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NLS2004143
November 9, 2004

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

Subject: Core Operating Limits Report, Cycle 22, Revision 2
Cooper Nuclear Station, NRC Docket No. 50-298, DPR-46

Reference:
1. Letter to U.S. Nuclear Regulatory Commission from Michael T. Coyle (Nebraska Public Power District) dated April 4, 2003, "Core Operating Limits Report" (NLS2003042)

2. Letter to U.S. Nuclear Regulatory Commission from Michael T. Coyle (Nebraska Public Power District) dated June 18, 2003, "Core Operating Limits Report, Cycle 22, Revision 1" (NLS2003061)

The purpose of this letter is to provide the Nuclear Regulatory Commission (NRC) the revised Core Operating Limits Report (COLR) for Cooper Nuclear Station (CNS) for Cycle 22. CNS Technical Specification 5.6.5.d requires that the COLR, including any midcycle revisions or supplements, be provided to the NRC upon issuance for each reload cycle. The Cycle 22 COLR, Revision 0 (Reference 1) contained an administrative error that was corrected with Revision 1 (Reference 2). The Cycle 22 COLR, Revision 1 (Reference 2) contained a technical error in that the Cycle 22 Rod Withdrawal Error (RWE) analysis was not bounded by the generic RWE analysis. The Cycle 22 COLR contained the incorrect statement that "the trip level settings associated with this MCPR [Minimum Critical Power Ratio] limit have been generically calculated and verified to bound the Rod Withdrawal Error Analysis for Cycle 22 operation." This statement has been corrected in Revision 2. In accordance with 10 CFR 50.4(b)(1), we are also transmitting a copy of this COLR to the Regional Office and to the NRC Senior Resident Inspector.

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Should you have any questions regarding this matter, please contact Mr. Paul Fleming at (402) 825-2774.

Sincerely,

for Paul V. Fleming
Licensing Manager

/cb

Enclosure

cc: Regional Administrator w/enclosure
USNRC Region IV

Senior Project Manager w/enclosure
USNRC - NRR Project Directorate IV-1

Senior Resident Inspector w/enclosure
USNRC

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ENCLOSURE

CORE OPERATING LIMITS REPORT

CYCLE 22, REVISION 2

COOPER NUCLEAR STATION

DOCKET No. 50-298, DPR-46

COOPER NUCLEAR STATION

CORE OPERATING LIMITS REPORT

Cycle 22
Revision 2

Signature Page

Revision 2

Preparer: Christine Parkyn
Print

Christine Parkyn 10-27-04
Sign/Date

Reviewer: Thomas H Black
Print

Thomas H Black 10-28-04
Sign/Date

RE Manager: Jerry L. Lewis
Print

28 Oct 04
Sign/Date

1.0 INTRODUCTION

The Core Operating Limits Report provides the limits for operation of the Cooper Nuclear Station for Cycle 22. It includes the limits for the Rod Block Monitor Upscale Set Point, Average Planar Linear Heat Generation Rate (APLHGR), and Minimum Critical Power Ratio (MCPR). In addition, this COLR also contains:

- MCPR limits for an inoperable Main Turbine Bypass System (one bypass valve inoperable)
- Power to flow map defining the Stability Exclusion Region
- Turbine Bypass System response time
- Maximum allowable LHGR

If any of these limits is exceeded, action will be taken as defined in the Technical Specifications.

The core operating limit values have been determined using the NRC-approved methodologies given in References 1, 2, 10, and 11 and have been established such that all applicable plant safety analysis limits are met.

2.0 CORE OPERATING LIMITS

Cooper Nuclear Station shall operate within the bounds of the below limits/values. The applicable Technical Specifications are referenced in each subsection.

2.1 Rod Block Monitor Upscale Set Point

The Technical Specifications reflect a reference to Allowable Values for the Rod Block Monitor (RBM) upscale (power referenced) trip level setting, found in Reference 9, are as follows:

Lowest Rated MCPR Limit	Low Trip Set Point (LTSP) (LPSP≤P≤IPSP)	Intermed Trip Set Point (ITSP) (IPSP<P≤HPSP)	High Trip Set Point (HTSP) (HPSP<P)
≥1.33	≤117.0/125	≤112.5/125	≤107.5/125

LPSP, IPSP, and HPSP are the Low Power Set Point, Intermediate Power Set Point, and High Power Set Point, respectively.

The trip level settings associated with this MCPR limit have been verified to bound the Rod Withdrawal Error Analysis for Cycle 22 operation as found in Reference 5.

Technical Specification Reference: 3.3.2.1

2.2 Average Planar Linear Heat Generation Limits

The most limiting lattice APLHGR value (excluding natural uranium) for each fuel bundle as a function of Planar Average Exposure, core power, and core flow is calculated by multiplying the value from Figures 1, 2, 3, 4, 5, and 6 by the smaller of the MAPLHGR Flow Factor, $MAPFAC_F$ (Figure 7) or the Power-Dependent MAPLHGR Factor, $MAPFAC_P$, (Figure 8). APLHGR values determined with the SAFER/GESTR-LOCA methodology are given in References 2, 3, and 5 while $MAPFAC_F$ and $MAPFAC_P$ were determined in Reference 8.

The calculated maximum APLHGR (MAPLHGR) limits in Figures 1, 2, 3, 4, 5 and 6 are conservative values bounding all fuel lattice types (excluding natural uranium) in a given fuel bundle design. MAPLHGR limits for each individual fuel lattice design in a bundle design, as a function of axial location and average planar exposure, are determined based on the approved methodology referenced in Technical Specification 5.6.5 and loaded in the process computer for use in core monitoring calculations. The MAPLHGR values for these lattices, along with the axial location of each lattice in the bundle, are considered proprietary information by General Electric and are given in Reference 3 as a function of planar average exposure.

The MAPLHGR limits referred to above are for two recirculation loop operations. For single loop operation, the limiting APLHGR value is multiplied by 0.77 for GE8x8 NB fuel (as can be found in Reference 5) and by 0.91 for GE14 fuel (as can be found in Reference 5).

Technical Specification Reference: 3.2.1 and 3.4.1

2.3 Linear Heat Generation Rate Limit

The limiting power density and maximum allowable Linear Heat Generation Rate (LHGR) referred to in Technical Requirements Manual Section T 3.2.1 is the design LHGR. The design LHGR for fuel type GE 8x8 NB is 14.4 kW/ft as found in Reference 12. The design LHGR for fuel type GE14 is 13.4 kW/ft as found in Reference 13.

2.4 Minimum Critical Power Ratio Limits

The operating limit MCPR (OLMCPR) values are a function of core thermal power, core flow, fuel bundle, scram time (τ), and fuel exposure. The scram time (τ) is determined from CNS Procedure 10.9, Control Rod Scram Time Evaluation. The OLMCPR values are as follows:

For core thermal power $\geq$ 25 percent and <30 percent of rated power, the OLMCPR is the power dependent MCPR ($MCPR_P$) from Figure 9.

For core thermal power ≥ 30 percent of rated power, the OLMCPR is the greater of either:

The applicable flow dependent MCPR ($MCPR_F$) determined from Figure 10, or the appropriate scram time (τ) dependent MCPR at rated power from Figures 11, and 12, multiplied by the applicable power dependent MCPR multiplier (K_P) from Figure 9.

The appropriate scram time (τ) dependent MCPR at rated power with One Turbine Bypass Valve Unavailable is shown in Figure 13.

The system response time for the Turbine Bypass System to be at 80% of rated bypass flow is 0.3 seconds.

For single recirculation loop operation, the OLMCPR is 0.02 greater than the two recirculation loop operation OLMCPR.

Technical Specification References: 3.2.2, 3.4.1 and 3.7.7

2.5 Power/Flow Map

The power/flow map defining the Stability Exclusion Region can be found as Figure 14. References 5 and 6 reflect the documents describing the current Cooper Nuclear Station power/flow map. The Stability Exclusion Region boundary is given by the equation

$$P = P_B\left(\frac{P_A}{P_B}\right)^{\frac{1}{2}\left[\frac{W-W_B}{W_A-W_B}+\left(\frac{W-W_B}{W_A-W_B}\right)^2\right]}$$

where,

P = a core thermal power value on the region boundary (% of rated),
W = the core flow rate corresponding to power, P, on the region boundary (% of rated),
P_A = core thermal power at point A (% of rated),
P_B = core thermal power at point B (% of rated),

W_A = core flow rate at point A (% of rated), and
W_B = core flow rate at point B (% of rated).

Technical Specification Reference: 3.4.1

3.0 REFERENCES

1. NEDE-24011-P-A-14-US, June 2000, *General Electric Standard Application for Reactor Fuel.*

2. NEDC-32687P, Revision 1, March 1997, *Cooper Nuclear Station SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis.*

3. *Lattice Dependent MAPLHGR Report for Cooper Nuclear Station Reload 21, Cycle 22,* 0000-0002-9865-MAPL, Revision 0.

4. Letter (with attachment), R.H. Buckholz (GE) to P.S. Check (NRC) dated September 5, 1980, *Response to NRC Request for Information on ODYN Computer Model.*

5. *Supplemental Reload Licensing Report for Cooper Nuclear Station Reload 21, Cycle 22,* 0000-0002-9865-SRLR, Revision 0.

6. GE-NE-A13-00395-01, Class I, November, 1996, *Application of the "Regional Exclusion with Flow-Biased APRM Neutron Flux Scram" Stability Solution (Option 1-D) to the Cooper Nuclear Station, Licensing Topical Report.*

7. Letter from James R. Hall (NRC) to G. R. Horn (NPPD) dated September 23, 1997, *Approval of SAFER/GESTAR LOCA Analysis for Cooper Nuclear Station (TAC NO. M98293.)*

8. GE-NE-L12-00867-12, *Cooper Nuclear Station MIG Project Task 900: Transient Analysis,* Revision 1, May 2000.

9. NEDC 98-024, Revision 3, May 2000, *APRM - RBM Setpoint Calculation.*

10. NEDO-31960-A and NEDO-31960-A Supplement 1, *BWR Owner's Group Long-Term Stability Solutions Licensing Methodology.*
(The approved revision at the time the reload analysis is performed.)

11. NEDE-23785-1-P-A, *The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident,* Volume III, Revision 1, October 1984.

12. *Nuclear Design Report for Cooper Nuclear Station Reload, 18,* J11-03354-03, July 1998.

13. GE-NE-L12-00867-09-02, *Cooper Nuclear Station MIG Project Task 407: SAFER/GESTR-LOCA Analysis,* May 2000.

14. Letter from S. Shelton (GNF) to J.L. Lewis (NPPD) dated December 21, 2000, *GE9B LHGR Relaxation for Cooper Nuclear Station.*

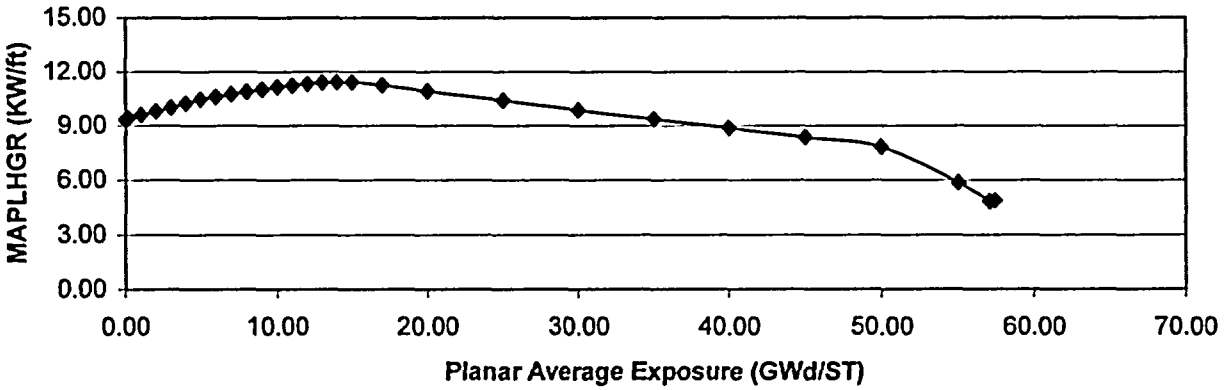
15. NEDE-31152P, *GE Fuel Bundle Designs, December 1988 (As Revised)*

16. NEDC-32538P-A, *Determination of Limiting Cold Water Event*

17. GE-NE-J1103910-09-02P, *Cooper Nuclear Station ECCS-LOCA Evaluation for Cycle 21, August 2001.*

18. GE-NE-J1103910-09-01, *Cooper Nuclear Station ECCS-LOCA Evaluation for GE14, August 2001.*
19. NEDC-32687P, *Cooper Nuclear Station SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis, Revison 1, March 1997.*

Figure 1
Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) versus Exposure with LPCI Modification and Bypass Holes Plugged, Bundle 2610, 3.93 w/o with 17GZ GE14C Fuel

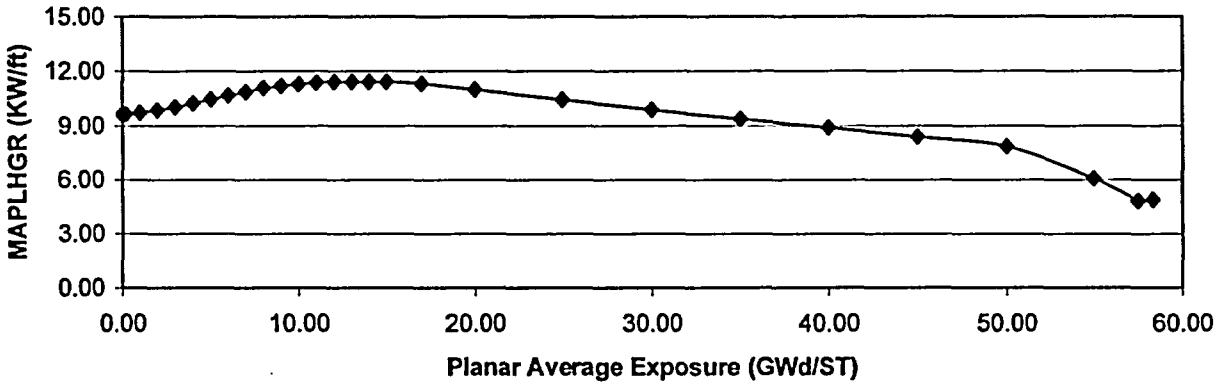


DATA COORDINATES (Reference 3)

Planar Average Exposure (GWD/ST)	MAPLHGR (kW/ft)
0.00	9.34
0.20	9.43
1.00	9.58
2.00	9.79
3.00	10.00
4.00	10.23
5.00	10.45
6.00	10.61
7.00	10.74
8.00	10.88
9.00	11.01
10.00	11.13
11.00	11.23
12.00	11.32
13.00	11.39
14.00	11.41
15.00	11.42
17.00	11.24
20.00	10.92
25.00	10.39
30.00	9.86
35.00	9.37
40.00	8.87
45.00	8.35
50.00	7.82
55.00	5.86
57.05	4.84
57.08	4.83
57.41	4.88
57.42	4.87

Figure 2

Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) versus Exposure with LPCI Modification and Bypass Holes Plugged, Bundle 2568, 3.98 w/o with 16GZ GE14C Fuel

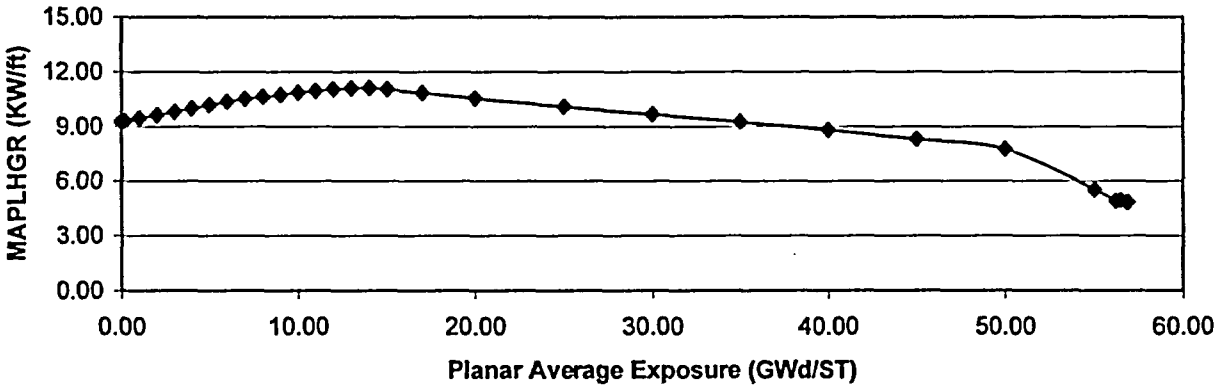


DATA COORDINATES (Reference 3)

Planar Average Exposure (GWD/ST)	MAPLHGR (kW/ft)
0.00	9.63
0.20	9.64
1.00	9.71
2.00	9.86
3.00	10.03
4.00	10.23
5.00	10.45
6.00	10.66
7.00	10.87
8.00	11.09
9.00	11.20
10.00	11.28
11.00	11.36
12.00	11.42
13.00	11.42
14.00	11.42
15.00	11.42
17.00	11.33
20.00	11.00
25.00	10.43
30.00	9.89
35.00	9.39
40.00	8.90
45.00	8.38
50.00	7.85
55.00	6.07
57.47	4.83
57.49	4.83
58.31	4.89
58.32	4.88

Figure 3

Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) versus Exposure with LPCI Modification and Bypass Holes Plugged, Bundle 2472, 3.79 w/o with 17GZ GE14C Fuel

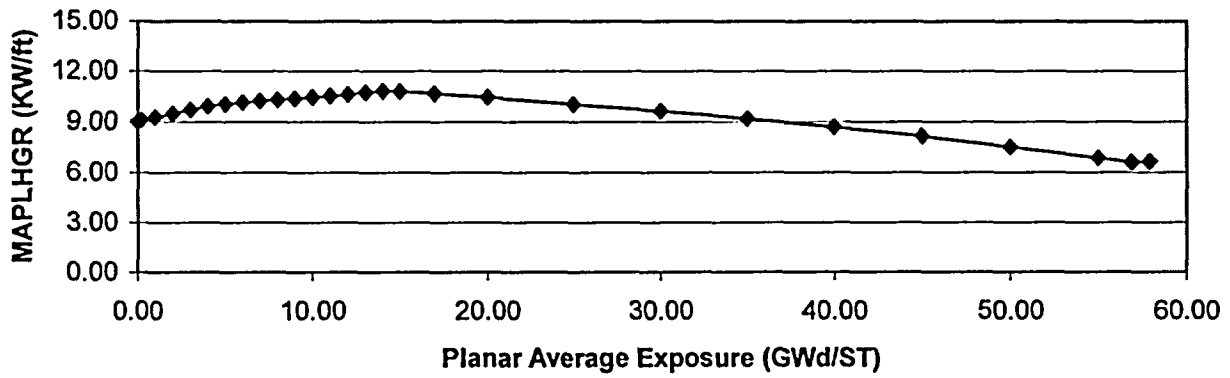


DATA COORDINATES (Reference 3)

Planar Average Exposure (GWD/ST)	MAPLHGR (kW/ft)
0.00	9.25
0.20	9.32
1.00	9.45
2.00	9.62
3.00	9.80
4.00	9.99
5.00	10.18
6.00	10.38
7.00	10.52
8.00	10.62
9.00	10.74
10.00	10.86
11.00	10.96
12.00	11.04
13.00	11.10
14.00	11.13
15.00	11.04
17.00	10.85
20.00	10.56
25.00	10.10
30.00	9.67
35.00	9.25
40.00	8.81
45.00	8.31
50.00	7.75
55.00	5.52
56.21	4.91
56.48	4.93
56.83	4.83
56.90	4.83

Figure 4

Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) versus Exposure with LPCI Modification and Bypass Holes Plugged, Bundle 2380, 3.85 w/o with 14GZ GE14B Fuel

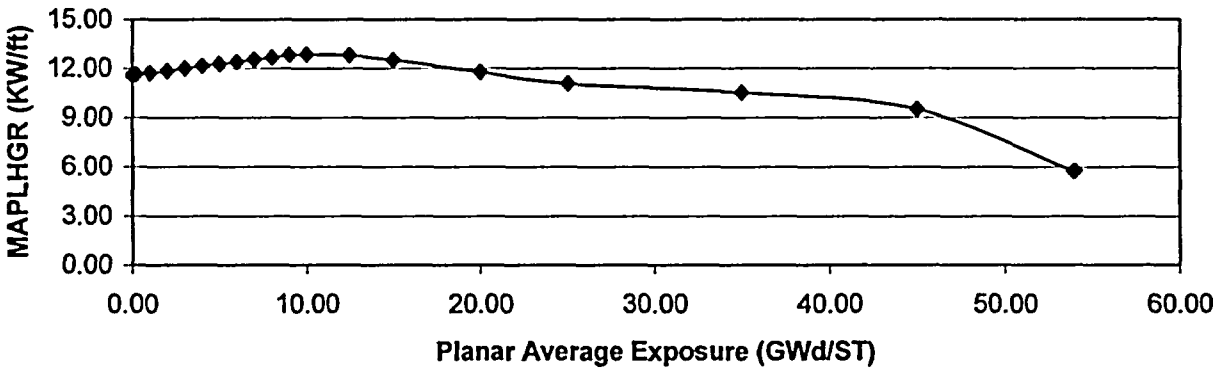


DATA COORDINATES (Reference 3)

Planar Average Exposure (GWD/ST)	MAPLHGR (kW/ft)
0.00	9.02
0.20	9.11
1.00	9.26
2.00	9.49
3.00	9.71
4.00	9.92
5.00	10.05
6.00	10.16
7.00	10.24
8.00	10.31
9.00	10.38
10.00	10.46
11.00	10.54
12.00	10.63
13.00	10.74
14.00	10.83
15.00	10.80
17.00	10.69
20.00	10.46
25.00	10.05
30.00	9.64
35.00	9.19
40.00	8.69
45.00	8.14
50.00	7.51
55.00	6.85
56.86	6.59
56.91	6.59
57.87	6.63
57.93	6.65

Figure 5

Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) versus Exposure with LPCI Modification and Bypass Holes Plugged, Bundle 2299, 3.50 w/o with 10GZ1 GE8X8NB Fuel

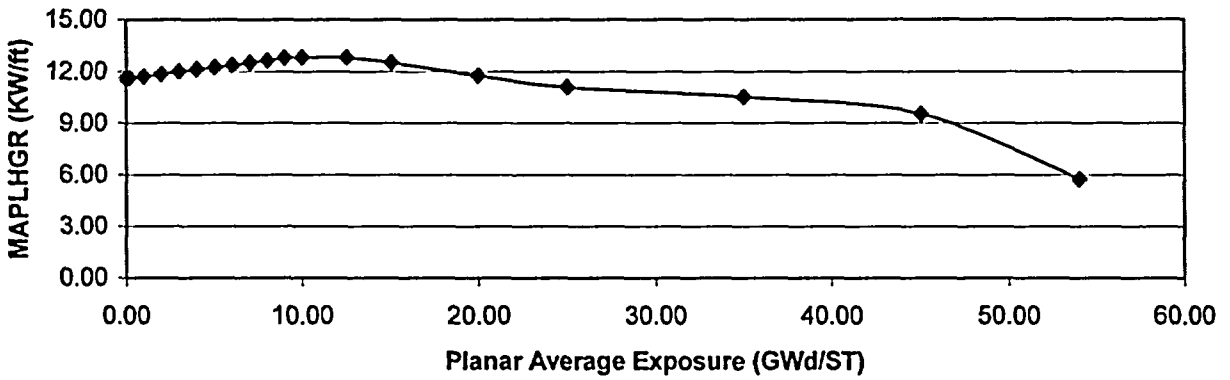


DATA COORDINATES (Reference 3)

Planar Average Exposure (GWD/ST)	MAPLHGR (kW/ft)
0.00	11.59
0.20	11.63
1.00	11.71
2.00	11.84
3.00	11.99
4.00	12.14
5.00	12.26
6.00	12.39
7.00	12.53
8.00	12.66
9.00	12.81
10.00	12.85
12.50	12.79
15.00	12.51
20.00	11.78
25.00	11.08
35.00	10.53
45.00	9.51
53.92	5.74
54.00	5.75

Figure 6

Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) versus Exposure with LPCI Modification and Bypass Holes Plugged, Bundle 2205, 3.50 w/o with 10GZ GE8X8NB Fuel



DATA COORDINATES (Reference 3)

Planar Average Exposure (GWD/ST)	MAPLHGR (kW/ft)
0.00	11.59
0.20	11.63
1.00	11.71
2.00	11.85
3.00	12.00
4.00	12.13
5.00	12.26
6.00	12.38
7.00	12.52
8.00	12.65
9.00	12.80
10.00	12.84
12.50	12.81
15.00	12.52
20.00	11.78
25.00	11.09
35.00	10.53
45.00	9.54
54.00	5.75
54.02	5.74

Figure 7

Reference 8

Figure 3-11
Cooper Nuclear Station
Flow-Dependent MAPLHGR Factor, MAPFAC(f)

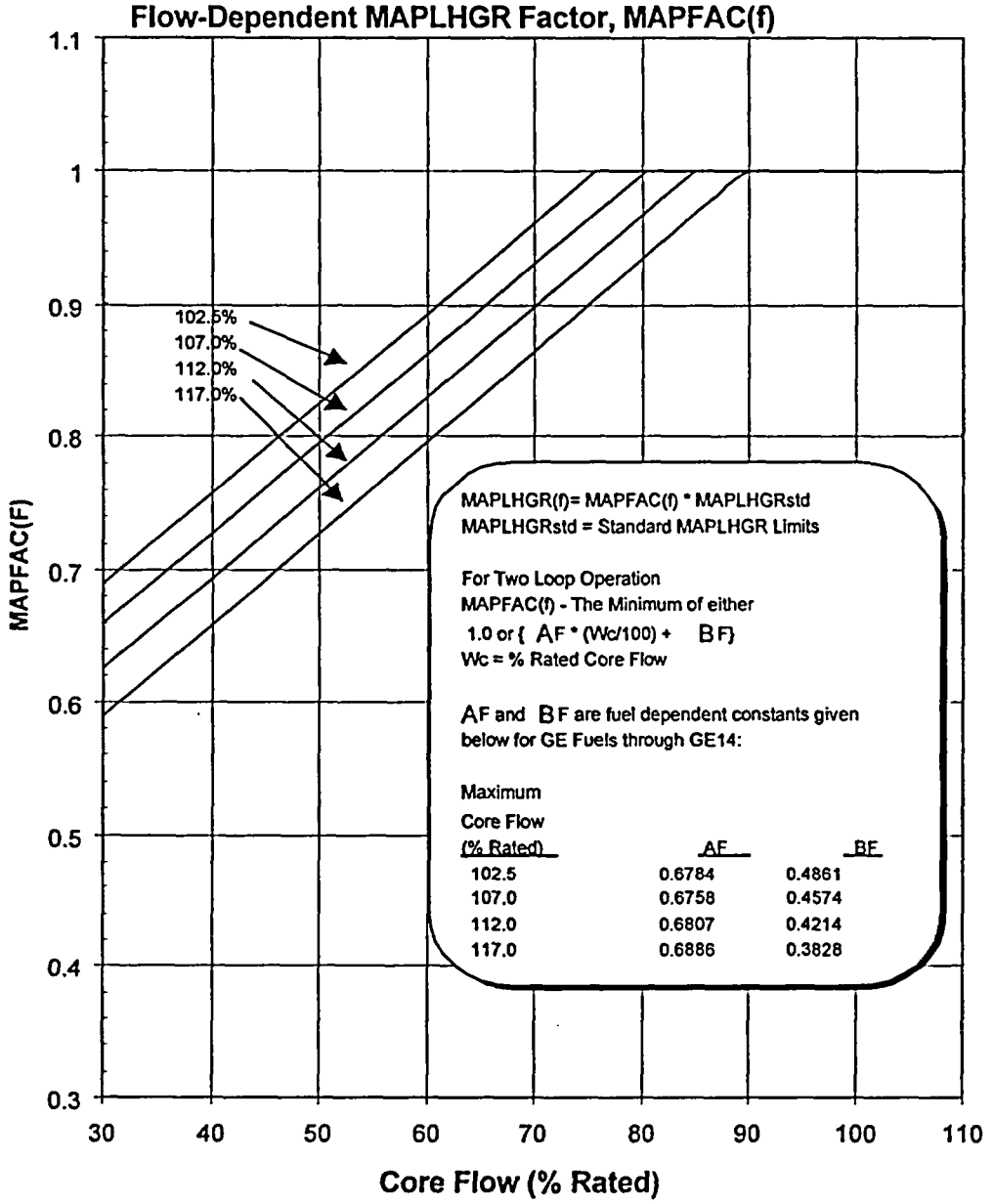


Figure 8

Reference 8

Figure 3-9
Cooper Nuclear Station
Power-Dependent MAPLHGR Factor MAPFAC(p)

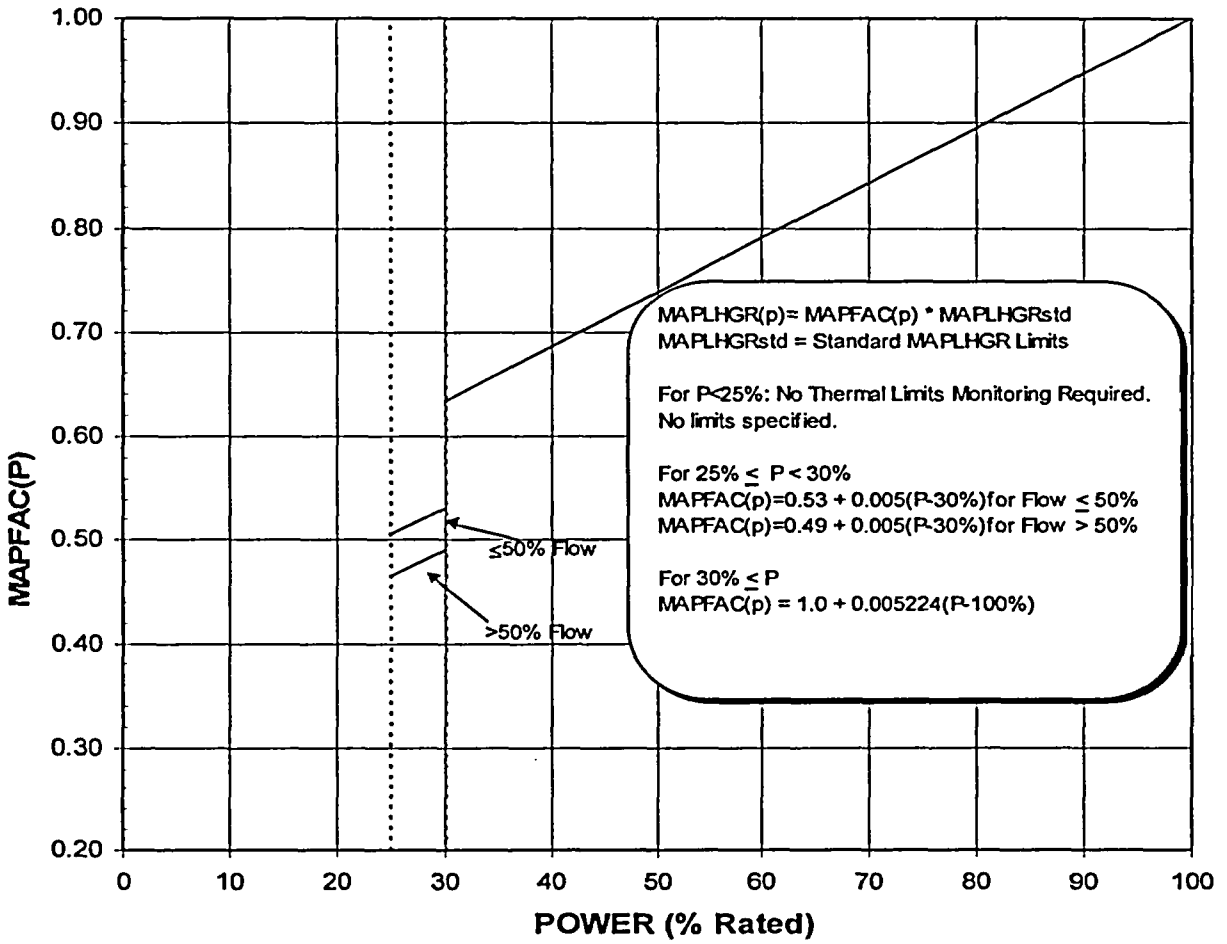


Figure 9

Reference 5

Cooper Nuclear Station
Power-Dependent MCPR Limits, Kp and MCPRp

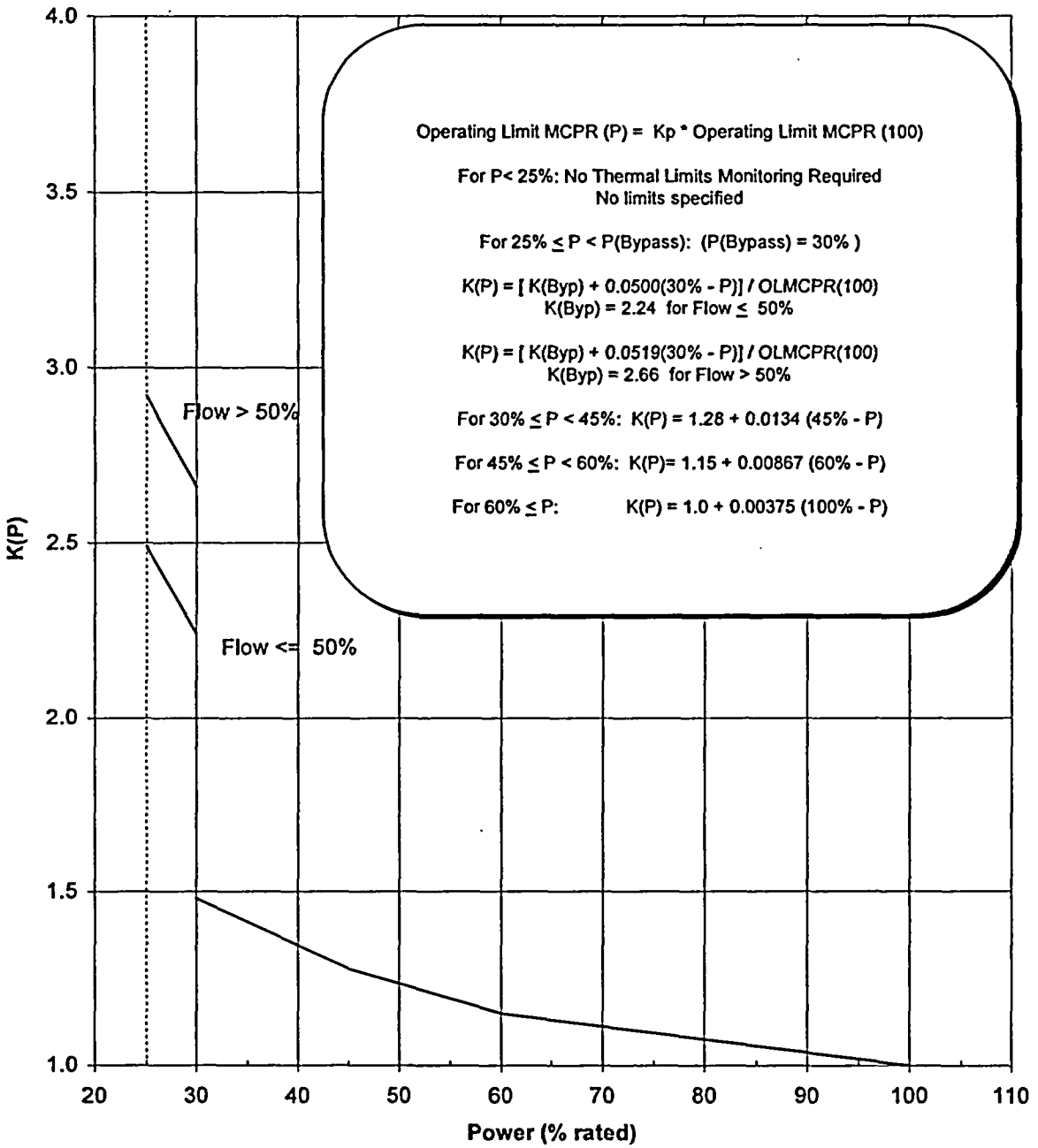


Figure 10

Reference 5

Cooper Nuclear Station
Flow-Dependent MCPR Limits, MCPR(f)

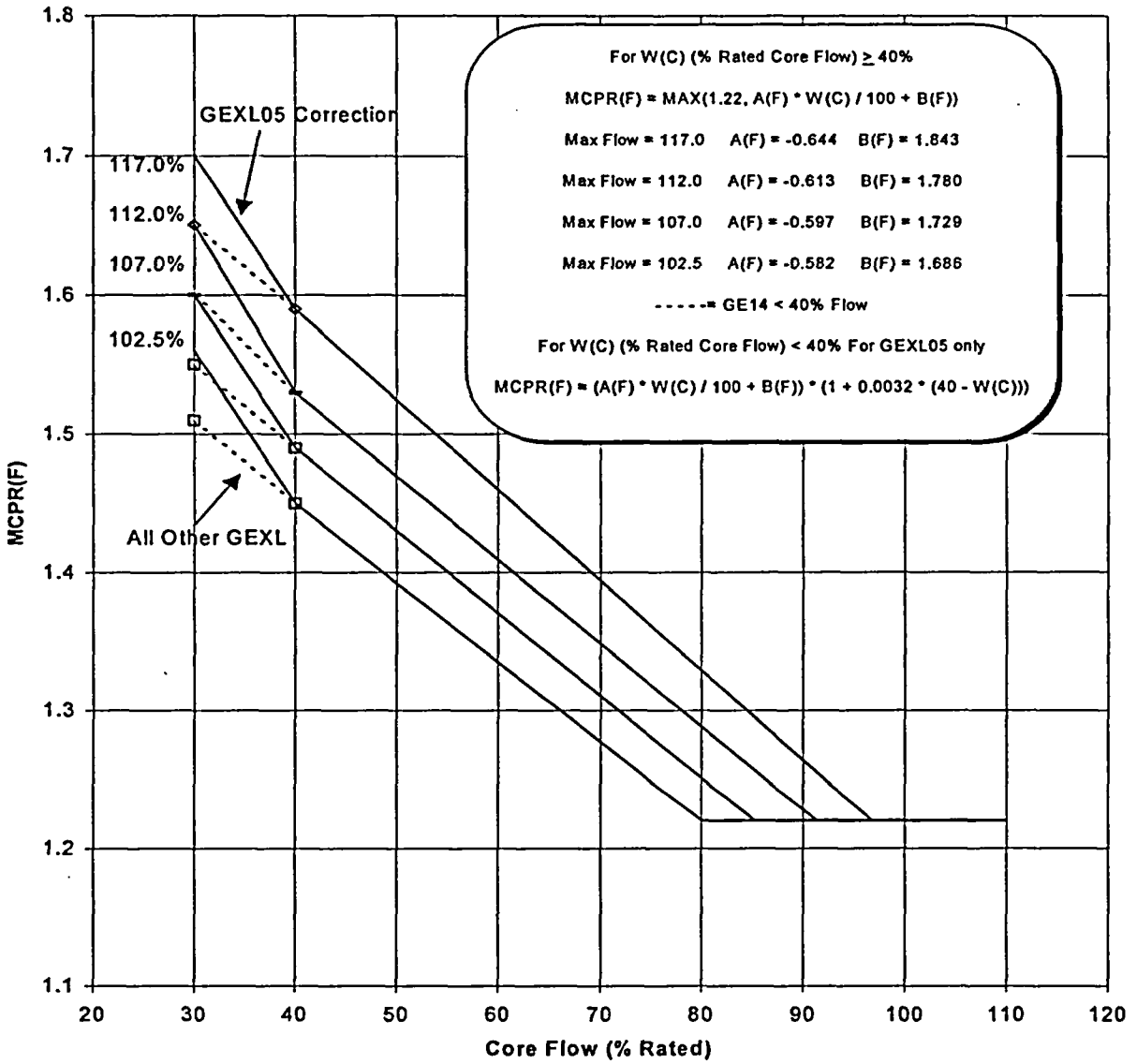
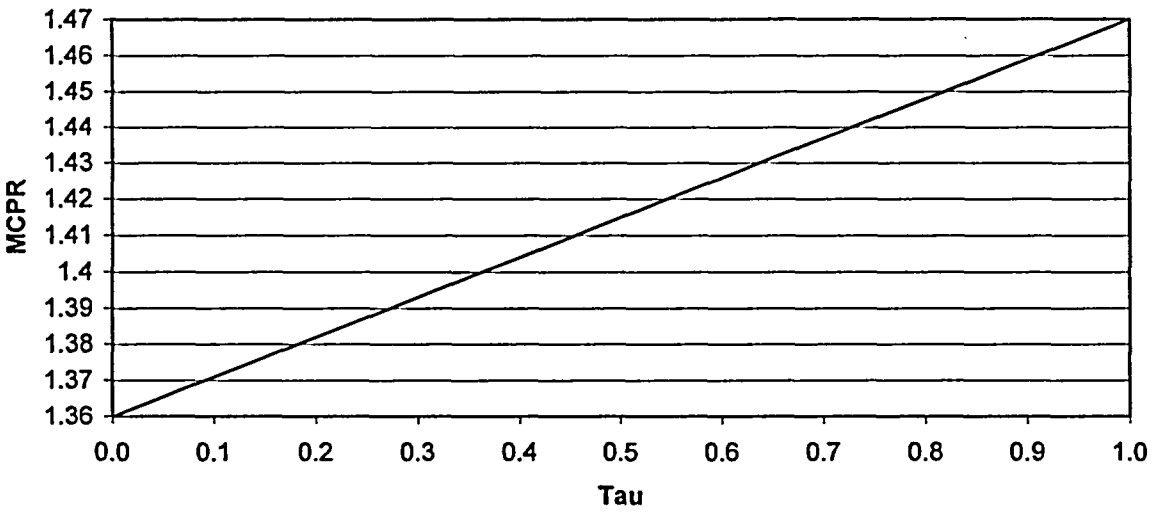


Figure 11

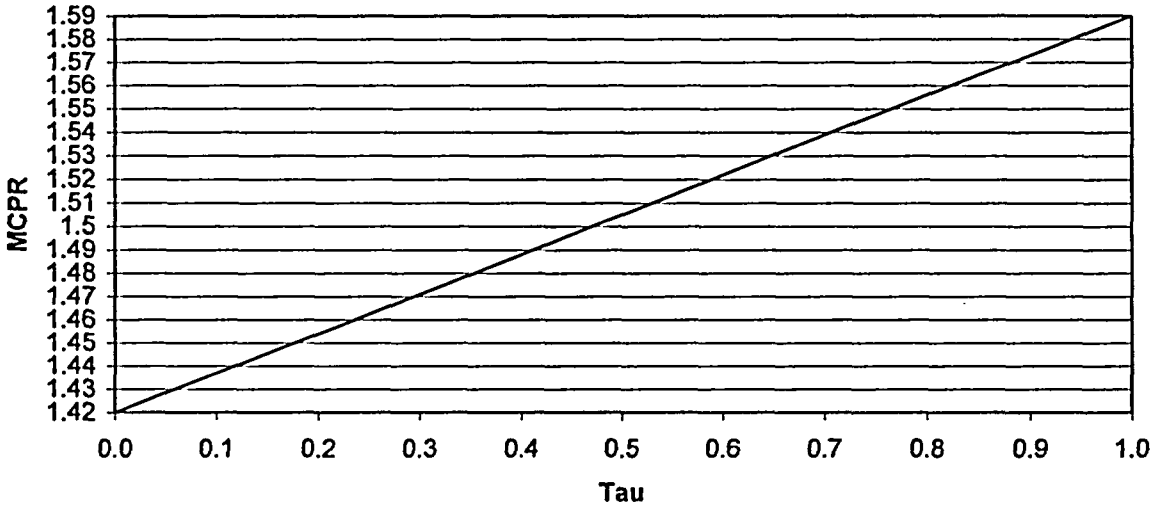
Minimum Critical Power Ratio (MCPR) versus Tau (based on tested measured scram time as defined in Reference 4), All Fuel



Exposure Range: BOC22 to EOC22-2315 MWd/MT (2100 MWd/ST) ICF

Figure 12

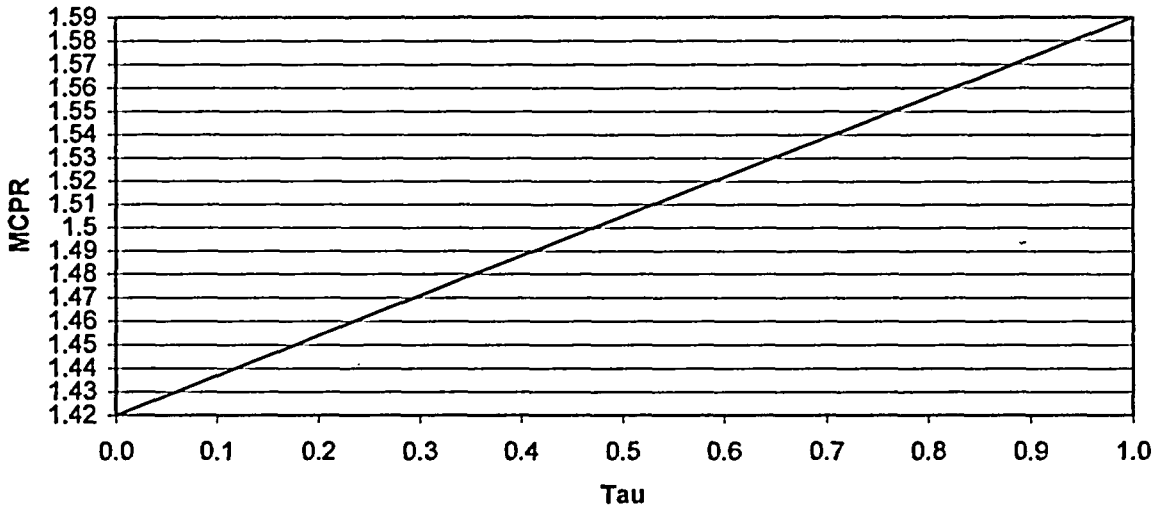
Minimum Critical Power Ratio (MCPR) versus Tau (based on tested measured scram time as defined in Reference 4), All Fuel



Exposure Range: EOC22-2315 MWd/MT (2100 MWd/ST) to EOC22 ICF

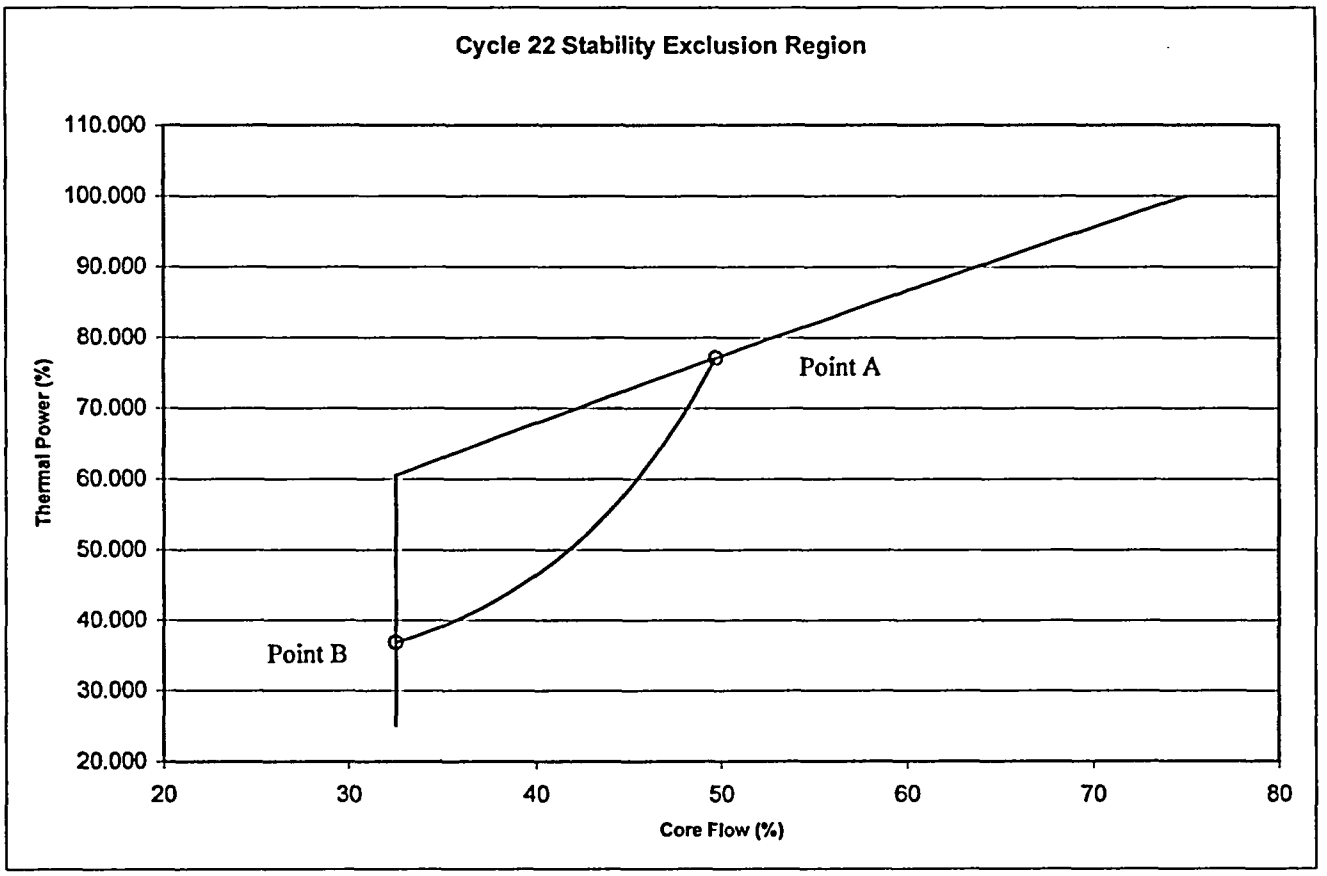
Figure 13

Minimum Critical Power Ratio (MCPR) versus Tau (based on tested measured scram time as defined in Reference 4), All Fuel



Exposure Range: BOC22 to EOC22 ICF_1TBPOOS

Figure 14



Exclusion Region Endpoints	Power (% rated)	Flow (% rated)
A	77.1	49.7
B	36.8	32.5

Correspondence Number: NLS2004143

The following table identifies those actions committed to by Nebraska Public Power District (NPPD) in this document. Any other actions discussed in the submittal represent intended or planned actions by NPPD. They are described for information only and are not regulatory commitments. Please notify the Licensing & Regulatory Affairs Manager at Cooper Nuclear Station of any questions regarding this document or any associated regulatory commitments.

COMMITMENT	COMMITTED DATE OR OUTAGE
None	