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

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT
DOCKET NO. 50-446
CORE OPERATING LIMITS REPORT

Dear Sir or Madam:

Enclosed is the Core Operating Limits Report for Comanche Peak Nuclear Power Plant (CPNPP) Unit 2, Cycle 13. 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

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Resident Inspectors, Comanche Peak

A001
NRR

ERX-11-001, Rev. 0

CPNPP UNIT 2 CYCLE 13

CORE OPERATING LIMITS REPORT

March 2011

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1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for CPNPP UNIT 2 CYCLE 13 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
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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.

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% Δk/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 ($F_Q(Z)$) (LCO 3.2.1)

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

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

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

2.8.2 $F_Q^{RTP} = 2.50$

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 $F_Q(Z)$ evaluations show an increase in the expression

maximum over Z [$F_Q^C(Z)$ / K(Z)],

the burnup dependent values in Table 1 shall be used instead of a constant 2% to increase $F_Q^W(Z)$ 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 ($F^N_{\Delta H}$) (LCO 3.2.2)

2.9.1 $F^N_{\Delta H} \leq F^{RTP}_{\Delta H}$ [1 + $PF_{\Delta H}$ (1-P)]

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

2.9.2 $F^{RTP}_{\Delta H}$ = 1.60 for all Fuel Assembly Regions

2.9.3 $PF_{\Delta H}$ = 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 /°F

K_3 = 0.00071 /psig

T_c^o = indicated loop specific T_c at Rated Thermal Power, °F

P^1 ≥ 2235 psig

τ_1 ≥ 10 sec

τ_2 ≤ 3 sec

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

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

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

2.12 <u>RCS PRESSURE, TEMPERATURE, AND FLOW DEPARTURE FROM NUCLEATE BOILING (DNB) LIMITS</u> (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 ≥ 2220 psig (4 channels)

≥ 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 ≤ 592 °F (4 channels)

≤ 591 °F (3 channels)

The RCS average temperature limits correspond to the analytical limit of 595.2 °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.

2.12.4 SR 3.4.1.3

The RCS total flow rate shall be ≥ 408,000 gpm.

2.12.5 SR 3.4.1.4

The RCS total flow rate based on precision heat balance shall be ≥ 408,000 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 ≥ 1973 ppm.

3.0 REFERENCES

Technical Specification 5.6.5.

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

Cycle Burnup (MWD/MTU)	Maximum Decrease In $F_Q(Z)$ MARGIN (Percent)
365	2.00
581	3.44
796	4.03
1011	3.94
1227	3.41
1442	2.76
1657	2.11
1872	2.00

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

Figure 1
Reactor Core Safety Limits

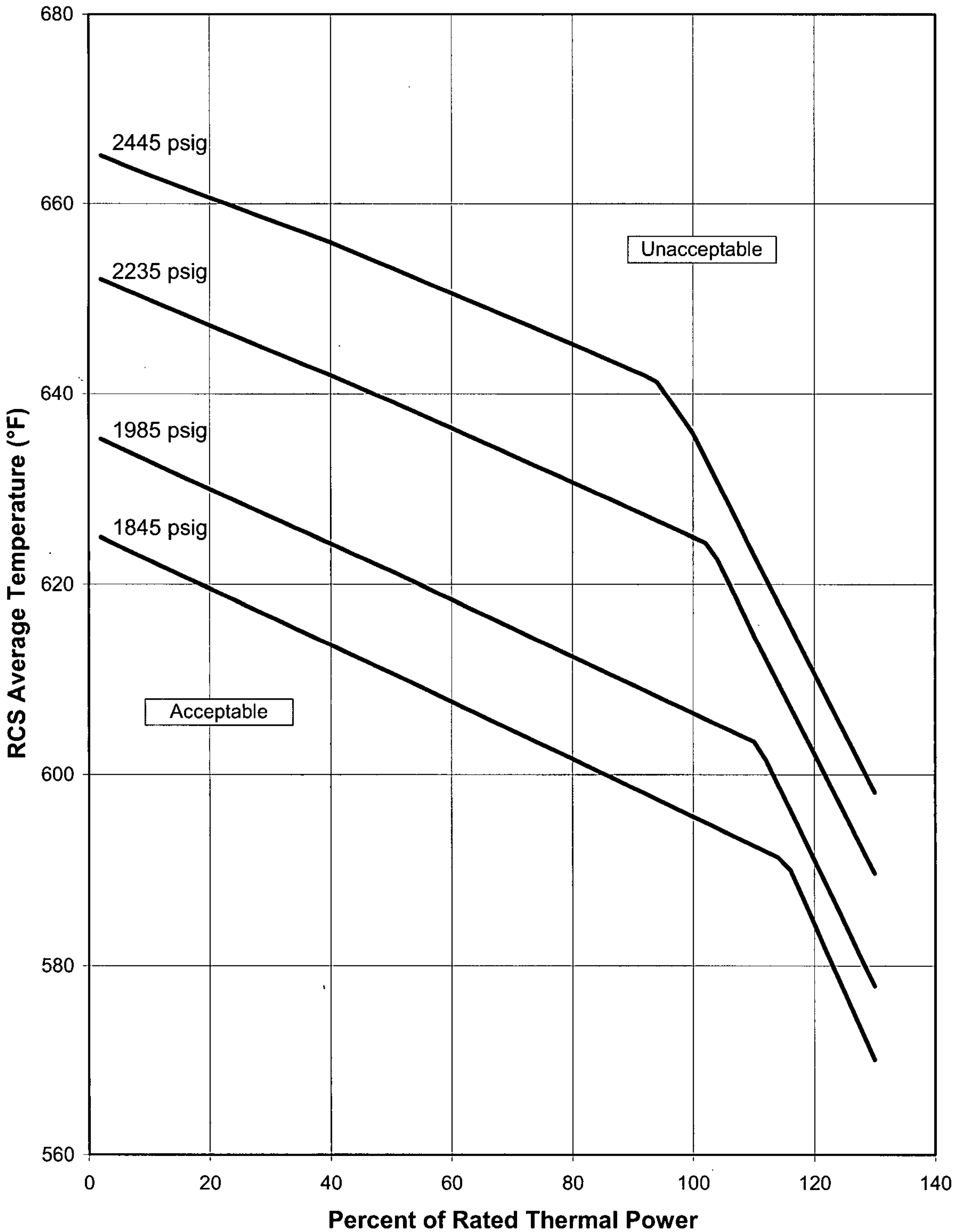
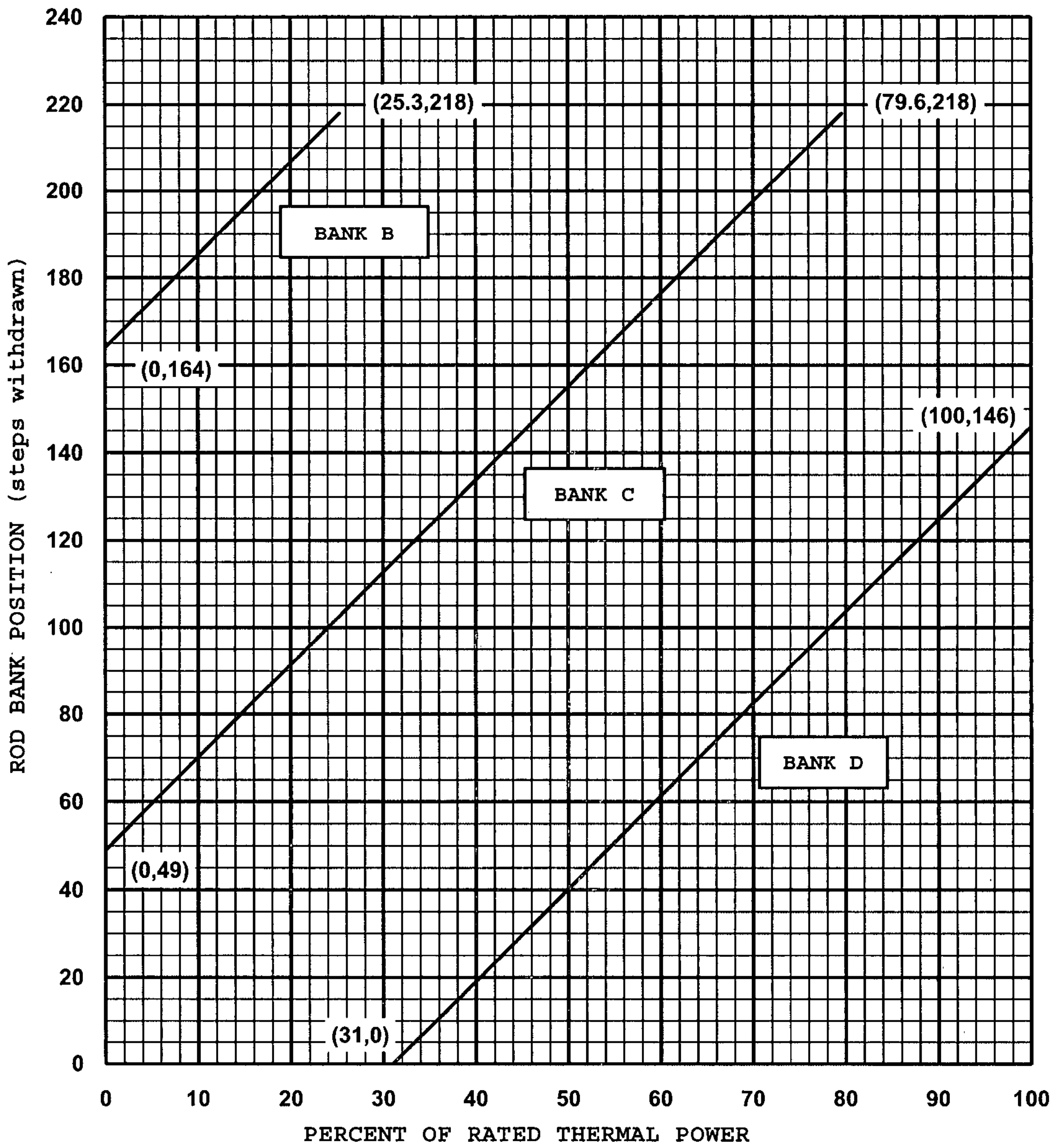


FIGURE 2

ROD BANK INSERTION LIMITS VERSUS THERMAL POWER



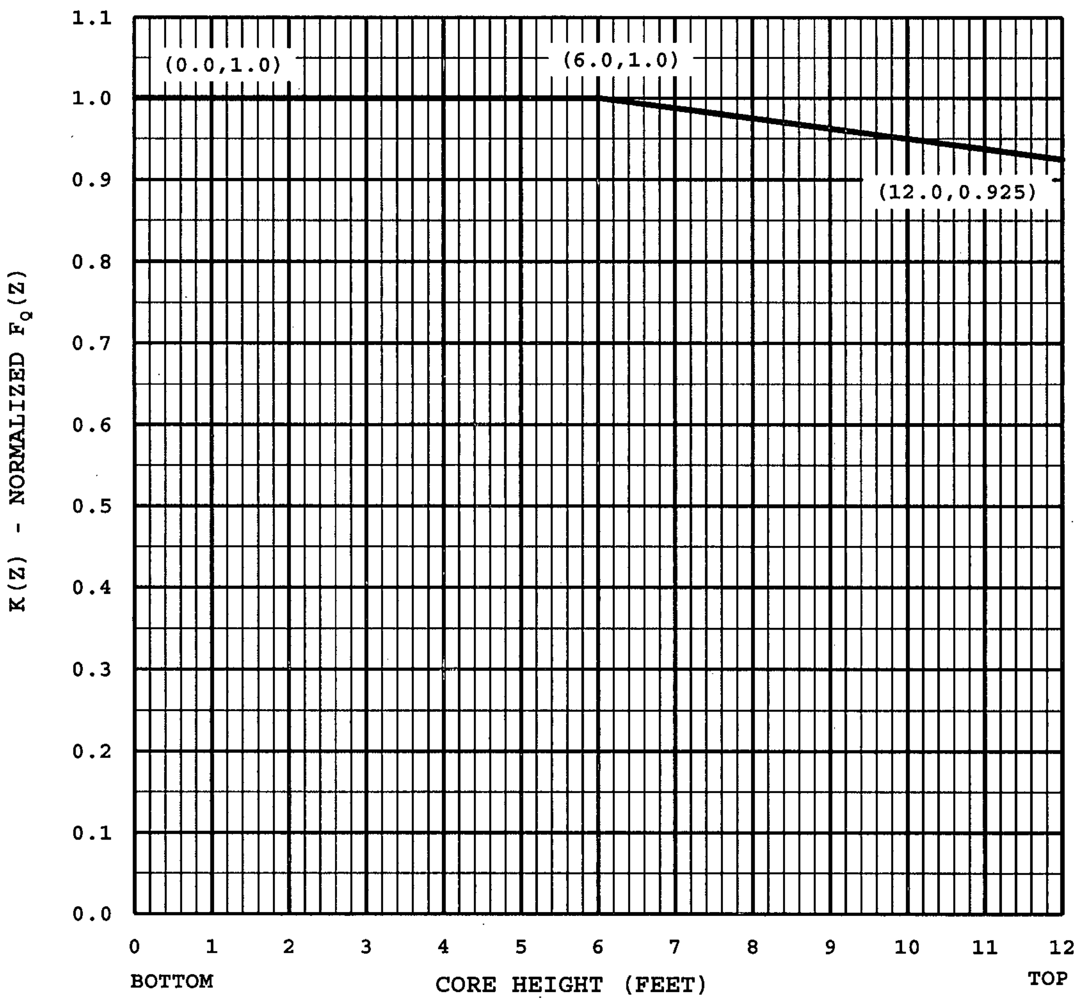
NOTES:

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.

FIGURE 3

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



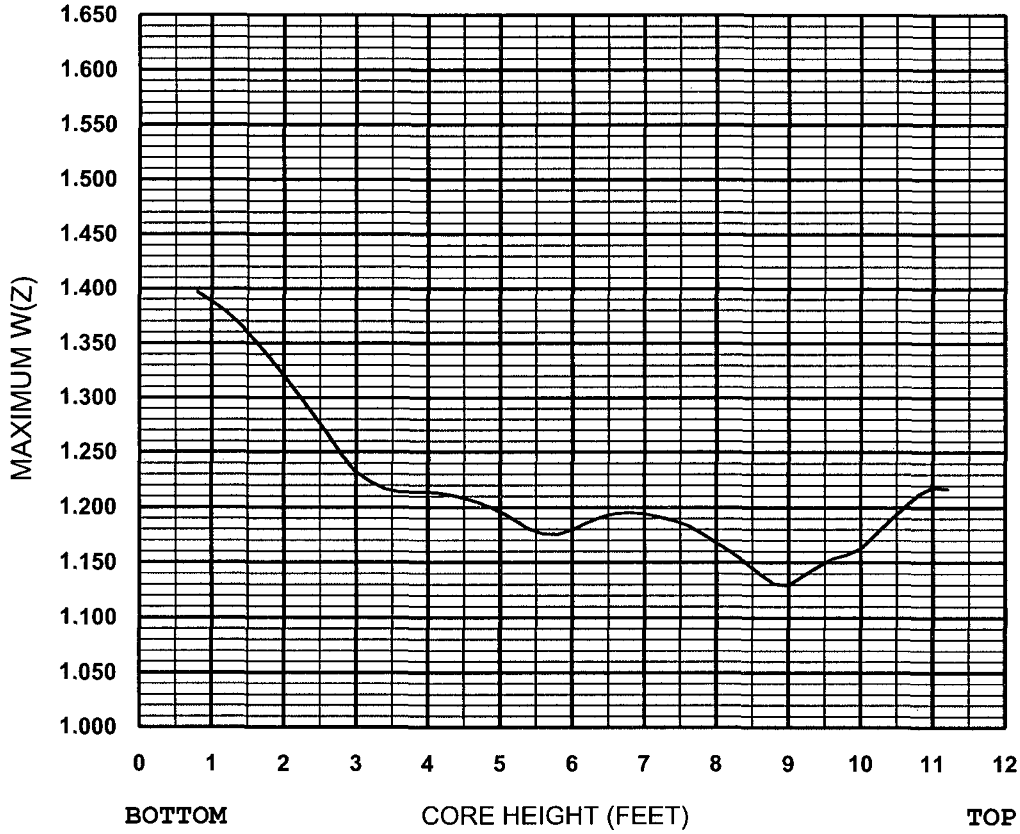
Axial Node	K(Z)	Axial Node	K(Z)	Axial Node	K(Z)	Axial Node	K(Z)
61	0.9250	53	0.9450	45	0.9650	37	0.9850
60	0.9275	52	0.9475	44	0.9675	36	0.9875
59	0.9300	51	0.9500	43	0.9700	35	0.9900
58	0.9325	50	0.9525	42	0.9725	34	0.9925
57	0.9350	49	0.9550	41	0.9750	33	0.9950
56	0.9375	48	0.9575	40	0.9775	32	0.9975
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

COLR for CPNPP Unit 2 Cycle 13

FIGURE 4

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

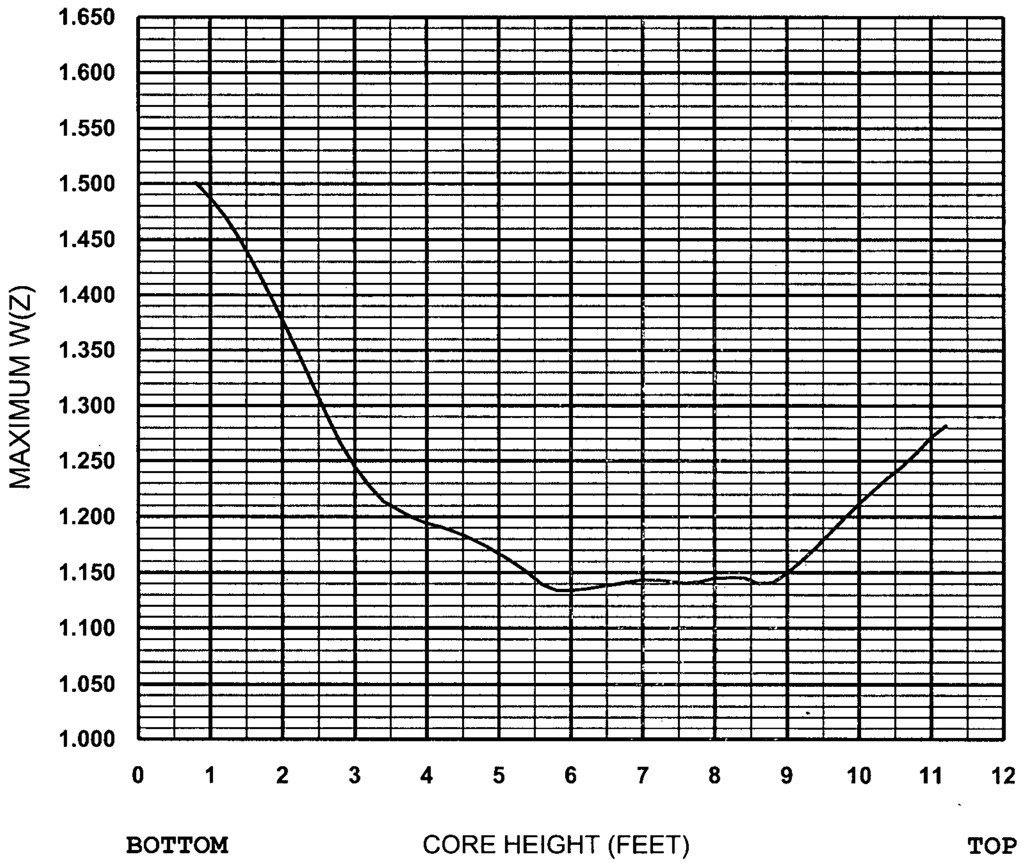


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1399	30	1.1755	16	1.2319
57	1.2170	43	1.1502	29	1.1760	15	1.2467
56	1.2184	42	1.1596	28	1.1804	14	1.2665
55	1.2116	41	1.1679	27	1.1886	13	1.2849
54	1.1996	40	1.1763	26	1.1961	12	1.3029
53	1.1878	39	1.1837	25	1.2019	11	1.3204
52	1.1751	38	1.1884	24	1.2067	10	1.3370
51	1.1625	37	1.1913	23	1.2102	9	1.3526
50	1.1569	36	1.1942	22	1.2125	8	1.3667
49	1.1531	35	1.1955	21	1.2139	7	1.3789
48	1.1460	34	1.1943	20	1.2139	6	1.3883
47	1.1381	33	1.1911	19	1.2140	5	1.3965
46	1.1295	32	1.1861	18	1.2170	1 - 4	---
45	1.1306	31	1.1795	17	1.2232		

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

FIGURE 5

W(Z) AS A FUNCTION OF CORE HEIGHT
(4,000 MWD/MTU)

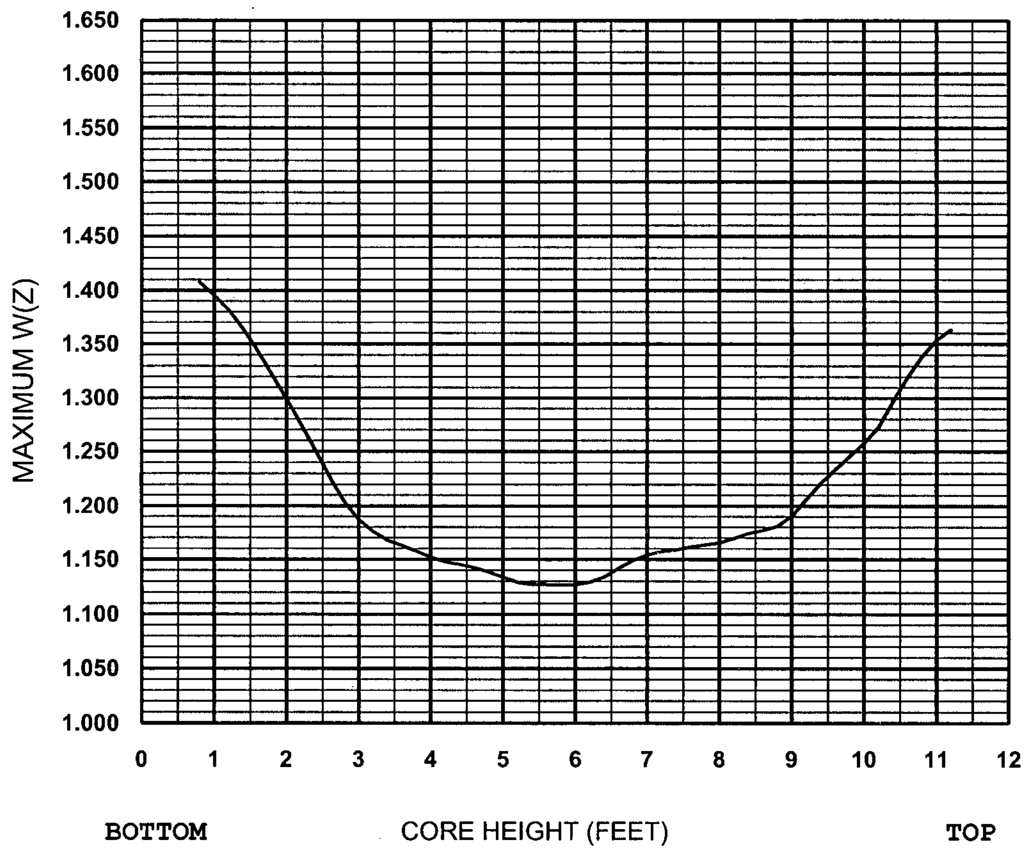


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1404	30	1.1341	16	1.2448
57	1.2820	43	1.1456	29	1.1394	15	1.2663
56	1.2715	42	1.1455	28	1.1501	14	1.2933
55	1.2575	41	1.1450	27	1.1591	13	1.3217
54	1.2452	40	1.1420	26	1.1671	12	1.3498
53	1.2351	39	1.1404	25	1.1744	11	1.3772
52	1.2237	38	1.1419	24	1.1807	10	1.4036
51	1.2118	37	1.1434	23	1.1861	9	1.4284
50	1.1992	36	1.1434	22	1.1908	8	1.4512
49	1.1858	35	1.1417	21	1.1940	7	1.4712
48	1.1725	34	1.1394	20	1.1994	6	1.4870
47	1.1604	33	1.1376	19	1.2065	5	1.5010
46	1.1495	32	1.1354	18	1.2137	1 - 4	---
45	1.1409	31	1.1340	17	1.2278		

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

FIGURE 6

W(Z) AS A FUNCTION OF CORE HEIGHT
(6,000 MWD/MTU)

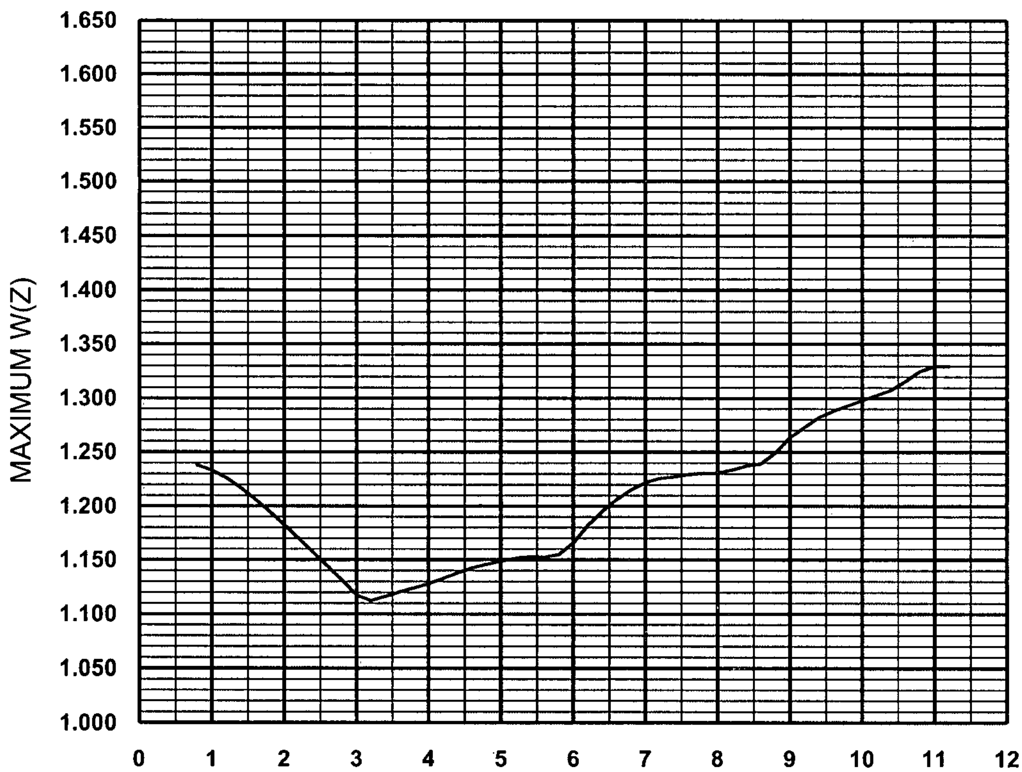


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1770	30	1.1269	16	1.1872
57	1.3634	43	1.1740	29	1.1272	15	1.2043
56	1.3536	42	1.1692	28	1.1272	14	1.2271
55	1.3385	41	1.1651	27	1.1291	13	1.2514
54	1.3195	40	1.1633	26	1.1338	12	1.2756
53	1.2968	39	1.1615	25	1.1386	11	1.2994
52	1.2724	38	1.1588	24	1.1424	10	1.3225
51	1.2576	37	1.1574	23	1.1456	9	1.3443
50	1.2454	36	1.1541	22	1.1479	8	1.3643
49	1.2334	35	1.1490	21	1.1521	7	1.3820
48	1.2211	34	1.1418	20	1.1577	6	1.3957
47	1.2061	33	1.1338	19	1.1628	5	1.4077
46	1.1903	32	1.1293	18	1.1676	1 - 4	---
45	1.1808	31	1.1271	17	1.1759		

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

FIGURE 7

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

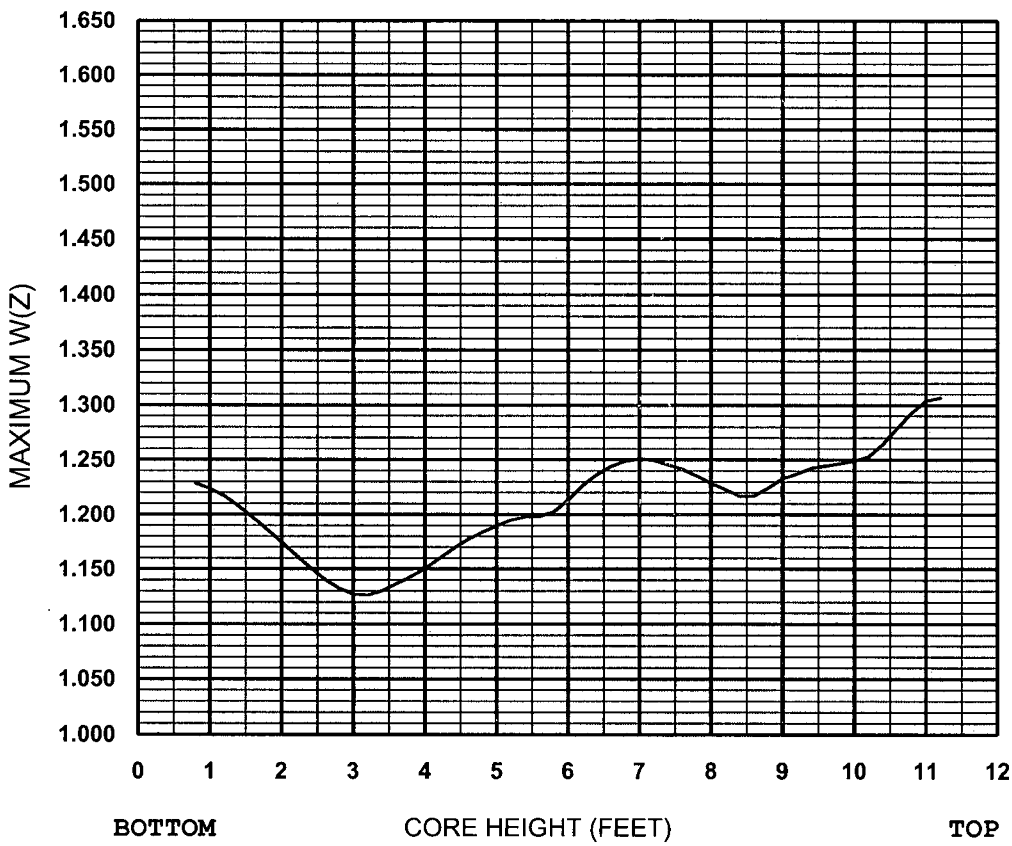


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.2394	30	1.1547	16	1.1177
57	1.3298	43	1.2375	29	1.1523	15	1.1313
56	1.3296	42	1.2336	28	1.1526	14	1.1439
55	1.3251	41	1.2309	27	1.1513	13	1.1569
54	1.3159	40	1.2306	26	1.1487	12	1.1698
53	1.3076	39	1.2297	25	1.1458	11	1.1825
52	1.3027	38	1.2274	24	1.1424	10	1.1949
51	1.2981	37	1.2261	23	1.1380	9	1.2065
50	1.2930	36	1.2221	22	1.1328	8	1.2173
49	1.2881	35	1.2153	21	1.1281	7	1.2266
48	1.2820	34	1.2062	20	1.1241	6	1.2333
47	1.2726	33	1.1949	19	1.1205	5	1.2381
46	1.2633	32	1.1817	18	1.1163	1 - 4	---
45	1.2494	31	1.1656	17	1.1122		

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

FIGURE 8

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



Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.2170	30	1.2024	16	1.1274
57	1.3068	43	1.2168	29	1.1983	15	1.1326
56	1.3039	42	1.2230	28	1.1979	14	1.1407
55	1.2929	41	1.2288	27	1.1947	13	1.1513
54	1.2790	40	1.2354	26	1.1895	12	1.1630
53	1.2644	39	1.2414	25	1.1837	11	1.1748
52	1.2528	38	1.2454	24	1.1770	10	1.1862
51	1.2490	37	1.2495	23	1.1688	9	1.1972
50	1.2466	36	1.2507	22	1.1595	8	1.2076
49	1.2445	35	1.2487	21	1.1502	7	1.2169
48	1.2423	34	1.2439	20	1.1428	6	1.2237
47	1.2373	33	1.2364	19	1.1365	5	1.2286
46	1.2328	32	1.2264	18	1.1300	1 - 4	---
45	1.2245	31	1.2131	17	1.1263		

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

FIGURE 9

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF RATED THERMAL POWER