50	1.2938	36	1.1480	22	1.2042	8	1.4699
49	1.2594	35	1.1443	21	1.2098	7	1.4916
48	1.2251	34	1.1384	20	1.2149	6	1.5102
47	1.1943	33	1.1321	19	1.2186	5	1.5238
46	1.1769	32	1.1293	18	1.2222	1 - 4	---
45	1.1699	31	1.1271	17	1.2317		

$$\text{Core Height (ft)} = (\text{Node} - 1) * 0.2$$

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FIGURE 6

W(Z) AS A FUNCTION OF CORE HEIGHT
(10,000 MWD/MTU)



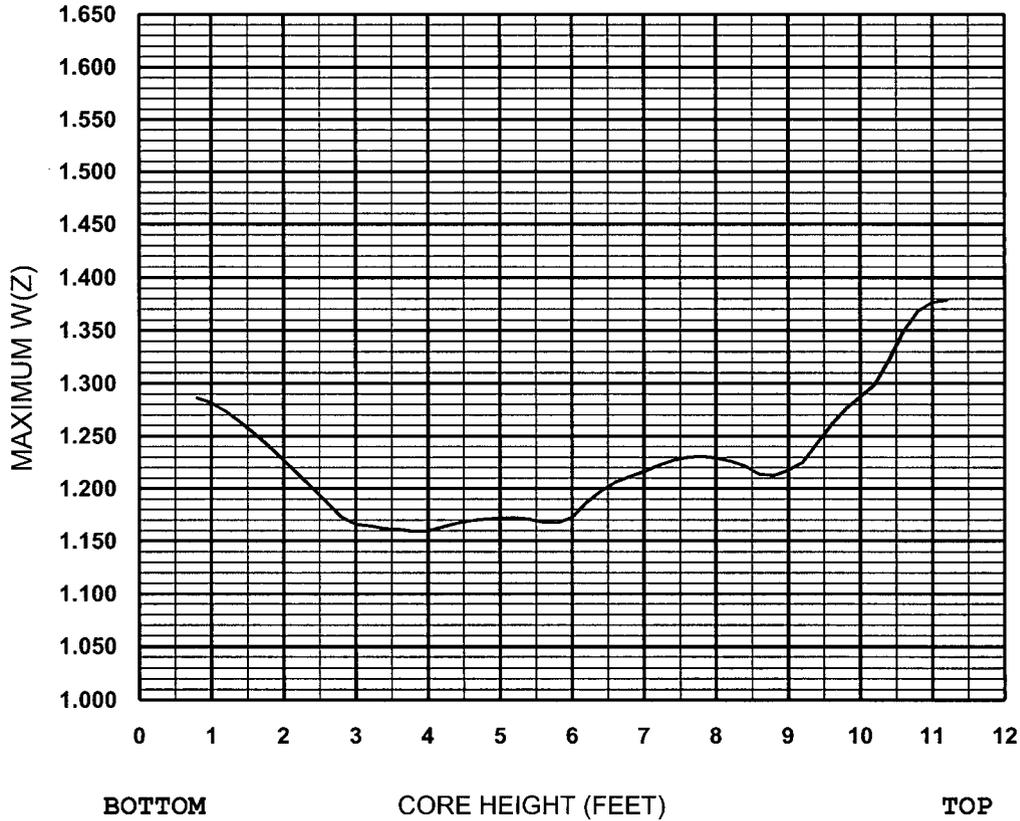
Axial Node	W(Z)						
58 - 61	---	44	1.2378	30	1.1312	16	1.1826
57	1.4204	43	1.2348	29	1.1315	15	1.2004
56	1.4141	42	1.2290	28	1.1382	14	1.2205
55	1.4042	41	1.2232	27	1.1435	13	1.2403
54	1.3904	40	1.2195	26	1.1476	12	1.2600
53	1.3730	39	1.2155	25	1.1515	11	1.2793
52	1.3517	38	1.2102	24	1.1552	10	1.2978
51	1.3275	37	1.2059	23	1.1581	9	1.3152
50	1.3021	36	1.1993	22	1.1602	8	1.3312
49	1.2748	35	1.1902	21	1.1624	7	1.3455
48	1.2496	34	1.1792	20	1.1651	6	1.3574
47	1.2368	33	1.1663	19	1.1679	5	1.3653
46	1.2379	32	1.1518	18	1.1701	1 - 4	---
45	1.2394	31	1.1369	17	1.1723		

Core Height (ft) = (Node - 1) * 0.2

COLR for CPNPP Unit 1 Cycle 16

FIGURE 7

W(Z) AS A FUNCTION OF CORE HEIGHT
(14,000 MWD/MTU)



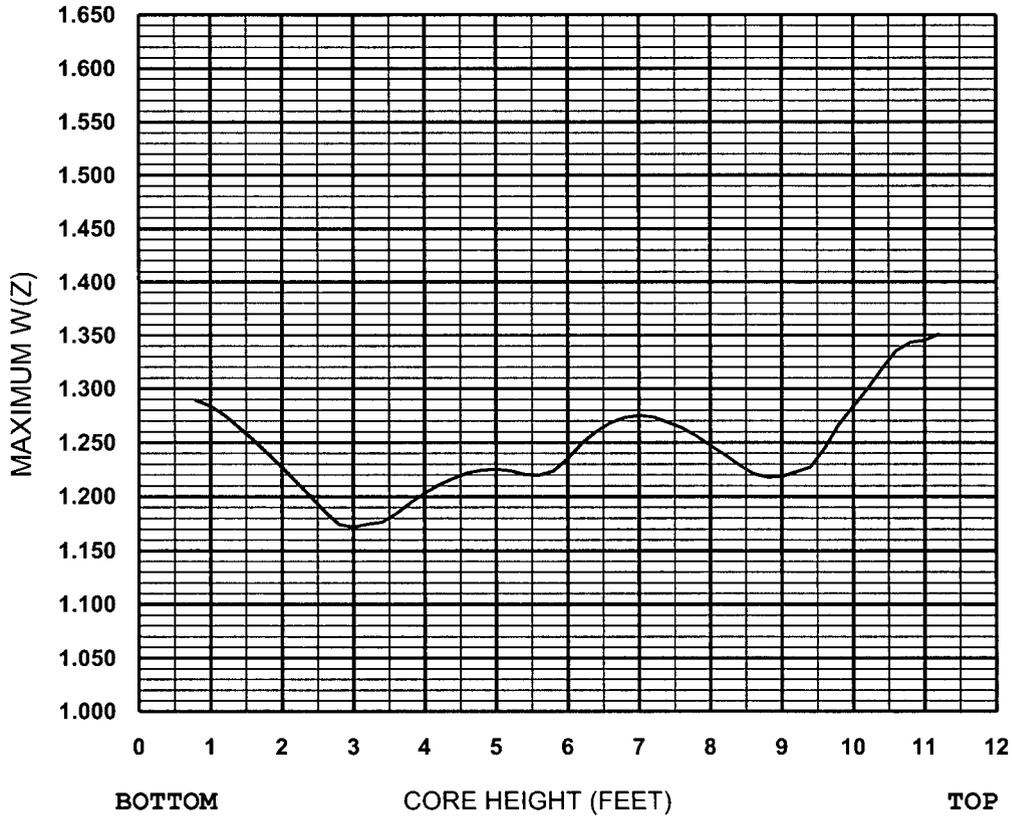
Axial Node	W(Z)						
58 - 61	---	44	1.2137	30	1.1673	16	1.1658
57	1.3788	43	1.2216	29	1.1678	15	1.1729
56	1.3767	42	1.2264	28	1.1709	14	1.1866
55	1.3681	41	1.2295	27	1.1721	13	1.2003
54	1.3491	40	1.2308	26	1.1717	12	1.2140
53	1.3227	39	1.2300	25	1.1708	11	1.2273
52	1.2989	38	1.2271	24	1.1694	10	1.2401
51	1.2874	37	1.2220	23	1.1667	9	1.2522
50	1.2759	36	1.2162	22	1.1630	8	1.2633
49	1.2609	35	1.2115	21	1.1595	7	1.2734
48	1.2432	34	1.2060	20	1.1593	6	1.2816
47	1.2249	33	1.1974	19	1.1610	5	1.2862
46	1.2174	32	1.1865	18	1.1617	1 - 4	---
45	1.2126	31	1.1723	17	1.1642		

Core Height (ft) = (Node - 1) * 0.2

COLR for CPNPP Unit 1 Cycle 16

FIGURE 8

W(Z) AS A FUNCTION OF CORE HEIGHT
(20,000 MWD/MTU)



Axial Node	W(Z)						
58 - 61	---	44	1.2213	30	1.2235	16	1.1718
57	1.3507	43	1.2295	29	1.2197	15	1.1744
56	1.3455	42	1.2389	28	1.2205	14	1.1859
55	1.3435	41	1.2474	27	1.2238	13	1.2000
54	1.3354	40	1.2562	26	1.2252	12	1.2137
53	1.3184	39	1.2637	25	1.2244	11	1.2271
52	1.2999	38	1.2689	24	1.2217	10	1.2401
51	1.2834	37	1.2736	23	1.2171	9	1.2524
50	1.2664	36	1.2751	22	1.2108	8	1.2641
49	1.2450	35	1.2731	21	1.2030	7	1.2750
48	1.2272	34	1.2681	20	1.1941	6	1.2840
47	1.2231	33	1.2602	19	1.1843	5	1.2893
46	1.2186	32	1.2495	18	1.1762	1 - 4	---
45	1.2181	31	1.2352	17	1.1745		

$$\text{Core Height (ft)} = (\text{Node} - 1) * 0.2$$

FIGURE 9

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF RATED THERMAL POWER

