

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT UNIT 2

CORE OPERATING LIMITS REPORT

Document No.: COLR2

Revision 01, Cycle 1

FOR INFORMATION ONLY
Not To Be Used For Operations & Maintenance

	<u>Name</u>	<u>Title</u>	<u>Date</u>
Prepared by:	<u>R. D. McCord</u> <i>Richard McCord</i>	<u>Fuels Engineer</u>	<u>7-16-90</u>
Reviewed by:	<u>C. W. Lepine</u> <i>Frank Lepine for Carl Lepine</i>	<u>Fuels Engineer</u>	<u>7-16-90</u>
Approved by:	<u>P. E. Netusil</u> <i>Paul Netusil</i>	<u>Lead Fuels Engineer</u>	<u>7/16/90</u>
Approved by:	<u>D. J. Wolniak</u> <i>D. J. Wolniak</i>	<u>Asst. Manager - Licensing</u>	<u>7/17/90</u>
Approved by:	<u>S. W. Wilczek</u> <i>S. W. Wilczek</i>	<u>Manager of Nuclear Technology</u>	<u>7/17/90</u>
Approved by:	<u>E. S. Tomlinson</u> <i>E. S. Tomlinson</i>	<u>Reactor Analyst Supervisor</u>	<u>7/31/90</u>
SORC Chairman			
Approval:	<u><i>R. B. [Signature]</i></u>		

This NMPC Controlled Document provides cycle specific core operating limits for use in conjunction with the Nine Mile Point Unit 2 Technical Specification.

5415W

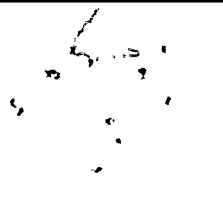
9010170215 901011
PDR . ADOCK 05000410
P PDC



NINE MILE POINT UNIT 2
CORE OPERATING LIMITS REPORT

TABLE OF CONTENTS

	<u>Page</u>
1.0 Average Planar Linear Heat Generation Rate	2
1.1 Limits for Technical Specification 3.2.1	
2.0 Average Power Range Monitor Setpoints	6
2.1 Limits for Technical Specification 3.2.2	
3.0 Minimum Critical Power Ratio (ODYN Option B)	7
3.1 Coefficients for Tau Equation, Technical Specification 3.2.3	
4.0 Linear Heat Generation Rate	10
4.1 Limits for Technical Specification 3.2.4	
5.0 Rod Block Monitor	11
5.1 Setpoints for Technical Specification Table 3.3.6-2 (Item 1)	
6.0 APRM	12
6.1 Setpoints for Technical Specification Table 3.3.6-2 (Item 2)	



NINE MILE POINT UNIT 2 LIMITING CONDITION FOR OPERATION

1.0 AVERAGE PLANAR LINEAR HEAT GENERATION RATE

1.1 Limits for Technical Specification 3.2.1

During Operational Condition 1, when thermal power is greater than or equal to 25% of rated thermal power, the Average Planar Linear Heat Generation Rates (APLHGRs) for each type of fuel as a function of AVERAGE PLANAR EXPOSURE shall not exceed the limits shown in Figures 1a, 1b, and 1c. The limits of Figure 1a, 1b, and 1c shall be reduced to a value of 0.81 times the two recirculation loop operation limit when in single recirculation loop operation.



Small, illegible marks and artifacts in the top right corner.

Small, illegible mark.

Small, illegible mark.

Small, illegible marks.

Small, illegible marks.

Small, illegible marks.

Small, illegible mark.

Small, illegible marks.

Small, illegible marks on the left edge.

Small, illegible mark on the left edge.

Small, illegible mark on the left edge.

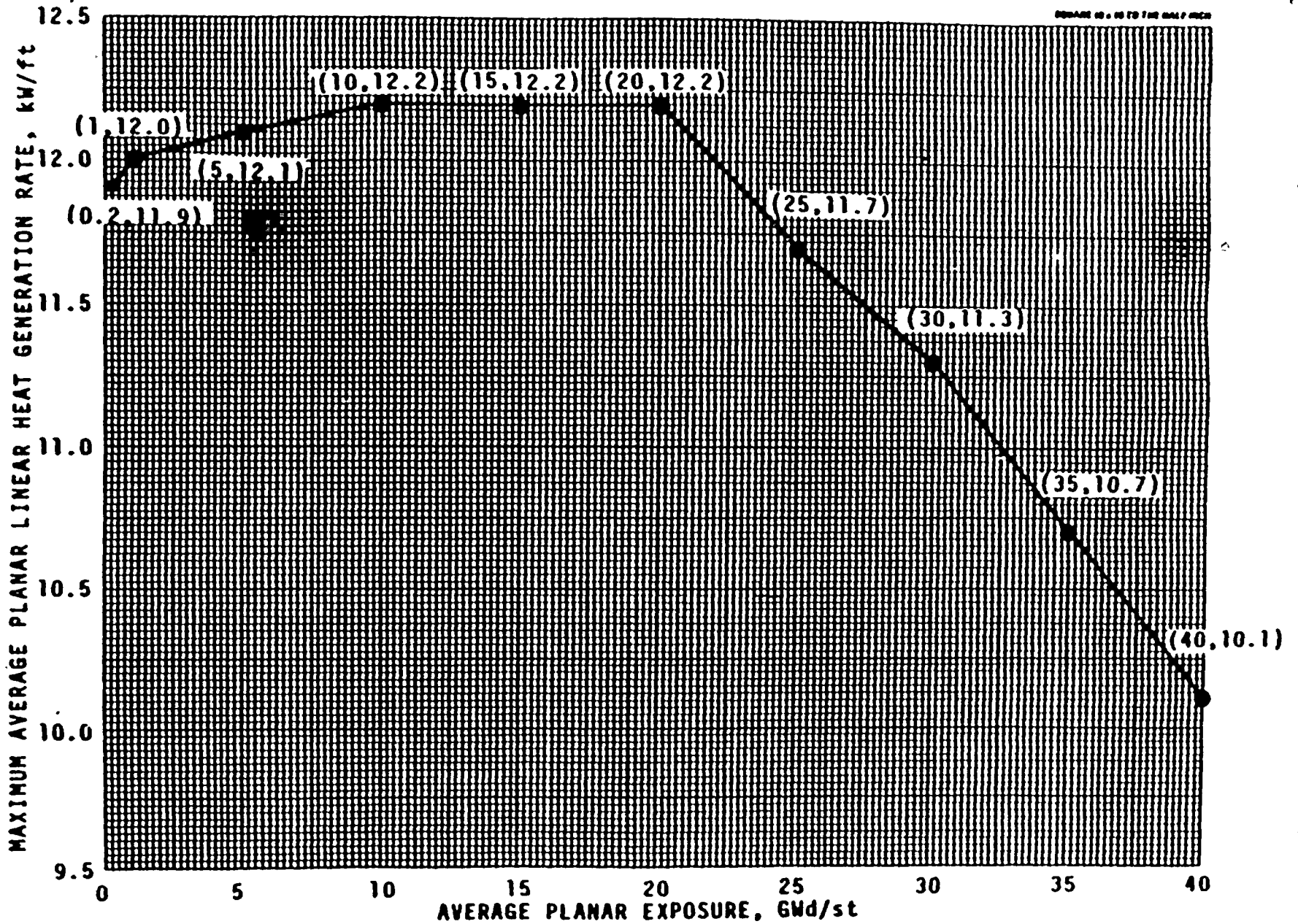
Small, illegible mark on the left edge.

Small, illegible mark on the left edge.

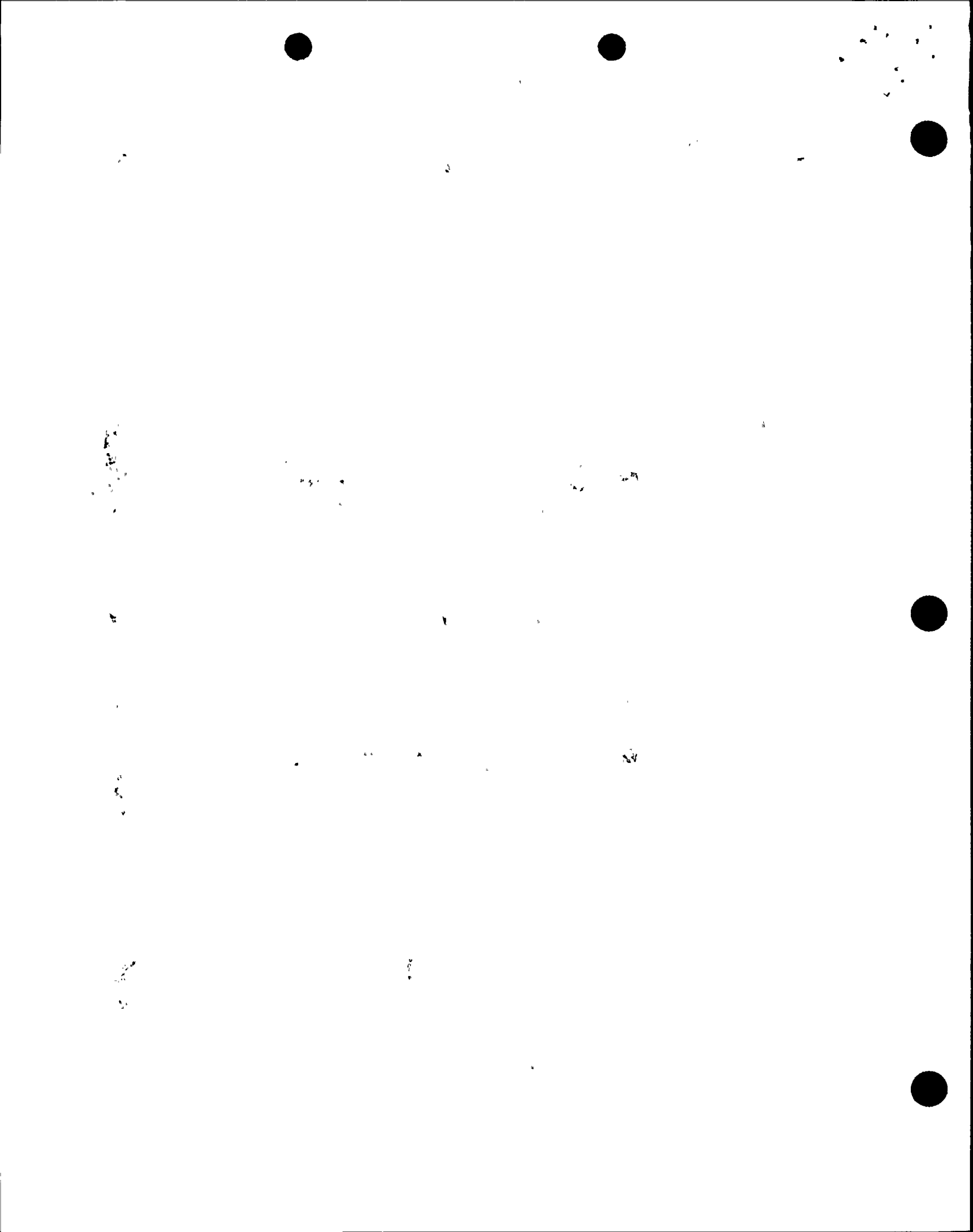
Small, illegible mark on the left edge.

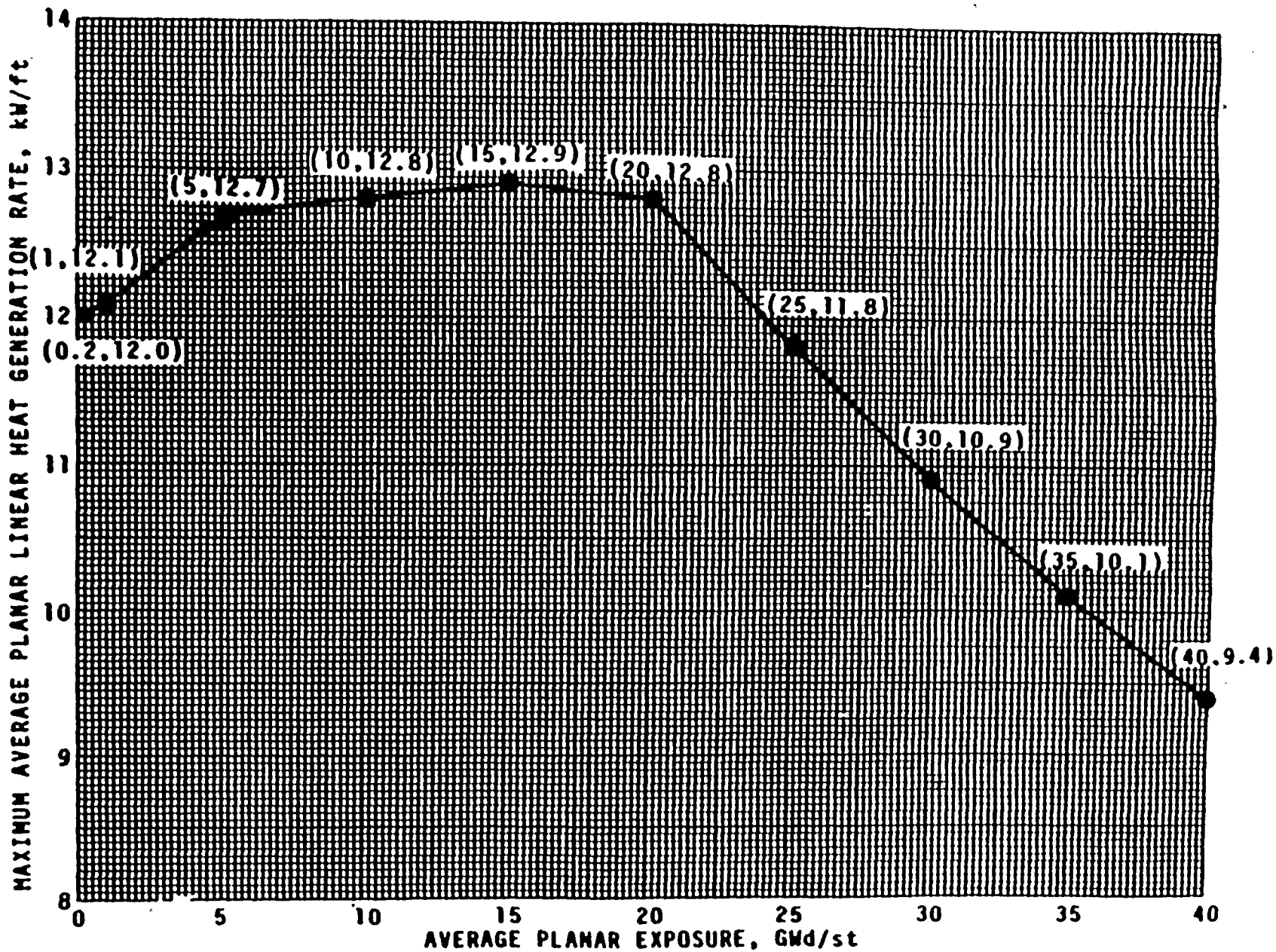
Small, illegible mark on the left edge.

Small, illegible mark on the left edge.



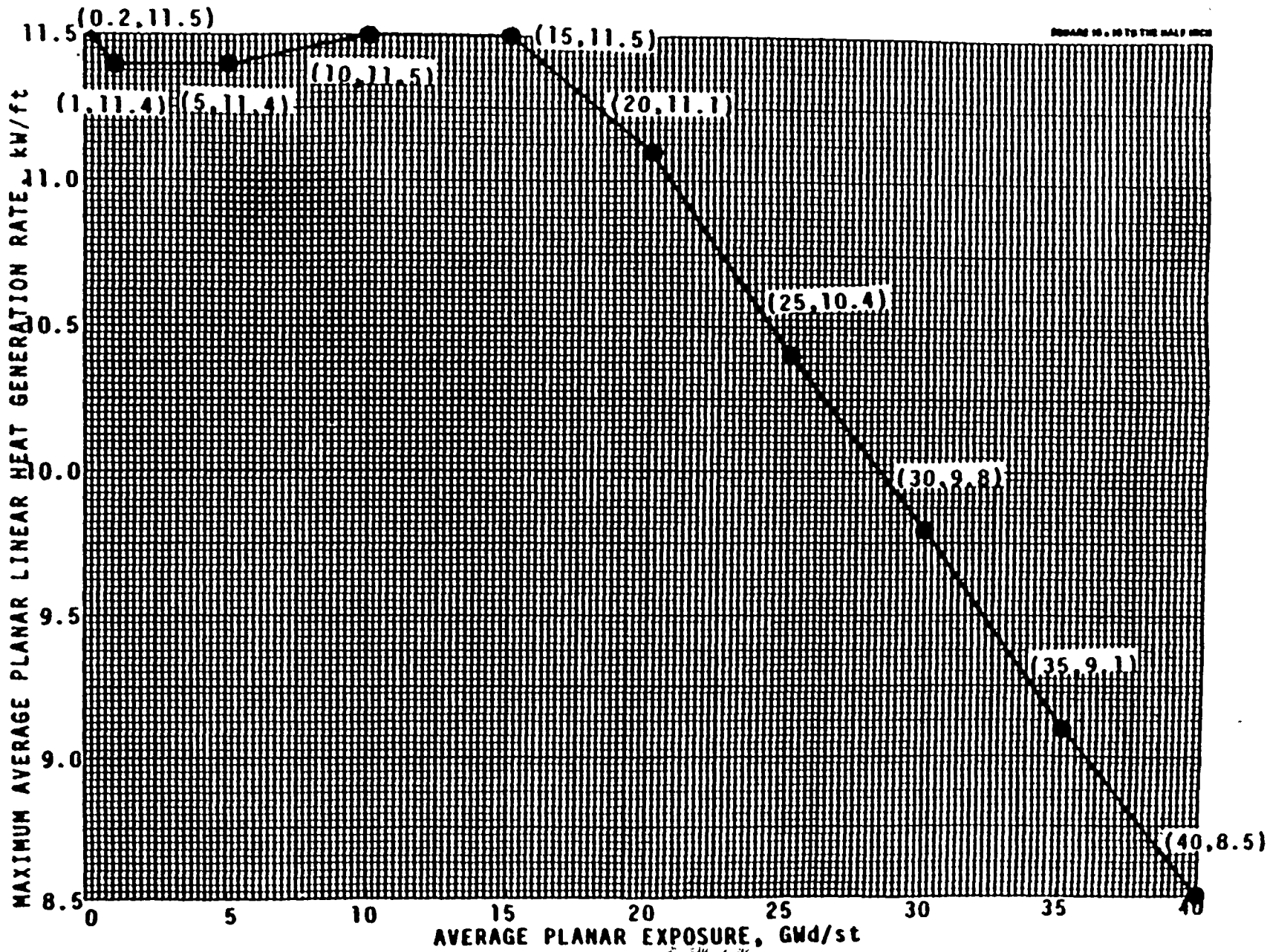
Maximum Average Planar Linear Heat Generation Rate vs. Average Planar Exposure, Fuel Type BP8CRB219





Maximum Average Planar Linear Heat Generation Rate vs. Average Planar Exposure, Fuel Type P8CRB176





Maximum Average Planar Linear Heat Generation Rate vs. Average Planar Exposure, Fuel Type P8CRB071



NINE MILE POINT UNIT 2 LIMITING CONDITION FOR OPERATION

2.0 AVERAGE POWER RANGE MONITOR SETPOINTS

2.1 Limits for Technical Specification 3.2.2

During OPERATIONAL CONDITION 1, when THERMAL POWER is greater than or equal to 25% of RATED THERMAL POWER, the Average Power Range Monitor (APRM) flow-biased simulated thermal power-upscale scram trip setpoint(S) and flow-biased neutron flux-upscale control rod block trip setpoint (S_{RB}) shall be established according to the following relationships:

<u>Trip Setpoint</u>	<u>Allowable Value</u>
$S \leq (0.66 (W - \Delta W) + 51\%)T$	$S \leq (0.66 (W - \Delta W) + 54\%)T$
$S_{RB} \leq (0.66 (W - \Delta W) + 42\%) T$	$S_{RB} \leq (0.66 (W - \Delta W) + 45\%)T$

Where:

S and S_{RB} are in percent of RATED THERMAL POWER

W = Loop recirculation flow as a percentage of the loop recirculation flow which produces a rated core flow of 108.5 MLB/HR.

T = The ratio FRACTION OF RATED THERMAL POWER divided by the CORE MAXIMUM FRACTION OF LIMITING POWER DENSITY.

T is applied only if less than or equal to 1.0.

ΔW is defined as the difference in indicated drive flow (in percent of drive flow which produces rated core flow) between two loop and single loop operation at the same core flow.

$\Delta W=0$ for two loop operation. $\Delta W=5\%$ for single loop operation.



NINE MILE POINT UNIT 2 LIMITING CONDITION FOR OPERATION

3.0 MINIMUM CRITICAL POWER RATIO (ODYN OPTION B)

3.1 Limits for Technical Specification 3.2.3

During Operational Condition 1, when thermal power is greater than or equal to 25% of rated thermal power, the MINIMUM CRITICAL POWER RATIO (MCPR) shall be equal to or greater than the MCPR limit shown in Figure 3a times the K(f) shown in Figure 3b with tau (or " τ ") as defined in Technical Specification 3.2.3.

3.2 Coefficients for Tau equation, Technical Specification 3.2.3

The following coefficients must be used with the tau equation specified in Technical Specification 3.2.3:

$$x = 0.688$$

$$y = 1.65$$

$$z = 0.052$$



.

..

.

W

W

W

W

.

.

.

.

.

.

.

.

.

.

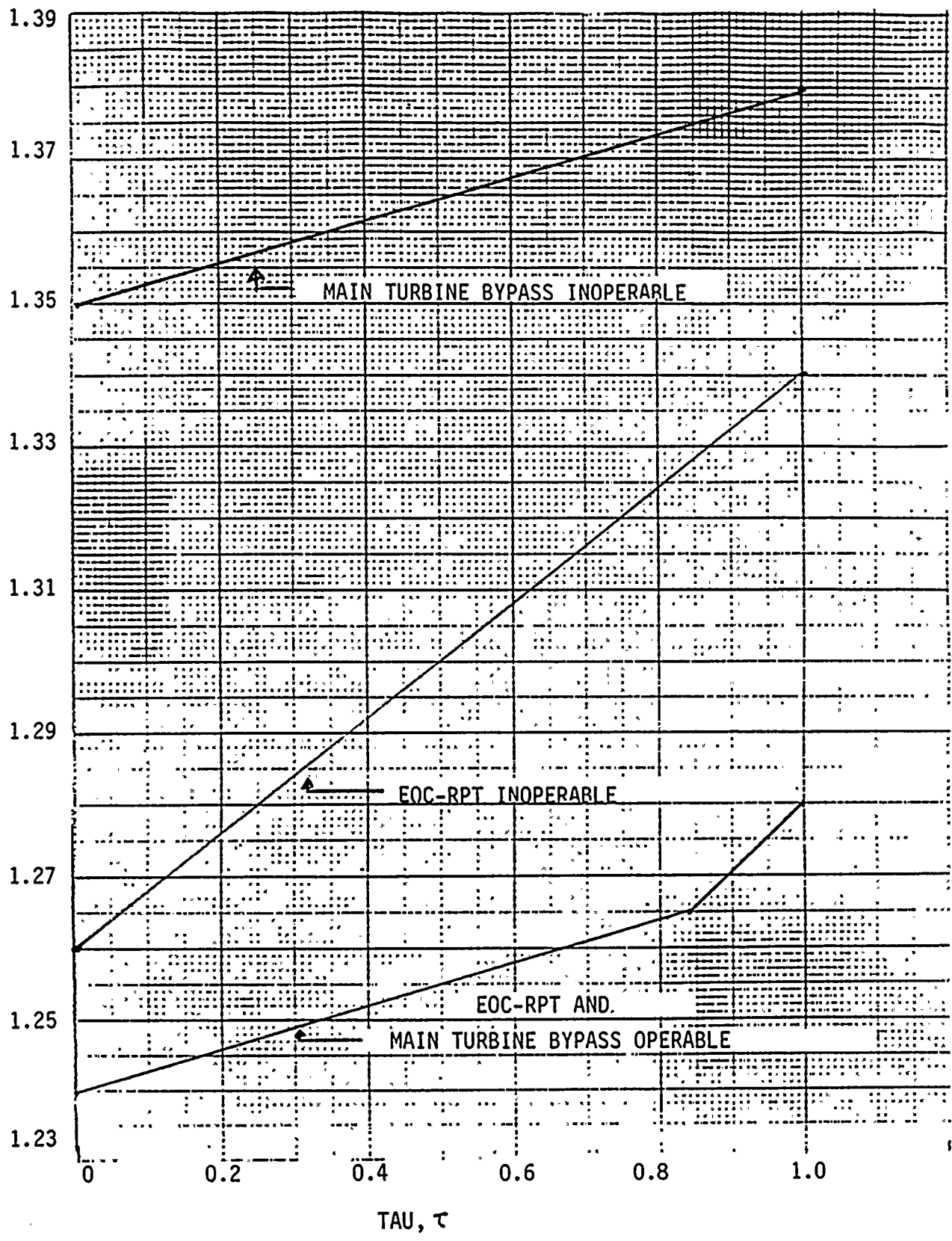
.

.

.



MINIMUM CRITICAL POWER RATIO, MCPR



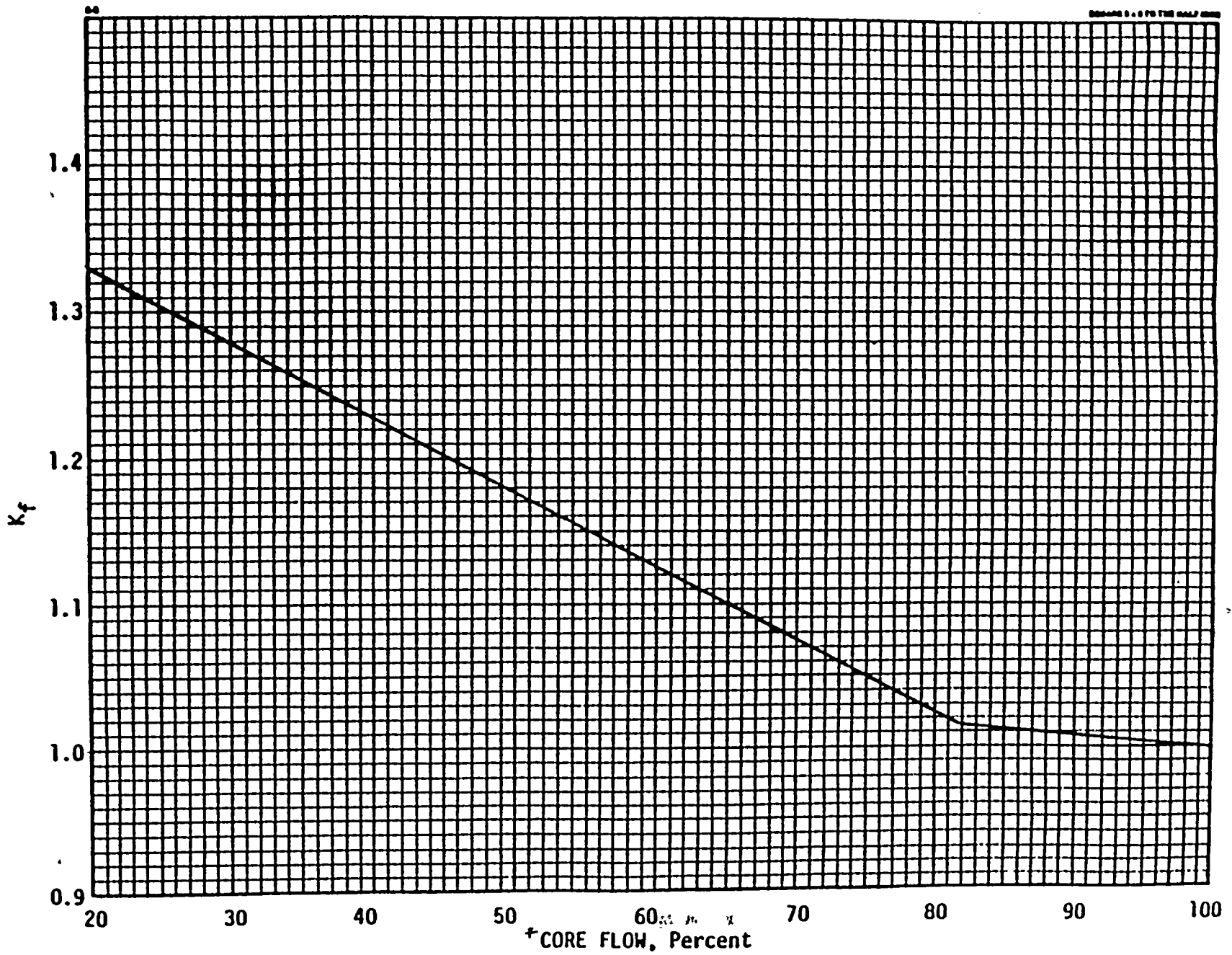
Minimum Critical Power Ratio. vs. τ at Rated Flow

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

1944

1944



K_f as a Function of Percent Core Flow

* Above 100% Core Flow $K_f = 1.0$



NINE MILE POINT UNIT 2 LIMITING CONDITION FOR OPERATION

4.0 LINEAR HEAT GENERATION RATE

4.1 Limits for Technical Specification 3.2.4

During OPERATIONAL CONDITION 1, when THERMAL POWER is greater than or equal 25% of RATED THERMAL POWER, the LINEAR HEAT GENERATION RATE (LHGR) shall not exceed the limits in the table below.

<u>Fuel Type</u>	<u>LHGR Limits</u>
BP8CRB219 (GE6)	13.4 KW/FT
P8CRB176 (GE6)	13.4 KW/FT
P8CRB071 (GE6)	13.4 KW/FT



NINE MILE POINT UNIT 2 CONTROL ROD BLOCK INSTRUMENTATION SETPOINT

5.0 ROD BLOCK MONITOR (RBM)

5.1 Setpoints for Technical Specification Table 3.3.6-2 (Item 1)

	<u>Trip Setpoint</u>	<u>Allowable Value</u>
RBM Upscale	$<0.66 (W - \Delta W) + 40\%$ with a maximum of 106%	$<0.66 (W - \Delta W) + 43\%$ with a maximum of 109%

NOTE: W = LOOP Recirculation flow as a percentage of the loop recirculation flow which produces a rated core flow of 108.5 MLB/HR.

ΔW is defined as the difference in indicated drive flow (in percent of drive flow which produces rated core flow) between two loop and single loop operation at the same core flow. W = 0 for two loop operation. $\Delta W = 5\%$ for single loop operation.



NINE MILE POINT UNIT 2 CONTROL ROD BLOCK INSTRUMENTATION SETPOINT

6.0 APRM

6.1 Setpoint for Technical Specification Table 3.3.6-2 (Item 2)

	<u>Trip Setpoint</u>	<u>Allowable Value</u>
Flow-Biased Neutron Flux-Upscale	$\leq .66 (W - \Delta W) + 42\%$	$\leq 0.66 (W - \Delta W) + 45\%$

NOTE: W = LOOP Recirculation flow as a percentage of the loop recirculation flow which produces a rated core flow of 108.5 MLB/HR.

ΔW is defined as the difference in indicated drive flow (in percent of drive flow which produces rated core flow) between two loop and single loop operation at the same core flow.
W = 0 for two loop operation. $\Delta W = 5\%$ for single loop operation.

