

Exelon Generation
Dresden Generating Station
6500 North Dresden Road
Morris, IL 60450-9765
Tel 815-942-2920

www.exeloncorp.com

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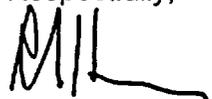
Dresden Nuclear Power Station, Unit 2
Facility Operating License No. DPR-19
NRC Docket No. 50-237

Subject: Core Operating Limits Report for Unit 2 Cycle 18, Revision 4

The purpose of this letter is to transmit the Core Operating Limits Report (COLR), Revision 4, for the current operating cycle (D2C18) in accordance with Technical Specification (TS) Section 5.6.5, "CORE OPERATING LIMITS REPORT (COLR)." The COLR was revised to change a control blade history penalty to the Linear Heat Generation Rate limit (LHGR) for specific bundles from a core-wide administrative penalty to a reduced LHFR limit within the COLR. The revised COLR incorporates the penalty into the base LGHR limit for the specified fuel. The analytical methods used to determine the operating limits were NRC approved. The COLR is enclosed as an attachment to this letter.

Should you have any questions concerning this letter, please contact Mr. J. Hansen at (815) 416-2800.

Respectfully,



R.J. Hovey
Site Vice President
Dresden Nuclear Power Station

Attachment: Core Operating Limits Report, Dresden Station Unit 2 Cycle 18, Revision 4

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Dresden Nuclear Power Station

A001

Core Operating Limits Report

for

Dresden Unit 2 Cycle 18
2957MW_{th} Rated Power

Revision 4

Core Operating Limits Report

for

Dresden Unit 2 Cycle 18
2957MW_{th} Rated Power

Issuance of Changes Summary

Affected Section	Affected Pages	Summary of Changes	Revision	Date
All	All	Original Issue (Cycle 18)	0	10/01
All	All	Complete reissue. Changes are increased core thermal power level (EPU – 2957 MWt), power and flow dependent limits (ARTS), exposure extended LHGR limits for SPC ATRIUM-9B fuel, support for new Equipment Out of Service options (TCV Slow Closure, PLUOOS, TCV Stuck Closed), clarification of TIP operating requirements, clarification of LPRM calibration frequency, clarification of coastdown overpower requirements.	1	12/01
References, 2, 3, and 5	ii, iv, 2-3, 2-4, 2-5, 3-4, 5-1, and 5-2	Change breakpoint exposure in Tables 2-1 and 2-2 to EOR – 1300 MWd/MT. Add thermal limit set for operation with Pressure Regulator Out-of-Service (PROOS) between cycle exposures of 7,716 MWd/MT and 11,023 MWd/MT. Add footnote in Section 5 indicating TCV Slow Closure limits apply for PROOS. Increase allowed Final Feedwater Temperature Reduction for the cycle to 120°F.	2	12/02
References, 2, and 5	ii, v, 2-3, 2-4, 2-5, 2-6, 5-1, and 5-2	Update OLMCPR limits based on 0.03 increase in SLMCPR. Added footnote in Section 5 indicating an MSIV OOS is an allowed EOOS option	3	2/03
References, and 3	ii, v and 3-1	Update the LHGR limits for GE14 fuel (fuel bundle type 47) in the 10B control cells.	4	4/03

Table of Contents

References		iv
1. Average Planar Linear Heat Generation Rate (3.2.1 and 3.4.1)		1-1
1.1 Technical Specification Reference...		1-1
1.2 Description		1-1
2. Minimum Critical Power Ratio (3.2.2, 3.4.1 and 3.7.7)		2-1
2.1 Technical Specification Reference...		2-1
2.2 Description		2-1
3. Linear Heat Generation Rate (3.2.3)		3-1
3.1 Technical Specification Reference...		3-1
3.2 Description		3-1
4. Control Rod Withdrawal Block Instrumentation (3.3.2.1)		4-1
4.1 Technical Specification Reference...		4-1
4.2 Description		4-1
5. Allowed Modes of Operation (B 3.2.2, B 3.2.3)		5-1
6. Methodology		6-1

References

1. Exelon Generation Company, LLC Docket No. 50-237, Dresden Nuclear Power Station, Unit 2 Facility Operating License, License No. 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 Tech Specs, October 3, 1988.
3. Supplemental Reload Licensing Report for DRESDEN UNIT 2 Reload 17 Cycle 18 Power Uprate to 2957 MWth, J11-03837-SRLR-2957, Revision 0, TODI NFM0100102 Sequence 0, September 2001.
4. MICROBURN Steady State LHGR Limit Curve Generation for GE-14 Fuel (D2C18), BNDD:01-008, May 30, 2001.
5. DRESDEN 2 and 3 QUAD CITIES 1 and 2 Equipment Out-Of-Service and Legacy Fuel Transient Analysis, GE-NE-J11-03912-00-01-R1, TODI NFM0100091 Sequence 01, November 2001.
6. Instrument Setpoint Calculation Nuclear Instrumentation Rod Block Monitor Dresden 2 & 3, GE DRF C51-00217-01, December 15, 1999.
7. OPL-3 Parameters for Dresden Unit 2 Cycle 18 Transient Analysis, TODI NFM0100057 Sequence 00, DG01-000355, May 10, 2001.
8. Fuel Mechanical Design Report Exposure Extension for ATRIUM-9B Fuel Assemblies at Dresden, Quad Cities, and LaSalle Units, EMF-2563(P) Revision 1, August 2001.
9. Dresden Unit 2 Cycle 17 Reload Analysis, NDIT NFM9900187, Sequence 01, EMF-2275 Revision 1, November 1999.
10. General Electric Standard Application for Reactor Fuel (GESTAR II) and US supplement, NEDE-24011-P-A-14, June 2000.
11. Letter from B. Currier to B. Henning, Determination of Middle of Cycle (MOC) Exposure Point for D2C18 EPU Core Operating Limits Report, NFM-MW:01-0390, December 13, 2001.
12. Dresden Unit 2 Cycle 18 FRED Form Revision 1, TODI NFM0100025 Sequence 01, DG01-000317, April 27, 2001.
13. Letter from Carlos de la Hoz to Doug Wise and Alex Misak, "Approval of GE Evaluation of Dresden and Quad Cities Pressure Regulator Out of Service Analysis," NF-MW:02-0413, October 22, 2002.
14. Letter from F. Russell Lindquist to Jim Nevling, "TSD NFM-MW-B105 Evaluation of reduction in Dresden Unit 2 TCV Slow Closure MCPR Limits for low power operation," FRL02DR2-001, December 11, 2002.
15. Letter from Carlos de la Hoz to Doug Wise and Alex Misak, "Approval of GE Evaluation of Dresden and Quad Cities Extended Final Feedwater Temperature Reduction," NF-MW:02-0081, August 27, 2002.

16. Letter from Carlos de la Hoz to Doug Wise and Alex Misak, "Approval of GE Evaluation of MSIV out of Service for Dresden and Quad Cities", NFM-MW:02-0274, dated August 2, 2002.
17. Letter from F. R. Lindquist to A. Giancatarino, "Dresden Unit 2 Cycle 18 Safety Limit MCPR Change," FRL03DR2-003, February 21, 2003.
18. NF Calculation Note BNDG:02-001, Revision 0, "Determination of Generic MCPR_f Limits," 5/17/2002.
19. Letter from R. Lindquist to J. Nevling, "TSD NFM-MW-B115 D2C18 CBH Impact from Withdrawing 10B Rods", FRL03DR2-0011, dated January 9, 2003.

1. **Average Planar Linear Heat Generation Rate (3.2.1 and 3.4.1)**

1.1 Technical Specification Reference:

Sections 3.2.1 and 3.4.1.

1.2 Description:

Tables 1-1, 1-2, and 1-3 are used to determine the maximum average planar linear heat generation rate (MAPLHGR) limit for each fuel type. Limits listed in Tables 1-1, 1-2, and 1-3 are for Dual Reactor Recirculation Loop Operation.

For Single Reactor Recirculation Loop Operation (SLO), the MAPLHGR limits given in Tables 1-1, 1-2, and 1-3 must be multiplied by a SLO MAPLHGR multiplier. The SLO MAPLHGR multiplier for SPC fuel is 0.84 (Reference 3 Section 16). The SLO MAPLHGR multiplier for GE14 fuel is 0.77 (Reference 3 Section 16).

Table 1-1
Maximum Average Planar Linear Heat
Generation Rate (MAPLHGR) for SPC ATRIUM-9B Fuel
ATRM9-P9DATB330-11GZ-SPC80M-9WR-144-T6-3915
ATRM9-P9DATB348-11GZ-SPC80M-9WR-144-T6-3913
ATRM9-P9HATB371-13GZ-SPC100T-9WR-144-T6-3914
ATRM9-P9HATB371-13GZ-SPC100T-9WR-144-T6-3912
(Bundles 3915,3913,3914,3912, bundle types 4,5,6,7,35,36,37)
(Reference 3 Section 16)

Planar Average Exposure (GWd/MTU)	MAPLHGR (kW/ft)
0.0	13.52
17.25	13.52
40.00	10.73
70.00	7.84

Table 1-2
Maximum Average Planar Linear Heat
Generation Rate (MAPLHGR) for SPC 9x9-2 Fuel
ANF9x9-2-P9DANB314-9GZ-SPC80M-145-T6-3909
(Bundle 3909, bundle type 1)
(Reference 3 Section 16)

Planar Average Exposure (GWd/MTU)	MAPLHGR (kW/ft)
0.0	10.84
25.00	10.84
48.00	7.20
55.00	7.20

Table 1-3
Maximum Average Planar Linear Heat
Generation Rate (MAPLHGR) for GE14 Fuel
GE14-P10HNAB408-16GZ-100T-145-T6-2483
GE14-P10HNAB411-4G7.0/9G6.0-100T-145-T6-2484
(Bundles 2483 & 2484, bundle types 16, 46, 17 & 47)
(Reference 3 Section 16)

Planar Average Exposure (GWd/MTU)	MAPLHGR (kW/ft)
0.0	11.68
16.00	11.68
50.00	8.02
63.50	6.97
70.00	4.36

2. Minimum Critical Power Ratio (3.2.2, 3.4.1 and 3.7.7)

2.1 Technical Specification Reference:

Sections 3.2.2, 3.4.1 and 3.7.7.

2.2 Description:

The various MCPR limits are described below.

2.2.1 Manual Flow Control MCPR Limits

The Operating Limit MCPR (OLMCPR) is determined from either section 2.2.1.1 or 2.2.1.2, whichever is greater at any given power and flow condition.

2.2.1.1 Power-Dependent MCPR

For operation at less than 38.5% core thermal power, the OLMCPR as a function of core thermal power is shown in Table 2-3. For operation at greater than 38.5% core thermal power, the OLMCPR as a function of core thermal power is determined by multiplying the applicable EOOS condition limit shown in Table 2-1 or 2-2 by the applicable MCPR multiplier K_P given in Table 2-3. For operation at exactly 38.5% core thermal power, the OLMCPR as a function of core thermal power is the higher of either of the two aforementioned methods evaluated at exactly 38.5% core thermal power.

2.2.1.2 Flow-Dependent MCPR

Tables 2-4, 2-5 and 2-6 give the $MCPR_F$ limit as a function of flow. The $MCPR_F$ limit determined from these tables is the flow dependent OLMCPR.

2.2.2 Automatic Flow Control MCPR Limits

Automatic Flow Control MCPR Limits are not provided.

2.2.3 Option A and Option B

Option A and Option B refer to scram speeds.

Option A scram speed is the Improved Technical Specification scram speed. The core average scram speed insertion time for 20% insertion must be less than or equal to the Technical Specification Scram Speed to utilize Option A MCPR limits. Reload analyses performed by Global Nuclear Fuel (GNF) for cycle 18 Option A MCPR limits utilized a 20% core average insertion time of 0.900 seconds.

To utilize the MCPR limits for the Option B scram speed, the core average scram insertion time for 20% insertion must be less than or equal to 0.694 seconds (Reference 7 Page 6). If the core average scram insertion time does not meet the Option B criteria, but is within the Option A criteria, the appropriate MCPR value may be determined from a linear interpolation between the Option A and B limits with standard

mathematical rounding to two decimal places. When performing a linear interpolation to determine MCPR limits, ensure that the time used for Option A is 0.900 seconds, which is the 20% insertion time utilized by GNF in the reload analysis.

2.2.4 Recirculation Pump Motor Generator Settings

Cycle 18 was analyzed with a maximum core flow runout of 110%; therefore the Recirculation Pump Motor Generator scoop tube mechanical and electrical stops must be set to maintain core flow less than 110% (107.8 Mlb/hr) for all runout events (Reference 12 Section 15). This value is consistent with the analyses of Reference 5.

Table 2-1
MCPR Option A Based Operating Limits
(Reference 3 Section 11, Reference 5 Section 2.3.9, Reference 14, and Reference 17)

EOOS Combination	Fuel Type ¹	Cycle Exposure	
		<EOR ² - 1300 MWd/MT	≥EOR ² - 1300 MWd/MT
Base Case	GE14	1.57	1.71
	ATRIUM-9B	1.56	1.67
Base Case SLO	GE14	1.58	1.72
	ATRIUM-9B	1.57	1.68
TBPOOS	GE14	1.77	1.79
	ATRIUM-9B	1.70	1.72
TBPOOS SLO	GE14	1.78	1.80
	ATRIUM-9B	1.71	1.73
TCV Slow Closure	GE14	1.65	1.71
	ATRIUM-9B	1.60	1.67
TCV Slow Closure SLO	GE14	1.66	1.72
	ATRIUM-9B	1.61	1.68
PLUOOS	GE14	1.71	1.71
	ATRIUM-9B	1.64	1.67
PLUOOS SLO	GE14	1.72	1.72
	ATRIUM-9B	1.65	1.68
TCV Stuck Closed	GE14	1.57	1.71
	ATRIUM-9B	1.56	1.67
TCV Stuck Closed SLO	GE14	1.58	1.72
	ATRIUM-9B	1.57	1.68
		7716 MWd/MT to 11023 MWd/MT	
Pressure Regulator OOS 7716 MWd/MT to 11023 MWd/MT	GE14	1.65	
	ATRIUM-9B	1.60	

1. SPC 9x9-2 fuel is bound for all conditions of Table 2-1 by SPC ATRIUM-9B fuel.
2. EOR refers to end of rated power (i.e. 100% power/100% flow operation with all rods out)

Table 2-2
 MCPR Option B Based Operating Limits
 (Reference 3 Section 11, Reference 5 Section 2.3.9, Reference 14, and Reference 17)

EOOS Combination	Fuel Type ¹	Cycle Exposure	
		<EOR ² - 1300 MWd/MT	≥EOR ² - 1300 MWd/MT
Base Case	GE14	1.46	1.53
	ATRIUM-9B	1.45	1.49
Base Case SLO	GE14	1.47	1.54
	ATRIUM-9B	1.46	1.50
TBPOOS	GE14	1.59	1.61
	ATRIUM-9B	1.52	1.54
TBPOOS SLO	GE14	1.60	1.62
	ATRIUM-9B	1.53	1.55
TCV Slow Closure	GE14	1.48	1.53
	ATRIUM-9B	1.45	1.49
TCV Slow Closure SLO	GE14	1.49	1.54
	ATRIUM-9B	1.46	1.50
PLUOOS	GE14	1.53	1.53
	ATRIUM-9B	1.47	1.49
PLUOOS SLO	GE14	1.54	1.54
	ATRIUM-9B	1.48	1.50
TCV Stuck Closed	GE14	1.46	1.53
	ATRIUM-9B	1.45	1.49
TCV Stuck Closed SLO	GE14	1.47	1.54
	ATRIUM-9B	1.46	1.50
		7716 MWd/MT to 11023 MWd/MT	
Pressure Regulator OOS 7716 MWd/MT to 11023 MWd/MT	GE14	1.48	
	ATRIUM-9B	1.45	

1. SPC 9x9-2 fuel is bound for all conditions of Table 2-2 by SPC ATRIUM-9B fuel.
2. EOR refers to end of rated power (i.e. 100% power/100% flow operation with all rods out)

Table 2-3
MCPR_P for GE and SPC Fuel

(Reference 5 Figures 2-1, 2-3, 2-5, and Sect 2.3.9, Reference 14, and Reference 17)

EOOS Combination	Core Flow (% of rated)	Core Thermal Power (% of rated)								
		0	25	38.5	38.5	45	60	70	70	100
		Operating Limit MCPR			Operating Limit MCPR Multiplier, K _P					
Base Case (Option A or Option B)	≤ 60	3.19	2.61	2.29	1.32	1.28	1.15			1.00
	> 60	3.81	3.01	2.59						
Base Case SLO (Option A or Option B)	≤ 60	3.20	2.62	2.30	1.32	1.28	1.15			1.00
	> 60	3.82	3.02	2.60						
TBPOOS (Option A or Option B)	≤ 60	5.60	3.81	2.84	1.37	1.28	1.15			1.00
	> 60	6.85	4.66	3.48						
TBPOOS SLO (Option A or Option B)	≤ 60	5.61	3.82	2.85	1.37	1.28	1.15			1.00
	> 60	6.86	4.67	3.49						
TCV Slow Closure (Option A or Option B)	≤ 60	5.60	3.81	2.84	1.64		1.45	1.26	1.11	1.00
	> 60	6.85	4.66	3.48						
TCV Slow Closure SLO (Option A or Option B)	≤ 60	5.61	3.82	2.85	1.64		1.45	1.26	1.11	1.00
	> 60	6.86	4.67	3.49						
PLUOOS (Option A or Option B)	≤ 60	5.60	3.81	2.84	1.64		1.45	1.26	1.11	1.00
	> 60	6.85	4.66	3.48						
PLUOOS SLO (Option A or Option B)	≤ 60	5.61	3.82	2.85	1.64		1.45	1.26	1.11	1.00
	> 60	6.86	4.67	3.49						
TCV Stuck Closed (Option A or Option B)	≤ 60	3.19	2.61	2.29	1.32	1.28	1.15			1.00
	> 60	3.81	3.01	2.59						
TCV Stuck Closed SLO (Option A or Option B)	≤ 60	3.20	2.62	2.30	1.32	1.28	1.15			1.00
	> 60	3.82	3.02	2.60						
Pressure Regulator OOS 7716 MWd/MT to 11023 MWd/MT (Option A or Option B)	≤ 60	3.20	2.61	2.29	1.64		1.31	1.14	1.11	1.00
	> 60	3.80	3.01	2.59						

Notes for Table 2-3:

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power multiplier K_P should be applied.
- Allowable EOOS conditions are listed in Section 5.

Table 2-4
 MCPR_F limits for GE and SPC Fuel
 Dual Reactor Recirculation Loop Operation
 (Reference 18)

Flow (% rated)	MCPR _F
110.0	1.22
100.0	1.22
0.0	1.86

Table 2-5
 MCPR_F for GE and SPC Fuel
 Single Reactor Recirculation Loop Operation
 (Reference 18)

Flow (% rated)	MCPR _F
110.0	1.22
100.0	1.22
0.0	1.86

Table 2-6
 MCPR_F limits for GE and SPC Fuel
 Dual and Single Reactor Recirculation Loop Operation
 with TCV Stuck Closed
 (Reference 18)

Flow (% rated)	MCPR _F
110.0	1.27
108.9	1.27
0.0	1.97

Notes for Tables 2-4, 2-5 and 2-6:

- Values are interpolated between relevant flow values.
- Rated flow is 98 Mlb/hr.

3. Linear Heat Generation Rate (3.2.3)

3.1 Technical Specification Reference:

Section 3.2.3.

3.2 Description:

The LHGR Limit is the product of the LHGR Limit from Tables 3-1, 3-2, 3-3 or 3-4 and the minimum of either the power dependent LHGR Factor, LHGRFAC_P, or the flow dependent LHGR Factor, LHGRFAC_F. The applicable power dependent LHGR Factor (LHGRFAC_P) is determined from Table 3-5. The applicable flow dependent LHGR Factor (LHGRFAC_F) is determined from Tables 3-6 and 3-7.

Table 3-1
LHGR Limits for Bundle Types 17 & 47
GE14-P10HNAB408-16GZ-100T-145-T6-2483
(Bundle 2483, bundle types 17 & 47)
(Reference 4 Page A5 and Reference 19)

Nodal Exposure (GWd/MT)	LHGR Limit, bundle type 17 (kW/ft)	LHGR Limit, bundle type 47 (kW/ft)
0	13.34	12.40
2.20	13.35	12.41
3.31	13.28	12.35
4.41	13.27	12.34
7.72	13.27	12.34
8.82	13.29	12.35
13.07	13.29	12.35
13.23	12.96	12.05
14.33	12.56	11.68
15.43	12.36	11.49
16.53	12.20	11.34
18.74	11.82	10.99
22.05	11.32	10.52
27.56	10.52	9.78
33.07	9.77	9.08
38.58	9.26	8.61
44.09	8.77	8.15
49.60	8.28	7.70
55.12	7.77	7.22
58.30	7.77	7.22
59.85	7.00	6.51
60.63	5.89	5.47
63.61	4.49	4.17
65.87	4.49	4.17

Table 3-2
 LHGR Limits for Bundle Types 16 & 46
 GE14-P10HNAB411-4G7.0/9G6.0-100T-145-T6-2484
 (Bundle 2484, bundle types 16 & 46)
 (Reference 4 Page A9)

Nodal Exposure (GWd/MT)	LHGR Limit (kW/ft)
0.00	13.40
12.58	13.40
13.23	13.23
14.33	12.94
15.43	12.81
16.53	12.69
18.74	12.32
22.05	11.81
27.56	11.08
33.07	10.40
38.58	9.75
44.09	9.13
49.60	8.54
55.12	7.97
56.63	7.97
63.03	5.00
64.58	4.90

Table 3-3
 LHGR Limits for SPC ATRIUM-9B Fuel
 ATRM9-P9DATB330-11GZ-SPC80M-9WR-144-T6-3915
 ATRM9-P9DATB348-11GZ-SPC80M-9WR-144-T6-3913
 ATRM9-P9HATB371-13GZ-SPC100T-9WR-144-T6-3914
 ATRM9-P9HATB371-13GZ-SPC100T-9WR-144-T6-3912
 (Bundles 3915,3913,3914,3912, bundle types 4,5,6,7,35,36,37)
 (Reference 8 Figure 2.1)

Nodal Exposure (GWd/MT)	LHGR Limit (kW/ft)
0.00	14.40
15.00	14.40
64.30	7.90

- Table 3-3 is applicable to all ATRIUM-9B fuel types

Table 3-4
 LHGR Limits for SPC 9x9-2 Fuel
 ANF9X9-2-P9DANB314-9GZ-SPC80M-145-T6-3909
 (Bundle 3909, bundle type 1)
 (Reference 9 Section 7.2.3)

Nodal Exposure (GWd/MT)	LHGR Limit (kW/ft)
0.0	14.50
5.0	14.50
25.2	10.80
48.0	7.20
55.0	7.20

Table 3-5
LHGRFAC_p for GE and SPC Fuel
 (Reference 5 Figures 2-2, 2-4, and 2-6 and Reference 14)

EOOS Combination	Core Flow (% of rated)	Core Thermal Power (% of rated)							
		0	25	38.5	38.5	70	70	80	100
		LHGRFAC _p multiplier							
Base Case (Option A or Option B)	≤ 60								
	> 60	0.50	0.56	0.59	0.68			0.86	1.00
Base Case SLO (Option A or Option B)	≤ 60								
	> 60	0.50	0.56	0.59	0.68			0.86	1.00
TBP OOS (Option A or Option B)	≤ 60	0.22	0.39	0.48	0.54				1.00
	> 60	0.33		0.42					
TBP OOS SLO (Option A or Option B)	≤ 60	0.22	0.39	0.48	0.54				1.00
	> 60	0.33		0.42					
TCV Slow Closure (Option A or Option B)	≤ 60	0.22	0.39	0.48	0.54	0.73	0.78		1.00
	> 60	0.33		0.42					
TCV Slow Closure SLO (Option A or Option B)	≤ 60	0.22	0.39	0.48	0.54	0.73	0.78		1.00
	> 60	0.33		0.42					
PLUOOS (Option A or Option B)	≤ 60	0.22	0.39	0.48	0.54	0.73	0.78		1.00
	> 60	0.33		0.42					
PLUOOS SLO (Option A or Option B)	≤ 60	0.22	0.39	0.48	0.54	0.73	0.78		1.00
	> 60	0.33		0.42					
TCV Stuck Closed (Option A or Option B)	≤ 60								
	> 60	0.50	0.56	0.59	0.68			0.86	1.00
TCV Stuck Closed SLO (Option A or Option B)	≤ 60								
	> 60	0.50	0.56	0.59	0.68			0.86	1.00
Pressure Regulator OOS 7716 MWd/MT to 11023 MWd/MT (Option A or Option B)	≤ 60	0.22	0.39	0.48	0.54	0.73	0.78		1.00
	> 60	0.33		0.42					

Notes for Table 3-5:

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power LHGRFAC_p multiplier should be applied.
- Allowable EOOS conditions are listed in Section 5.

Table 3-6
LHGRFAC_F multipliers

(Reference 5 Figure 3-3)

Flow (% rated)	LHGRFAC _F
0	0.28
30	0.55
40	0.64
50	0.77
80	1.00
100	1.00

Table 3-7
LHGRFAC_F multipliers for
Turbine Control Valve Stuck Closed

(Reference 5 Table 2-17)

Flow (% rated)	LHGRFAC _F
0	0.14
30	0.41
40	0.50
50	0.63
80	0.86
98.3	1.00
100	1.00

Notes for Tables 3-6 and 3-7:

- Values are interpolated between relevant flow values.
- 98 Mlb/hr is rated flow.
- For thermal limit monitoring at > 100% rated flow, the 100% rated flow multiplier should be used.
- LHGRFAC_F multipliers listed are bounding for all fuel types installed in Cycle 18.
- Table 3-6 is valid for both SLO and dual loop operating conditions for all EOOS scenarios except TCV stuck closed.
- Table 3-7 is valid for both SLO and dual loop operating conditions with a TCV stuck closed.

4. **Control Rod Withdrawal Block Instrumentation (3.3.2.1)**

4.1 Technical Specification Reference:

Table 3.3.2.1-1

4.2 Description:

The Rod Block Monitor Upscale Instrumentation Setpoints are determined from the relationships shown below (Reference 6 Page 11):

ROD BLOCK MONITOR UPSCALE TRIP FUNCTION	ALLOWABLE VALUE
Two Recirculation Loop Operation	$0.65 W_d + 55\%$
Single Recirculation Loop Operation	$0.65 W_d + 51\%$

The setpoint may be lower/higher and will still comply with the Rod Withdrawal Event (RWE) Analysis because RWE is analyzed unblocked.

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

5. Allowed Modes of Operation (B 3.2.2, B 3.2.3)

The Allowed Modes of Operation with combinations of Equipment Out-of-Service are as described below:

Equipment Out of Service Options ^{1,5}	-----OPERATING REGION-----			POWERPLEX Thermal Limit Set Number
	Standard	MELLLA	Coastdown ³	
Base Case ² ; Option A	Yes	Yes	Yes	1
Base Case SLO ² , Option A	Yes	Yes	Yes	2
TBPOOS ² , Option A	Yes	Yes	Yes	3
TBPOOS SLO ² , Option A	Yes	Yes	Yes	4
TCV Slow Closure ⁴ , Option A	Yes	Yes	Yes	5
TCV Slow Closure SLO ⁴ , Option A	Yes	Yes	Yes	6
PLUOOS, Option A	Yes	Yes	Yes	7
PLUOOS SLO, Option A	Yes	Yes	Yes	8
TCV Stuck Closed, Option A	Yes	Yes	Yes	9
TCV Stuck Closed SLO, Option A	Yes	Yes	Yes	10
Base Case ² , Option B	Yes	Yes	Yes	11
Base Case SLO ² , Option B	Yes	Yes	Yes	12
TBPOOS ² , Option B	Yes	Yes	Yes	13
TBPOOS SLO ² , Option B	Yes	Yes	Yes	14
TCV Slow Closure ⁴ , Option B	Yes	Yes	Yes	15
TCV Slow Closure SLO ⁴ , Option B	Yes	Yes	Yes	16
PLUOOS, Option B	Yes	Yes	Yes	17
PLUOOS SLO, Option B	Yes	Yes	Yes	18
TCV Stuck Closed, Option B	Yes	Yes	Yes	19
TCV Stuck Closed SLO, Option B	Yes	Yes	Yes	20
Pressure Regulator OOS ⁴ , Option A, 7716 MWd/MT to 11023 MWd/MT	Yes	Yes	No	N/A
Pressure Regulator OOS ⁴ , Option B, 7716 MWd/MT to 11023 MWd/MT	Yes	Yes	No	31

¹ Each OOS Option may be combined with up to 18 TIP channels OOS (provided the requirements for utilizing SUBTIP methodology are met) with all TIPS available at startup from a refuel outage, a 120°F

reduction in feedwater temperature throughout the cycle (provided the requirements of Reference 15 are met, Final Feedwater Temperature Reduction was analyzed for the entire cycle), and up to 50% of the LPRMs OOS with an LPRM calibration frequency of 2500 Effective Full Power Hours (EFPH) (2000 EFPH +25%).

² The base case condition supports 1 Turbine Bypass Valve OOS if the assumed opening profile for the remaining group of Turbine Bypass Valves is met. If the opening profile is not met, or if more than one Turbine Bypass Valve is OOS, utilize the TBPOOS condition. Ensure unit's license supports operation with 1 Turbine Bypass Valve out of service prior to crediting this flexibility.

³ Coastdown operation is defined as any cycle exposure beyond the full power, all rods out condition with plant power slowly lowering to a lesser value while core flow is held constant (Reference 10 Section 4.3.1.2.8). Up to a 15% overpower is analyzed per Reference 5.

⁴ For operation with a Pressure Regulator Out-of-Service (PROOS), the TCV Slow Closure limits should be applied (Reference 13) and the operational notes from Reference 13 reviewed. Between cycle exposures of 7716 MWd/MT and 11023 MWd/MT, the specific thermal limit set for PROOS may be used instead of the TCV Slow Closure set. PROOS and TCV Slow Closure is not an analyzed out-of-service combination.

⁵ A single Main Steam Isolation Valve (MSIV) may be taken OOS (shut) under any and all OOS Options so long as core thermal power is maintained $\leq 75\%$ of 2957 MWt (Reference 16):

6. Methodology

The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. ANF-1125 (P)(A) and Supplements 1 and 2, "Critical Power Correlation – ANFB," April 1990.
2. ANF-524 (P)(A) and Supplements 1 and 2, "ANF Critical Power Methodology for Boiling Water Reactors," Revision 2, November 1990.
3. XN-NF-79-71 (P)(A) Revision 2 and Supplements 1, 2 & 3, "Exxon Nuclear Plant Transient Methodology for Boiling Water Reactors," March 1986.
4. XN-NF-80-19 (P)(A) Volume 1 Supplement 3, Supplement 3 Appendix F, and Supplement 4, "Exxon Nuclear Methodology for Boiling Water Reactors," November 1990.
5. XN-NF-85-67 (P)(A) Revision 1, "Generic Mechanical Design for Exxon Nuclear Jet Pump BWR Reload Fuel," September 1986.
6. ANF-913 (P)(A) Volume 1 Revision 1, and Volume 1 Supplements 2, 3, 4, "COTRANSA2: A Computer Program for Boiling Water Reactor Transients Analysis," August 1990.
7. XN-NF-82-06- (P)(A) Supplement 1 Revision 2, "Qualification of Exxon Nuclear Fuel for Extended Burnup Supplement 1 Extended Burnup Qualification of ENC 9x9 BWR Fuel Grand Gulf Reactors," May 1988.
8. ANF-89-14(P)(A) Revision 1 and Supplements 1 & 2, "Advanced Nuclear Fuels Corporation Generic Mechanical Design for Advanced Nuclear Fuels Corporation 9X9 – IX and 9x9 – 9X BWR Reload Fuel," October 1991.
9. ANF-89-14(P), "Advanced Nuclear Fuels Corporation Generic Mechanical Design for Advanced Nuclear Fuels Corporation 9X9 – IX and 9x9 – 9X BWR Reload Fuel," May 1989.
10. ANF-89-98 (P)(A), Generic Mechanical Design Criteria for BWR Fuel Designs, Revision 1 and Revision 1 Supplement 1, May 1995.
11. ANF-91-048 (P)(A), "Advanced Nuclear Fuels Corporation Methodology for Boiling Water Reactors EXEM BWR ECCS Evaluation Model," January 1993.
12. Commonwealth Edison Company Topical Report NFSR-0091, "Benchmark of CASMO/MICROBURN BWR Nuclear Design Methods," Revision 0 and Supplements on Neutronics Licensing Analysis (Supplement 1) and La Salle County Unit 2 benchmarking (Supplement 2), December 1991, March 1992, and May 1992, respectively.
13. EMF-85-74 (P) Revision 0 and Supplement 1(P)(A) and Supplement 2(P)(A), "RODEX2A (BWR) Fuel Rod Thermal-Mechanical Evaluation Model," February 1998.
14. NEDE-24011-P-A-14 Revision 14, "General Electric Standard Application for Reactor Fuel (GESTAR)," June 2000.

**Dresden Unit 2 Cycle 18
COLR Attachments**