TXU Electric
Comanche Peak
Steam Electric Station
P.O. Box 1002
Glen Rose, TX 76043
Tel: 254 897 8920
Fax: 254 897 6652
lterry1@txu.com

C. Lance Terry
Senior Vice President & Principal Nuclear Officer

Ref: 10CFR50.36

CPSES-200002554
Log # TXX-00200
File # 10010, 916(COLR), RN-48

October 12, 2000

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

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NO. 50-446
THE UNIT 2, CYCLE 6 CORE OPERATING LIMITS REPORT

Gentlemen:

Enclosed is the Core Operating Limits Report for Unit 2, Cycle 6 prepared and submitted pursuant to Technical Specification 5.6.5.

A001

TXU Electric
P.O. Box 1002
Glen Rose, TX 76043

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

Sincerely,

C. L. Terry

By: Roger D. Walker
Roger D. Walker
Regulatory Affairs Manager

JDS/js

Enclosure

c - E. W. Merschoff, Region IV
J. I. Tapia, Region IV
D. H. Jaffe, NRR
Resident Inspectors, CPSES

ERX-2000-03, R0

CPSES UNIT 2 CYCLE 6

CORE OPERATING LIMITS REPORT

October 2000

Prepared: Daniel E. Brozak Date: 9/27/00

Daniel E. Brozak
Reactor Physics

Approved: Stephen M. Maier Date: 10/6/00

Stephen M. Maier
Reactor Physics Supervisor

Approved: Whee G. Choe Date: 10/6/00

Whee G. Choe
Safety Analysis Manager

DISCLAIMER

The information contained in this report was prepared for the specific requirement of TXU Electric and may not be appropriate for use in situations other than those for which it was specifically prepared. TXU Electric PROVIDES NO WARRANTY HEREUNDER, EXPRESS OR IMPLIED, OR STATUTORY, OF ANY KIND OR NATURE WHATSOEVER, REGARDING THIS REPORT OR ITS USE, INCLUDING BUT NOT LIMITED TO ANY WARRANTIES ON MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

By making this report available, TXU Electric does not authorize its use by others, and any such use is forbidden except with the prior written approval of TXU Electric. Any such written approval shall itself be deemed to incorporate the disclaimers of liability and disclaimers of warranties provided herein. In no event shall TXU Electric have any liability for any incidental or consequential damages of any type in connection with the use, authorized or unauthorized, of this report or of the information in it.

TABLE OF CONTENTS

LIST OF FIGURES

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for CPSES UNIT 2 CYCLE 6 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 5 and 9 through 19, as supplemented by Item 20. 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% $\Delta k/k$ 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 222 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 $F_Q^{RTP} = 2.42$

2.8.3 K(Z) is provided in Figure 3.

2.8.4 Maximum elevation dependent W(Z) values are given in Figure 4. Figures 5, 6, and 7 give burnup dependent values for W(Z). Figures 5, 6, and 7 can be used in place of Figure 4 to interpolate or extrapolate (via a three point fit) the W(Z) at a particular burnup.

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 $[\ F_Q^C(Z)\ /\ K(Z)\ ]$

$F_Q^W(Z)$ shall be increased by a factor of 1.02. This requirement is for all cycle burnups.

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 $F^{RTP}_{\Delta H} = 1.55$

2.9.3 $PF_{\Delta H} = 0.3$

2.10 AXIAL FLUX DIFFERENCE (AFD) (LCO 3.2.3)

2.10.1 The AFD target band is +5%, -12% at 100% RTP linearly expanding to +20%, -17% at 50% RTP. Below 50% RTP, the AFD target band remains constant at +20%, -17%.

2.10.2 The AFD Acceptable Operation Limits are provided in Figure 8.

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:

$K_1 = 1.150$

$K_2 = 0.0145\ /°F$

$K_3 = 0.00075\ /psig$

$T_c^{\circ} = 560.5\ °F$

$P^1 \geq 2235\ psig$

$T_1 \geq 10\ sec$

$T_2 \leq 3\ sec$

$f_1(\Delta q) = 0.00 \cdot \{(q_t - q_b) + 65\%\}$ when $(q_t - q_b) \leq -65\%$ RTP

$= 0\%$ when -65% RTP $< (q_t - q_b) < +7.6\%$ RTP

$= 2.03 \cdot \{(q_t - q_b) - 7.6\%\}$ when $(q_t - q_b) \geq +7.6\%$ 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)
	≤	592 °F	(3 channels)

The RCS average temperature limits correspond to the analytical limit of 595.7 °F 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 based on precision heat balance 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 317,000 gpm.

2.13 BORON CONCENTRATION (LCO 3.9.1)

2.13.1 The required refueling boron concentration is 2193 ppm.

FIGURE 1

REACTOR CORE SAFETY LIMITS

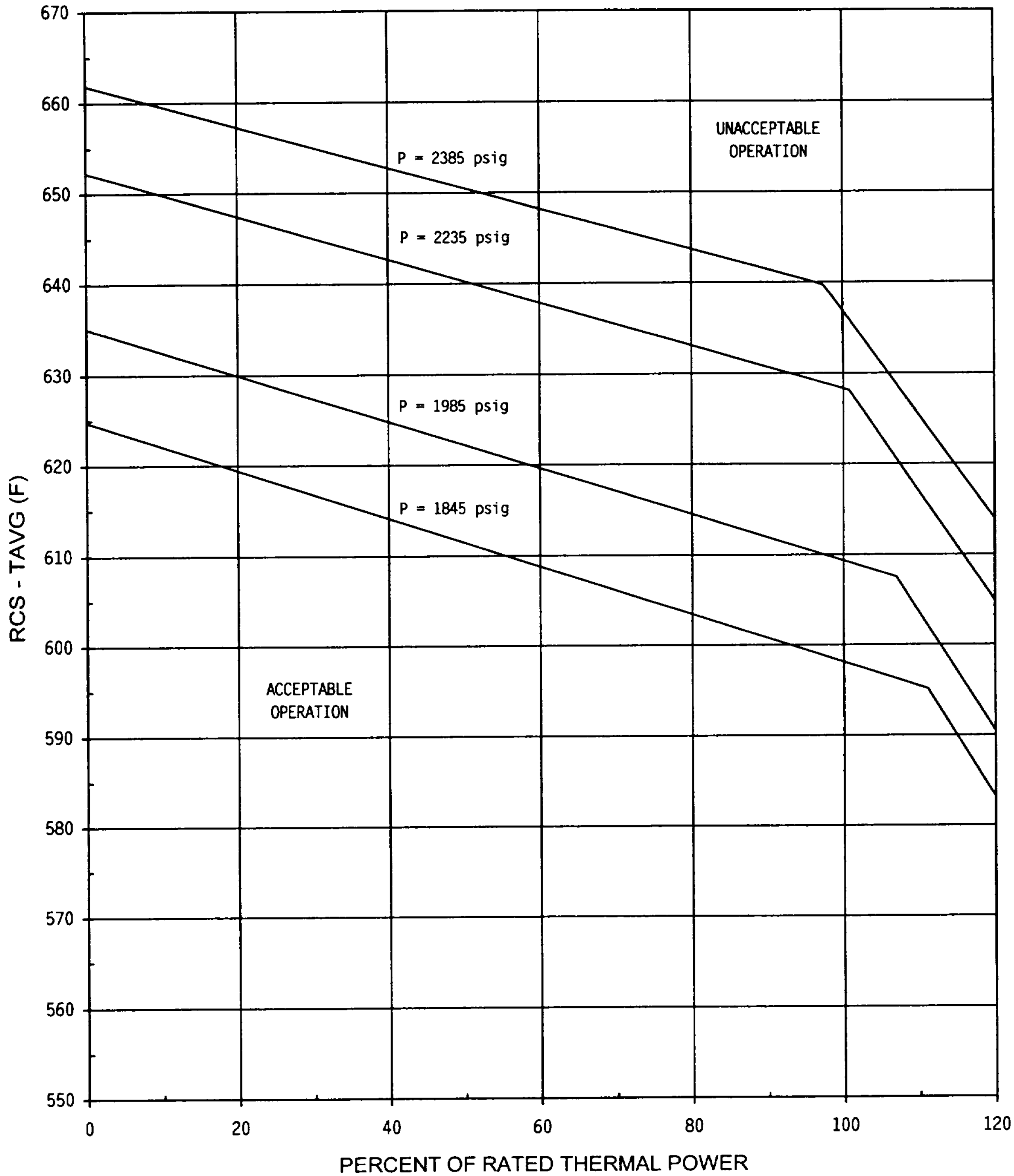
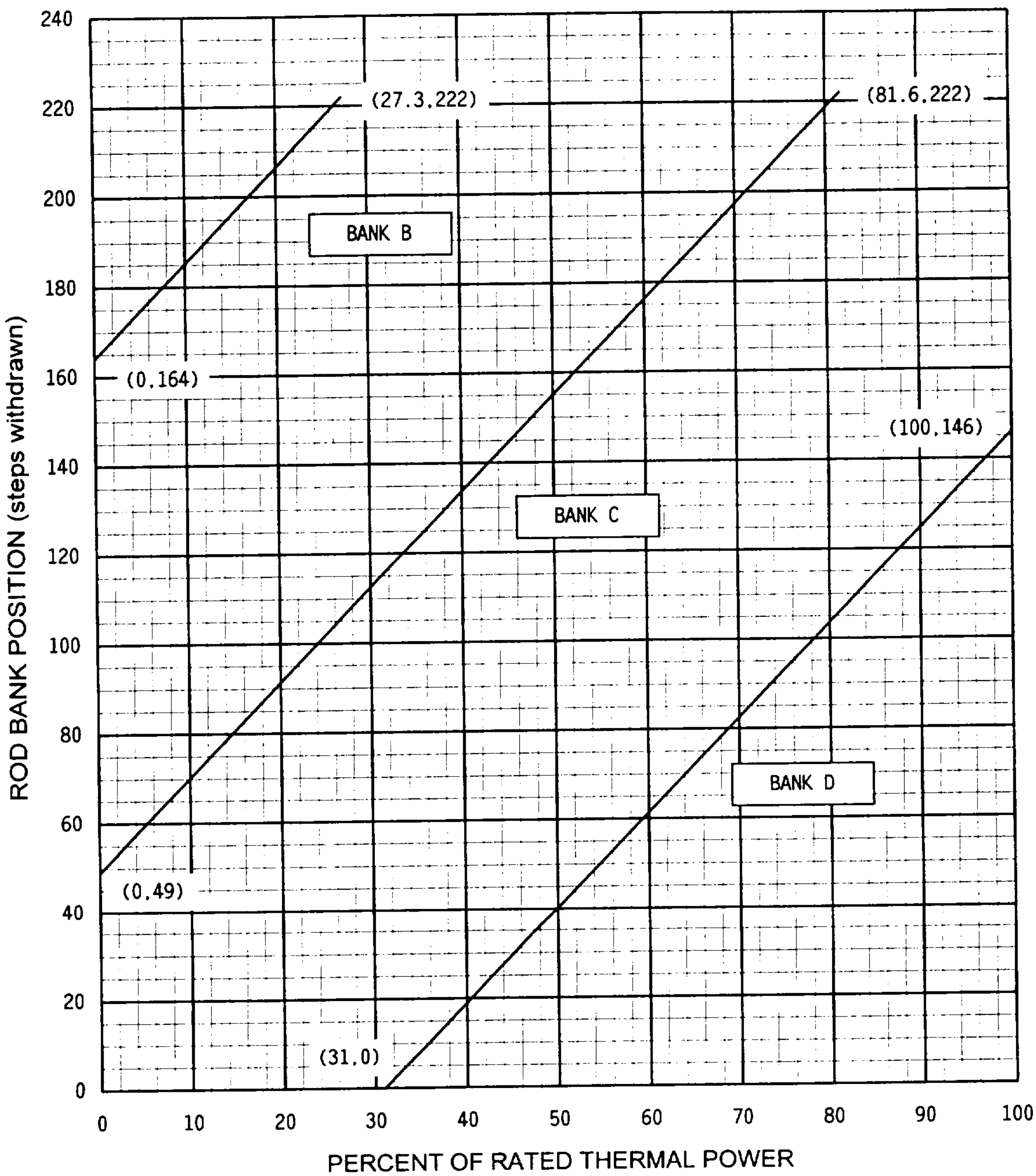


FIGURE 2

ROD BANK INSERTION LIMITS VERSUS THERMAL POWER



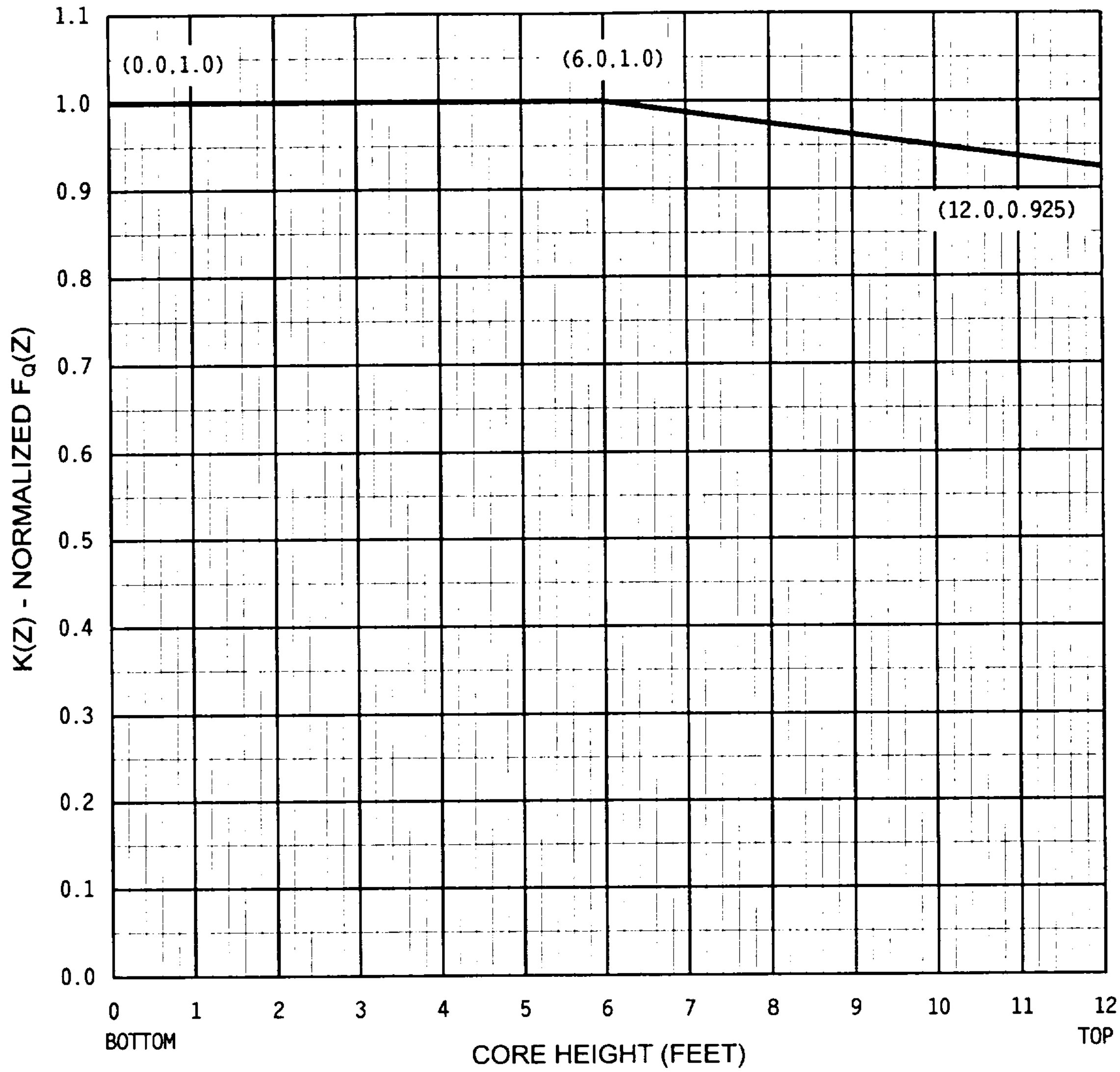
NOTES:

1. Fully withdrawn shall be the condition where control rods are at a position within the interval of 222 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

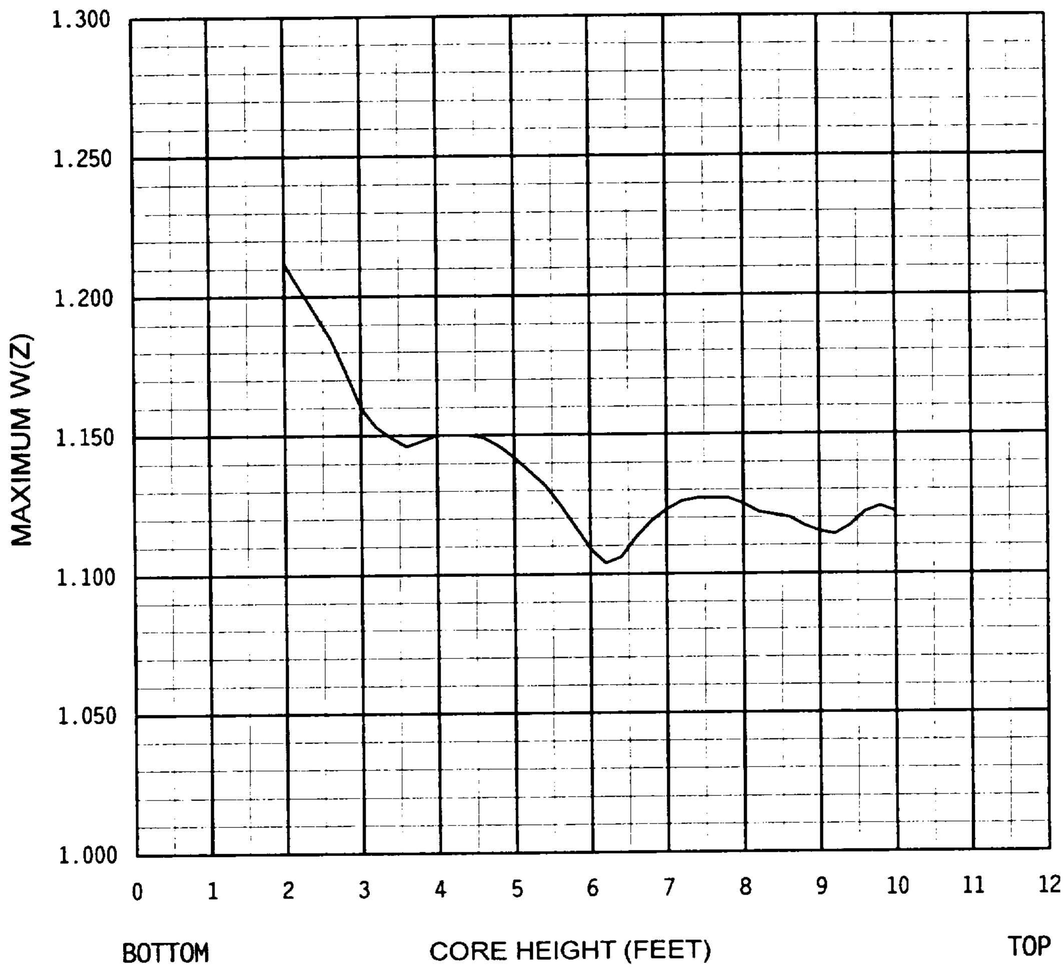


Axial Node	K(Z)	Axial Node	K(Z)	Axial Node	K(Z)	Axial Node	K(Z)
61	0.9250	53	0.9450	45	0.9650	37	0.9850
60	0.9275	52	0.9475	44	0.9675	36	0.9875
59	0.9300	51	0.9500	43	0.9700	35	0.9900
58	0.9325	50	0.9525	42	0.9725	34	0.9925
57	0.9350	49	0.9550	41	0.9750	33	0.9950
56	0.9375	48	0.9575	40	0.9775	32	0.9975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

FIGURE 4

W(Z) AS A FUNCTION OF CORE HEIGHT (MAXIMUM)

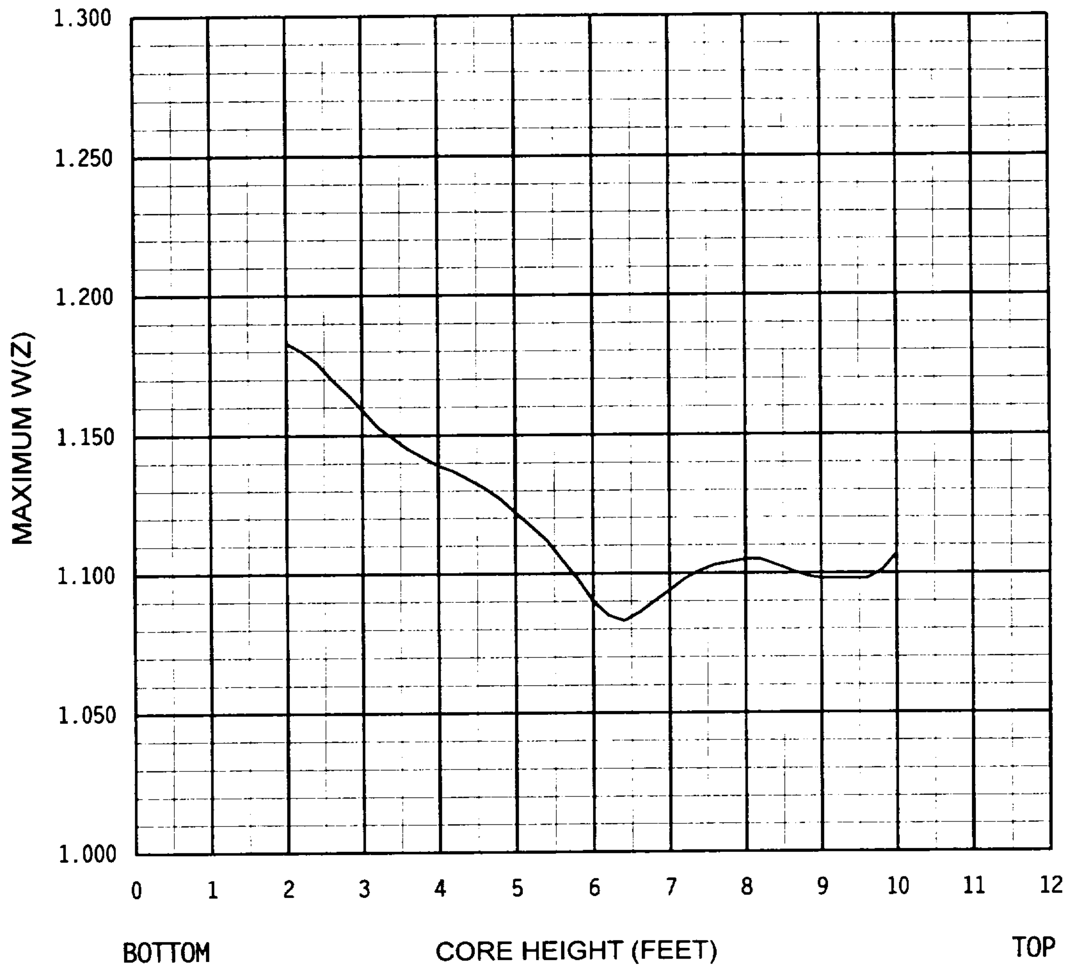


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
52 - 61	---	41	1.125	30	1.117	19	1.146
51	1.122	40	1.127	29	1.125	18	1.149
50	1.124	39	1.127	28	1.132	17	1.153
49	1.122	38	1.127	27	1.137	16	1.160
48	1.117	37	1.126	26	1.142	15	1.173
47	1.114	36	1.123	25	1.146	14	1.185
46	1.115	35	1.119	24	1.149	13	1.194
45	1.117	34	1.113	23	1.150	12	1.203
44	1.120	33	1.106	22	1.150	11	1.212
43	1.121	32	1.104	21	1.150	1 - 10	---
42	1.122	31	1.109	20	1.148		

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

FIGURE 5

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

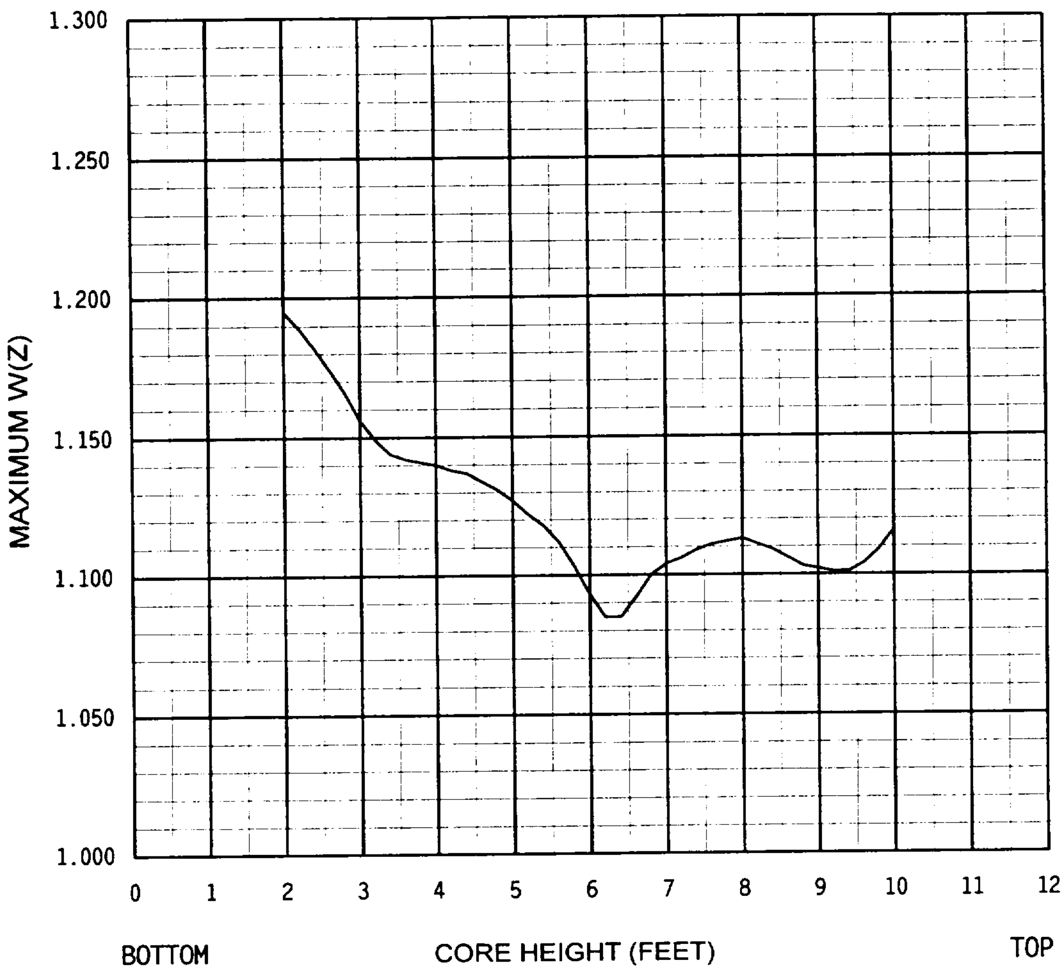


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
52 - 61	---	41	1.105	30	1.098	19	1.145
51	1.107	40	1.104	29	1.105	18	1.149
50	1.101	39	1.103	28	1.112	17	1.153
49	1.098	38	1.101	27	1.117	16	1.159
48	1.098	37	1.098	26	1.122	15	1.165
47	1.098	36	1.094	25	1.127	14	1.170
46	1.098	35	1.090	24	1.131	13	1.176
45	1.099	34	1.086	23	1.134	12	1.180
44	1.101	33	1.083	22	1.137	11	1.183
43	1.103	32	1.085	21	1.139	1 - 10	---
42	1.105	31	1.090	20	1.142		

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

FIGURE 6

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

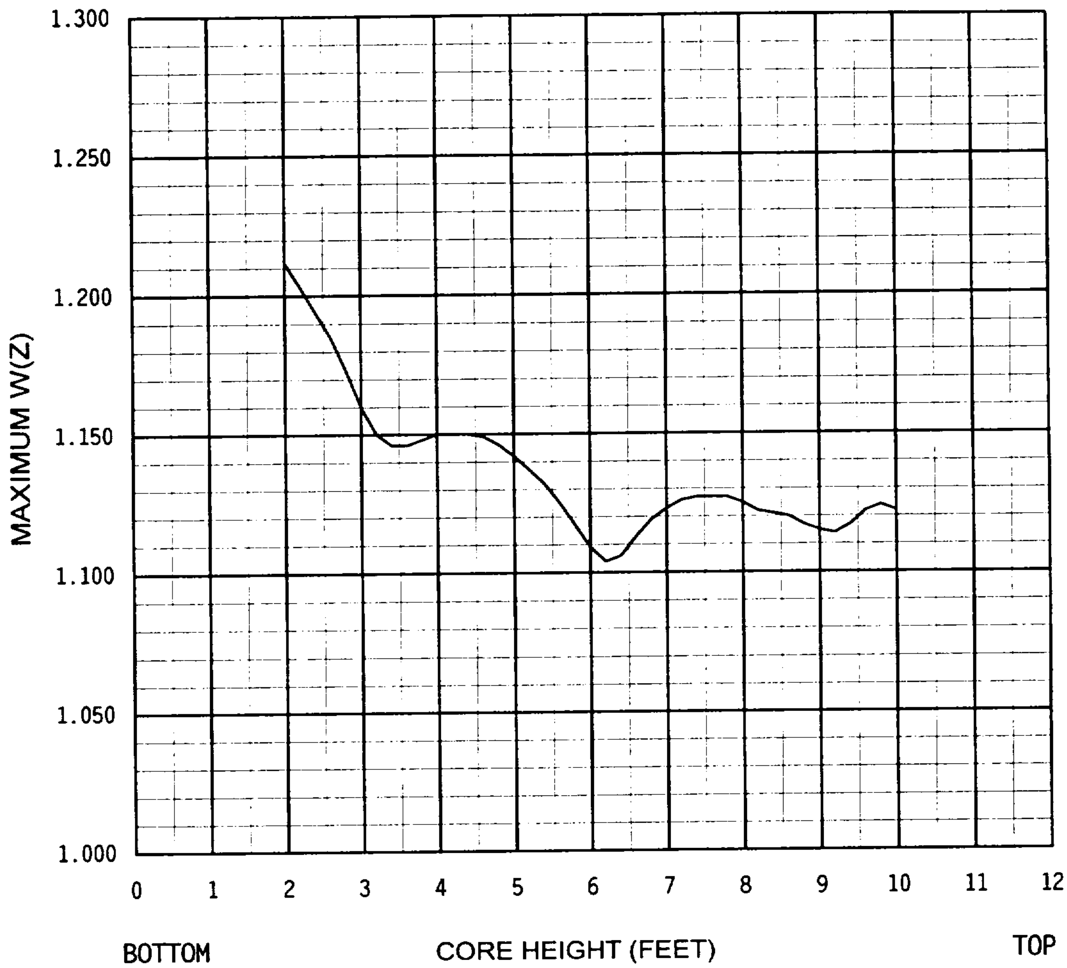


Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)	Axial Node	W(Z)
52 - 61	---	41	1.113	30	1.103	19	1.142
51	1.116	40	1.112	29	1.112	18	1.144
50	1.109	39	1.111	28	1.118	17	1.149
49	1.104	38	1.109	27	1.122	16	1.156
48	1.101	37	1.106	26	1.127	15	1.166
47	1.101	36	1.104	25	1.131	14	1.174
46	1.102	35	1.100	24	1.134	13	1.182
45	1.103	34	1.092	23	1.137	12	1.189
44	1.106	33	1.085	22	1.138	11	1.195
43	1.109	32	1.085	21	1.140	1 - 10	---
42	1.111	31	1.093	20	1.141		

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

FIGURE 7

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)
52 - 61	---	41	1.125	30	1.117	19	1.146
51	1.122	40	1.127	29	1.125	18	1.146
50	1.124	39	1.127	28	1.132	17	1.150
49	1.122	38	1.127	27	1.137	16	1.160
48	1.117	37	1.126	26	1.142	15	1.173
47	1.114	36	1.123	25	1.146	14	1.185
46	1.115	35	1.119	24	1.149	13	1.194
45	1.117	34	1.113	23	1.150	12	1.203
44	1.120	33	1.106	22	1.150	11	1.212
43	1.121	32	1.104	21	1.150	1 - 10	---
42	1.122	31	1.109	20	1.148		

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

FIGURE 8

AXIAL FLUX DIFFERENCE LIMITS AS A FUNCTION OF
RATED THERMAL POWER