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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 (UNIT 1)
CORE OPERATING LIMITS REPORT

Dear Sir or Madam:

Enclosed is Revision 0 of the Core Operating Limits Report for Comanche Peak Nuclear Power Plant (CPNPP) Unit 1, Cycle 18. This report is prepared and submitted pursuant to Technical Specification 5.6.5.

This communication contains no new licensing basis commitments regarding CPNPP Unit 1.

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

Sincerely,

Luminant Generation Company LLC

Rafael Flores

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Director, External Affairs

Enclosure - Unit 1 Cycle 18 Core Operating Limits Report, Revision 0

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A001
NRR

ERX-14-002, Rev. 0

CPNPP UNIT 1 CYCLE 18

CORE OPERATING LIMITS REPORT

September 2014

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This Core Operating Limits Report (COLR) for CPNPP UNIT 1 CYCLE 18 has been prepared in accordance with the requirements of Technical Specification 5.6.5.

The Technical Specifications affected by this report are listed below:

SLs 2.1	SAFETY LIMITS (SLs)
LCO 3.1.1	SHUTDOWN MARGIN (SDM)
LCO 3.1.3	MODERATOR TEMPERATURE COEFFICIENT (MTC)
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 (SLs) (SLs 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% $\Delta k/k$ 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 ($F_Q(Z)$) (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, Note 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: $P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

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° = 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 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 ≥ 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 ≤ 588 °F (4 channels)

≤ 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.

2.12.4 SR 3.4.1.3

The RCS total flow rate shall be ≥ 403,700 gpm.

2.12.5 SR 3.4.1.4

The RCS total flow rate based on precision heat balance shall be ≥ 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 <u>BORON CONCENTRATION</u> (LCO 3.9.1)

2.13.1 The required refueling boron concentration is ≥ 1861 ppm.

3.0 <u>REFERENCES</u>

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)
5730	2.00
5945	2.26
6159	3.04
6374	3.67
6589	3.70
6803	3.29
7018	2.87
7232	2.44
7447	2.00
10023	2.00
10237	2.04
10452	2.03
10666	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 Surveillance Requirement 3.2.1.2, Note a. 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

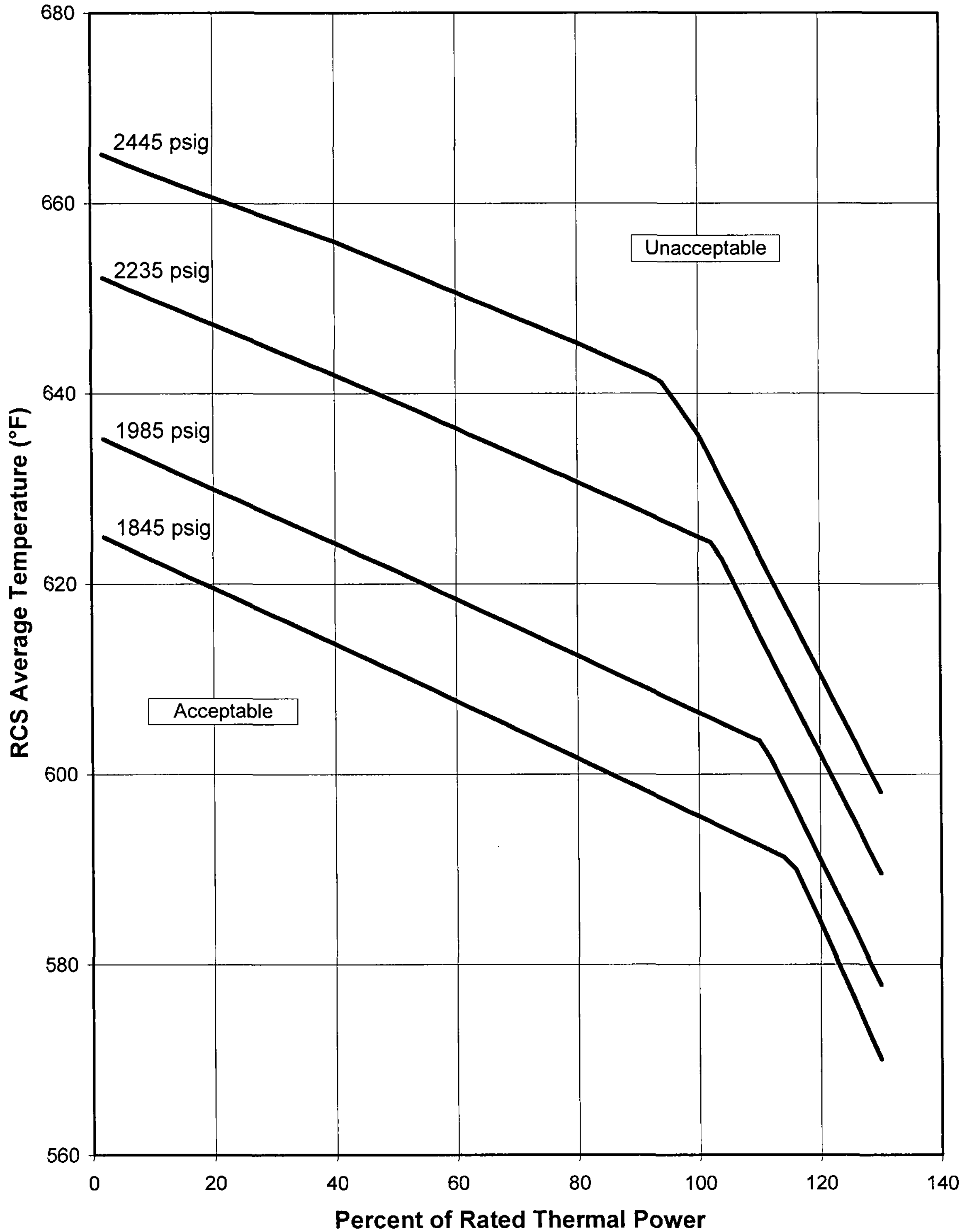
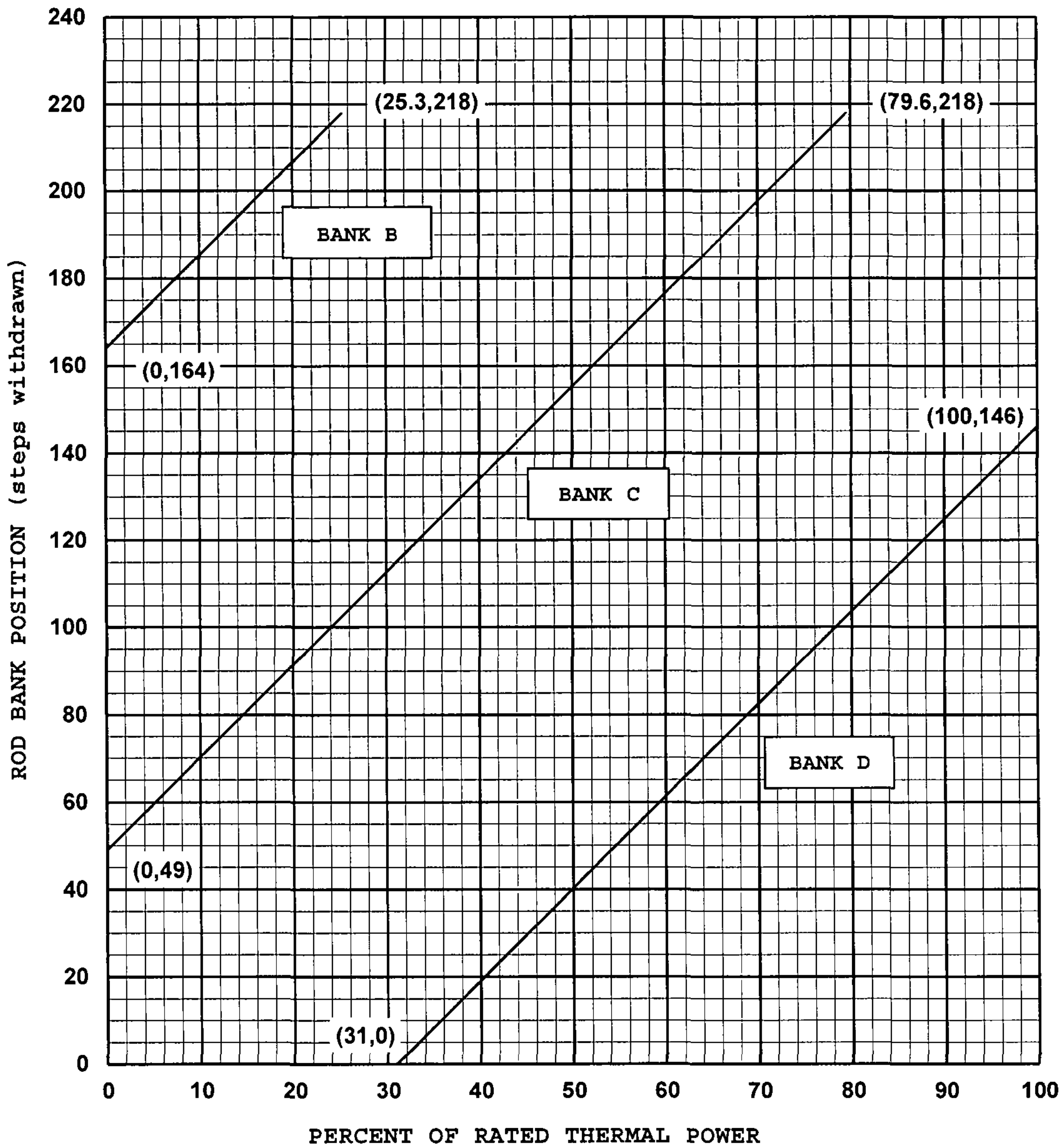


FIGURE 2

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

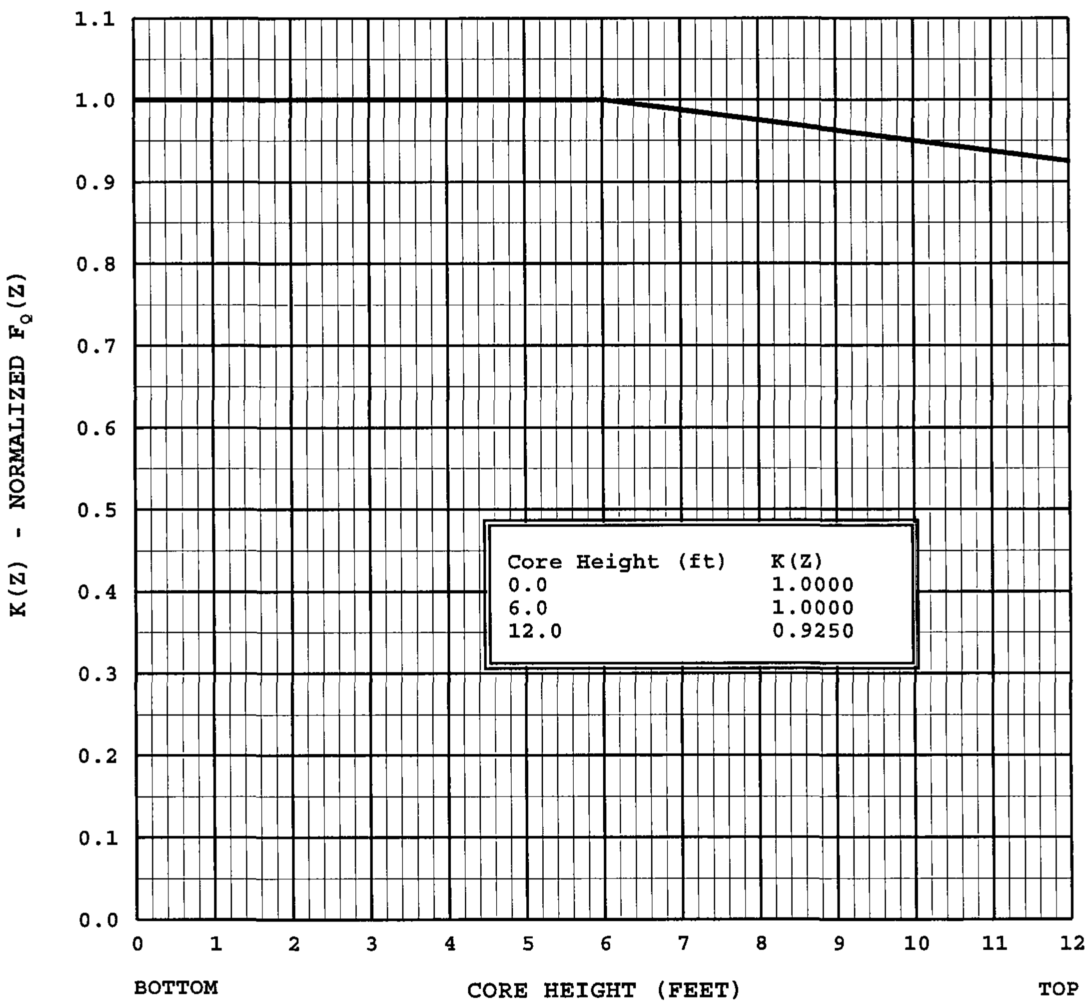
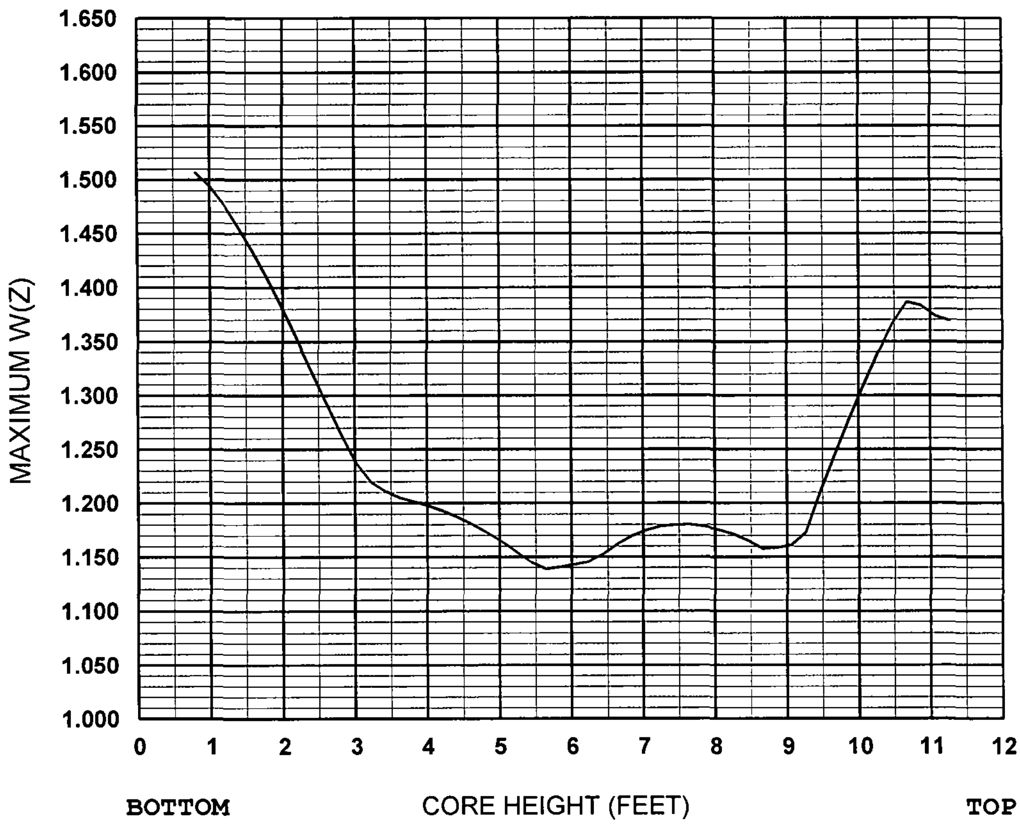


FIGURE 4

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

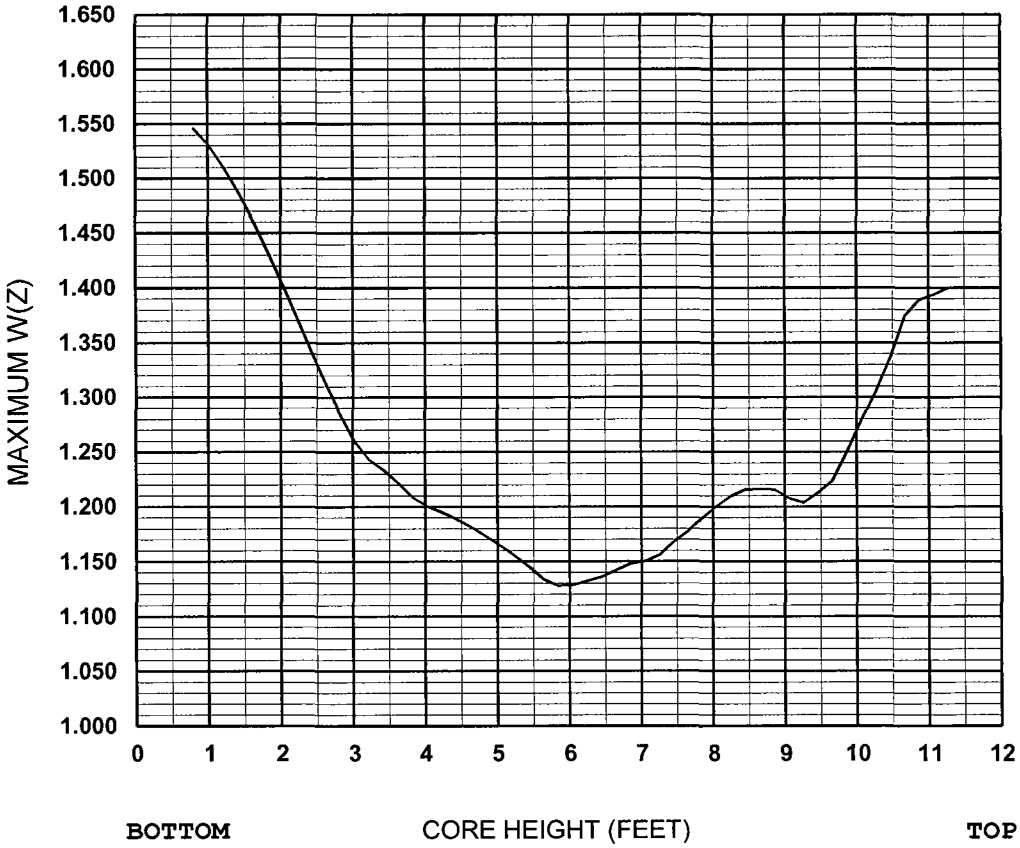


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1577	30	1.1407	16	1.2372
57	1.3694	43	1.1652	29	1.1389	15	1.2631
56	1.3736	42	1.1715	28	1.1451	14	1.2918
55	1.3834	41	1.1755	27	1.1549	13	1.3210
54	1.3867	40	1.1785	26	1.1644	12	1.3500
53	1.3663	39	1.1804	25	1.1727	11	1.3784
52	1.3381	38	1.1799	24	1.1802	10	1.4057
51	1.3083	37	1.1786	23	1.1868	9	1.4313
50	1.2770	36	1.1752	22	1.1925	8	1.4548
49	1.2442	35	1.1697	21	1.1975	7	1.4760
48	1.2099	34	1.1621	20	1.2013	6	1.4938
47	1.1730	33	1.1528	19	1.2051	5	1.5068
46	1.1613	32	1.1455	18	1.2113	1 - 4	---
45	1.1586	31	1.1428	17	1.2197		

Core Height (ft) = (Node - 1) * 0.2013217

FIGURE 5

W(Z) AS A FUNCTION OF CORE HEIGHT
(3,000 MWD/MTU)

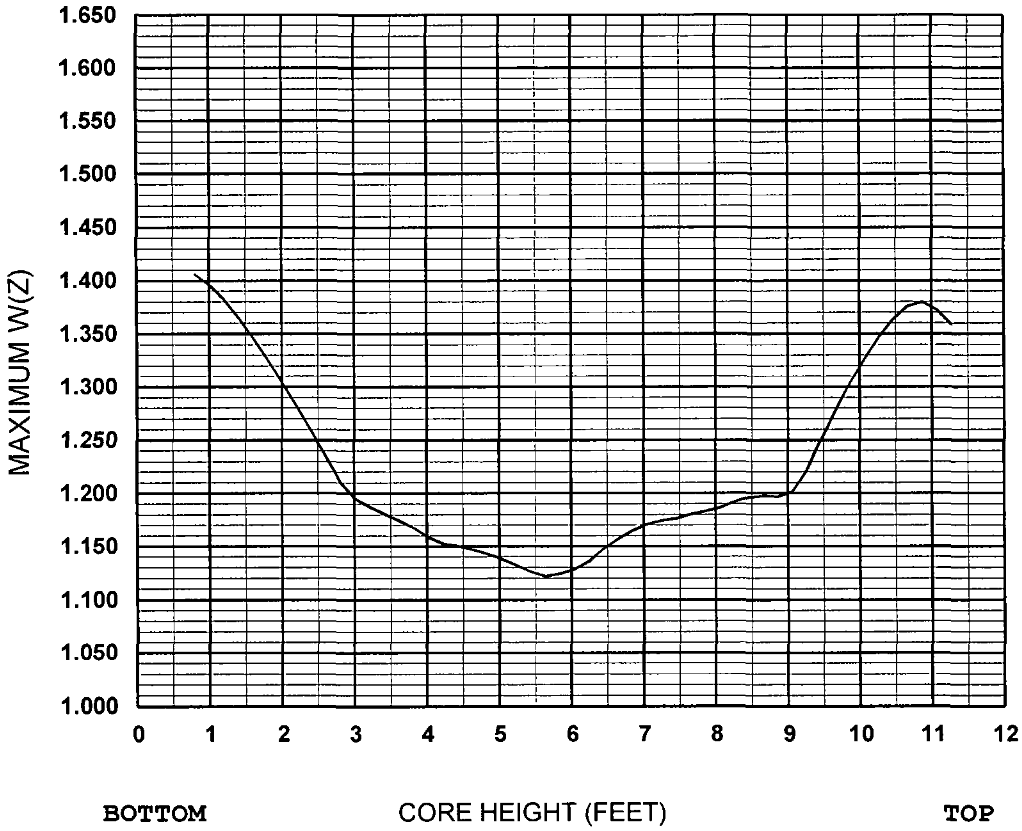


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.2164	30	1.1278	16	1.2603
57	1.4000	43	1.2159	29	1.1338	15	1.2854
56	1.3936	42	1.2099	28	1.1452	14	1.3138
55	1.3889	41	1.2009	27	1.1556	13	1.3434
54	1.3746	40	1.1897	26	1.1647	12	1.3745
53	1.3369	39	1.1775	25	1.1734	11	1.4053
52	1.3054	38	1.1677	24	1.1816	10	1.4348
51	1.2782	37	1.1556	23	1.1888	9	1.4627
50	1.2492	36	1.1500	22	1.1952	8	1.4883
49	1.2235	35	1.1477	21	1.2004	7	1.5113
48	1.2126	34	1.1418	20	1.2088	6	1.5312
47	1.2037	33	1.1359	19	1.2220	5	1.5462
46	1.2076	32	1.1320	18	1.2337	1 - 4	---
45	1.2158	31	1.1285	17	1.2434		

Core Height (ft) = (Node - 1) * 0.2013217

FIGURE 6

W(Z) AS A FUNCTION OF CORE HEIGHT
(8,000 MWD/MTU)

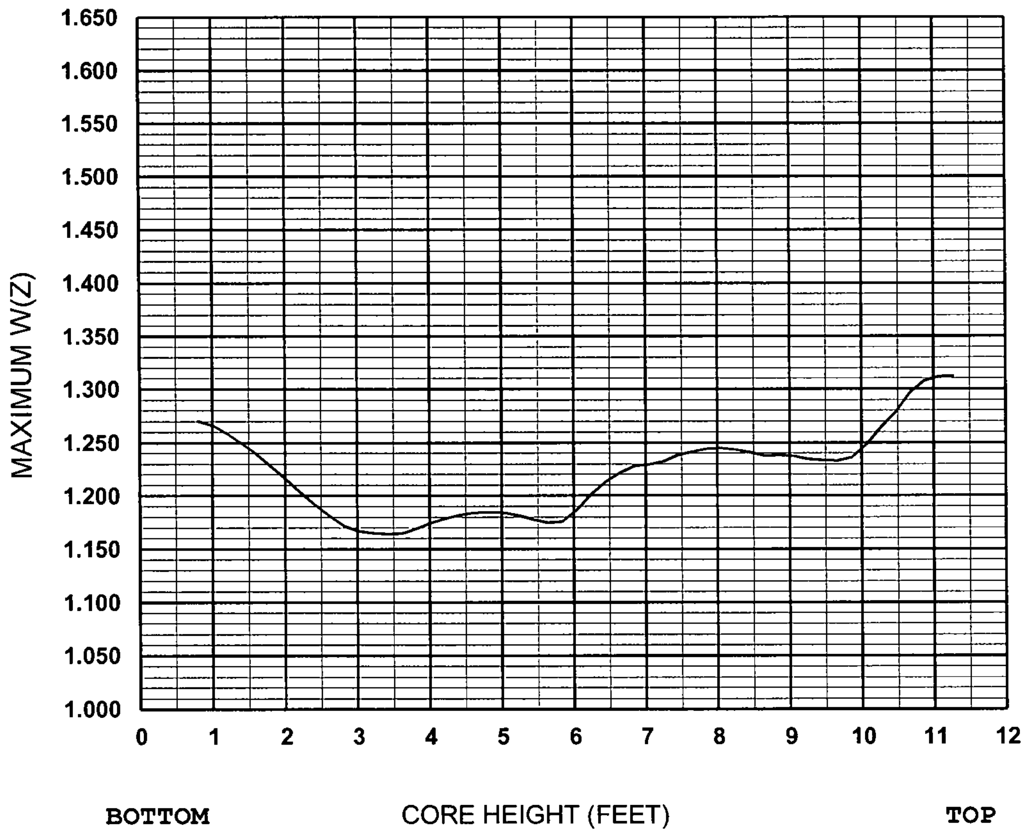


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1975	30	1.1240	16	1.1945
57	1.3582	43	1.1961	29	1.1217	15	1.2097
56	1.3722	42	1.1916	28	1.1259	14	1.2340
55	1.3797	41	1.1862	27	1.1322	13	1.2570
54	1.3756	40	1.1827	26	1.1380	12	1.2801
53	1.3637	39	1.1803	25	1.1427	11	1.3029
52	1.3466	38	1.1762	24	1.1469	10	1.3248
51	1.3267	37	1.1740	23	1.1503	9	1.3454
50	1.3040	36	1.1705	22	1.1523	8	1.3644
49	1.2784	35	1.1645	21	1.1585	7	1.3814
48	1.2507	34	1.1568	20	1.1671	6	1.3958
47	1.2208	33	1.1475	19	1.1740	5	1.4060
46	1.2013	32	1.1357	18	1.1805	1 - 4	---
45	1.1969	31	1.1282	17	1.1871		

Core Height (ft) = (Node - 1) * 0.2013217

FIGURE 7

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

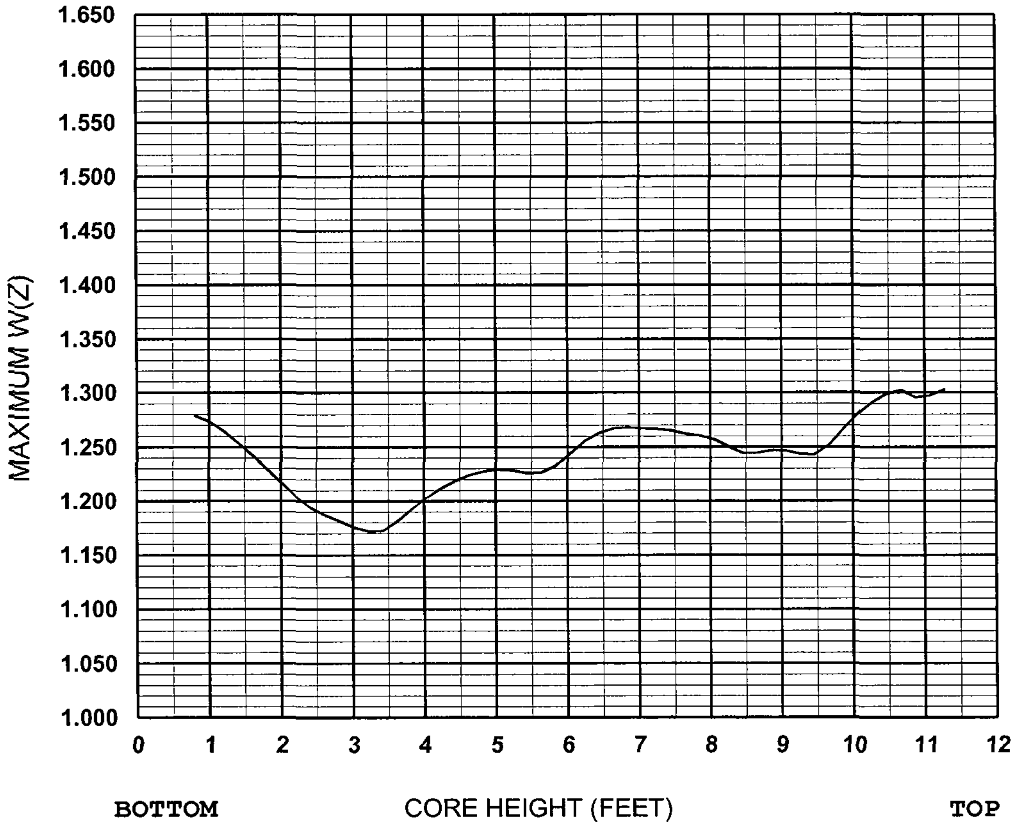


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.2376	30	1.1756	16	1.1668
57	1.3123	43	1.2407	29	1.1748	15	1.1718
56	1.3115	42	1.2432	28	1.1775	14	1.1811
55	1.3076	41	1.2446	27	1.1813	13	1.1917
54	1.2961	40	1.2440	26	1.1839	12	1.2032
53	1.2784	39	1.2411	25	1.1846	11	1.2154
52	1.2641	38	1.2382	24	1.1839	10	1.2275
51	1.2485	37	1.2323	23	1.1819	9	1.2388
50	1.2359	36	1.2295	22	1.1787	8	1.2492
49	1.2328	35	1.2278	21	1.1747	7	1.2586
48	1.2333	34	1.2216	20	1.1695	6	1.2661
47	1.2343	33	1.2129	19	1.1649	5	1.2703
46	1.2372	32	1.2017	18	1.1641	1 - 4	---
45	1.2383	31	1.1866	17	1.1650		

Core Height (ft) = (Node - 1) * 0.2013217

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	1.2446	30	1.2325	16	1.1754
57	1.3026	43	1.2445	29	1.2264	15	1.1814
56	1.2972	42	1.2503	28	1.2262	14	1.1870
55	1.2956	41	1.2572	27	1.2283	13	1.1939
54	1.3021	40	1.2606	26	1.2292	12	1.2041
53	1.2986	39	1.2623	25	1.2276	11	1.2168
52	1.2911	38	1.2650	24	1.2241	10	1.2298
51	1.2805	37	1.2665	23	1.2185	9	1.2420
50	1.2664	36	1.2672	22	1.2112	8	1.2536
49	1.2520	35	1.2679	21	1.2024	7	1.2644
48	1.2433	34	1.2672	20	1.1921	6	1.2734
47	1.2434	33	1.2628	19	1.1811	5	1.2789
46	1.2466	32	1.2553	18	1.1722	1 - 4	---
45	1.2471	31	1.2440	17	1.1719		

Core Height (ft) = (Node - 1) * 0.2013217

FIGURE 9

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF RATED THERMAL POWER