

Core Operating Limits Report  
Dresden Station Unit 2 Cycle 13

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9105130328 910503  
PDR ADOCK 05000237  
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**ATTACHMENT D**

**CORE OPERATING LIMITS REPORT**

**DRESDEN UNIT 2**

Issuance of Changes Summary

Affected Section	Affected Pages	Summary of Changes	Date
All	All	Original Issue	12/89
5.0	5-1,5-2,5-4	Channel Bow MCPR Adjustment	05/90
2.0, 3.0 4.0, 5.0	2-2,3-2, 3-2,4-2,5-1, 5-2,5-3,5-4	MCPR Adjustment Extended 8x8 Burnup Limit	09/90
2.0, 3.0	2-2,3-2	Extended 8x8 Burnup Limit	03/91

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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 from 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.

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## 1.0 CONTROL ROD WITHDRAWAL BLOCK INSTRUMENTATION

### 1.1 Technical Specification Reference

Technical Specification 3.2.C - Control Rod Block Actuation

### 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)	Less than or equal to (0.65 Wd plus 45)*
	Less than or equal to (0.65 Wd plus 41)*

\*Wd - 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

### 2.2 Description

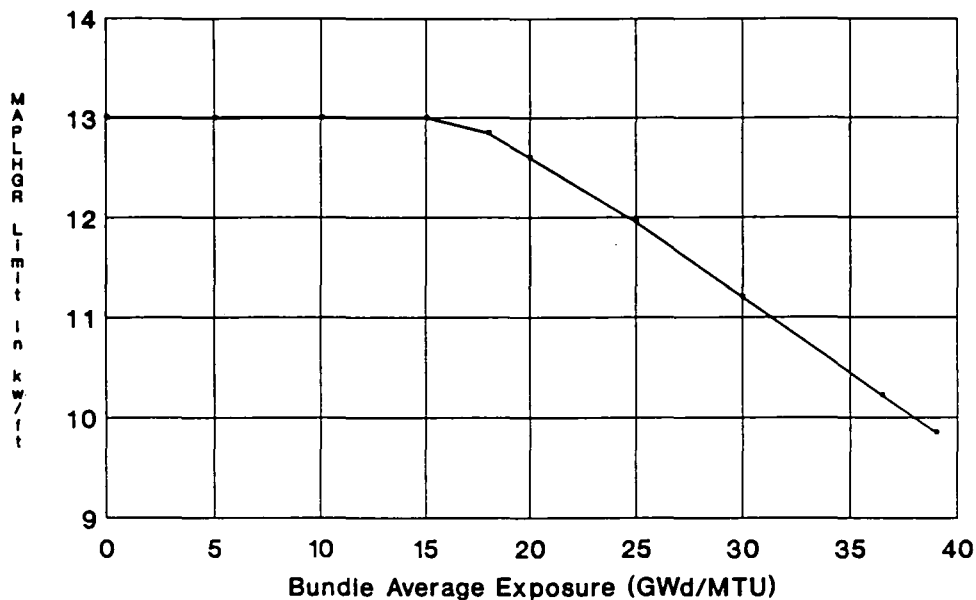
The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) versus Bundle Average Exposure for ANF 8x8 fuel is determined from Figure 2.2-1.

The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) versus Bundle Average Exposure for ANF 9x9 fuel is determined from Figure 2.2-2.

### 2.3 MAPLHGR Multipliers

The appropriate multiplicative factors to apply to the base MAPLHGR limits specified in Section 2.2 are shown in Table 2.3-1.

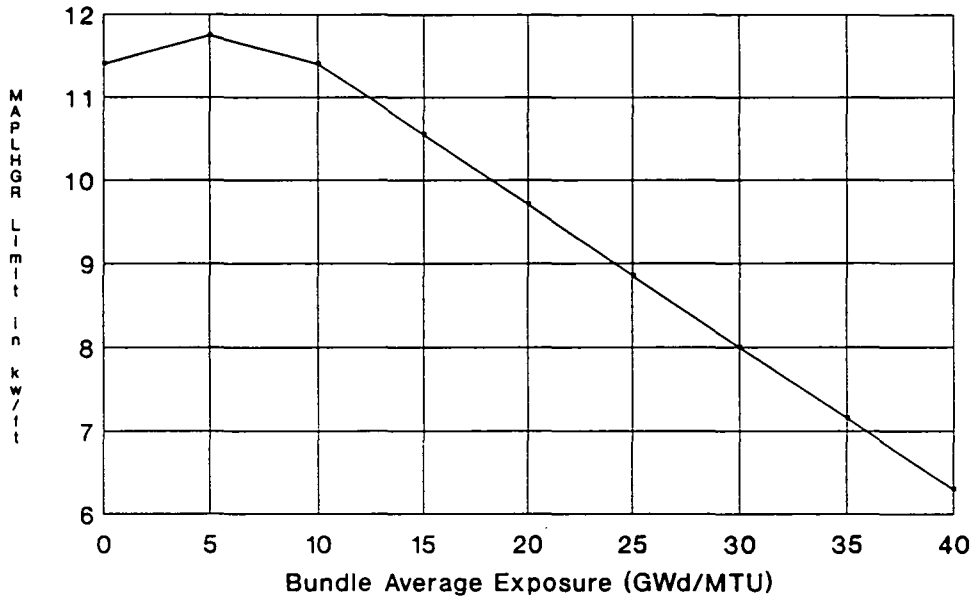
Figure 2.2-1  
 MAPLHGR Limit vs. Bundle Avg. Exposure  
 ANF 8x8 Fuel



The above graph is based on the following MAPLHGR summary for ANF 8x8 fuel design.

Bundle Average Exposure (GWd/MTU)	MAPLHGR Limit, Kw/ft
0	13.00
10	13.00
15	13.00
18	12.85
20	12.60
25	11.95
30	11.20
36.5	10.22
39	9.85

Figure 2.2-2  
 MAPLHGR Limit vs. Bundle Avg. Exposure  
 ANF 9x9 Fuel



The above graph is based on the following MAPLHGR summary for ANF 9x9 fuel design.

Bundle Average Exposure (GWD/MTU)	MAPLHGR Limit, Kw/ft
0	11.40
5	11.75
10	11.40
15	10.55
20	9.70
25	8.85
30	8.00
35	7.15
40	6.30

Table 2.3-1  
MAPLHGR Multipliers

Specification	Title of TS	Scenario	Multiplicative Factors	
			ANF 8x8	ANF 9x9
3.5.D.2	Automatic Pressure Relief Subsystems	One Relief Valve Out Of Service (OOS)	0.89	0.76
3.5.I & 3.6.H.3.f	Average Planar LHGR Recirculation Pump Flow Limitations	Single Loop Operation (SLO)	0.91	0.91
3.5.I & 3.6.H.3.f	Average Planar LHGR Recirculation Pump Flow Limitations	One Relief Valve OOS & SLO.	0.89	0.76

### 3.0 LOCAL STEADY STATE LHGR

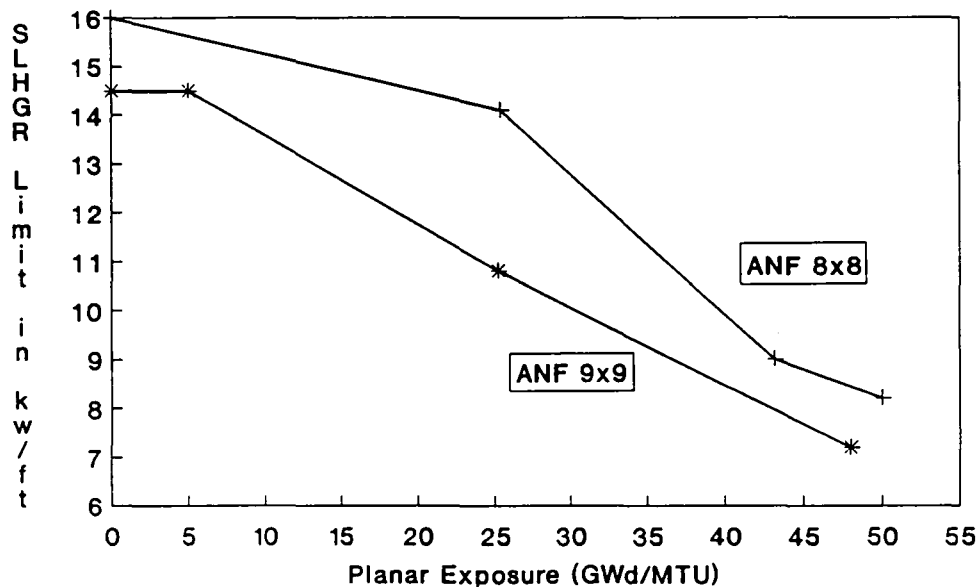
#### 3.1 Technical Specification Reference

Technical Specification 3.5.J - Local Steady State LHGR

#### 3.2 Description

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

Figure 3.2-1  
Steady State LHGR (SLHGR)  
Versus Planar Exposure



ANF 8x8 Fuel

Exposure(GWd/MTU)	LHGR(Kw/ft)
0.0	16.0
25.4	14.1
43.2	9.0
50.0	8.2

ANF 9x9 Fuel

Exposure(GWd/MTU)	LHGR(Kw/ft)
0.0	14.5
5.0	14.5
25.2	10.8
48.0	7.2

## 4.0 LOCAL TRANSIENT LHGR

### 4.1 Technical Specification Reference

Technical Specification 3.5.K - Local Transient LHGR

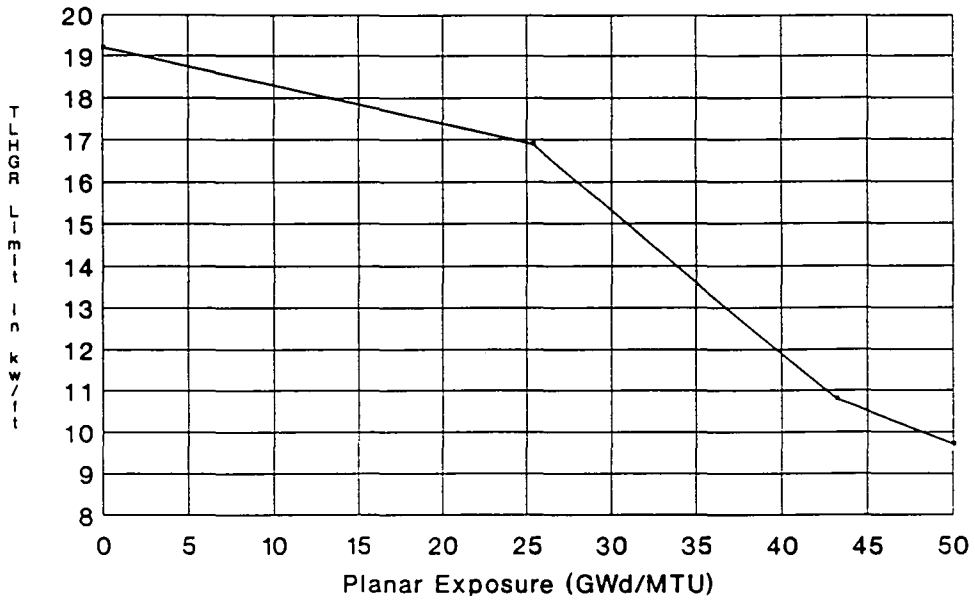
### 4.2 Description

The Local Transient LHGR (TLHGR) limit versus Average Planar Exposure for ANF 8x8 fuel is determined from Figure 4.2-1.

The TLHGR limit versus Average Planar Exposure for ANF 9x9 fuel is determined from Figure 4.2-2.

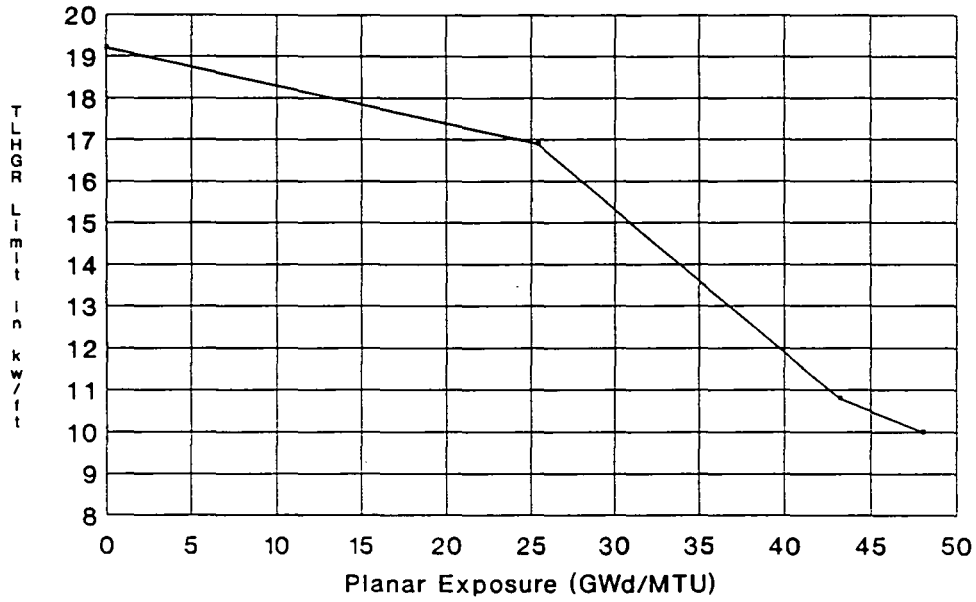


Figure 4.2-1  
 Transient LHGR (TLHGR) Versus  
 Planar exposure for ANF 8x8 Fuel



Exposure(Gw/MTU)	LHGR(Kw/ft)
0.0	19.2
25.4	16.9
43.2	10.8
50.0	9.7

Figure 4.2-2  
 Transient LHGR (TLHGR) Versus  
 Planar exposure for ANF 9x9 Fuel



Exposure (GWd/MTU)	LHGR (Kw/ft)
0.0	19.2
25.4	16.9
43.2	10.8
48.0	10.0

## 5.0 OPERATING LIMIT MINIMUM CRITICAL POWER RATIO

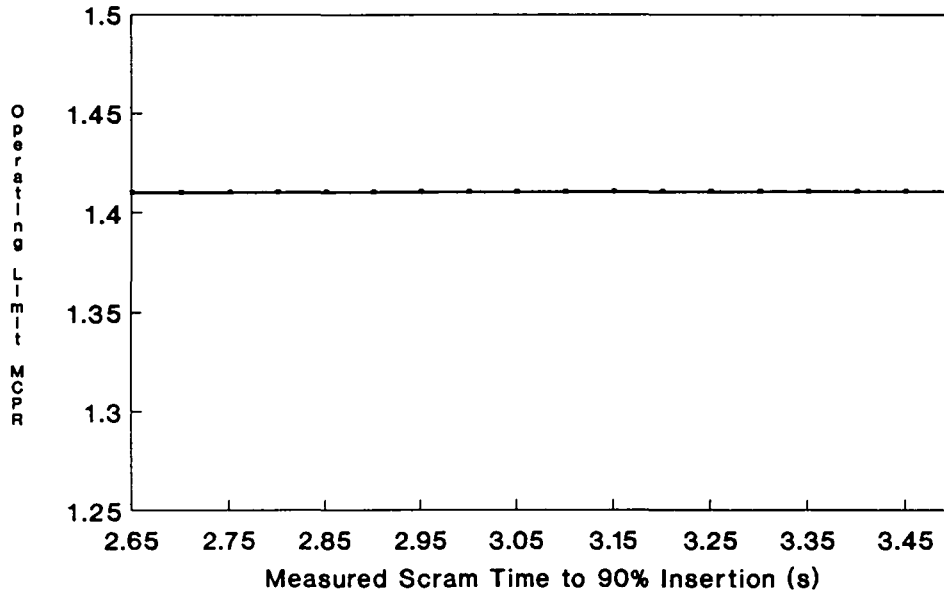
### 5.1 Technical Specification References

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

### 5.2 Description

- a. The Operating Limit MCPR at rated output versus measured scram time is shown in Figure 5.2-1. The Operating Limit MCPR is 1.41 or greater whenever the measured 90% insertion time is 3.50 seconds or less.
- b. During Manual Flow Control, the Operating Limit MCPR at reduced core flow conditions can be determined from:
  - i. Figure 5.2-2 using the appropriate flow rate, or
  - ii. The Operating Limit MCPR determined via Figure 5.2-1, whichever is greater.
- c. During Automatic Flow Control, the Operating Limit MCPR at reduced flow rates can be determined from Figure 5.2-3 using the appropriate flow rate and the Operating Limit MCPR, which is obtained from Figure 5.2-1. Linear interpolation between the curves on Figure 5.2-3 is permissible.

Figure 5.2-1  
MCPR Limit vs. Measured Scram Time  
to 90% Insertion

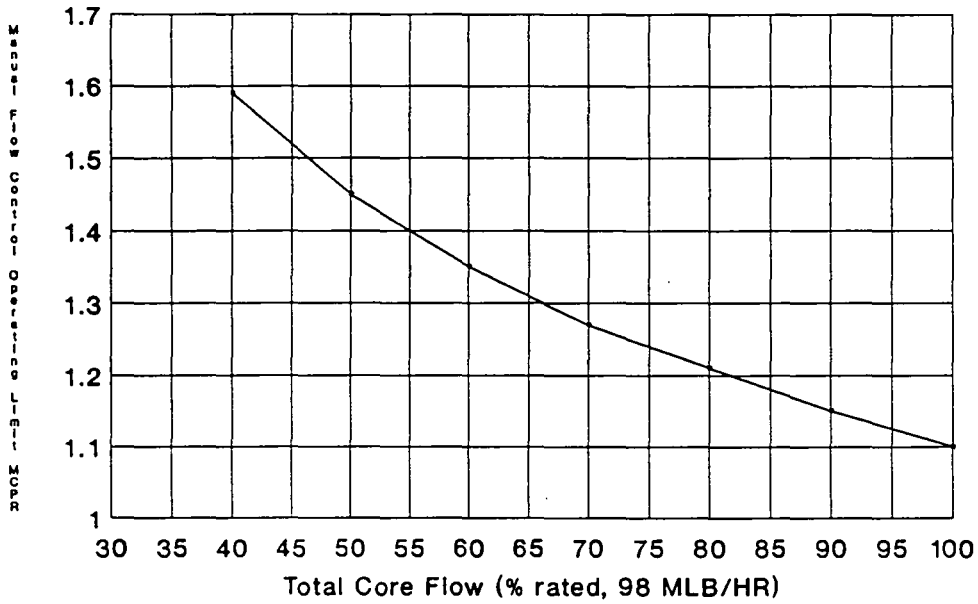


The above graph demonstrates the following dependence of the Operating Limit MCPR versus measured scram time to 90% insertion for all resident fuel types:

$$\text{MCPR LCO} = 1.41$$

Note that the Operating Limit MCPR is not a function of scram time assuming the Technical Specification scram time limit of 3.50 seconds to 90% insertion (3.3.C) is met.

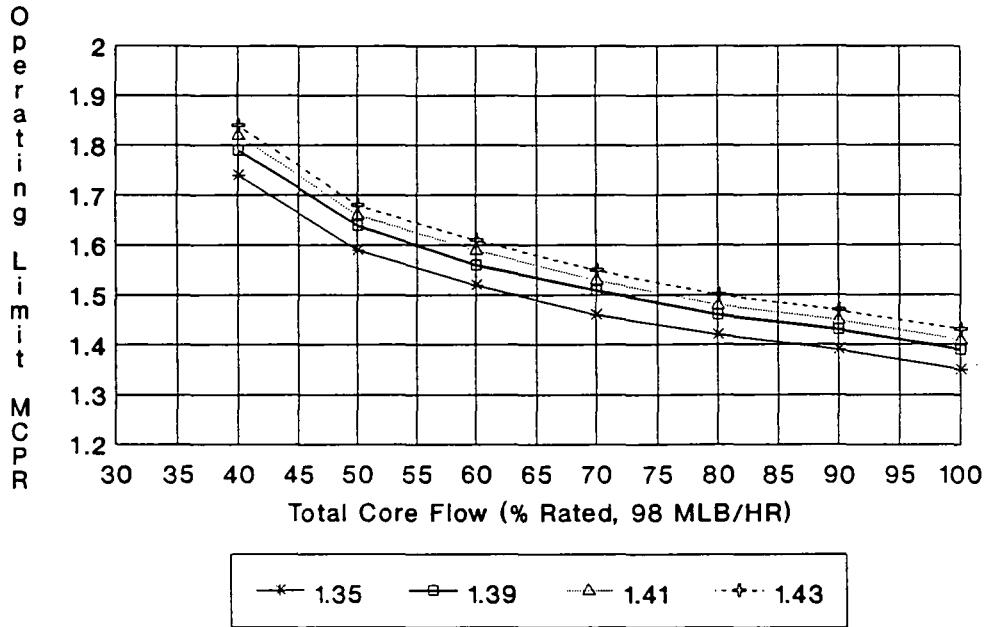
Figure 5.2-2  
 Operating Limit MCPR  
 For Manual Flow Control



The above curve is based on the following Operating Limit MCPR summary for Manual Flow Control and all fuel types:

Total Core Flow (% Rated)	Operating Limit MCPR
100	1.10
90	1.15
80	1.21
70	1.27
60	1.35
50	1.45
40	1.59

**Figure 5.2-3  
Operating Limit MCPR  
For Automatic Flow Control**



The above curve is based on the following Operating Limit MCPR summary for Automatic Flow Control and all fuel types:

Total Core Flow (% Rated)	Operating Limit MCPR*			
	1.35	1.39	1.41	1.43
100	1.35	1.39	1.41	1.43
90	1.39	1.43	1.45	1.47
80	1.42	1.46	1.48	1.50
70	1.46	1.51	1.53	1.55
60	1.52	1.56	1.59	1.61
50	1.59	1.64	1.66	1.68
40	1.74	1.79	1.82	1.84

\*Column Headers are Operating Limit MCPRs at rated output.