Exelon Generation®

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October 29, 2015

TS 5.6.5

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 2055-0001

R.E. Ginna Nuclear Power Plant
Facility Operating License No. DPR-18
NRC Docket No. 50-244

Subject: R.E. Ginna Nuclear Power Plant Cycle 39 Core Operating Limits Report, Revision 0

Enclosed is a copy of the R.E. Ginna Nuclear Power Plant Cycle 39 Core Operating Limits Report, Revision 0. The cycle-specific core operating limits contained in the report have been determined in accordance with Technical Specification 5.6.5.

The COLR is being submitted to the NRC in accordance with the R.E. Ginna Nuclear Power Plant Technical Specification Section 5.6.5.

There are no regulatory commitments contained in this letter.

Should you have any questions regarding this submittal, please contact Thomas Harding at 315-791-5219.

Respectfully,

Thomas Harding
Manager, Regulatory Assurance
R.E. Ginna Nuclear Power Plant, LLC

TH/kc

Attachment: (1) R.E. Ginna Nuclear Power Plant Cycle 39 Core Operating Limits Report, Revision 0

cc: NRC Regional Administrator, Region I
NRC Project Manager, Ginna
NRC Resident Inspector, Ginna

A001
NRR

Attachment (1)

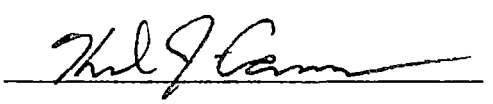
R.E. Ginna Nuclear Power Plant Cycle 39 Core Operating Limits Report, Revision 0

R. E. Ginna Nuclear Power Plant

Core Operating Limits Report
COLR

Cycle 39

Revision 0

Responsible Manager: 

Effective Date: October 24, 2015

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for the R. E. Ginna Nuclear Power Plant has been prepared in accordance with the requirements of Technical Specification 5.6.5.

The Technical Specifications affected by this report are listed below:

2.1 Safety Limits (SLs)

3.1.1 SHUTDOWN MARGIN (SDM)

3.1.3 MODERATOR TEMPERATURE COEFFICIENT (MTC)

3.1.5 Shutdown Bank Insertion Limit

3.1.6 Control Bank Insertion Limits

3.2.1 Heat Flux Hot Channel Factor ($F_Q(Z)$)

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

3.2.3 AXIAL FLUX DIFFERENCE (AFD)

3.3.1 Reactor Trip System (RTS) Instrumentation

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

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 5.6.5. All items that appear in capitalized type are defined in Technical Specification 1.1, Definitions.

2.1 SAFETY LIMITS (SLs)[1]

(2.1)

2.1.1 In MODES 1 and 2, the combination of THERMAL POWER, Reactor Coolant System (RCS) average temperature, and pressurizer pressure shall not exceed the SLs specified in Figure COLR-1.

2.2 SHUTDOWN MARGIN[1]

(LCO 3.1.1)

2.2.1 The SHUTDOWN MARGIN in MODE 2 with K_{eff} < 1.0 and MODES 3 and 4 shall be greater than or equal to the limits specified in Figure COLR-2 for the number of reactor coolant pumps in operation.

2.2.2 The SHUTDOWN MARGIN in MODE 4 when both reactor coolant pumps are not in operation and in MODE 5 shall be greater than or equal to the one loop operation curve of Figure COLR-2.

2.2.3 The SHUTDOWN MARGIN required in LCO 3.1.4, LCO 3.1.5, LCO 3.1.6, LCO 3.1.8, and LCO 3.4.5 shall be greater than the limits specified in Figure COLR-2 for the number of reactor coolant pumps in operation.

2.3 MODERATOR TEMPERATURE COEFFICIENT[1]

(LCO 3.1.3)

2.3.1 The Moderator Temperature Coefficient (MTC) limits are:

The BOL ARO/HZP - MTC shall be equal to or less positive than +5.0 pcm/°F for power levels below 70% RTP and less than or equal to 0 pcm/°F for power levels at or above 70% RTP.

The EOL ARO/RTP - MTC shall be less negative than -44.6 pcm/°F.

where:

ARO stands for All Rods Out

BOL stands for Beginning of Cycle Life

EOL stands for End of Cycle Life

HZP stands for Hot Zero Power

RTP stands for RATED THERMAL POWER

2.4 Shutdown Bank Insertion Limit[1]

(LCO 3.1.5)

2.4.1 The shutdown bank shall be fully withdrawn which is defined as ≥ 220 steps.

2.5 Control Bank Insertion Limits[1]

(LCO 3.1.6)

2.5.1 The control banks shall be limited in physical insertion as shown in Figure COLR-3. Control Bank A shall be at least 220 steps withdrawn.

2.5.2 The control rod banks shall be withdrawn maintaining a nominal 130 step tip-to-tip distance while moving in overlap through the active core region. The minimum allowable tip-to-tip distance shall never be less than 121 steps between two banks moving in the active core region.

2.6 Heat Flux Hot Channel Factor ($F_Q(Z)$)[2]

(LCO 3.2.1)

2.6.1 $F_Q(Z) \leq CFQ * K(Z) / P$ for $P > 0.5$

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

where:

CFQ is the $F_Q(Z)$ limit

P = THERMAL POWER / RATED THERMAL POWER

Z is the height of the core

2.6.2 CFQ = 2.60

2.6.3 K(Z) is provided in Figure COLR-4

2.6.4 W(Z) values are provided in Table COLR-1. For W(Z) data at a desired burnup not listed in the table, 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 W(Z) data for 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. If data are listed for only two burnup steps, a linear fit can be used for both interpolation and extrapolation.

2.6.5 The $F_Q(Z)$ penalty factors are provided in Table COLR-2.

2.6.6 Table COLR-3 provides W(Z) values for the BOC startup flux map to be taken prior to exceeding 75% power. For part power surveillances during other times in life or at powers other than 75%, the W(Z) values in Table COLR-1 should be used. The W(Z) values in Table COLR-3 do not include the 1/P factor, where P is the surveillance power level. This factor will be applied by the INCORE-3D software.

2.7 Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$)[1]

(LCO 3.2.2)

2.7.1 $F^N_{\Delta H} \leq F^{RTP}_{\Delta H} * (1 + PF_{\Delta H} * (1-P))$

where:

$F^{RTP}_{\Delta H} = 1.72$

$PF_{\Delta H} = 0.3$, and

P = THERMAL POWER / RATED THERMAL POWER

2.8 AXIAL FLUX DIFFERENCE[3]

(LCO 3.2.3)

2.8.1 The AFD acceptable operation limits are provided in Figure COLR-5.

2.9 Reactor Trip System (RTS) Instrumentation[5]

(LCO 3.3.1)

2.9.1 Overtemperature ΔT Setpoint Parameter Values

Parameter	Value
Overtemperature ΔT reactor trip setpoint	$K_1 \leq 1.19$
Overtemperature ΔT reactor trip depressurization setpoint penalty coefficient	$K_2 \geq 0.00093$/psi
Overtemperature ΔT reactor trip heatup setpoint coefficient	$K_3 \geq 0.0185$/°F penalty
Measured lead time constant	$\tau_1 \geq 25$ seconds
Measured lag time constant	$\tau_2 \leq 5$ seconds

$f_1(\Delta I)$ is a function of the indicated difference between top and bottom detectors of the power range nuclear ion chambers. Selected gains are based on measured instrument response during plant startup tests, where q_t and q_b are percent RATED THERMAL POWER in the upper and lower halves of the core, respectively, and $q_t + q_b$ is the total percent RATED THERMAL POWER, such that:

- For $q_t - q_b$ between -14% and +6%, $f_1(\Delta I) = 0$.
- For each percent that the magnitude of $q_t - q_b$ exceeds -14%, the ΔT trip setpoint shall be automatically reduced by an equivalent of 3.08% of RATED THERMAL POWER.
- For each percent that the magnitude of $q_t - q_b$ exceeds +6%, the ΔT trip setpoint shall be automatically reduced by an equivalent of 2.27% of RATED THERMAL POWER.

2.9.2 Overpower ΔT Setpoint Parameter Values

Parameter	Value		
Overpower ΔT reactor trip setpoint	K_4	≤	1.077
Overpower ΔT reactor trip heatup setpoint penalty coefficient	K_5	=	0/°F for T < T'
		≥	0.0014/°F for T ≥ T'
Overpower ΔT reactor trip thermal time delay setpoint penalty	K_6	≥	0.00/°F for increasing T
		=	0.00/°F for decreasing T
Measured impulse/lag time constant	τ_3	=	0 seconds

$f_2(\Delta I)$ = 0.0% RTP for all ΔI

2.10 RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits[4]

(LCO 3.4.1)

2.10.1 The pressurizer pressure shall be ≥ 2175 psig.

2.10.2 The RCS average temperature shall be ≤ 580.0°F.

2.10.3 The RCS total flow rate shall be ≥ 177,300 gpm (includes 4% minimum flow uncertainty per Revised Thermal Design Methodology).

2.11 Boron Concentration[1]

(LCO 3.9.1)

2.11.1 The boron concentrations of the hydraulically coupled Reactor Coolant System, the refueling canal, and the refueling cavity shall be ≥ 2750 ppm. Boron concentration based on All Rods In less the highest worth rod with a K-effective of 0.95. A 100 ppm Factor of Safety has been included in this parameter.

3.0 REFERENCES

1. WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985.
2. WCAP-10054-P-A and WCAP-10081-A, "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," August 1985.
3. 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.

4. WCAP-11145-P-A, "Westinghouse Small Break LOCA ECCS Evaluation Model Generic Study with the NOTRUMP Code," October 1986.
5. WCAP-10079-P-A, "NOTRUMP - A Nodal Transient Small Break and General Network Code," August 1985.
6. WCAP-16009-P-A, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment of Uncertainty Method (ASTRUM)," January 2005.
7. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," April 1995.
8. WCAP-10216-P-A, Revision 1A (Proprietary), "Relaxation of Constant Axial Offset Control F_Q - Surveillance Technical Specification," February 1994.
9. WCAP-11397-P-A, "Revised Thermal Design Procedure," April 1989.
10. WCAP-14710-P-A, "1-D Heat Conduction Model for Annular Fuel Pellets," May 1998.
11. WCAP-8745, "Design Basis for the Thermal Overpower ΔT and Thermal Overtemperature ΔT Trip Functions," March 1977.

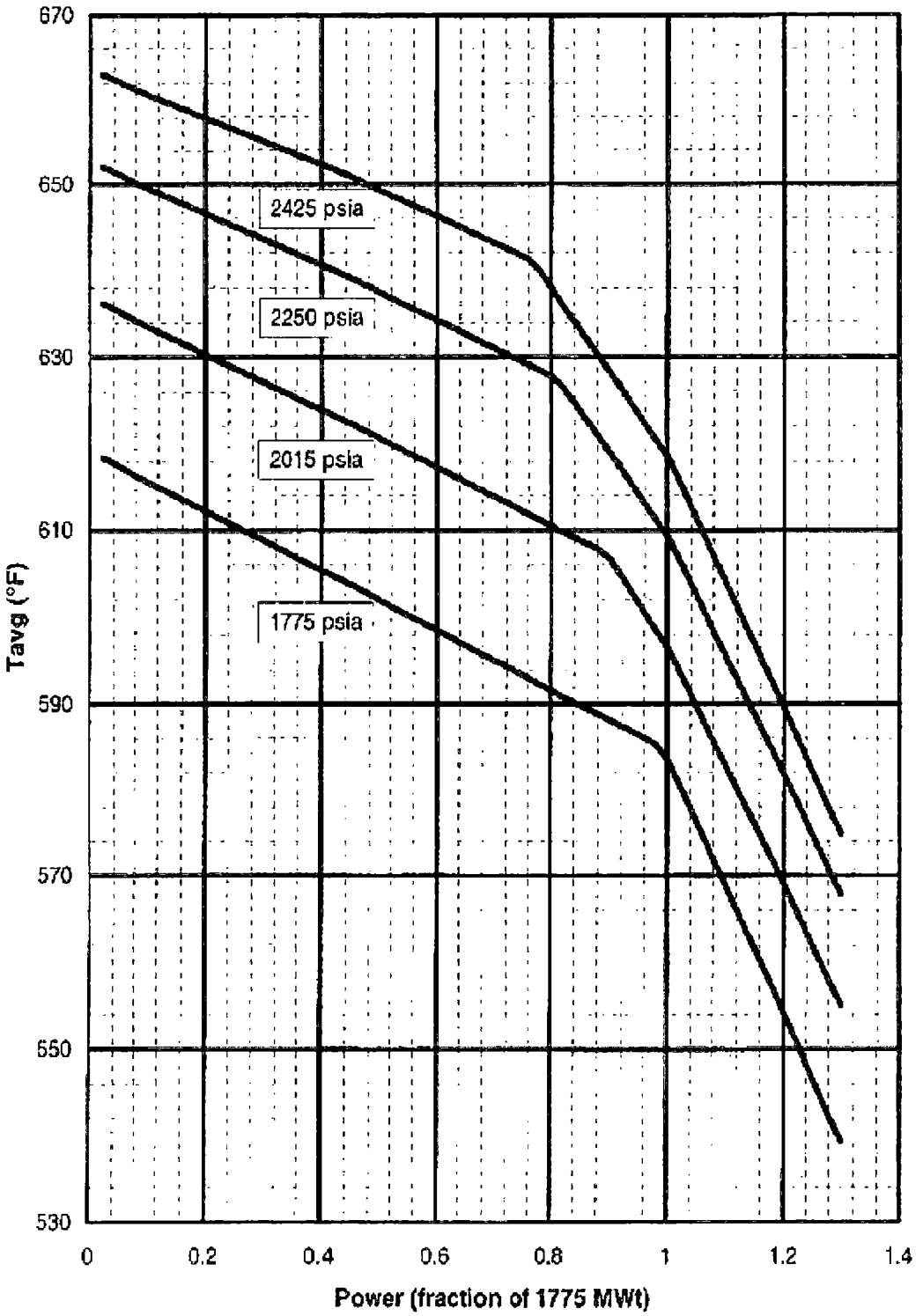


Figure COLR-1
Reactor Safety Limits

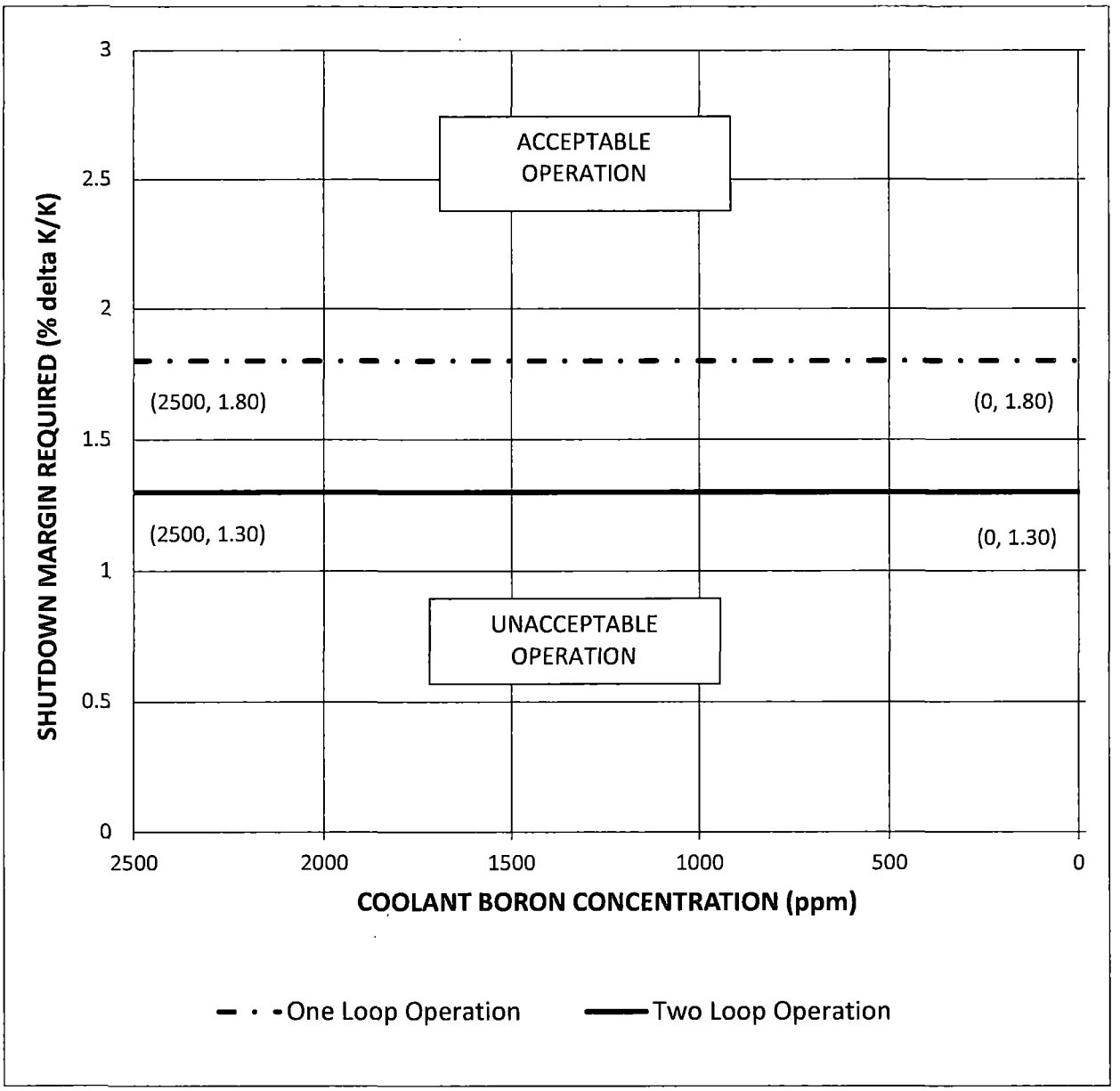
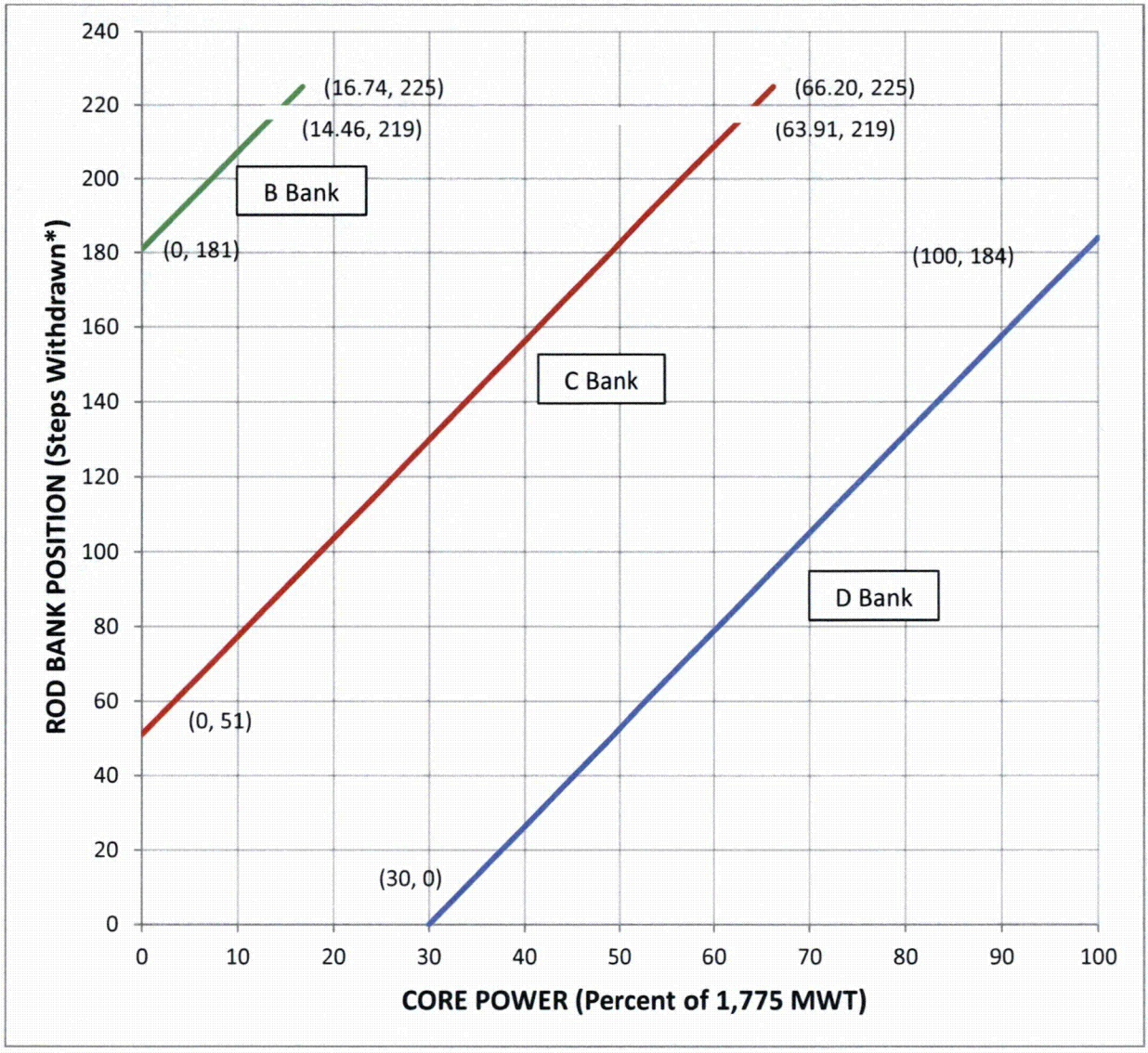


Figure COLR-2
REQUIRED SHUTDOWN MARGIN



*The top of the active fuel corresponds to 219. The ARO parking position may be any position above the corresponding top of active fuel for each respective bank. The control rod tip-to-tip distance is defined as 130 steps while rods are moving in overlap. The bank positions are given as follows:

- **Bank D:** **(184/70) * (P-100) + 184** **(for 30 ≤ P ≤ 100)**
- **Bank C:** **(184/70) * (P-100) + 184 + 130** **(for 0 ≤ P ≤ 66.20)**
- **Bank B:** **(184/70) * (P-100) + 184 + 130 + 130** **(for 0 ≤ P ≤ 16.74)**

Where P is defined as the core power (in percent).

Figure COLR-3
CONTROL BANK INSERTION LIMITS

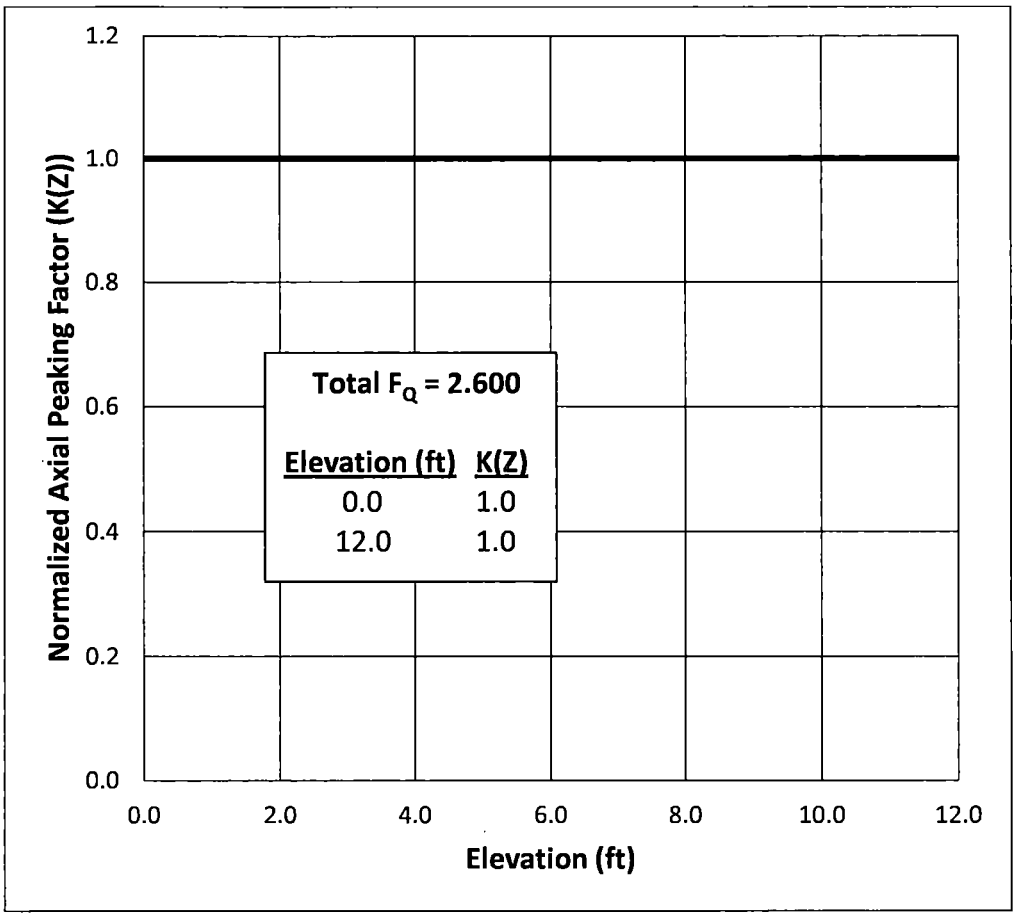


Figure COLR-4
K(Z) – NORMALIZED $F_Q(Z)$ AS A FUNCTION OF CORE HEIGHT

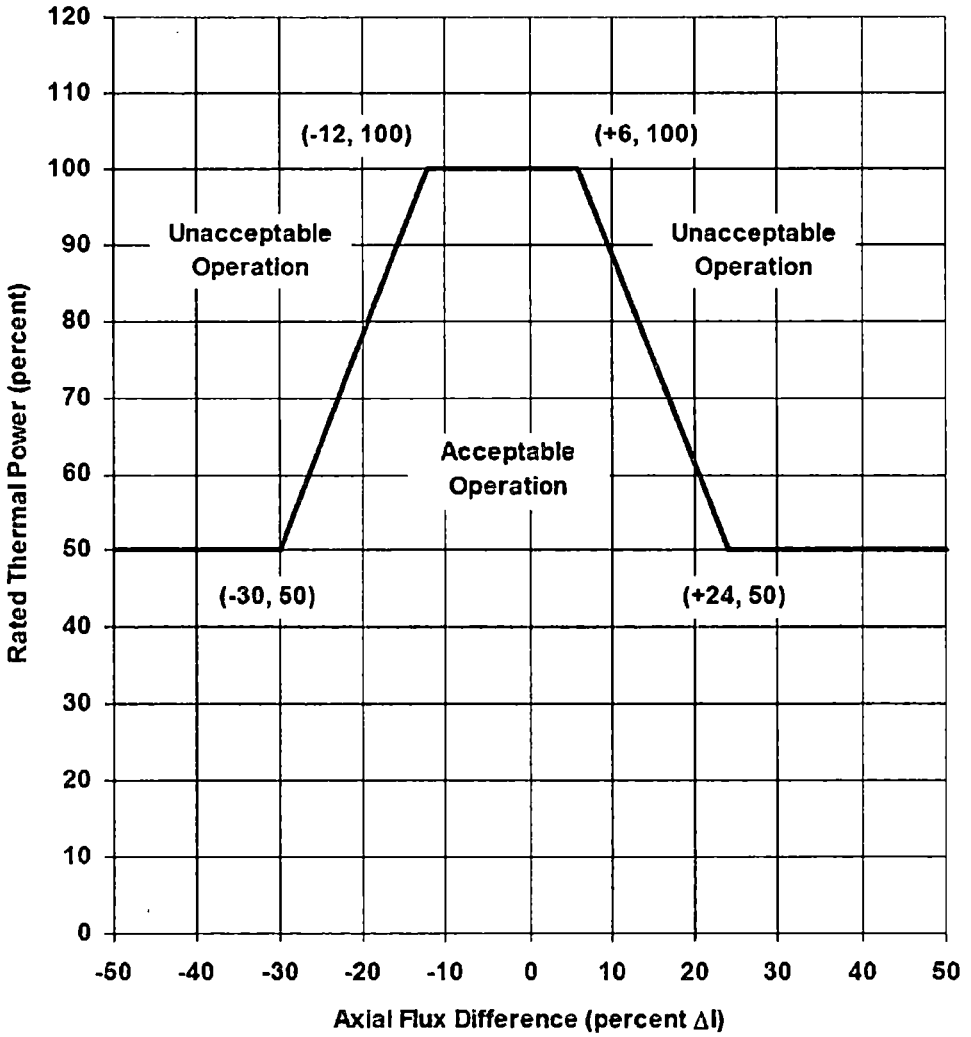


Figure COLR-5
AXIAL FLUX DIFFERENCE ACCEPTABLE OPERATION LIMITS AS A FUNCTION OF RATED THERMAL POWER

Table COLR-1

RAOC Summary of W(Z) with HFP %AFD Band of -12/+6%
(Top 8% and Bottom 8% Excluded)

Height (feet)	150 MWD/MTU	3000 MWD/MTU	10000 MWD/MTU	16000 MWD/MTU
(Bottom) 0.00	1.0000	1.0000	1.0000	1.0000
0.17	1.0000	1.0000	1.0000	1.0000
0.33	1.0000	1.0000	1.0000	1.0000
0.50	1.0000	1.0000	1.0000	1.0000
0.67	1.0000	1.0000	1.0000	1.0000
0.83	1.0000	1.0000	1.0000	1.0000
1.00	1.4159	1.3493	1.2689	1.2657
1.17	1.4043	1.3384	1.2605	1.2585
1.33	1.3914	1.3264	1.2509	1.2500
1.50	1.3762	1.3121	1.2396	1.2399
1.67	1.3596	1.2966	1.2272	1.2289
1.83	1.3428	1.2808	1.2147	1.2178
2.00	1.3238	1.2632	1.2012	1.2053
2.17	1.3041	1.2449	1.1881	1.1924
2.33	1.2853	1.2275	1.1758	1.1800
2.50	1.2654	1.2095	1.1621	1.1670
2.67	1.2447	1.1941	1.1506	1.1541
2.83	1.2259	1.1826	1.1432	1.1421
3.00	1.2128	1.1704	1.1368	1.1310
3.17	1.2048	1.1614	1.1320	1.1249
3.33	1.1983	1.1573	1.1292	1.1250
3.50	1.1917	1.1532	1.1261	1.1246
3.67	1.1849	1.1485	1.1229	1.1236
3.83	1.1780	1.1437	1.1201	1.1225
4.00	1.1702	1.1379	1.1166	1.1207
4.17	1.1620	1.1328	1.1128	1.1182
4.33	1.1539	1.1296	1.1088	1.1156
4.50	1.1447	1.1258	1.1041	1.1131
4.67	1.1358	1.1215	1.0998	1.1114
4.83	1.1288	1.1171	1.0972	1.1102
5.00	1.1223	1.1122	1.0945	1.1085
5.17	1.1163	1.1069	1.0914	1.1067
5.33	1.1101	1.1016	1.0882	1.1056
5.50	1.1022	1.0961	1.0865	1.1058
5.67	1.0975	1.0894	1.0863	1.1071
5.83	1.0980	1.0827	1.0919	1.1083

Table COLR-1 (Continued)

RAOC Summary of W(Z) with HFP %AFD Band of -12/+6%
(Top 8% and Bottom 8% Excluded)

Height (feet)	150 MWD/MTU	3000 MWD/MTU	10000 MWD/MTU	16000 MWD/MTU
6.00	1.1003	1.0833	1.0986	1.1088
6.17	1.1036	1.0893	1.1045	1.1098
6.33	1.1061	1.0942	1.1097	1.1130
6.50	1.1083	1.0993	1.1148	1.1172
6.67	1.1100	1.1044	1.1194	1.1208
6.83	1.1111	1.1086	1.1232	1.1236
7.00	1.1118	1.1125	1.1263	1.1269
7.17	1.1118	1.1159	1.1295	1.1311
7.33	1.1112	1.1185	1.1339	1.1356
7.50	1.1099	1.1207	1.1387	1.1399
7.67	1.1080	1.1222	1.1428	1.1434
7.83	1.1054	1.1229	1.1461	1.1461
8.00	1.1021	1.1230	1.1490	1.1483
8.17	1.0978	1.1223	1.1511	1.1499
8.33	1.0930	1.1209	1.1525	1.1508
8.50	1.0885	1.1187	1.1537	1.1511
8.67	1.0874	1.1160	1.1537	1.1507
8.83	1.0913	1.1154	1.1539	1.1498
9.00	1.0967	1.1188	1.1578	1.1481
9.17	1.1007	1.1287	1.1681	1.1462
9.33	1.1038	1.1370	1.1764	1.1474
9.50	1.1105	1.1461	1.1843	1.1541
9.67	1.1200	1.1563	1.1915	1.1714
9.83	1.1273	1.1658	1.1970	1.1890
10.00	1.1357	1.1754	1.2041	1.2068
10.17	1.1427	1.1843	1.2126	1.2242
10.33	1.1434	1.1920	1.2195	1.2414
10.50	1.1454	1.1978	1.2248	1.2573
10.67	1.1488	1.2010	1.2266	1.2681
10.83	1.1461	1.2027	1.2231	1.2731
11.00	1.1385	1.2025	1.2163	1.2704
11.17	1.0000	1.0000	1.0000	1.0000
11.33	1.0000	1.0000	1.0000	1.0000
11.50	1.0000	1.0000	1.0000	1.0000
11.67	1.0000	1.0000	1.0000	1.0000
11.83	1.0000	1.0000	1.0000	1.0000
12.00 (Top)	1.0000	1.0000	1.0000	1.0000

Table COLR-2

Penalty Factor for Increasing F_Q

Cycle Burnup (MWD/MTU)[a]	Penalty Factor (%)	Penalty Multiplier
150	2.00	1.020
294	2.00	1.020
437	2.00	1.020
581	2.10	1.021
724	2.60	1.026
868	2.90	1.029
1011	2.90	1.029
1155	2.70	1.027
1298	2.50	1.025
1442	2.30	1.023
≥ 1585	2.00	1.020

(a) A penalty multiplier is not required for part power surveillances during startup. The penalty factor should be applied beginning with the first full power surveillance.

Table COLR-3

Part-Power W(Z) Generated at
150 MWD/MTU, 75% Power
(Top 8% and Bottom 8% Excluded)

Height (feet)	HFP ARO	75% D at 180 Steps
(Bottom) 0.00	1.0000	1.0000
0.17	1.0000	1.0000
0.33	1.0000	1.0000
0.50	1.0000	1.0000
0.67	1.0000	1.0000
0.83	1.0000	1.0000
1.00	1.4159	1.4664
1.17	1.4043	1.4507
1.33	1.3914	1.4338
1.50	1.3762	1.4146
1.67	1.3596	1.3939
1.83	1.3428	1.3731
2.00	1.3238	1.3501
2.17	1.3041	1.3266
2.33	1.2853	1.3040
2.50	1.2654	1.2804
2.67	1.2447	1.2560
2.83	1.2259	1.2337
3.00	1.2128	1.2172
3.17	1.2048	1.2062
3.33	1.1983	1.1968
3.50	1.1917	1.1872
3.67	1.1849	1.1771
3.83	1.1780	1.1666
4.00	1.1702	1.1556
4.17	1.1620	1.1448
4.33	1.1539	1.1352
4.50	1.1447	1.1245
4.67	1.1358	1.1137
4.83	1.1288	1.1044
5.00	1.1223	1.0957
5.17	1.1163	1.0873
5.33	1.1101	1.0786
5.50	1.1022	1.0682
5.67	1.0975	1.0612
5.83	1.0980	1.0595

Table COLR-3 (Continued)
Part-Power W(Z) Generated at
150 MWD/MTU, 75% Power
(Top 8% and Bottom 8% Excluded)

Height (feet)	HFP ARO	75% D at 180 Steps
6.00	1.1003	1.0597
6.17	1.1036	1.0609
6.33	1.1061	1.0615
6.50	1.1083	1.0620
6.67	1.1100	1.0620
6.83	1.1111	1.0616
7.00	1.1118	1.0608
7.17	1.1118	1.0595
7.33	1.1112	1.0578
7.50	1.1099	1.0557
7.67	1.1080	1.0534
7.83	1.1054	1.0506
8.00	1.1021	1.0475
8.17	1.0978	1.0438
8.33	1.0930	1.0399
8.50	1.0885	1.0367
8.67	1.0874	1.0370
8.83	1.0913	1.0425
9.00	1.0967	1.0502
9.17	1.1007	1.0568
9.33	1.1038	1.0625
9.50	1.1105	1.0714
9.67	1.1200	1.0831
9.83	1.1273	1.0930
10.00	1.1357	1.1048
10.17	1.1427	1.1160
10.33	1.1434	1.1205
10.50	1.1454	1.1257
10.67	1.1488	1.1318
10.83	1.1461	1.1314
11.00	1.1385	1.1256
11.17	1.0000	1.0000
11.33	1.0000	1.0000
11.50	1.0000	1.0000
11.67	1.0000	1.0000
11.83	1.0000	1.0000
12.00 (Top)	1.0000	1.0000

End Notes

1. Limits generated using Reference 1.
2. Limits generated using References 1 through 8 and 10.
3. Limits generated using References 1 and 8.
4. Limits generated using Reference 9.
5. Limits generated using Reference 11.