NEXTera ENERGY POINT BEACH

April 18, 2013

NRC 2013-0040
TS 5.6.4

U.S. Nuclear Regulatory Commission
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Point Beach Nuclear Plant Unit 1
Docket No. 50-266
Renewed License No. DPR-24

Core Operating Limits Report (COLR)
Unit 1 Cycle 35 (U1C35)

In accordance with the requirements of Point Beach Nuclear Plant (PBNP) Technical Specification 5.6.4, enclosed is revised TRM 2.1, COLR, Unit 1, Cycle 35.

The enclosure to this letter contains the revised PBNP U1C35 COLR that was issued on April 2, 2013.

This letter contains no new regulatory commitments and no revisions to existing commitments.

Very truly yours,

NextEra Energy Point Beach, LLC

Michael Millen
Licensing Manager

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Point Beach Nuclear Plant, USNRC
Resident Inspector, Point Beach Nuclear Plant, USNRC
PSCW

ENCLOSURE

NEXTERA ENERGY POINT BEACH, LLC
POINT BEACH NUCLEAR PLANT, UNIT 1

CORE OPERATING LIMITS REPORT (COLR)
UNIT 1 CYCLE 35 (U1C35)

18 pages follow

TRM 2.1

CORE OPERATING LIMITS REPORT (COLR)

UNIT 1 CYCLE 35

REVISION 15

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for Point Beach Nuclear Plant has been prepared in accordance with the requirements of Technical Specification (TS) 5.6.4.

A cross-reference between the COLR sections and the PBNP Technical Specifications affected by this report is given below:

COLR Section	PBNP TS	Description
2.1	2.1.1	Reactor Core Safety Limits
2.2	3.1.1	Shutdown Margin
	3.1.4	Rod Group Alignment Limits
	3.1.5	Shutdown Bank Insertion Limits
	3.1.6	Control Bank Insertion Limits
	3.1.8	Physics Test Exceptions
2.3	3.1.3	Moderator Temperature Coefficient
2.4	3.1.5	Shutdown Bank Insertion Limit
2.5	3.1.6	Control Bank Insertion Limits
2.6	3.2.1	Nuclear Heat Flux Hot Channel Factor ($F_Q(Z)$)
2.7	3.2.2	Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$)
2.8	3.2.3	Axial Flux Difference (AFD)
2.9	3.3.1	Overtemperature ΔT Setpoint
2.10	3.3.1	Overpower ΔT Setpoint
2.11	3.4.1	RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits
2.12	3.9.1	Refueling Boron Concentration
Figure 1	2.1.1	Reactor Core Safety Limits Curve
Figure 2	3.1.1	Required Shutdown Margin
Figure 3	3.1.6	Control Bank Insertion Limits
Figure 4	3.2.1	Hot ChanneFactor Normalized Operating Envelope (K(Z))
Figure 5	3.2.1	Summary of W(Z) as a Function of Core Height
Figure 5A	3.2.1	BOC Part-Power Summary of W(Z) as a Function of Core Height
Figure 6	3.2.3	Flux Difference Operating Envelope
Table 1	5.6.4	NRC Approved Methodologies for COLR Parameters

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 5.6.4.

2.1 Reactor Core Safety Limits (TS 2.1.1)

The combination of THERMAL POWER, Reactor Coolant System (RCS) highest loop average temperature, and pressurizer pressure shall not exceed the limits specified in Figure 1.

Applicability: MODES 1 and 2

2.2 Shutdown Margin (TS 3.1.1 and referenced in TS 3.1.4, 3.1.5, 3.1.6, and 3.1.8)

2.2.1 SDM shall be $\geq$2.0% Δk/k (see Figure 2).

Applicability: MODES 1, 2, and 3

2.2.2 SDM shall be $\geq$1% Δk/k.

Applicability: MODES 4 and 5

2.3 Moderator Temperature Coefficient (TS 3.1.3)

2.3.1 The upper MTC limits shall be maintained within the limits.

2.3.2 The maximum upper MTC limits shall be:

$\leq$5 pcm/°F for power levels $\leq$70% RTP
$\leq$0 pcm/°F for power levels >70% RTP

Applicability: MODE 1 and MODE 2 with $k_{eff} \geq 1.0$.

2.4 Shutdown Bank Insertion Limit (TS 3.1.5)

NOTE: This limit is not applicable while performing SR 3.1.4.2.

2.4.1 Each shutdown bank shall be fully withdrawn.

2.4.2 Fully withdrawn is defined as $\geq$ 225 steps.

Applicability: MODES 1 and 2

2.5 Control Bank Insertion Limits (TS 3.1.6)

NOTE: This limit is not applicable while performing SR 3.1.4.2.

The control banks shall be within the insertion, sequence and overlap limits specified in Figure 3.

Applicability: MODE 1 and MODE 2 with $k_{eff} \geq 1.0$

2.6 Nuclear Heat Flux Hot Channel Factor ($F_Q(Z)$) (TS 3.2.1)

The Heat Flux Hot Channel Factor shall be within the following limits:

$F_Q(Z) \leq CF_Q * K(Z) / P$ for $P > 0.5$

$F_Q(Z) \leq CF_Q * K(Z) / 0.5$ for $P \leq 0.5$

Where P is the fraction of Rated Power at which the core is operating.

$F_Q(Z)$ is both:

- Steady State $F_Q^C(Z) = F_Q(Z) * 1.08$
- Transient $F_Q^W(Z) = F_Q^C(Z) * W(Z) / P$ for $P>0.5$

  $F_Q^W(Z) = F_Q^C(Z) * W(Z) / 0.5$ for $P \leq 0.5$

$CF_Q = 2.60$

K(Z) is the function in Figure 4

W(Z) is the function in Figures 5 and 5A.

The following F_Q penalty factors are applicable to Cycle 35.

Cycle Burnup (MWD/MTU)	$F^W_Q(Z)$ Penalty Factors
BOL TO 1178	1.0378
1179 TO 1473	1.0298
1474 TO 1620	1.0218
1621 TO EOL	1.02

Applicability: MODE 1

2.7 Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$) (TS 3.2.2)

The Nuclear Enthalpy Rise Hot Channel Factor shall be within the following limit:

2.7.1 $F^N_{\Delta H} < 1.68 \times [1 + 0.3(1-P)]$

where: P is the fraction of Rated Power at which the core is operating.

Applicability: MODE 1

2.8 Axial Flux Difference (AFD) (TS 3.2.3)

The AFD target band is ±5%.

The AFD Acceptability Operation Limits are provided in Figure 6.

Applicability: MODE 1 with THERMAL POWER ≥15% RTP

2.9 Overtemperature ΔT Setpoint (TS 3.3.1, Table 3.3.1-1 note 1)

Overtemperature ΔT setpoint parameter values (for 1800 MWt core power):

ΔT_O = indicated ΔT at RTP, °F
T = indicated RCS average temperature, °F
T′ $\leq$ 576.0°F
P = pressurizer pressure, psig
P′ = 2235 psig
K_1 $\leq$ 1.175 (NTSP)[1]
K_1 $\leq$ 1.188 (AV)[2]
K_2 = 0.016
K_3 = 0.000811
τ_1 = 40 sec
τ_2 = 8 sec
τ_3 = 4 sec
τ_4 = 2 sec

f(ΔI) is an even function of the indicated difference between top and bottom detectors of the power-range nuclear ion chambers; with gains to be selected based on measured instrument response during plant startup tests, where q_t and q_b are the percent power in the top and bottom halves of the core respectively, and $q_t + q_b$ is total core power in percent of RTP, such that:

2.9.1 For $q_t - q_b$ within -12, +6 percent, f(ΔI) = 0.

2.9.2 For each percent that the magnitude of $q_t - q_b$ exceeds +6 percent, the ΔT trip setpoint shall be automatically reduced by an equivalent of 2.00 percent of Rated Power.

2.9.3 For each percent that the magnitude of $q_t - q_b$ exceeds -12 percent, the ΔT trip setpoint shall be automatically reduced by an equivalent of 2.69 percent of Rated Power.

Applicability: MODES 1 and 2

[1] Nominal Setpoint Value
[2] Allowable Value

2.10 Overpower ΔT Setpoint (TS 3.3.1, Table 3.3.1-1 note 2)

Overpower ΔT setpoint parameter values (for 1800 MWt core power):

ΔT_O	=	indicated ΔT at RTP, °F
T	=	indicated RCS average temperature, °F
T′	≤	576.0°F
K_4	≤	1.098 (NTSP)[1]
K_4	≤	1.111 (AV)[2]
K_5	=	0.0 for increasing T
K_5	=	0.0 for decreasing T
K_6	=	0.00123 for T ≥ T′
K_6	=	0.0 for T < T′
τ_5	=	0 sec
τ_3	=	4 sec
τ_4	=	2 sec

Applicability: MODES 1 and 2

2.11 RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits (TS 3.4.1)

2.11.1 T_{avg} shall be ≤577°F.

2.11.2 Pressurizer pressure shall be maintained ≥2205 psig during operation.

NOTE: Pressurizer pressure limit does not apply during:

1) THERMAL POWER ramp >5% RTP per minute; or

2) THERMAL POWER step >10% RTP.

2.11.3 Reactor Coolant System raw measured Total Flow Rate shall be maintained ≥186,000 gpm.

Applicability: MODE 1

2.12 Refueling Boron Concentration (TS 3.9.1)

Boron concentrations of the Reactor Coolant System, the refueling canal, and the refueling cavity shall be maintained ≥2350 ppm.

Applicability: MODE 6

[1] Nominal Setpoint Value
[2] Allowable Value

FIGURE 1
REACTOR CORE SAFETY LIMITS CURVE

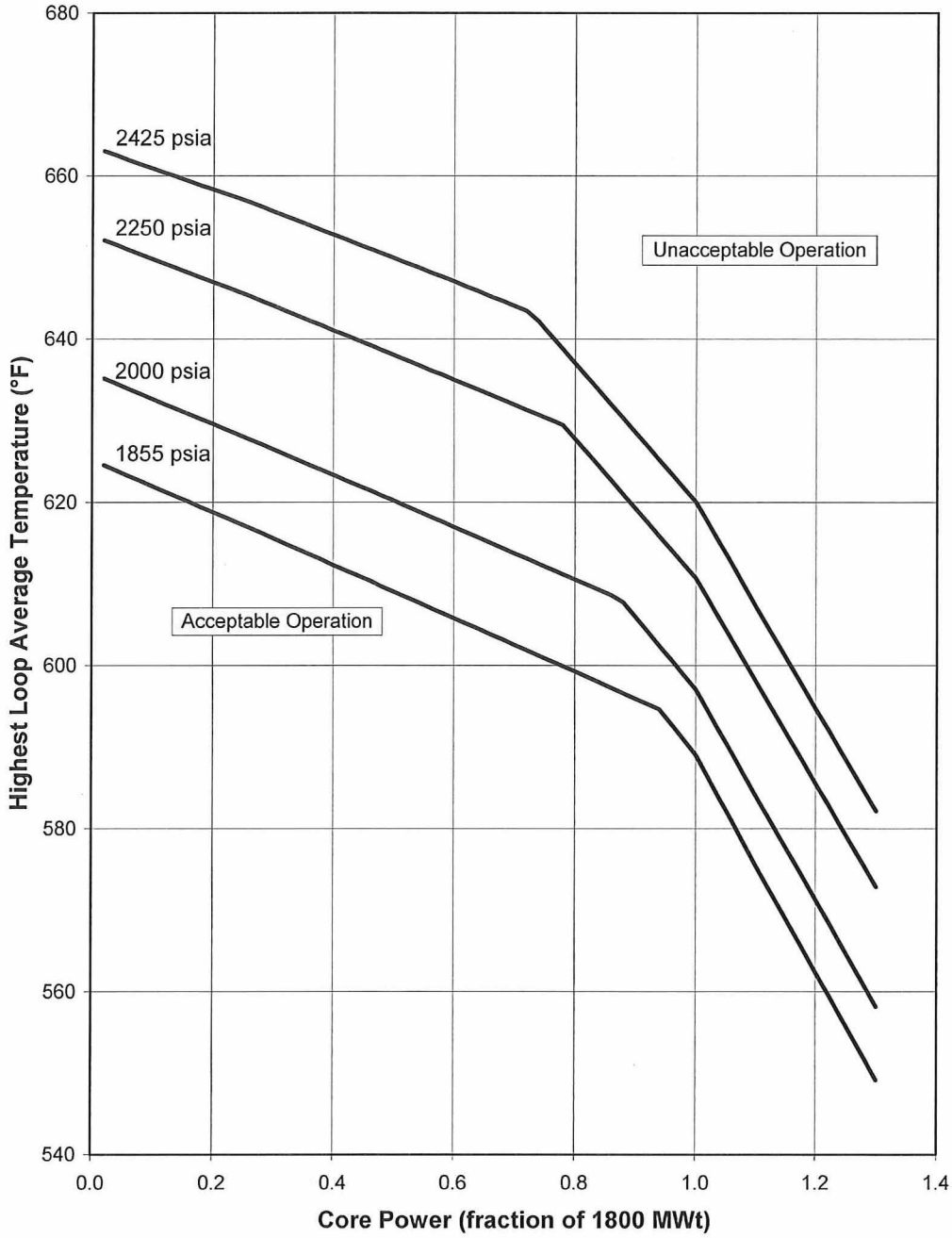


FIGURE 2
REQUIRED SHUTDOWN MARGIN

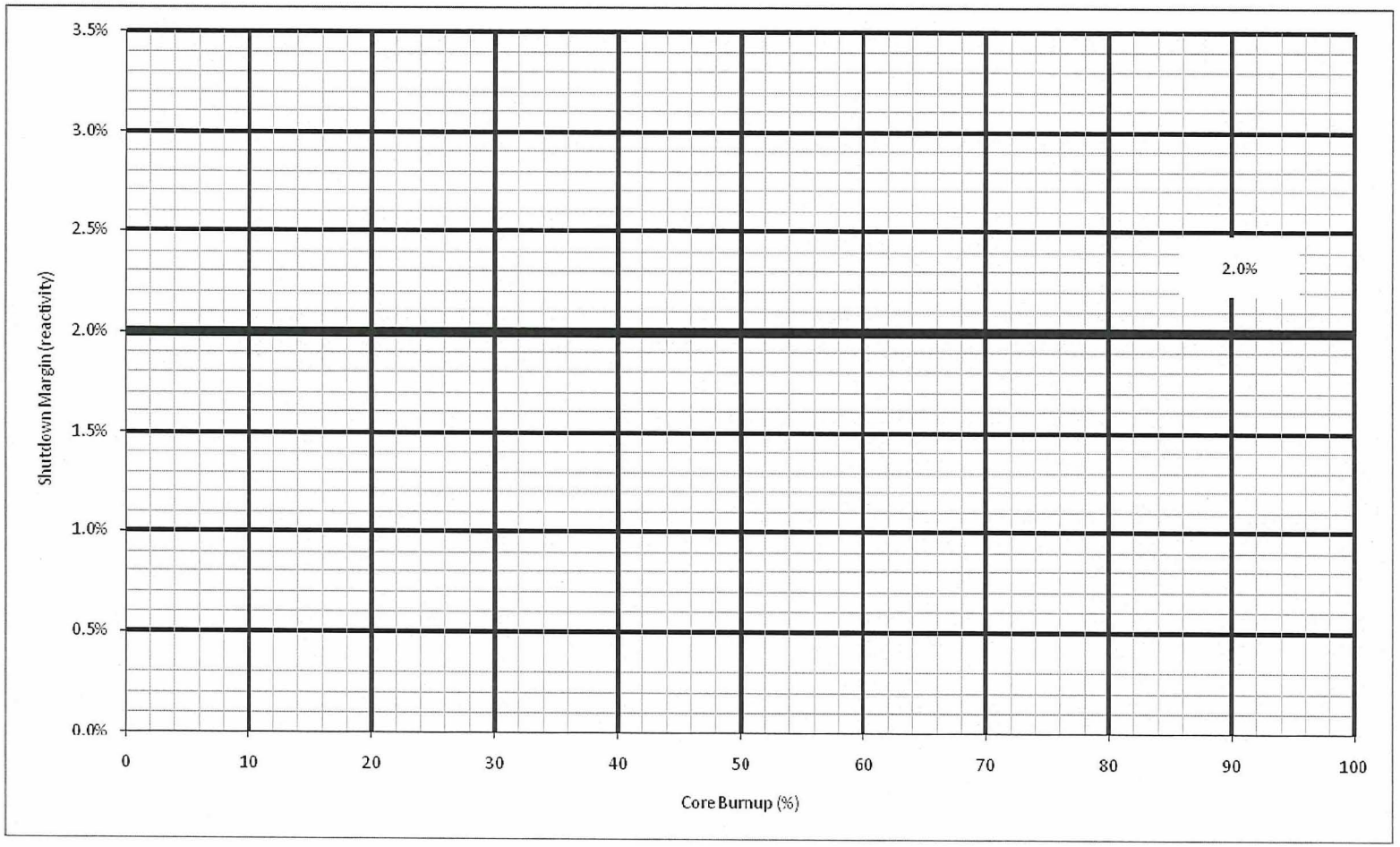
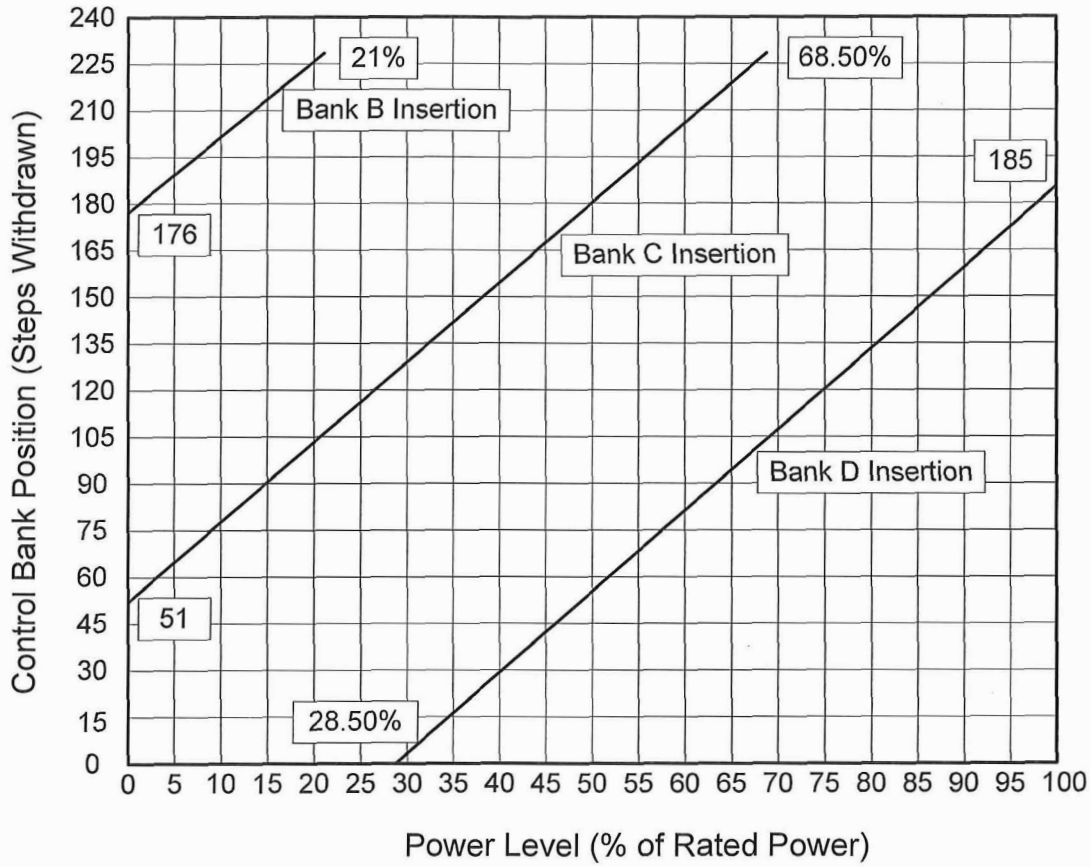


FIGURE 3
CONTROL BANK INSERTION LIMITS



NOTE: **The Figure is applicable for any fully withdrawn position of ≥ 225 steps (Limits are always considered met when withdrawn position is ≥ 225 steps).**

FIGURE 4
HOT CHANNEL FACTOR NORMALIZED OPERATING ENVELOPE (K(Z))

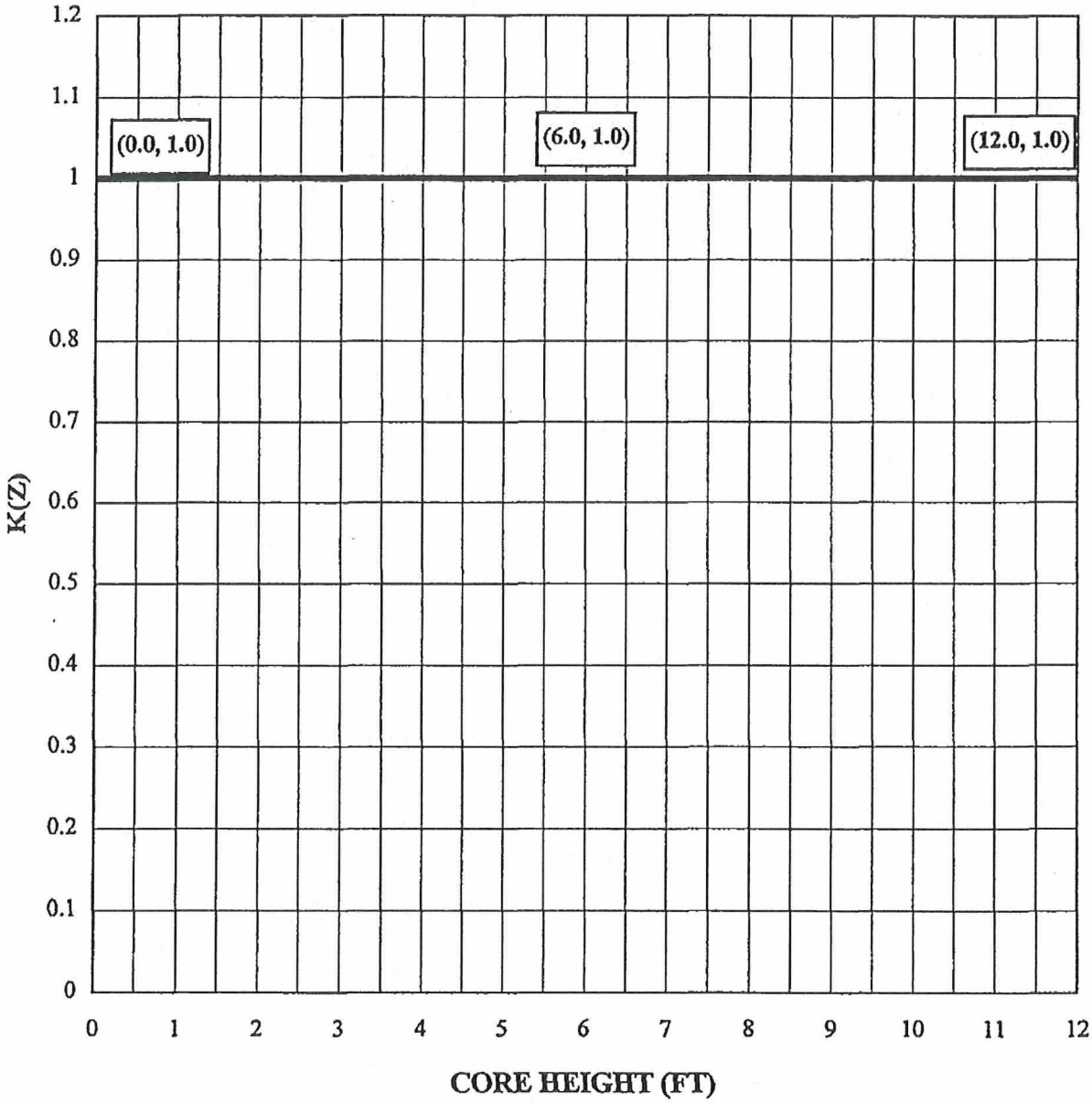


FIGURE 5
Summary of W(Z) as a Function of Core Height
(Top 15% and Bottom 12% Excluded)

Height (feet)	W(Z)			
	150 MWD/MTU	2000 MWD/MTU	8000 MWD/MTU	18000 MWD/MTU
0.0	1.0000	1.0000	1.0000	1.0000
0.2	1.0000	1.0000	1.0000	1.0000
0.4	1.0000	1.0000	1.0000	1.0000
0.6	1.0000	1.0000	1.0000	1.0000
0.8	1.0000	1.0000	1.0000	1.0000
1.0	1.0000	1.0000	1.0000	1.0000
1.2	1.0000	1.0000	1.0000	1.0000
1.4	1.0000	1.0000	1.0000	1.0000
1.6	1.0979	1.0985	1.1058	1.1243
1.8	1.0979	1.0974	1.1051	1.1213
2.0	1.0976	1.0964	1.1040	1.1177
2.2	1.0970	1.0957	1.1025	1.1134
2.4	1.0962	1.0953	1.1007	1.1086
2.6	1.0952	1.0946	1.0985	1.1036
2.8	1.0940	1.0937	1.0960	1.0983
3.0	1.0924	1.0925	1.0931	1.0924
3.2	1.0909	1.0910	1.0902	1.0873
3.4	1.0899	1.0899	1.0879	1.0840
3.6	1.0892	1.0894	1.0861	1.0829
3.8	1.0884	1.0889	1.0841	1.0837
4.0	1.0878	1.0885	1.0828	1.0848
4.2	1.0871	1.0880	1.0819	1.0856
4.4	1.0863	1.0872	1.0810	1.0864
4.6	1.0854	1.0863	1.0803	1.0869
4.8	1.0842	1.0852	1.0793	1.0873
5.0	1.0828	1.0838	1.0782	1.0873
5.2	1.0812	1.0822	1.0768	1.0870
5.4	1.0795	1.0803	1.0753	1.0864
5.6	1.0776	1.0781	1.0742	1.0853
5.8	1.0754	1.0755	1.0732	1.0838
6.0	1.0728	1.0727	1.0720	1.0819

FIGURE 5 (con't)
Summary of W(Z) as a Function of Core Height
(Top 15% and Bottom 12% Excluded)

Height (feet)	W(Z)			
	150 MWD/MTU	2000 MWD/MTU	8000 MWD/MTU	18000 MWD/MTU
6.2	1.0700	1.0695	1.0702	1.0795
6.4	1.0671	1.0663	1.0684	1.0765
6.6	1.0647	1.0635	1.0675	1.0744
6.8	1.0626	1.0615	1.0657	1.0766
7.0	1.0609	1.0598	1.0664	1.0806
7.2	1.0593	1.0584	1.0704	1.0835
7.4	1.0587	1.0583	1.0747	1.0862
7.6	1.0629	1.0619	1.0786	1.0885
7.8	1.0682	1.0676	1.0823	1.0903
8.0	1.0736	1.0735	1.0858	1.0918
8.2	1.0791	1.0792	1.0890	1.0929
8.4	1.0844	1.0847	1.0920	1.0937
8.6	1.0894	1.0900	1.0947	1.0941
8.8	1.0941	1.0951	1.0969	1.0944
9.0	1.0985	1.0999	1.0988	1.0943
9.2	1.1026	1.1042	1.1002	1.0940
9.4	1.1062	1.1083	1.1011	1.0938
9.6	1.1101	1.1125	1.1022	1.0934
9.8	1.1139	1.1167	1.1033	1.0941
10.0	1.1173	1.1206	1.1035	1.0958
10.2	1.1201	1.1240	1.1043	1.0971
10.4	1.0000	1.0000	1.0000	1.0000
10.6	1.0000	1.0000	1.0000	1.0000
10.8	1.0000	1.0000	1.0000	1.0000
11.0	1.0000	1.0000	1.0000	1.0000
11.2	1.0000	1.0000	1.0000	1.0000
11.4	1.0000	1.0000	1.0000	1.0000
11.6	1.0000	1.0000	1.0000	1.0000
11.8	1.0000	1.0000	1.0000	1.0000
12.0	1.0000	1.0000	1.0000	1.0000

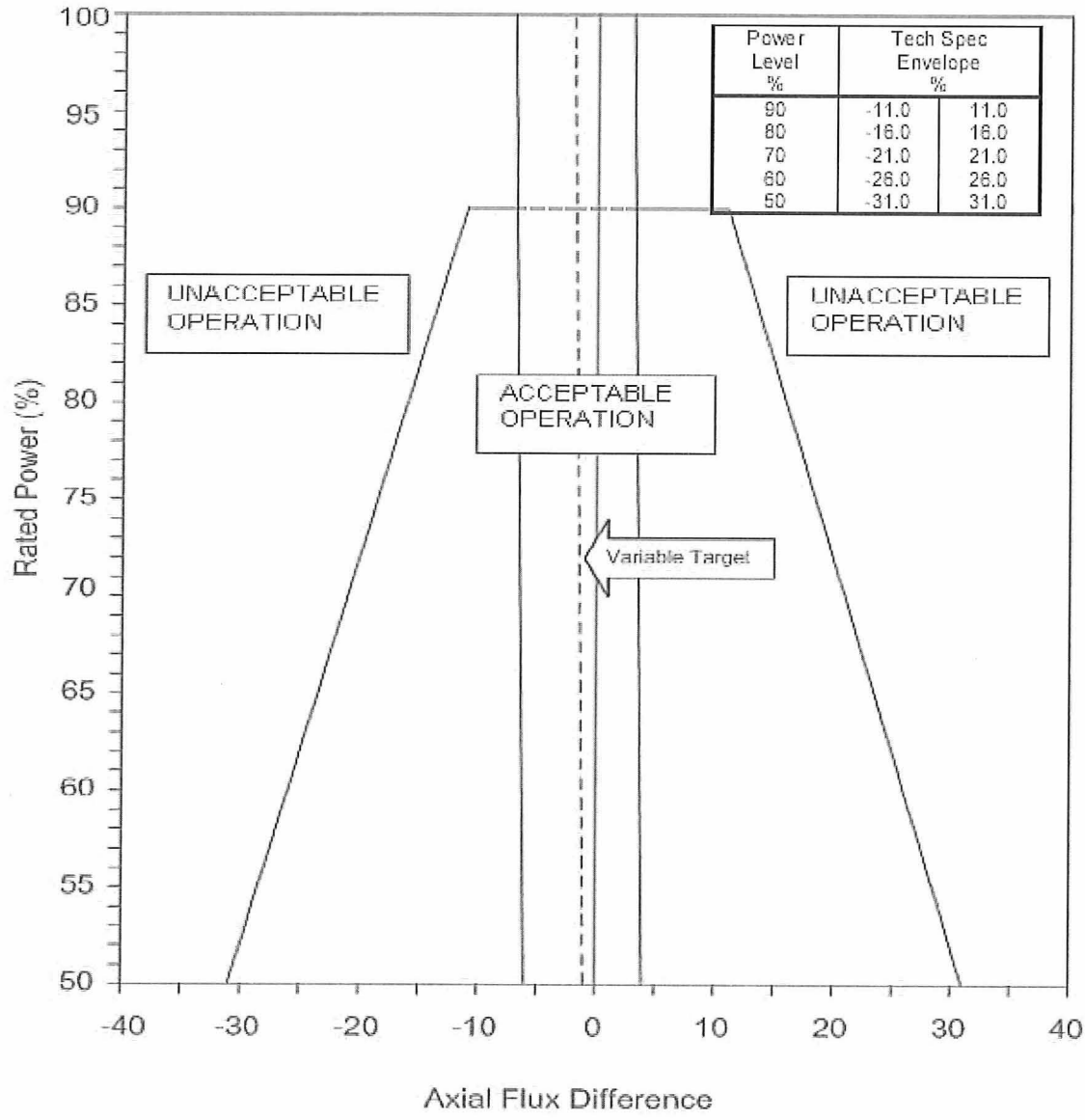
FIGURE 5A
BOC Part-Power Summary of W(Z) as a Function of Core Height
(Top 15% and Bottom 12% Excluded)

Height (feet)	Part-Power W(Z) with Correction Factor (excluding power ratio)	
	Hot Full Power	75% Power
0	1.0000	1.0000
0.2	1.0000	1.0000
0.4	1.0000	1.0000
0.6	1.0000	1.0000
0.8	1.0000	1.0000
1	1.0000	1.0000
1.2	1.0000	1.0000
1.4	1.0000	1.0000
1.6	1.0979	1.1759
1.8	1.0979	1.1717
2	1.0976	1.1670
2.2	1.0970	1.1619
2.4	1.0962	1.1567
2.6	1.0952	1.1514
2.8	1.0940	1.1458
3	1.0924	1.1396
3.2	1.0909	1.1336
3.4	1.0899	1.1284
3.6	1.0892	1.1235
3.8	1.0884	1.1183
4	1.0878	1.1131
4.2	1.0871	1.1076
4.4	1.0863	1.1027
4.6	1.0854	1.0980
4.8	1.0842	1.0931
5	1.0828	1.0879
5.2	1.0812	1.0824
5.4	1.0795	1.0764
5.6	1.0776	1.0702
5.8	1.0754	1.0640
6	1.0728	1.0578

FIGURE 5A (con't)
BOC Part-Power Summary of W(Z) as a Function of Core Height
(Top 15% and Bottom 12% Excluded)

Height (feet)	Part-Power W(Z) with Correction Factor (excluding power ratio)	
	Hot Full Power	75% Power
6.2	1.0688	1.0514
6.4	1.0661	1.0445
6.6	1.0639	1.0381
6.8	1.0619	1.0328
7	1.0605	1.0294
7.2	1.0596	1.0268
7.4	1.0596	1.0250
7.6	1.0649	1.0272
7.8	1.0705	1.0298
8	1.0755	1.0317
8.2	1.0808	1.0334
8.4	1.0863	1.0350
8.6	1.0914	1.0367
8.8	1.0963	1.0383
9	1.1010	1.0400
9.2	1.1052	1.0416
9.4	1.1090	1.0429
9.6	1.1129	1.0449
9.8	1.1167	1.0471
10	1.1203	1.0511
10.2	1.1233	1.0533
10.4	1.0000	1.0000
10.6	1.0000	1.0000
10.8	1.0000	1.0000
11	1.0000	1.0000
11.2	1.0000	1.0000
11.4	1.0000	1.0000
11.6	1.0000	1.0000
11.8	1.0000	1.0000
12	1.0000	1.0000

FIGURE 6
FLUX DIFFERENCE OPERATING ENVELOPE



NOTES:

1) This figure represents the Constant Axial Offset Control (CAOC) band used in safety analyses, it may be administratively tightened depending on in-core flux map results. Refer to Figure 2 of Reactor Operating Data (ROD) 1.2 for the administrative limit.
2) The AFD may deviate outside the target band with THERMAL POWER < 50% RTP.
3) The AFD target band is +/-5% for THERMAL POWER ≥15% RTP.

TABLE 1
NRC APPROVED METHODOLOGIES FOR COLR PARAMETERS

COLR Section	Parameter	NRC Approved Methodology
All	Reactor Thermal Output	Caldon, Inc., Engineering Report-80P, "TOPICAL REPORT: Improving Thermal Power Accuracy and Plant Safety While Increasing Operating Power Level Using the LEFM√™ System," Revision 0, Mar 1997. Caldon, Inc., Engineering Report-160P, "Supplement to Topical Report ER-80P: Basis for a Power Uprate With the LEFM√™ System," Revision 0, May 2000.
2.1	Reactor Core Safety Limits	WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985
2.2	Shutdown Margin	WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985
2.3	Moderator Temperature Coefficient	WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985
2.4	Shutdown Bank Insertion Limit	WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985
2.5	Control Bank Insertion Limits	WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985
2.6	Height Dependent Heat Flux Hot Channel Factor (F_Q)	WCAP-8403 (non-proprietary), "Power Distribution Control and Load Following Procedures," September 1974 WCAP-14449-P-A, "Application of Best Estimate Large Break LOCA Methodology to Westinghouse PWRs with Upper Plenum Injection," Revision 1, October 1999 (cores containing 422V + fuel) WCAP-16009-P-A, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment of Uncertainty Method (ASTRUM)," January 2005. WCAP-10054-P-A, "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," August 1985 WCAP-10054-P-A, Addendum 2, Revision 1, "Addendum to the Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code: Safety Injection into the Broken Loop and COSI Condensation Model," July 1997

COLR Section	Parameter	NRC Approved Methodology
2.7	Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$)	WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985 WCAP-16259-P-A, "Westinghouse Methodology for Applications of 3-D Transient Neutronics to Non-LOCA Accident Analysis," August 2006.
2.8	Axial Flux Difference (AFD)	WCAP-8403 (non-proprietary), "Power Distribution Control and Load Following Procedures," September 1974 NS-TMA-2198, Westinghouse to NRC Letter Attachment: "Operation and Safety Analysis Aspects of an Improved Load Follow Package," January 31, 1980. NS-CE-687, Westinghouse to NRC Letter, "Power Distribution Control Analysis," July 16, 1975.
2.9	Overtemperature ΔT Setpoint	WCAP-8745-P-A, "Design Bases for the Thermal Overpower ΔT and Thermal Overtemperature ΔT Trip Functions," September 1986
2.10	Overpower ΔT Setpoint	WCAP-8745-P-A, "Design Bases for the Thermal Overpower ΔT and Thermal Overtemperature ΔT Trip Functions," September 1986
2.11	RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits	WCAP-11397-P-A, "Revised Thermal Design Procedure," April 1989, for those events analyzed using RTDP WCAP-14787-P, Rev. 3, "Westinghouse Revised Thermal Design Procedure Instrument Uncertainty Methodology for Point Beach Units 1 & 2 Power Uprate 1775 MWt Core-Power with Feedwater Venturis, or 1800 MWt Core-Power with LEFM on Feedwater Header)," February 2009. WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985 for those events not utilizing RTDP
2.12	Refueling Boron Concentration	WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985