



1717 Wakonade Drive  
Welch, MN 55089

October 26, 2021

L-PI-21-041

TS 5.6.5.d

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

Prairie Island Nuclear Generating Plant, Unit 2  
Docket No. 50-306  
Renewed Facility Operating License No. DPR-60

Core Operating Limits Report (COLR) for Prairie Island Nuclear Generating Plant (PINGP) Unit 2, Cycle 32, Revision 1

References: 1) Core Operating Limits Report (COLR) for Prairie Island Nuclear Generating Plant (PINGP) Unit 2, Cycle 32, Revision 0 (ADAMS Accession No. ML21287A123), dated October 14, 2021

Pursuant to the requirements of Technical Specification 5.6.5.d, Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), hereby submits the COLR for the PINGP Unit 2, Cycle 32, Revision 1.

Revision 0 of the Unit 2, Cycle 32 COLR was submitted per the above reference. This revised Unit 2, Cycle 32 COLR was required to clarify the power factor used in the calculation of Heat Flux Hot Channel Factor.

If you have any questions about this submittal, please contact Carrie Seipp, Senior Regulatory Engineer, at 612-330-5576.

Summary of Commitments

This letter makes no new commitments and no revisions to existing commitments.

Christopher P. Domingos  
Site Vice President, Prairie Island Nuclear Generating Plant  
Northern States Power Company – Minnesota

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Enclosure (1)

cc: Administrator, Region III, USNRC  
Project Manager, Prairie Island, USNRC  
Resident Inspector, Prairie Island, USNRC  
State of Minnesota

**ENCLOSURE 1**

**PRAIRIE ISLAND NUCLEAR GENERATING PLANT  
CORE OPERATING LIMITS REPORT  
UNIT 2 – CYCLE 32  
REVISION 1**

42 pages follow

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

Core Operating Limits Report

Record of Revision

Unit	Cycle	Revision No.	Approval Date	Remarks
2	13	0	3/22/90	Original Unit 2 Core Operating Limits Report, distributed with Technical Specification Revision 92.
1	14	0	3/22/90	Original Unit 1 Core Operating Limits Report, distributed with Technical Specification Revision 92.
		1	7/27/90	Incorporated expanded V(z) curves.
		2	9/27/90	Clarified rod insertion limit curve applicability.
		3	2/11/91	Incorporated revised $F_Q$ of 2.45 as a result of NRC approval of Westinghouse Topical Report WCAP-10924-P-A, Volume 1, Addendum 4, October 1990.
2	14	0	-	Not used.
		1	9/27/90	Updated to Unit 2 Cycle 14, incorporated expanded V(z) curves and clarified rod insertion limit curve applicability.
		2	2/11/91	Incorporated revised $F_Q$ of 2.45 as a result of NRC approval of Westinghouse Topical Report WCAP-10924-P-A, Volume 1, Addendum 4, October 1990.
1	15	0	6/25/91	Updated to Unit 1 Cycle 15.
2	15	0	3/9/92	Updated to Unit 2 Cycle 15 and clarified labeling of Figure 4. Clarified the actions to be taken if the nuclear enthalpy rise hot channel factor exceeds the Technical Specification limit.
1	16	0	12/28/92	Updated to Unit 1 Cycle 16, removed V(z) curves and replaced them with list of bounding V(z) values for three ranges of exposures.
2	16	0	12/8/93	Updated to Unit 2 Cycle 16. Removed the multiple V(z) curves and replaced them with a single figure with bounding V(z) curves for four ranges of exposures. Incorporated additional discussion related to V(z) and K(z).

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Unit	Cycle	Revision No.	Approval Date	Remarks
2	16	1	11/3/94	The table containing the bounding V(z) values and Figure 2 updated to incorporate revised bounding V(z) values for the exposure range of 14-21.5 GWD/MTU. Figures 3 through 6 re-formatted.
1	17	0	6/17/94	Updated to Unit 1 Cycle 17. Removed the list of bounding V(z) values and replaced it with multiple V(z) curves. Incorporated additional discussion related to V(z) and K(z).
2	17	0	6/2/95	Updated to Unit 2 Cycle 17. Incorporated Table 1 and expanded Figure 2 with updated bounding V(z) values.
1	18	0	2/7/96	Updated to Unit 1 Cycle 18. Incorporated revised $F_{\Delta H}$ limit of 1.77. Incorporated Table 1 and updated Figure 2 with revised bounding V(z) values.
2	18	0	2/27/97	Updated to Unit 2 Cycle 18. Revised $F_{\Delta H}$ limit to 1.77. Updated Table 1 and Figures 2a through 2e with revised bounding V(z) values. Incorporated new Figures 2f and 2g with additional bounding V(z) values.
1	19	0	9/25/97	Updated to Unit 1 Cycle 19. Updated Table 1 and Figures 2a through 2f with revised bounding V(z) values.
2	19	0	12/17/98	Updated to Unit 2 Cycle 19. Updated Table 1 and Figures 2a through 2d with revised bounding V(z) values. Deleted Figures 2e, 2f and 2g.
1	20	0	5/13/99	Updated to Unit 1 Cycle 20. Updated Table 1 and Figures 2a through 2f with revised bounding V(z) values.
		1	8/4/00	Technical Specification Amendment 151: Relocate shutdown margin (SDM) requirements from Tech Specs and incorporate additional SDM requirements for Modes 3-6 from revised analysis of Uncontrolled Dilution event.

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Unit	Cycle	Revision No.	Approval Date	Remarks
2	20	0	5/31/00	Updated to Unit 2 Cycle 20. Updated Table 1 and Figures 2a through 2d with revised bounding V(z) values. Added new Table 2 and Figures 2e, 2f and 2g with additional bounding V(z) values. Added references to Tables 1 and 2 and to Figures 2e, 2f and 2g to discussion of heat flux hot channel factor limits. Added discussion clarifying applicability of axial flux difference limits when using Tables 1 and 2 and Figures 2a through 2g. Added discussion of two tier V(z) curve presented in Table 2 and Figure 2g.
		1	8/4/00	Technical Specification Amendment 142: Relocate shutdown margin (SDM) requirements from Tech Specs and incorporate additional SDM requirements for Modes 3-6 from revised analysis of Uncontrolled Dilution event.
1	20	2	9/1/00	Revised to change axial flux difference target band.
1	21	0	1/31/01	Updated to support refueling activities associated with Unit 1 Cycle 21. Revision 0 of the Unit 1 Cycle 21 COLR had to be issued prior to confirming the applicability of the LOCA analysis. Therefore, Revision 0 of the Unit 1 Cycle 21 COLR does not contain all of the operating limits necessary to support operation of Unit 1 Cycle 21.
1	21	1	2/19/01	Updated to Unit 1 Cycle 21. Updated Tables 1 and 2 and Figures 2a through 2f with revised bounding V(z) values.
1	21	2	10/02/02	Revised to support License Amendment 158 changes, including revision of all references to TS, revision of F <sub>Q</sub> symbols, addition of Table 4, ITC limits, DNB limits and refueling boron concentrations.
2	21	0	2/06/02	Updated to Unit 2 Cycle 21.

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Unit	Cycle	Revision No.	Approval Date	Remarks
2	21	1	10/02/02	Revised to support License Amendment 149 changes, including revision of all references to TS, revision of $F_Q$ symbols, addition of Table 4, ITC limits, DNB limits and refueling boron concentrations. Also revised to include an additional $V(z)$ curve to give greater $F_Q$ margin between 13.0 and 16.0 GWd/MTU.
1	22	0	11/25/02	Updated to Unit 1 Cycle 22. Updated Tables 1 and 2 and Figures 2a through 2f with revised bounding $V(z)$ values. Incorporated new Figure 2g with additional bounding $V(z)$ values. Updated Table 3 with revised minimum shutdown margin limits. Deleted and revised text to eliminate duplication with the Technical Specifications and the Bases.
2	22	0	9/19/03	Updated to Unit 2 Cycle 22. Updated Tables 1 and 2. A reduced number of exposure ranges were calculated in Table 1, therefore new Figures 2a through 2e with revised bounding $V(z)$ values replaced Figures 2a through 2f. New Figure 2f replaced Figure 2g for the 2 tier band bounding $V(z)$ values. Updated Table 3 with revised minimum shutdown margin limits. Deleted and revised text to eliminate duplication with the Technical Specifications and the Bases.
1	22	1	7/6/04	Revision to incorporate Westinghouse Safety Analysis Transition per LA 162/153. Revision 1 contains transitional values for the OP/OT $\Delta T$ Trip setpoints that will be used while the physical changes are implemented.
2	22	1	7/6/04	Revision to incorporate Westinghouse Safety Analysis transition per LA 162/153. Revision 1 contains transitional values for the OP/OT $\Delta T$ Trip setpoints that will be used while the physical changes are implemented.
2	22	2	7/12/04	Revised $F_Q$ limit from 2.4 to 2.5. Removed OP and OT delta-T setpoints based on NMC methodology and replaced with Westinghouse developed setpoints.

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Record of Revision

Unit	Cycle	Revision No.	Approval Date	Remarks
1	22	2	7/16/04	Revised Fq limit from 2.4 to 2.5. Removed OP and OT delta-T setpoints based on NMC methodology and replaced with Westinghouse developed setpoints.
1	23	0	10/20/04	Updated to Unit 1 Cycle 23.
2	23	0	-	Not used due to core redesign.
2	23	1	5/19/05	Updated to Unit 2 Cycle 23 and to support redesign of Unit 2 Cycle 23 core.
1	23	1	7/11/05	Revised ITC upper limit from $< 0$ pcm/°F for power levels $> 70\%$ RTP to less than a line that slopes linearly from 0 pcm/°F at 70% RTP to -2.9 pcm/°F at 100% RTP. Revised the title of Figure 3 to reference T.S. 3.1.4 Condition B and revised the title of Figure 4 to reference T.S. 3.1.4 Condition A. Added references 24 and 25 to include the 50.59 screenings written to issue revision 1.
1	24	0	5/10/06	Updated to Unit 1 Cycle 24.
1	24	1	8/7/06	Updated Table 3 to reflect the correct $F_q^w(z)$ penalty factors.
2	24	0	11/26/06	Updated to Unit 2 Cycle 24 Modes 5 and 6.
2	24	1	12/6/06	Updated to Unit 2 Cycle 24 for Modes 1-6.
2	24	2	9/4/07	Revised to support LA-179/169. Revised reference 24 to include the revision number (revision 0) and the correct date of the report (January 2005). Revised references 6a, 6b, 6c, and 8 to say 'Deleted.' These references referred to the old LBLOCA methodology and model.
1	24	2	2/11/08	Updated Table 1 to reflect correct Shutdown Margin Requirements and added Figures 6A through 6H.



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Unit	Cycle	Revision No.	Approval Date	Remarks
2	24	3	2/11/08	Updated Table 1 to reflect correct Shutdown Margin Requirements and added Figures 6A through 6H.
1	25	0	2/24/08	Updated to Unit 1 Cycle 25
1	25	1	5/28/08	Updated Table 2 to reflect the correct W(z) at a burnup of 150 MWd/MTU and a core height of 6.20 feet
2	25	0	9/26/08	Updated for Unit 2 Cycle 25
1	26	0	9/24/09	Updated for Unit 1 Cycle 26
2	26	0	5/3/10	Updated for Unit 2 Cycle 26
2	26	1	5/17/10	Updated to include part power W(z) factors
1	26	1	9/2/10	Updated for second set of W(z) factors
2	26	2	9/30/10	Updated for Measurement Uncertainty Recapture power uprate to 1677 MWth and for a second set of W(z) factors
1	26	2	9/30/10	Updated for Measurement Uncertainty Recapture power uprate to 1677 MWth
1	26	3	12/17/10	Updated SDM in Table 1 for Mode 2 to say 1.9.
1	27	0	5/5/11	Updated for Unit 1 Cycle 27
1	27	1	6/2/11	Updated for Unit 1 Cycle 27 Modes 1 through 6
2	27	0	3/28/12	Updated for Unit 2 Cycle 27
1	28	0	11/29/12	Updated for Unit 1 Cycle 28

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Unit	Cycle	Revision No.	Approval Date	Remarks
2	28	0	11/23/13	Updated for Unit 2 Cycle 28
1	29	0	10/23/14	Updated for Unit 1 Cycle 29
2	29	0	11/05/15	Updated for Unit 2 Cycle 29
1	30	0	10/25/16	Updated for Unit 1 Cycle 30
2	30	0	10/24/17	Updated for Unit 2 Cycle 30
1	31	0	09/06/18	Updated for Unit 1 Cycle 31
2	31	0	10/14/19	Updated for Unit 2 Cycle 31
2	31	1	09/14/20	Updated to revise Table 2 and Table 3 due to Flexible Power Operation
1	32	0	09/21/20	Updated for Unit 1 Cycle 32
2	32	0	10/11/21	Updated for Unit 2 Cycle 32
2	32	1	10/25/21	Updated to clarify power value used in calculation of $F_Q^W(Z)$

**PRAIRIE ISLAND NUCLEAR GENERATING PLANT**

**CORE OPERATING LIMITS REPORT**

**UNIT 2 - CYCLE 32**

**REVISION 1**

Reviewed By: *Reviewed per LDC 604000000711*

Darius Ahrar

Manager, Nuclear Analysis & Design

Approved By: *Reviewed per LDC 604000000711*

Mark Brossart

Manager, Engineering

Note: This report is not part of the Technical Specifications

This report is referenced in the Technical Specifications

**PRAIRIE ISLAND NUCLEAR GENERATING PLANT**  
**CORE OPERATING LIMITS REPORT**  
**UNIT 2 – CYCLE 32**  
**REVISION 1**

This report provides the values of the limits for Unit 2 Cycle 32 as required by Technical Specification 5.6.5. These values have been established using NRC approved methodology and are established such that all applicable limits of the plant safety analysis are met. The Technical Specifications affected by this report are listed below:

1. 2.1.1 Reactor Core Safety Limits
2. 3.1.1 Shutdown Margin Requirements
3. 3.1.3 Isothermal Temperature Coefficient (ITC)
4. 3.1.5 Shutdown Bank Insertion Limits
5. 3.1.6 Control Bank Insertion Limits
6. 3.1.8 Physics Tests Exceptions - MODE 2
7. 3.2.1 Heat Flux Hot Channel Factor ( $F_Q(z)$ )
8. 3.2.2 Nuclear Enthalpy Rise Hot Channel Factor ( $F_{\Delta H}^N$ )
9. 3.2.3 Axial Flux Difference (AFD)
10. 3.3.1 Reactor Trip System (RTS) Instrumentation  
Overtemperature  $\Delta T$  and Overpower  $\Delta T$  Parameter Values for Technical Specification Table 3.3.1-1 (Note 1 and Note 2)
11. 3.4.1 RCS Pressure, Temperature, and Flow - Departure from Nucleate Boiling (DNB) Limits
12. 3.9.1 Refueling Boron Concentration

1. 2.1.1 Reactor Core Safety Limits

Reactor Core Safety Limits are shown in Figure 1.

Reference Technical Specification 2.1.1.

2. 3.1.1 Shutdown Margin Requirements

Minimum Shutdown Margin requirements are shown in Table 1.

Reference Technical Specification 3.1.1.

3. 3.1.3 Isothermal Temperature Coefficient (ITC)

ITC Upper limit:

- a.  $< 5$  pcm/°F for power levels  $< 70\%$  RTP; and
- b. a line which slopes linearly from
  - i.  $0$  pcm/°F at a power level =  $70\%$  RTP to
  - ii.  $-1.5$  pcm/°F at a power level =  $100\%$  RTP

ITC Lower limit:

- a.  $-43.15$  pcm/°F

Reference Technical Specification 3.1.3.

4. 3.1.5 Shutdown Bank Insertion Limits

The shutdown rods shall be fully withdrawn.

Reference Technical Specification 3.1.5.

5. 3.1.6 Control Bank Insertion Limits

The control rod banks shall be limited in physical insertion as shown in Figures 2, 3, and 4.

The control rod banks withdrawal sequence shall be Bank A, Bank B, Bank C, and finally Bank D.

The control rod banks shall be withdrawn maintaining 128 step tip-to-tip distance.

Reference Technical Specification 3.1.6.

6. 3.1.8 Physics Tests Exceptions - MODE 2

Minimum Shutdown Margin requirements during physics testing are shown in Table 1.

Reference Technical Specification 3.1.8.

7. 3.2.1 Heat Flux Hot Channel Factor ( $F_Q(Z)$ )

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

$$F_Q^W(z) \leq \frac{CFQ}{P} * K(z) \text{ for } P > 0.5$$

$$F_Q^W(z) \leq \frac{CFQ}{0.5} * K(z) \text{ for } P \leq 0.5$$

$$F_Q^W(z) = [F_{XY}(z)]_{Surv}^M * \frac{[T(z)]^{COLR}}{P} * A_{XY}(z) * [R_j]^{COLR} * 1.0815$$

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

P is the ratio of thermal power at the time of surveillance to rated thermal power.

The 'P' in the  $[\frac{T(z)^{COLR}}{P}]$  term is the ratio of thermal power at the time of the surveillance to rated thermal power, if the thermal power at the time of the surveillance is greater than 50%.

The 'P' in the  $[\frac{T(z)^{COLR}}{P}]$  term is 0.5, if the thermal power at the time of the surveillance is less than or equal to 50%.

$$CFQ = 2.50$$

K(Z) is a constant value = 1.0 at all elevations.

The T(Z) values are provided in Tables 2, 4, 7, and 9.

The T(Z) values in Tables 2 and 7 are applicable to Figure 5 which represents "RAOC Operation Space #1 (ROS1).

The T(Z) values in Tables 4 and 9 are applicable to Figure 6, which represents "RAOC Operating Space #2 (ROS2).

The R<sub>j</sub> Penalty Factors associated with Figure 5 and Table 2 (ROS1) are provided in Table 3.

The R<sub>j</sub> Penalty Factors associated with Figure 6 and Table 4 (ROS2) are provided in Table 5.

The R<sub>j</sub> Penalty Factors associated with Figure 5 and Table 7 (ROS1) are provided in Table 8.

The  $R_j$  Penalty Factors associated with Figure 6 and Table 9 (ROS2) are provided in Table 10.

The  $A_{XY}(Z)$  factors adjust the surveillance to the reference conditions in generating the  $T(z)$  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 5.6.5.

The  $T(Z)$  values in Tables 7 and 9, the  $R_j$  Penalty Factors in Tables 8 and 10, and the Margin Improvement values in Table 11 are to be used upon exceeding the 250 MWd/MTU reduced power burnup criterion for Flexible Power Operation (FPO), but may be used for the entire cycle. For ROS1, the Table 7  $T(z)$  values replace those in Table 2, and the Table 8  $R_j$  Penalty Factors replace those in Table 3. For ROS 2, the Table 9  $T(z)$  values replace those in Table 4, and the Table 10  $R_j$  Penalty Factors replace those in Table 5. Table 11, if used, replaces Table 6.

Either ROS1 or ROS2 may be implemented at any time during Cycle 32

If ROS1 is implemented and entering LCO 3.2.1 Condition B for  $F^W_Q(Z)$  not within limits, EITHER take Action B.1.1 by implementing ROS2, OR take Action B.2.1 by using Table 6 or 11 to determine required THERMAL POWER and AFD limits based on Required  $F^W_Q(Z)$  margin improvement available in ROS1.

If ROS2 is implemented and entering LCO 3.2.1 Condition B for  $F^W_Q(Z)$  not within limits, take Action B.2.1 by using Table 6 or 11 to determine required THERMAL POWER and AFD limits based on Required  $F^W_Q(Z)$  margin improvement available in ROS2.

Reference Technical Specification 3.2.1.

8. 3.2.2 Nuclear Enthalpy Rise Hot Channel Factor ( $F_{\Delta H}^N$ )

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

$$F_{\Delta H} \leq 1.77 \times [1 + 0.3(1 - P)]$$

where: P is the fraction of RATED THERMAL POWER at which the core is operating.

Reference Technical Specification 3.2.2.

9. 3.2.3 Axial Flux Difference (AFD)

The indicated axial flux difference shall be maintained within the allowed operational space defined by either Figure 5, if ROS1 is implemented, or Figure 6 if ROS2 is implemented. If implementing TS 3.2.1 Required Action B.2.1, the AFD shall be maintained within the allowed space defined by Figure 7 or 8, as determined by Table 6 or 11 and the condition that led to the required action.

Reference Technical Specification 3.2.3.

10. 3.3.1 Reactor Trip System (RTS) Instrumentation

Overtemperature  $\Delta T$  and Overpower  $\Delta T$  Parameter Values for Technical Specification Table 3.3.1-1 (Note 1 and Note 2):

Overtemperature  $\Delta T$  Setpoint

Overtemperature  $\Delta T$  setpoint parameter values:

$\Delta T_0$	=	Indicated $\Delta T$ at RATED THERMAL POWER, %
T	=	Average temperature, °F
T'	=	560.0 °F
P	=	Pressurizer Pressure, psig
P'	=	2235 psig
$K_1$	$\leq$	1.17
$K_2$	=	0.014 /°F
$K_3$	=	0.00100 /psi
$\tau_1$	=	30 seconds
$\tau_2$	=	4 seconds
f( $\Delta I$ )	=	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 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 RATED THERMAL POWER, such that
	(a)	For $q_t - q_b$ within $-13, +8$ % f( $\Delta I$ ) = 0
	(b)	For each percent that the magnitude of $q_t - q_b$ exceeds $+8$ %



the  $\Delta T$  trip setpoint shall be automatically reduced by an equivalent of 1.73 % of RATED THERMAL POWER.

- (c) For each percent that the magnitude of  $q_t - q_b$  exceeds -13 % the  $\Delta T$  trip setpoint shall be automatically reduced by an equivalent of 3.846 % of RATED THERMAL POWER.

### Overpower $\Delta T$ Setpoint

Overpower  $\Delta T$  setpoint parameter values:

$\Delta T_0$	=	Indicated $\Delta T$ at RATED THERMAL POWER, %
T	=	Average temperature, °F
T'	=	560.0 °F
K <sub>4</sub>	≤	1.11
K <sub>5</sub>	=	0.0275/°F for increasing T; 0 for decreasing T
K <sub>6</sub>	=	0.002/°F for T > T' ; 0 for T ≤ T'
$\tau_3$	=	10 seconds

Reference Technical Specification 3.3.1.

#### 11. 3.4.1 RCS Pressure, Temperature, and Flow - Departure from Nucleate Boiling (DNB) Limits

The DNB Limits are:

Pressurizer pressure limit = 2190 psia

RCS average temperature limit = 564°F

RCS total flow rate limit = 178,000 gpm

Reference Technical Specification 3.4.1.

#### 12. 3.9.1 Refueling Boron Concentration.

The boron concentration of the reactor coolant system and the refueling cavity shall be sufficient to ensure that the more restrictive of the following conditions is met:

- $K_{\text{eff}} \leq 0.95$
- 2000 ppm
- The Shutdown Margin specified in Table 1

Reference Technical Specification 3.9.1.

**REFERENCES**  
**(NRC Approved Methodologies for COLR Parameters)**

1. NSPNAD-8101-A, "Qualification of Reactor Physics Methods for Application to Prairie Island," Revision 2, October 2000.
2. NSPNAD-8102-PA, "Prairie Island Nuclear Power Plant Reload Safety Evaluation Methods for Application to PI Units," Revision 7, July 1999.
3. NSPNAD-97002-PA, "Northern States Power Company's "Steam Line Break Methodology,"" Revision 1, October 2000.
4. WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July, 1985.
- 5.a WCAP-10054-P-A, "Westinghouse Small Break ECCS Evaluation Model using the NOTRUMP Code," August, 1985.
- 5.b WCAP-10054-P-A, "Westinghouse Small Break ECCS Evaluation Model using the NOTRUMP Code," Addendum 2 Revision 1, July 1997.
6. WCAP-16045-P-A Addendum 1-A, "Qualification of the NEXUS Nuclear Data Methodology," August 2007.
7. WCAP-10924-P-A, Volume 1, Revision 1, and Volume 2, Revision 2, "Westinghouse Large Break LOCA Best Estimate Methodology," September 2005.
8. XN-NF-77-57-(A), XN-NF-77-57, Supplement 1 (A), "Exxon Nuclear Power Distribution Control for Pressurized Water Reactors Phase II," May 1981.
9. WCAP-13677-P-A, "10 CFR 50.46 Evaluation Model Report: W-COBRA/TRAC 2-Loop Upper Plenum Injection Model Update to Support ZIRLO™ Cladding Options," February 1994.
10. NSPNAD-93003-A, "Prairie Island Units 1 and 2 Transient Power Distribution Methodology," Revision 0, April 1993.
11. NAD-PI-003, "Prairie Island Nuclear Power Plant Required Shutdown Margin During Physics Tests," Revision 0, January 2001.
12. NAD-PI-004, "Prairie Island Nuclear Power Plant  $F_{Q(Z)}^W$  Penalty With Increasing  $[F_{Q(Z)}^C / K(Z)]$  Trend," Revision 0, January 2001.
13. WCAP-10216-P-A, Revision 1A, "Relaxation of Constant Axial Offset Control/ FQ Surveillance Technical Specification," February 1994.

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14. WCAP-8745-P-A, "Design Bases for the Thermal Overpower  $\Delta T$  and Thermal Overtemperature  $\Delta T$  Trip Functions," September 1986.
15. WCAP-11397-P-A, "Revised Thermal Design Procedure," April 1989.
16. WCAP-14483-A, "Generic Methodology for Expanded Core Operating Limits Report," January 1999.
17. WCAP-7588 Rev. 1-A, "An Evaluation of the Rod Ejection Accident in Westinghouse Pressurized Water Reactors Using Spatial Kinetics Methods," January 1975.
18. WCAP-7908-A, "FACTRAN – A FORTRAN IV Code for Thermal Transients in a UO<sub>2</sub> Fuel Rod," December 1989.
19. WCAP-7907-P-A, "LOFTRAN Code Description," April 1984.
20. WCAP-7979-P-A, "TWINKLE – A Multidimensional Neutron Kinetics Computer Code," January 1975.
21. WCAP-10965-P-A, "ANC: A Westinghouse Advanced Nodal Computer Code," September 1986.
22. WCAP-11394-P-A, "Methodology for the Analysis of the Dropped Rod Event," January 1990.
23. WCAP-16045-P-A, "Qualification of the Two-Dimensional Transport Code PARAGON," August 2004.
24. WCAP-12910 Rev. 1-A, "Pressurizer Safety Valve Set Pressure Shift," May 1993.
25. WCAP-14565-P-A, "VIPRE-01 Modeling and Qualification for Pressurized Water Reactor Non-LOCA Thermal-Hydraulic Safety Analysis," October 1999.
26. WCAP-14882-P-A, "RETRAN-02 Modeling and Qualification for Westinghouse Pressurized Water Reactor Non-LOCA Safety Analyses," April 1999.
27. WCAP-16009-P-A, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment Of Uncertainty Method (ASTRUM)," Revision 0, January 2005.
28. Caldon, Inc. Engineering Report-80P, "Improving Thermal Power Accuracy and Plant Safety While Increasing Operating Power Level Using the LEFM  $\sqrt{TM}$  System," Revision 0, March 1997.
29. Caldon, Inc. Engineering Report-157P, "Supplement to Topical Report ER-80P: Basis for a Power Uprate With the LEFM  $\sqrt{TM}$  Check or CheckPlus<sup>TM</sup> System," Revision 5, October 2001.
30. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," April 1995.

31. WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, “**Optimized ZIRLO™**,” July 2006.
32. Design Equivalent Change EC 601000002799 Rev.0 “2R32 Core Reload”
33. AD 8127, “Revision to Unit 2 Cycle 32 COLR”
34. WCAP-17661-P-A, “Improved RAOC and CAOC FQ Surveillance Technical Specifications”, February 2019.

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**Table 1****Minimum Required Shutdown Margin, % $\Delta\rho$** 

<b>Number of Charging Pumps Running**</b>			
<b>Mode 1*</b>			
	<b>0-1 Pump</b>	<b>2 Pumps</b>	<b>3 Pumps</b>
<b>0 - 25000 MWd/MTU</b>	-	-	-

<b>Mode 2*</b>			
	<b>0-1 Pump</b>	<b>2 Pumps</b>	<b>3 Pumps</b>
<b>0 - 25000 MWd/MTU</b>	1.7	1.7	1.7

<b>Physics Testing in Mode 2</b>			
	<b>0-1 Pump</b>	<b>2 Pumps</b>	<b>3 Pumps</b>
<b>0 - 25000 MWd/MTU</b>	0.5	0.5	0.5

<b>Mode 3</b>	<b>T<sub>ave</sub> ≥ 520°F (Most Reactive Rod Out)</b>		
	<b>0-1 Pump</b>	<b>2 Pumps</b>	<b>3 Pumps</b>
<b>0 - 25000 MWd/MTU</b>	2.0	2.0	2.0

<b>Mode 3</b>	<b>350°F ≤ T<sub>ave</sub> &lt; 520°F (Most Reactive Rod Out)</b>		
	<b>0-1 Pump</b>	<b>2 Pumps</b>	<b>3 Pumps</b>
<b>0 MWd/MTU</b>	2.0	2.0	2.0
<b>4000 MWd/MTU</b>	2.0	2.0	2.0
<b>7000 MWd/MTU</b>	2.0	2.0	2.0
<b>11000 MWd/MTU</b>	2.0	2.0	2.0
<b>16000 MWd/MTU</b>	2.0	2.0	2.0
<b>25000 MWd/MTU</b>	2.0	2.0	2.0

Operational Mode Definitions, as per TS Table 1.1-1.

\* For Mode 1 and Mode 2 with  $K_{eff} \geq 1.0$ , the minimum shutdown margin requirements are provided by the Rod Insertion Limits.

\*\* Charging pump(s) in service only pertains to steady state operations. It does not include transitory operations. For example, operations such as starting a second charging pump in order to secure the operating pump would fall under the one pump in service column.

Note: Linear interpolation between burnup steps is allowed. Extrapolation is not allowed.

Table 1, Continued

Minimum Required Shutdown Margin,  $\% \Delta \rho$ 

Number of Charging Pumps Running**			
Mode 4	200°F < T <sub>ave</sub> < 350°F (Most Reactive Rod Out)		
	0-1 Pump	2 Pumps	3 Pumps
0 MWd/MTU	2.0	3.5	5.5
4000 MWd/MTU	2.0	3.5	5.5
7000 MWd/MTU	2.0	3.5	5.5
11000 MWd/MTU	2.0	3.5	5.5
16000 MWd/MTU	2.0	3.0	5.0
25000 MWd/MTU	2.0	2.0	2.5

Number of Charging Pumps Running**			
Mode 5	68°F ≤ T <sub>ave</sub> ≤ 200°F (Most Reactive Rod Out)		
	0-1 Pump	2 Pumps	3 Pumps
0 MWd/MTU***	2.0	4.0	6.5
4000 MWd/MTU	2.0	4.0	6.5
7000 MWd/MTU	2.0	4.0	6.5
11000 MWd/MTU	2.0	4.0	6.0
16000 MWd/MTU	2.0	3.5	5.5
25000 MWd/MTU	2.0	2.0	3.0

Operational Mode Definitions, as per TS Table 1.1-1.

\*\* Charging pump(s) in service only pertains to steady state operations. It does not include transitory operations. For example, operations such as starting a second charging pump in order to secure the operating pump would fall under the one pump in service column.

\*\*\* These values are also applicable for the Unit 2 Cycle 31 end of cycle.

Note: Linear interpolation between burnup steps is allowed. Extrapolation is not allowed.

Table 1, Continued

Minimum Required Shutdown Margin, % $\Delta\rho$ 

Number of Charging Pumps Running**			
Mode 6	68°F ≤ T <sub>ave</sub> < 200°F (ARI)		
	0-1 Pump	2 Pumps	3 Pumps
0 MWd/MTU***	5.129	5.129	6.0
4000 MWd/MTU	5.129	5.129	6.0
7000 MWd/MTU	5.129	5.129	6.0
11000 MWd/MTU	5.129	5.129	6.0
16000 MWd/MTU	5.129	5.129	5.5
25000 MWd/MTU	5.129	5.129	5.129

Mode 6	68°F ≤ T <sub>ave</sub> < 200°F (ARO)		
	0-1 Pump	2 Pumps	3 Pumps
0 MWd/MTU***	5.129	5.129	8.0
4000 MWd/MTU	5.129	5.5	8.5
7000 MWd/MTU	5.129	5.5	8.5
11000 MWd/MTU	5.129	5.129	8.0
16000 MWd/MTU	5.129	5.129	7.5
25000 MWd/MTU	5.129	5.129	5.129

\*\* Charging pump(s) in service only pertains to steady state operations. It does not include transitory operations. For example, operations such as starting a second charging pump in order to secure the operating pump would fall under the one pump in service column.

\*\*\* These values are also applicable for the Unit 2 Cycle 31 end of cycle.

Note: Linear interpolation between burnup steps is allowed. Extrapolation is not allowed.

**Table 2: Baseload Only T(z) Factors associated with Figure 5 (ROS1)  
(Top 10% and Bottom 8% excluded)\***

	Height	BU [Mwd/MTU]									
	[ft]	150	1000	2000	3000	4000	6000	6500	7000	8000	8500
[BOTTOM] 1	0.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	0.40	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	0.60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	0.80	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.00	1.0821	1.0602	1.0413	1.0310	1.0293	1.0383	1.0386	1.0403	1.0664	1.0785
7	1.20	1.1248	1.1074	1.0933	1.0858	1.0864	1.0988	1.0995	1.1016	1.1294	1.1420
8	1.40	1.1550	1.1419	1.1324	1.1269	1.1290	1.1426	1.1434	1.1453	1.1731	1.1852
9	1.60	1.1849	1.1757	1.1705	1.1664	1.1695	1.1833	1.1840	1.1855	1.2124	1.2238
10	1.80	1.1957	1.1895	1.1883	1.1852	1.1893	1.2029	1.2033	1.2044	1.2301	1.2402
11	2.00	1.1670	1.1626	1.1651	1.1630	1.1680	1.1813	1.1816	1.1824	1.2060	1.2149
12	2.20	1.1342	1.1348	1.1409	1.1403	1.1446	1.1571	1.1588	1.1583	1.1748	1.1824
13	2.40	1.1667	1.1659	1.1734	1.1768	1.1788	1.1899	1.1909	1.1904	1.2070	1.2097
14	2.60	1.2167	1.2186	1.2257	1.2336	1.2359	1.2429	1.2425	1.2414	1.2554	1.2515
15	2.80	1.2349	1.2398	1.2466	1.2582	1.2625	1.2644	1.2631	1.2612	1.2722	1.2696
16	3.00	1.2276	1.2353	1.2426	1.2566	1.2618	1.2607	1.2591	1.2568	1.2650	1.2669
17	3.20	1.2232	1.2329	1.2413	1.2547	1.2597	1.2571	1.2565	1.2536	1.2602	1.2601
18	3.40	1.2285	1.2405	1.2490	1.2588	1.2635	1.2601	1.2601	1.2567	1.2616	1.2605
19	3.60	1.2420	1.2564	1.2660	1.2729	1.2761	1.2720	1.2694	1.2646	1.2687	1.2660
20	3.80	1.2571	1.2734	1.2846	1.2909	1.2929	1.2882	1.2831	1.2769	1.2797	1.2734
21	4.00	1.2514	1.2691	1.2816	1.2883	1.2902	1.2834	1.2783	1.2717	1.2724	1.2615
22	4.20	1.2093	1.2280	1.2415	1.2483	1.2503	1.2432	1.2380	1.2314	1.2316	1.2171
23	4.40	1.1691	1.1889	1.2032	1.2103	1.2124	1.2048	1.1998	1.1932	1.1925	1.1782
24	4.60	1.1990	1.2201	1.2354	1.2423	1.2437	1.2338	1.2282	1.2207	1.2183	1.2052
25	4.80	1.2456	1.2681	1.2841	1.2906	1.2911	1.2784	1.2719	1.2647	1.2595	1.2477
26	5.00	1.2597	1.2826	1.2991	1.3056	1.3056	1.2913	1.2852	1.2794	1.2708	1.2610
27	5.20	1.2497	1.2715	1.2883	1.2947	1.2946	1.2805	1.2757	1.2708	1.2592	1.2513
28	5.40	1.2435	1.2644	1.2809	1.2869	1.2867	1.2734	1.2696	1.2637	1.2512	1.2437
29	5.60	1.2467	1.2679	1.2848	1.2907	1.2904	1.2760	1.2722	1.2652	1.2531	1.2455
30	5.80	1.2577	1.2791	1.2969	1.3027	1.3023	1.2868	1.2831	1.2753	1.2628	1.2550
31	6.00	1.2721	1.2943	1.3135	1.3190	1.3186	1.3010	1.2976	1.2898	1.2757	1.2678
32	6.20	1.2650	1.2888	1.3086	1.3141	1.3138	1.2946	1.2915	1.2843	1.2688	1.2614
33	6.40	1.2217	1.2470	1.2663	1.2721	1.2725	1.2536	1.2513	1.2452	1.2297	1.2229
34	6.61	1.1823	1.2086	1.2276	1.2334	1.2345	1.2164	1.2145	1.2094	1.1992	1.1888
35	6.81	1.2157	1.2442	1.2611	1.2666	1.2676	1.2516	1.2460	1.2412	1.2311	1.2227
36	7.01	1.2644	1.2951	1.3112	1.3162	1.3169	1.3013	1.2929	1.2884	1.2789	1.2704
37	7.21	1.2793	1.3116	1.3274	1.3319	1.3329	1.3187	1.3082	1.3044	1.2963	1.2882
38	7.41	1.2684	1.3010	1.3161	1.3205	1.3220	1.3104	1.2990	1.2962	1.2896	1.2824
39	7.61	1.2593	1.2898	1.3041	1.3083	1.3101	1.3012	1.2912	1.2896	1.2818	1.2758
40	7.81	1.2592	1.2867	1.2991	1.3031	1.3050	1.2999	1.2917	1.2913	1.2817	1.2763
41	8.01	1.2657	1.2895	1.3015	1.3051	1.3072	1.3040	1.2981	1.2986	1.2883	1.2855
42	8.21	1.2733	1.2923	1.3030	1.3061	1.3084	1.3075	1.3050	1.3071	1.2986	1.2975
43	8.41	1.2588	1.2720	1.2812	1.2841	1.2866	1.2893	1.2906	1.2943	1.2885	1.2878
44	8.61	1.2091	1.2180	1.2254	1.2283	1.2314	1.2393	1.2428	1.2475	1.2439	1.2442
45	8.81	1.1643	1.1718	1.1782	1.1809	1.1845	1.1944	1.1990	1.2048	1.2036	1.2048
46	9.01	1.1957	1.2004	1.2073	1.2090	1.2120	1.2197	1.2247	1.2317	1.2332	1.2347
47	9.21	1.2429	1.2443	1.2518	1.2526	1.2552	1.2605	1.2632	1.2709	1.2741	1.2760
48	9.41	1.2559	1.2538	1.2616	1.2618	1.2644	1.2682	1.2663	1.2753	1.2814	1.2838
49	9.61	1.2406	1.2348	1.2428	1.2425	1.2450	1.2473	1.2459	1.2536	1.2618	1.2648
50	9.81	1.2228	1.2131	1.2208	1.2198	1.2221	1.2237	1.2292	1.2298	1.2394	1.2428
51	10.01	1.2120	1.1985	1.2055	1.2029	1.2044	1.2086	1.2164	1.2088	1.2247	1.2287
52	10.21	1.2055	1.1878	1.1936	1.1884	1.1890	1.1979	1.2061	1.1955	1.2132	1.2176
53	10.41	1.1951	1.1719	1.1795	1.1697	1.1690	1.1808	1.1891	1.1797	1.1931	1.1978
54	10.61	1.1557	1.1295	1.1374	1.1241	1.1228	1.1343	1.1423	1.1391	1.1456	1.1505
55	10.81	1.0780	1.0529	1.0524	1.0399	1.0381	1.0458	1.0534	1.0550	1.0602	1.0649
56	11.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
57	11.21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
58	11.41	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
59	11.61	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	11.81	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
[TOP] 61	12.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

\*Linear extrapolation based on a line between 20,000 MWD/MTU and 22,000 MWD/MTU is adequate for addressing burnups beyond 22,000 MWD/MTU.



**Table 2 (cont.): Baseload Only T(z) Factors associated with Figure 5 (ROS1)  
(Top 10% and Bottom 8% excluded)\***

	Height	BU [Mwd/MTU]									
	[ft]	10000	11000	12000	13000	14000	15000	16000	17000	20000	22000
[BOTTOM] 1	0.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	0.40	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	0.60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	0.80	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.00	1.1051	1.1430	1.1473	1.1809	1.2081	1.2166	1.2354	1.2401	1.2569	1.2984
7	1.20	1.1692	1.2074	1.2103	1.2433	1.2688	1.2744	1.2906	1.2921	1.3002	1.3367
8	1.40	1.2103	1.2466	1.2469	1.2771	1.2992	1.3012	1.3137	1.3119	1.3111	1.3418
9	1.60	1.2457	1.2796	1.2768	1.3038	1.3221	1.3204	1.3295	1.3247	1.3162	1.3415
10	1.80	1.2593	1.2900	1.2847	1.3086	1.3234	1.3189	1.3254	1.3186	1.3048	1.3259
11	2.00	1.2310	1.2581	1.2512	1.2720	1.2839	1.2780	1.2831	1.2756	1.2600	1.2781
12	2.20	1.1952	1.2186	1.2102	1.2279	1.2369	1.2299	1.2339	1.2261	1.2100	1.2258
13	2.40	1.2181	1.2378	1.2263	1.2406	1.2460	1.2368	1.2391	1.2301	1.2114	1.2240
14	2.60	1.2551	1.2708	1.2559	1.2672	1.2689	1.2575	1.2587	1.2491	1.2276	1.2364
15	2.80	1.2625	1.2754	1.2587	1.2663	1.2657	1.2529	1.2520	1.2426	1.2206	1.2265
16	3.00	1.2489	1.2594	1.2419	1.2458	1.2436	1.2305	1.2275	1.2184	1.1980	1.2012
17	3.20	1.2400	1.2467	1.2278	1.2297	1.2249	1.2118	1.2096	1.2014	1.1835	1.1832
18	3.40	1.2380	1.2401	1.2200	1.2210	1.2129	1.1996	1.1983	1.1919	1.1768	1.1761
19	3.60	1.2434	1.2405	1.2199	1.2204	1.2108	1.1984	1.1940	1.1910	1.1767	1.1785
20	3.80	1.2529	1.2447	1.2238	1.2233	1.2078	1.1990	1.1916	1.1920	1.1803	1.1836
21	4.00	1.2442	1.2336	1.2126	1.2110	1.1973	1.1859	1.1760	1.1807	1.1723	1.1756
22	4.20	1.2043	1.1919	1.1725	1.1706	1.1568	1.1469	1.1385	1.1443	1.1402	1.1445
23	4.40	1.1663	1.1522	1.1363	1.1322	1.1183	1.1098	1.1063	1.1098	1.1096	1.1149
24	4.60	1.1896	1.1739	1.1578	1.1501	1.1362	1.1276	1.1259	1.1264	1.1276	1.1336
25	4.80	1.2277	1.2103	1.1933	1.1816	1.1674	1.1587	1.1580	1.1554	1.1573	1.1638
26	5.00	1.2378	1.2198	1.2030	1.1882	1.1762	1.1664	1.1674	1.1623	1.1653	1.1727
27	5.20	1.2266	1.2082	1.1926	1.1755	1.1670	1.1552	1.1577	1.1520	1.1554	1.1641
28	5.40	1.2183	1.1987	1.1838	1.1657	1.1578	1.1449	1.1481	1.1433	1.1453	1.1548
29	5.60	1.2187	1.1993	1.1835	1.1657	1.1569	1.1447	1.1467	1.1424	1.1427	1.1515
30	5.80	1.2267	1.2079	1.1925	1.1746	1.1633	1.1531	1.1516	1.1481	1.1462	1.1559
31	6.00	1.2395	1.2202	1.2061	1.1897	1.1744	1.1676	1.1617	1.1597	1.1602	1.1701
32	6.20	1.2351	1.2147	1.2022	1.1899	1.1719	1.1673	1.1590	1.1597	1.1658	1.1747
33	6.40	1.2009	1.1807	1.1708	1.1623	1.1446	1.1413	1.1327	1.1364	1.1458	1.1544
34	6.61	1.1740	1.1537	1.1464	1.1395	1.1225	1.1225	1.1158	1.1201	1.1298	1.1378
35	6.81	1.2050	1.1828	1.1761	1.1697	1.1558	1.1562	1.1478	1.1519	1.1599	1.1661
36	7.01	1.2509	1.2264	1.2238	1.2134	1.2035	1.2035	1.1926	1.1964	1.2020	1.2059
37	7.21	1.2682	1.2467	1.2467	1.2317	1.2257	1.2260	1.2133	1.2170	1.2209	1.2231
38	7.41	1.2653	1.2485	1.2484	1.2301	1.2277	1.2287	1.2147	1.2186	1.2212	1.2218
39	7.61	1.2651	1.2487	1.2488	1.2293	1.2292	1.2307	1.2151	1.2190	1.2204	1.2198
40	7.81	1.2713	1.2561	1.2562	1.2375	1.2369	1.2388	1.2217	1.2254	1.2249	1.2236
41	8.01	1.2844	1.2705	1.2703	1.2527	1.2515	1.2537	1.2348	1.2381	1.2351	1.2322
42	8.21	1.2973	1.2850	1.2843	1.2683	1.2664	1.2689	1.2483	1.2512	1.2455	1.2416
43	8.41	1.2885	1.2787	1.2776	1.2643	1.2618	1.2648	1.2431	1.2456	1.2378	1.2343
44	8.61	1.2464	1.2399	1.2389	1.2293	1.2266	1.2309	1.2094	1.2123	1.2045	1.2020
45	8.81	1.2084	1.2054	1.2043	1.1998	1.1969	1.2014	1.1837	1.1887	1.1823	1.1765
46	9.01	1.2371	1.2373	1.2346	1.2322	1.2284	1.2302	1.2147	1.2204	1.2094	1.2035
47	9.21	1.2784	1.2804	1.2776	1.2760	1.2733	1.2685	1.2600	1.2640	1.2476	1.2423
48	9.41	1.2861	1.2918	1.2877	1.2901	1.2908	1.2830	1.2798	1.2789	1.2613	1.2571
49	9.61	1.2680	1.2770	1.2756	1.2794	1.2853	1.2771	1.2782	1.2744	1.2573	1.2569
50	9.81	1.2506	1.2590	1.2672	1.2652	1.2764	1.2671	1.2732	1.2742	1.2562	1.2586
51	10.01	1.2414	1.2495	1.2636	1.2596	1.2747	1.2648	1.2720	1.2815	1.2630	1.2668
52	10.21	1.2338	1.2427	1.2613	1.2568	1.2755	1.2649	1.2754	1.2905	1.2723	1.2772
53	10.41	1.2183	1.2266	1.2508	1.2446	1.2709	1.2591	1.2743	1.2923	1.2767	1.2833
54	10.61	1.1730	1.1817	1.2094	1.2033	1.2343	1.2230	1.2437	1.2644	1.2551	1.2652
55	10.81	1.0847	1.0971	1.1241	1.1214	1.1534	1.1456	1.1695	1.1927	1.1923	1.2081
56	11.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
57	11.21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
58	11.41	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
59	11.61	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	11.81	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
[TOP] 61	12.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

\*Linear extrapolation based on a line between 20,000 MWD/MTU and 22,000 MWD/MTU is adequate for addressing burnups beyond 22,000 MWD/MTU.

**Table 3: Baseload Only R<sub>J</sub> Margin Decrease Factors  
associated with Figure 5 (ROS1) and Table 2**

Cycle Burnup (MWD/MTU)	R <sub>J</sub> Penalty Multiplier	Cycle Burnup (MWD/MTU)	R <sub>J</sub> Penalty Multiplier	Cycle Burnup (MWD/MTU)	R <sub>J</sub> Penalty Multiplier
150	1.001	7175	1.012	14200	1.000
321	1.000	7346	1.010	14371	1.000
493	1.000	7517	1.004	14542	1.002
664	1.000	7689	1.002	14714	1.002
835	1.000	7860	1.001	14885	1.002
1007	1.000	8031	1.000	15056	1.003
1178	1.000	8203	1.000	15228	1.003
1349	1.000	8374	1.001	15399	1.003
1521	1.000	8545	1.001	15570	1.000
1692	1.000	8717	1.000	15742	1.000
1863	1.000	8888	1.000	15913	1.000
2035	1.000	9059	1.000	16084	1.000
2206	1.000	9231	1.009	16256	1.000
2377	1.000	9402	1.015	16427	1.000
2549	1.000	9573	1.018	16598	1.000
2720	1.001	9745	1.019	16770	1.000
2891	1.001	9916	1.019	16941	1.000
3063	1.002	10088	1.018	17112	1.000
3234	1.001	10259	1.017	17284	1.000
3405	1.001	10430	1.016	17455	1.000
3577	1.001	10602	1.007	17626	1.000
3748	1.000	10773	1.004	17798	1.000
3919	1.000	10944	1.002	17969	1.000
4091	1.000	11116	1.000	18140	1.000
4262	1.000	11287	1.002	18312	1.000
4433	1.000	11458	1.005	18483	1.000
4605	1.000	11630	1.014	18654	1.000
4776	1.001	11801	1.016	18826	1.000
4947	1.003	11972	1.017	18997	1.000
5119	1.003	12144	1.019	19168	1.000
5290	1.006	12315	1.018	19340	1.000
5461	1.007	12486	1.017	19511	1.000
5633	1.008	12658	1.011	19682	1.000
5804	1.009	12829	1.009	19854	1.000
5975	1.011	13000	1.007	20025	1.001
6147	1.016	13172	1.005	20196	1.002
6318	1.016	13343	1.004	20368	1.003
6489	1.016	13514	1.002	20539	1.004
6661	1.016	13686	1.001	20710	1.004
6832	1.015	13857	1.000		
7003	1.014	14028	1.000		

Values may be interpolated to the surveillance cycle burnup. The R<sub>J</sub> factor value for the last burnup step shall be used for all burnups greater than the last burnup step.

**Table 4 : Baseload Only T(z) Factors associated with Figures 6, 7 and 8 (ROS2)  
(Top 10% and Bottom 8% excluded)\***

	Height	BU [Mwd/MTU]									
	[ft]	150	1000	2000	3000	4000	6000	6500	7000	8000	8500
[BOTTOM] 1	0.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	0.40	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	0.60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	0.80	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.00	1.0610	1.0390	1.0197	1.0144	1.0133	1.0226	1.0229	1.0245	1.0444	1.0561
7	1.20	1.1031	1.0856	1.0707	1.0685	1.0698	1.0824	1.0831	1.0851	1.1065	1.1187
8	1.40	1.1331	1.1199	1.1090	1.1092	1.1120	1.1258	1.1266	1.1284	1.1498	1.1616
9	1.60	1.1627	1.1534	1.1461	1.1483	1.1522	1.1662	1.1668	1.1683	1.1890	1.1999
10	1.80	1.1727	1.1672	1.1632	1.1671	1.1719	1.1858	1.1862	1.1872	1.2070	1.2169
11	2.00	1.1428	1.1410	1.1400	1.1456	1.1512	1.1648	1.1651	1.1658	1.1842	1.1928
12	2.20	1.1089	1.1139	1.1157	1.1224	1.1284	1.1410	1.1411	1.1413	1.1548	1.1619
13	2.40	1.1387	1.1430	1.1468	1.1540	1.1600	1.1705	1.1699	1.1692	1.1842	1.1897
14	2.60	1.1860	1.1913	1.1969	1.2045	1.2101	1.2179	1.2164	1.2146	1.2280	1.2317
15	2.80	1.2041	1.2103	1.2162	1.2236	1.2289	1.2348	1.2330	1.2307	1.2415	1.2436
16	3.00	1.1991	1.2066	1.2143	1.2216	1.2266	1.2313	1.2284	1.2257	1.2338	1.2346
17	3.20	1.1967	1.2058	1.2155	1.2233	1.2281	1.2311	1.2283	1.2247	1.2312	1.2309
18	3.40	1.2030	1.2142	1.2229	1.2311	1.2356	1.2369	1.2334	1.2289	1.2348	1.2332
19	3.60	1.2176	1.2306	1.2400	1.2476	1.2507	1.2494	1.2450	1.2395	1.2450	1.2427
20	3.80	1.2338	1.2485	1.2597	1.2672	1.2691	1.2636	1.2592	1.2535	1.2591	1.2559
21	4.00	1.2298	1.2457	1.2581	1.2663	1.2680	1.2590	1.2553	1.2504	1.2544	1.2504
22	4.20	1.1901	1.2069	1.2202	1.2287	1.2306	1.2214	1.2178	1.2141	1.2166	1.2124
23	4.40	1.1528	1.1700	1.1842	1.1931	1.1951	1.1869	1.1836	1.1807	1.1806	1.1762
24	4.60	1.1857	1.2024	1.2176	1.2267	1.2279	1.2193	1.2156	1.2123	1.2086	1.2032
25	4.80	1.2358	1.2528	1.2684	1.2758	1.2762	1.2671	1.2626	1.2592	1.2518	1.2453
26	5.00	1.2552	1.2733	1.2890	1.2952	1.2951	1.2845	1.2812	1.2764	1.2662	1.2591
27	5.20	1.2492	1.2689	1.2849	1.2911	1.2909	1.2778	1.2761	1.2698	1.2580	1.2506
28	5.40	1.2435	1.2644	1.2809	1.2869	1.2867	1.2723	1.2696	1.2637	1.2512	1.2437
29	5.60	1.2467	1.2679	1.2848	1.2907	1.2904	1.2758	1.2722	1.2652	1.2531	1.2455
30	5.80	1.2577	1.2792	1.2962	1.3027	1.3023	1.2868	1.2831	1.2753	1.2628	1.2550
31	6.00	1.2721	1.2939	1.3116	1.3191	1.3186	1.3010	1.2976	1.2898	1.2757	1.2678
32	6.20	1.2650	1.2866	1.3060	1.3141	1.3138	1.2945	1.2915	1.2843	1.2689	1.2614
33	6.40	1.2217	1.2436	1.2639	1.2720	1.2724	1.2535	1.2513	1.2452	1.2297	1.2229
34	6.61	1.1822	1.2101	1.2251	1.2332	1.2343	1.2159	1.2144	1.2094	1.1947	1.1877
35	6.81	1.2155	1.2440	1.2605	1.2663	1.2674	1.2470	1.2458	1.2410	1.2286	1.2177
36	7.01	1.2641	1.2947	1.3110	1.3158	1.3166	1.2937	1.2926	1.2881	1.2764	1.2624
37	7.21	1.2791	1.3112	1.3269	1.3315	1.3325	1.3087	1.3081	1.3043	1.2939	1.2778
38	7.41	1.2677	1.3006	1.3156	1.3200	1.3215	1.2981	1.2981	1.2954	1.2872	1.2696
39	7.61	1.2556	1.2893	1.3036	1.3078	1.3096	1.2865	1.2872	1.2855	1.2799	1.2602
40	7.81	1.2518	1.2862	1.2986	1.3025	1.3045	1.2827	1.2840	1.2834	1.2797	1.2586
41	8.01	1.2548	1.2889	1.3009	1.3045	1.3066	1.2843	1.2862	1.2866	1.2851	1.2653
42	8.21	1.2623	1.2921	1.3027	1.3057	1.3080	1.2852	1.2877	1.2894	1.2905	1.2746
43	8.41	1.2486	1.2711	1.2803	1.2832	1.2858	1.2653	1.2683	1.2709	1.2738	1.2626
44	8.61	1.1987	1.2136	1.2215	1.2243	1.2275	1.2143	1.2181	1.2213	1.2231	1.2175
45	8.81	1.1540	1.1615	1.1679	1.1704	1.1740	1.1673	1.1719	1.1772	1.1768	1.1766
46	9.01	1.1781	1.1825	1.1849	1.1933	1.1966	1.1907	1.1958	1.2013	1.2020	1.2033
47	9.21	1.2121	1.2160	1.2183	1.2275	1.2305	1.2305	1.2362	1.2383	1.2402	1.2418
48	9.41	1.2188	1.2214	1.2233	1.2269	1.2292	1.2381	1.2444	1.2419	1.2459	1.2480
49	9.61	1.2030	1.2035	1.2032	1.2043	1.2060	1.2183	1.2253	1.2192	1.2257	1.2284
50	9.81	1.1836	1.1815	1.1796	1.1842	1.1857	1.1952	1.2028	1.1961	1.2026	1.2057
51	10.01	1.1729	1.1668	1.1627	1.1680	1.1690	1.1771	1.1853	1.1814	1.1851	1.1880
52	10.21	1.1702	1.1599	1.1488	1.1553	1.1552	1.1614	1.1702	1.1701	1.1675	1.1734
53	10.41	1.1642	1.1498	1.1330	1.1364	1.1351	1.1418	1.1508	1.1517	1.1485	1.1533
54	10.61	1.1286	1.1106	1.0910	1.0902	1.0879	1.0976	1.1071	1.1072	1.1077	1.1100
55	10.81	1.0511	1.0305	1.0084	1.0072	1.0042	1.0147	1.0253	1.0234	1.0250	1.0275
56	11.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
57	11.21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
58	11.41	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
59	11.61	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	11.81	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
[TOP] 61	12.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

\*Linear extrapolation based on a line between 20,000 MWD/MTU and 22,000 MWD/MTU is adequate for addressing burnups beyond 22,000 MWD/MTU.

**Table 4 (cont.): Baseload Only T(z) Factors associated with Figures 6, 7 and 8 (ROS2)  
(Top 10% and Bottom 8% excluded)\***

	Height	BU [Mwd/MTU]									
	[ft]	10000	11000	12000	13000	14000	15000	16000	17000	20000	22000
[BOTTOM] 1	0.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	0.40	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	0.60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	0.80	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.00	1.0880	1.1008	1.1220	1.1356	1.1607	1.1674	1.1849	1.2155	1.2289	1.2262
7	1.20	1.1514	1.1634	1.1841	1.1962	1.2197	1.2237	1.2386	1.2669	1.2716	1.2635
8	1.40	1.1921	1.2020	1.2205	1.2297	1.2498	1.2503	1.2618	1.2867	1.2827	1.2697
9	1.60	1.2274	1.2348	1.2505	1.2564	1.2728	1.2698	1.2780	1.2997	1.2880	1.2710
10	1.80	1.2410	1.2459	1.2590	1.2621	1.2752	1.2696	1.2754	1.2941	1.2774	1.2580
11	2.00	1.2135	1.2163	1.2272	1.2281	1.2385	1.2316	1.2361	1.2524	1.2340	1.2148
12	2.20	1.1785	1.1795	1.1879	1.1869	1.1945	1.1867	1.1902	1.2043	1.1855	1.1672
13	2.40	1.2015	1.1994	1.2049	1.2006	1.2049	1.1948	1.1967	1.2087	1.1871	1.1678
14	2.60	1.2380	1.2327	1.2353	1.2277	1.2284	1.2163	1.2180	1.2270	1.2024	1.1818
15	2.80	1.2466	1.2394	1.2389	1.2292	1.2276	1.2143	1.2138	1.2213	1.1963	1.1763
16	3.00	1.2350	1.2266	1.2232	1.2116	1.2089	1.1952	1.1923	1.1972	1.1763	1.1587
17	3.20	1.2263	1.2160	1.2111	1.1978	1.1928	1.1792	1.1778	1.1759	1.1628	1.1482
18	3.40	1.2244	1.2124	1.2078	1.1942	1.1836	1.1702	1.1699	1.1632	1.1572	1.1455
19	3.60	1.2282	1.2157	1.2114	1.1969	1.1846	1.1710	1.1713	1.1647	1.1600	1.1491
20	3.80	1.2362	1.2235	1.2189	1.2032	1.1888	1.1751	1.1759	1.1712	1.1656	1.1566
21	4.00	1.2286	1.2148	1.2100	1.1941	1.1784	1.1646	1.1665	1.1631	1.1581	1.1514
22	4.20	1.1910	1.1765	1.1723	1.1573	1.1431	1.1290	1.1321	1.1307	1.1272	1.1236
23	4.40	1.1562	1.1418	1.1363	1.1222	1.1104	1.0973	1.0994	1.0998	1.0977	1.0970
24	4.60	1.1819	1.1663	1.1578	1.1428	1.1314	1.1179	1.1181	1.1194	1.1162	1.1167
25	4.80	1.2224	1.2050	1.1933	1.1769	1.1657	1.1514	1.1495	1.1515	1.1462	1.1474
26	5.00	1.2355	1.2175	1.2030	1.1865	1.1761	1.1619	1.1583	1.1611	1.1554	1.1578
27	5.20	1.2264	1.2080	1.1926	1.1758	1.1669	1.1534	1.1485	1.1522	1.1478	1.1519
28	5.40	1.2183	1.1987	1.1838	1.1657	1.1578	1.1449	1.1398	1.1433	1.1405	1.1464
29	5.60	1.2187	1.1993	1.1835	1.1657	1.1569	1.1447	1.1400	1.1424	1.1396	1.1463
30	5.80	1.2270	1.2079	1.1925	1.1746	1.1633	1.1531	1.1478	1.1481	1.1443	1.1524
31	6.00	1.2382	1.2202	1.2061	1.1897	1.1744	1.1675	1.1606	1.1599	1.1575	1.1648
32	6.20	1.2328	1.2147	1.2022	1.1899	1.1719	1.1674	1.1593	1.1593	1.1613	1.1663
33	6.40	1.2009	1.1806	1.1707	1.1623	1.1446	1.1412	1.1323	1.1330	1.1398	1.1435
34	6.61	1.1740	1.1537	1.1463	1.1395	1.1218	1.1195	1.1097	1.1110	1.1223	1.1245
35	6.81	1.2048	1.1827	1.1762	1.1695	1.1501	1.1478	1.1358	1.1378	1.1506	1.1499
36	7.01	1.2506	1.2259	1.2202	1.2132	1.1916	1.1887	1.1758	1.1790	1.1909	1.1869
37	7.21	1.2681	1.2424	1.2379	1.2315	1.2086	1.2071	1.1945	1.1973	1.2083	1.2025
38	7.41	1.2630	1.2369	1.2349	1.2296	1.2071	1.2076	1.1957	1.1963	1.2072	1.2008
39	7.61	1.2575	1.2318	1.2315	1.2271	1.2063	1.2075	1.1958	1.1949	1.2054	1.1983
40	7.81	1.2587	1.2369	1.2352	1.2316	1.2120	1.2136	1.2022	1.1992	1.2090	1.2008
41	8.01	1.2652	1.2480	1.2459	1.2443	1.2245	1.2263	1.2153	1.2098	1.2172	1.2078
42	8.21	1.2738	1.2599	1.2578	1.2579	1.2373	1.2395	1.2290	1.2209	1.2264	1.2155
43	8.41	1.2629	1.2516	1.2493	1.2514	1.2313	1.2341	1.2247	1.2139	1.2180	1.2070
44	8.61	1.2192	1.2115	1.2097	1.2143	1.1956	1.1994	1.1925	1.1799	1.1840	1.1749
45	8.81	1.1796	1.1758	1.1742	1.1813	1.1641	1.1704	1.1683	1.1544	1.1582	1.1510
46	9.01	1.2052	1.2043	1.2010	1.2101	1.1935	1.2010	1.2006	1.1832	1.1831	1.1747
47	9.21	1.2441	1.2446	1.2445	1.2510	1.2365	1.2436	1.2423	1.2243	1.2177	1.2068
48	9.41	1.2506	1.2543	1.2599	1.2607	1.2552	1.2567	1.2574	1.2446	1.2281	1.2169
49	9.61	1.2325	1.2390	1.2502	1.2493	1.2540	1.2490	1.2508	1.2480	1.2254	1.2158
50	9.81	1.2160	1.2198	1.2368	1.2417	1.2498	1.2441	1.2415	1.2488	1.2265	1.2201
51	10.01	1.2068	1.2049	1.2267	1.2395	1.2478	1.2468	1.2412	1.2526	1.2343	1.2271
52	10.21	1.1993	1.1956	1.2166	1.2385	1.2470	1.2509	1.2428	1.2578	1.2448	1.2367
53	10.41	1.1842	1.1795	1.2014	1.2296	1.2374	1.2475	1.2389	1.2553	1.2496	1.2405
54	10.61	1.1402	1.1352	1.1602	1.1908	1.1988	1.2144	1.2058	1.2248	1.2281	1.2199
55	10.81	1.0544	1.0522	1.0774	1.1090	1.1199	1.1381	1.1324	1.1536	1.1666	1.1634
56	11.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
57	11.21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
58	11.41	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
59	11.61	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	11.81	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
[TOP] 61	12.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

\*Linear extrapolation based on a line between 20,000 MWD/MTU and 22,000 MWD/MTU is adequate for addressing burnups beyond 22,000 MWD/MTU.

**Table 5: Baseload Only R<sub>J</sub> Margin Decrease Factors associated with Figures 6, 7, and 8 (ROS2) and Table 4**

Cycle Burnup (MWD/MTU)	R <sub>J</sub> Penalty Multiplier	Cycle Burnup (MWD/MTU)	R <sub>J</sub> Penalty Multiplier	Cycle Burnup (MWD/MTU)	R <sub>J</sub> Penalty Multiplier
150	1.007	7175	1.004	14200	1.000
321	1.006	7346	1.003	14371	1.000
493	1.005	7517	1.000	14542	1.000
664	1.005	7689	1.000	14714	1.001
835	1.004	7860	1.000	14885	1.003
1007	1.002	8031	1.001	15056	1.005
1178	1.001	8203	1.002	15228	1.009
1349	1.000	8374	1.001	15399	1.011
1521	1.000	8545	1.002	15570	1.012
1692	1.000	8717	1.004	15742	1.012
1863	1.000	8888	1.004	15913	1.012
2035	1.000	9059	1.003	16084	1.011
2206	1.000	9231	1.002	16256	1.010
2377	1.000	9402	1.000	16427	1.008
2549	1.000	9573	1.000	16598	1.004
2720	1.001	9745	1.000	16770	1.003
2891	1.001	9916	1.000	16941	1.002
3063	1.002	10088	1.000	17112	1.001
3234	1.002	10259	1.002	17284	1.000
3405	1.002	10430	1.005	17455	1.000
3577	1.001	10602	1.008	17626	1.000
3748	1.000	10773	1.010	17798	1.000
3919	1.000	10944	1.009	17969	1.000
4091	1.000	11116	1.008	18140	1.000
4262	1.000	11287	1.006	18312	1.000
4433	1.000	11458	1.005	18483	1.000
4605	1.000	11630	1.002	18654	1.000
4776	1.000	11801	1.001	18826	1.000
4947	1.000	11972	1.000	18997	1.000
5119	1.009	12144	1.003	19168	1.000
5290	1.012	12315	1.003	19340	1.000
5461	1.014	12486	1.004	19511	1.000
5633	1.015	12658	1.006	19682	1.000
5804	1.015	12829	1.006	19854	1.000
5975	1.014	13000	1.006	20025	1.000
6147	1.015	13172	1.006	20196	1.000
6318	1.012	13343	1.005	20368	1.000
6489	1.009	13514	1.001	20539	1.000
6661	1.007	13686	1.000	20710	1.000
6832	1.006	13857	1.000		
7003	1.005	14028	1.000		

Values may be interpolated to the surveillance cycle burnup. The R<sub>J</sub> factor value for the last burnup step shall be used for all burnups greater than the last burnup step.

**Table 6: Required THERMAL POWER Limits and AFD Reductions\***

RAOC Operating Space	Required $F_Q^{W(z)}$ Margin Improvement (%)	Required THERMAL POWER Limit (%RTP)	Reference AFD Figure
ROS1 (Figure 5)	> 0	< 50	N/A
ROS2 (Figure 6)	$\leq 2.8$	$\leq 95$	Use Figure 7
	> 2.8 and $\leq 6.1$	$\leq 90$	Use Figure 8
	> 6.1	< 50	N/A

\*For Unit 2 Cycle 32, the margin improvement in this Table 6 is additionally applicable to FPO.

**Table 7: Baseload and FPO T(z) Factors associated with Figure 5 (ROS1)  
(Top 10% and Bottom 8% excluded)\***

Height	BU [Mwd/MTU]											
	[ft]	150	1000	2000	3000	4000	6000	6500	7000	8000	8500	
[BOTTOM] 1	0.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	0.40	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	0.60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	0.80	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.00	1.0884	1.0660	1.0452	1.0375	1.0312	1.0530	1.0634	1.0687	1.0973	1.1032	
7	1.20	1.1309	1.1136	1.0971	1.0928	1.0887	1.1144	1.1256	1.1313	1.1616	1.1675	
8	1.40	1.1609	1.1484	1.1359	1.1343	1.1317	1.1592	1.1698	1.1752	1.2054	1.2104	
9	1.60	1.1905	1.1824	1.1735	1.1741	1.1727	1.2010	1.2109	1.2155	1.2443	1.2480	
10	1.80	1.2012	1.1962	1.1905	1.1930	1.1930	1.2209	1.2298	1.2340	1.2606	1.2629	
11	2.00	1.1737	1.1690	1.1666	1.1708	1.1724	1.1987	1.2064	1.2101	1.2341	1.2352	
12	2.20	1.1458	1.1423	1.1418	1.1472	1.1501	1.1740	1.1801	1.1798	1.2008	1.2006	
13	2.40	1.1763	1.1764	1.1746	1.1796	1.1823	1.2034	1.2078	1.2100	1.2274	1.2259	
14	2.60	1.2278	1.2310	1.2271	1.2349	1.2367	1.2512	1.2535	1.2550	1.2685	1.2664	
15	2.80	1.2471	1.2531	1.2515	1.2595	1.2625	1.2669	1.2669	1.2740	1.2775	1.2748	
16	3.00	1.2399	1.2486	1.2489	1.2573	1.2618	1.2667	1.2591	1.2670	1.2650	1.2669	
17	3.20	1.2334	1.2445	1.2475	1.2558	1.2597	1.2632	1.2565	1.2612	1.2602	1.2601	
18	3.40	1.2352	1.2478	1.2546	1.2620	1.2635	1.2664	1.2608	1.2619	1.2616	1.2605	
19	3.60	1.2431	1.2613	1.2714	1.2786	1.2761	1.2750	1.2726	1.2684	1.2687	1.2660	
20	3.80	1.2582	1.2784	1.2900	1.2974	1.2929	1.2882	1.2855	1.2792	1.2797	1.2734	
21	4.00	1.2524	1.2741	1.2869	1.2943	1.2902	1.2834	1.2784	1.2718	1.2724	1.2615	
22	4.20	1.2102	1.2327	1.2467	1.2544	1.2503	1.2432	1.2380	1.2314	1.2316	1.2171	
23	4.40	1.1699	1.1931	1.2080	1.2159	1.2124	1.2048	1.1998	1.1932	1.1925	1.1782	
24	4.60	1.1998	1.2242	1.2399	1.2475	1.2437	1.2338	1.2282	1.2207	1.2183	1.2052	
25	4.80	1.2469	1.2724	1.2882	1.2954	1.2911	1.2784	1.2719	1.2647	1.2595	1.2477	
26	5.00	1.2608	1.2871	1.3030	1.3103	1.3056	1.2913	1.2852	1.2794	1.2708	1.2610	
27	5.20	1.2519	1.2765	1.2928	1.2986	1.2946	1.2805	1.2757	1.2708	1.2592	1.2513	
28	5.40	1.2442	1.2697	1.2866	1.2906	1.2867	1.2734	1.2696	1.2637	1.2512	1.2437	
29	5.60	1.2469	1.2730	1.2901	1.2939	1.2905	1.2760	1.2722	1.2652	1.2531	1.2455	
30	5.80	1.2580	1.2838	1.3011	1.3055	1.3023	1.2868	1.2831	1.2753	1.2628	1.2550	
31	6.00	1.2745	1.2981	1.3161	1.3216	1.3186	1.3010	1.2976	1.2898	1.2757	1.2678	
32	6.20	1.2700	1.2922	1.3108	1.3161	1.3138	1.2946	1.2915	1.2843	1.2688	1.2614	
33	6.40	1.2286	1.2498	1.2681	1.2734	1.2725	1.2551	1.2513	1.2452	1.2297	1.2229	
34	6.61	1.1911	1.2110	1.2290	1.2343	1.2345	1.2245	1.2200	1.2147	1.2027	1.1955	
35	6.81	1.2270	1.2465	1.2624	1.2671	1.2676	1.2599	1.2558	1.2510	1.2407	1.2306	
36	7.01	1.2785	1.2975	1.3112	1.3162	1.3169	1.3119	1.3082	1.3038	1.2944	1.2831	
37	7.21	1.2960	1.3138	1.3274	1.3319	1.3333	1.3313	1.3285	1.3247	1.3174	1.3059	
38	7.41	1.2864	1.3029	1.3161	1.3205	1.3228	1.3251	1.3234	1.3199	1.3152	1.3039	
39	7.61	1.2764	1.2912	1.3041	1.3083	1.3114	1.3183	1.3178	1.3135	1.3118	1.3006	
40	7.81	1.2746	1.2877	1.2991	1.3031	1.3077	1.3181	1.3186	1.3136	1.3149	1.3035	
41	8.01	1.2790	1.2901	1.3015	1.3051	1.3094	1.3235	1.3251	1.3195	1.3236	1.3119	
42	8.21	1.2837	1.2926	1.3030	1.3061	1.3108	1.3288	1.3316	1.3256	1.3322	1.3201	
43	8.41	1.2648	1.2762	1.2812	1.2889	1.2893	1.3102	1.3139	1.3077	1.3167	1.3061	
44	8.61	1.2117	1.2264	1.2306	1.2389	1.2342	1.2551	1.2601	1.2534	1.2652	1.2576	
45	8.81	1.1673	1.1817	1.1874	1.1932	1.1875	1.2046	1.2107	1.2048	1.2179	1.2134	
46	9.01	1.1968	1.2066	1.2134	1.2169	1.2147	1.2309	1.2318	1.2317	1.2386	1.2381	
47	9.21	1.2429	1.2468	1.2518	1.2555	1.2570	1.2720	1.2681	1.2709	1.2798	1.2760	
48	9.41	1.2559	1.2580	1.2616	1.2618	1.2650	1.2784	1.2761	1.2761	1.2896	1.2845	
49	9.61	1.2406	1.2409	1.2428	1.2425	1.2450	1.2580	1.2594	1.2555	1.2711	1.2696	
50	9.81	1.2228	1.2209	1.2208	1.2198	1.2221	1.2339	1.2381	1.2331	1.2498	1.2500	
51	10.01	1.2120	1.2076	1.2055	1.2029	1.2044	1.2154	1.2217	1.2192	1.2334	1.2352	
52	10.21	1.2055	1.2002	1.1936	1.1891	1.1892	1.2028	1.2075	1.2098	1.2193	1.2268	
53	10.41	1.1951	1.1903	1.1795	1.1716	1.1723	1.1830	1.1891	1.1933	1.2005	1.2114	
54	10.61	1.1557	1.1503	1.1374	1.1256	1.1270	1.1345	1.1431	1.1469	1.1572	1.1651	
55	10.81	1.0780	1.0677	1.0524	1.0403	1.0388	1.0490	1.0562	1.0581	1.0720	1.0753	
56	11.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
57	11.21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
58	11.41	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
59	11.61	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
60	11.81	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
[TOP] 61	12.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

\*Linear extrapolation based on a line between 20,000 MWD/MTU and 22,000 MWD/MTU is adequate for addressing burnups beyond 22,000 MWD/MTU.

**Table 7 (cont.): Baseload and FPO T(z) Factors associated with Figure 5 (ROS1)  
(Top 10% and Bottom 8% excluded)\***

	Height	BU [Mwd/MTU]									
	[ft]	10000	11000	12000	13000	14000	15000	16000	17000	20000	22000
[BOTTOM] 1	0.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	0.40	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	0.60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	0.80	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.00	1.1335	1.1569	1.1873	1.1961	1.2337	1.2611	1.2822	1.2814	1.3138	1.3063
7	1.20	1.1980	1.2214	1.2510	1.2568	1.2942	1.3187	1.3362	1.3317	1.3547	1.3422
8	1.40	1.2384	1.2598	1.2865	1.2896	1.3234	1.3434	1.3565	1.3481	1.3611	1.3441
9	1.60	1.2723	1.2912	1.3145	1.3154	1.3444	1.3596	1.3685	1.3569	1.3607	1.3415
10	1.80	1.2834	1.2997	1.3194	1.3186	1.3433	1.3539	1.3596	1.3461	1.3432	1.3259
11	2.00	1.2519	1.2658	1.2821	1.2806	1.3012	1.3077	1.3115	1.2977	1.2912	1.2781
12	2.20	1.2132	1.2245	1.2373	1.2351	1.2517	1.2544	1.2567	1.2431	1.2341	1.2258
13	2.40	1.2327	1.2408	1.2494	1.2455	1.2578	1.2565	1.2564	1.2421	1.2314	1.2240
14	2.60	1.2661	1.2709	1.2753	1.2693	1.2775	1.2725	1.2700	1.2557	1.2374	1.2364
15	2.80	1.2695	1.2754	1.2761	1.2664	1.2713	1.2631	1.2590	1.2441	1.2252	1.2265
16	3.00	1.2542	1.2594	1.2575	1.2458	1.2456	1.2355	1.2279	1.2184	1.1995	1.2012
17	3.20	1.2417	1.2467	1.2370	1.2297	1.2249	1.2123	1.2096	1.2014	1.1835	1.1832
18	3.40	1.2383	1.2401	1.2235	1.2210	1.2129	1.1996	1.1983	1.1919	1.1768	1.1761
19	3.60	1.2434	1.2405	1.2221	1.2204	1.2108	1.1984	1.1940	1.1910	1.1767	1.1785
20	3.80	1.2529	1.2447	1.2238	1.2233	1.2078	1.1990	1.1916	1.1920	1.1803	1.1836
21	4.00	1.2442	1.2336	1.2126	1.2110	1.1973	1.1859	1.1760	1.1807	1.1723	1.1756
22	4.20	1.2043	1.1919	1.1725	1.1706	1.1568	1.1469	1.1385	1.1443	1.1402	1.1445
23	4.40	1.1663	1.1522	1.1363	1.1322	1.1183	1.1098	1.1063	1.1098	1.1096	1.1149
24	4.60	1.1896	1.1739	1.1578	1.1501	1.1362	1.1276	1.1259	1.1264	1.1276	1.1336
25	4.80	1.2277	1.2103	1.1933	1.1816	1.1674	1.1587	1.1580	1.1554	1.1573	1.1638
26	5.00	1.2378	1.2198	1.2030	1.1882	1.1762	1.1664	1.1674	1.1623	1.1653	1.1727
27	5.20	1.2266	1.2082	1.1926	1.1755	1.1670	1.1552	1.1577	1.1520	1.1554	1.1641
28	5.40	1.2183	1.1987	1.1838	1.1657	1.1578	1.1449	1.1481	1.1433	1.1453	1.1548
29	5.60	1.2187	1.1993	1.1835	1.1657	1.1569	1.1447	1.1467	1.1424	1.1427	1.1515
30	5.80	1.2267	1.2079	1.1925	1.1746	1.1633	1.1531	1.1516	1.1481	1.1462	1.1559
31	6.00	1.2395	1.2202	1.2061	1.1897	1.1744	1.1676	1.1617	1.1597	1.1602	1.1701
32	6.20	1.2351	1.2147	1.2022	1.1899	1.1719	1.1673	1.1590	1.1597	1.1658	1.1747
33	6.40	1.2009	1.1850	1.1708	1.1623	1.1446	1.1413	1.1327	1.1364	1.1458	1.1544
34	6.61	1.1761	1.1656	1.1464	1.1395	1.1225	1.1225	1.1158	1.1201	1.1298	1.1378
35	6.81	1.2123	1.2026	1.1817	1.1697	1.1558	1.1562	1.1478	1.1519	1.1599	1.1661
36	7.01	1.2639	1.2540	1.2323	1.2156	1.2039	1.2035	1.1926	1.1964	1.2020	1.2059
37	7.21	1.2877	1.2775	1.2561	1.2383	1.2274	1.2260	1.2133	1.2170	1.2209	1.2231
38	7.41	1.2881	1.2785	1.2585	1.2404	1.2313	1.2287	1.2147	1.2186	1.2212	1.2218
39	7.61	1.2873	1.2780	1.2599	1.2417	1.2344	1.2307	1.2151	1.2190	1.2204	1.2198
40	7.81	1.2927	1.2836	1.2676	1.2489	1.2435	1.2388	1.2217	1.2254	1.2249	1.2236
41	8.01	1.3049	1.2958	1.2822	1.2630	1.2594	1.2537	1.2348	1.2381	1.2351	1.2322
42	8.21	1.3167	1.3075	1.2970	1.2771	1.2758	1.2689	1.2483	1.2512	1.2455	1.2416
43	8.41	1.3053	1.2968	1.2900	1.2704	1.2717	1.2648	1.2431	1.2456	1.2378	1.2343
44	8.61	1.2591	1.2518	1.2500	1.2317	1.2366	1.2309	1.2110	1.2123	1.2045	1.2020
45	8.81	1.2171	1.2117	1.2143	1.1998	1.2060	1.2014	1.1870	1.1887	1.1823	1.1765
46	9.01	1.2418	1.2431	1.2417	1.2322	1.2338	1.2302	1.2208	1.2204	1.2094	1.2035
47	9.21	1.2835	1.2850	1.2842	1.2767	1.2810	1.2739	1.2635	1.2640	1.2476	1.2423
48	9.41	1.2929	1.2922	1.2971	1.2909	1.2975	1.2947	1.2851	1.2789	1.2659	1.2576
49	9.61	1.2785	1.2790	1.2869	1.2868	1.2984	1.2985	1.2929	1.2805	1.2759	1.2630
50	9.81	1.2625	1.2736	1.2806	1.2866	1.3026	1.3058	1.3016	1.2844	1.2890	1.2659
51	10.01	1.2485	1.2698	1.2783	1.2886	1.3079	1.3145	1.3165	1.2970	1.3080	1.2717
52	10.21	1.2387	1.2668	1.2793	1.2911	1.3127	1.3235	1.3323	1.3102	1.3291	1.2882
53	10.41	1.2239	1.2557	1.2716	1.2849	1.3104	1.3270	1.3390	1.3158	1.3430	1.3011
54	10.61	1.1790	1.2122	1.2312	1.2453	1.2759	1.2962	1.3116	1.2912	1.3258	1.2853
55	10.81	1.0901	1.1238	1.1457	1.1602	1.1955	1.2184	1.2367	1.2229	1.2644	1.2305
56	11.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
57	11.21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
58	11.41	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
59	11.61	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	11.81	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
[TOP] 61	12.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

\*Linear extrapolation based on a line between 20,000 MWD/MTU and 22,000 MWD/MTU is adequate for addressing burnups beyond 22,000 MWD/MTU.



**Table 8: Baseload and FPO R<sub>J</sub> Margin Decrease Factors associated with Figure 5 (ROS1) and Table 7**

Cycle Burnup (MWD/MTU)	R <sub>J</sub> Penalty Multiplier	Cycle Burnup (MWD/MTU)	R <sub>J</sub> Penalty Multiplier	Cycle Burnup (MWD/MTU)	R <sub>J</sub> Penalty Multiplier
150	1.003	7175	1.012	14200	1.007
321	1.002	7346	1.010	14371	1.007
493	1.001	7517	1.004	14542	1.011
664	1.000	7689	1.003	14714	1.011
835	1.000	7860	1.002	14885	1.010
1007	1.000	8031	1.003	15056	1.009
1178	1.000	8203	1.004	15228	1.008
1349	1.000	8374	1.005	15399	1.007
1521	1.000	8545	1.006	15570	1.001
1692	1.000	8717	1.006	15742	1.000
1863	1.000	8888	1.006	15913	1.000
2035	1.000	9059	1.007	16084	1.000
2206	1.000	9231	1.009	16256	1.000
2377	1.000	9402	1.015	16427	1.001
2549	1.000	9573	1.018	16598	1.000
2720	1.001	9745	1.019	16770	1.000
2891	1.001	9916	1.019	16941	1.000
3063	1.002	10088	1.018	17112	1.000
3234	1.001	10259	1.017	17284	1.000
3405	1.001	10430	1.016	17455	1.000
3577	1.002	10602	1.015	17626	1.002
3748	1.002	10773	1.014	17798	1.004
3919	1.002	10944	1.012	17969	1.006
4091	1.001	11116	1.010	18140	1.007
4262	1.002	11287	1.008	18312	1.008
4433	1.003	11458	1.006	18483	1.010
4605	1.004	11630	1.014	18654	1.000
4776	1.006	11801	1.016	18826	1.000
4947	1.009	11972	1.017	18997	1.000
5119	1.012	12144	1.019	19168	1.000
5290	1.015	12315	1.018	19340	1.000
5461	1.016	12486	1.017	19511	1.000
5633	1.017	12658	1.019	19682	1.000
5804	1.018	12829	1.021	19854	1.000
5975	1.018	13000	1.022	20025	1.001
6147	1.020	13172	1.024	20196	1.002
6318	1.018	13343	1.023	20368	1.003
6489	1.016	13514	1.018	20539	1.004
6661	1.016	13686	1.015	20710	1.004
6832	1.015	13857	1.012		
7003	1.014	14028	1.010		

Values may be interpolated to the surveillance cycle burnup. The R<sub>J</sub> factor value for the last burnup step shall be used for all burnups greater than the last burnup step.

**Table 9: Baseload and FPO T(z) Factors associated with Figures 6, 7, and 8 (ROS2)  
(Top 10% and Bottom 8% excluded)\***

	Height	BU [Mwd/MTU]									
	[ft]	150	1000	2000	3000	4000	6000	6500	7000	8000	8500
[BOTTOM] 1	0.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	0.40	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	0.60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	0.80	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.00	1.0736	1.0448	1.0266	1.0206	1.0133	1.0226	1.0237	1.0502	1.0635	1.0763
7	1.20	1.1171	1.0918	1.0779	1.0753	1.0698	1.0824	1.0840	1.1128	1.1269	1.1400
8	1.40	1.1482	1.1263	1.1164	1.1163	1.1120	1.1258	1.1271	1.1572	1.1706	1.1832
9	1.60	1.1789	1.1600	1.1536	1.1558	1.1522	1.1662	1.1668	1.1976	1.2097	1.2212
10	1.80	1.1894	1.1738	1.1707	1.1747	1.1719	1.1858	1.1862	1.2161	1.2265	1.2368
11	2.00	1.1592	1.1474	1.1474	1.1531	1.1512	1.1648	1.1651	1.1929	1.2016	1.2104
12	2.20	1.1248	1.1202	1.1230	1.1300	1.1284	1.1412	1.1411	1.1633	1.1700	1.1772
13	2.40	1.1554	1.1491	1.1539	1.1616	1.1600	1.1711	1.1710	1.1934	1.1972	1.2026
14	2.60	1.2028	1.1978	1.2040	1.2121	1.2101	1.2227	1.2216	1.2376	1.2382	1.2417
15	2.80	1.2185	1.2158	1.2227	1.2309	1.2289	1.2436	1.2416	1.2512	1.2495	1.2512
16	3.00	1.2107	1.2123	1.2203	1.2284	1.2266	1.2397	1.2368	1.2428	1.2388	1.2392
17	3.20	1.2081	1.2117	1.2216	1.2299	1.2281	1.2362	1.2323	1.2383	1.2315	1.2309
18	3.40	1.2118	1.2193	1.2293	1.2376	1.2356	1.2390	1.2367	1.2399	1.2348	1.2332
19	3.60	1.2236	1.2355	1.2458	1.2527	1.2507	1.2494	1.2485	1.2466	1.2450	1.2427
20	3.80	1.2368	1.2534	1.2650	1.2716	1.2691	1.2636	1.2634	1.2565	1.2591	1.2559
21	4.00	1.2308	1.2509	1.2633	1.2705	1.2680	1.2596	1.2584	1.2504	1.2544	1.2504
22	4.20	1.1913	1.2133	1.2254	1.2332	1.2306	1.2219	1.2194	1.2141	1.2166	1.2124
23	4.40	1.1554	1.1781	1.1940	1.1974	1.1951	1.1869	1.1836	1.1807	1.1806	1.1762
24	4.60	1.1885	1.2126	1.2260	1.2314	1.2279	1.2193	1.2156	1.2123	1.2086	1.2032
25	4.80	1.2384	1.2635	1.2773	1.2822	1.2765	1.2671	1.2626	1.2592	1.2518	1.2453
26	5.00	1.2581	1.2824	1.2977	1.3010	1.2951	1.2845	1.2812	1.2764	1.2662	1.2591
27	5.20	1.2517	1.2756	1.2925	1.2951	1.2909	1.2778	1.2761	1.2698	1.2580	1.2506
28	5.40	1.2442	1.2697	1.2866	1.2906	1.2867	1.2723	1.2696	1.2637	1.2512	1.2437
29	5.60	1.2469	1.2730	1.2901	1.2939	1.2905	1.2758	1.2722	1.2652	1.2531	1.2455
30	5.80	1.2577	1.2838	1.3011	1.3053	1.3023	1.2868	1.2831	1.2753	1.2628	1.2550
31	6.00	1.2726	1.2981	1.3162	1.3216	1.3186	1.3010	1.2976	1.2898	1.2757	1.2678
32	6.20	1.2672	1.2922	1.3108	1.3161	1.3138	1.2945	1.2915	1.2843	1.2689	1.2614
33	6.40	1.2261	1.2497	1.2680	1.2734	1.2724	1.2535	1.2513	1.2452	1.2297	1.2229
34	6.61	1.1924	1.2109	1.2289	1.2343	1.2343	1.2219	1.2164	1.2094	1.1976	1.1912
35	6.81	1.2266	1.2463	1.2622	1.2671	1.2674	1.2549	1.2499	1.2410	1.2310	1.2255
36	7.01	1.2782	1.2971	1.3110	1.3158	1.3166	1.3062	1.2996	1.2896	1.2806	1.2749
37	7.21	1.2956	1.3134	1.3269	1.3315	1.3328	1.3255	1.3172	1.3083	1.3014	1.2946
38	7.41	1.2860	1.3024	1.3156	1.3200	1.3223	1.3182	1.3097	1.3014	1.2972	1.2908
39	7.61	1.2759	1.2907	1.3036	1.3078	1.3109	1.3092	1.3013	1.2929	1.2919	1.2863
40	7.81	1.2742	1.2872	1.2986	1.3025	1.3064	1.3077	1.3002	1.2915	1.2932	1.2880
41	8.01	1.2785	1.2896	1.3009	1.3045	1.3088	1.3114	1.3044	1.2958	1.3000	1.2953
42	8.21	1.2834	1.2923	1.3027	1.3057	1.3104	1.3150	1.3086	1.3001	1.3068	1.3025
43	8.41	1.2640	1.2711	1.2803	1.2832	1.2884	1.2945	1.2893	1.2810	1.2900	1.2867
44	8.61	1.2081	1.2136	1.2215	1.2243	1.2304	1.2381	1.2342	1.2264	1.2381	1.2361
45	8.81	1.1576	1.1615	1.1679	1.1704	1.1772	1.1860	1.1837	1.1772	1.1906	1.1899
46	9.01	1.1781	1.1826	1.1873	1.1933	1.1966	1.2029	1.2050	1.2013	1.2083	1.2109
47	9.21	1.2149	1.2217	1.2242	1.2304	1.2305	1.2406	1.2362	1.2383	1.2456	1.2472
48	9.41	1.2238	1.2277	1.2284	1.2345	1.2292	1.2452	1.2444	1.2435	1.2506	1.2491
49	9.61	1.2075	1.2075	1.2066	1.2126	1.2085	1.2236	1.2253	1.2244	1.2305	1.2300
50	9.81	1.1882	1.1845	1.1812	1.1867	1.1857	1.1976	1.2028	1.2019	1.2074	1.2148
51	10.01	1.1759	1.1703	1.1627	1.1680	1.1690	1.1771	1.1868	1.1844	1.1899	1.2016
52	10.21	1.1702	1.1621	1.1503	1.1553	1.1552	1.1614	1.1736	1.1739	1.1775	1.1899
53	10.41	1.1642	1.1498	1.1339	1.1364	1.1351	1.1418	1.1527	1.1562	1.1572	1.1702
54	10.61	1.1286	1.1106	1.0910	1.0902	1.0879	1.0976	1.1071	1.1104	1.1112	1.1228
55	10.81	1.0511	1.0305	1.0086	1.0072	1.0042	1.0147	1.0253	1.0234	1.0279	1.0371
56	11.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
57	11.21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
58	11.41	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
59	11.61	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	11.81	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
[TOP] 61	12.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

\*Linear extrapolation based on a line between 20,000 MWD/MTU and 22,000 MWD/MTU is adequate for addressing burnups beyond 22,000 MWD/MTU.

**Table 9 (cont.): Baseload and FPO T(z) Factors associated with Figures 6, 7, and 8 (ROS2)  
(Top 10% and Bottom 8% excluded)\***

	Height	BU [Mwd/MTU]									
	[ft]	10000	11000	12000	13000	14000	15000	16000	17000	20000	22000
[BOTTOM] 1	0.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	0.40	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	0.60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	0.80	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.00	1.1147	1.1255	1.1503	1.1725	1.1928	1.2274	1.2372	1.2516	1.2865	1.2978
7	1.20	1.1785	1.1887	1.2117	1.2321	1.2521	1.2832	1.2907	1.3010	1.3271	1.3331
8	1.40	1.2184	1.2267	1.2459	1.2646	1.2812	1.3068	1.3116	1.3172	1.3339	1.3348
9	1.60	1.2521	1.2579	1.2730	1.2904	1.3023	1.3225	1.3246	1.3259	1.3344	1.3310
10	1.80	1.2633	1.2667	1.2781	1.2942	1.3020	1.3179	1.3173	1.3153	1.3181	1.3121
11	2.00	1.2327	1.2341	1.2426	1.2574	1.2618	1.2743	1.2719	1.2680	1.2682	1.2617
12	2.20	1.1949	1.1950	1.2009	1.2131	1.2144	1.2239	1.2199	1.2144	1.2133	1.2071
13	2.40	1.2145	1.2147	1.2163	1.2241	1.2214	1.2272	1.2213	1.2133	1.2119	1.2047
14	2.60	1.2476	1.2478	1.2449	1.2486	1.2417	1.2440	1.2360	1.2270	1.2195	1.2114
15	2.80	1.2523	1.2526	1.2467	1.2465	1.2371	1.2363	1.2283	1.2213	1.2076	1.1997
16	3.00	1.2362	1.2346	1.2277	1.2244	1.2137	1.2082	1.2043	1.1972	1.1788	1.1723
17	3.20	1.2263	1.2181	1.2111	1.2047	1.1928	1.1846	1.1825	1.1759	1.1628	1.1560
18	3.40	1.2244	1.2124	1.2078	1.1942	1.1836	1.1720	1.1699	1.1632	1.1572	1.1483
19	3.60	1.2282	1.2157	1.2114	1.1969	1.1846	1.1710	1.1713	1.1647	1.1600	1.1491
20	3.80	1.2362	1.2235	1.2189	1.2032	1.1888	1.1751	1.1759	1.1712	1.1656	1.1566
21	4.00	1.2286	1.2148	1.2100	1.1941	1.1784	1.1646	1.1665	1.1631	1.1581	1.1514
22	4.20	1.1910	1.1765	1.1723	1.1573	1.1431	1.1290	1.1321	1.1307	1.1272	1.1236
23	4.40	1.1562	1.1418	1.1363	1.1222	1.1104	1.0973	1.0994	1.0998	1.0977	1.0970
24	4.60	1.1819	1.1663	1.1578	1.1428	1.1314	1.1179	1.1181	1.1194	1.1162	1.1167
25	4.80	1.2224	1.2050	1.1933	1.1769	1.1657	1.1514	1.1495	1.1515	1.1462	1.1474
26	5.00	1.2355	1.2175	1.2030	1.1865	1.1761	1.1619	1.1583	1.1611	1.1554	1.1578
27	5.20	1.2264	1.2080	1.1926	1.1758	1.1669	1.1534	1.1485	1.1522	1.1478	1.1519
28	5.40	1.2183	1.1987	1.1838	1.1657	1.1578	1.1449	1.1398	1.1433	1.1405	1.1464
29	5.60	1.2187	1.1993	1.1835	1.1657	1.1569	1.1447	1.1400	1.1424	1.1396	1.1463
30	5.80	1.2270	1.2079	1.1925	1.1746	1.1633	1.1531	1.1478	1.1481	1.1443	1.1524
31	6.00	1.2382	1.2202	1.2061	1.1897	1.1744	1.1675	1.1606	1.1599	1.1575	1.1648
32	6.20	1.2328	1.2147	1.2022	1.1899	1.1719	1.1674	1.1593	1.1593	1.1613	1.1663
33	6.40	1.2009	1.1806	1.1707	1.1623	1.1446	1.1412	1.1323	1.1330	1.1398	1.1435
34	6.61	1.1740	1.1557	1.1463	1.1395	1.1218	1.1195	1.1097	1.1110	1.1223	1.1245
35	6.81	1.2097	1.1903	1.1762	1.1695	1.1501	1.1478	1.1358	1.1378	1.1506	1.1499
36	7.01	1.2602	1.2392	1.2224	1.2132	1.1930	1.1887	1.1758	1.1790	1.1909	1.1869
37	7.21	1.2819	1.2604	1.2438	1.2315	1.2139	1.2071	1.1945	1.1973	1.2083	1.2025
38	7.41	1.2804	1.2594	1.2439	1.2296	1.2154	1.2076	1.1957	1.1963	1.2072	1.2008
39	7.61	1.2778	1.2572	1.2431	1.2271	1.2158	1.2075	1.1958	1.1949	1.2054	1.1983
40	7.81	1.2813	1.2610	1.2485	1.2316	1.2223	1.2136	1.2022	1.1992	1.2090	1.2008
41	8.01	1.2902	1.2713	1.2607	1.2443	1.2357	1.2268	1.2153	1.2098	1.2172	1.2078
42	8.21	1.2992	1.2812	1.2728	1.2582	1.2493	1.2412	1.2290	1.2209	1.2264	1.2155
43	8.41	1.2854	1.2692	1.2637	1.2525	1.2433	1.2366	1.2247	1.2151	1.2180	1.2070
44	8.61	1.2375	1.2238	1.2219	1.2156	1.2067	1.2024	1.1925	1.1842	1.1840	1.1749
45	8.81	1.1937	1.1827	1.1845	1.1832	1.1759	1.1729	1.1683	1.1601	1.1582	1.1510
46	9.01	1.2152	1.2090	1.2144	1.2105	1.2078	1.2021	1.2006	1.1896	1.1831	1.1747
47	9.21	1.2536	1.2473	1.2563	1.2510	1.2508	1.2456	1.2423	1.2314	1.2208	1.2083
48	9.41	1.2583	1.2620	1.2659	1.2661	1.2632	1.2606	1.2589	1.2531	1.2402	1.2281
49	9.61	1.2375	1.2505	1.2581	1.2645	1.2607	1.2659	1.2653	1.2604	1.2463	1.2342
50	9.81	1.2199	1.2435	1.2542	1.2644	1.2657	1.2724	1.2743	1.2693	1.2586	1.2443
51	10.01	1.2096	1.2394	1.2514	1.2693	1.2711	1.2807	1.2853	1.2848	1.2733	1.2618
52	10.21	1.2004	1.2363	1.2487	1.2746	1.2765	1.2892	1.2988	1.3016	1.2893	1.2819
53	10.41	1.1842	1.2254	1.2386	1.2709	1.2727	1.2883	1.3050	1.3101	1.2997	1.2960
54	10.61	1.1402	1.1830	1.1985	1.2341	1.2356	1.2560	1.2782	1.2864	1.2821	1.2821
55	10.81	1.0544	1.0974	1.1157	1.1517	1.1557	1.1811	1.2057	1.2173	1.2231	1.2278
56	11.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
57	11.21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
58	11.41	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
59	11.61	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
60	11.81	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
[TOP] 61	12.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

\*Linear extrapolation based on a line between 20,000 MWD/MTU and 22,000 MWD/MTU is adequate for addressing burnups beyond 22,000 MWD/MTU.

**Table 10: Baseload and FPO R<sub>J</sub> Margin Decrease Factors associated with Figures 6, 7, and 8 (ROS2) and Table 9**

Cycle Burnup (MWD/MTU)	R <sub>J</sub> Penalty Multiplier	Cycle Burnup (MWD/MTU)	R <sub>J</sub> Penalty Multiplier	Cycle Burnup (MWD/MTU)	R <sub>J</sub> Penalty Multiplier
150	1.007	7175	1.008	14200	1.013
321	1.006	7346	1.007	14371	1.011
493	1.005	7517	1.008	14542	1.004
664	1.005	7689	1.009	14714	1.002
835	1.004	7860	1.009	14885	1.003
1007	1.002	8031	1.009	15056	1.005
1178	1.001	8203	1.008	15228	1.009
1349	1.000	8374	1.008	15399	1.011
1521	1.000	8545	1.008	15570	1.012
1692	1.000	8717	1.006	15742	1.012
1863	1.000	8888	1.004	15913	1.012
2035	1.000	9059	1.004	16084	1.013
2206	1.000	9231	1.005	16256	1.013
2377	1.000	9402	1.004	16427	1.012
2549	1.000	9573	1.005	16598	1.006
2720	1.001	9745	1.005	16770	1.004
2891	1.002	9916	1.006	16941	1.003
3063	1.002	10088	1.008	17112	1.002
3234	1.002	10259	1.006	17284	1.007
3405	1.002	10430	1.005	17455	1.009
3577	1.001	10602	1.009	17626	1.009
3748	1.003	10773	1.010	17798	1.009
3919	1.003	10944	1.010	17969	1.010
4091	1.003	11116	1.010	18140	1.010
4262	1.003	11287	1.010	18312	1.011
4433	1.003	11458	1.010	18483	1.012
4605	1.003	11630	1.013	18654	1.000
4776	1.004	11801	1.013	18826	1.000
4947	1.005	11972	1.013	18997	1.000
5119	1.009	12144	1.012	19168	1.000
5290	1.012	12315	1.010	19340	1.000
5461	1.014	12486	1.009	19511	1.000
5633	1.015	12658	1.006	19682	1.000
5804	1.015	12829	1.007	19854	1.000
5975	1.014	13000	1.009	20025	1.000
6147	1.015	13172	1.016	20196	1.000
6318	1.012	13343	1.017	20368	1.000
6489	1.009	13514	1.019	20539	1.000
6661	1.008	13686	1.018	20710	1.000
6832	1.008	13857	1.017		
7003	1.008	14028	1.015		

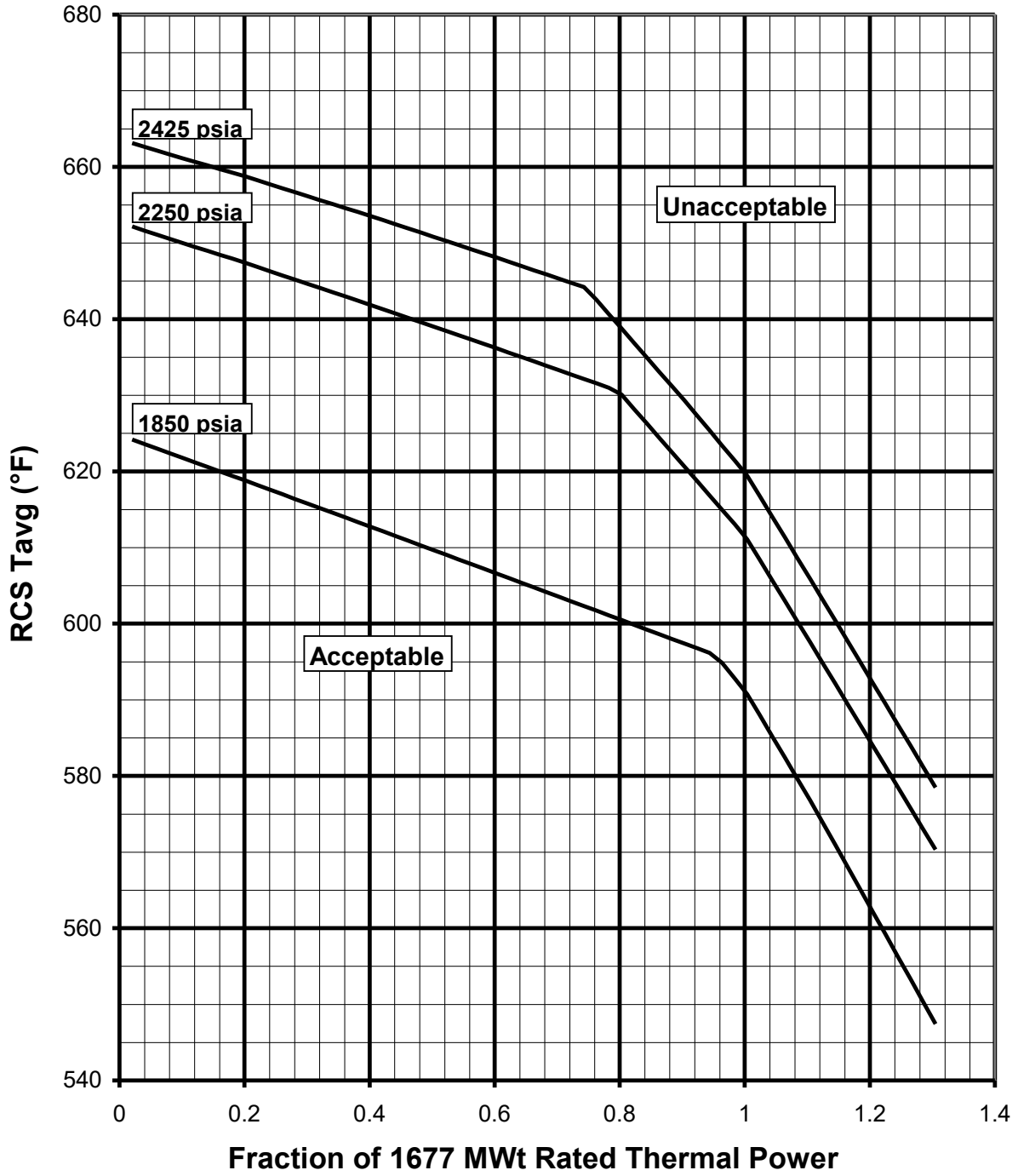
Values may be interpolated to the surveillance cycle burnup. The R<sub>J</sub> factor value for the last burnup step shall be used for all burnups greater than the last burnup step.

**Table 11: Required THERMAL POWER Limits and AFD Reductions for Flexible Power  
Operation**

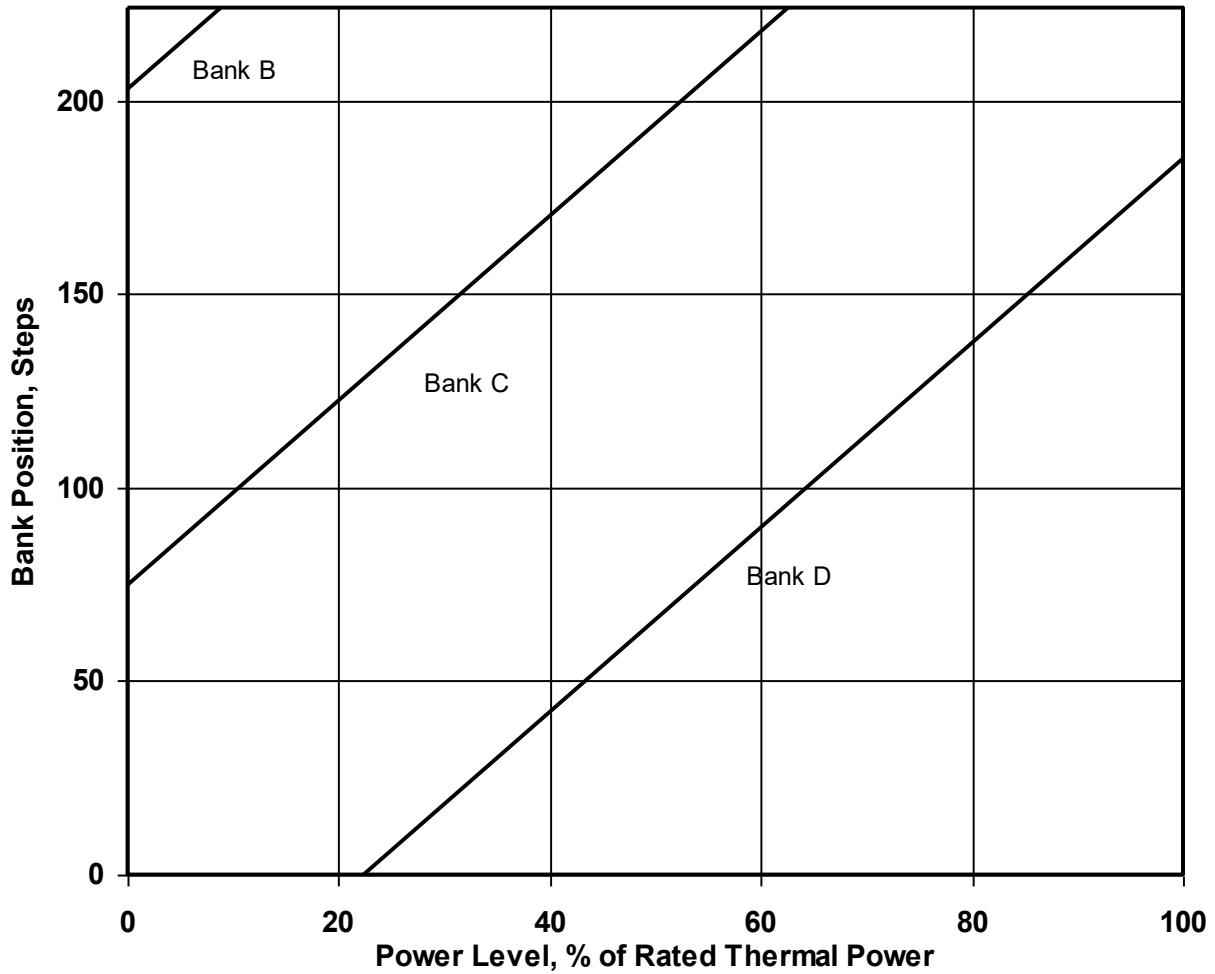
(Not Used. See Table 6 for all operation.)

Figure 1

### Reactor Core Safety Limits



**Figure 2**  
**Rod Insertion Limit, 128 Step Tip-to-Tip**

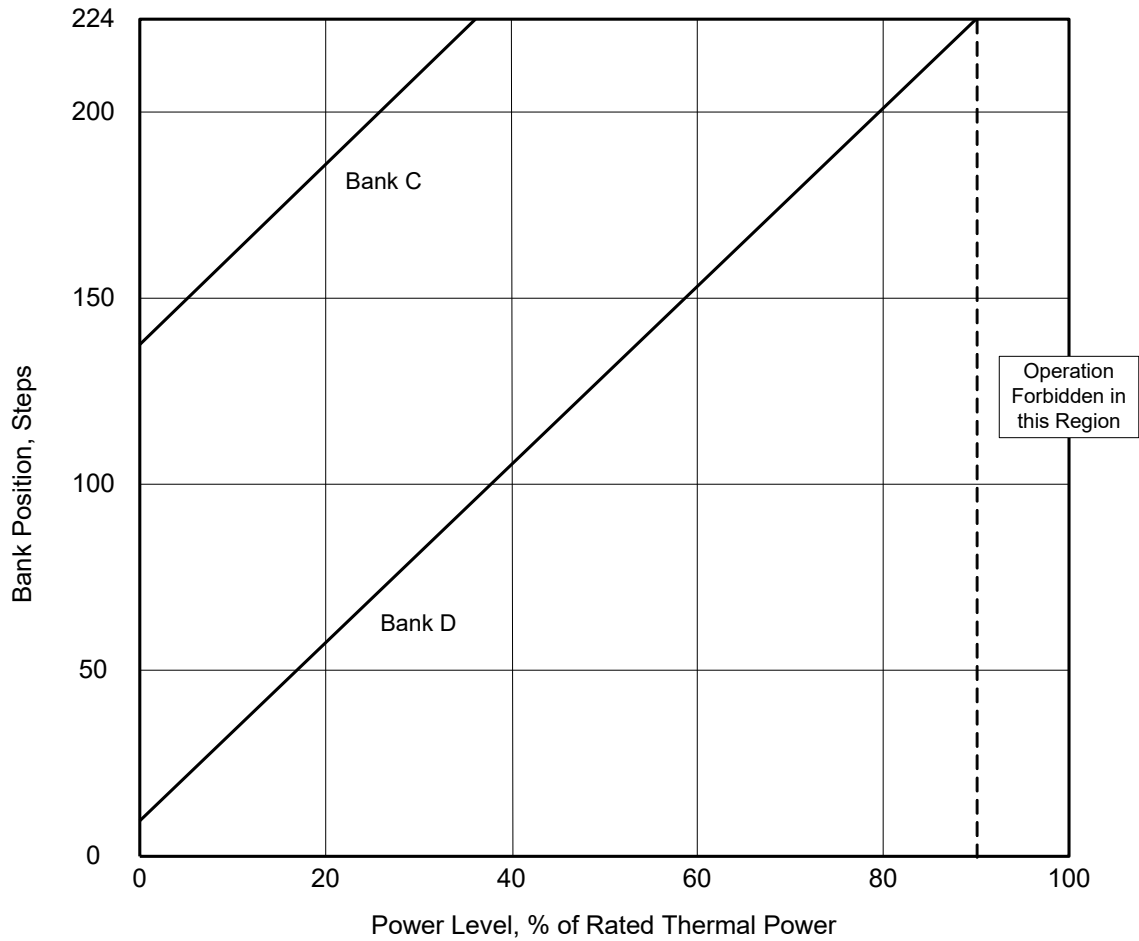


Bank Positions Given By:

- Bank D =  $(150 / 63) * (P - 100) + 185$
- Bank C =  $(150 / 63) * (P - 100) + 185 + 128$
- Bank B =  $(150 / 63) * (P - 100) + 185 + 128 + 128$

NOTE: The top of the active fuel height corresponds to 224 steps.

**Figure 3**  
**Rod Insertion Limit, 128 Step Tip-to-Tip, One Bottomed Rod**  
**(Technical Specification 3.1.4, Condition B)**



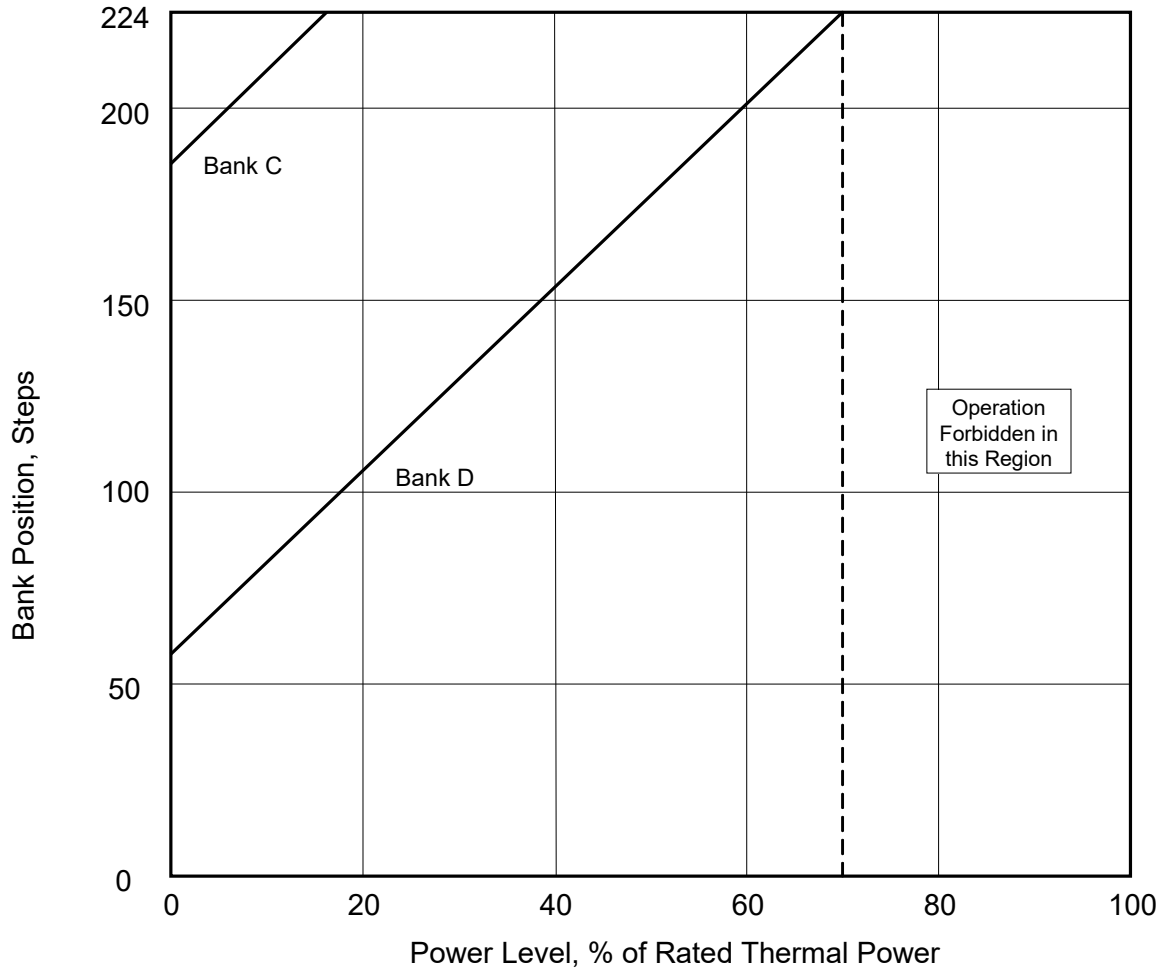
Bank Positions Given By:

- Bank D =  $(150 / 63) * (P - 90) + 224$
- Bank C =  $(150 / 63) * (P - 90) + 224 + 128$

NOTE: The top of the active fuel height corresponds to 224 steps.



**Figure 4**  
**Rod Insertion Limit, 128 Step Tip-to-Tip, One Inoperable Rod**  
**(Technical Specification 3.1.4, Condition A)**

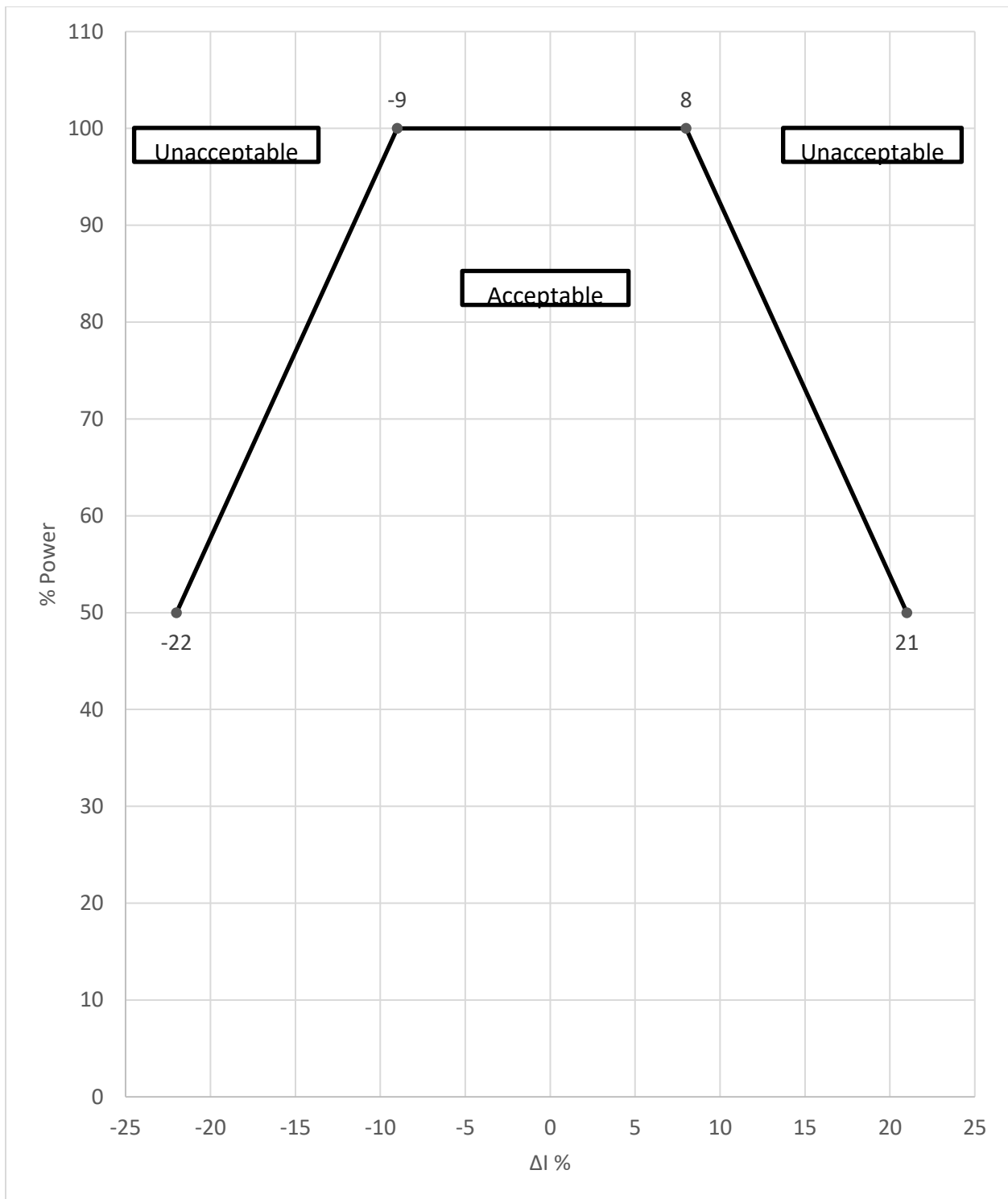


Bank Positions Given By:

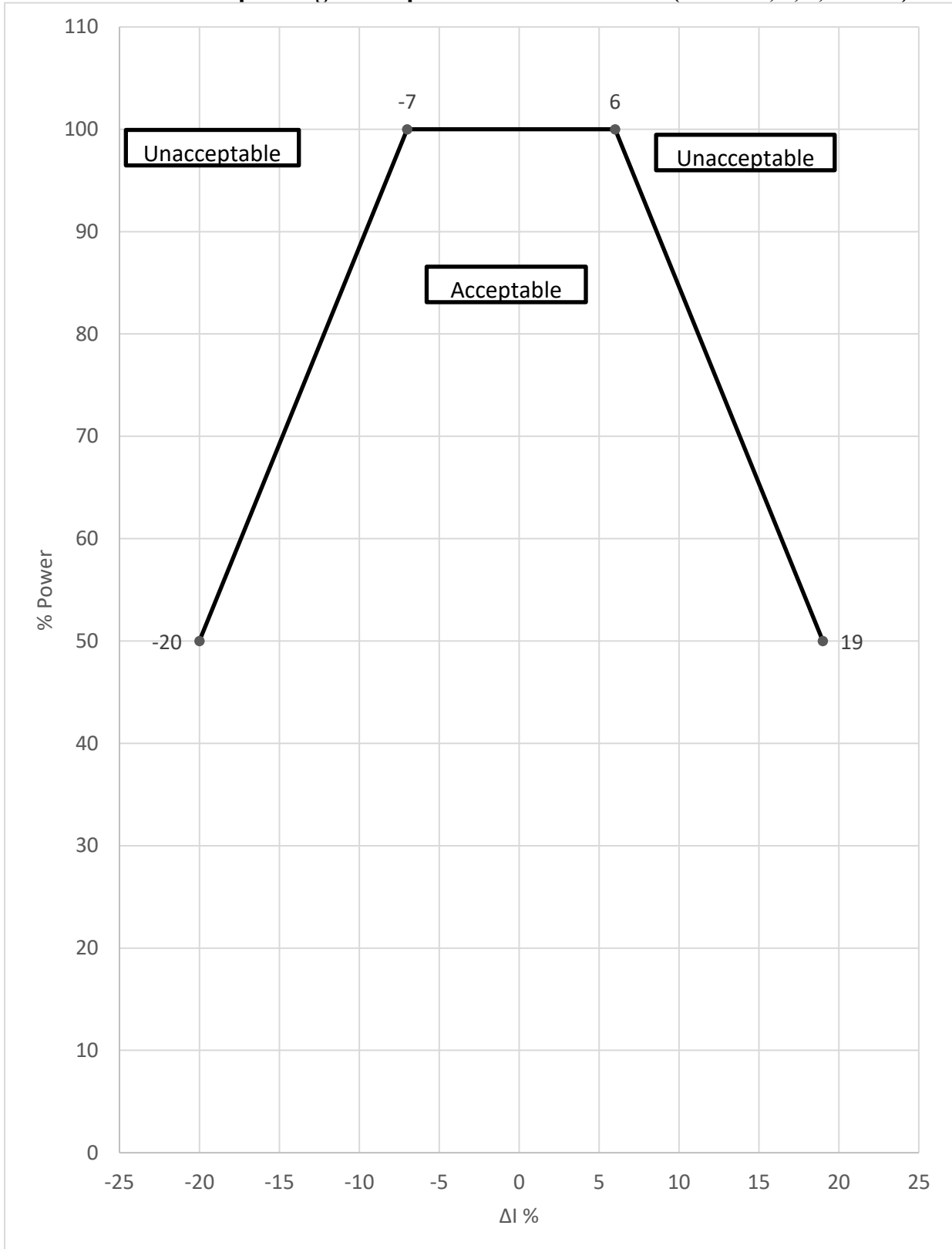
- Bank D =  $(150 / 63) * (P - 70) + 224$
- Bank C =  $(150 / 63) * (P - 70) + 224 + 128$

NOTE: The top of the active fuel height corresponds to 224 steps.

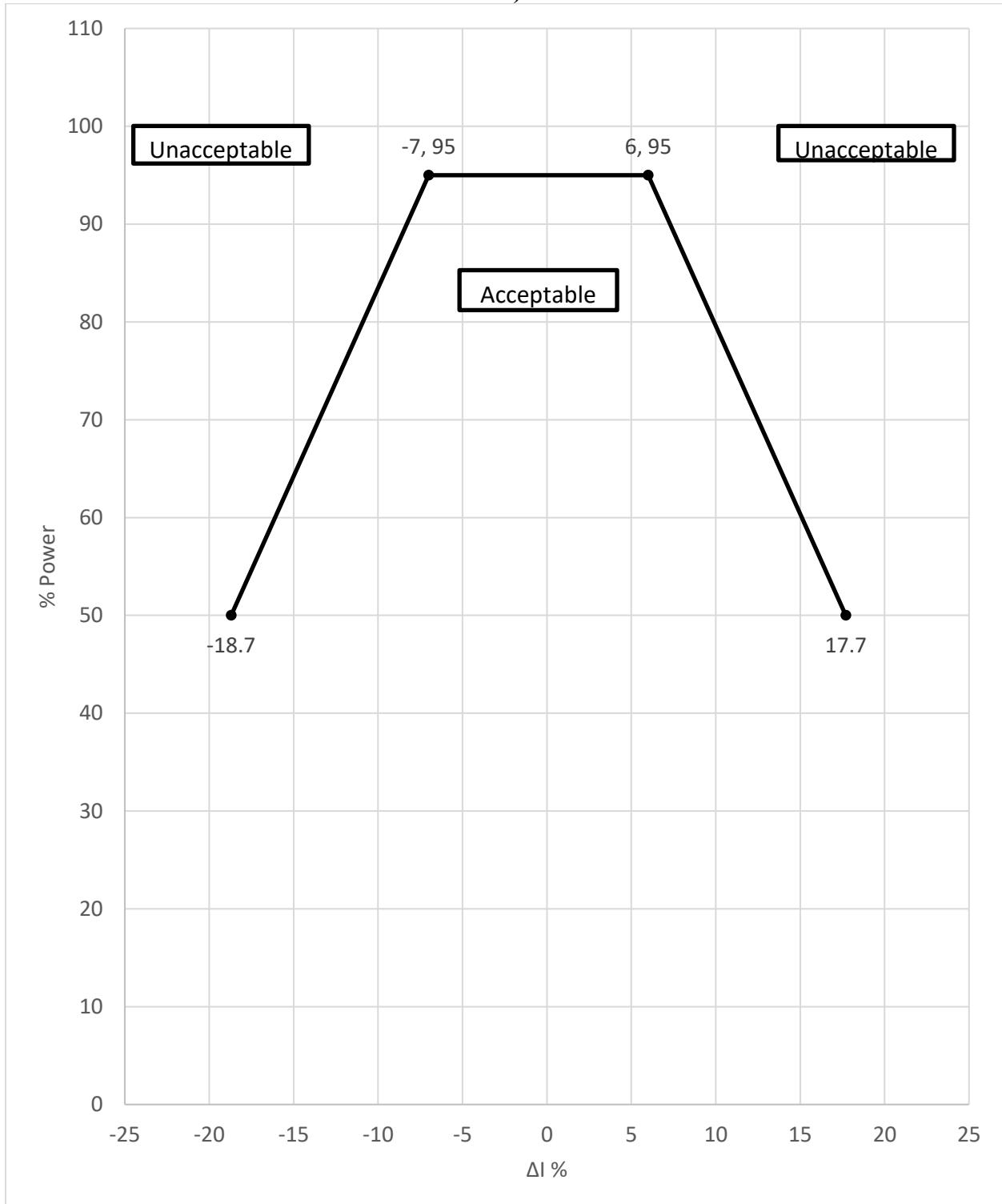
**Figure 5**  
**Flux Difference Operating Envelope associated with ROS1 (Tables 2, 3, 7, and 8)**



**Figure 6**  
**Flux Difference Operating Envelope associated with ROS2 (Tables 4, 5, 9, and 10)**



**Figure 7**  
**Flux Difference Operating Envelope associated with**  
**ROS2 95% THERMAL POWER Required Action (Tables 6 or 11 and Tables 4, 5, 9 and**  
**10)**



**Figure 8**  
**Flux Difference Operating Envelope associated with**  
**ROS2 90% THERMAL POWER Required Action (Tables 6 or 11 and Tables 4, 5, 9 and**  
**10)**

