Core Operating Limits Report

Dresden Station Unit 2

Cycle 15

February 1996

ISSUANCE OF CHANGES SUMMARY

Affected Section	Affected Pages	Summary of Changes	Date
All	1-1 through 5-6	Incorporated Reference to TSUP Section Number	02/96
References	iii	Identified Analyses of Record for D2C15	02/96
Table 1.2-1	1-2	Increased Rod Block Monitor trip setpoint	02/96
2.2 and Figure 2.2-1	2-1, 2-2 and 2-3	Included MAPLHGR limits for ATRIUM-9B LFAs	02/96
3.2 and Figure 3.2-1	3-1 and 3-2	Included SLHGR limits for ATRIUM-9B LFAs	02/96
4.2 and Figure 4.2-1	4-1 and 4-2	Included TLHGR limits for ATRIUM-9B LFAs	02/96
5.2 and Figure 5.2-1A	5-1 and 5-2	Expanded to include a review of the four Technical Specification Scram Timing points for impact on OLMCPR	02/96
Figures 5.2-2, 5.2-3A and 5.2-3B	5-4, 5-5 and 5-6	Included Recirculation Pump Maximum Flow Setpoint	02/96
Figures 5.2-1A, 5.2-2 and 5.2-3A	5-2, 5-4 and 5-5	Revised to reflect new Operating Limit MCPRs for 9x9-2	02/96
5.2 and Figures 5.2-1B, 5.2-2 and 5.2-3B	5-1, 5-3, 5-4 and 5-6	Included Operating Limit MCPRs for ATRIUM-9B LFAs	02/96
2-2, 3-2, 4-2	2-2, 3-2, and 4-2	Modified data tables to match Reload Analysis and separated 9x9-2 and ATRIUM-9B information into individual tables to alleviate differences in exposure breakpoints for different fuel types. Done at Dresden.	02/96
Table 2.3-1	2.3	Added footnote to clarify multiplicative factors in TSUP. Done at Dresden	02/96

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REFERENCES

1. Commonwealth Edison Company Docket No. 50-237, Dresden Nuclear Power Station, Unit 2, Facility Operating License DPR-19.

2. Letter, D.M. Crutchfield to All Power Reactor Licensees and Applicants, Generic Letter 88-16, Concerning the Removal of Cycle-Specific Parameter Limits from Technical Specifications.

3. ANF-88-191, DRESDEN UNITS 2 AND 3 LOCA-ECCS ANALYSIS, MAPLHGR RESULTS FOR ANF 9X9 FUEL, December 1988.

4. Supplement 1 to ANF-88-191, DRESDEN UNITS 2 AND 3 LOCA-ECCS ANALYSIS, MAPLHGR RESULTS FOR ANF 9X9 FUEL, NFS NDIT 960004, October 1995.

5. Supplement 2 to ANF-88-191, DRESDEN UNITS 2 AND 3 LOCA-ECCS ANALYSIS, MAPLHGR RESULTS FOR ANF 9X9 FUEL, NFS NDIT 960005, October 1995.

6. Supplement 3 to ANF-88-191, DRESDEN UNITS 2 AND 3 LOCA-ECCS ANALYSIS, MAPLHGR RESULTS FOR ANF 9X9 FUEL, NFS NDIT 960006, November 1995.

7. ANF-88-205, DRESDEN UNITS 2 AND 3 LOCA-ECCS ANALYSIS DURING SINGLE LOOP OPERATION WITH ANF FUEL, December 1988.

8. ANF-89-131, DRESDEN UNITS 2 AND 3 LOCA-ECCS ANALYSIS, SINGLE FAILURE DIESEL GENERATOR, August 1989.

9. Supplement 1 to ANF-89-131, DRESDEN UNITS 2 AND 3 LOCA-ECCS ANALYSIS, SINGLE FAILURE DIESEL GENERATOR, November 1995.

10. EMF-94-213, Revision 1, DRESDEN UNIT 2 CYCLE 15 PLANT TRANSIENT ANALYSIS, NFS NDIT 950020 Revision 1, June 1995.

11. EMF-94-214, Revision 1, DRESDEN UNIT 2 CYCLE 15 RELOAD ANALYSIS, NFS NDIT 950021 Revision 1, June 1995.

LIST OF FIGURES

LIST OF TABLES

1.0 CONTROL ROD WITHDRAWAL BLOCK INSTRUMENTATION

1.1 Technical Specification Reference

Technical Specification 3.2.C - Control Rod Block Actuation

(TSUP 3.3.M - Rod Block Monitor (RBM))

1.2 Description

The Rod Block Monitor Upscale Instrumentation Setpoints are determined from the relationships shown in Table 1.2-1.

TABLE 1.2-1

CONTROL ROD WITHDRAWAL BLOCK INSTRUMENTATION SETPOINTS

TRIP FUNCTION:	TRIP LEVEL SETTING:
Rod Block Monitor Upscale (Flow Bias)	
Dual Loop Operation	Less than or equal to (0.65 W_d plus 55)*
Single Loop Operation	Less than or equal to (0.65 W_d plus 51)*

*W_d - percent of drive flow required to produce a rated core flow of 98 Mlb/hr.

2.0 AVERAGE PLANAR LINEAR HEAT GENERATION RATE

2.1 Technical Specification References

Section 2.2: Technical Specification 3.5.I - Average Planar LHGR
Section 2.3: See Table 2.3-1

(TSUP 3.11.A - AVERAGE PLANAR LINEAR HEAT GENERATION RATE)

2.2 Description

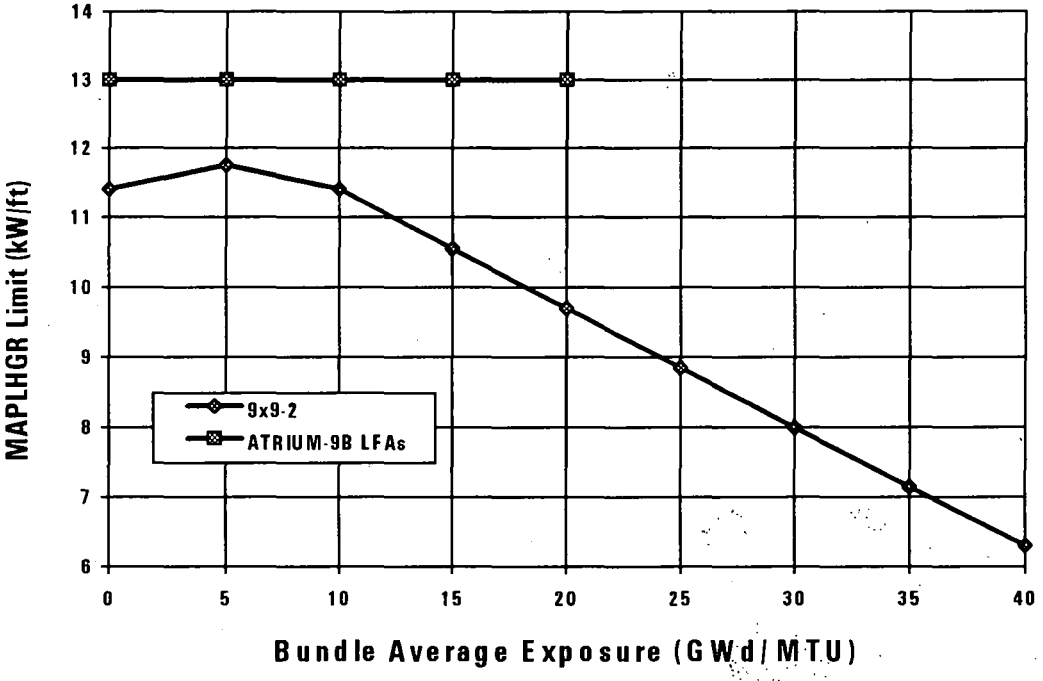
The Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) limit versus Bundle Average Exposure for each fuel type is determined from Figure 2.2-1.

2.3 MAPLHGR Multipliers

The appropriate multiplicative factors, during power operation with equipment out of service, to apply to the base MAPLHGR limits specified in Section 2.2 are shown in Table 2.3-1.

FIGURE 2.2-1

MAPLHGR LIMIT VS. BUNDLE AVERAGE EXPOSURE



Bundle Average Exposure (GWD/MTU)	MAPLHGR Limit 9x9-2 (kW/ft)	MAPLHGR Limit[1] ATRIUM-9B LFAs (kW/ft)
0	11.40	13.0
5	11.75	13.0
10	11.40	13.0
15	10.55	13.0
20	9.70	13.0
25	8.85	--
30	8.00	--
35	7.15	--
40	6.30	--

[1] MAPLHGR limit values for the ATRIUM-9B lead fuel assemblies for bundle exposures above 20 GWD/MTU will be provided prior to Cycle 16 operation.

TABLE 2.3-1

EQUIPMENT OUT OF SERVICE MAPLHGR LIMIT MULTIPLIERS

Technical Specification	Title of Technical Specification	Scenario	Multiplicative Factors, 9x9-2	Multiplicative Factors, ATRIUM-9B LFAs
3.5.D.2 (TSUP 3.5.A Action 4 & 3.6.F Action 2)[2]	Automatic Pressure Relief Subsystems	One Relief Valve Out Of Service (OOS)	0.76	0.76
3.5.I & 3.6.H.3.f (TSUP 3.11.A & 3.6.A Action 1)	Average Planar LHGR Recirculation Pump Flow Limitations	Single Loop Operation (SLO)	0.91	0.91
3.5.I & 3.6.H.3.f (TSUP 3.11.A & 3.6.A Action 1)[2]	Average Planar LHGR Recirculation Pump Flow Limitations	One Relief Valve OOS & SLO	0.76	0.76

[2] Multiplicative Factor for MAPLHGR (One Relief Valve OOS) is not required per TSUP. Reference TSUP for more information.

3.0 LOCAL STEADY STATE LHGR

3.1 Technical Specification Reference

Technical Specification 3.5.J - Local Steady State LHGR

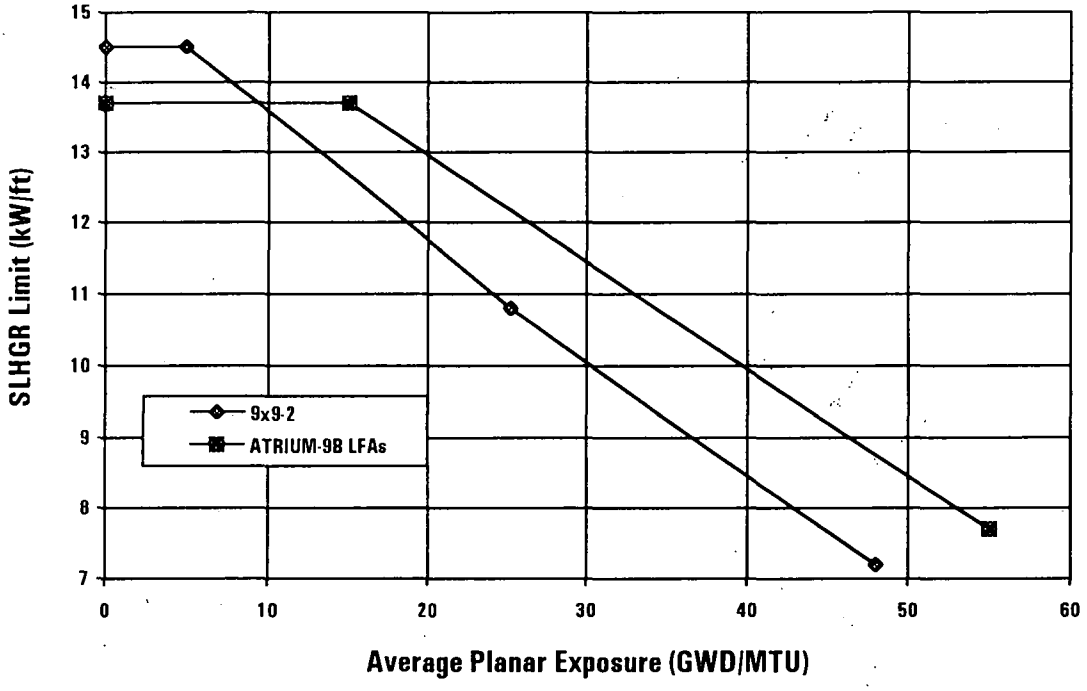
(TSUP 3.11.D - STEADY STATE LINEAR HEAT GENERATION RATE)

3.2 Description

The Steady State LHGR (SLHGR) limit versus Average Planar Exposure for each fuel type is determined from Figure 3.2-1.

FIGURE 3.2-1

STEADY STATE LHGR (SLHGR) LIMIT VS. AVERAGE PLANAR EXPOSURE



Average Planar Exposure (GWD/MTU)	SLHGR Limit 9x9-2 (kW/ft)
0	14.5
5.0	14.5
25.2	10.8
48.0	7.2

Average Planar Exposure (GWD/MTU)	SLHGR Limit ATRIUM-9B LFAs (kW/ft)
0	13.7
15.0	13.7
55.0	7.7

4.0 LOCAL TRANSIENT LHGR

4.1 Technical Specification Reference

Technical Specification 3.5.K - Local Transient LHGR

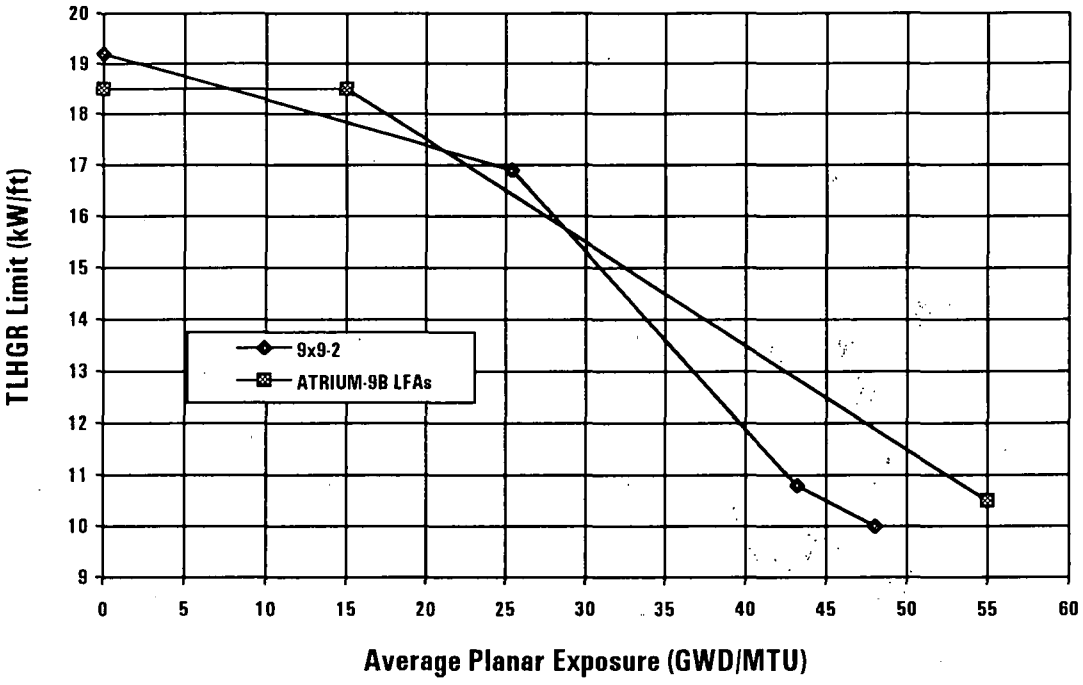
(TSUP 3.11.B - Average Power Range Monitor Setpoints (TRANSIENT LINEAR HEAT GENERATION RATE))

4.2 Description

The Transient LHGR (TLHGR) limit versus Average Planar Exposure for each fuel type is determined from Figure 4.2-1.

FIGURE 4.2-1

TRANSIENT LHGR (TLHGR) LIMIT VS. AVERAGE PLANAR EXPOSURE



Average Planar Exposure (GWD/MTU)	TLHGR Limit 9x9-2 (kW/ft)
0.0	19.2
25.4	16.9
43.2	10.8
48.0	10.0

Average Planar Exposure (GWD/MTU)	TLHGR Limit ATRIUM-9B LFAs (kW/ft)
0.0	18.5
15.0	18.5
55.0	10.5

5.0 OPERATING LIMIT MINIMUM CRITICAL POWER RATIO

5.1 Technical Specification References

Technical Specification 3.5.L - Minimum Critical Power Ratio (MCPR)

(TSUP 3.11.C - MINIMUM CRITICAL POWER RATIO)

5.2 Description

a. The Operating Limit MCPR at rated output versus the measured average control rod drive scram insertion times (t_{ave}) is shown in Figures 5.2-1A and 5.2-1B for 9x9-2 fuel and ATRIUM-9B LFAs, respectively. t_{ave} is determined by:

   i. Prior to the performance of the initial scram time measurements for the operating cycle, t_{ave} is assumed to equal the associated Technical Specification Section 3.3.C.1 (TSUP 3.3.D) value for the measurement points (this is also the maximum time presented in each of the referenced figures).

   ii. t_{ave} shall be determined and the Operating Limit MCPR revised, if necessary, within 72 hours of the conclusion of each scram time surveillance test required by Technical Specification Surveillance 4.3.C (TSUP 4.3.C).

   iii. t_{ave} is the average scram insertion time as defined in the Technical Specifications (3.3.C.1) for each prescribed measurement point and is determined by summing the most recent scram insertion time (for the measured peint of interest) for each operable control rod drive and then dividing this sum by the number of operable control rod drives.

b. During Manual Flow Control, the Operating Limit MCPR for each fuel type at reduced core flow conditions can be determined from I or ii, whichever is greater:

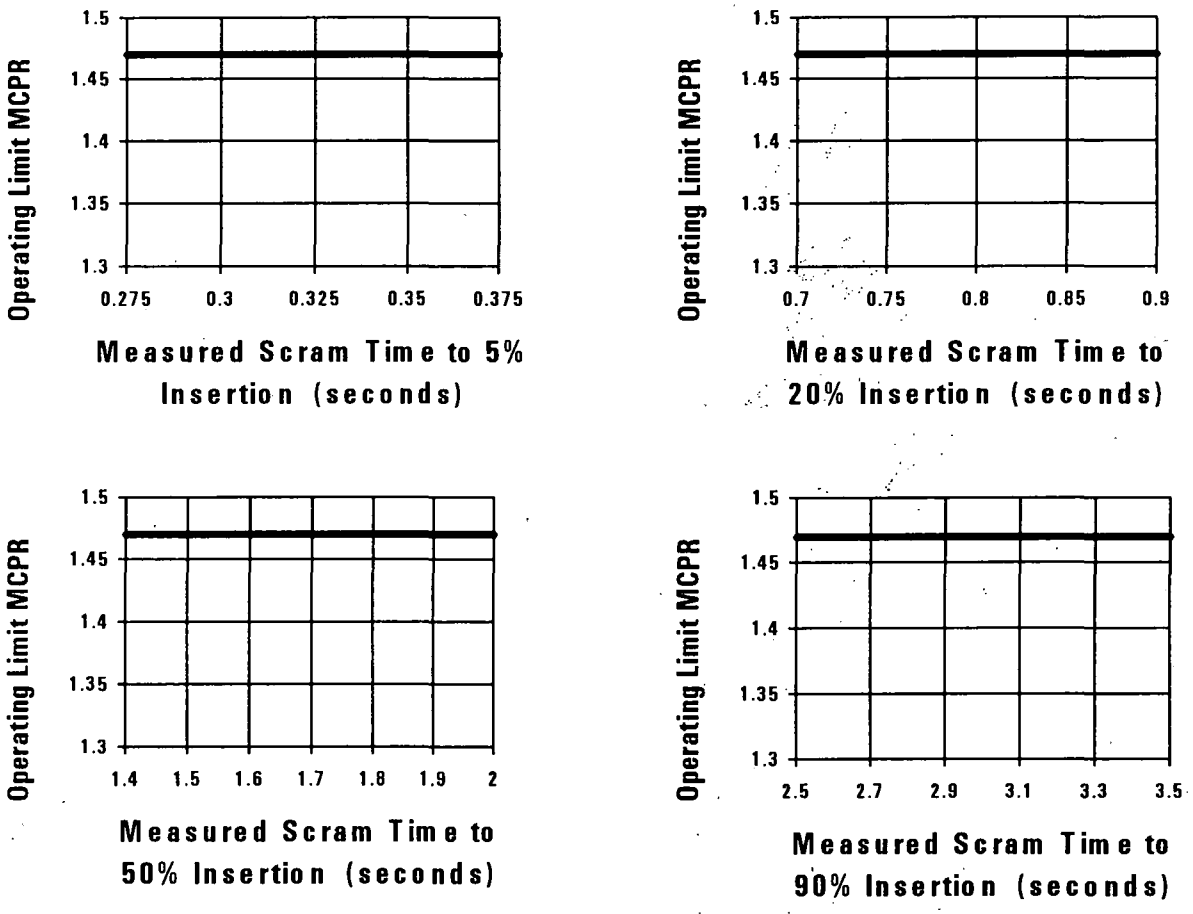
   i. Figure 5.2-2 using the appropriate curve and flow rate, or

   ii. The Operating Limit MCPR determined from Figure 5.2-1A or Figure 5.2-1B, as appropriate.

c. During Automatic Flow Control, the Operating Limit MCPR for each fuel type at reduced flow rates can be determined from Figure 5.2-3A for 9x9-2 fuel or Figure 5.2-3B for ATRIUM-9B LFAs using the appropriate flow rate and the Operating Limit MCPR, which is obtained from Figure 5.2-1A or 5.2-1B, as appropriate. Linear interpolation between the curves on Figures 5.2-3A and 5.2-3B is permissible.

FIGURE 5.2-1A

OPERATING LIMIT MCPR VS. MEASURED AVERAGE CRD SCRAM INSERTION TIMES FOR 9x9-2 FUEL



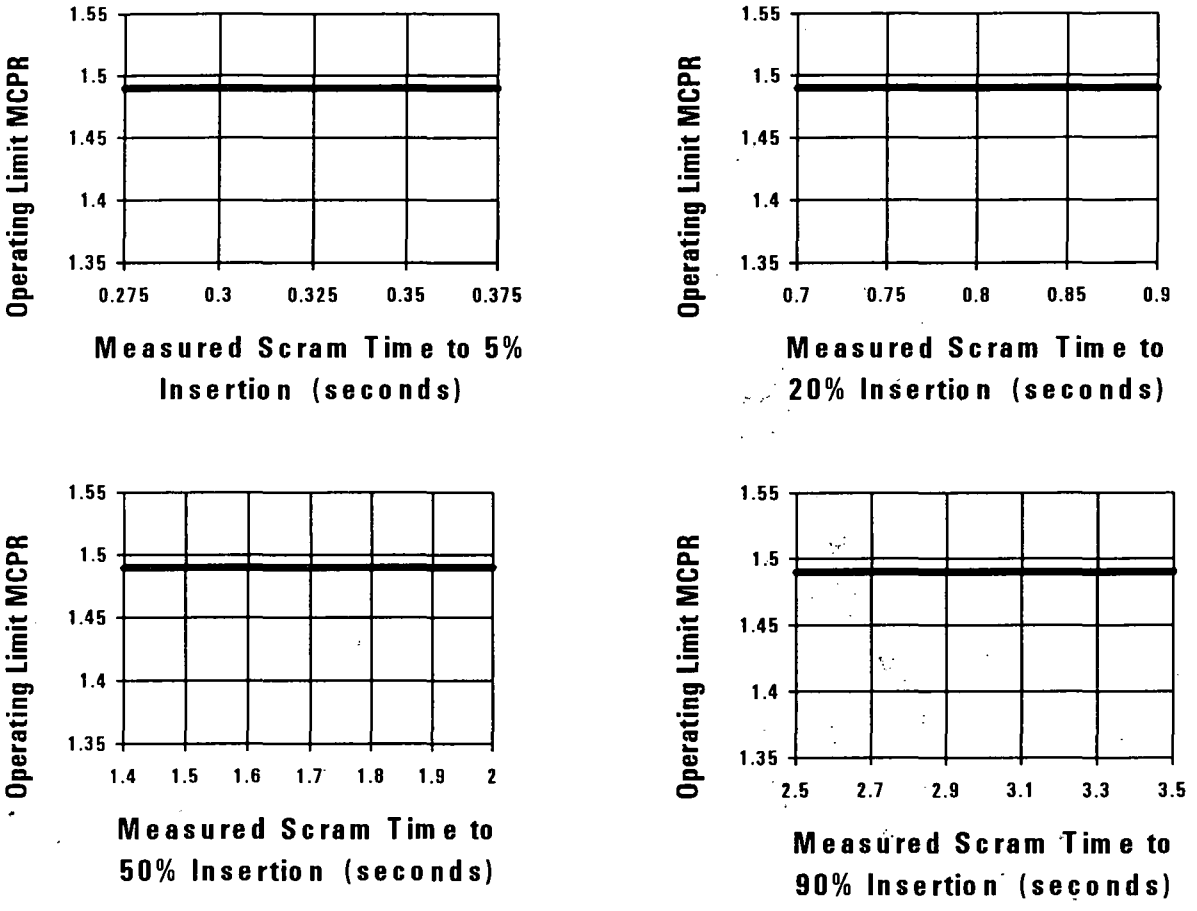
The above graphs demonstrate the dependence of the Operating Limit MCPR versus the measured average control rod drive scram insertion times, t_{ave} , for the 9x9-2 fuel type for each of the measured insertion points. The Operating Limit MCPR (9x9-2) shall be determined by selecting the greatest OLMCPR from Figure 5.2-1A for the associated average CRD scram insertion time.

Operating Limit MCPR (9x9-2) = 1.47

Note that the Operating Limit MCPR is not a function of the average CRD scram insertion time for the current operating cycle assuming the Technical Specification average CRD scram insertion time limits (3.3.C, TSUP 3.3.E) are met.

FIGURE 5.2-1B

OPERATING LIMIT MCPR VS. MEASURED AVERAGE CRD SCRAM INSERTION TIMES FOR ATRIUM-9B LFAs



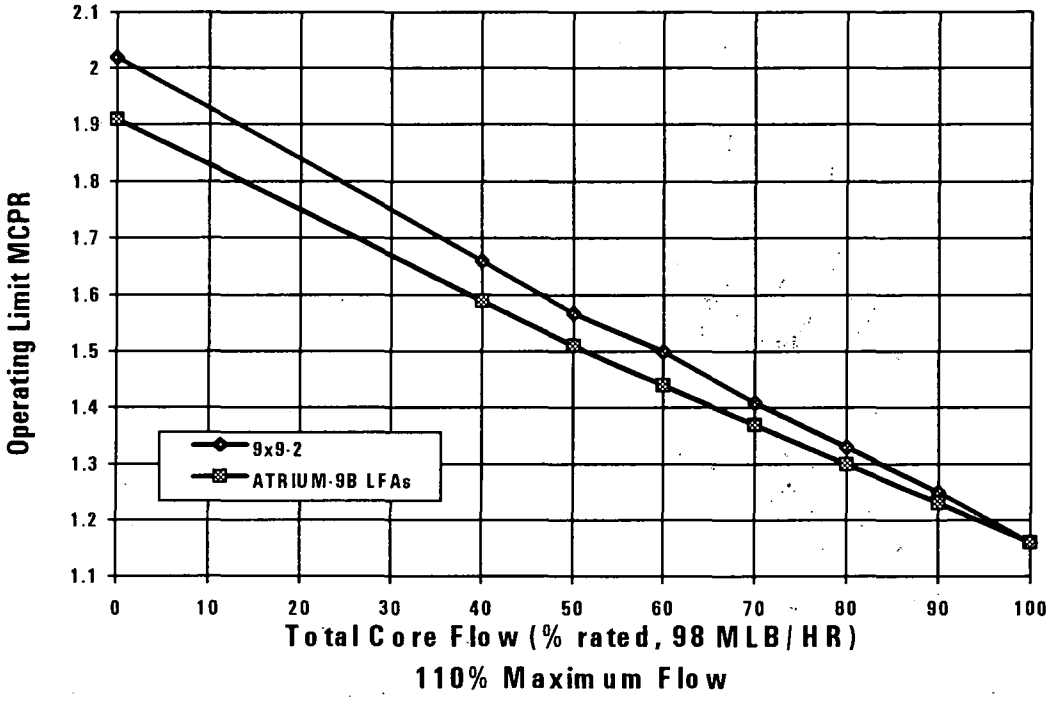
The above graphs demonstrate the dependence of the Operating Limit MCPR versus the measured average control rod drive scram insertion times, t_{ave} , for the ATRIUM-9B LFAs for each of the measured insertion points. The Operating Limit MCPR (ATRIUM-9B) shall be determined by selecting the greatest OLMCPR from Figure 5.2-1A for the associated average CRD scram insertion time.

Operating Limit MCPR (ATRIUM-9B) = 1.49

Note that the Operating Limit MCPR is not a function of the average CRD scram insertion time for the current operating cycle assuming the Technical Specification average CRD scram insertion time limits (3.3.C, TSUP 3.3.E) are met.

FIGURE 5.2-2

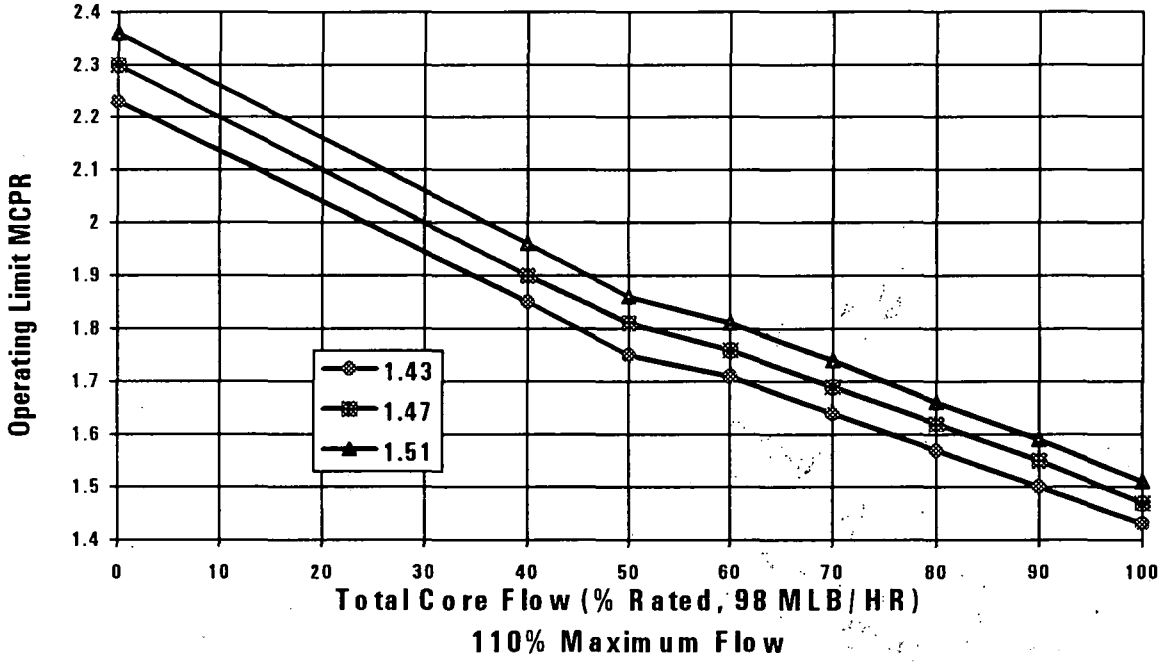
OPERATING LIMIT MCPR FOR MANUAL FLOW CONTROL



Total Core Flow (% Rated)	Operating Limit MCPR 9x9-2	Operating Limit MCPR ATRIUM-9B LFAs
100	1.16	1.16
90	1.25	1.23
80	1.33	1.30
70	1.41	1.37
60	1.50	1.44
50	1.57	1.51
40	1.66	1.59
0	2.02	1.91

FIGURE 5.2-3A

OPERATING LIMIT MCPR FOR AUTOMATIC FLOW CONTROL
FOR 9x9-2 FUEL[3]

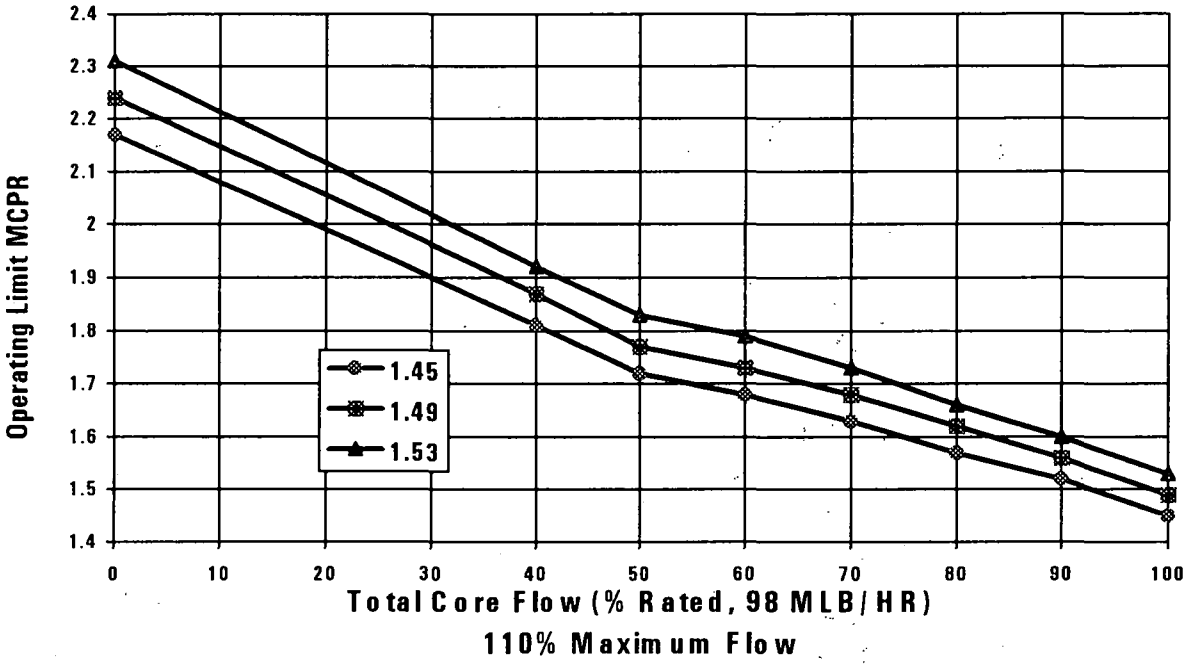


Total Core Flow (% Rated)	Operating Limit MCPR 9x9-2		
	1.43	1.47	1.51
100	1.43	1.47	1.51
90	1.50	1.55	1.59
80	1.57	1.62	1.66
70	1.64	1.69	1.74
60	1.71	1.76	1.81
50	1.75	1.81	1.86
40	1.85	1.90	1.96
00	2.23	2.30	2.36

[3] Although analyzed for core flows from 0% to 100%, Technical Specification 3.3.G (TSUP 3.3.N) prohibits AFC operation below 65% core flow.

FIGURE 5.2-3B

OPERATING LIMIT MCPR FOR AUTOMATIC FLOW CONTROL
FOR ATRIUM-9B LFAs[4]



Total Core Flow (% Rated)	Operating Limit MCPR ATRIUM-9B LFAs		
	1.45	1.49	1.53
100	1.45	1.49	1.53
90	1.52	1.56	1.60
80	1.57	1.62	1.66
70	1.63	1.68	1.73
60	1.68	1.73	1.79
50	1.72	1.77	1.83
40	1.81	1.87	1.92
00	2.17	2.24	2.31

[4] Although analyzed for core flows from 0% to 100%, Technical Specification 3.3.G (TSUP 3.3.N) prohibits AFC operation below 65% core flow.

6.0 METHODOLOGY

The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC in the latest approved revision or supplement of the topical reports describing the methodology. For Dresden Unit 2, the NRC approved topical reports are:

1) ANF-1125(P)(A), "Critical Power Correlation - ANFB."

2) ANF-524(P)(A), "ANF Critical Power Methodology for Boiling Water Reactors."

3) XN-NF-79-71(P)(A), "Exxon Nuclear Plant Transient Methodology for Boiling Water Reactors."

4) XN-NF-80-19(P)(A), "Exxon Nuclear Methodology for Boiling Water Reactors."

5) XN-NF-85-67(P)(A), "Generic Mechanical Design for Exxon Nuclear Jet Pump Boiling Water Reactors Reload Fuel."

6) XN-NF-81-22(P)(A), "Generic Statistical Uncertainty Analysis Methodology."

7) ANF-913(P)(A), "COTRANSA2: A Computer Program for Boiling Water Reactor Transient Analyses."

8) Commonwealth Edison Company Topical Report NFSR-0091, "Benchmark of CASMO/MICROBURN BWR Nuclear Design Methods," and associated Supplements on Neutronic Licensing Analyses (Supplement 1) and LaSalle County Unit 2 Benchmarking (Supplement 2).