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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 (UNIT 2)
CORE OPERATING LIMITS REPORT

Dear Sir or Madam:

Enclosed is Revision 1 of the Core Operating Limits Report for Comanche Peak Nuclear Power Plant (CPNPP) Unit 2, Cycle 15. This report is prepared and submitted pursuant to Technical Specification 5.6.5.

This communication contains no new licensing basis commitments regarding CPNPP Unit 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
Fred W. Madden
Director, External Affairs

Enclosure - Unit 2 Cycle 15 Core Operating Limits Report, Revision 1

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A001
NRR

ERX-14-001, Rev. 1

CPNPP UNIT 2 CYCLE 15

CORE OPERATING LIMITS REPORT

September 2014

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This Core Operating Limits Report (COLR) for CPNPP UNIT 2 CYCLE 15 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
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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: $P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

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 <u>NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR ($F^N_{\Delta H}$)</u> (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 <u>AXIAL FLUX DIFFERENCE (AFD)</u> (LCO 3.2.3)

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

2.11 <u>REACTOR TRIP SYSTEM (RTS) INSTRUMENTATION</u> (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 ≤ 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 ≥ 1950 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)
794	2.00
1009	2.25
1224	2.44
1439	2.26
1653	2.00
4230	2.00
4445	2.24
4660	2.09
4875	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

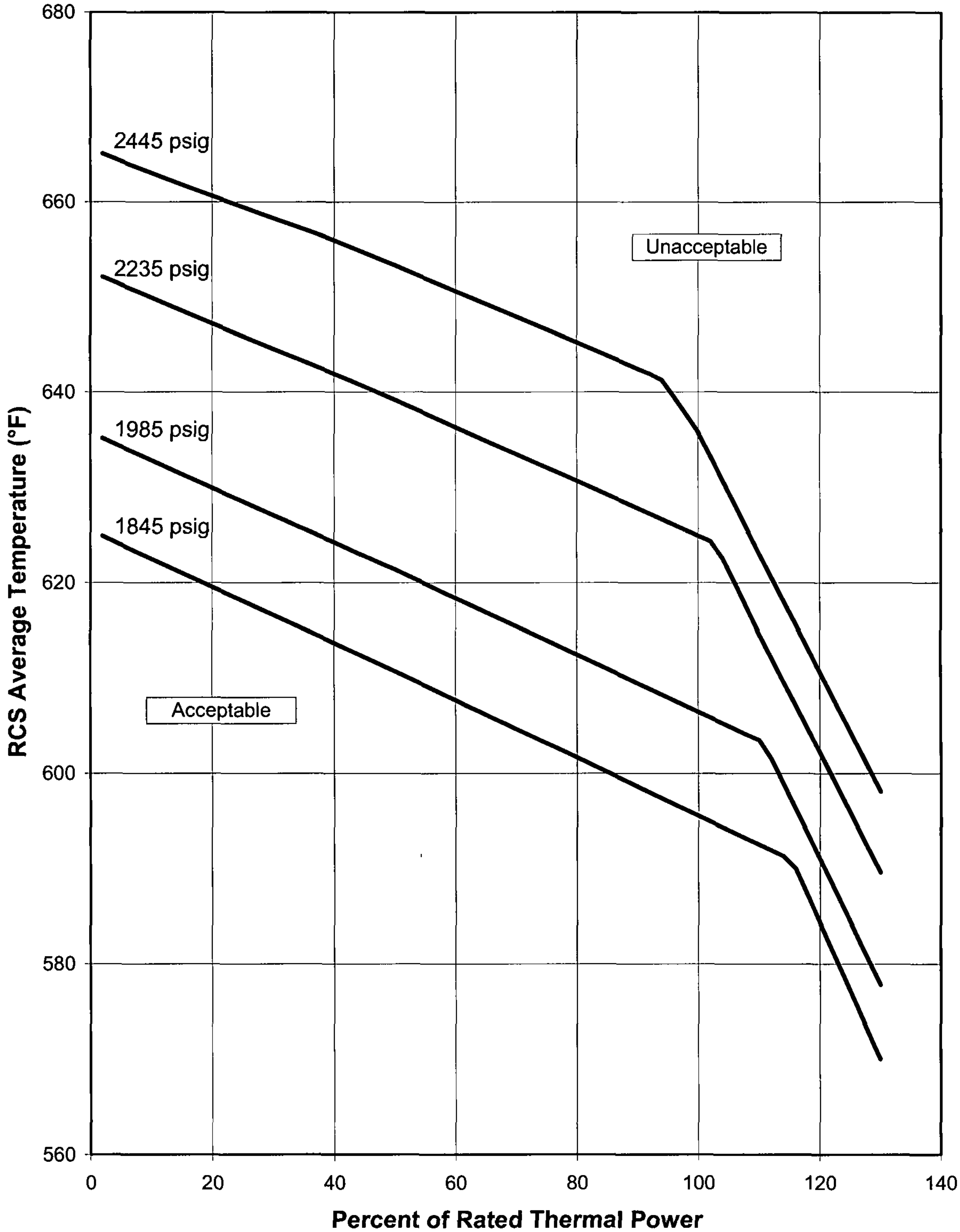
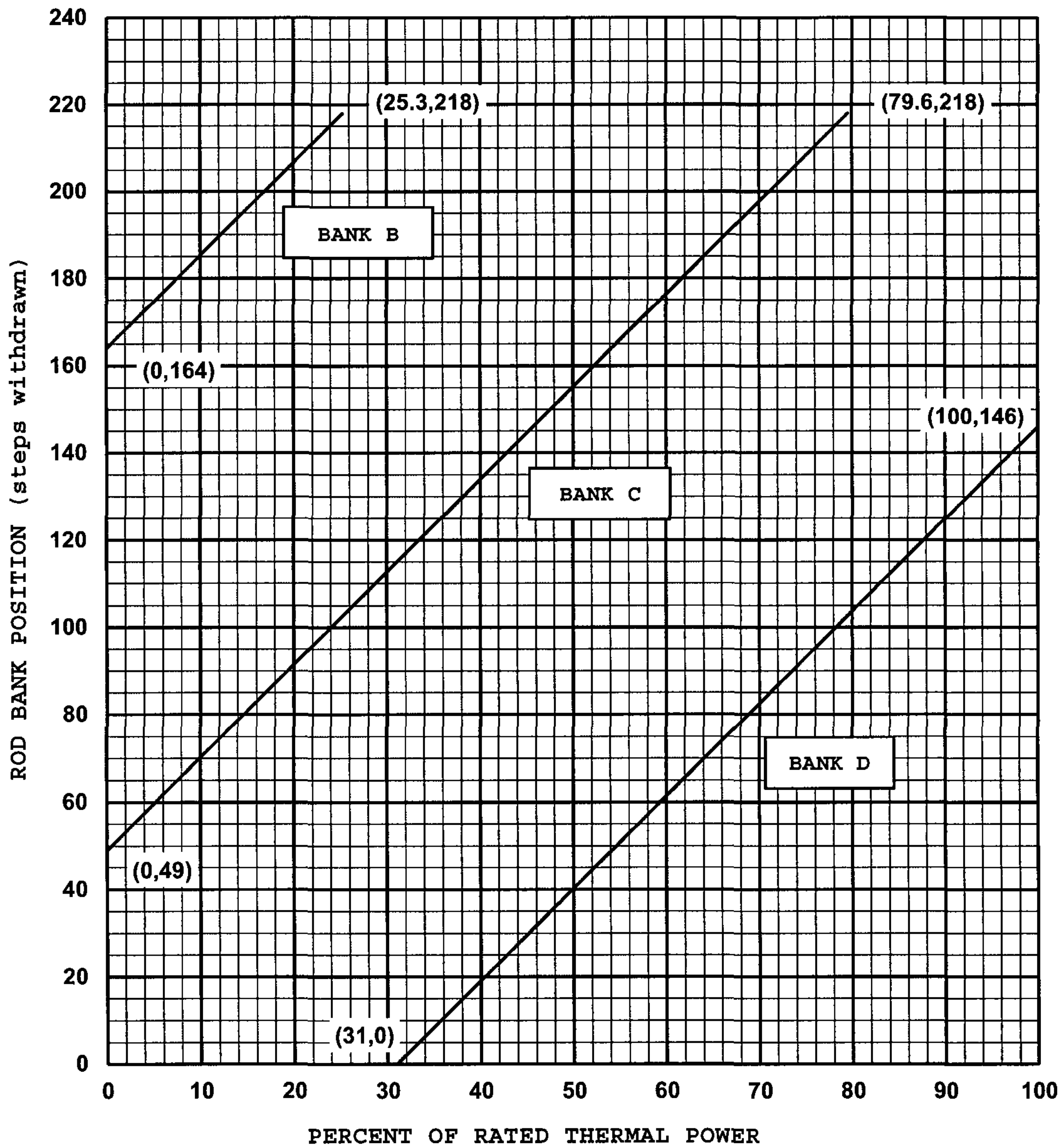


FIGURE 2

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

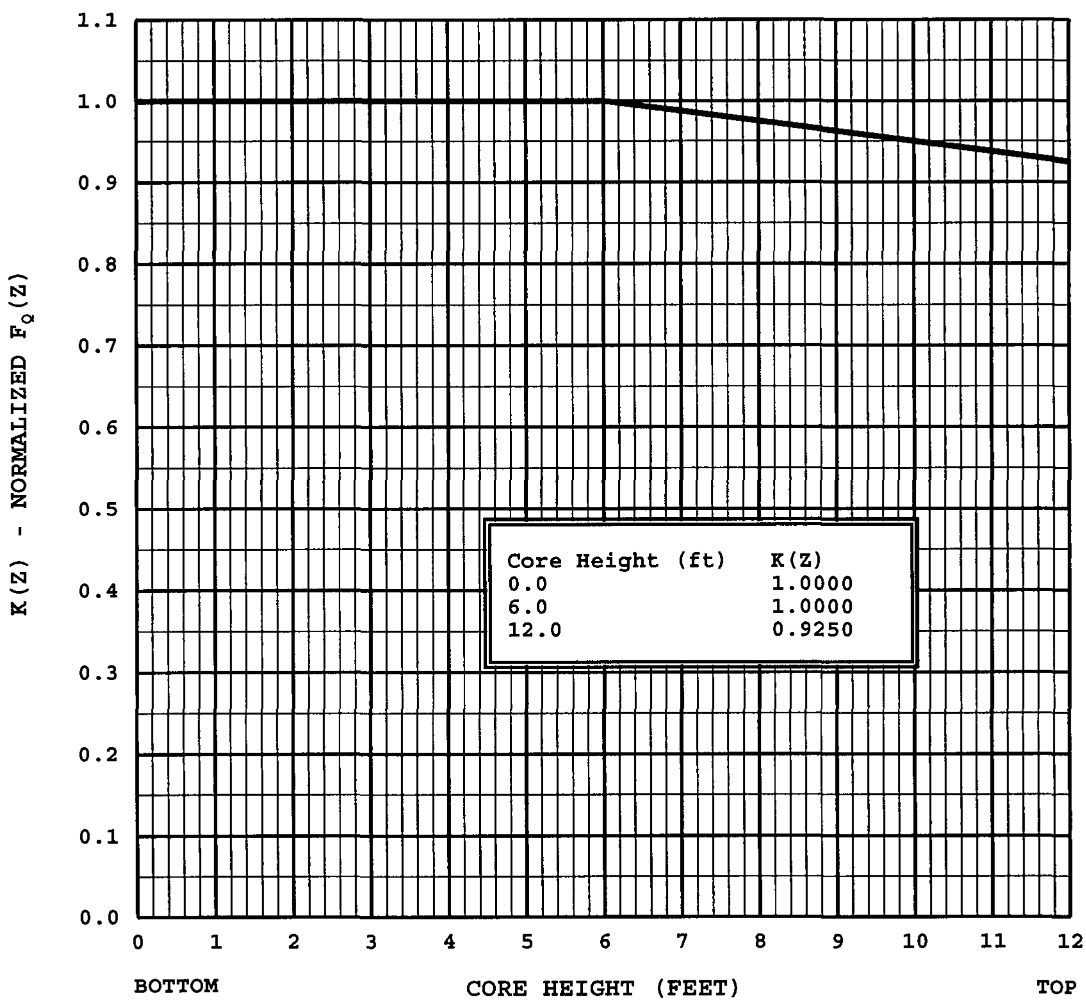
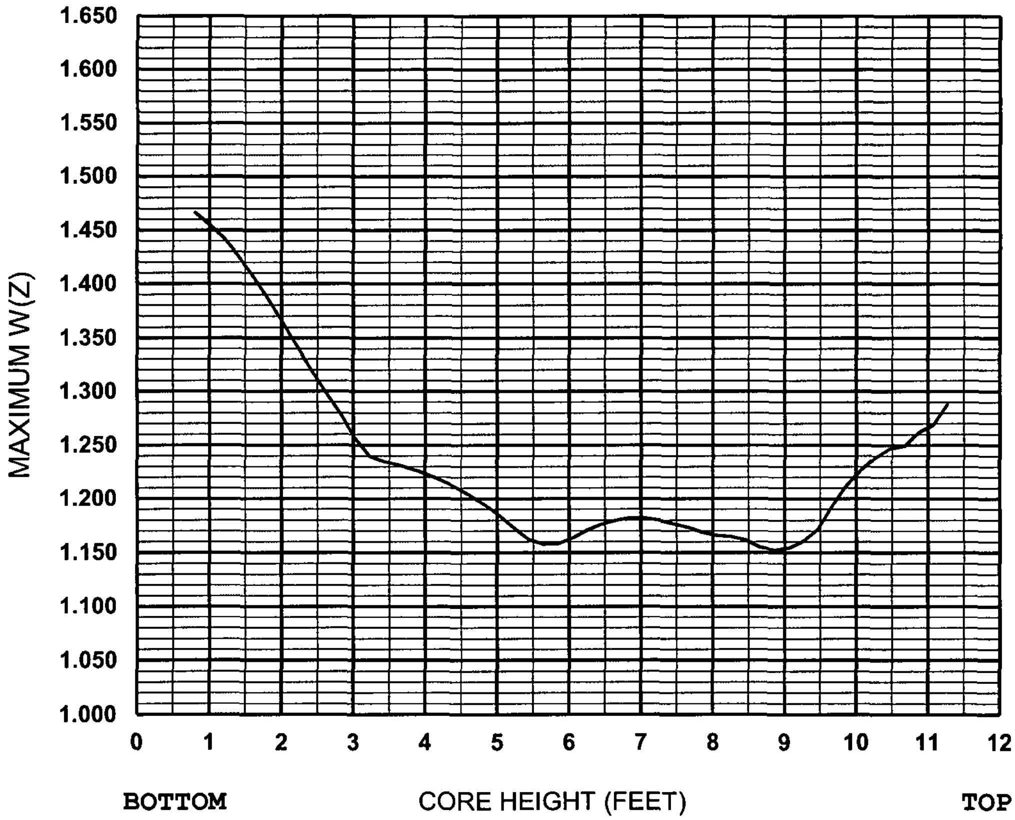


FIGURE 4

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

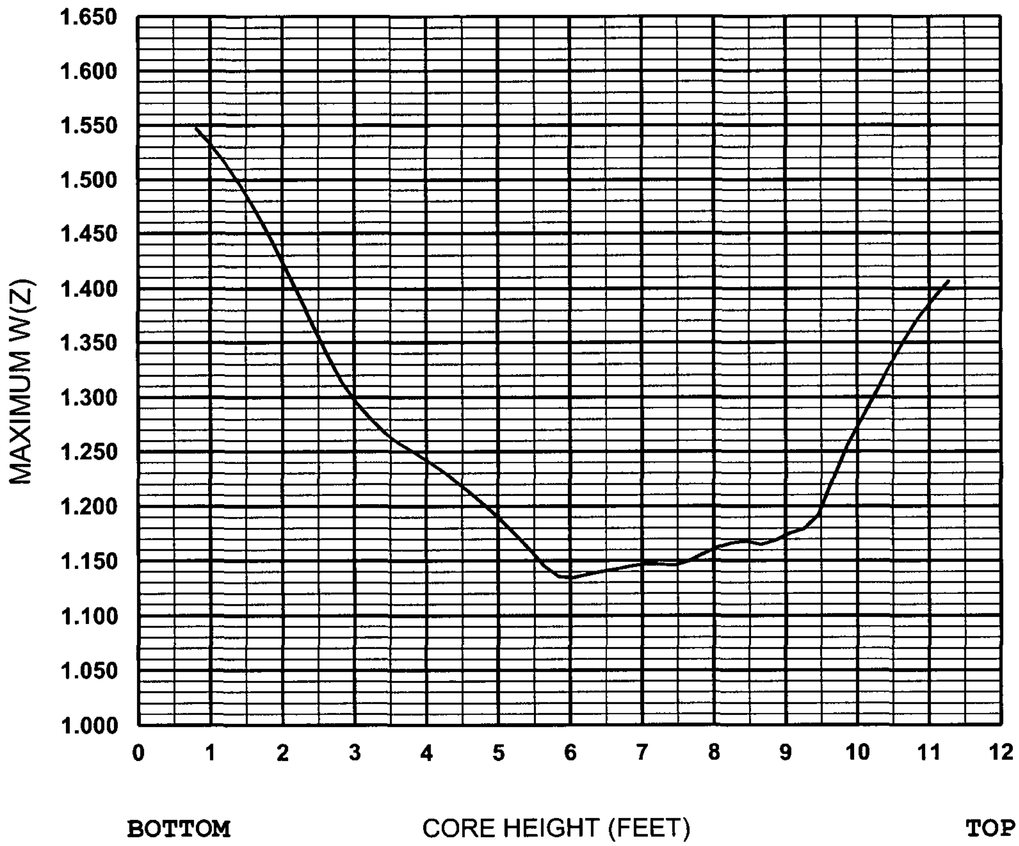


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1550	30	1.1580	16	1.2564
57	1.2880	43	1.1618	29	1.1579	15	1.2794
56	1.2688	42	1.1648	28	1.1624	14	1.3001
55	1.2622	41	1.1660	27	1.1730	13	1.3208
54	1.2493	40	1.1690	26	1.1843	12	1.3423
53	1.2469	39	1.1734	25	1.1940	11	1.3645
52	1.2387	38	1.1770	24	1.2028	10	1.3864
51	1.2267	37	1.1801	23	1.2106	9	1.4069
50	1.2124	36	1.1820	22	1.2173	8	1.4256
49	1.1929	35	1.1820	21	1.2230	7	1.4420
48	1.1713	34	1.1799	20	1.2279	6	1.4551
47	1.1606	33	1.1760	19	1.2318	5	1.4665
46	1.1544	32	1.1703	18	1.2350	1 - 4	---
45	1.1524	31	1.1631	17	1.2399		

Core Height (ft) = (Node - 1) * 0.2013133

FIGURE 5

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

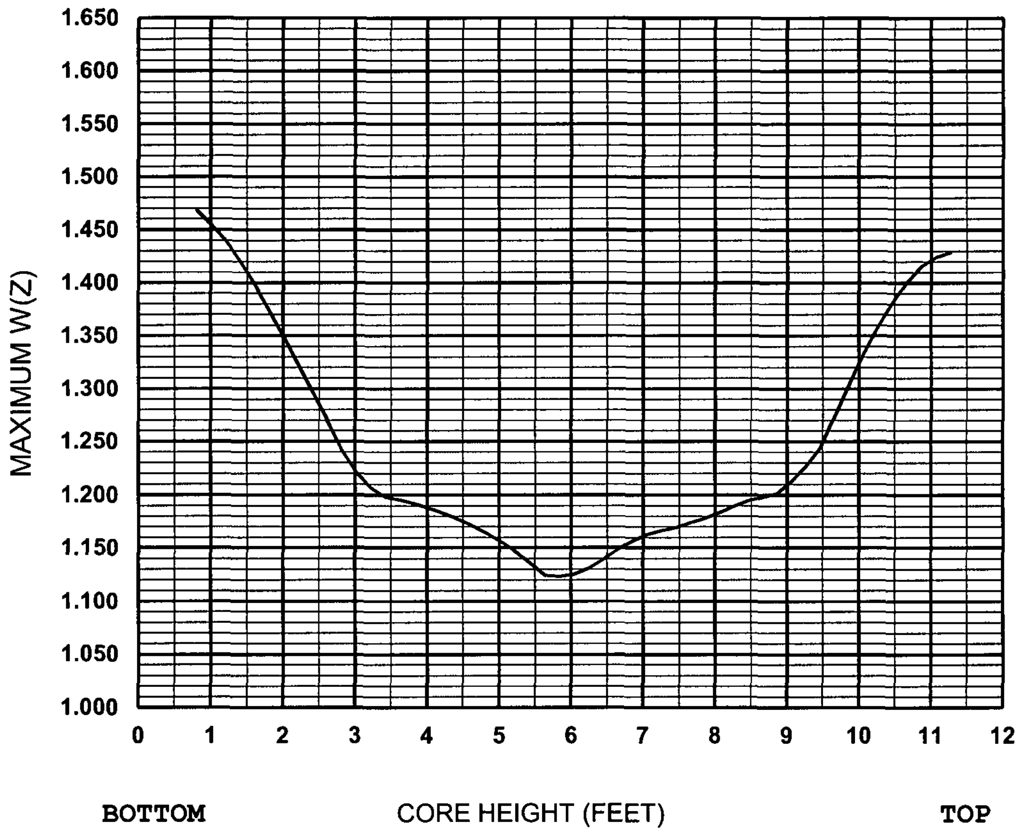


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1649	30	1.1355	16	1.2954
57	1.4066	43	1.1682	29	1.1450	15	1.3146
56	1.3915	42	1.1668	28	1.1604	14	1.3400
55	1.3742	41	1.1624	27	1.1748	13	1.3678
54	1.3534	40	1.1563	26	1.1879	12	1.3954
53	1.3307	39	1.1495	25	1.2000	11	1.4224
52	1.3047	38	1.1460	24	1.2111	10	1.4485
51	1.2806	37	1.1467	23	1.2218	9	1.4732
50	1.2561	36	1.1470	22	1.2320	8	1.4959
49	1.2247	35	1.1450	21	1.2412	7	1.5161
48	1.1918	34	1.1422	20	1.2494	6	1.5323
47	1.1794	33	1.1399	19	1.2574	5	1.5466
46	1.1753	32	1.1373	18	1.2671	1 - 4	---
45	1.1690	31	1.1343	17	1.2805		

Core Height (ft) = (Node - 1) * 0.2013133

FIGURE 6

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

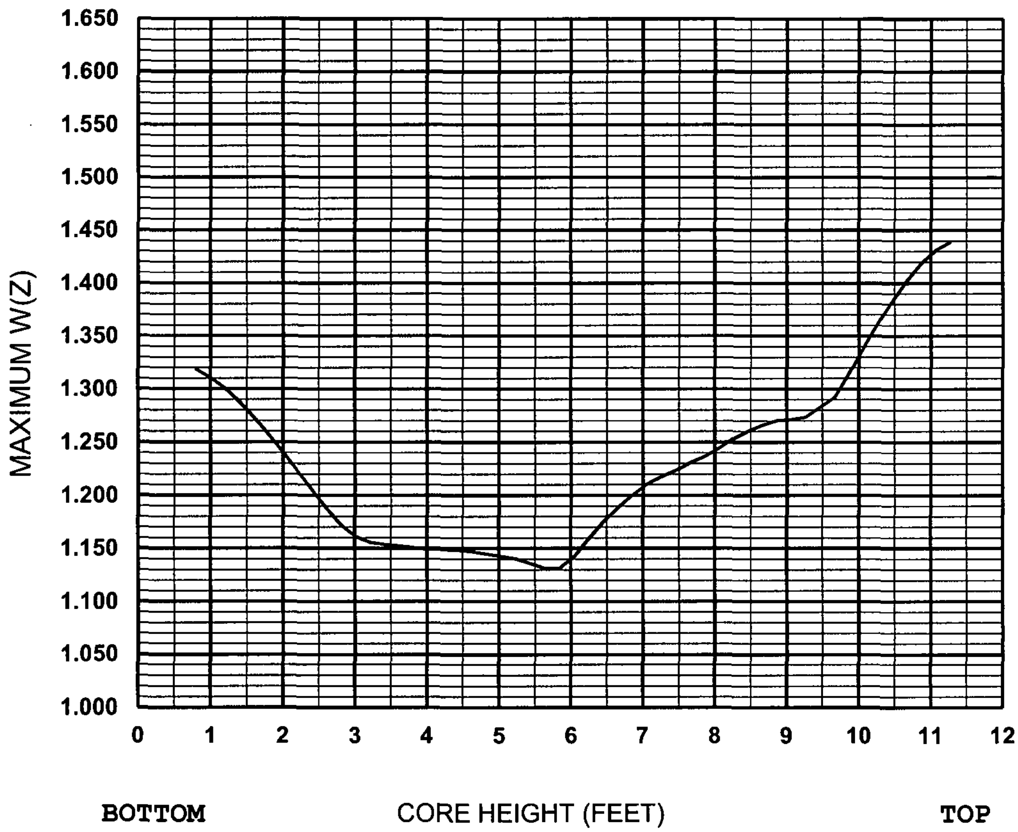


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.1980	30	1.1231	16	1.2206
57	1.4287	43	1.1945	29	1.1243	15	1.2416
56	1.4245	42	1.1895	28	1.1357	14	1.2690
55	1.4161	41	1.1832	27	1.1462	13	1.2957
54	1.4011	40	1.1779	26	1.1551	12	1.3223
53	1.3815	39	1.1738	25	1.1634	11	1.3485
52	1.3589	38	1.1692	24	1.1707	10	1.3738
51	1.3332	37	1.1664	23	1.1772	9	1.3978
50	1.3050	36	1.1626	22	1.1829	8	1.4198
49	1.2742	35	1.1564	21	1.1877	7	1.4394
48	1.2435	34	1.1484	20	1.1921	6	1.4547
47	1.2266	33	1.1389	19	1.1954	5	1.4681
46	1.2128	32	1.1307	18	1.1982	1 - 4	---
45	1.2017	31	1.1252	17	1.2067		

Core Height (ft) = (Node - 1) * 0.2013133

FIGURE 7

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

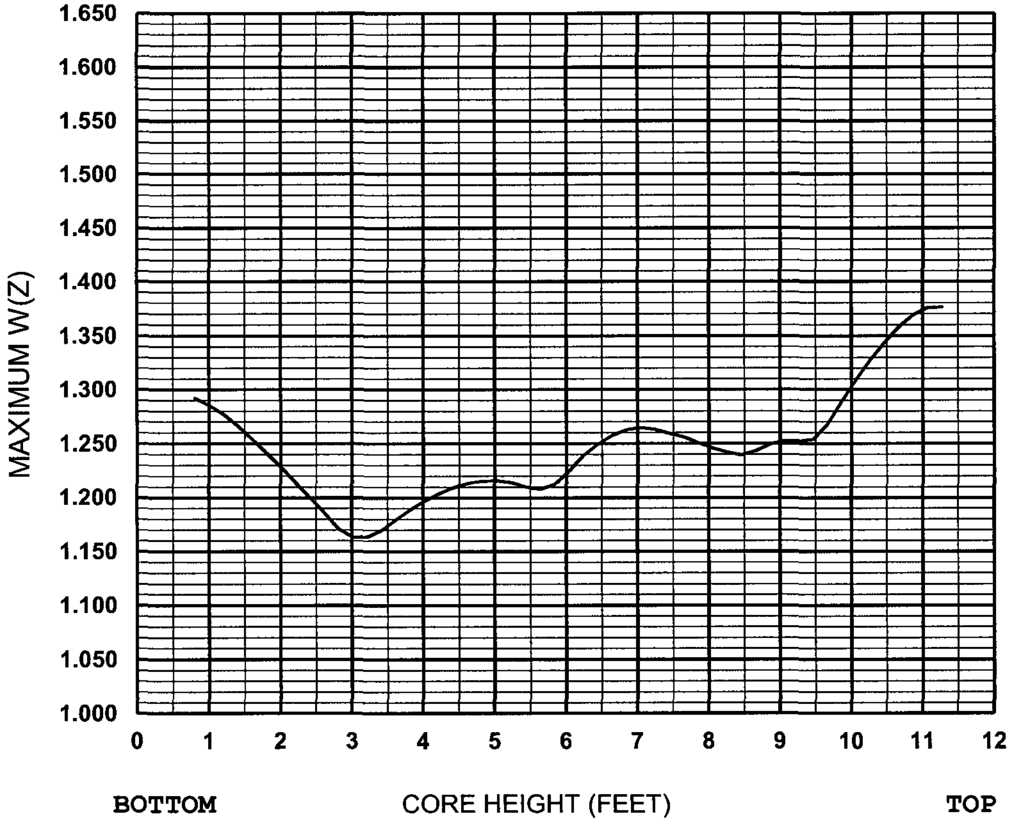


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
58 - 61	---	44	1.2657	30	1.1313	16	1.1609
57	1.4387	43	1.2601	29	1.1311	15	1.1715
56	1.4311	42	1.2531	28	1.1360	14	1.1863
55	1.4191	41	1.2441	27	1.1401	13	1.2040
54	1.4024	40	1.2363	26	1.1426	12	1.2218
53	1.3832	39	1.2306	25	1.1449	11	1.2391
52	1.3621	38	1.2232	24	1.1472	10	1.2561
51	1.3395	37	1.2175	23	1.1486	9	1.2722
50	1.3143	36	1.2103	22	1.1491	8	1.2871
49	1.2920	35	1.2002	21	1.1493	7	1.3003
48	1.2825	34	1.1882	20	1.1503	6	1.3103
47	1.2735	33	1.1742	19	1.1521	5	1.3184
46	1.2710	32	1.1584	18	1.1532	1 - 4	---
45	1.2701	31	1.1419	17	1.1552		

Core Height (ft) = (Node - 1) * 0.2013133

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	1.2431	30	1.2123	16	1.1628
57	1.3762	43	1.2396	29	1.2079	15	1.1706
56	1.3755	42	1.2420	28	1.2102	14	1.1860
55	1.3690	41	1.2458	27	1.2140	13	1.2001
54	1.3578	40	1.2505	26	1.2159	12	1.2139
53	1.3439	39	1.2561	25	1.2156	11	1.2276
52	1.3275	38	1.2591	24	1.2135	10	1.2410
51	1.3093	37	1.2629	23	1.2096	9	1.2538
50	1.2886	36	1.2645	22	1.2040	8	1.2659
49	1.2677	35	1.2624	21	1.1970	7	1.2769
48	1.2538	34	1.2574	20	1.1890	6	1.2854
47	1.2523	33	1.2495	19	1.1798	5	1.2918
46	1.2524	32	1.2391	18	1.1701	1 - 4	---
45	1.2494	31	1.2250	17	1.1638		

Core Height (ft) = (Node - 1) * 0.2013133

FIGURE 9

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF RATED THERMAL POWER