

ATTACHMENT D

(Second Mid-cycle) UNIT 2 CYCLE 15  
CORE OPERATING LIMITS REPORT  
SEPTEMBER 19, 1997

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**Core Operating Limits Report**

**Dresden Station Unit 2**

**Cycle 15**

**September 1997**

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
All Sections	All pages	Removed references to Custom Technical Specifications, Retained references to TSUP	6/97
References	iii	Deleted references to previous LOCA analyses of record and replaced with new analyses of record	6/97
Figure 2.2-1	2-2	Updated MAPLHGR limits to be consistent with new analysis of record	6/97
Table 2.3-1	2-3	Updated MAPLHGR multiplier for SLO to be consistent with new analysis of record, Deleted multiplier for RVOOS	6/97
5.2	5-1	Updated references to Scram Timing Technical Specification, 3/4.3.E, based on final TSUP	6/97
Methodology	6-1	Inserted methodologies consistent with NRC approved Tech Spec amendment for transition to ATRIUM-9B	6/97

5.0	5-1	Revised the format used to present the Operating Limit Minimum Critical Power Ratio, and increased the Operating Limit Minimum Critical Power Ratio by 0.02 due to operation at up to 15 psi below analyzed pressure ( 0.01) and conservatism (another 0.01) due to future potential additional MCPR penalties (i.e. for operation at a higher steam flow rate)	9/97
Figure 5.2-1A	5-2	Deleted this page because the operating limit MCPR is not dependent on Scram Times. The OLMCPR can now be found in Table 5.2-1.	9/97
Figure 5.2-1B	5-3	Deleted this page because the operating limit MCPR is not dependent on Scram Times. The OLMCPR can now be found in Table 5.2-1.	9/97
Figures 5.2-2, 5.2-3A, and 5.2-3B	5-4, 5-5, and 5-6	These Figures were all renumbered to be Figures 5.2-1, 5.2-2, and 5.2-3 due to deleting Figure Figures 5.2-1A and 5.2-1B. (Note the page numbering for these figures also changed.)	9/97
Table 2.3-1	2-3	Corrected the Action number for Technical Specification 3.6.A to "1.d" to be consistent with TSUP.	9/97
1.1 and 4.1	iii, 1-1, and 4-1	Corrected the titles of these Technical Specification References to be consistent with TSUP and corrected the associated Table of Contents.	9/97
References	iv	The SPC letter documenting the 0.01 adder for the reduced dome pressure operation was added	9/97
List of Figures	v	Revised the Figure numbering and the page numbers to reflect that Figures 5.2-1A and 5.2-1B were deleted.	9/97
List of Tables	vi	Added Table 5.2-1 to this list	9/97
Issuance of Changes Summary	i, ii	The table of changes increased by one page, therefore affecting the page numbering of the following pages, and the Table of Contents	9/97

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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. EMF-97-031(P), Revision 1, DRESDEN LOCA-ECCS ANALYSIS MAPLHGR LIMITS FOR ATRIUM-9B AND 9X9-2 FUEL, NFS NDIT 970107, MAY 1997.
4. EMF-94-213, Revision 1, DRESDEN UNIT 2 CYCLE 15 PLANT TRANSIENT ANALYSIS, NFS NDIT 950020 Revision 1, June 1995.
5. EMF-94-214, Revision 1, DRESDEN UNIT 2 CYCLE 15 RELOAD ANALYSIS, NFS NDIT 950021 Revision 1, June 1995.
6. DEG:97:054, DRESDEN UNIT 3 CYCLE 15 MAPLHGR LIMITS VERSUS ASSEMBLY AVERAGE EXPOSURE (REVISION AND CLARIFICATION), June 12, 1997, NFS NDIT :970111, Revision 1.
7. BND:97:059, APPLICABILITY OF DEG:97:054 (DRESDEN UNIT 3 CYCLE 15 MAPLHGR LIMITS VERSUS ASSEMBLY AVERAGE EXPOSURE) TO D2C15, June 19, 1997.
8. DEG:97:102, DRESDEN REDUCED DOME PRESSURE ANALYSIS, August 6, 1997, NFS NDIT 970117 Revision 1.

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1.0 ROD BLOCK MONITOR (RBM)

1.1 Technical Specification Reference

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

3.11.A - AVERAGE PLANAR LINEAR HEAT GENERATION RATE

2.2 Description

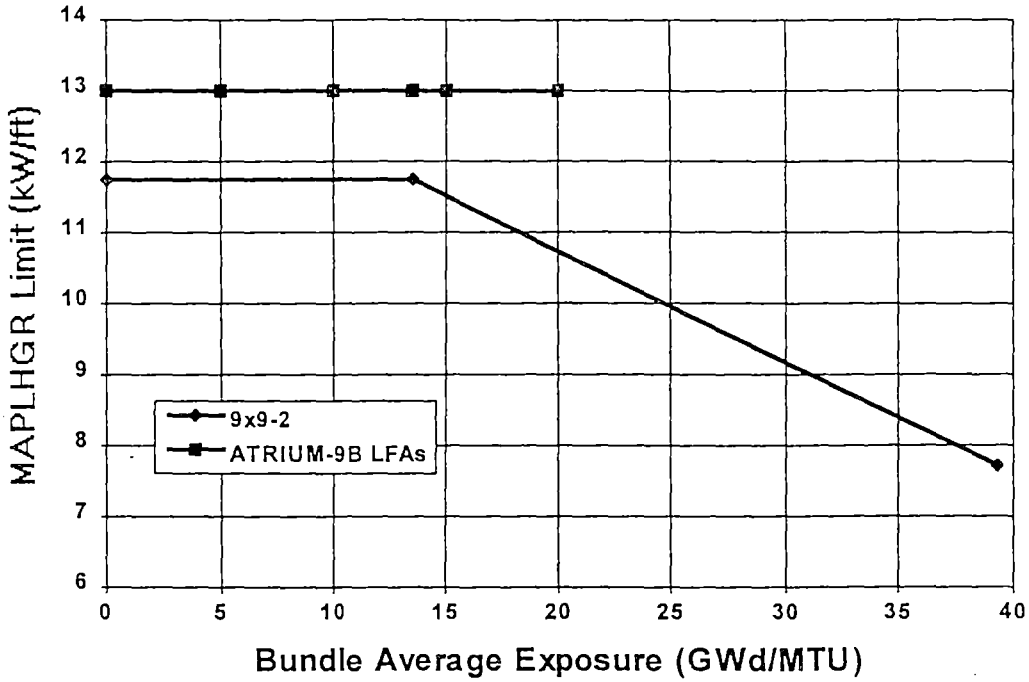
The Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) limit versus Bundle Average Exposure for each fuel type is determined from Figure 2.2-1.

2.3 MAPLHGR Multipliers

The appropriate multiplicative factor, during power operation with equipment out of service, to apply to the base MAPLHGR limits specified in Section 2.2 is 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)
0	11.75
13.5	11.75
39.3	7.70

Bundle Average Exposure (GWD/MTU)	MAPLHGR Limit ATRIUM-9B LFAs (kW/ft) <sup>1</sup>
0	13.0
20	13.0

<sup>1</sup> 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
3.11.A & 3.6.A.1.d	Average Planar LHGR Recirculation Loops	Single Loop Operation (SLO)	0.90	0.90

### 3.0 LOCAL STEADY STATE LHGR

#### 3.1 Technical Specification Reference

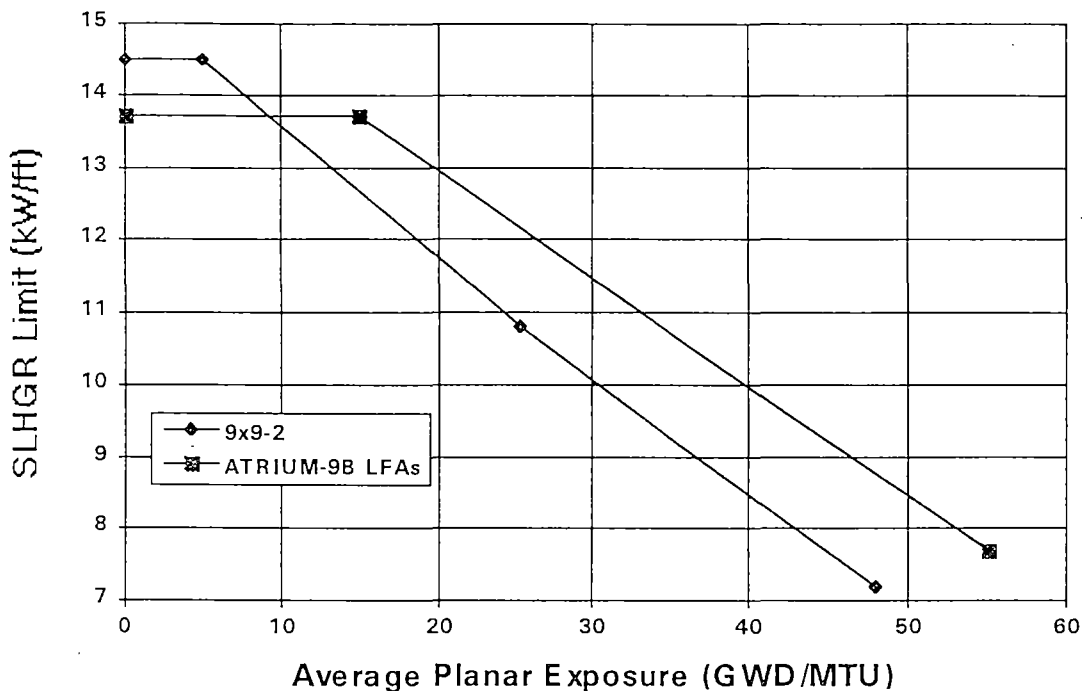
##### 3.11.D - STEADY STATE LINEAR HEAT GENERATION RATE

#### 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

3.11.B - TRANSIENT LINEAR HEAT GENERATION RATE

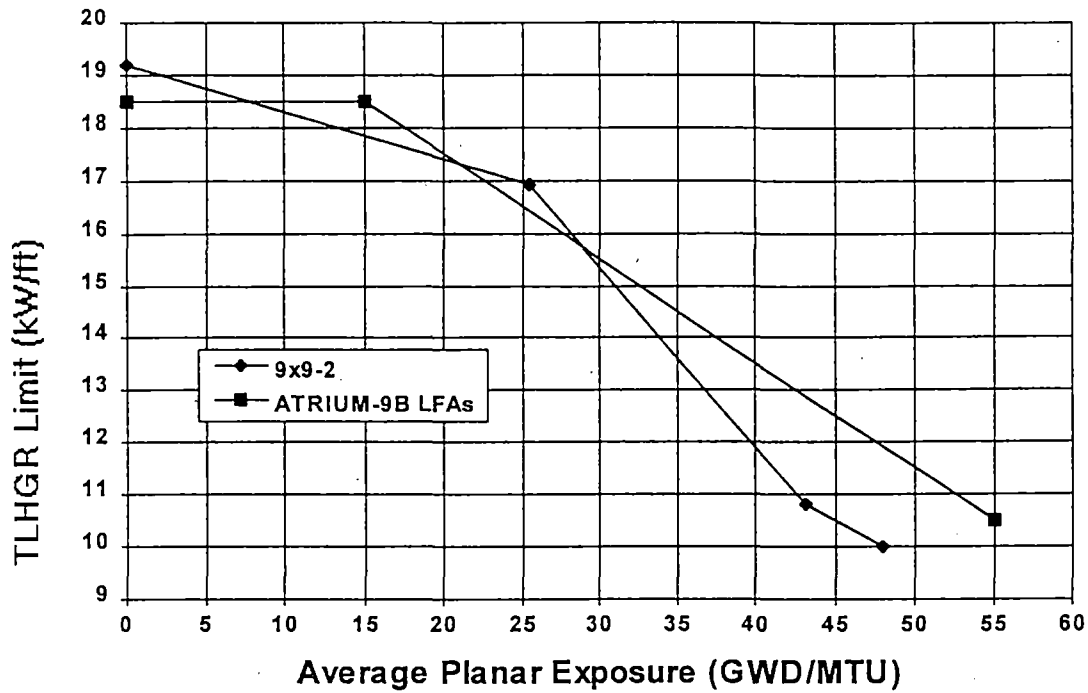
### 4.2 Description

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

#### 3.11.C - MINIMUM CRITICAL POWER RATIO

### 5.2 Description

- a. The Operating Limit MCPRs for D2C15 are listed in Table 5.2-1 for 9x9-2 fuel and ATRIUM-9B LFAs. The OLMCPRs calculated for D2C15 are based on Technical Specification Scram Insertion Speeds (3.3.E).
- 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 5.2-1 using the appropriate curve and flow rate, or
  - ii. The Operating Limit MCPR determined from Table 5.2-1 as appropriate.
- c. During Automatic Flow Control, the Operating Limit MCPR for each fuel type at reduced flow rates can be determined from Figure 5.2-2 for 9x9-2 fuel or Figure 5.2-3 for ATRIUM-9B LFAs using the appropriate flow rate and the Operating Limit MCPR, which is obtained from Table 5.2-1, as appropriate. Linear interpolation between the curves on Figures 5.2-2 and 5.2-3 is permissible.

TABLE 5.2-1

OPERATING LIMIT MCPR\*  
FOR 9x9-2 AND ATRIUM-9B RELOAD FUEL

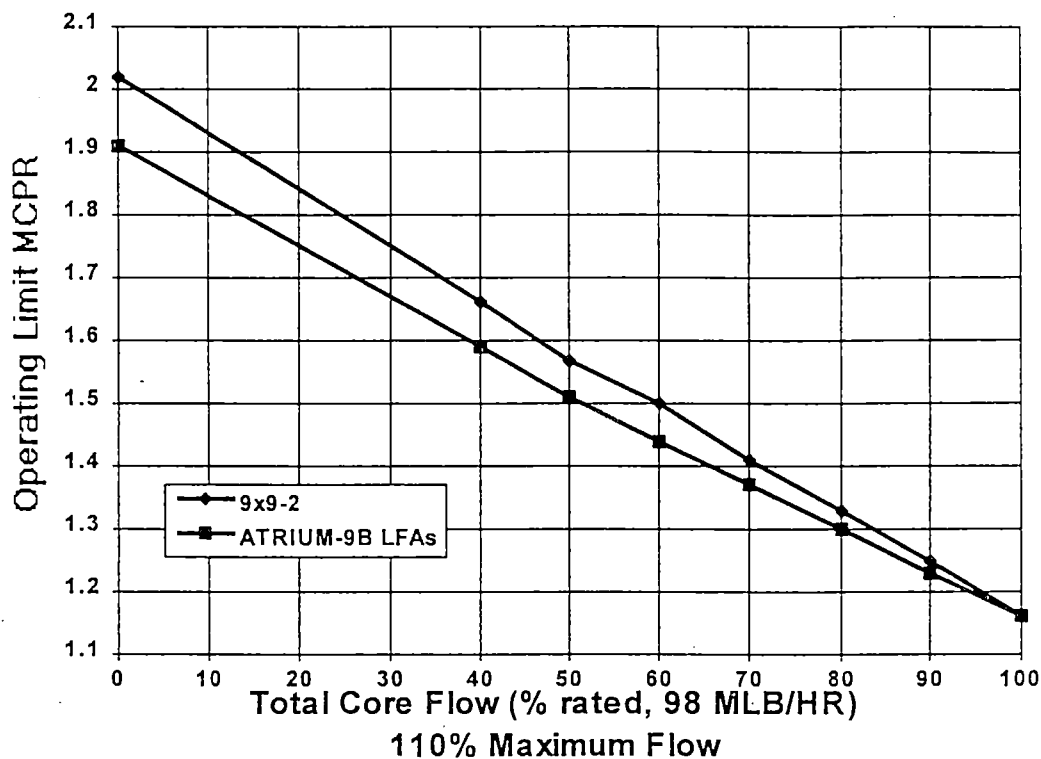
Operating Scenario	9x9-2 Fuel Operating Limit MCPR	ATRIUM-9B LFAs Operating Limit MCPR
Normal Operation	1.49	1.51
Normal Operation with Feedwater Heaters Out of Service	1.49	1.51
Single Loop Operation	1.50	1.52
Coastdown	1.49	1.51
Coastdown and SLO Operation	1.50	1.52

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

For simplification of implementing the limits for D2C15, the site has specified only limits corresponding to the Technical Specification Scram Speeds. The MCPR Operating Limits presented are based on Technical Specification Scram Speeds and bound the Nominal Scram Speed Operating Limits.

FIGURE 5.2-1

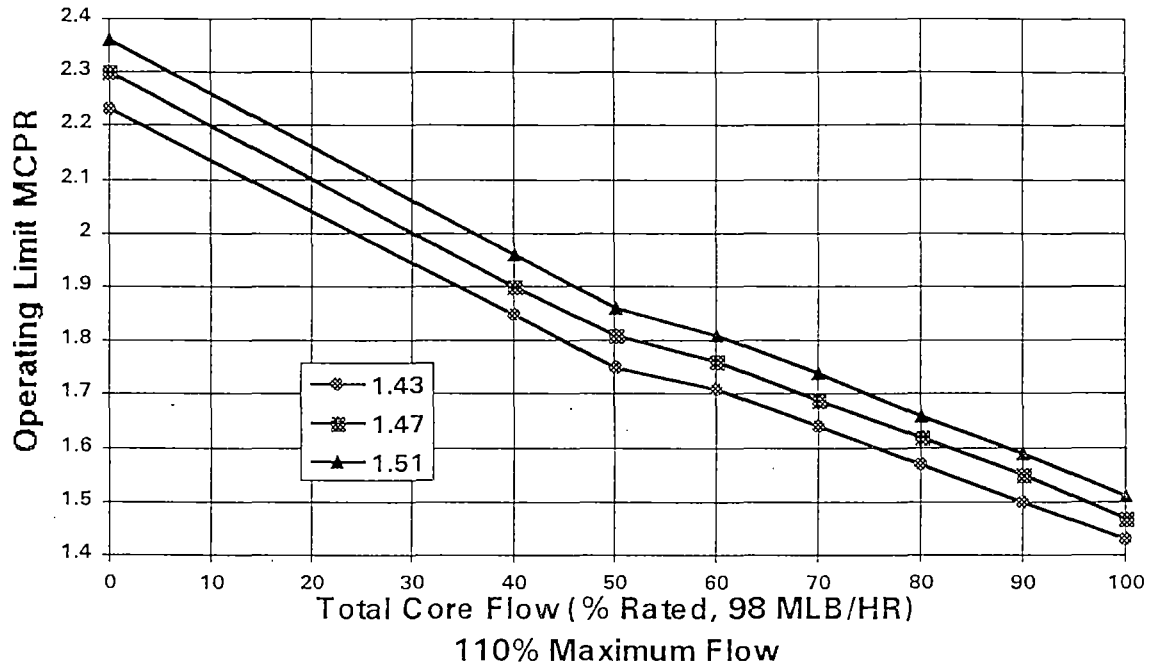
OPERATING LIMIT MCPR FOR MANUAL FLOW CONTROL



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 5.2-2

OPERATING LIMIT MCPR FOR AUTOMATIC FLOW CONTROL  
FOR 9x9-2 FUEL<sup>1</sup>

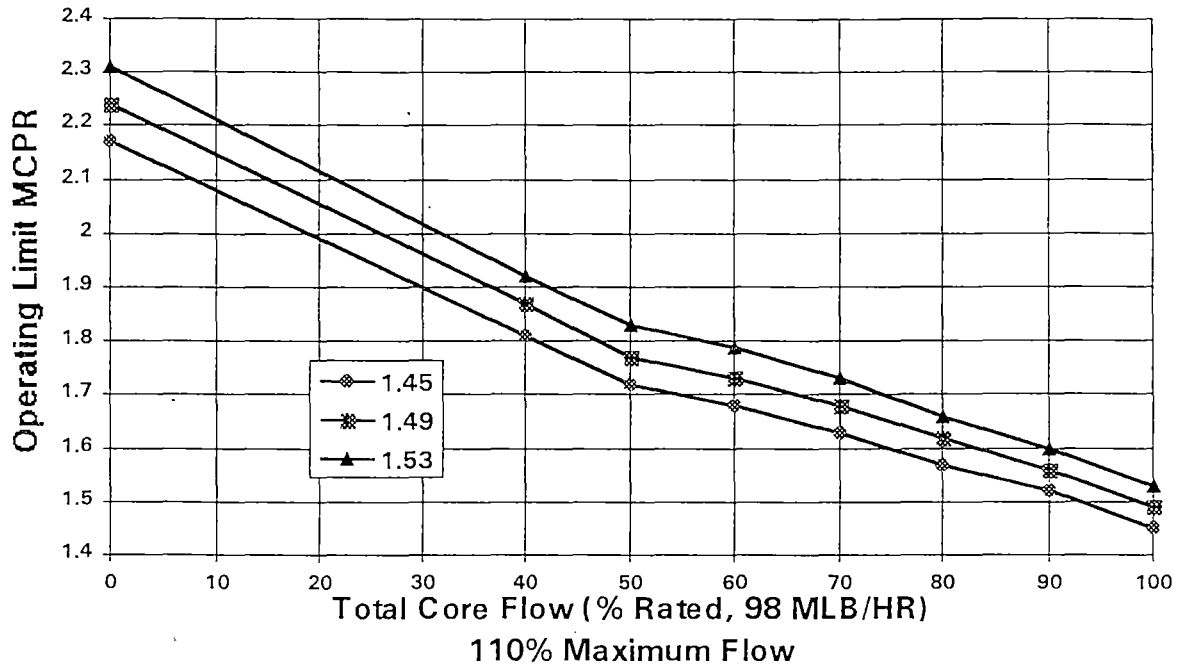


Total Core Flow (% Rated)	Operating Limit MCPR 9x9-2		
	1.43	1.47	1.51
100	1.43	1.47	1.51
90	1.50	1.55	1.59
80	1.57	1.62	1.66
70	1.64	1.69	1.74
60	1.71	1.76	1.81
50	1.75	1.81	1.86
40	1.85	1.90	1.96
00	2.23	2.30	2.36

<sup>1</sup> Although analyzed for core flows from 0% to 100%, Technical Specification 3.3.N prohibits AFC operation below 65% core flow.

FIGURE 5.2-3

OPERATING LIMIT MCPR FOR AUTOMATIC FLOW CONTROL  
FOR ATRIUM-9B LFAs<sup>2</sup>



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

<sup>2</sup> Although analyzed for core flows from 0% to 100%, Technical Specification 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)
- 9) ANF-91-048(P)(A), "Advanced Nuclear Fuels Corporation Methodology for Boiling Water Reactors EXEM BWR Evaluation Model," January 1993.