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U. S. Nuclear Regulatory Commission
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Subject: McGuire Nuclear Station,
Docket No.50-369, 50-370
Units 1 and 2, Cycle 14
Core Operating Limits Report (COLR)

Pursuant to McGuire Technical Specification 5.6.5.d, please find enclosed the McGuire Unit 1 and Unit 2, Cycle 14 Core Operating Limits Reports (COLR).

The COLRs were issued upon implementation of License Amendment No. 188 and 195 to Facility Operating License NPF-9 and Amendment No. 169 and 176 to Facility Operating License NPF-17. These amendments revised the Technical Specifications to permit use of Westinghouse Robust Fuel Assemblies and to reference the Best Estimate Large Break Loss-of-Coolant Accident (LOCA) analysis methodology described in WCAP-12945-P-A, March 1998.

Questions regarding this submittal should be directed to Kay Crane, McGuire Regulatory Compliance at (704) 875-4306.

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Attachment

A001

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McGuire Unit 1 Cycle 14

Core Operating Limits Report
Revision 19

September 2000

Calculation Number: MCC-1553.05-00-0310, Rev. 1

Duke Power Company

		Date
Prepared By:	David E. Bortz	9/12/00
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QA Condition 1

The contents of this document have been reviewed to verify that no material herein invalidates the results or conclusions presented in the 10CFR50.59 McGuire 1 Cycle 14 Reload Safety Evaluation (Calculation File: MCC-1552.08-00-0304.)

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IMPLEMENTATION INSTRUCTIONS FOR REVISION 19

Revision 19 of the McGuire Unit 1 COLR relocates the 31 EFPD peaking penalty factor from Technical Specifications 3.2.1 and 3.2.2 to the COLR, consistent with license Amendment 188. This revision also adds a clarification statement to the Shutdown Bank Insertion Limit criterion in Section 2.4.1, adds Control bank withdrawal and overlap limits in COLR Table A1 and updates Selected Licensing Commitment (SLC) cross reference numbers to reflect current values specified in UFSAR Chapter 16.

This revision should be issued before or concurrently with Amendment No. 188 of the McGuire Unit 1 Technical Specifications.

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REVISION LOG

Revision	Effective Date	Effective Pages	COLR
Revisions 0-3	Superseded	N/A	M1C09
Revisions 4-8	Superseded	N/A	M1C10
Revisions 9-11	Superseded	N/A	M1C11
Revisions 12-15	Superseded	N/A	M1C12
Revisions 16-17	Superseded	N/A	M1C13
Revision 18	September 21, 1999	6, 8-11, 13-14, 15, 17-21	M1C14
Revision 19	September 12, 2000	1-5, 7, 7a-d, 12, 14a, 16, 22 and 23	M1C14 (Rev. 1)

McGuire 1 Cycle 14 Core Operating Limits Report

INSERTION SHEET FOR REVISION 19

Remove pages	Insert Rev. 19 pages
Pages 1-5, 7, 12, 16, 22 and 23	Pages 1-5, 7, 7a-d, 12, 14a, 16, 22 and 23

McGuire 1 Cycle 14 Core Operating Limits Report

1.0 Core Operating Limits Report

This Core Operating Limits Report (COLR) has been prepared in accordance with the requirements of the Technical Specification 5.6.5.

The Technical Specifications that reference this report are listed below:

TS Section	Technical Specifications	Section	Page
1.1	Requirements for Operational Mode 6	2.1	5
3.1.1	Shutdown Margin (Additional Entry points from TS 3.1.4, TS 3.1.5 and TS 3.1.6)	2.2	6
3.1.3	Moderator Temperature Coefficient	2.3	6
3.1.5	Shutdown Bank Insertion Limit	2.4	7
3.1.6	Control Bank Insertion Limit	2.5	7
3.2.1	Heat Flux Hot Channel Factor	2.6	10
3.2.2	Nuclear Enthalpy Rise Hot Channel Factor	2.7	15
3.2.3	Axial Flux Difference	2.8	16
3.3.1	Reactor Trip System Instrumentation Setpoint	2.9	18
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3.5.4	Refueling Water Storage Tank	2.11	20
3.7.14	Spent Fuel Pool Boron Concentration	2.12	21
3.9.1	Refueling Operations - Boron Concentration	2.13	21

The Selected Licensee Commitments that reference this report are listed below:

SLC Section	Selected License Commitment	Section	Page
16.9.14	Borated Water Source – Shutdown	2.14	22
16.9.11	Borated Water Source – Operating	2.15	23

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 NRC approved methodologies specified in Technical Specification 5.6.5.

2.1 Requirements for Operational Mode 6

The following condition is required for operational mode 6.

2.1.1 The Reactivity Condition requirement for operational mode 6 is that k_{eff} must be less than, or equal to 0.95.

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2.2 Shutdown Margin - SDM (TS 3.1.1, TS 3.1.4, TS 3.1.5, and TS 3.1.6)

2.2.1 For TS 3.1.1, SDM shall be ≥ 1.3% ΔK/K in mode 2 with k-eff < 1.0 and in modes 3 and 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 ≥ 1.3% ΔK/K in modes 1 and 2

2.2.4 For TS 3.1.5, SDM shall be ≥ 1.3% ΔK/K in mode 1 and mode 2 with any control bank not fully inserted.

2.2.5 For TS 3.1.6, SDM shall be ≥ 1.3% ΔK/K in mode 1 and mode 2 with K-eff ≥ 1.0.

2.3 Moderator Temperature Coefficient - MTC (TS 3.1.3)

2.3.1 The Moderator Temperature Coefficient (MTC) Limits are:

The MTC shall be less positive than the upper limits shown in Figure 1. The BOC, ARO, HZP MTC shall be less positive than 0.7E-04 ΔK/K/°F.

The EOC, ARO, RTP MTC shall be less negative than the -4.1E-04 ΔK/K/°F lower MTC limit.

2.3.2 The 300 PPM MTC Surveillance Limit is:

The measured 300 PPM ARO, equilibrium RTP MTC shall be less negative than or equal to -3.2E-04 ΔK/K/°F.

2.2.3 The 60 PPM MTC Surveillance Limit is:

The 60 PPM ARO, equilibrium RTP MTC shall be less negative than or equal to -3.85E-04 ΔK/K/°F.

Where: BOC = Beginning of Cycle
EOC = End of Cycle
ARO = All Rods Out
HZP = Hot Zero Power
RTP = Rated Thermal Power
PPM = Parts per million (Boron)

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2.4 Shutdown Bank Insertion Limit (TS 3.1.5)

2.4.1 Each shutdown bank shall be withdrawn to at least 222 steps. Shutdown banks are withdrawn in sequence and with no overlap.

2.5 Control Bank Insertion Limits (TS 3.1.6)

2.5.1 Control banks shall be within the insertion, sequence, and overlap limits shown in Figure 2. Specific control bank withdrawal and overlap limits as a function of the fully withdrawn position are shown in Table A1.

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Table A1
RCCA Withdrawal Steps and Sequence

A. RCCAs Fully Withdrawn at 222 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
222 Stop	106	0	0
222	116	0 Start	0
222	222 Stop	106	0
222	222	116	0 Start
222	222	222 Stop	106

B. RCCAs Fully Withdrawn at 223 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
223 Stop	107	0	0
223	116	0 Start	0
223	223 Stop	107	0
223	223	116	0 Start
223	223	223 Stop	107

C. RCCAs Fully Withdrawn at 224 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
224 Stop	108	0	0
224	116	0 Start	0
224	224 Stop	108	0
224	224	116	0 Start
224	224	224 Stop	108

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Table A1
RCCA Withdrawal Steps and Sequence Continued

D. RCCAs Fully Withdrawn at 225 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
225 Stop	109	0	0
225	116	0 Start	0
225	225 Stop	109	0
225	225	116	0 Start
225	225	225 Stop	109

E. RCCAs Fully Withdrawn at 226 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
226 Stop	110	0	0
226	116	0 Start	0
226	226 Stop	110	0
226	226	116	0 Start
226	226	226 Stop	110

F. RCCAs Fully Withdrawn at 227 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
227 Stop	111	0	0
227	116	0 Start	0
227	227 Stop	111	0
227	227	116	0 Start
227	227	227 Stop	111

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Table A1
RCCA Withdrawal Steps and Sequence Continued

G. RCCAs Fully Withdrawn at 228 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
228 Stop	112	0	0
228	116	0 Start	0
228	228 Stop	112	0
228	228	116	0 Start
228	228	228 Stop	112

H. RCCAs Fully Withdrawn at 229 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
229 Stop	113	0	0
229	116	0 Start	0
229	229 Stop	113	0
229	229	116	0 Start
229	229	229 Stop	113

I. RCCAs Fully Withdrawn at 230 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
230 Stop	114	0	0
230	116	0 Start	0
230	230 Stop	114	0
230	230	116	0 Start
230	230	230 Stop	114

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Table A1
RCCA Withdrawal Steps and Sequence Continued

J. RCCAs Fully Withdrawn at 231 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
231 Stop	115	0	0
231	116	0 Start	0
231	231 Stop	115	0
231	231	116	0 Start
231	231	231 Stop	115

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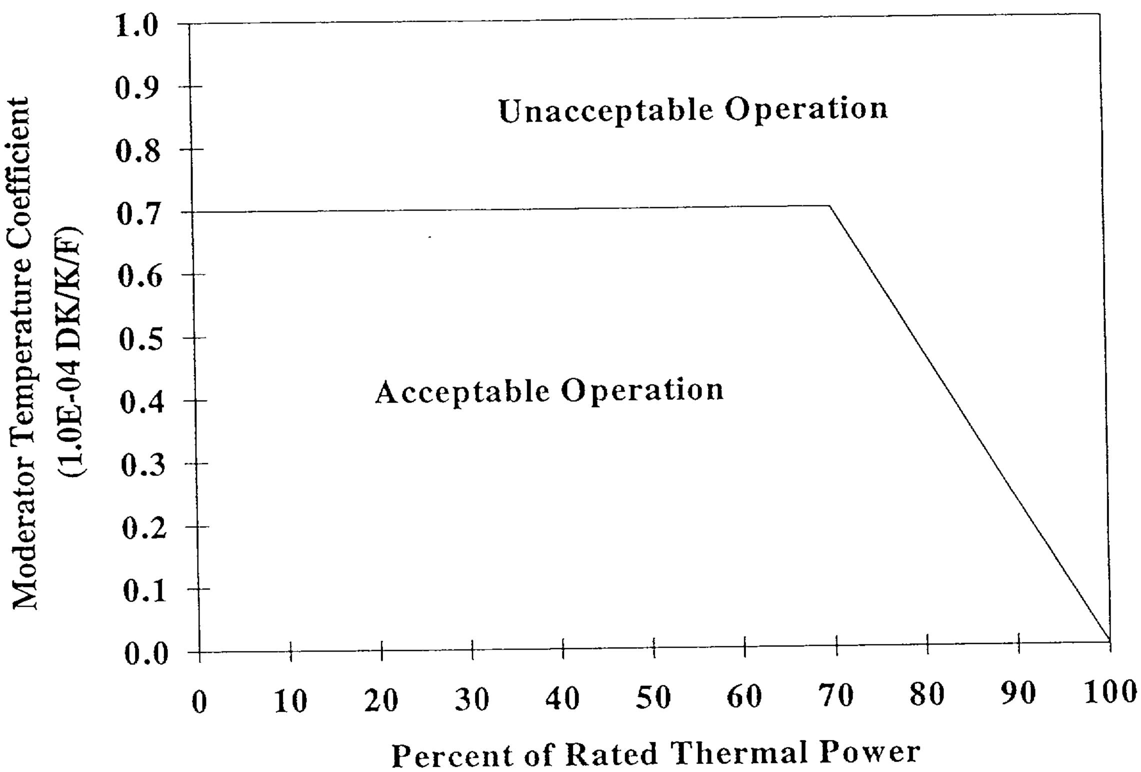
Figure 1

Moderator Temperature Coefficient Upper Limit Versus Power Level



NOTE: Compliance with Technical Specification 3.1.3 may require rod withdrawal limits. Refer to OP/1/A/6100/22 Unit 1 Data Book for details.

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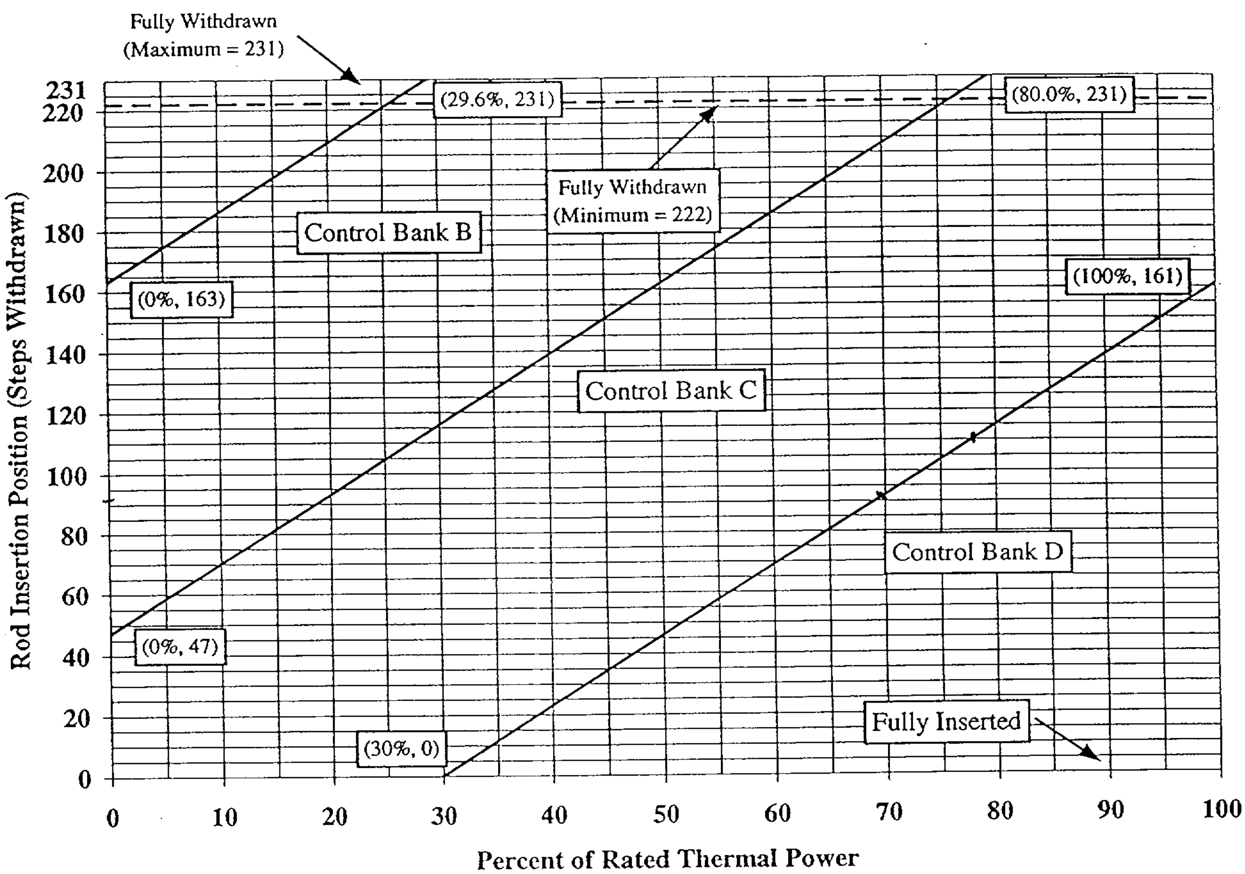
Figure 2

Control Bank Insertion Limits Versus Percent Rated Thermal Power



NOTE: Compliance with Technical Specification 3.1.3 may require rod withdrawal limits. Refer to OP/1/A/6100/22 Unit 1 Data Book for details.

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2.6 Heat Flux Hot Channel Factor - $F_Q(X,Y,Z)$ (TS 3.2.1)

2.6.1 $F_Q(X,Y,Z)$ steady-state limits are defined by the following relationships:

$$F_Q^{RTP} * K(Z)/P \quad \text{for } P > 0.5$$

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

where,

P = (Thermal Power)/(Rated Power)

Note: The measured $F_Q(X,Y,Z)$ shall be increased by 3% to account for manufacturing tolerances and 5% to account for measurement uncertainty when comparing against the LCO limits. The manufacturing tolerance and measurement uncertainty are implicitly included in the F_Q surveillance limits as defined in COLR Sections 2.6.5 and 2.6.6.

2.6.2 $F_Q^{RTP} = 2.50 \times K(BU)$

2.6.3 K(Z) is the normalized $F_Q(X,Y,Z)$ as a function of core height for MkBW fuel and is provided in Figure 3.

2.6.4 K(BU) is the normalized $F_Q(X,Y,Z)$ as a function of burnup for MkBW fuel and is provided in Figure 4.

The following parameters are required for core monitoring per the Surveillance Requirements of Technical Specification 3.2.1:

2.6.5 $$F_Q^L(X,Y,Z)^{OP} = \frac{F_Q^D(X,Y,Z) * M_Q(X,Y,Z)}{UMT * MT * TILT}$$

where:

$F_Q^L(X,Y,Z)^{OP}$ = Cycle dependent maximum allowable design peaking factor that ensures that the $F_Q(X,Y,Z)$ LOCA limit will be preserved for operation within the LCO limits. $F_Q^L(X,Y,Z)^{OP}$ includes allowances for calculation and measurement uncertainties.

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$F_Q^D(X,Y,Z)$ = Design power distribution for F_Q. $F_Q^D(X,Y,Z)$ is provided in Table 1, Appendix A, for normal operating conditions and in Table 2, Appendix A for power escalation testing during initial startup operation.

$M_Q(X,Y,Z)$ = Margin remaining in core location X,Y,Z to the LOCA limit in the transient power distribution. $M_Q(X,Y,Z)$ is provided in Table 1, Appendix A for normal operating conditions and in Table 2, Appendix A for power escalation testing during initial startup operation.

UMT = Total Peak Measurement Uncertainty. (UMT = 1.05)

MT = Engineering Hot Channel Factor. (MT = 1.03)

TILT = Peaking penalty that accounts for the peaking increase from an allowable quadrant power tilt ratio of 1.02. (TILT = 1.035)

NOTE: $F_Q^L(X,Y,Z)^{OP}$ is the parameter identified as $F_Q^{MAX}(X,Y,Z)$ in DPC-NE-2011PA.

2.6.6 $$F_Q^L(X,Y,Z)^{RPS} = \frac{F_Q^D(X,Y,Z) * M_C(X,Y,Z)}{UMT * MT * TILT}$$

where:

$F_Q^L(X,Y,Z)^{RPS}$ = Cycle dependent maximum allowable design peaking factor that ensures that the $F_Q(X,Y,Z)$ Centerline Fuel Melt (CFM) limit will be preserved for operation within the LCO limits. $F_Q^L(X,Y,Z)^{RPS}$ includes allowances for calculation and measurement uncertainties.

$F_Q^D(X,Y,Z)$ = Design power distributions for F_Q. $F_Q^D(X,Y,Z)$ is provided in Table 1, Appendix A for normal operating conditions and in Table 2, Appendix A for power escalation testing during initial startup operation.

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$M_C(X,Y,Z)$ = Margin remaining to the CFM limit in core location X,Y,Z from the transient power distribution. $M_C(X,Y,Z)$ calculations parallel the $M_Q(X,Y,Z)$ calculations described in DPC-NE-2011PA, except that the LOCA limit is replaced with the CFM limit. $M_C(X,Y,Z)$ is provided in Table 3, Appendix A for normal operating conditions and in Table 4, Appendix A for power escalation testing during initial startup operation.

UMT = Total Peak Measurement Uncertainty (UMT = 1.05)

MT = Engineering Hot Channel Factor (MT = 1.03)

TILT = Peaking penalty that accounts for the peaking increase for an allowable quadrant power tilt ratio of 1.02. (TILT = 1.035)

NOTE: $F_Q^L(X,Y,Z)^{RPS}$ is the parameter identified as $F_Q^{MAX}(X,Y,Z)$ in DPC-NE-2011PA, except that $M_Q(X,Y,Z)$ is replaced by $M_C(X,Y,Z)$.

2.6.7 KSLOPE = 0.0725

where:

KSLOPE is the adjustment to the K_1 value from OTΔT trip setpoint required to compensate for each 1% that $F_Q^M(X,Y,Z)$ exceeds $F_Q^L(X,Y,Z)^{RPS}$.

2.6.8 $F_Q(X,Y,Z)$ penalty factors for Technical Specification Surveillance's 3.2.1.2 and 3.2.1.3 are provided in Table B1.

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Figure 3

K(Z), Normalized $F_Q(X,Y,Z)$ as a Function of Core Height for MkBW Fuel

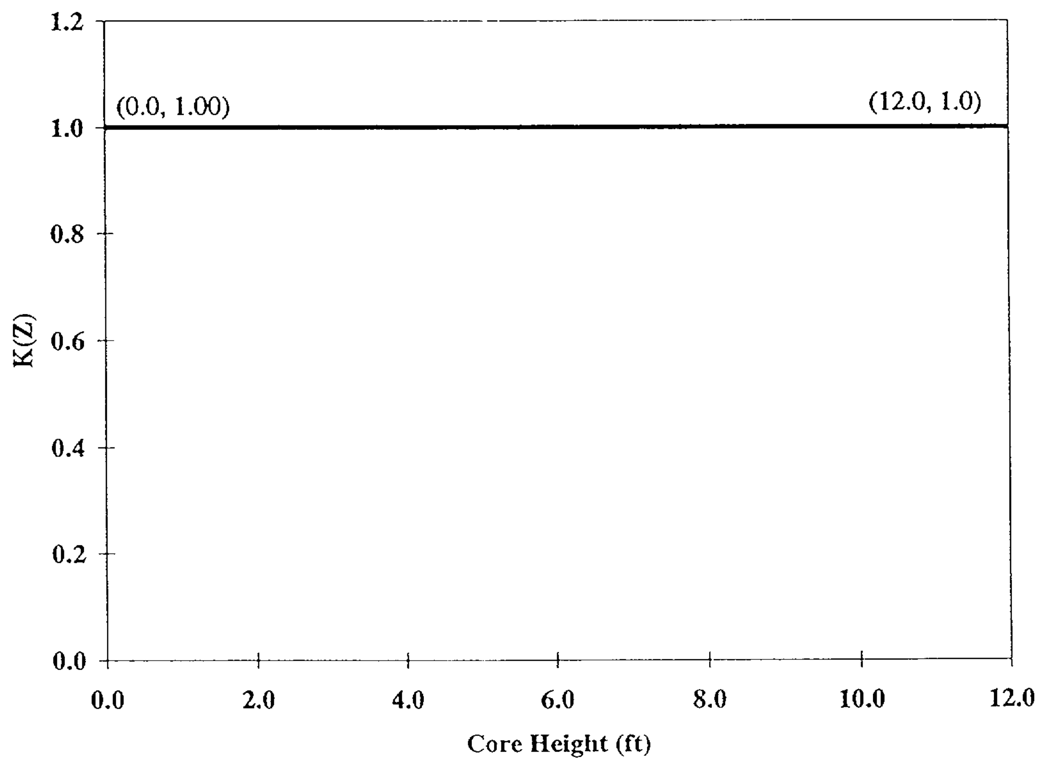

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Figure 4

K(BU), Normalized $F_Q(X,Y,Z)$ as a Function of Burnup for MkBW Fuel

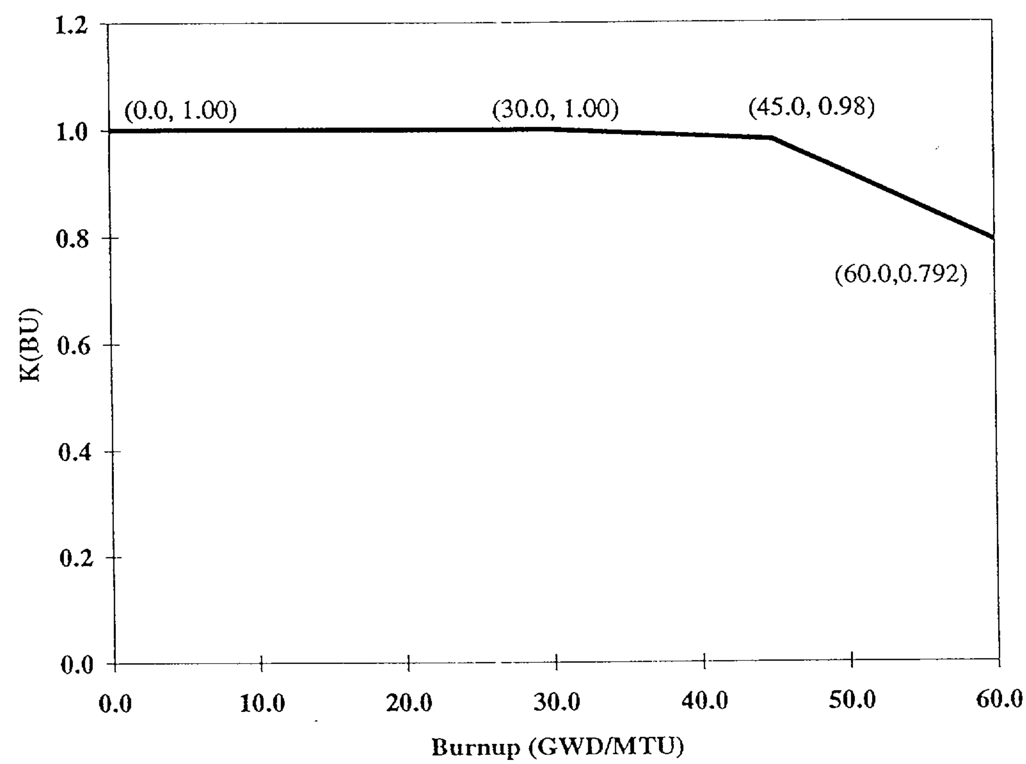

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Table B1
$F_Q(X,Y,Z)$ and $F_{\Delta H}(X,Y)$ Penalty Factors
For Technical Specification Surveillance's 3.2.1.2, 3.2.1.3 and 3.2.2.2

Burnup (EFPD)	$F_Q(X,Y,Z)$ Penalty Factor (%)	$F_{\Delta H}(X,Y,Z)$ Penalty Factor (%)
0	2.00	2.00
4	2.00	2.00
12	2.00	2.00
50	2.00	2.00
100	2.00	2.00
150	2.00	2.00
200	2.00	2.00
250	2.00	2.00
300	2.00	2.00
350	2.00	2.00
400	2.00	2.00
450	2.00	2.00
480	2.00	2.00

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2.7 Nuclear Enthalpy Rise Hot Channel Factor - $F_{\Delta H}(X,Y)$ (TS 3.2.2)

The $F_{\Delta H}$ steady-state limits referred to in Technical Specification 3.2.2 is defined by the following relationship.

2.7.1 $$F^{L}_{\Delta H}(X,Y)^{LCO} = MARP(X,Y) * \left[1.0 + \frac{1}{RRH} * (1.0 - P)\right]$$

where:

$F^{L}_{\Delta H}(X,Y)^{LCO}$ is defined as the steady-state, maximum allowed radial peak. $F^{L}_{\Delta H}(X,Y)^{LCO}$ includes allowances for calculation - measurement uncertainty.

MARP(X,Y) = Cycle-specific operating limit Maximum Allowable Radial Peaks. MARP(X,Y) radial peaking limits are provided in Table 7, Appendix A.

$$P = \frac{\text{Thermal Power}}{\text{Rated Thermal Power}}$$

RRH = Thermal Power reduction required to compensate for each 1% that the measured radial peak, $F^{M}_{\Delta H}(X,Y)$, exceeds the limit.
RRH = 3.34 $(0.0 < P \le 1.0)$

The following parameters are required for core monitoring per the Surveillance requirements of Technical Specification 3.2.2.

2.7.2 $$F^{L}_{\Delta H}(X,Y)^{SURV} = \frac{F^{D}_{\Delta H}(X,Y) \times M_{\Delta H}(X,Y)}{UMR \times TILT}$$

where:

$F^{L}_{\Delta H}(X,Y)^{SURV}$ = Cycle dependent maximum allowable design peaking factor that ensures that the $F_{\Delta H}(X,Y)$ limit will be preserved for operation within the LCO limits. $F^{L}_{\Delta H}(X,Y)^{SURV}$ includes allowances for calculation - measurement uncertainty.

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$F^{D}_{\Delta H}$ (X,Y) = Design radial power distribution for $F_{\Delta H}$. $F^{D}_{\Delta H}$ (X,Y) is provided in Table 5, Appendix A for normal operation and in Table 6, Appendix A for power escalation testing during initial startup operation.

$M_{\Delta H}$(X,Y) = The margin remaining in core location X,Y relative to the Operational DNB limits in the transient power distribution. $M_{\Delta H}$(X,Y) is provided in Table 5, Appendix A for normal operation and in Table 6, Appendix A for power escalation testing during initial startup operation.

UMR = Uncertainty value for measured radial peaks, (UMR is set 1.0 since a factor of 1.04 is implicitly included in the variable $M_{\Delta H}$(X,Y)).

TILT = Peaking penalty that accounts for the peaking increase for an allowable quadrant power tilt ratio of 1.02, (TILT = 1.035).

NOTE: $F^{L}_{\Delta H}(X,Y)^{SURV}$ is the parameter identified as $F_{\Delta H}(X,Y)^{MAX}$ in DPC-NE-2011PA.

2.7.3 RRH = 3.34

where:

RRH = Thermal power reduction required to compensate for each 1% that the measured radial peak, $F^{M}_{\Delta H}$ (X,Y) exceeds its limit.

2.7.4 TRH = 0.04

where:

TRH = Reduction in OTΔT K_1 setpoint required to compensate for each 1% that the measured radial peak, $F_{\Delta H}$ (X,Y) exceeds its limit.

2.7.5 $F_{\Delta H}$(X,Y) penalty factors for Technical Specification Surveillance 3.2.2.2 are provided in Table B1.

2.8 Axial Flux Difference – AFD (TS 3.2.3)

2.8.1 The Axial Flux Difference (AFD) Limits are provided in Figure 5.

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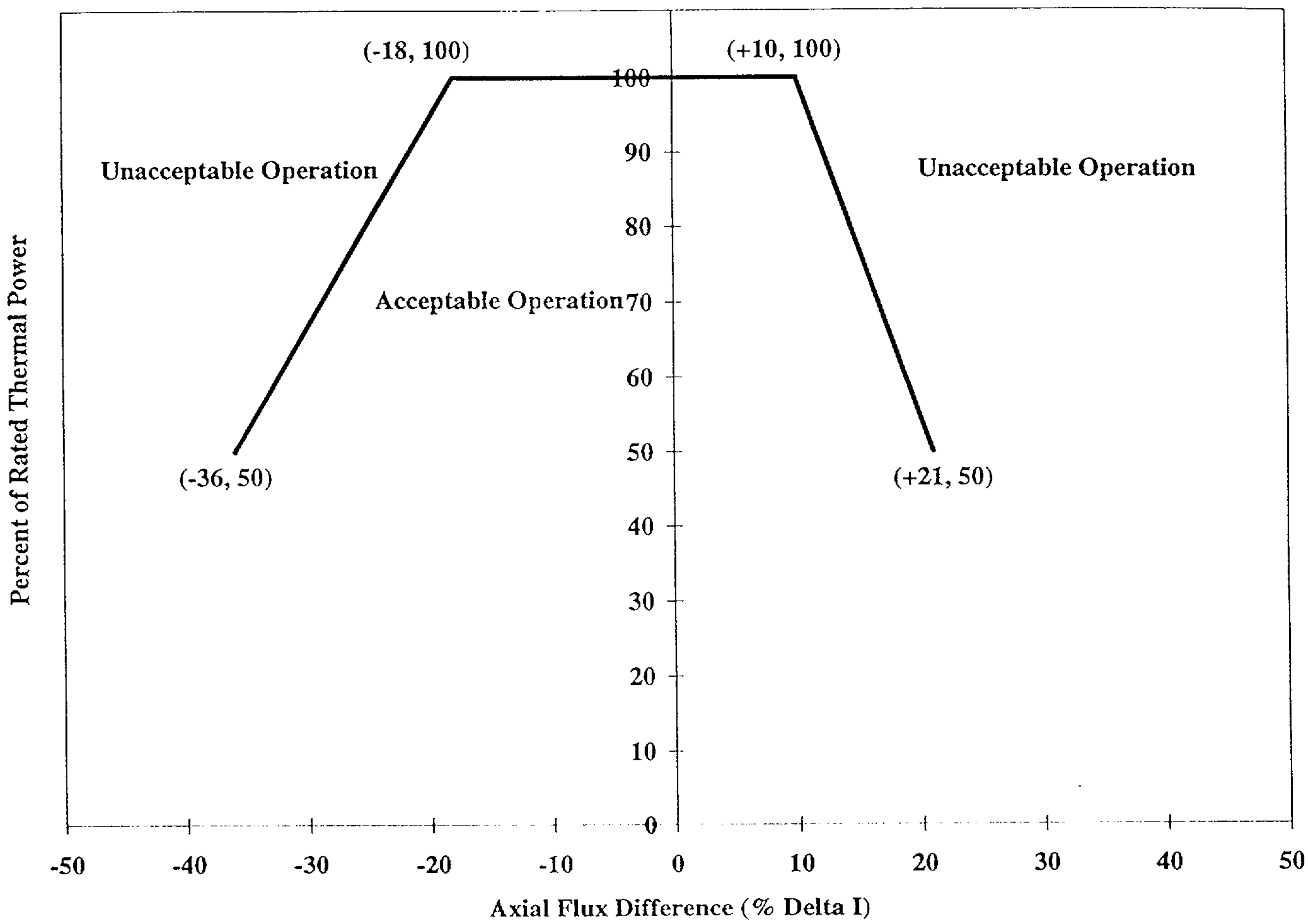
Figure 5

Percent of Rated Thermal Power Versus Percent Axial Flux Difference Limits



NOTE: Compliance with Technical Specification 3.2.1 may require more restrictive AFD limits. Refer to OP/1/A/6100/22 Unit 1 Data Book of more details.

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2.9 Reactor Trip System Instrumentation Setpoints (TS 3.3.1) Table 3.3.1-1

2.9.1 Overtemperature ΔT Setpoint Parameter Values

Parameter	Value
Overtemperature ΔT reactor trip setpoint	$K_1 \leq 1.1978$
Overtemperature ΔT reactor trip heatup setpoint penalty coefficient	$K_2 = 0.0334/^oF$
Overtemperature ΔT reactor trip depressurization setpoint penalty coefficient	$K_3 = 0.001601/psi$
Time constants utilized in the lead-lag compensator for ΔT	$\tau_1 \geq 8$ sec. $\tau_2 \leq 3$ sec.
Time constant utilized in the lag compensator for ΔT	$\tau_3 \leq 2$ sec.
Time constants utilized in the lead-lag compensator for T_{avg}	$\tau_4 \geq 28$ sec. $\tau_5 \leq 4$ sec.
Time constant utilized in the measured T_{avg} lag compensator	$\tau_6 \leq 2$ sec.
$f_1(\Delta I)$ "positive" breakpoint	= 19.0 %ΔI
$f_1(\Delta I)$ "negative" breakpoint	= N/A*
$f_1(\Delta I)$ "positive" slope	= 1.769 $\%\Delta T_0/\ \%\Delta I$
$f_1(\Delta I)$ "negative" slope	= N/A*

* The $f_1(\Delta I)$ "negative" breakpoint and the $f_1(\Delta I)$ "negative" slope are not applicable since the $f_1(\Delta I)$ function is not required below the $f_1(\Delta I)$ "positive" breakpoint of 19.0% ΔI.

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2.9.2 Overpower ΔT Setpoint Parameter Values

Parameter	Value
Overpower ΔT reactor trip setpoint	$K_4 \leq 1.086359$
Overpower ΔT reactor trip heatup setpoint penalty coefficient	$K_6 = 0.001179/^oF$
Time constants utilized in the lead-lag compensator for ΔT	$\tau_1 \geq 8$ sec. $\tau_2 \leq 3$ sec.
Time constant utilized in the lag compensator for ΔT	$\tau_3 \leq 2$ sec.
Time constant utilized in the measured T_{avg} lag compensator	$\tau_6 \leq 2$ sec.
Time constant utilized in the rate-lag controller for T_{avg}	$\tau_7 \geq 5$ sec.
$f_2(\Delta I)$ "positive" breakpoint	= 35.0 %ΔI
$f_2(\Delta I)$ "negative" breakpoint	= -35.0 %ΔI
$f_2(\Delta I)$ "positive" slope	= 7.0 $\%\Delta T_0/\ \%\Delta I$
$f_2(\Delta I)$ "negative" slope	= 7.0 $\%\Delta T_0/\ \%\Delta I$

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2.10 Accumulators (TS 3.5.1)

2.10.1 Boron concentration limits during modes 1 and 2, and mode 3 with RCS pressure >1000 psi:

Parameter	Limit
Cold Leg Accumulator minimum boron concentration.	2,475 ppm
Cold Leg Accumulator maximum boron concentration.	2,875 ppm

2.11 Refueling Water Storage Tank - RWST (TS 3.5.4)

2.11.1 Boron concentration limits during modes 1, 2, 3, and 4:

Parameter	Limit
Refueling Water Storage Tank minimum boron concentration.	2,675 ppm
Refueling Water Storage Tank maximum boron concentration.	2,875 ppm

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2.12 Spent Fuel Pool Boron Concentration (TS 3.7.14)

2.12.1 Minimum boron concentration limit for the spent fuel pool. Applicable when fuel assemblies are stored in the spent fuel pool.

Parameter	Limit
Spent fuel pool minimum boron concentration.	2,675 ppm

2.13 Refueling Operations - Boron Concentration (TS 3.9.1)

2.13.1 Minimum boron concentration limit for the filled portions of the Reactor Coolant System, refueling canal, and refueling cavity for mode 6 conditions. The minimum boron concentration limit and plant refueling procedures ensure that the Keff of the core will remain within the mode 6 reactivity requirement of Keff $\leq$ 0.95.

Parameter	Limit
Minimum Boron concentration of the Reactor Coolant System, the refueling canal, and the refueling cavity.	2,675 ppm

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2.14 Borated Water Source – Shutdown (SLC 16.9.14)

2.14.1 Volume and boron concentrations for the Boric Acid Storage System and the Refueling Water Storage Tank (RWST) during modes 5 and 6.

Parameter	Limit
Boric Acid Storage System minimum contained borated water volume	8,884 gallons 10% Level
Boric Acid Storage System minimum boron concentration	7,000 ppm
Boric Acid Storage System minimum water volume required to maintain SDM at 7,000 ppm	585 gallons
Refueling Water Storage Tank minimum contained borated water volume	43,000 gallons 35 inches
Refueling Water Storage Tank minimum boron concentration	2,675 ppm
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,675 ppm	3,500 gallons

McGuire 1 Cycle 14 Core Operating Limits Report

2.15 Borated Water Source - Operating (SLC 16.9.11)

2.15.1 Volume and boron concentrations for the Boric Acid Storage System and the Refueling Water Storage Tank (RWST) during modes 1, 2, 3, and mode 4:

Parameter	Limit
Boric Acid Storage System minimum contained borated water volume	22,520 gallons 39.0% Level
Boric Acid Storage System minimum boron concentration	7,000 ppm
Boric Acid Storage System minimum water volume required to maintain SDM at 7,000 ppm	11,851 gallons
Refueling Water Storage Tank minimum contained borated water volume	96,607 gallons 103.6 inches
Refueling Water Storage Tank minimum boron concentration	2,675 ppm
Refueling Water Storage Tank maximum boron concentration (TS 3.5.4)	2875 ppm
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,675 ppm	57,107 gallons

NOTE: Data contained in the Appendix to this document was generated in the McGuire 1 Cycle 14 Maneuvering Analysis calculation file, MCC-1553.05-00-0289. The Plant Nuclear Engineering Section will control this information via computer file(s) and should be contacted if there is a need to access this information.

McGuire Unit 2 Cycle 14

Core Operating Limits Report
Revision 18

September 2000

Calculation Number: MCC-1553.05-00-0328

Duke Power Company

		Date
Prepared By:	David C Botz	9/18/00
Checked By:	Keith Cauthen	9/19/2000
Checked By:	Robert C Harvey	9/19/2000
Approved By:	P.M. Abraham	9/19/2000

QA Condition 1

McGuire 2 Cycle 14 Core Operating Limits Report

IMPLEMENTATION INSTRUCTIONS FOR REVISION 18

Revision 18 of the McGuire Unit 2 COLR contains limits specific to the McGuire Unit 2 Cycle 14 core and may become effective any time during the no-mode between Cycles 13 and 14 with the following restrictions.

This COLR revision incorporates a relocation of the 31 EFPD peaking penalty factor from Technical Specifications 3.2.1 and 3.2.2 to the COLR per the requirements of Technical Specification Amendment No. 169. Therefore, this revision of the COLR should be issued before or concurrently with Amendment No. 169 of the McGuire Unit 2 Technical Specifications.

This revision must become effective prior to entering Mode 6 that starts Cycle 14.

The implementation of the LOCA COLR limits is conditional upon the NRC approval of the BELOCA COLR method in Technical specification 5.6.5. The LOCA limits contained in Rev. 18 to the COLR are based on Appendix K ECCS methods. Due to an issue on Westinghouse Appendix K analyses, transition to a new BELOCA analysis is required. Analyses have been completed in MCC-1553.05-00-0323 to support this transition.

McGuire 2 Cycle 14 Core Operating Limits Report

REVISION LOG

Revision	Issuance Date	Effective Pages	COLR
Revisions 0-2	Superseded	N/A	M2C09
Revisions 3-6	Superseded	N/A	M2C10
Revisions 7-12	Superseded	N/A	M2C11
Revision 13-15	Superseded	N/A	M2C12
Revision 16-17	Superseded	N/A	M2C13
Revision 18	September 19, 2000	1-27	M2C14 - Orig. Issue

McGuire 2 Cycle 14 Core Operating Limits Report

INSERTION SHEET FOR REVISION 18

Remove pages	Insert Rev. 18 pages
Pages 1-23 and Appendix A	Pages 1-27 and Appendix A

McGuire 2 Cycle 14 Core Operating Limits Report

1.0 Core Operating Limits Report

This Core Operating Limits Report (COLR) has been prepared in accordance with the requirements of Technical Specification 5.6.5.

The Technical Specifications that reference this report are listed below:

TS Section	Technical Specifications	Section	Page
1.1	Requirements for Operational Mode 6	2.1	5
3.1.1	Shutdown Margin	2.2	6
3.1.3	Moderator Temperature Coefficient	2.3	6
3.1.4	Shutdown Margin	2.2	6
3.1.5	Shutdown Margin	2.2	6
3.1.5	Shutdown Bank Insertion Limit	2.4	7
3.1.6	Shutdown Margin	2.2	6
3.1.6	Control Bank Insertion Limit	2.5	7
3.2.1	Heat Flux Hot Channel Factor	2.6	12
3.2.2	Nuclear Enthalpy Rise Hot Channel Factor	2.7	18
3.2.3	Axial Flux Difference	2.8	19
3.3.1	Reactor Trip System Instrumentation Setpoint	2.9	22
3.5.1	Accumulators	2.10	24
3.5.4	Refueling Water Storage Tank	2.11	24
3.7.14	Spent Fuel Pool Boron Concentration	2.12	25
3.9.1	Refueling Operations – Boron Concentration	2.13	25

The Selected Licensee Commitments that reference this report are listed below:

SLC Section	Selected License Commitment	Section	Page
16.9.14	Borated Water Source – Shutdown	2.14	26
16.9.11	Borated Water Source – Operating	2.15	27

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 NRC approved methodologies specified in Technical Specification 5.6.5.

2.1 Requirements for Operational Mode 6

The following condition is required for operational mode 6.

2.1.1 The Reactivity Condition requirement for operational mode 6 is that k_{eff} must be less than, or equal to 0.95.

McGuire 2 Cycle 14 Core Operating Limits Report

2.2 Shutdown Margin - SDM (TS 3.1.1, TS 3.1.4, TS 3.1.5, and TS 3.1.6)

2.2.1 For TS 3.1.1, SDM shall be ≥ 1.3% ΔK/K in mode 2 with k-eff < 1.0 and in modes 3 and 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 ≥ 1.3% ΔK/K in modes 1 and 2.

2.2.4 For TS 3.1.5, SDM shall be ≥ 1.3% ΔK/K in mode 1 and mode 2 with any control bank not fully inserted.

2.2.5 For TS 3.1.6, SDM shall be ≥ 1.3% ΔK/K in mode 1 and mode 2 with K-eff ≥ 1.0.

2.3 Moderator Temperature Coefficient - MTC (TS 3.1.3)

2.3.1 The Moderator Temperature Coefficient (MTC) Limits are:

The MTC shall be less positive than the upper limits shown in Figure 1. The BOC, ARO, HZP MTC shall be less positive than 0.7E-04 ΔK/K/°F.

The EOC, ARO, RTP MTC shall be less negative than the -4.1E-04 ΔK/K/°F lower MTC limit.

2.3.2 The 300 ppm MTC Surveillance Limit is:

The measured 300 PPM ARO, equilibrium RTP MTC shall be less negative than or equal to -3.2E-04 ΔK/K/°F.

2.2.3 The 60 PPM MTC Surveillance Limit is:

The 60 PPM ARO, equilibrium RTP MTC shall be less negative than or equal to -3.85E-04 ΔK/K/°F.

Where: BOC = Beginning of Cycle
EOC = End of Cycle
ARO = All Rods Out
HZP = Hot Zero Power
RTP = Rated Thermal Power
PPM = Parts per million (Boron)

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2.4 Shutdown Bank Insertion Limit (TS 3.1.5)

2.4.1 Each shutdown bank shall be withdrawn to at least 226 steps. Shutdown banks are withdrawn in sequence and with no overlap.

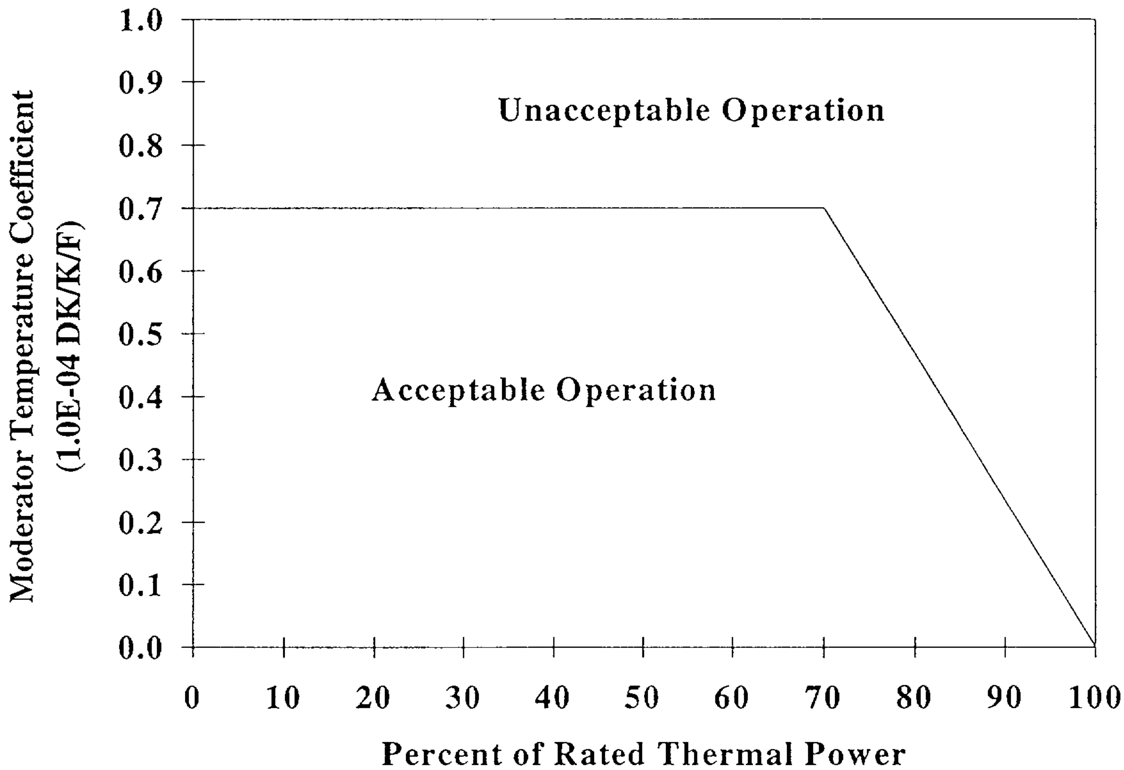
2.5 Control Bank Insertion Limits (TS 3.1.6)

2.5.1 Control banks shall be within the insertion, sequence, and overlap limits shown in Figure 2. Specific control bank withdrawal and overlap limits as a function of the fully withdrawn position are shown in Table 1.

McGuire 2 Cycle 14 Core Operating Limits Report

Figure 1

Moderator Temperature Coefficient Upper Limit Versus Power Level

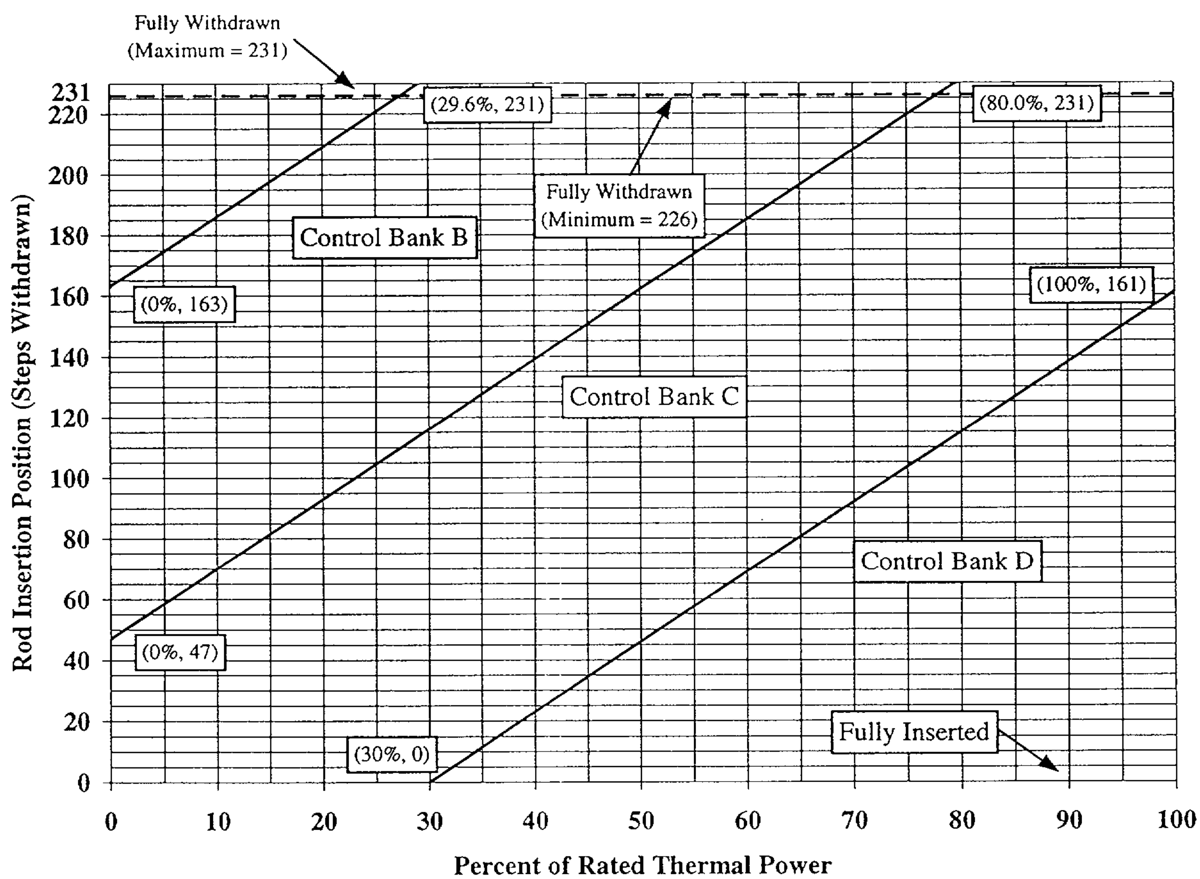


NOTE: Compliance with Technical Specification 3.1.3 may require rod withdrawal limits. Refer to OP/2/A/6100/22 Unit 2 Data Book for details.

McGuire 2 Cycle 14 Core Operating Limits Report

Figure 2

Control Bank Insertion Limits Versus Percent Rated Thermal Power



NOTE: Compliance with Technical Specification 3.1.3 may require rod withdrawal limits. Refer to OP/2/A/6100/22 Unit 2 Data Book for details.

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Table 1
RCCA Withdrawal Steps and Sequence

A. RCCAs Fully Withdrawn at 226 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
226 Stop	110	0	0
226	116	0 Start	0
226	226 Stop	110	0
226	226	116	0 Start
226	226	226 Stop	110

B. RCCAs Fully Withdrawn at 227 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
227 Stop	111	0	0
227	116	0 Start	0
227	227 Stop	111	0
227	227	116	0 Start
227	227	227 Stop	111

C. RCCAs Fully Withdrawn at 228 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
228 Stop	112	0	0
228	116	0 Start	0
228	228 Stop	112	0
228	228	116	0 Start
228	228	228 Stop	112

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Table 1
RCCA Withdrawal Steps and Sequence Continued

D. RCCAs Fully Withdrawn at 229 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
229 Stop	113	0	0
229	116	0 Start	0
229	229 Stop	113	0
229	229	116	0 Start
229	229	229 Stop	113

E. RCCAs Fully Withdrawn at 230 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
230 Stop	114	0	0
230	116	0 Start	0
230	230 Stop	114	0
230	230	116	0 Start
230	230	230 Stop	114

F. RCCAs Fully Withdrawn at 231 Steps

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
231 Stop	115	0	0
231	116	0 Start	0
231	231 Stop	115	0
231	231	116	0 Start
231	231	231 Stop	115

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2.6 Heat Flux Hot Channel Factor - $F_Q(X,Y,Z)$ (TS 3.2.1)

2.6.1 $F_Q(X,Y,Z)$ steady-state limits are defined by the following relationships:

$$F_Q^{RTP} * K(Z)/P \qquad \text{for } P > 0.5$$

$$F_Q^{RTP} * K(Z)/0.5 \qquad \text{for } P \leq 0.5$$

where,

P = (Thermal Power)/(Rated Power)

Note: The measured $F_Q(X,Y,Z)$ shall be increased by 3% to account for manufacturing tolerances and 5% to account for measurement uncertainty when comparing against the LCO limits. The manufacturing tolerance and measurement uncertainty are implicitly included in the F_Q surveillance limits as defined in COLR Sections 2.6.5 and 2.6.6.

2.6.2 $F_Q^{RTP} = 2.50 \times K(BU)$

2.6.3 K(Z) is the normalized $F_Q(X,Y,Z)$ as a function of core height. The K(Z) function is provided in Figure 3 for MkBW fuel and in Figure 4 for Westinghouse RFA fuel.

2.6.4 K(BU) is the normalized $F_Q(X,Y,Z)$ as a function of burnup. K(BU) for both MkBW and Westinghouse RFA fuel is 1.0 for all burnups.

The following parameters are required for core monitoring per the Surveillance Requirements of Technical Specification 3.2.1:

2.6.5 $$[F_Q^L(X,Y,Z)]^{OP} = \frac{F_Q^D(X,Y,Z) * M_Q(X,Y,Z)}{UMT * MT * TILT}$$

where:

$[F_Q^L(X,Y,Z)]^{OP}$ = Cycle dependent maximum allowable design peaking factor that ensures that the $F_Q(X,Y,Z)$ LOCA limit will be preserved for operation within the LCO limits. $[F_Q^L(X,Y,Z)]^{OP}$ includes allowances for calculation and measurement uncertainties.

McGuire 2 Cycle 14 Core Operating Limits Report

F_Q^D(X,Y,Z) = Design power distribution for F_Q. F_Q^D(X,Y,Z) is provided in Table 4, Appendix A, for normal operating conditions and in Table 5, Appendix A for power escalation testing during initial startup operation.

M_Q(X,Y,Z) = Margin remaining in core location X,Y,Z to the LOCA limit in the transient power distribution. M_Q(X,Y,Z) is provided in Table 4, Appendix A for normal operating conditions and in Table 5, Appendix A for power escalation testing during initial startup operation.

UMT = Total Peak Measurement Uncertainty. (UMT = 1.05)

MT = Engineering Hot Channel Factor. (MT = 1.03)

TILT = Peaking penalty that accounts for the peaking increase from an allowable quadrant power tilt ratio of 1.02. (TILT = 1.035)

Note: $[F_Q^L(X,Y,Z)]^{OP}$ is the parameter identified as F_Q^{MAX}(X,Y,Z) in DPC-NE-2011PA.

2.6.6 $$[F_Q^L(X,Y,Z)]^{RPS} = \frac{F_Q^D(X,Y,Z) * M_C(X,Y,Z)}{UMT * MT * TILT}$$

where:

$[F_Q^L(X,Y,Z)]^{RPS}$ = Cycle dependent maximum allowable design peaking factor that ensures that the F_Q(X,Y,Z) Centerline Fuel Melt (CFM) limit will be preserved for operation within the LCO limits. $F_Q^L(X,Y,Z)^{RPS}$ includes allowances for calculation and measurement uncertainties.

F_Q^D(X,Y,Z) = Design power distributions for F_Q. F_Q^D(X,Y,Z) is provided in Table 4, Appendix A for normal operating conditions and in Table 5, Appendix A for power escalation testing during initial startup operation.

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$M_C(X,Y,Z)$ = Margin remaining to the CFM limit in core location X,Y,Z from the transient power distribution. $M_C(X,Y,Z)$ calculations parallel the $M_Q(X,Y,Z)$ calculations described in DPC-NE-2011PA, except that the LOCA limit is replaced with the CFM limit. $M_C(X,Y,Z)$ is provided in Table 6, Appendix A for normal operating conditions and in Table 7, Appendix A for power escalation testing during initial startup operation.

UMT = Total Peak Measurement Uncertainty (UMT = 1.05)

MT = Engineering Hot Channel Factor (MT = 1.03)

TILT = Peaking penalty that accounts for the peaking increase from an allowable quadrant power tilt ratio of 1.02. (TILT = 1.035)

NOTE: $[F_Q^L(X,Y,Z)]^{RPS}$ is the parameter identified as $F_Q^{MAX}(X,Y,Z)$ in DPC-NE-2011PA, except that $M_Q(X,Y,Z)$ is replaced by $M_C(X,Y,Z)$.

2.6.7 KSLOPE = 0.0725

where:

KSLOPE is the adjustment to the K_1 value from the OTΔT trip setpoint required to compensate for each 1% that $F_Q^M(X,Y,Z)$ exceeds $F_Q^L(X,Y,Z)^{RPS}$.

2.6.8 $F_Q(X,Y,Z)$ penalty factors for Technical Specification Surveillance's 3.2.1.2 and 3.2.1.3 are provided in Table 2.

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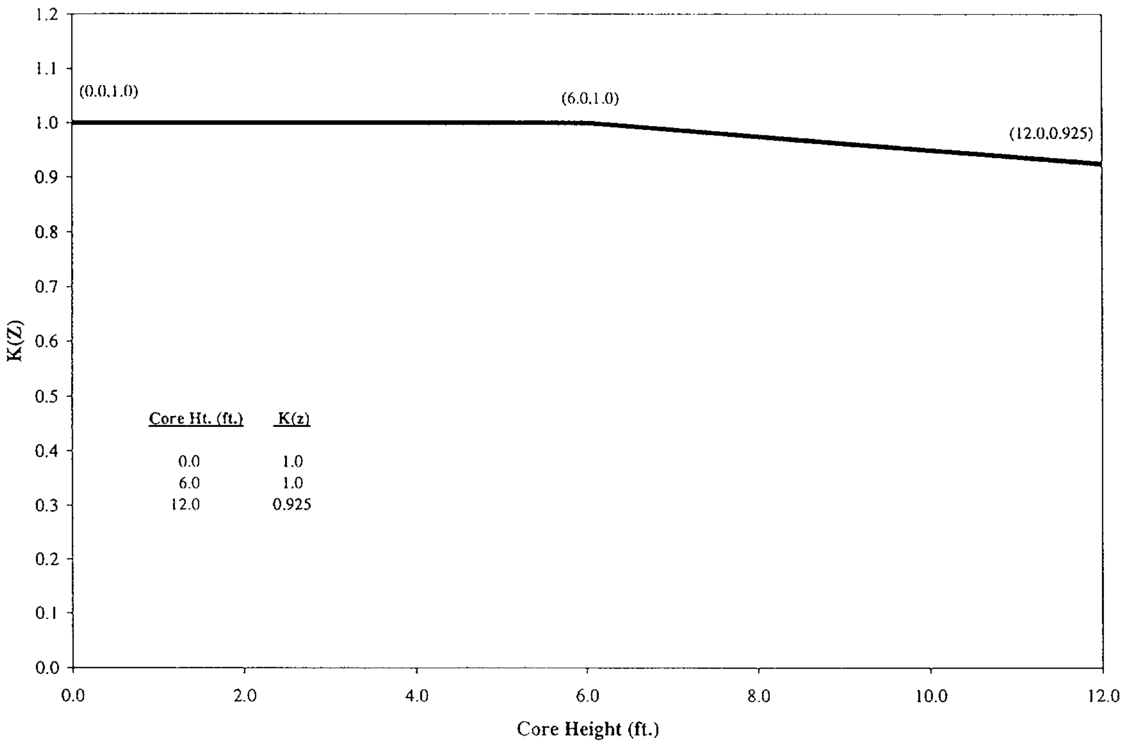
Figure 3

K(Z), Normalized $F_Q(X,Y,Z)$ as a Function of Core Height for MkBW Fuel



Core Ht. (ft.)	K(z)
0.0	1.0
6.0	1.0
12.0	0.925

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Figure 4

K(Z), Normalized $F_Q(X,Y,Z)$ as a Function of Core Height for Westinghouse RFA Fuel

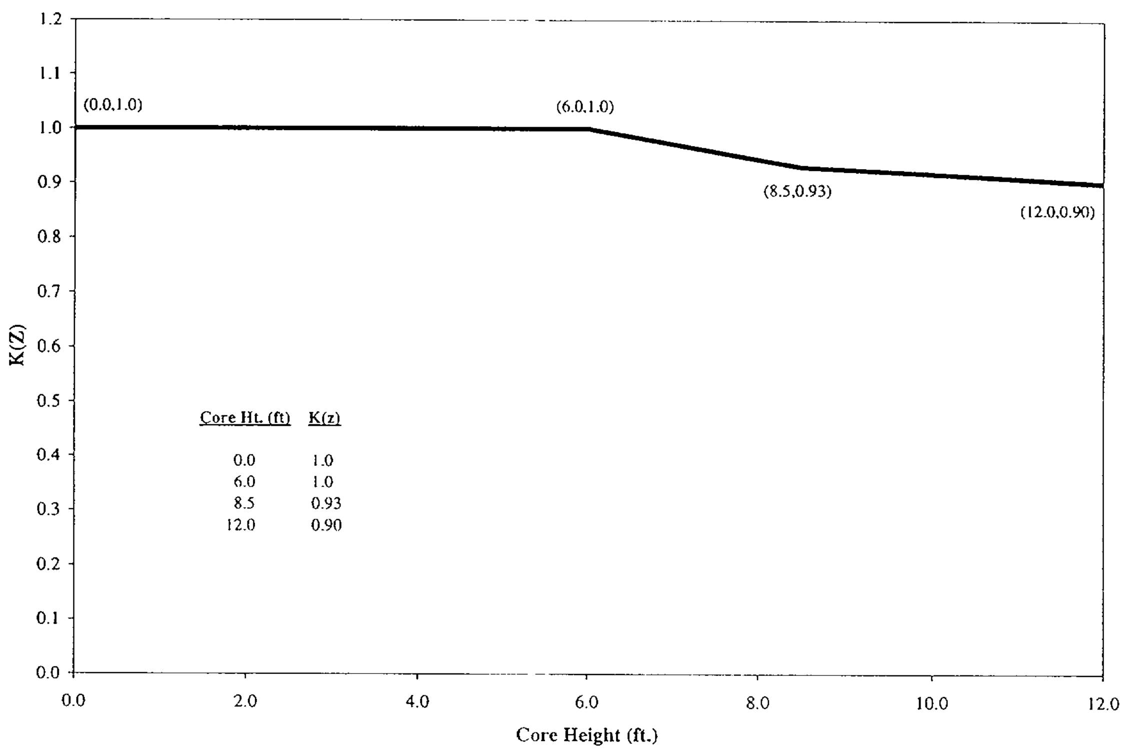

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Table 2

$F_Q(X,Y,Z)$ and $F_{\Delta H}(X,Y)$ Penalty Factors

For Technical Specification Surveillance's 3.2.1.2, 3.2.1.3 and 3.2.2.2

Burnup (EFPD)	$F_Q(X,Y,Z)$ Penalty Factor (%)	$F_{\Delta H}(X,Y,Z)$ Penalty Factor (%)
0	2.00	2.00
4	2.00	2.00
12	2.00	2.00
25	2.00	2.00
50	2.00	2.00
75	2.00	2.00
100	2.00	2.00
125	2.00	2.00
150	2.00	2.00
175	2.00	2.00
200	2.00	2.00
225	2.00	2.00
250	2.00	2.00
275	2.00	2.00
300	2.00	2.00
490	2.00	2.00

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2.7 Nuclear Enthalpy Rise Hot Channel Factor - $F_{\Delta H}(X,Y)$ (TS 3.2.2)

The $F_{\Delta H}$ steady-state limits referred to in Technical Specification 3.2.2 is defined by the following relationship.

2.7.1 $$[F^{L}_{\Delta H}(X,Y)]^{LCO} = MARP(X,Y) * \left[1.0 + \frac{1}{RRH} * (1.0 - P)\right]$$

where:

$[F^{L}_{\Delta H}(X,Y)]^{LCO}$ is defined as the steady-state, maximum allowed radial peak. $[F^{L}_{\Delta H}(X,Y)]^{LCO}$ includes allowances for calculation-measurement uncertainty.

MARP(X,Y) = Cycle-specific operating limit Maximum Allowable Radial Peaks. MARP(X,Y) radial peaking limits are provided in Table 3.

$$P = \frac{\text{Thermal Power}}{\text{Rated Thermal Power}}$$

RRH = Thermal Power reduction required to compensate for each 1% that the measured radial peak, $F^{M}_{\Delta H}(X,Y)$, exceeds the limit.
$RRH = 3.34 \quad (0.0 < P \leq 1.0)$

The following parameters are required for core monitoring per the Surveillance requirements of Technical Specification 3.2.2.

2.7.2 $$[F^{L}_{\Delta H}(X,Y)]^{SURV} = \frac{F^{D}_{\Delta H}(X,Y) \times M_{\Delta H}(X,Y)}{UMR \times TILT}$$

where:

$[F^{L}_{\Delta H}(X,Y)]^{SURV}$ = Cycle dependent maximum allowable design peaking factor that ensures that the $F_{\Delta H}(X,Y)$ limit will be preserved for operation within the LCO limits. $[F^{L}_{\Delta H}(X,Y)]^{SURV}$ includes allowances for calculation- measurement uncertainty.

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$F^{D}_{\Delta H}$ (X,Y) = Design radial power distribution for $F_{\Delta H}$. $F^{D}_{\Delta H}$ (X,Y) is provided in Table 8, Appendix A for normal operation and in Table 9, Appendix A for power escalation testing during initial startup operation.

$M_{\Delta H}$(X,Y) = The margin remaining in core location X,Y relative to the Operational DNB limits in the transient power distribution. $M_{\Delta H}$(X,Y) is provided in Table 8, Appendix A for normal operation and in Table 9, Appendix A for power escalation testing during initial startup operation.

UMR = Uncertainty value for measured radial peaks, (UMR= 1.04). UMR is set to 1.0 since a factor of 1.04 is implicitly included in the variable $M_{\Delta H}$(X,Y).

TILT = Peaking penalty that accounts for the peaking increase for an allowable quadrant power tilt ratio of 1.02, (TILT = 1.035).

NOTE: $[F^{L}_{\Delta H}(X,Y)]^{SURV}$ is the parameter identified as $F_{\Delta H}(X,Y)^{MAX}$ in DPC-NE-2011PA.

2.7.3 RRH = 3.34

where:

RRH = Thermal power reduction required to compensate for each 1% that the measured radial peak, $F^{M}_{\Delta H}$ (X,Y) exceeds its limit.

2.7.4 TRH = 0.04

where:

TRH = Reduction in the OTΔT K_1 setpoint required to compensate for each 1% that the measured radial peak, $F^{M}_{\Delta H}$ (X,Y) exceeds its limit.

2.7.5 $F_{\Delta H}$(X,Y) penalty factors for Technical Specification Surveillance 3.2.2.2 are provided in Table 2.

2.8 Axial Flux Difference – AFD (TS 3.2.3)

2.8.1 The Axial Flux Difference (AFD) Limits are provided in Figure 5.

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Table 3
Maximum Allowable Radial Peaks (MARPS)
(Applicable to Both MkBW and RFA Fuel)

Core Ht. (ft)	Axial Peak -----> 1.05	1.10	1.20	1.30	1.40	1.50	1.60
0.12	1.708	1.738	1.804	1.862	1.913	1.919	1.849
1.20	1.705	1.737	1.798	1.853	1.902	1.882	1.825
2.40	1.704	1.733	1.789	1.842	1.882	1.831	1.776
3.60	1.702	1.729	1.781	1.825	1.833	1.782	1.729
4.80	1.699	1.723	1.770	1.807	1.782	1.731	1.679
6.00	1.695	1.717	1.755	1.771	1.725	1.679	1.631
7.20	1.690	1.708	1.738	1.718	1.670	1.621	1.575
8.40	1.685	1.696	1.706	1.664	1.616	1.567	1.522
9.60	1.677	1.681	1.655	1.605	1.562	1.518	1.476
10.80	1.666	1.654	1.607	1.554	1.507	1.465	1.423
12.00	1.641	1.612	1.557	1.509	1.46	1.421	1.384

Core Ht. (ft)	Axial Peak -----> 1.70	1.80	1.90	2.10	3.00	3.25
0.12	1.793	1.710	1.633	1.531	1.209	1.144
1.20	1.801	1.727	1.652	1.536	1.179	1.115
2.40	1.759	1.702	1.647	1.549	1.161	1.100
3.60	1.708	1.654	1.605	1.543	1.204	1.132
4.80	1.661	1.612	1.562	1.499	1.218	1.173
6.00	1.615	1.567	1.522	1.454	1.188	1.139
7.20	1.559	1.516	1.477	1.413	1.156	1.108
8.40	1.511	1.468	1.429	1.363	1.125	1.081
9.60	1.465	1.425	1.389	1.327	1.102	1.057
10.80	1.416	1.380	1.345	1.284	1.067	1.025
12.00	1.379	1.346	1.317	1.263	1.053	1.009

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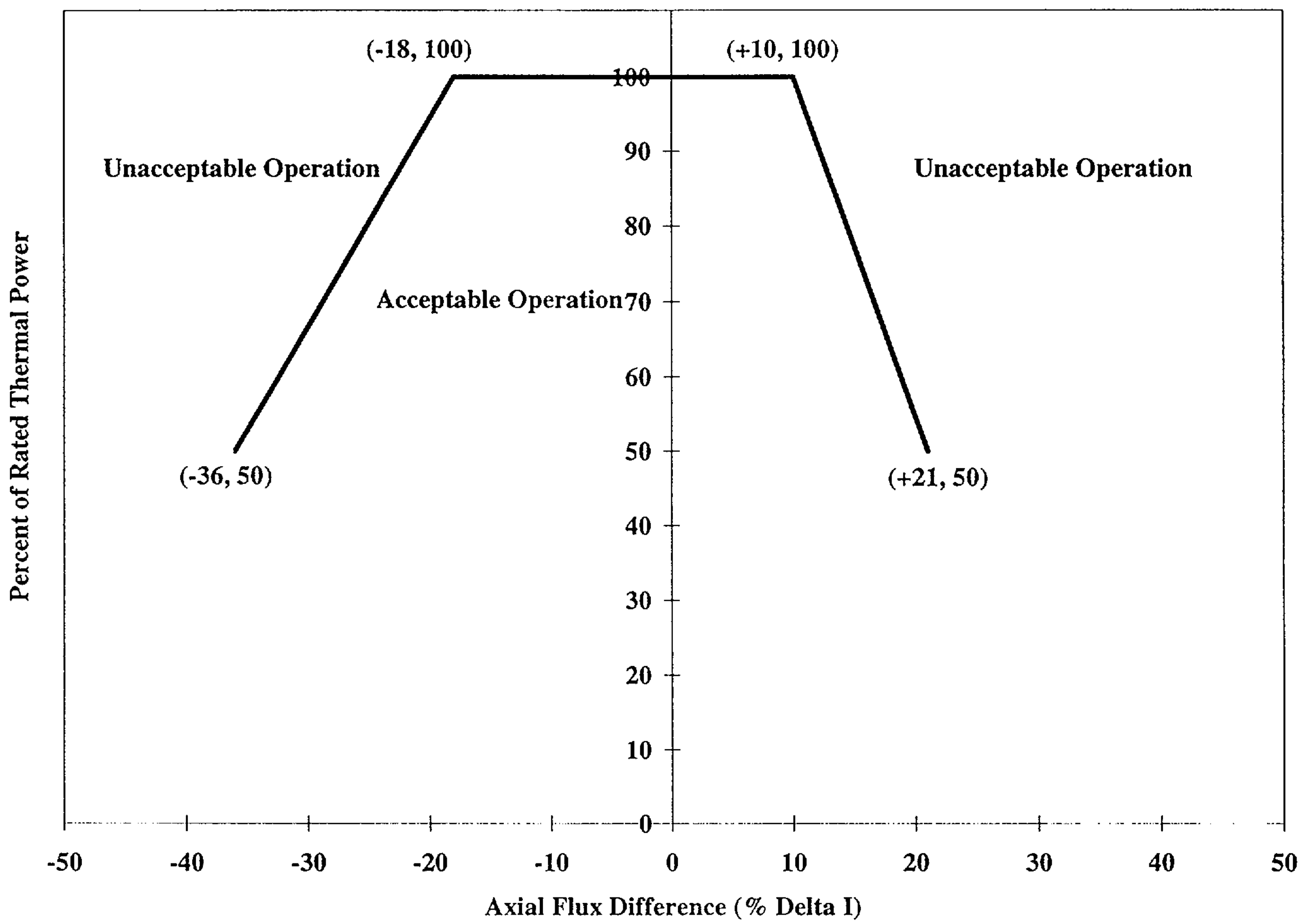
Figure 5

Percent of Rated Thermal Power Versus Percent Axial Flux Difference Limits



NOTE: Compliance with Technical Specification 3.2.1 may require more restrictive AFD limits. Refer to OP/2/A/6100/22 Unit 2 Data Book of more details.

McGuire 2 Cycle 14 Core Operating Limits Report

2.9 Reactor Trip System Instrumentation Setpoints (TS 3.3.1) Table 3.3.1-1

2.9.1 Overtemperature ΔT Setpoint Parameter Values

Parameter	Value
Overtemperature ΔT reactor trip setpoint	$K_1 \leq 1.1978$
Overtemperature ΔT reactor trip heatup setpoint penalty coefficient	$K_2 = 0.0334/^{o}F$
Overtemperature ΔT reactor trip depressurization setpoint penalty coefficient	$K_3 = 0.001601/psi$
Time constants utilized in the lead-lag compensator for ΔT	$\tau_1 \geq 8$ sec. $\tau_2 \leq 3$ sec.
Time constant utilized in the lag compensator for ΔT	$\tau_3 \leq 2.0$ sec.
Time constants utilized in the lead-lag compensator for T_{avg}	$\tau_4 \geq 28$ sec. $\tau_5 \leq 4$ sec.
Time constant utilized in the measured T_{avg} lag compensator	$\tau_6 \leq 2.0$ sec.
$f_1(\Delta I)$ "positive" breakpoint	= 19.0 %ΔI
$f_1(\Delta I)$ "negative" breakpoint	= N/A*
$f_1(\Delta I)$ "positive" slope	= 1.769 $\%\Delta T_0 / \%\Delta I$
$f_1(\Delta I)$ "negative" slope	= N/A*

* The $f_1(\Delta I)$ "negative" breakpoint and the $f_1(\Delta I)$ "negative" slope are not applicable since the $f_1(\Delta I)$ function is not required below the $f_1(\Delta I)$ "positive" breakpoint of 19.0% ΔI.

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2.9.2 Overpower ΔT Setpoint Parameter Values

Parameter	Value
Overpower ΔT reactor trip setpoint	$K_4 \leq 1.086359$
Overpower ΔT reactor trip heatup setpoint penalty coefficient	$K_6 = 0.001179/^oF$
Time constants utilized in the lead-lag compensator for ΔT	$\tau_1 \geq 8$ sec. $\tau_2 \leq 3$ sec.
Time constant utilized in the lag compensator for ΔT	$\tau_3 \leq 2.0$ sec.
Time constant utilized in the measured T_{avg} lag compensator	$\tau_6 \leq 2.0$ sec.
Time constant utilized in the rate-lag controller for T_{avg}	$\tau_7 \geq 5$ sec.
$f_2(\Delta I)$ "positive" breakpoint	= 35.0 %ΔI
$f_2(\Delta I)$ "negative" breakpoint	= -35.0 %ΔI
$f_2(\Delta I)$ "positive" slope	= 7.0 $\%\Delta T_0/\ \%\Delta I$
$f_2(\Delta I)$ "negative" slope	= 7.0 $\%\Delta T_0/\ \%\Delta I$

McGuire 2 Cycle 14 Core Operating Limits Report

2.10 Accumulators (TS 3.5.1)

2.10.1 Boron concentration limits during modes 1 and 2, and mode 3 with RCS pressure >1000 psi:

Parameter	Limit
Cold Leg Accumulator minimum boron concentration.	2,475 ppm
Cold Leg Accumulator maximum boron concentration.	2,875 ppm

2.11 Refueling Water Storage Tank - RWST (TS 3.5.4)

2.11.1 Boron concentration limits during modes 1, 2, 3, and 4:

Parameter	Limit
Refueling Water Storage Tank minimum boron concentration.	2,675 ppm
Refueling Water Storage Tank maximum boron concentration.	2,875 ppm

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2.12 Spent Fuel Pool Boron Concentration (TS 3.7.14)

2.12.1 Minimum boron concentration limit for the spent fuel pool. Applicable when fuel assemblies are stored in the spent fuel pool.

Parameter	Limit
Spent fuel pool minimum boron concentration.	2,675 ppm

2.13 Refueling Operations - Boron Concentration (TS 3.9.1)

2.13.1 Minimum boron concentration limit for the filled portions of the Reactor Coolant System, refueling canal, and refueling cavity for mode 6 conditions. The minimum boron concentration limit and plant refueling procedures ensure that the Keff of the core will remain within the mode 6 reactivity requirement of Keff $\leq$ 0.95.

Parameter	Limit
Minimum Boron concentration of the Reactor Coolant System, the refueling canal, and the refueling cavity.	2,675 ppm

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2.14 Borated Water Source – Shutdown (SLC 16.9.14)

2.14.1 Volume and boron concentrations for the Boric Acid Storage System and the Refueling Water Storage Tank (RWST) during modes 5 and 6.

Parameter	Limit
Boric Acid Storage System minimum contained borated water volume	8,884 gallons 10% Level
Boric Acid Storage System minimum boron concentration	7,000 ppm
Boric Acid Storage System minimum water volume required to maintain SDM at 7,000 ppm	585 gallons
Refueling Water Storage Tank minimum contained borated water volume	43,000 gallons 35 inches
Refueling Water Storage Tank minimum boron concentration	2,675 ppm
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,675 ppm	3,500 gallons

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2.15 Borated Water Source - Operating (SLC 16.9.11)

2.15.1 Volume and boron concentrations for the Boric Acid Storage System and the Refueling Water Storage Tank (RWST) during modes 1, 2, 3, and mode 4:

Parameter	Limit
Boric Acid Storage System minimum contained borated water volume	22,520 gallons 39.0% Level
Boric Acid Storage System minimum boron concentration	7,000 ppm
Boric Acid Storage System minimum water volume required to maintain SDM at 7,000 ppm	11,851 gallons
Refueling Water Storage Tank minimum contained borated water volume	96,607 gallons 103.6 inches
Refueling Water Storage Tank minimum boron concentration	2,675 ppm
Refueling Water Storage Tank maximum boron concentration (TS 3.5.4)	2875 ppm
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,675 ppm	57,107 gallons

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NOTE: Data contained in the Appendix to this document was generated in the McGuire 2 Cycle 14 Maneuvering Analysis calculation file, MCC-1553.05-00-0323. The Plant Nuclear Engineering Section will control this information via computer file(s) and should be contacted if there is a need to access this information.