ENCLOSURE 1

Monticello Nuclear Generating Plant Cycle 23 Core Operating Limits Report, NAD-MN-010, Revision 1, Non-Proprietary

30 pages follow

NMC
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Monticello Nuclear Generating Plant

Cycle 23

Core Operating Limits Report

NAD-MN-010

Revision 1

Prepared By: _____ Date: 03 Aug 2005
Roy Ramavarapu
Senior Nuclear Engineer, Nuclear Analysis and Design

Verified By: _____ Date: 8/10/05
Kenneth Smolinske
Senior Nuclear Engineer, Nuclear Analysis and Design

Reviewed By: _____ Date: 8/14/5
Thomas M. Parker
Superintendent, Nuclear Engineering – Monticello

Approved By: _____ Date: 8/17/05
Richard J Rohrer
Project Manager, Nuclear Analysis and Design

Monticello Nuclear Generating Plant, Cycle 23 Core Operating Limits Report (COLR)

Record of Revisions

Revision 1:

1. Corrected typographical error in footer on page 27 of 29 in Revision 0: the as-found 'Cycle 22' revised to read 'Cycle 23', and renumbered this page to Page 28 of 30. There are no other revisions on this page.
2. Corrected typographical error in footer on page 28 of 29 in Revision 0: the as-found 'Cycle 22' revised to read 'Cycle 23', and renumbered this page to Page 29 of 30. There are no other revisions on this page.
3. One additional page, 'Record of Revisions' inserted as Page 2 of 30 after front page; re-numbered pages, and total number of pages is 30 pages.
4. There are no other revisions.

1.0 Core Operating Limits Report (COLR)

This non-proprietary Core Operating Limits Report for Monticello Nuclear Generating Plant Cycle 23 is prepared in accordance with the requirements of Technical Specification 6.7.A.7. The core operating limits are developed using NRC approved methodology (References 1 and 3), and are established such that all applicable thermal limits of the plant safety analysis are met.

The SLMCPR of 1.10 was used for two-loop operation for all fuel types in Cycle 23. The SLMCPR for single loop operation is 1.12. These values are consistent with the values specified in Reference 2.

This non-proprietary report includes stability exclusion region definition, buffer region definition, and power distribution limits as required by Amendment 97 of Monticello's operating license approved by the NRC in Reference 10.

GNF proprietary information in Tables 8 through 14 is indicated by enclosing it in double brackets, and in each case, the superscript notation [(3)] refers to Paragraph (3) in the Affidavit from GNF.

2.0 References

1.0 General Electric Standard Application for Reactor Fuel (GESTAR-II), NEDE-24011-P-A-14, June 2000.

2.0 Supplemental Reload Licensing Report for Monticello Nuclear Generating Plant, Reload 22, Cycle 23, 0000-0029-6441-SRLR, Revision 0, January 2005.

3.0 General Electric Licensing Topical Report ODYSY Application for Stability Licensing Calculations, NEDC-32992-P-A, DRF AI3-00426-00, July 2001.

4.0 Fuel Bundle Information Report for Monticello Nuclear Generating Plant, Reload 22, Cycle 23, 0000-0029-6441-FBIR, Revision 0, (Proprietary), January 2005.

5.0 Letter from M. F. Hammer (NSP) to USNRC dated December 4 1997, Revision 1 to License Amendment Request dated July 26, 1996 Supporting the Monticello Nuclear Generating Plant Rerate Program, including attached exhibits.

6.0 Document GE14 Fuel Design Cycle-Independent Analysis for Monticello Nuclear Generating Plant, GE-NE-0000-0013-9576P, GE Nuclear Energy (Proprietary), March 2003.

7.0 Letter from Les Conner (GNF) to R. J. Rohrer (NMC), dated March 24, 2003, Monticello Option B Licensing Basis, IC.MN.2003.010, Global Nuclear Fuel (Proprietary).

8.0 GE14 Fuel Design, Cycle Independent Transient Analysis for Monticello Nuclear Generating Plant, GE-NE-0000-0014-7048-01P, Rev. 0, March 2003 (GNF Proprietary).

9.0 BWR Owners Group Long Term Stability Solution Licensing Methodology, (Supplement 1), NEDO-31960-A, Licensing Topical Report, Supplement 1, March 1992.

10.0 Letter from Tae Kim (USNRC) to Roger O Anderson (NSP), "Monticello Nuclear Generating Plant – Issuance of Amendment Re. Implementation of Boiling Water Reactor Owners Group Option 1-D Core Stability Solution (TAC No. M92947)," including enclosures, September 17, 1996.

11.0 Letter from M. F. Hammer (NSP) to USNRC dated July 30, 1998, "Supplementary Information Regarding the Monticello Power Rerate (TAC No. 96238)", including attachments.

12.0 Letter from Tae Kim (USNRC) to Roger O Anderson (NSP), "Monticello Nuclear Generating Plant – Issuance of Amendment Re. Power Uprate Program (TAC No. M96238)," including enclosures, September 16, 1998.

3.0 Rod Block Monitor Operability Requirements

The ARTS Rod Withdrawal Error (RWE) analysis (Reference 2) validated that the following MCPR values provide the required margin for full withdrawal of any control rod during Monticello Cycle 23:

For Power < 90%: MCPR ≥ 1.70

For Power ≥ 90%: MCPR ≥ 1.40

When the core power is less than 90% of rated and the MCPR is less than 1.70, then a limiting control rod pattern exists and the Rod Block Monitor is required to be operable. If the core power is greater than or equal to 90% and the MCPR is less than 1.40, then a limiting control rod pattern exists and the Rod Block Monitor is required to be operable.

Reference: Technical Specification Section 3.2.C.2.a

4.0 Rod Block Monitor Upscale Trip Setpoint

Low Trip Setpoint (LTSP)	≤	120/125 of full scale
Intermediate Trip Setpoint (ITSP)	≤	115/125 of full scale
High Trip Setpoint (HTSP)	≤	110/125 of full scale

Reference: Technical Specification Sections: Table 3.2.3 Item 4.a, Table 3.2.3 Note 8.

5.0 Minimum Critical Power Ratio (MCPR)

5.1 Option A

The Operating Limit Minimum Critical Power Ratio (OLMCPR) for Option A does not account for scram speeds that are faster than those required by Technical Specifications.

5.1.1 Option A OLMCPR for Two Recirculation Loop Operation

The Option A OLMCPR shall be determined for two recirculation loop operation as follows:
If core thermal power (P) is ≥ 45% of rated core thermal power, then the Option A OLMCPR for all fuel types is the greater of {1.70 * K(P) from Figure 3} or {MCPR(F) from Figure 4}, where 1.70 is the Option A OLMCPR at rated (100%) core thermal power reported in Table 16.

i.e. if P ≥ 45% rated core thermal power,
then Option A OLMCPR limit
= Max {1.70 * K(P) from Figure 3, MCPR(F) from Figure 4}.

If core thermal power (P) is < 45% of rated core thermal power, the Option A OLMCPR for all fuel types is obtained from Figure 3.

Reference: Technical Specification Section 3.11.C.

5.1.2 Option A OLMCPR for Single Recirculation Loop Operation

The Option A OLMCPR as defined above for two recirculation loop operation in Section 5.1.1 is increased by the following adder for single recirculation loop operation:

0.02 ΔMCPR adder to account for core flow measurement and TIP reading uncertainties.

Reference: Technical Specification Section 3.11.C.

5.2 Option B

Option B does take into account the measured scram speeds that are faster than the Technical Specification requirements, thus reducing the potential consequences of a limiting transient. Calculation of the Option B OLMCPR value as a function of measured scram speeds is described in Section 10.

5.2.1 Option B OLMCPR for Two Recirculation Loop Operation

The Option B OLMCPR shall be determined for two recirculation loop operation as follows:

The rated (100%) core thermal power Option B OLMCPR ($OLMCPR^{100\%}_{OptionB}$) is 1.54, and is reported in Table 16. This $OLMCPR^{100\%}_{OptionB}$ = 1.54 value is modified as described in Section 10 to be a function of the measured scram speeds to yield $OLMCPR^{New}_{OptionB}$. Then, if core thermal power (P) is ≥ 45% of rated core thermal power, the Option B OLMCPR for all fuel types is the greater of

{ $OLMCPR^{New}_{OptionB}$ * K(P) from Figure 3} or {MCPR(F) from Figure 4},

i.e. if P ≥ 45% rated core thermal power,
then Option B OLMCPR limit
= Max { $OLMCPR^{New}_{OptionB}$ * K(P) from Figure 3, MCPR(F) from Figure 4}.

If core thermal power (P) is < 45% of rated core thermal power, the Option B OLMCPR for all fuel types is obtained from Figure 3.

Reference: Technical Specification Section 3.11.C.

5.2.2 Option B OLMCPR for Single Recirculation Loop Operation

The Option B OLMCPR as defined above for two recirculation loop operation in Section 5.2.1 is increased by the following adder for single recirculation loop operation:

0.02 ΔMCPR adder to account for core flow measurement and TIP reading uncertainties.

Reference: Technical Specification Section 3.11.C.

6.0 Power-Flow Map

The Power-Flow Operating Map based on analysis to support Cycle 23 is shown in Figures 5 and 6. The Power-Flow Operating Map is consistent with a rated power of 1775 MWth as described in References 5, 11, and 12.

7.0 Approved Analytical Methods

NEDE-24011-P-A	Rev. 14	"General Electric Standard Application for Reactor Fuel"
NEDO-31960-A		"BWR Owners Group Long-Term Stability Solutions Licensing Methodology," Licensing Topical Report, June 1991.
NEDO-31960-A	Sup. 1	"BWR Owners Group Long-Term Stability Solutions Licensing Methodology, (Supplement 1)," Licensing Topical Report, Supplement 1, March 1992.
NEDC-32992P-A		General Electric Licensing Topical Report, "ODYSY Application for Stability Licensing Calculations," July 2001.

8.0 Fuel Rod Heat Generation Rate

8.1 Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) as a Function of Exposure

The MAPLHGR limits in Tables 1 through 7 are conservative values bounding all fuel lattice types (all natural uranium lattices are excluded) in a given fuel bundle design, and are intended only for use in hand calculations as described in Technical Specification 3.11.A. No channel bow effects are included in the bounding MAPLHGR values in Tables 1 through 7 as there are no reused channels. MAPLHGR limits for each individual fuel lattice for a given bundle design as a function of axial location and average planar exposure are determined based on the approved methodology referenced in Monticello Technical Specification 6.7.A.7.b, and are loaded into the process computer for use in core monitoring calculations.

When and if hand calculations are required:

8.1.1 Two-Recirculation Loop Operation (MAPLHGR)

At rated core thermal power and core flow conditions, the MAPLHGR limit for each fuel bundle design as a function of average planar exposure shall not exceed the bounding limits provided in Tables 1 through 7.

The MAPLHGR limit is adjusted for off-rated core thermal power and core flow conditions by determining the following:

MAPLHGR (P)= MAPFAC(P) * MAPLHGR limit from Tables 1 through 7.
MAPLHGR (F)= MAPFAC(F) * MAPLHGR limit from Tables 1 through 7.

where MAPFAC(P) and MAPFAC(F) are determined from Figures 1 and 2, respectively, and where P is the core thermal power in percent of rated, and F is the core flow in percent of rated.

The Technical Specification (TS) MAPLHGR limit is determined as follows:

MAPLHGR TS Limit = Minimum{MAPLHGR(P), MAPLHGR(F)}

Note that all natural uranium lattices are excluded in Tables 1 through 7. Straight line interpolation between nearest data points is permitted only within each individual Tables 1 through 7.

8.1.2 Single Recirculation Loop Operation (MAPLHGR)

When in single recirculation loop operation, perform the following:

8.1.2.1 Perform the action specified in Section 8.1.1 above.

8.1.2.2 Separately, apply the single loop operation multipliers to the limiting values of MAPLHGR from Tables 1 through 7 as follows:

for GE11: multiplier is 0.80,
for GE14C: multiplier is 0.90.

8.1.2.3 Select the more limiting (i.e. smaller) value from Sections 8.1.2.1 or 8.1.2.2.

Reference: Technical Specification Section 3.11.A.

8.2 Linear Heat Generation Rate (LHGR)

The uranium dioxide (UO_2) and gadolinia LHGR limits as a function of fuel rod peak pellet exposure for each bundle type in Cycle 23 are given in Tables 8 through 14. The gadolinia LHGR limits in Tables 8 through 14 are bounding gadolinia LHGR limits for all the gadolinia concentrations occurring in each of the bundle types used in Cycle 23. The LHGR limits are fuel rod nodal limits, and are to be applied at every node of the fuel rod including the natural uranium lattices.

The individual LHGR limits for the uranium dioxide and gadolinia fuel rods in each fuel bundle type used in Cycle 23, as a function of axial location and pellet exposure are determined based on the approved methodology referenced in Monticello Technical Specification 6.7.A.7.b, and are loaded into the process computer for use in core monitoring calculations.

GNF proprietary information in Tables 8 through 14 is indicated by enclosing it in double brackets, and in each case, the superscript notation [3] refers to Paragraph (3) in the Affidavit from GNF.

The LHGR limits are presented in this report for use when and if hand calculations are performed to demonstrate compliance with Technical Specification 3.11.B.

When and if hand calculations are performed:

8.2.1 Two-Recirculation Loop Operation (LHGR)

At rated core thermal power and core flow conditions, the LHGR limit for each fuel bundle design as a function of peak pellet exposure and fuel pin type shall not exceed the bounding limits provided in Tables 8 through 14.

The LHGR limit is adjusted for off-rated core thermal power and core flow conditions by determining the following:

LHGR (P)= MAPFAC(P) * LHGR limit from Tables 8 through 14.
LHGR (F)= MAPFAC(F) * LHGR limit from Tables 8 through 14.

where the multipliers MAPFAC(P) and MAPFAC(F) are determined from Figures 1 and 2, respectively, and where P is the core thermal power in percent of rated, and F is the core flow in percent of rated.

The Technical Specification (TS) LHGR limit is determined as follows:

LHGR TS Limit = Minimum{LHGR(P), LHGR(F)}

Note that the LHGR limits are fuel rod nodal limits, and are to be applied at every node of the fuel rod, including the natural uranium lattices. Straight line interpolation between nearest data points is permitted only within each individual Tables 8 through 14.

8.2.2 Single Recirculation Loop Operation (LHGR)

When in single recirculation loop operation, perform the following:

8.2.2.1 Perform the same action specified in Section 8.2.1above. There are no separate single loop operation specific multipliers applicable to LHGR, i.e. the multipliers from Section 8.2.1 also apply to single recirculation loop operation.

Reference: Technical Specification Section 3.11.B.

Table 1: MAPLHGR Limits[1]

GE11 EDB-3823[2]: GE11-P9DUB380-17GZ-100T-141-T6

(formerly EDB-2367)

Average Planar Exposure GWD/MTU (GWD/STU)	MAPLHGR Limit (kW/ft)
0.00 (0.00)	8.23
0.22 (0.20)	8.30
1.10 (1.00)	8.43
2.20 (2.00)	8.61
3.31 (3.00)	8.80
4.41 (4.00)	9.00
5.51 (5.00)	9.22
6.61 (6.00)	9.44
7.72 (7.00)	9.70
8.82 (8.00)	9.97
9.92 (9.00)	10.21
11.02 (10.00)	10.39
12.13 (11.00)	10.55
13.23 (12.00)	10.68
14.33 (13.00)	10.76
15.43 (14.00)	10.80
16.53 (15.00)	10.84
18.74 (17.00)	10.91
22.05 (20.00)	10.97
27.56 (25.00)	10.40
33.07 (30.00)	9.83
38.58 (35.00)	9.24
44.09 (40.00)	8.58
49.60 (45.00)	7.88
55.12 (50.00)	7.21
60.63 (55.00)	6.56
61.11 (55.44)	6.54
61.23 (55.55)	6.54
61.32 (55.63)	6.48
61.67 (55.94)	6.57

Note:

(1) Values in Table 1 are for two recirculation loop operation; see Section 8.1.1. For single recirculation loop operation, see Section 8.1.2.

(2) Engineering Data Bank (EDB) number, Reference 2.

Table 2: MAPLHGR Limits[1]

GE11 EDB-3824[2]: GE11-P9DUB380-16GZ-100T-141-T6

(formerly EDB-2368)

Average Planar Exposure GWD/MTU (GWD/STU)	MAPLHGR Limit (kW/ft)
0.00 (0.00)	8.36
0.22 (0.20)	8.42
1.10 (1.00)	8.55
2.20 (2.00)	8.73
3.31 (3.00)	8.91
4.41 (4.00)	9.11
5.51 (5.00)	9.32
6.61 (6.00)	9.55
7.72 (7.00)	9.77
8.82 (8.00)	9.94
9.92 (9.00)	10.13
11.02 (10.00)	10.33
12.13 (11.00)	10.52
13.23 (12.00)	10.67
14.33 (13.00)	10.77
15.43 (14.00)	10.82
16.53 (15.00)	10.84
18.74 (17.00)	10.86
22.05 (20.00)	10.88
27.56 (25.00)	10.40
33.07 (30.00)	9.82
38.58 (35.00)	9.24
44.09 (40.00)	8.58
49.60 (45.00)	7.88
55.12 (50.00)	7.21
60.63 (55.00)	6.57
61.01 (55.35)	6.55
61.17 (55.49)	6.54
61.39 (55.69)	6.48
61.60 (55.89)	6.57

Note:

(1) Values in Table 2 are for two recirculation loop operation; see Section 8.1.1. For single recirculation loop operation, see Section 8.1.2.

(2) Engineering Data Bank (EDB) number, Reference 2.

Table 3: MAPLHGR Limits[1]

GE14C EDB-2598[2]: GE14-P10DNAB393-17GZ-100T-145-T6-2598

(formerly EDB-2587)

Average Planar Exposure GWD/MTU(GWD/STU)	MAPLHGR Limit (kW/ft)
0.00 (0.00)	8.14
0.22 (0.20)	8.20
1.10 (1.00)	8.34
2.20 (2.00)	8.47
3.31 (3.00)	8.59
4.41 (4.00)	8.71
5.51 (5.00)	8.84
6.61 (6.00)	8.97
7.72 (7.00)	9.11
8.82 (8.00)	9.23
9.92 (9.00)	9.35
11.02 (10.00)	9.47
12.13 (11.00)	9.59
13.23 (12.00)	9.70
14.33 (13.00)	9.80
15.43 (14.00)	9.90
16.53 (15.00)	9.98
18.74 (17.00)	9.98
22.05 (20.00)	9.97
27.56 (25.00)	9.95
33.07 (30.00)	9.83
38.58 (35.00)	9.23
41.33 (37.49)	8.95
44.09 (40.00)	8.66
49.60 (45.00)	8.13
55.12 (50.00)	7.61
60.63 (55.00)	6.26
63.50 (57.61)	4.94
63.59 (57.68)	4.90
63.72 (57.81)	4.89
64.44 (58.46)	4.90
64.47 (58.49)	4.89

Note:

(1) Values in Table 3 are for two recirculation loop operation; see Section 8.1.1. For single recirculation loop operation, see Section 8.1.2.

(2) Engineering Data Bank (EDB) number, Reference 2.

Table 4: MAPLHGR Limits[1]

GE14C EDB-2599[2]: GE14-P10DNAB393-17GZ-100T-145-T6-2599

(formerly EDB-2588)

Average Planar Exposure GWD/MTU (GWD/STU)	MAPLHGR Limit (kW/ft)
0.00 (0.00)	8.21
0.22 (0.20)	8.26
1.10 (1.00)	8.35
2.20 (2.00)	8.47
3.31 (3.00)	8.59
4.41 (4.00)	8.71
5.51 (5.00)	8.84
6.61 (6.00)	8.97
7.72 (7.00)	9.11
8.82 (8.00)	9.23
9.92 (9.00)	9.35
11.02 (10.00)	9.47
12.13 (11.00)	9.59
13.23 (12.00)	9.70
14.33 (13.00)	9.80
15.43 (14.00)	9.90
16.53 (15.00)	9.98
18.74 (17.00)	9.97
22.05 (20.00)	9.96
27.56 (25.00)	9.94
33.07 (30.00)	9.84
38.58 (35.00)	9.24
41.33 (37.49)	8.95
44.09 (40.00)	8.67
49.60 (45.00)	8.13
55.12 (50.00)	7.62
60.63 (55.00)	6.26
63.50 (57.61)	4.94
63.59 (57.68)	4.90
63.72 (57.81)	4.89
64.46 (58.48)	4.90
64.49 (58.50)	4.89

Note:

(1) Values in Table 4 are for two recirculation loop operation; see Section 8.1.1. For single recirculation loop operation, see Section 8.1.2.

(2) Engineering Data Bank (EDB) number, Reference 2.

Table 5: MAPLHGR Limits[1]

GE14C EDB-2824[2]: GE14-P10DNAB392-16GZ-100T-145-T6-2824

(no former EDB designation)

Average Planar Exposure GWD/MTU (GWD/STU)	MAPLHGR Limit (kW/ft)
0.00 (0.00)	8.33
0.22 (0.20)	8.37
1.10 (1.00)	8.44
2.20 (2.00)	8.54
3.31 (3.00)	8.63
4.41 (4.00)	8.73
5.51 (5.00)	8.84
6.61 (6.00)	8.93
7.72 (7.00)	9.02
8.82 (8.00)	9.11
9.92 (9.00)	9.21
11.02 (10.00)	9.32
12.13 (11.00)	9.44
13.23 (12.00)	9.56
14.33 (13.00)	9.50
15.43 (14.00)	9.50
16.53 (15.00)	9.52
18.74 (17.00)	9.54
22.05 (20.00)	9.56
27.56 (25.00)	9.60
33.07 (30.00)	9.41
38.58 (35.00)	8.91
41.33 (37.49)	8.67
44.09 (40.00)	8.43
49.60 (45.00)	7.90
55.12 (50.00)	7.39
60.63 (55.00)	5.79
63.16 (57.30)	4.68
63.50 (57.61)	4.84
63.59 (57.68)	4.91
63.72 (57.81)	4.90
63.76 (57.85)	4.73

Note:

(1) Values in Table 5 are for two recirculation loop operation; see Section 8.1.1. For single recirculation loop operation, see Section 8.1.2.

(2) Engineering Data Bank (EDB) number, Reference 2.

Table 6: MAPLHGR Limits[1]

GE14C EDB-2480[2]: GE14-P10DNAB391-14GZ-100T-145-T6-2480

(formerly EDB-2427)

Average Planar Exposure GWD/MTU (GWD/STU)	MAPLHGR Limit (kW/ft)
0.00 (0.00)	8.37
0.22 (0.20)	8.43
1.10 (1.00)	8.54
2.20 (2.00)	8.65
3.31 (3.00)	8.77
4.41 (4.00)	8.90
5.51 (5.00)	9.03
6.61 (6.00)	9.16
7.72 (7.00)	9.27
8.82 (8.00)	9.39
9.92 (9.00)	9.51
11.02 (10.00)	9.63
12.13 (11.00)	9.75
13.23 (12.00)	9.84
14.33 (13.00)	9.92
15.43 (14.00)	9.98
16.53 (15.00)	10.03
18.74 (17.00)	10.10
22.05 (20.00)	10.20
27.56 (25.00)	10.19
33.07 (30.00)	10.04
38.58 (35.00)	9.44
41.33 (37.49)	9.15
44.09 (40.00)	8.87
49.60 (45.00)	8.33
55.12 (50.00)	7.81
60.63 (55.00)	6.26
63.50 (57.61)	4.95
63.72 (57.81)	4.85
63.79 (57.87)	4.85
64.37 (58.40)	4.90
64.39 (58.42)	4.89

Note:

(1) Values in Table 6 are for two recirculation loop operation; see Section 8.1.1. For single recirculation loop operation, see Section 8.1.2.

(2) Engineering Data Bank (EDB) number, Reference 2.

Table 7: MAPLHGR Limits[1]

GE14C EDB-2481[2]: GE14-P10DNAB391-14GZ-100T-145-T6-2481

(formerly EDB-2428)

Average Planar Exposure GWD/MTU (GWD/STU)	MAPLHGR Limit (kW/ft)
0.00 (0.00)	8.32
0.22 (0.20)	8.37
1.10 (1.00)	8.48
2.20 (2.00)	8.63
3.31 (3.00)	8.75
4.41 (4.00)	8.87
5.51 (5.00)	8.99
6.61 (6.00)	9.11
7.72 (7.00)	9.22
8.82 (8.00)	9.33
9.92 (9.00)	9.44
11.02 (10.00)	9.56
12.13 (11.00)	9.68
13.23 (12.00)	9.79
14.33 (13.00)	9.88
15.43 (14.00)	9.95
16.53 (15.00)	9.84
18.74 (17.00)	9.80
22.05 (20.00)	9.79
27.56 (25.00)	9.79
33.07 (30.00)	9.74
38.58 (35.00)	9.14
41.33 (37.49)	8.87
44.09 (40.00)	8.59
49.60 (45.00)	8.06
55.12 (50.00)	7.56
60.63 (55.00)	6.25
63.50 (57.61)	4.94
63.68 (57.77)	4.86
63.79 (57.87)	4.85
64.30 (58.33)	4.90
64.32 (58.35)	4.89

Note:

(1) Values in Table 7 are for two recirculation loop operation; see Section 8.1.1. For single recirculation loop operation, see Section 8.1.2.

(2) Engineering Data Bank (EDB) number, Reference 2.

Table 8 [4]
UO2/Gd Thermal Mechanical LHGR Limits [1]

(Reference 4)

Bundle Type: GE11-P9DUB380-17GZ-100T-141-T6 (GE11)

Engineering Data Bank (EDB) Bundle Number [2]: 3823 (formerly EDB-2367)

Peak Pellet Exposure GWd/MT (GWD/ST)	UO_2 LHGR Limit (kW/ft)	Peak Pellet Exposure GWd/MT (GWD/ST)	Most Limiting Gadolinia LHGR Limit [3] (kW/ft)
0.00 (0.00)	14.40	[[	
[[			
	{3}]]		{3}]]

Notes:

1. This table contains GNF proprietary information.
2. Reference 2.
3. [[{3}]]
4. Applicable multipliers per Section 8.2 will be applied to the data in this table for two recirculation loop and single recirculation loop operations.

Table 9 [4]
UO2/Gd Thermal Mechanical LHGR Limits [1]

(Reference 4)

Bundle Type: GE11-P9DUB380-16GZ-100T-141-T6 (GE11)

Engineering Data Bank (EDB) Bundle Number [2]: 3824 (formerly EDB-2368)

Peak Pellet Exposure GWd/MT (GWD/ST)	UO_2 LHGR Limit (kW/ft)	Peak Pellet Exposure GWd/MT (GWD/ST)	Most Limiting Gadolinia LHGR Limit [3] (kW/ft)
0.00 (0.00)	14.40	[[	
[[			
	{3}]]		{3}]]

Notes:

1. This table contains GNF proprietary information.
2. Reference 2.
3. [[{3}]]
4. Applicable multipliers per Section 8.2 will be applied to the data in this table for two recirculation loop and single recirculation loop operations.

Table 10 [4]
UO2/Gd Thermal Mechanical LHGR Limits [1]

(Reference 4)

Bundle Type: GE14-P10DNAB393-17GZ-100T-145-T6-2598 (GE14C)

Engineering Data Bank (EDB) Bundle Number [2]: 2598 (formerly EDB-2587)

Peak Pellet Exposure GWd/MT (GWD/ST)	UO_2 LHGR Limit (kW/ft)	Peak Pellet Exposure GWd/MT (GWD/ST)	Most Limiting Gadolinia LHGR Limit [3] (kW/ft)
0.00 (0.00)	13.40	[[	
[[			
	{3}]]		{3}]]

Notes:

1. This table contains GNF proprietary information.
2. Reference 2.
3. [[{3}]]
4. Applicable multipliers per Section 8.2 will be applied to the data in this table for two recirculation loop and single recirculation loop operations.

Table 11 [4]
UO2/Gd Thermal Mechanical LHGR Limits [1]

(Reference 4)

Bundle Type: GE14-P10DNAB393-17GZ-100T-145-T6-2599 (GE14C)

Engineering Data Bank (EDB) Bundle Number [2]: 2599 (formerly EDB-2588)

Peak Pellet Exposure GWd/MT (GWD/ST)	UO2 LHGR Limit (kW/ft)	Peak Pellet Exposure GWd/MT (GWD/ST)	Most Limiting Gadolinia LHGR Limit [3] (kW/ft)
0.00 (0.00)	13.40	[[	
[[			
	{3}]]		{3}]]

Notes:

1 This table contains GNF proprietary information.
2. Reference 2.
3. [[{3}]]
4. Applicable multipliers per Section 8.2 will be applied to the data in this table for two recirculation loop and single recirculation loop operations.

Table 12 [4]
UO2/Gd Thermal Mechanical LHGR Limits [1]

(Reference 4)

Bundle Type: GE14-P10DNAB392-16GZ-100T-145-T6-2824 (GE14C)

Engineering Data Bank (EDB) Bundle Number [2]: 2824 (no former EDB designation)

Peak Pellet Exposure GWd/MT (GWD/ST)	UO2 LHGR Limit (kW/ft)	Peak Pellet Exposure GWd/MT (GWD/ST)	Most Limiting Gadolinia LHGR Limit [3] (kW/ft)
0.00 (0.00)	13.40	[[	
[[			
	{3}]]		{3}]]

Notes:

1. This table contains GNF proprietary information.
2. Reference 2.
3. [[{3}]]
4. Applicable multipliers per Section 8.2 will be applied to the data in this table for two recirculation loop and single recirculation loop operations.

Table 13 [4]
UO2/Gd Thermal Mechanical LHGR Limits [1]

(Reference 4)

Bundle Type: GE14-P10DNAB391-14GZ-100T-145-T6-2480 (GE14C)

Engineering Data Bank (EDB) Bundle Number [2]: 2480 (formerly EDB-2427)

Peak Pellet Exposure GWd/MT (GWD/ST)	UO2 LHGR Limit (kW/ft)	Peak Pellet Exposure GWd/MT (GWD/ST)	Most Limiting Gadolinia LHGR Limit [3] (kW/ft)
0.00 (0.00)	13.40	[[	
[[			
	{3}]]		{3}]]

Notes:

1. This table contains GNF proprietary information.
2. Reference 2.
3. [[{3}]]
4. Applicable multipliers per Section 8.2 will be applied to the data in this table for two recirculation loop and single recirculation loop operations.

Table 14 [4]
UO2/Gd Thermal Mechanical LHGR Limits [1]

(Reference 4)

Bundle Type: GE14-P10DNAB391-14GZ-100T-145-T6-2481 (GE14C)

Engineering Data Bank (EDB) Bundle Number [2]: 2481 (formerly EDB-2428)

Peak Pellet Exposure GWd/MT (GWD/ST)	UO2 LHGR Limit (kW/ft)	Peak Pellet Exposure GWd/MT (GWD/ST)	Most Limiting Gadolinia LHGR Limit [3] (kW/ft)
0.00 (0.00)	13.40	[[	
[[			
	{3}]]		{3}]]

Notes:

1. This table contains GNF proprietary information.
2. Reference 2.
3. [[{3}]]
4. Applicable multipliers per Section 8.2 will be applied to the data in this table for two recirculation loop and single recirculation loop operations.

9.0 Core Stability Requirements

Stability Exclusion Region
The stability exclusion region is shown in Figure 5, and is given in greater detail in Figure 6.

Stability Buffer Region
The stability buffer region is shown in Figure 5, and is given in greater detail in Figure 6.

Power Distribution Controls
Prior to intentionally entering the stability buffer region, the hot channel and core wide decay ratios shall be shown to be within the stable portion of Figure 7. While operating in the stability buffer region, the hot channel and core wide decay ratios shall be maintained within the stable portion of Figure 7.

Reference: Technical Specification Section 3.5.F.

10.0 Scram Time Dependence

The Option A (no scram times dependence) OLMCPR can be found in Section 5 of this report. If the Option B scram time dependence option is preferred, then the procedure listed in this section may be used.

Technical Specification 3.3.C provides the scram insertion time versus position requirements for continued operations. Technical Specification 4.3.C provides the surveillance requirements for the CRDs. Data from testing of the CRDs, or from an unplanned scram, is summarized in Surveillance Test 0081.

Using this cycle specific information, values of τ_{ave} can be calculated in accordance with the equation below at the 20% insertion position:

The Equation (1) used to calculate the average of all the scram data generated to date in the cycle is:

$$\tau_{ave} = \frac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i} \qquad (1)$$

where: n = the number of surveillance tests performed to date in the cycle;

$\sum_{i=1}^{n} N_i$ = total number of active control rods measured to date in the cycle; and

$\sum_{i=1}^{n} N_i \tau_i$ = sum of the scram time to the 20 percent insertion position of all active rods measured to date in the cycle to comply with the Technical Specification surveillance requirements.

The average scram time, τ_{ave} is tested against the analysis mean using the following equation:

$$\tau_{ave} \leq \tau_B \qquad (2)$$

where:

$$\tau_B = \mu + 1.65 \sqrt{\left(\frac{N_1}{\sum_{i=1}^{n} N_i} \right)} \sigma \qquad (3)$$

The parameters μ and σ are the mean and standard deviation of the distribution of the average scram insertion time to the 20% insertion position in the ODYN Option B analysis (Table 15), and N_1 = number of active control rods tested at BOC.

Table 15

GEMINI Methods, CRD Control Fraction vs. Time

	0%	5%	20%	50%	90%	100%
μ (sec)	0.200	0.324	0.694	1.459	2.535	2.804
σ (sec)	----	0.014	0.016	0.031	0.070	----

If the cycle average scram time satisfies the Equation 2 criteria, continued plant operation under the ODYN Option B operating limit minimum critical power ratio (OLMCPR) for pressurization events is permitted. If not, the OLMCPR for pressurization events must be re-established, based on linear interpolation between the Option B and Option A OLMCPRs.

Note that Option B has an OLMCPR applicable to two recirculation loop operation, and an OLMCPR applicable to single recirculation loop operation. The Option B OLMCPR value for single recirculation loop operation is 0.02 greater than the Option B OLMCPR value for two recirculation loop operation.

The equation to establish the new operating limit for pressurization events is given below:

$$\mathrm{OLMCPR}^{\mathrm{New}}_{\mathrm{OptionB}} = \mathrm{OLMCPR}^{100\%}_{\mathrm{OptionB}} + \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B}\Delta\mathrm{OLMCPR} \qquad (4)$$

where:

τ_{ave} and τ_B are defined in Equations 1 and 3, respectively; and

τ_A = the Technical Specification limit on core average scram time to the 20% insertion limit. (Technical Specification 3.3.C at 20% insertion)

ΔOLMCPR = the difference between the Option A OLMCPR and the Option B OLMCPR reported in Table 16.

Table 16

Cycle OLMCPR Values

Transient	Option A	Option B
Inadvertent HPCI / L8 Turbine Trip	1.70	1.53
Turbine Trip with Bypass[1]	1.54	

1. The Turbine Trip with Bypass transient will be used as the Minimum OLMCPR transient for Option B Analysis.
2. All the OLMCPR values reported in this Table 16 are for two recirculation loop operation.
3. For Options A and B, the OLMCPR value for single recirculation loop operation is 0.02 greater than the OLMCPR value for two recirculation loop operation.

Sample Calculation:

Assume two recirculation loop operation.

If τ_{ave} is 0.694 seconds (scram time test) and τ_B (as calculated with equation 3) is 0.700 seconds then the criteria from Equation 2 is met and the Option B OLMCPR of 1.54 can be used.

Note that the value of 1.54 will be used as the rated (100%) core thermal power Option B OLMCPR (i.e. $OLMCPR^{100\%}_{OptionB} = 1.54$). The 1.54 Option B OLMCPR is conservative with respect to the pressurization transient Option B OLMCPR of 1.53 reported in Table 16.

If τ_{ave} is 0.800 seconds and τ_B is 0.700 seconds, then the criteria from Equation 2 is not met and a new Option B OLMCPR must be calculated using Equation 4 above.

The example calculation is as follows:

$$OLMCPR^{New}_{OptionB} = OLMCPR^{100\%}_{OptionB} + \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B}\Delta OLMCPR$$

$OLMCPR^{100\%}_{OptionB}$ = 1.54 (from Table 16 above)

τ_{ave} = 0.800

τ_B = 0.700

τ_A = 0.900 (Technical Specification 3.3.C)

$\Delta OLMCPR$ = 1.70 - 1.53 = 0.17 (from Table 16 above; assume two recirculation loop operation)

$$OLMCPR^{New}_{OptionB} = 1.54 + \left(\frac{0.800 - 0.700}{0.900 - 0.700}\right) * 0.17 = 1.63$$; two recirculation loop operation.

Note: If single recirculation loop operation Option B OLMCPR value is desired, add 0.02, i.e. 1.63 + 0.02 = 1.65.

Figure 1
Monticello Cycle 23
Power Dependent MAPLHGR and LHGR Multipliers

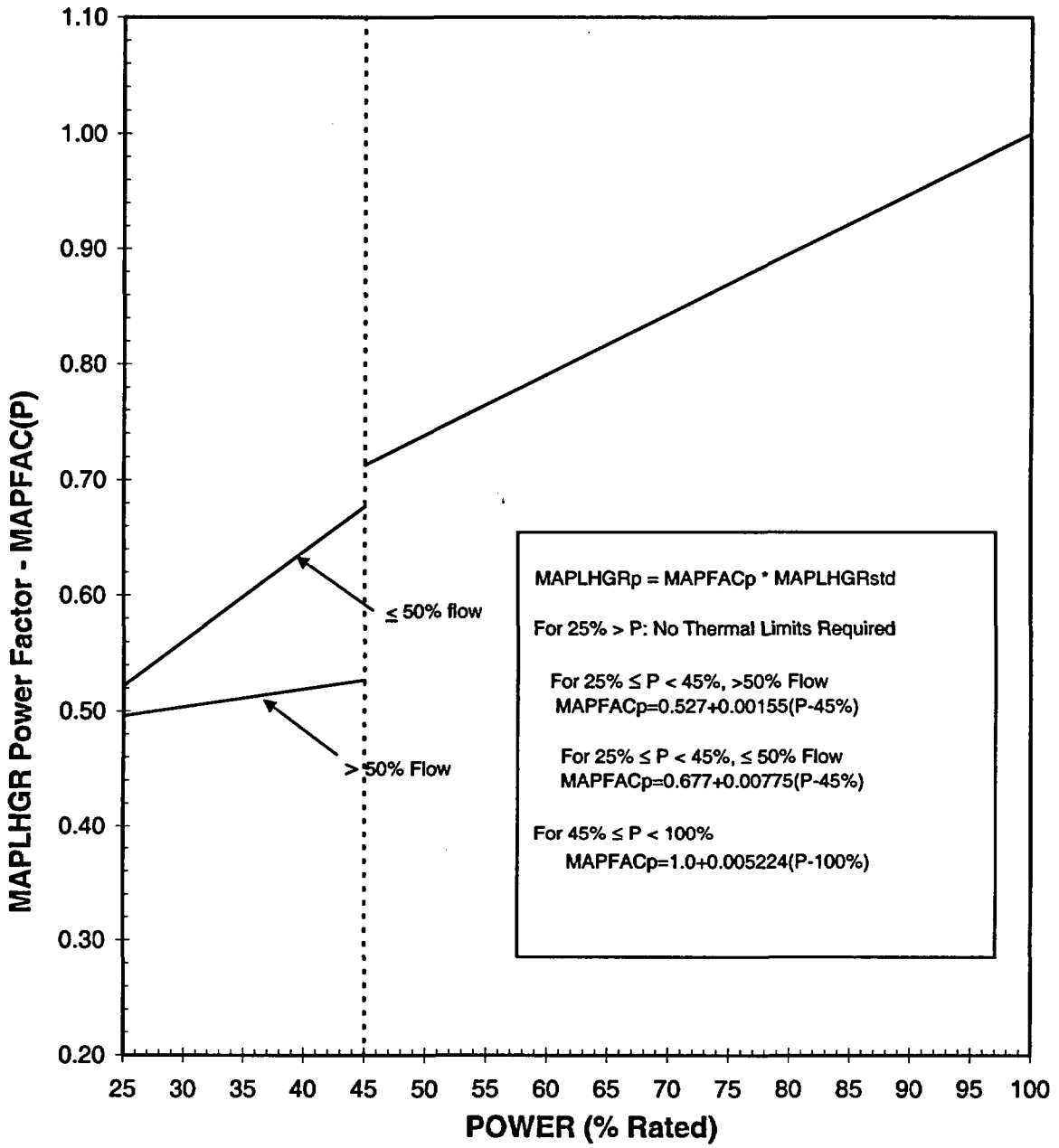


Figure 2
Monticello Cycle 23
Flow Dependent MAPLHGR and LHGR Multipliers

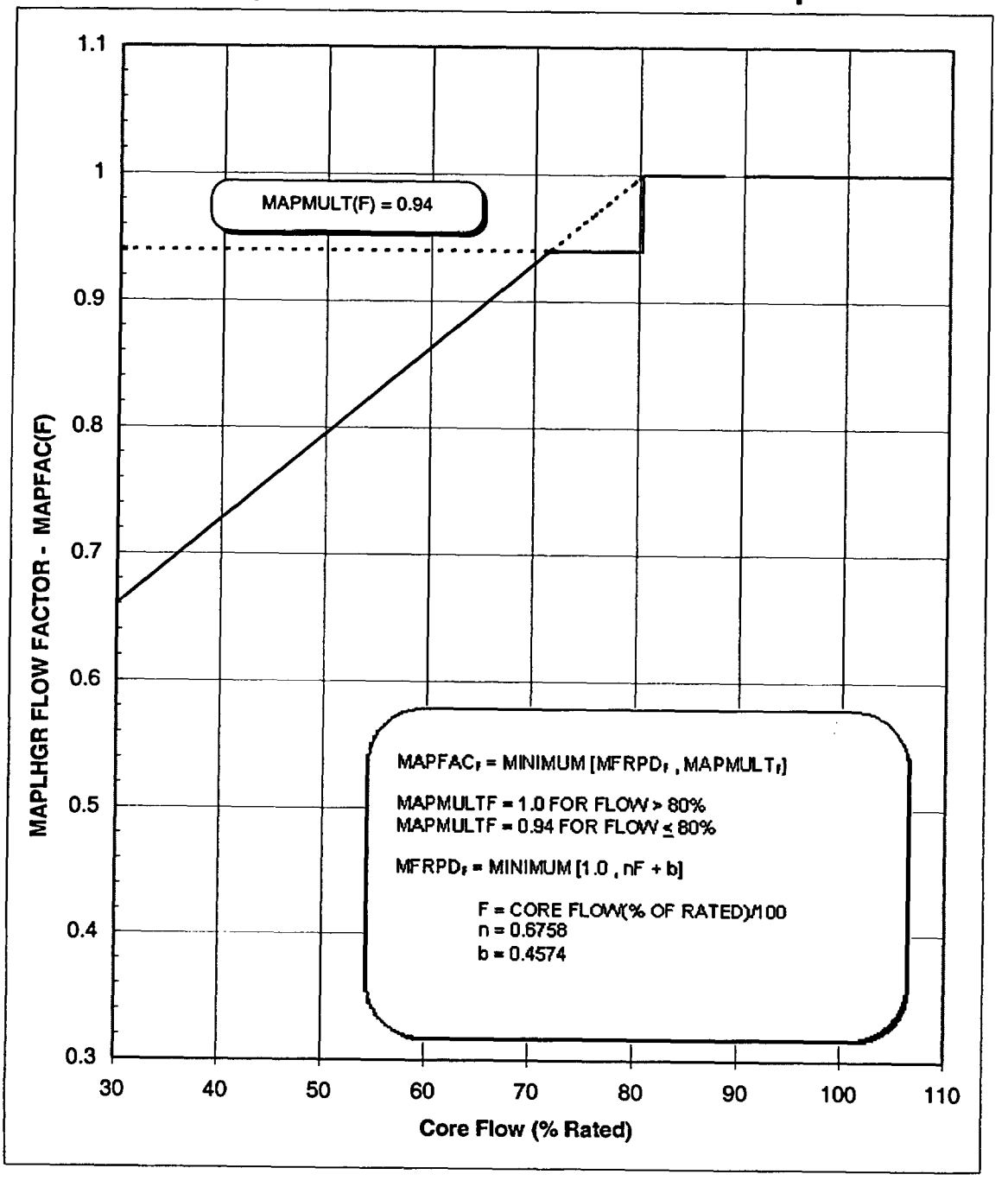


Figure 3
Monticello Cycle 23
Power Dependent K(P) / MCPR(P) Limits

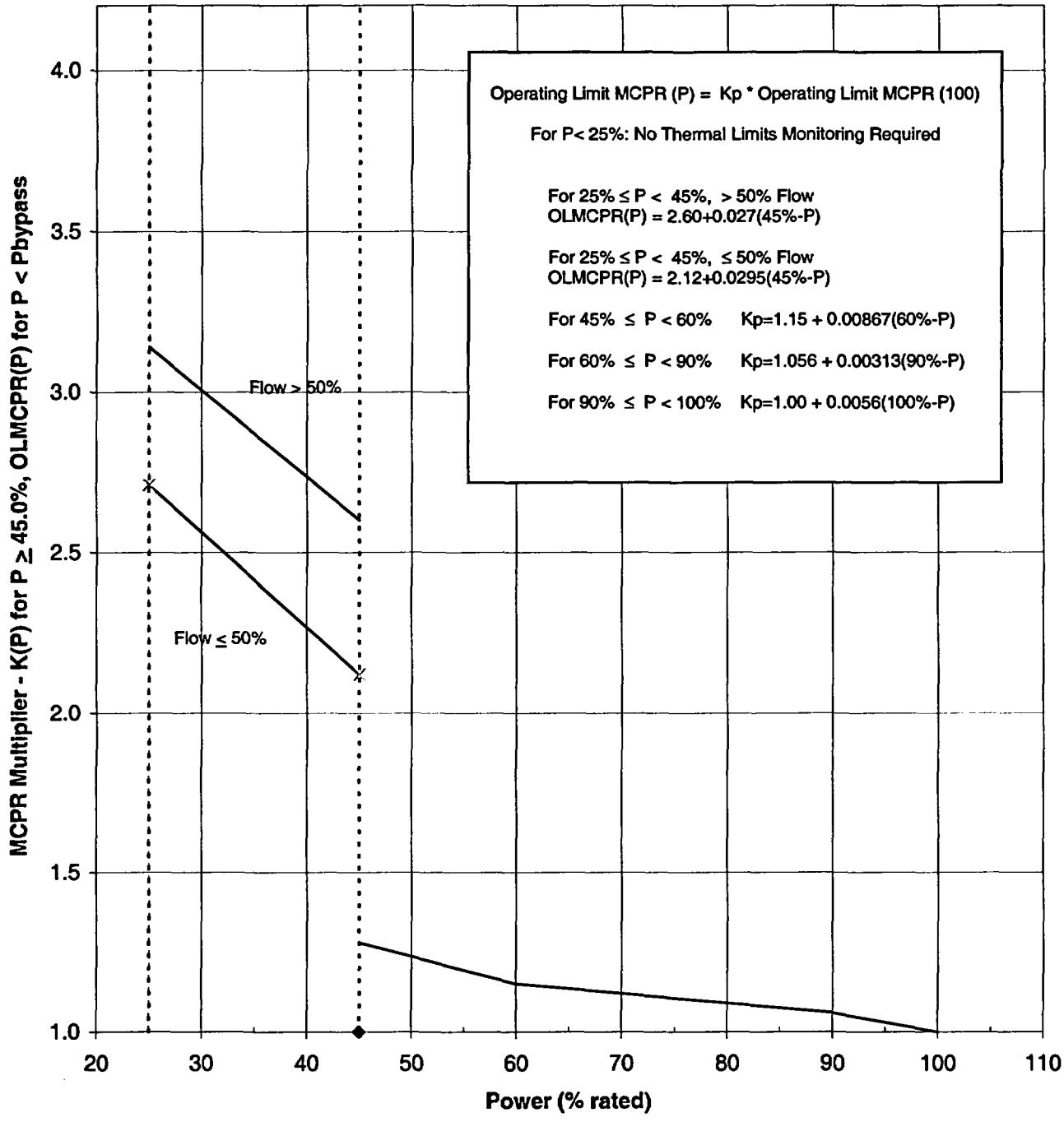


Figure 4
Monticello Cycle 23
Flow Dependent CPR Limits

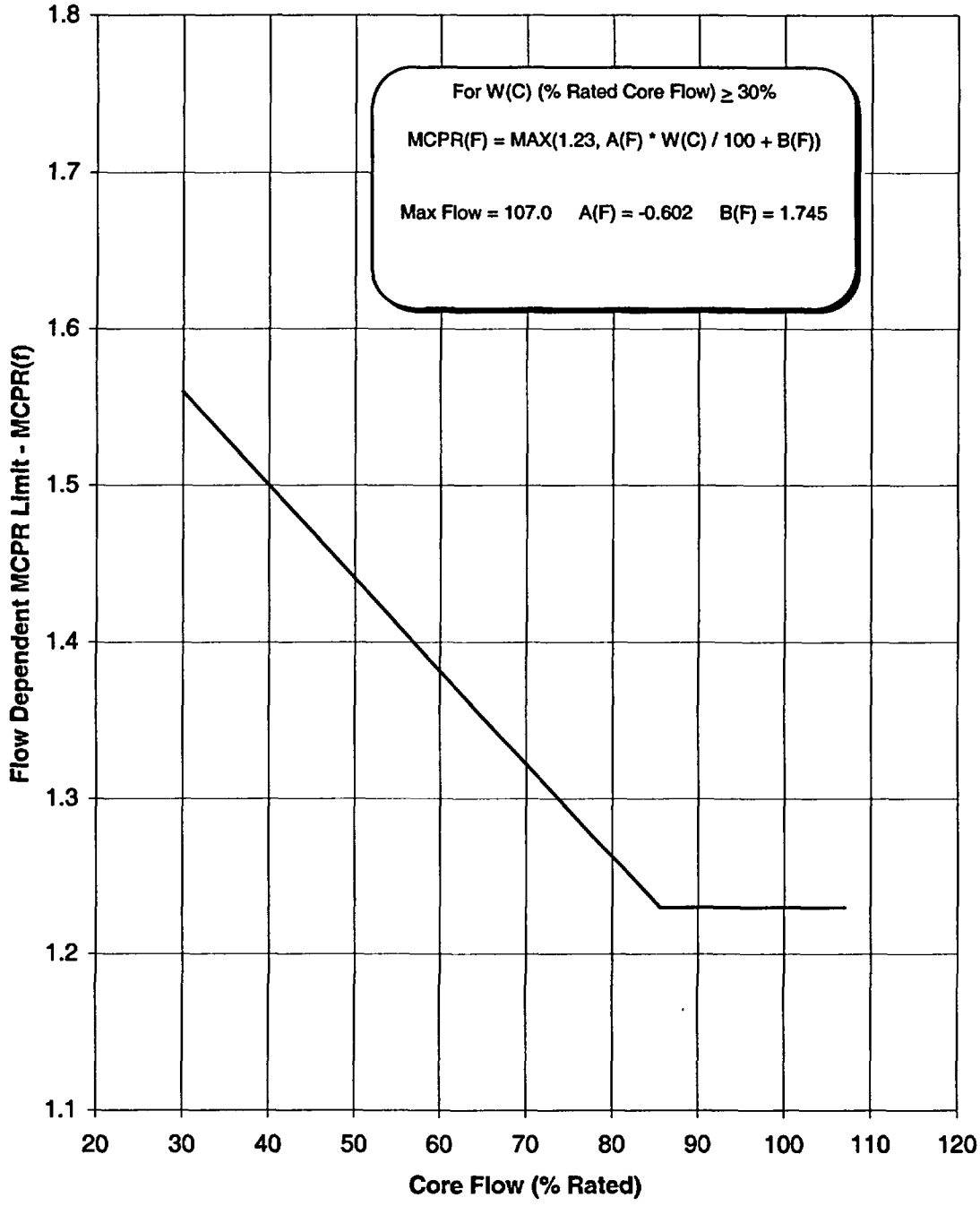


Figure 5

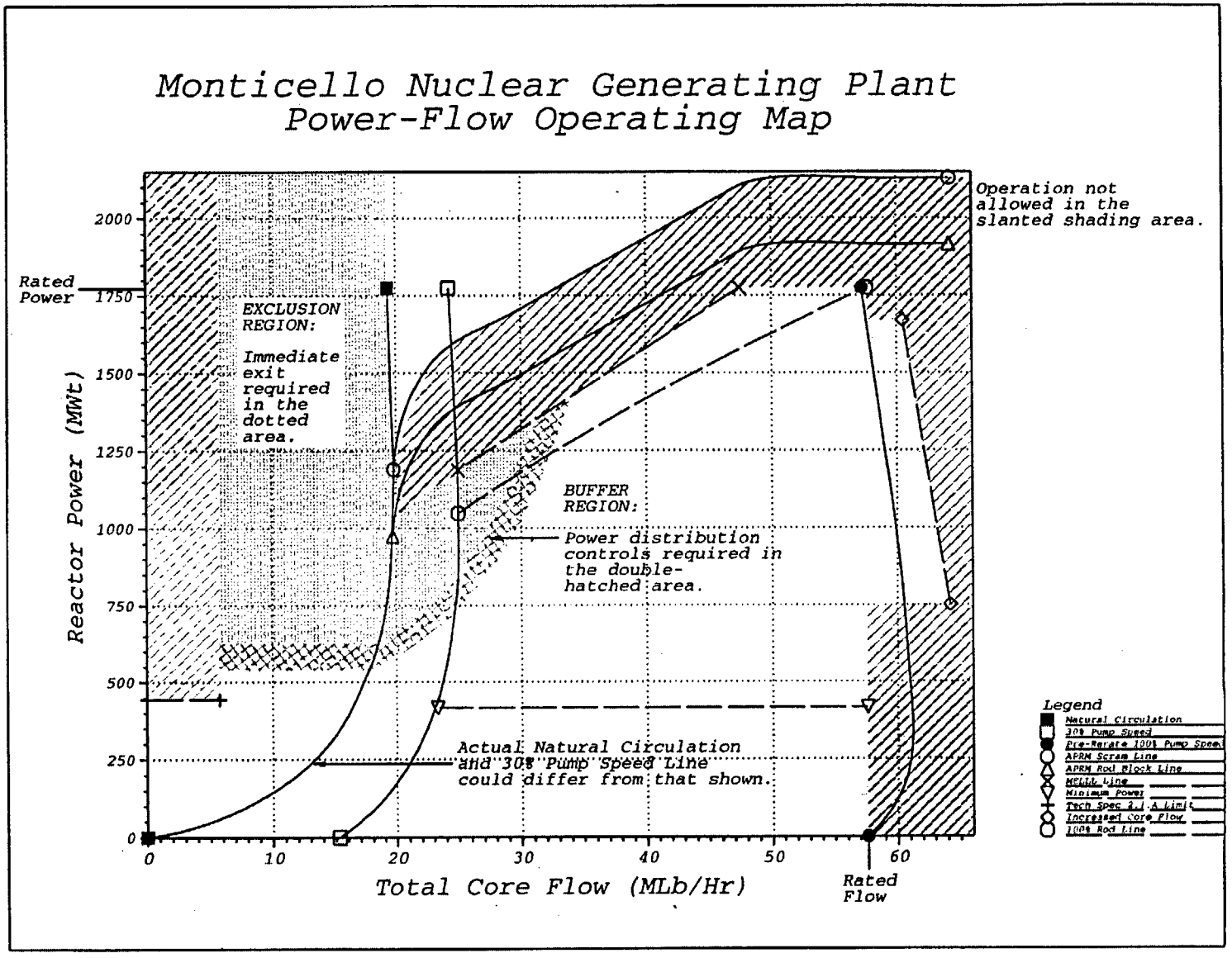

Monticello Nuclear Generating Plant
Power-Flow Operating Map
Operation not allowed in the slanted shading area.
Rated Power
EXCLUSION REGION:
Immediate exit required in the dotted area.
BUFFER REGION:
Power distribution controls required in the double-hatched area.
Actual Natural Circulation and 30% Pump Speed Line could differ from that shown.
Reactor Power (MWt)
Total Core Flow (MLb/Hr)
Rated Flow
2000
1750
1500
1250
1000
750
500
250
0
0
10
20
30
40
50
60
Legend
Natural Circulation
30% Pump Speed
Pre-Rerate 100% Pump Speed
APRM Scram Line
APRM Rod Block Line
MSIVL Line
Minimum Power
Tech Spec 2.1.A Limit
Increased Core Flow
100% Rod Line

Figure 6

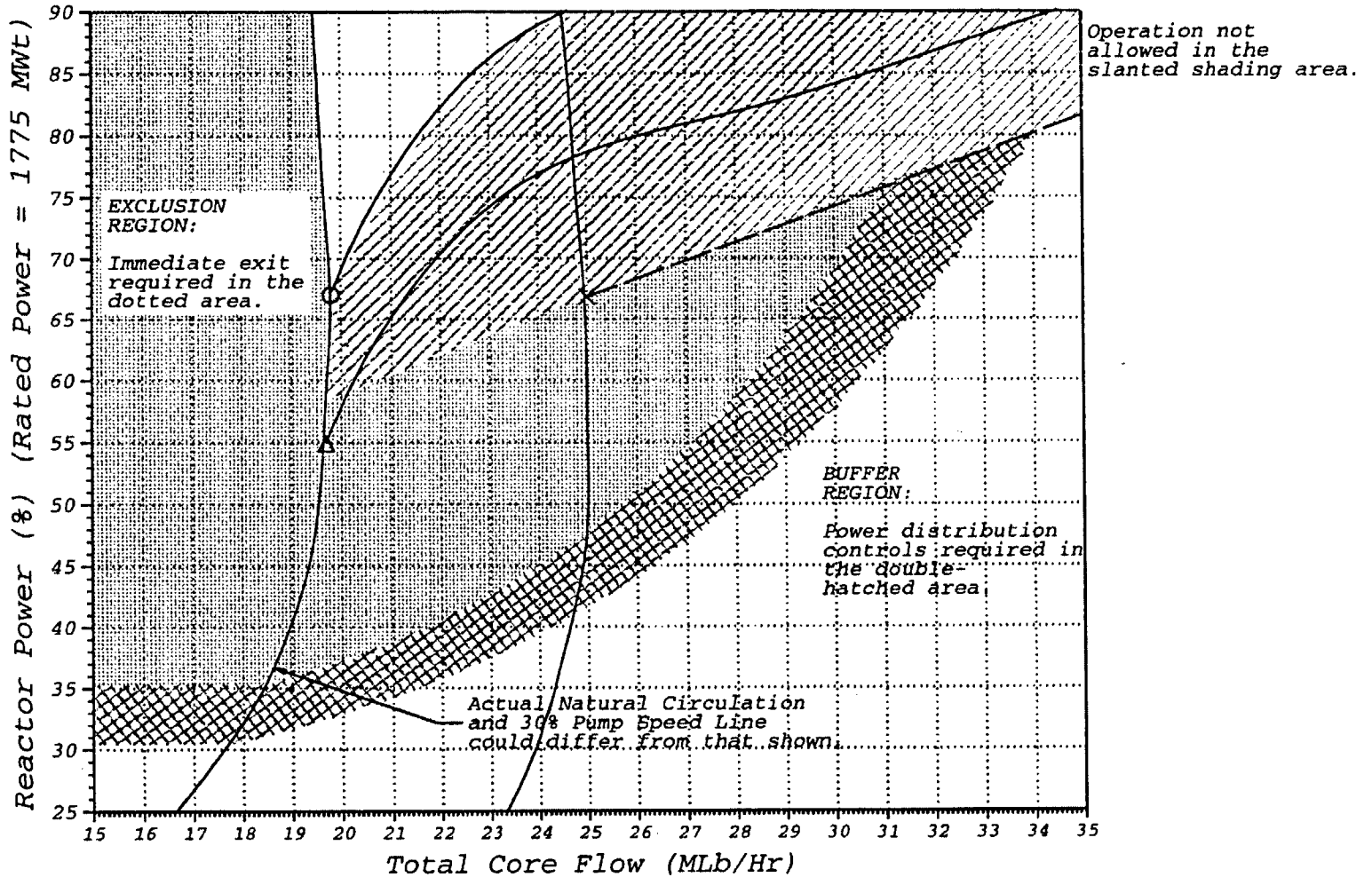
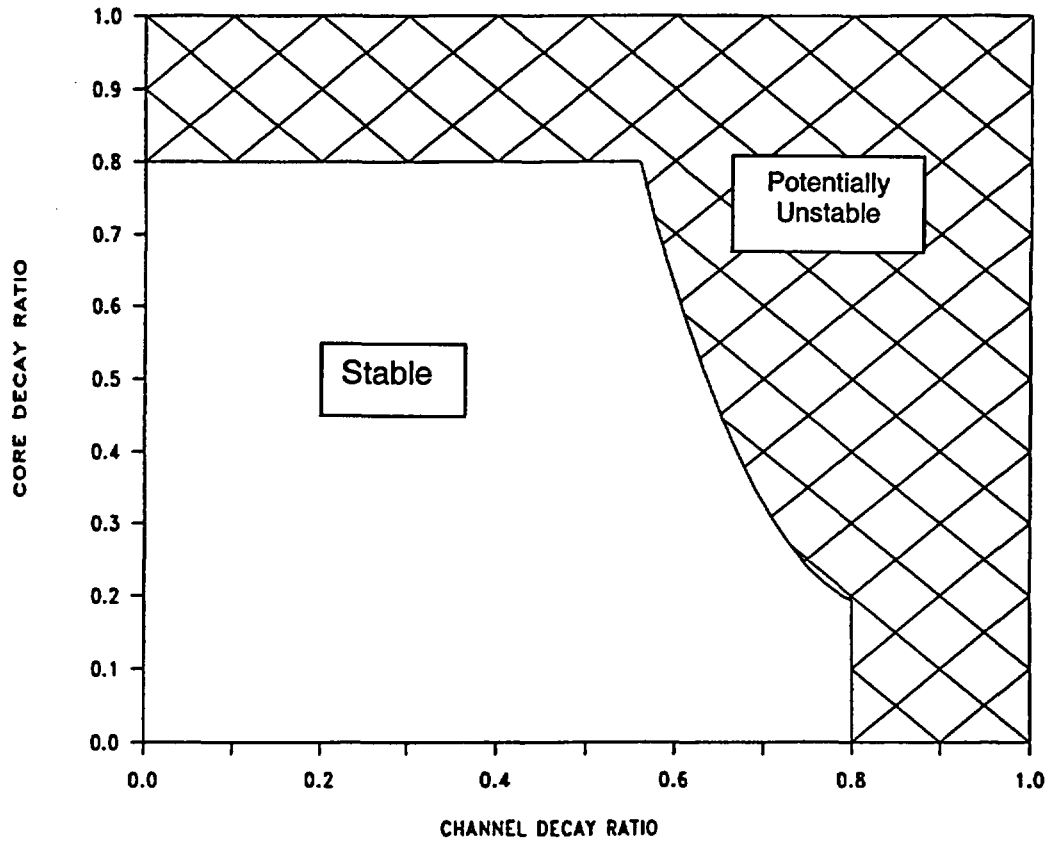

Monticello Nuclear Generating Plant
Power-Flow Operating Map
Reactor Power (%) (Rated Power = 1775 MWt)
Total Core Flow (MLb/Hr)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
EXCLUSION REGION:
Immediate exit required in the dotted area.
Operation not allowed in the slanted shading area.
BUFFER REGION:
Power distribution controls required in the double-hatched area.
Actual Natural Circulation and 30% Pump Speed Line could differ from that shown.

Figure 7
Stability Criterion Map



ENCLOSURE 2

Global Nuclear Fuel – Americas, LLC, Affidavit
Proprietary information contained in the Monticello Nuclear Generating Plant
Core Operating Limits Report for Cycle 23, NAD MN 010, Revision 1, Proprietary

3 pages follow

Affidavit

I, Jens G. M. Andersen, state as follows:

(1) I am Fellow and project manager, TRACG Development, Global Nuclear Fuel – Americas, L.L.C. ("GNF-A") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in the attachment, "Monticello Cycle 23 Core Operating Limits Report (COLR) Revision 1", NAD File No. OC.MN.2005.27, dated August 17, 2005. GNF proprietary information is indicated by enclosing it in double brackets. In each case, the superscript notation $^{\{3\}}$ refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GNF-A relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4) and 2.390(a)(4) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information," and some portions also qualify under the narrower definition of "trade secret," within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GNF-A's competitors without license from GNF-A constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals cost or price information, production capacities, budget levels, or commercial strategies of GNF-A, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future GNF-A customer–funded development plans and programs, of potential commercial value to GNF-A;

e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b., above.

(5) To address the 10 CFR 2.390 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GNF-A, and is in fact so held. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in (6) and (7) following. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GNF-A, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GNF-A. Access to such documents within GNF-A is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GNF-A are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2) is classified as proprietary because it contains details of GNF-A's fuel design and licensing methodology.

The development of the methods used in these analyses, along with the testing, development and approval of the supporting methodology was achieved at a significant cost, on the order of several million dollars, to GNF-A or its licensor.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GNF-A's competitive position and foreclose or reduce the availability of profit–making opportunities. The fuel design and licensing methodology is part of GNF-A's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC–approved methods.

The research, development, engineering, analytical, and NRC review costs comprise a substantial investment of time and money by GNF-A or its licensor.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GNF-A's competitive advantage will be lost if its competitors are able to use the results of the GNF-A experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GNF-A would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GNF-A of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed at Wilmington, North Carolina, this 7th day of September, 2005.

Jens G M Andersen

Jens G. M. Andersen
Global Nuclear Fuel – Americas, LLC