

Core Operating Limits Report  
Dresden Station Unit 3 Cycle 12

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**ATTACHMENT E**

**CORE OPERATING LIMITS REPORT**

**DRESDEN UNIT 3**



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## References

1. Commonwealth Edison Company Docket No. 50-249, Dresden Nuclear Power Station, Unit 3, Facility Operating License DPR-25.
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
<hr/> <p>Rod Block Monitor Upscale (Flow Bias)</p>	
Dual Loop Operation	Less than or equal to (0.65 Wd plus 45)*
Single Loop Operation	Less than or equal to (0.65 Wd plus 41)*

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\*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

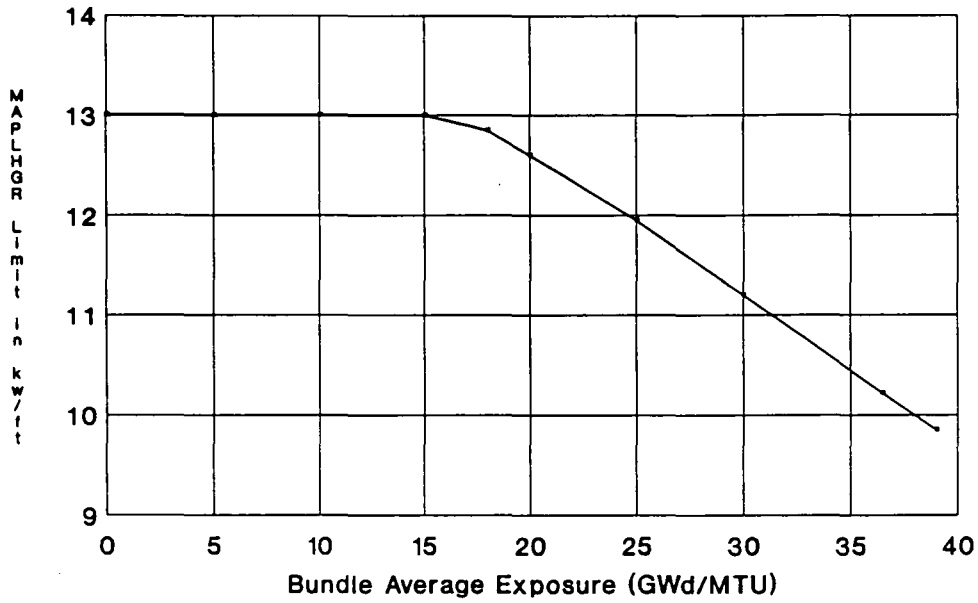
The Maximum Average Planar Linear Heat Generation Rates (MAPLHGR) versus Bundle Average Exposure for ANF 8x8 fuel is determined from Figure 2.2-1.

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.

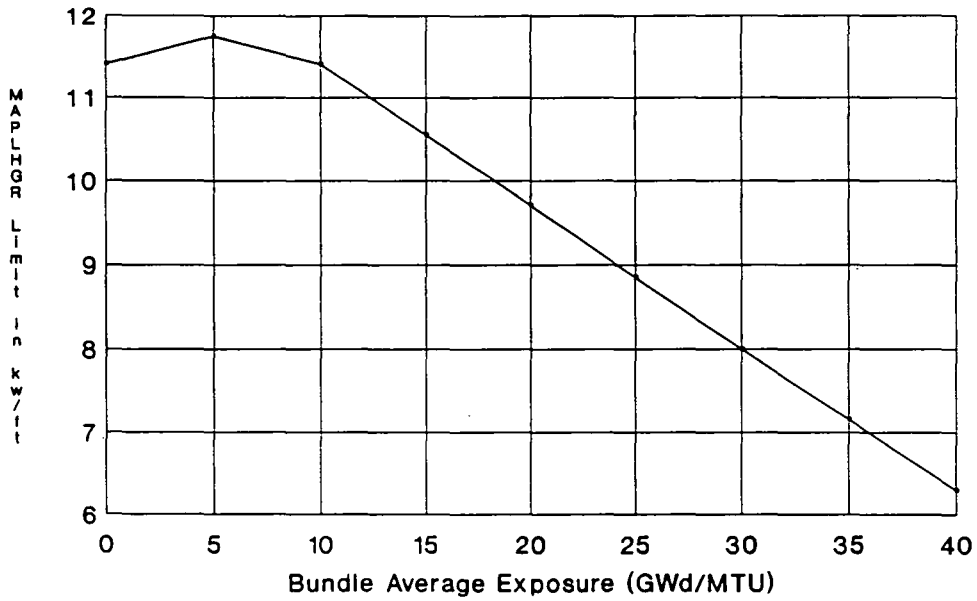
Figure 2.2-1  
 MAPLHGR Limit vs. Bundle Avg. Exposure  
 ANF 8x8 Fuel



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

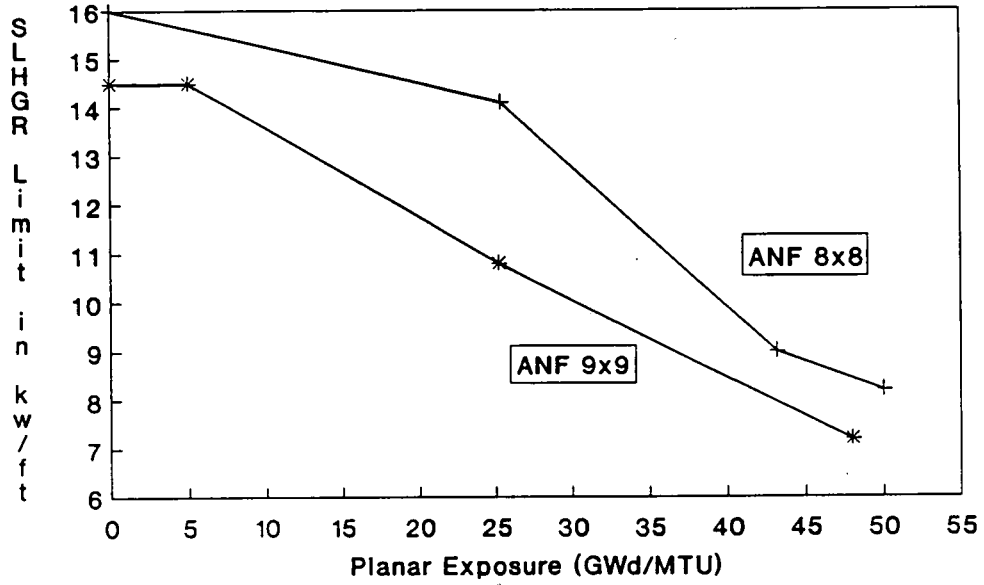
#### 3.1 Technical Specification Reference

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

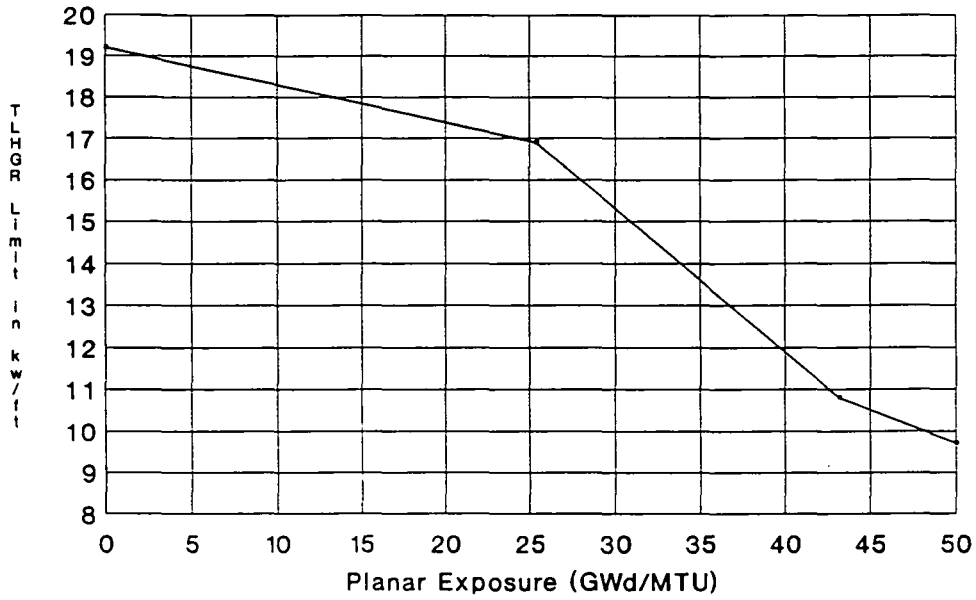
### 4.2 Description

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.

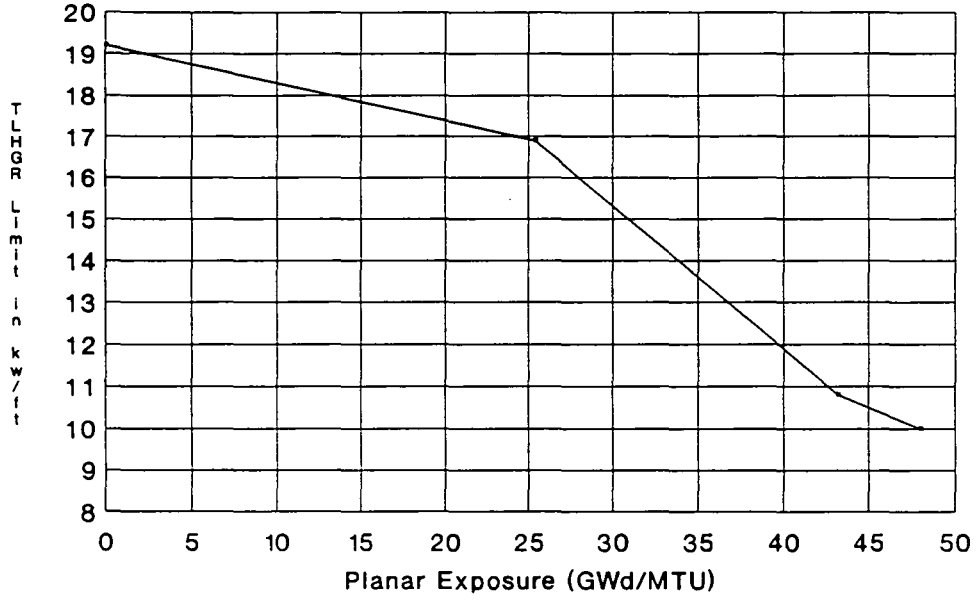


Figure 4.2-1  
 Transient LHGR (TLHGR) Versus  
 Planar exposure for ANF 8x8 Fuel



Exposure(GWd/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

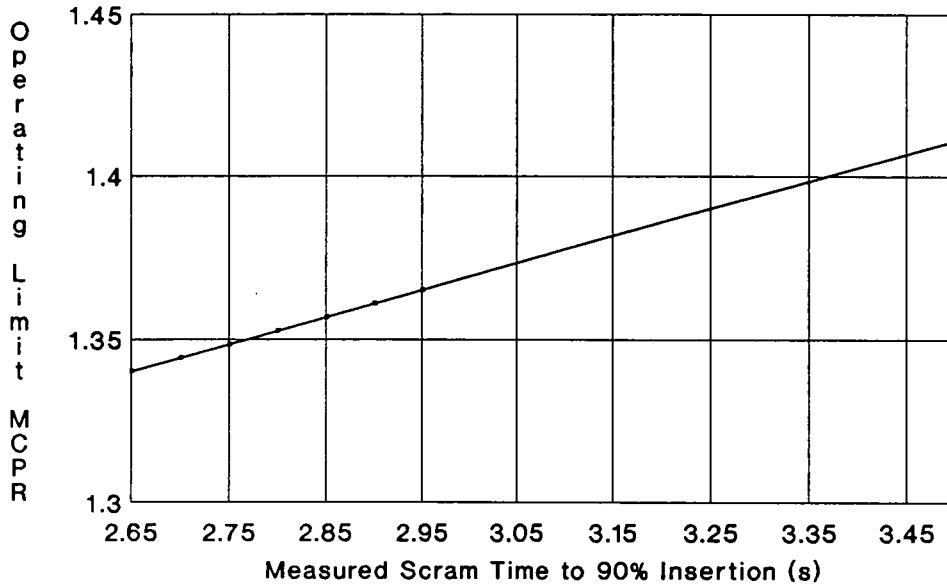
### 5.1 Technical Specification References

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 1.34 or greater whenever the measured 90% insertion time is 2.65 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

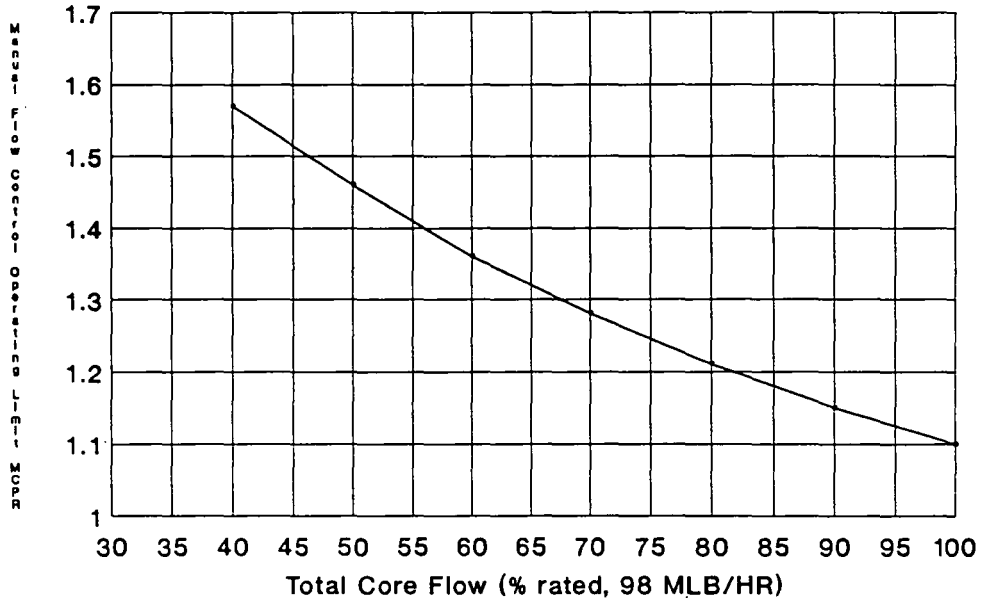


The above graph demonstrates the following dependence of the Operating Limit MCPR versus measured scram time to 90% insertion for all resident fuel types:

$$\text{MCPR LCO} = 1.34 + (\text{Tave} - 2.65) * 0.083$$

where Tave is the average insertion time to the 90% insertion point for all control rods in the core.

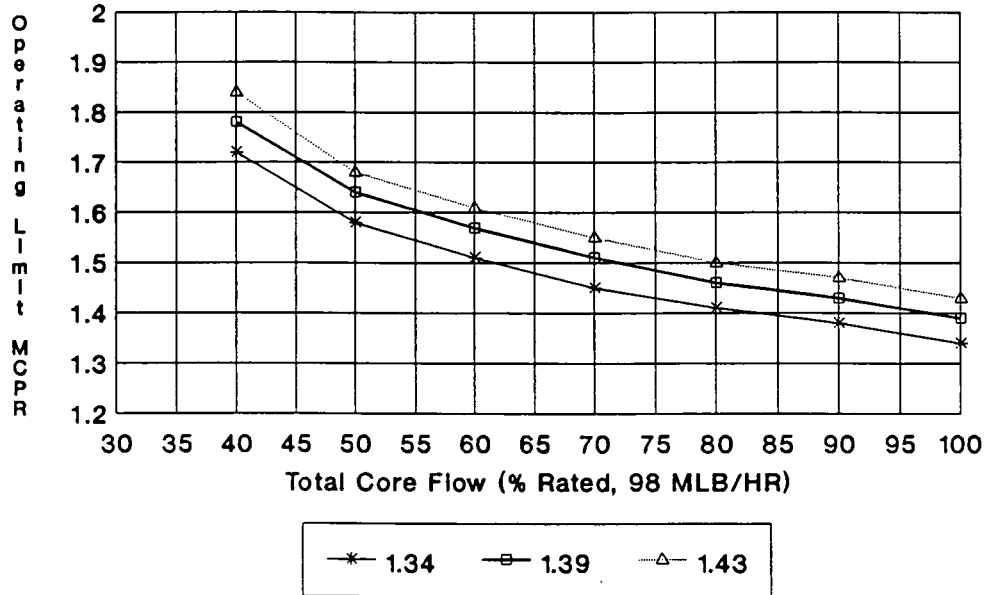
Figure 5.2-2  
 Operating Limit MCPR  
 For Manual Flow Control



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	1.28
60	1.36
50	1.46
40	1.57

**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*		
	1.34	1.39	1.43
100	1.34	1.39	1.43
90	1.38	1.43	1.47
80	1.41	1.46	1.50
70	1.45	1.51	1.55
60	1.51	1.57	1.61
50	1.58	1.64	1.68
40	1.72	1.78	1.84

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