TENNESSEE VALLEY AUTHORITY

Sequoyah Nuclear Plant, P.O. Box 2000, Soddy Daisy, Tennessee 37384

November 28, 2022

10 CFR 50.4

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Sequoyah Nuclear Plant, Unit 1
Renewed Facility Operating License No. DPR-77
NRC Docket No. 50-327

Subject: **SEQUOYAH UNIT 1 CYCLE 26 CORE OPERATING LIMITS REPORT REVISION 0**

In accordance with Sequoyah Nuclear Plant (SQN) Unit 1 Technical Specification (TS) 5.6.3.d, enclosed is the Unit 1 Cycle 26 Core Operating Limits Report (COLR), Revision 0 that was issued on November 2, 2022.

There are no new regulatory commitments in this letter. If you have any questions, please contact Jeffrey Sowa, SQN Site Licensing Manager at (423) 843-8129.

Respectfully,

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Thomas Marshall
Site Vice President
Sequoyah Nuclear Plant

Enclosure:
Sequoyah Unit 1 Cycle 26 Core Operating Limits Report, Revision 0

cc (Enclosure):
NRC Regional Administrator – Region II
NRC Senior Resident Inspector – SQN

ENCLOSURE

SEQUOYAH UNIT 1 CYCLE 26
CORE OPERATING LIMITS REPORT
REVISION 0

SEQUOYAH UNIT 1 CYCLE 26 CORE OPERATING LIMITS REPORT

REVISION 0

October 2022

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PORC Chairman / 10/13/2022 Date

Plant Manager / 10/20/22 Date

Revision	Date of PORC Approval	Affected Pages	Reason for Revision
0	See above	All	Initial Issue

1.0 CORE OPERATING LIMITS REPORT

This Core Operating Limits Report (COLR) for Sequoyah Nuclear Plant Unit 1 has been prepared in accordance with the requirements of the Technical Specifications (TS) 5.6.3.

The Technical Specifications affected by this report are listed below:

TS Section	Technical Specification	COLR Parameter	COLR Section	COLR Page
2.1.1	Reactor Core Safety Limits	Reactor Core Safety Limits	2.1	3
3.1.1	SHUTDOWN MARGIN (SDM)	SDM	2.2.1 2.2.2	3 3
3.1.3	Moderator Temperature Coefficient (MTC)	BOL MTC Limit EOL MTC Limit 300 ppm Surveillance Limit 60 ppm Surveillance Limit	2.3.1 2.3.1 2.3.2 2.3.3	4 4 4 4
3.1.4	Rod Group Alignment Limits	SDM	2.2.3	3
3.1.5	Shutdown Bank Insertion Limits	Shutdown Bank Insertion Limits SDM	2.4 2.2.4	4 3
3.1.6	Control Bank Insertion Limits	Control Bank Insertion Limits SDM	2.5 2.2.5	4 3
3.1.8	PHYSICS TESTS Exceptions – MODE 2	SDM	2.2.6	3
3.2.1	Heat Flux Hot Channel Factor ($F_Q(Z)$)	F_Q^{RTP} K(Z) $F_Q^W(Z)$ $[T(Z)]^{COLR}$ $A_{xy}(Z)$ Factor R_j Penalty Factor Thermal Power Limits U_{FQ}	2.6.1 2.6.2 2.6.3 2.6.4 2.6.5 2.6.6 2.6.7 2.6.8	5 5 5 5 5 5 6 6
3.2.2	Nuclear Enthalpy Rise Hot Channel Factor ($F_{\Delta H}^N$)	$F_{\Delta H}^N$	2.7	6
3.2.3	Axial Flux Difference (AFD)	AFD Limits	2.8	6
3.3.1	Reactor Trip System (RTS) Instrumentation	Overtemperature ΔT Trip Setpoints Overpower ΔT Trip Setpoints QTNL, QTPL, QTNS, and QTPS QPNL, QPPL, QPNS, and QPPS	2.9.1 2.9.2 2.9.3 2.9.4	7 7 7 8
3.4.1	RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits	Pressurizer pressure RCS average temperature RCS flow	2.10	8
3.9.1	Boron Concentration	Refueling Boron Concentration	2.11	8
5.6.3	CORE OPERATING LIMITS REPORT (COLR)	Analytical Methods	Table 1	13

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 the Technical Specifications 5.6.3.

The following abbreviations are used in this section:

BOL	--	Beginning of Cycle Life
ARO	--	All Rods Out
HZP	--	Hot Zero Thermal Power
EOL	--	End of Cycle Life
RTP	--	Rated Thermal Power
RCS	--	Reactor Coolant System
RAOC	--	Relaxed Axial Offset Control
ROS	--	RAOC Operating Space
SFCP	--	Surveillance Frequency Control Program

2.1 REACTOR CORE SAFETY LIMITS (Safety Limit 2.1.1)

In MODES 1 and 2, the combination of THERMAL POWER, Reactor Coolant System (RCS) highest loop average temperature, and pressurizer pressure shall not exceed the limits in Figure 1.

2.2 SHUTDOWN MARGIN (LCO 3.1.1, 3.1.4, 3.1.5, 3.1.6, 3.1.8)

2.2.1 For TS 3.1.1, SDM shall be ≥ 1.6% Δk/k in MODE 2 with k_{eff} < 1.0, MODE 3 and MODE 4.

2.2.2 For TS 3.1.1, SDM shall be ≥ 1.0% Δk/k in MODE 5.

2.2.3 For TS 3.1.4, SDM shall be ≥ 1.6% Δk/k in MODE 1 and MODE 2.

2.2.4 For TS 3.1.5, SDM shall be ≥ 1.6% Δk/k in MODE 1 and MODE 2.

2.2.5 For TS 3.1.6, SDM shall be ≥ 1.6% Δk/k in MODE 1 and MODE 2 with k_{eff} ≥ 1.0.

2.2.6 For TS 3.1.8, SDM shall be ≥ 1.6% Δk/k in MODE 2.

2.3 MODERATOR TEMPERATURE COEFFICIENT - MTC (LCO 3.1.3)

2.3.1 The Moderator Temperature Coefficient (MTC) limits are:

The BOL/ARO/HZP - MTC shall be less positive than 0 Δk/k/°F (upper limit). With the measured BOL/ARO/HZP - MTC more positive than -2.210×10^{-5} Δk/k/°F (as-measured MTC limit), establish control rod withdrawal limits to ensure the MTC remains less positive than or equal to 0 Δk/k/°F (upper limit) for all times in core life.

The EOL/ARO/RTP - MTC shall be less negative than or equal to -4.45×10^{-4} Δk/k/°F (lower limit).

2.3.2 The 300 ppm surveillance limit is:

The measured 300 ppm /ARO/RTP-MTC should be less negative than or equal to -3.80×10^{-4} Δk/k/°F.

2.3.3 The 60 ppm surveillance limit is:

The measured 60 ppm /ARO/RTP-MTC should be less negative than or equal to -4.20×10^{-4} Δk/k/°F.

2.4 SHUTDOWN BANK INSERTION LIMITS (LCO 3.1.5)

2.4.1 The shutdown banks shall be withdrawn to a position greater than or equal to 225 steps withdrawn.

2.5 CONTROL BANK INSERTION LIMITS (LCO 3.1.6)

2.5.1 The control banks are fully withdrawn or shall be limited in physical insertion as shown in Figure 2.

2.5.2 Each control bank shall be considered fully withdrawn from the core at greater than or equal to 225 steps.

2.5.3 The control banks shall be operated in sequence by withdrawal of Bank A, Bank B, Bank C, and Bank D. The control banks shall be sequenced in reverse order upon insertion.

2.5.4 Each control bank not fully withdrawn from the core shall be operated with the following overlap as a function of park position.

Park Position (steps)	Bank Overlap (steps)	Bank Difference Tip-to-Tip Separation (steps)
225	97	128
226	98	128
227	99	128
228	100	128
229	101	128
230	102	128
231	103	128

2.6 HEAT FLUX HOT CHANNEL FACTOR - $F_Q(Z)$ (LCO 3.2.1)

$$F_Q^C(Z) \leq \frac{F_Q^{RTP}}{P} * K(Z) \quad for\ P > 0.5$$

$$F_Q^C(Z) \leq \frac{F_Q^{RTP}}{0.5} * K(Z) \quad for\ P \leq 0.5$$

where:

$$F_Q^C(Z) = F_Q^M(Z) * \mathrm{U}_{FQ}$$

$$P = \frac{THERMAL\ POWER}{RATED\ THERMAL\ POWER}$$

2.6.1 $F_Q^{RTP} = 2.62$

2.6.2 K(Z) is provided in Figure 3.

2.6.3

$$F_Q^W(Z) \leq \frac{F_Q^{RTP}}{P} * K(Z) \quad for\ P > 0.5$$

$$F_Q^W(Z) \leq \frac{F_Q^{RTP}}{0.5} * K(Z) \quad for\ P \leq 0.5$$

where:

$$F_Q^W(Z) = [F_{XY}(Z)]_{Surv}^M * \frac{[T(Z)]^{COLR}}{P} * A_{XY}(Z) * R_j * \mathrm{U}_{FQ} \quad for\ P > 0.5$$

$$F_Q^W(Z) = [F_{XY}(Z)]_{Surv}^M * \frac{[T(Z)]^{COLR}}{0.5} * A_{XY}(Z) * R_j * \mathrm{U}_{FQ} \quad for\ P \leq 0.5$$

and, $[F_{XY}(Z)]_{Surv}^M$ is the measured planar radial peaking factor.

$F_Q^W(Z)$ evaluations are not applicable for axial core regions, measured in percent of core height:

a. Lower core region, from 0 to 10% inclusive,
b. Upper core region, from 90 to 100% inclusive,
c. Grid plane regions, ±2% inclusive, and
d. Core plane regions, within ±2% of the bank demand positions of the control banks.

2.6.4

$[T(Z)]^{COLR}$ values are provided in Tables 2 and 3 for RAOC operating space one (ROS1) and RAOC operating space two (ROS2).

2.6.5

The $A_{XY}(Z)$ factors adjust the surveillance to the reference conditions assumed in generating the $[T(Z)]^{COLR}$ factors. $A_{XY}(Z)$ may be assumed to equal 1.0 or may be determined for specific surveillance conditions using the approved methods listed in TS 5.6.3.

2.6.6

The R_j penalty factors account for the potential decrease in transient F_Q margin between surveillances. The R_j factors for ROS1 and ROS2 are provided in Tables 4 and 5 respectively.

2.6.7

Table 6 provides the required limits on THERMAL POWER and the required AFD reductions for each ROS in the event that additional margin is required.

2.6.8

The uncertainty, U_{FQ}, to be applied to measured $F_Q(Z)$ shall be calculated by the following:

$$U_{FQ} = U_{qu} * U_e$$

where:

U_{qu} = Base F_Q measurement uncertainty = 1.05 when PDMS is inoperable
(U_{qu} is defined by PDMS and cannot be less than 1.05 when OPERABLE)
U_e = Engineering uncertainty factor = 1.03

2.7 NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR – $F_{\Delta H}^N$ (LCO 3.2.2)

$$F_{\Delta H}^N * U_{\Delta H} \leq F_{\Delta H}^{RTP} * (1 + PF_{\Delta H} * (1-P))$$

where P = Thermal Power / Rated Thermal Power

$F_{\Delta H}^{RTP}$ = 1.70 for RFA-2 fuel, and 1.61 for HTP fuel

$PF_{\Delta H}$ = 0.3

The uncertainty, $U_{\Delta H}$, to be applied to measured $F_{\Delta H}^N$ shall be 1.04 when PDMS is inoperable ($U_{\Delta H}$ is defined by PDMS and cannot be less than 1.04 when OPERABLE).

2.8 AXIAL FLUX DIFFERENCE - AFD (LCO 3.2.3)

The AFD limits for Cycle 26 are provided in Figure 4.

2.9 REACTOR TRIP SYSTEM (RTS) INSTRUMENTATION (LCO 3.3.1)

2.9.1 Overtemperature ΔT Trip Setpoints

Parameter	Value
Overtemperature ΔT reactor trip setpoint	$K_1 \leq 1.15$
Overtemperature ΔT reactor trip setpoint T_{avg} coefficient	$K_2 \geq 0.015$/°F
Overtemperature ΔT reactor trip setpoint pressure coefficient	$K_3 = 0.0008$/psig
Nominal T_{avg} at RTP	$T' \leq 578.2$°F
Nominal RCS operating pressure	$P' = 2235$ psig
Measured RCS ΔT lead/lag time constants	$\tau_4 \geq 5$ sec
	$\tau_5 \leq 3$ sec
Measured RCS average temperature lead/lag time constants	$\tau_1 \geq 33$ sec
	$\tau_2 \leq 4$ sec

2.9.2 Overpower ΔT Trip Setpoints

Parameter	Value
Overpower ΔT reactor trip setpoint	$K_4 \leq 1.087$
Overpower ΔT reactor trip setpoint T_{avg} rate/lag coefficient	$K_5 \geq 0.02$/°F for increasing T_{avg} 0/°F for decreasing T_{avg}
Overpower ΔT reactor trip setpoint T_{avg} heatup coefficient	$K_6 \geq 0.0011$/°F when $T > T''$ 0/°F when $T \leq T''$
Nominal T_{avg} at RTP	$T'' \leq 578.2$°F
Measured RCS ΔT lead/lag time constants	$\tau_4 \geq 5$ sec
	$\tau_5 \leq 3$ sec
Measured RCS average temperature rate/lag time constant	$\tau_3 \geq 10$ sec

2.9.3 Trip Reset Term [$f_1(\Delta I)$] for Overtemperature ΔT Trip

The following parameters are required to specify the power level-dependent $f_1(\Delta I)$ trip reset term limits for TS Table 3.3.1-1 (function 6), Overtemperature ΔT trip function:

2.9.3.1 QTNL = -20%

where QTNL = the maximum negative ΔI setpoint at RATED THERMAL POWER at which the trip setpoint is not reduced by the axial power distribution.

2.9.3.2 QTPL = +5%

where QTPL = the maximum positive ΔI setpoint at RATED THERMAL POWER at which the trip setpoint is not reduced by the axial power distribution.

2.9.3.3 QTNS = 2.50%

where QTNS = the percent reduction in Overtemperature ΔT trip setpoint for each percent that the magnitude of ΔI exceeds its negative limit at RATED THERMAL POWER (QTNL).

2.9.3.4 QTPS = 1.40%

where QTPS = the percent reduction in Overtemperature ΔT trip setpoint for each percent that the magnitude of ΔI exceeds its positive limit at RATED THERMAL POWER (QTPL).

2.9.4 Trip Reset Term [$f_2(\Delta I)$] for Overpower ΔT Trip

The following parameters are required to specify the power level-dependent $f_2(\Delta I)$ trip reset term limits for TS Table 3.3.1-1 (function 7), Overpower ΔT trip function:

2.9.4.1 QPNL = 0%

where QPNL = the maximum negative ΔI setpoint at RATED THERMAL POWER at which the trip setpoint is not reduced by the axial power distribution.

2.9.4.2 QPPL = 0%

where QPPL = the maximum positive ΔI setpoint at RATED THERMAL POWER at which the trip setpoint is not reduced by the axial power distribution.

2.9.4.3 QPNS = 0%

where QPNS = the percent reduction in Overpower ΔT trip setpoint for each percent that the magnitude of ΔI exceeds its negative limit at RATED THERMAL POWER (QPNL).

2.9.4.4 QPPS = 0%

where QPPS = the percent reduction in Overpower ΔT trip setpoint for each percent that the magnitude of ΔI exceeds its positive limit at RATED THERMAL POWER (QPPL).

2.10 RCS PRESSURE, TEMPERATURE, AND FLOW DEPARTURE FROM NUCLEATE BOILING (DNB) LIMITS (LCO 3.4.1)

Parameter	Indicated Value
Pressurizer pressure	≥ 2220 psia
RCS average temperature	≤ 583ºF
RCS flow	≥ 378,400 gpm

2.11 REFUELING BORON CONCENTRATION (LCO 3.9.1)

The refueling boron concentration shall be ≥ 2000 ppm.

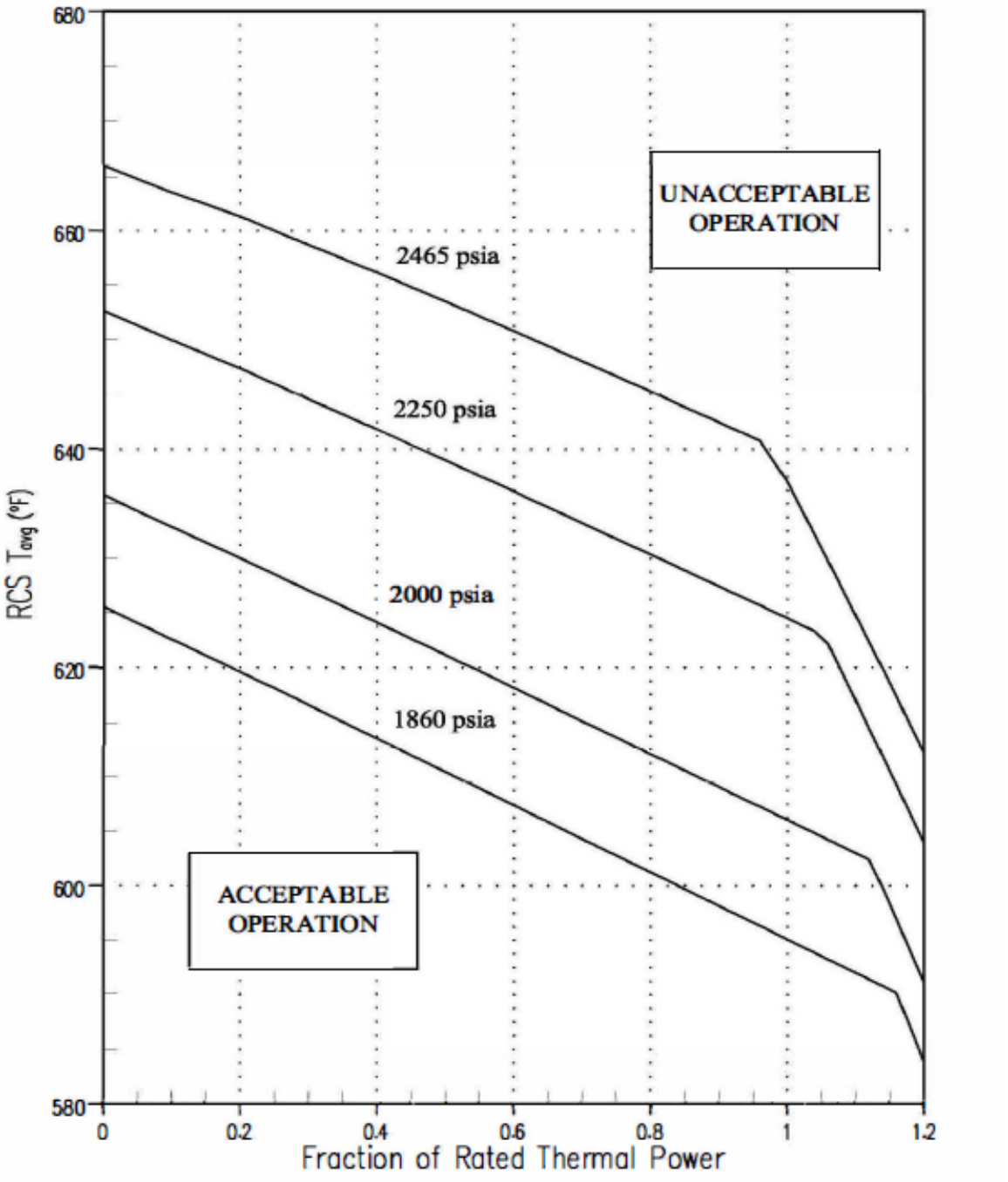


Figure 1
Reactor Core Safety Limits
RCS T-avg Versus Rated Thermal Power

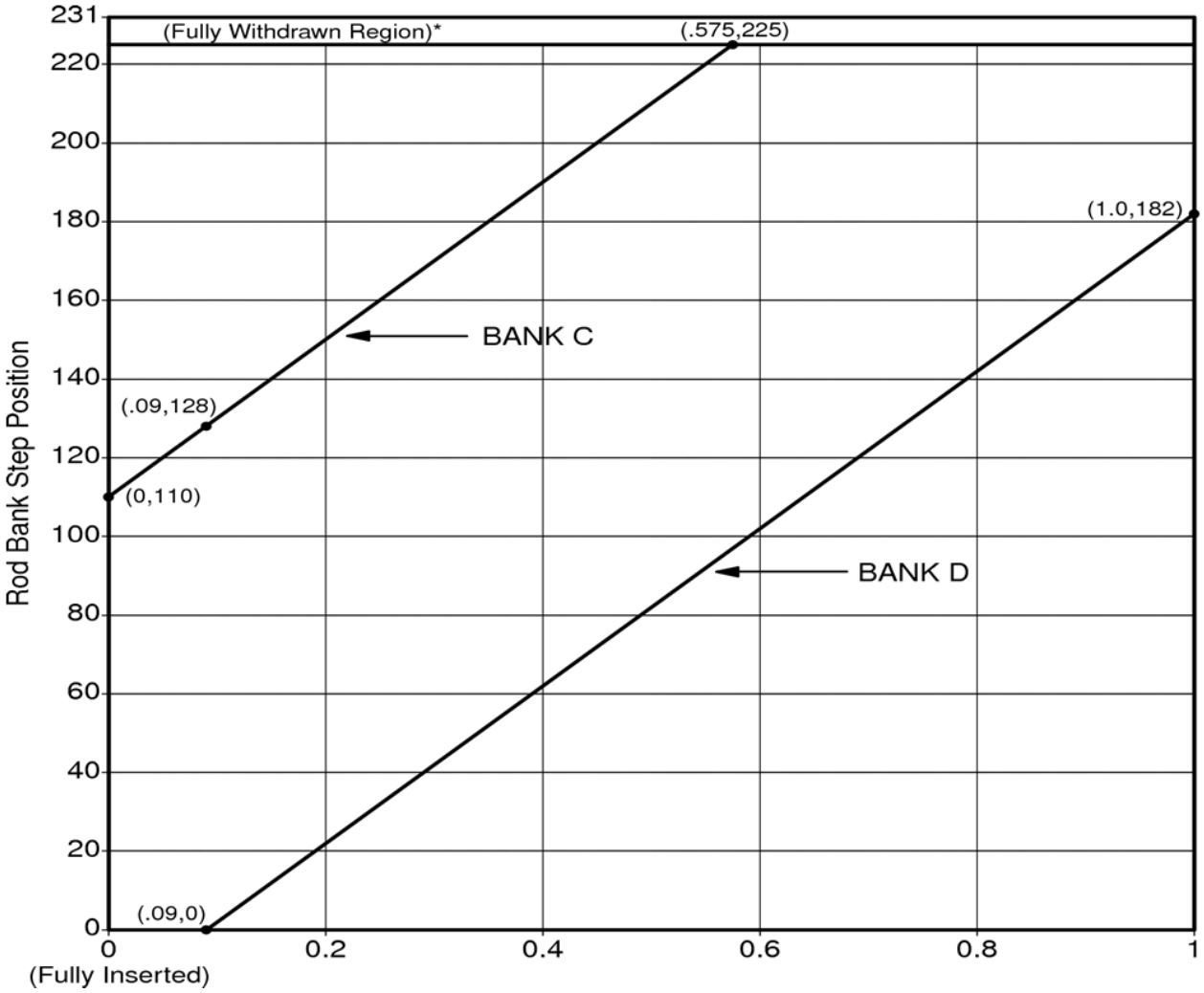


Figure 2
Control Bank Insertion Limits Versus Rated Thermal Power
Four Loop Operation

Note: the above control bank insertion limits are applicable to both ROS1 and ROS2.

* Fully withdrawn region shall be the condition where shutdown and control banks are at a position within the interval of ≥ 225 and ≤ 231 steps withdrawn.

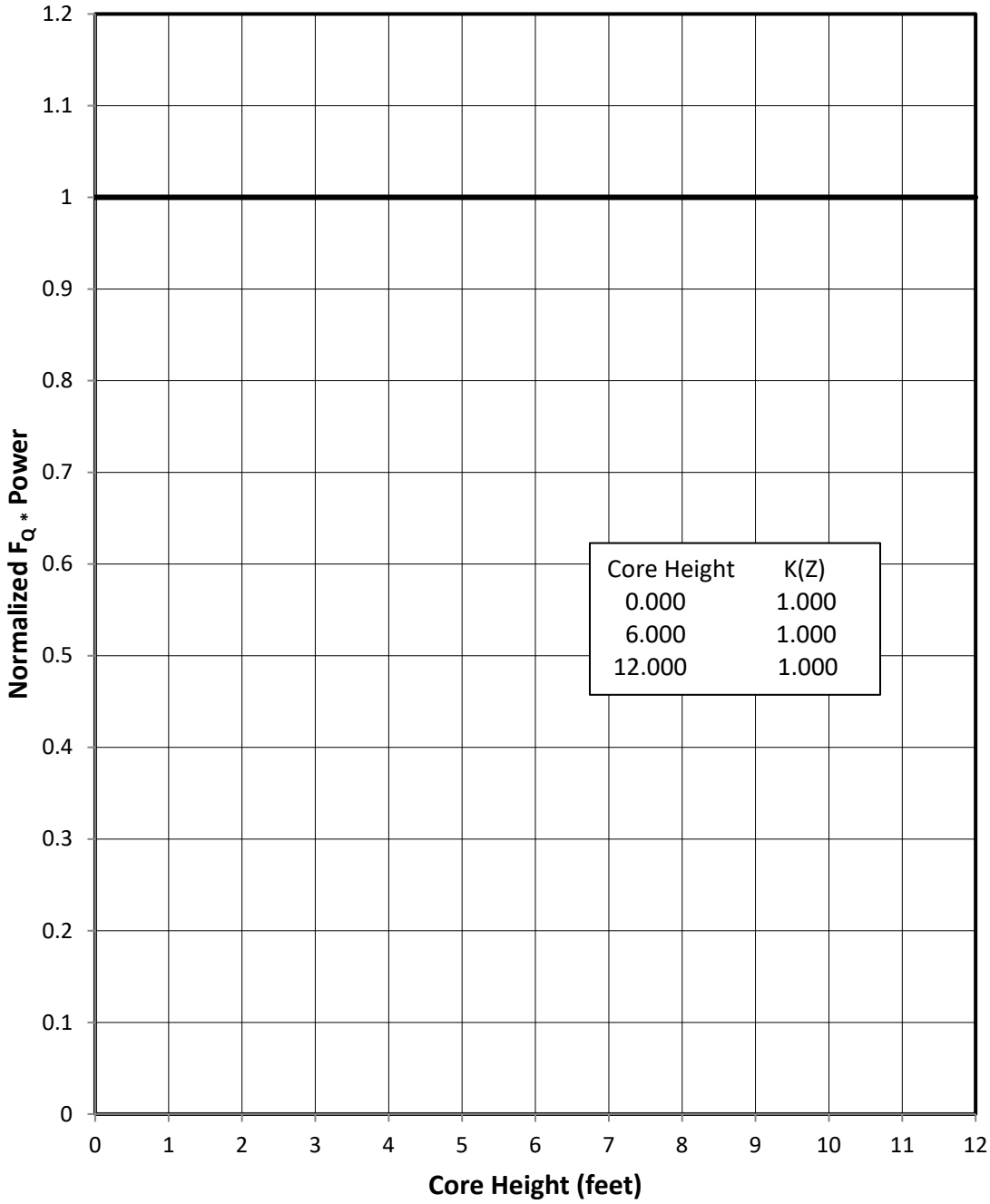
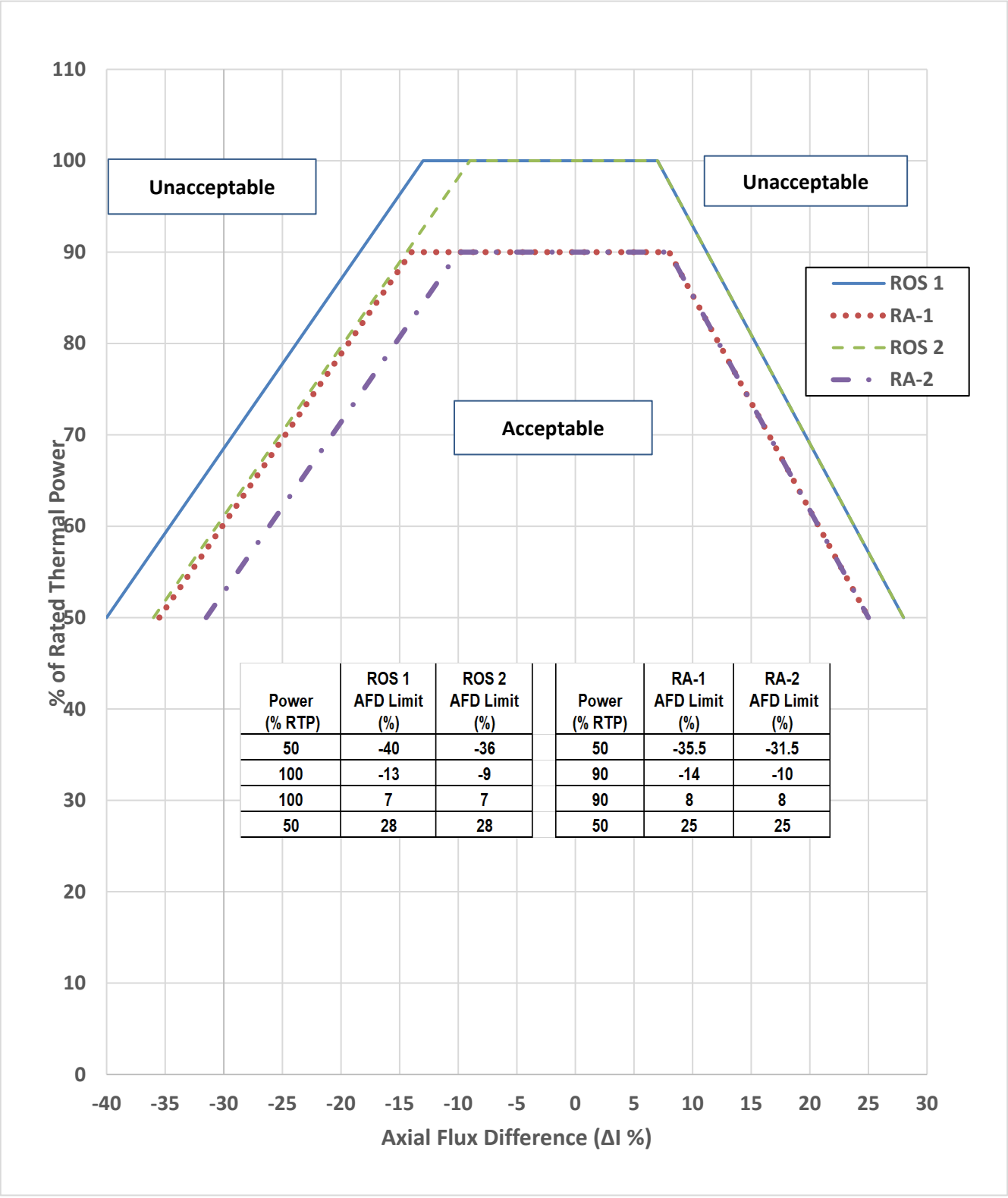


Figure 3
K(Z) - Normalized $F_Q(Z)$ as a Function of Core Height



Power (% RTP)	ROS 1 AFD Limit (%)	ROS 2 AFD Limit (%)
50	-40	-36
100	-13	-9
100	7	7
50	28	28

Power (% RTP)	RA-1 AFD Limit (%)	RA-2 AFD Limit (%)
50	-35.5	-31.5
90	-14	-10
90	8	8
50	25	25

Figure 4
Axial Flux Difference Acceptable Operation Limits as a function of Rated Thermal Power (RAOC)

Table 1
COLR Methodology Topical Reports

1. WCAP-8745-P-A, "Design Bases for the Thermal Overpower ΔT and Thermal Overtemperature ΔT Trip Functions," September 1986.
   (methodology for OTΔT and OPΔT Reactor Trip System setpoints in TS 3.3.1)

2. WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985.
   (methodology for Shutdown Margin, Moderator Temperature Coefficient, Shutdown Bank Insertion Limit, Control Bank Insertion Limits, Axial Flux Difference, Heat Flux Hot Channel Factor, Nuclear Enthalpy Rise Hot Channel Factor, DNB Limits, Refueling Pool Boron Concentration)

3. WCAP-10216-P-A, Revision 1A, "Relaxation of Constant Axial Offset Control – F_Q Surveillance Technical Specification," February 1994.
   (methodology for Axial Flux Difference limits with Relaxed Axial Offset Control and Heat Flux Hot Channel Factor (W(z)) Surveillance Requirements for F_Q)

4. WCAP-10444-P-A, "Reference Core Report VANTAGE 5 Fuel Assembly," September 1985.
   (methodology for Axial Flux Difference and Heat Flux Hot Channel Factor Limits)

5. WCAP-10444-P-A Addendum 2-A, "VANTAGE 5H Fuel Assembly," February 1989.
   (methodology for Axial Flux Difference and Heat Flux Hot Channel Factor Limits)

6. WCAP-10965-P-A, "ANC: A Westinghouse Advanced Nodal Computer Code," September 1986.
   (methodology for Shutdown Margin, Moderator Temperature Coefficient, Shutdown Bank Insertion Limit, Control Bank Insertion Limits, Axial Flux Difference, Heat Flux Hot Channel Factor, Nuclear Enthalpy Rise Hot Channel Factor, Refueling Pool Boron Concentration)

7. WCAP-10965-P-A, Addendum 2-A, Revision 0, "Qualification of the New Pin Power Recovery Methodology," September 2010.
   (methodology for Shutdown Margin, Moderator Temperature Coefficient, Shutdown Bank Insertion Limit, Control Bank Insertion Limits, Heat Flux Hot Channel Factor, Nuclear Enthalpy Rise Hot Channel Factor, Axial Flux Difference, TS 3.4.1 DNB Limits, Refueling Pool Boron Concentration)

8. WCAP-11397-P-A, "Revised Thermal Design Procedure," April 1989.
   (methodology for Reactor Core Safety Limits, Nuclear Enthalpy Rise Hot Channel Factor, TS 3.4.1 DNB Limits)

9. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," April 1995.
   (methodology for Axial Flux Difference and Heat Flux Hot Channel Factor Limits)

10. WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006.
    (methodology for Axial Flux Difference and Heat Flux Hot Channel Factor Limits)

11. WCAP-14565-P-A, "VIPRE-01 Modeling and Qualification for Pressurized Water Reactor Non-LOCA Thermal-Hydraulic Safety Analysis," October 1999.
    (methodology for DNB Safety Limit, Nuclear Enthalpy Rise Hot Channel Factor, and TS 3.4.1 DNB Limits)

12. WCAP-14565-P-A, Addendum 1-A, Revision 0, “Addendum 1 to WCAP 14565-P-A Qualification of ABB-NV Critical Heat Flux Correlations with VIPRE-01 Code,” August 2004.
(methodology for DNB Safety Limit)

13. WCAP-14565-P-A, Addendum 2-P-A, Revision 0, “Addendum 2 to WCAP-14565-P-A Extended Application of ABB-NV Correlation and Modified ABB-NV Correlation WLOP for PWR Low Pressure Applications,” April 2008.
(methodology for DNB Safety Limit)

14. WCAP-15025-P-A, “Modified WRB-2 Correlation, WRB-2M, for Predicting Critical Heat Flux in 17x17 Rod Bundles with Modified LPD Mixing Vane Grids,” April 1999.
(methodology for DNB Safety Limit and Nuclear Enthalpy Rise Hot Channel Factor)

15. WCAP-16045-P-A, “Qualification of the Two-Dimensional Transport Code PARAGON,” August 2004.
(methodology for Shutdown Margin, Moderator Temperature Coefficient, Shutdown Bank Insertion Limit, Control Bank Insertion Limits, Heat Flux Hot Channel Factor, Nuclear Enthalpy Rise Hot Channel Factor, Axial Flux Difference, TS 3.4.1 DNB Limits, Refueling Pool Boron Concentration)

16. WCAP-16045-P-A, Addendum 1-A, “Qualification of the NEXUS Nuclear Data Methodology,” August 2007.
(methodology for Moderator Temperature Coefficient)

17. WCAP-16996-P-A, Revision 1, “Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology),” November 2016.
(methodology for F_Q and $F^N_{\Delta H}$ limits)

18. WCAP-17661-P-A, Revision 1, "Improved RAOC and CAOC F_Q Surveillance Technical Specifications," February 2019.
(methodology for control bank insertion limits, F_Q limits, and AFD limits)

Table 2
$[T(Z)]^{COLR}$ Factors for ROS1

Point	Elevation (ft)	150 MWD/MTU	3000 MWD/MTU	6000 MWD/MTU	10000 MWD/MTU	14000 MWD/MTU	16000 MWD/MTU
1	12.2067	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	12.0033	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	11.7998	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	11.5964	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	11.3929	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	11.1895	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	10.9860	1.1109	0.9943	1.0176	1.1496	1.2655	1.2510
8	10.7826	1.1424	1.0551	1.0760	1.1961	1.3040	1.2861
9	10.5791	1.1942	1.1169	1.1596	1.2708	1.3551	1.3194
10	10.3757	1.2064	1.1358	1.1910	1.2850	1.3468	1.3063
11	10.1723	1.2266	1.1798	1.2387	1.3093	1.3527	1.3126
12	9.9688	1.2132	1.1703	1.2222	1.2816	1.3084	1.2757
13	9.7654	1.2759	1.2383	1.2884	1.3286	1.3215	1.3081
14	9.5619	1.2474	1.2232	1.2683	1.2895	1.2924	1.2629
15	9.3585	1.2525	1.2490	1.2787	1.2789	1.2875	1.2548
16	9.1550	1.2266	1.2403	1.2554	1.2419	1.2579	1.2249
17	8.9516	1.2557	1.2861	1.2863	1.2645	1.2772	1.2422
18	8.7481	1.2889	1.3357	1.3270	1.2924	1.2936	1.2558
19	8.5447	1.2908	1.3462	1.3292	1.2851	1.2877	1.2440
20	8.3412	1.3468	1.4088	1.3800	1.3225	1.3247	1.2822
21	8.1378	1.3700	1.4362	1.3980	1.3305	1.3334	1.2932
22	7.9344	1.3376	1.4099	1.3669	1.2939	1.2982	1.2623
23	7.7309	1.3462	1.4226	1.3732	1.2930	1.2978	1.2649
24	7.5275	1.3288	1.4056	1.3526	1.2703	1.2776	1.2494
25	7.3240	1.3164	1.3931	1.3359	1.2504	1.2591	1.2353
26	7.1206	1.3625	1.4393	1.3755	1.2788	1.2849	1.2626
27	6.9171	1.3517	1.4251	1.3636	1.2636	1.2672	1.2485
28	6.7137	1.3762	1.4450	1.3828	1.2787	1.2769	1.2614
29	6.5102	1.3236	1.3861	1.3307	1.2322	1.2286	1.2181
30	6.3068	1.3772	1.4337	1.3756	1.2699	1.2576	1.2485
31	6.1034	1.3385	1.3966	1.3392	1.2379	1.2176	1.2166
32	5.8999	1.3264	1.3896	1.3250	1.2274	1.2051	1.2073
33	5.6965	1.2838	1.3504	1.2863	1.1881	1.1657	1.1772
34	5.4930	1.3114	1.3768	1.3117	1.2065	1.1826	1.1915
35	5.2896	1.3537	1.4190	1.3511	1.2443	1.2148	1.2189
36	5.0861	1.3551	1.4200	1.3535	1.2509	1.2185	1.2193
37	4.8827	1.3495	1.4147	1.3516	1.2524	1.2175	1.2149
38	4.6792	1.3514	1.4165	1.3572	1.2613	1.2229	1.2173
39	4.4758	1.3544	1.4198	1.3652	1.2733	1.2312	1.2233
40	4.2723	1.3426	1.4072	1.3611	1.2746	1.2306	1.2221
41	4.0689	1.3030	1.3616	1.3281	1.2505	1.2083	1.2004
42	3.8655	1.2920	1.3447	1.3198	1.2494	1.2073	1.1989
43	3.6620	1.3349	1.3818	1.3627	1.2952	1.2496	1.2357
44	3.4586	1.3480	1.3860	1.3757	1.3191	1.2732	1.2531
45	3.2551	1.3366	1.3656	1.3656	1.3244	1.2819	1.2577
46	3.0517	1.3335	1.3510	1.3582	1.3372	1.2955	1.2729
47	2.8482	1.3369	1.3447	1.3577	1.3461	1.3168	1.2961
48	2.6448	1.3338	1.3339	1.3567	1.3557	1.3373	1.3197
49	2.4413	1.3421	1.3344	1.3648	1.3856	1.3711	1.3585
50	2.2379	1.3198	1.3016	1.3400	1.3827	1.3790	1.3734
51	2.0345	1.3118	1.2815	1.3269	1.3919	1.4005	1.4024
52	1.8310	1.3352	1.2920	1.3435	1.4297	1.4497	1.4585
53	1.6276	1.3184	1.2622	1.3186	1.4268	1.4636	1.4818
54	1.4241	1.2681	1.1990	1.2569	1.3828	1.4375	1.4657
55	1.2207	1.2040	1.1217	1.1777	1.3157	1.3880	1.4260
56	1.0172	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
57	0.8138	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
58	0.6103	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
59	0.4069	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
60	0.2034	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
61	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 3
$[T(Z)]^{COLR}$ Factors for ROS2

Point	Elevation (ft)	150 MWD/MTU	3000 MWD/MTU	6000 MWD/MTU	10000 MWD/MTU	14000 MWD/MTU	16000 MWD/MTU
1	12.2067	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	12.0033	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	11.7998	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	11.5964	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	11.3929	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	11.1895	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	10.9860	1.0925	0.9943	1.0037	1.1273	1.2344	1.2510
8	10.7826	1.1226	1.0551	1.0522	1.1732	1.2730	1.2861
9	10.5791	1.1746	1.1169	1.1301	1.2521	1.3226	1.3193
10	10.3757	1.1850	1.1358	1.1630	1.2750	1.3113	1.3064
11	10.1723	1.2104	1.1799	1.2111	1.3090	1.3151	1.3117
12	9.9688	1.2063	1.1687	1.1968	1.2816	1.2786	1.2702
13	9.7654	1.2326	1.2363	1.2637	1.3287	1.3248	1.3003
14	9.5619	1.2171	1.2221	1.2460	1.2928	1.2924	1.2565
15	9.3585	1.2253	1.2492	1.2585	1.2798	1.2833	1.2515
16	9.1550	1.2015	1.2403	1.2374	1.2359	1.2499	1.2253
17	8.9516	1.2325	1.2861	1.2725	1.2471	1.2722	1.2422
18	8.7481	1.2698	1.3357	1.3136	1.2699	1.2907	1.2558
19	8.5447	1.2725	1.3462	1.3165	1.2636	1.2791	1.2440
20	8.3412	1.3289	1.4088	1.3675	1.3014	1.3108	1.2822
21	8.1378	1.3529	1.4362	1.3862	1.3104	1.3149	1.2932
22	7.9344	1.3222	1.4099	1.3561	1.2755	1.2764	1.2623
23	7.7309	1.3319	1.4226	1.3631	1.2758	1.2729	1.2649
24	7.5275	1.3160	1.4056	1.3436	1.2547	1.2504	1.2494
25	7.3240	1.3051	1.3931	1.3279	1.2364	1.2302	1.2353
26	7.1206	1.3519	1.4393	1.3681	1.2659	1.2534	1.2626
27	6.9171	1.3424	1.4251	1.3570	1.2521	1.2363	1.2485
28	6.7137	1.3683	1.4450	1.3771	1.2684	1.2486	1.2614
29	6.5102	1.3176	1.3861	1.3263	1.2240	1.2045	1.2181
30	6.3068	1.3726	1.4337	1.3722	1.2633	1.2364	1.2486
31	6.1034	1.3357	1.3966	1.3370	1.2333	1.2041	1.2122
32	5.8999	1.3253	1.3893	1.3236	1.2247	1.1917	1.2025
33	5.6965	1.2838	1.3492	1.2859	1.1877	1.1588	1.1687
34	5.4930	1.3092	1.3699	1.3091	1.2034	1.1708	1.1827
35	5.2896	1.3482	1.4035	1.3450	1.2328	1.1927	1.2093
36	5.0861	1.3457	1.3946	1.3431	1.2311	1.1919	1.2086
37	4.8827	1.3355	1.3840	1.3342	1.2246	1.1896	1.2033
38	4.6792	1.3331	1.3822	1.3329	1.2252	1.1935	1.2034
39	4.4758	1.3317	1.3817	1.3338	1.2321	1.1999	1.2054
40	4.2723	1.3157	1.3660	1.3217	1.2305	1.1971	1.1985
41	4.0689	1.2697	1.3179	1.2845	1.2046	1.1734	1.1718
42	3.8655	1.2519	1.2958	1.2728	1.2010	1.1703	1.1650
43	3.6620	1.2896	1.3264	1.3105	1.2413	1.2066	1.1954
44	3.4586	1.2972	1.3273	1.3198	1.2564	1.2220	1.2058
45	3.2551	1.2819	1.3026	1.3069	1.2594	1.2296	1.2094
46	3.0517	1.2732	1.2911	1.2992	1.2679	1.2487	1.2210
47	2.8482	1.2750	1.2898	1.3022	1.2789	1.2746	1.2443
48	2.6448	1.2716	1.2786	1.3004	1.2846	1.2977	1.2680
49	2.4413	1.2792	1.2777	1.3080	1.3079	1.3329	1.3031
50	2.2379	1.2579	1.2450	1.2831	1.3022	1.3427	1.3159
51	2.0345	1.2504	1.2247	1.2695	1.3078	1.3655	1.3422
52	1.8310	1.2730	1.2336	1.2843	1.3404	1.4150	1.3943
53	1.6276	1.2575	1.2041	1.2595	1.3350	1.4298	1.4152
54	1.4241	1.2100	1.1429	1.1997	1.2914	1.4052	1.3984
55	1.2207	1.1493	1.0684	1.1233	1.2267	1.3571	1.3593
56	1.0172	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
57	0.8138	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
58	0.6103	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
59	0.4069	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
60	0.2034	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
61	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 4
R_j Margin Decrease Factors for ROS1

Cycle Burnup (MWD/MTU)	R_j	Cycle Burnup (MWD/MTU)	R_j	Cycle Burnup (MWD/MTU)	R_j
≤150	1.0089	7958	1.0266	13671	1.0066
340	1.0111	8148	1.0242	13861	1.0066
531	1.0127	8339	1.0229	14052	1.0065
721	1.0143	8529	1.0215	14242	1.0065
912	1.0234	8720	1.0201	14433	1.0064
1102	1.0324	8910	1.0187	14623	1.0062
1293	1.0412	9101	1.0173	14814	1.0060
1483	1.0484	9291	1.0159	15004	1.0058
1673	1.0532	9481	1.0146	15194	1.0055
1864	1.0555	9672	1.0132	15385	1.0053
2054	1.0558	9862	1.0126	15575	1.0050
2245	1.0533	10053	1.0120	15766	1.0047
2435	1.0437	10243	1.0115	15956	1.0044
2626	1.0336	10434	1.0109	16147	1.0042
2816	1.0241	10624	1.0093	16337	1.0039
3007	1.0170	10814	1.0079	16528	1.0036
3197	1.0117	11005	1.0067	16718	1.0033
3387	1.0079	11195	1.0056	16908	1.0031
3578	1.0052	11386	1.0040	17099	1.0029
3768	1.0033	11576	1.0025	17289	1.0027
3959	1.0020	11767	1.0014	17480	1.0026
4149	1.0009	11957	1.0011	17670	1.0025
4340	1.0000	12147	1.0070	17861	1.0024
4530	1.0002	12338	1.0068	18051	1.0023
4720 ≤ BU ≤ 6815	1.0000	12528	1.0066	18241	1.0022
7006	1.0045	12719	1.0065	18432	1.0021
7196	1.0100	12909	1.0064	18622	1.0020
7387	1.0154	13100	1.0065	BU ≥ 18813	1.0019
7577	1.0209	13290	1.0065		
7767	1.0255	13481	1.0065		

Values may be interpolated to the surveillance cycle burnup.

Table 5
R_j Margin Decrease Factors for ROS2

Cycle Burnup (MWD/MTU)	R_j	Cycle Burnup (MWD/MTU)	R_j
≤150	1.0167	9291	1.0065
340	1.0156	9481	1.0109
531	1.0152	9672	1.0173
721	1.0158	9862	1.0199
912	1.0250	10053	1.0199
1102	1.0347	10243	1.0205
1293	1.0433	10434	1.0212
1483	1.0503	10624	1.0388
1673	1.0548	10814	1.0389
1864	1.0568	11005	1.0388
2054	1.0568	11195	1.0384
2245	1.0546	11386	1.0377
2435	1.0443	11576	1.0364
2626	1.0334	11767	1.0345
2816	1.0231	11957	1.0322
3007	1.0158	12147	1.0129
3197	1.0104	12338	1.0105
3387	1.0066	12528	1.0082
3578	1.0040	12719	1.0062
3768	1.0023	12909	1.0044
3959	1.0012	13100	1.0030
4149	1.0004	13290	1.0018
4340 ≤ BU ≤ 7958	1.0000	13481	1.0010
8148	1.0004	13671	1.0004
8339	1.0035	13861	1.0001
8529	1.0064	BU ≥ 14052	1.0000
8720	1.0092		
8910	1.0088		
9101	1.0054		

Values may be interpolated to the surveillance cycle burnup.

Table 6
Required Thermal Power Limits and AFD Reductions

RAOC Operating Space	Required $F_Q^W(Z)$ Margin Improvement (%)	Required THERMAL POWER Limit (%RTP)	Required AFD Reduction
ROS1	≤ 4.3	≤ 90	See Figure 4 RA-1
	> 4.3	< 50	N/A
ROS2	≤ 3.7	≤ 90	See Figure 4 RA-2
	> 3.7	< 50	N/A