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PSLTR: #01-0115

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington D.C. 20555

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

Subject: Unit 2 Cycle 18 Core Operating Limits Report

The purpose of this letter is to transmit the Core Operating Limits Report (COLR) for the upcoming operating cycle (D2C18) in accordance with Technical Specification (TS) Section 5.6.5, "CORE OPERATING LIMITS REPORT (COLR)." 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. D.F. Ambler at (815) 416-2800.

Respectfully,

Preston Swafford
Site Vice President
Dresden Nuclear Power Station

Attachment: Core Operating Limits Report, Dresden Station Unit 2 Cycle 18
2527MWth Rated Power, dated October 2001

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
2527MWth Rated Power

October 2001

Issuance of Changes Summary

Affected Section	Affected Pages	Summary of Changes	Date
All	All	Original Issue (Cycle 18)	10/01

Table of Contents

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, dated October 3, 1988.

3. Supplemental Reload Licensing Report for Dresden Unit 2 Reload 17 Cycle 18, J11-03837-SRLR-2527, Revision 0, dated September 2001.

4. MICROBURN Steady State LHGR Limit Curve Generation for GE-14 Fuel (D2C18), BNDD: 01-008, Revision 0, dated May 30, 2001.

5. OPL-3 Transient Analysis Principle Input Parameter, TODI NFM0100057, Sequence 00, DG01-000355, dated May 10, 2001.

6. Dresden Unit 2 Cycle 17 Reload Analysis, NDIT NFM9900187, Sequence 01, EMF-2275 Revision 1, dated November 1999.

7. General Electric Standard Application for Reactor Fuel, NEDE-24011-P-A-14, dated June 2000.

8. Dresden Unit 2 Cycle 18 FRED Form Rev 1, TODI NFM0100025, Sequence 01, DG01-000317, dated April 27, 2001.

9. Instrument Setpoint Calculation Nuclear Instrumentation Rod Block Monitor Dresden 2 & 3, GE DRF C51-00217-01, dated December 15, 1999.

10. Letter from T. Orr to A. Giancatarino, "Recommendation of FDLRC Application for Dresden-2 Cycle 18 (pre-EPU)," dated October 2, 2001.

1. Average Planar Linear Heat Generation Rate (3.2.1)

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 MAPLHGR limit for each fuel type.

For Single Reactor Recirculation Loop Operation (SLO), the MAPLHGR limit listed in Table 1-1, 1-2, or 1-3 is multiplied by the MAPLHGR multiplier to obtain the SLO condition MAPLHGR limit. The SLO MAPLHGR multiplier for SPC fuel is 0.84 (Reference 3 Section 16). The SLO MAPLHGR multiplier for GE-14 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/MT)	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/MT)	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 GE-14 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/MT)	**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)

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 Base Limit MCPR

The Base Limit MCPR is given in Table 2-1 or 2-2 for the given Equipment Out Of Service (EOOS) condition.

2.2.1.2 Flow-Dependent MCPR

The $MCPR_F$ values in Tables 2-3 and 2-4 are the OLMCPR as a function of core flow during dual reactor recirculation loop and single reactor recirculation loop operation, respectively. Table 2-3 is applicable to all dual loop allowed modes of operation listed in Section 5. Table 2-4 is applicable to all single loop allowed modes of operation listed in Section 5.

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.

To utilize the MCPR limits for Option B scram speed, the core average scram speed insertion time for 20% insertion must be less than or equal to 0.694 seconds (Reference 5 Page 6). If the core average scram insertion time does not meet the Option B criteria, but is within the Option A limit, the 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 maximum settings of the Recirculation Pump Motor Generator scoop tube mechanical and electrical stop overspeed setpoints are 110% (Reference 8 Section 15).

Table 2-1
MCPR Option A Based Operating Limits
(Reference 3 Section 11)

Condition	Fuel Type	Cycle Exposure	
		<14,600 MWd/MT	≥14,600 MWd/MT
Base Case	GE-14	1.55	1.70
	ATRIUM-9B	1.55	1.63
TBPOOS	GE-14	1.75	1.75
	ATRIUM-9B	1.64	1.64
Base Case SLO	GE-14	1.56	1.71
	ATRIUM-9B	1.56	1.64
TBPOOS SLO	GE-14	1.76	1.76
	ATRIUM-9B	1.65	1.65

Table 2-2
MCPR Option B Based Operating Limits
(Reference 3 Section 11)

Condition	Fuel Type	Cycle Exposure	
		<14,600 MWd/MT	≥14,600 MWd/MT
Base Case	GE-14	1.44	1.53
	ATRIUM-9B	1.44	1.46
TBPOOS	GE-14	1.58	1.58
	ATRIUM-9B	1.47	1.47
Base Case SLO	GE-14	1.45	1.54
	ATRIUM-9B	1.45	1.47
TBPOOS SLO	GE-14	1.59	1.59
	ATRIUM-9B	1.48	1.48

Notes for Tables 2-1 and 2-2:

- SPC 9x9-2 fuel is bound for all conditions by SPC ATRIUM-9B fuel.
- Option B scram time criteria must be met to use Option B Base Operating Limits, see Section 2.2.3.
- Allowed OOS options are shown in Section 5.

Table 2-3
$MCPR_F$ for GE and SPC Fuel
Dual Reactor Recirculation Loop Operation
(Reference 3 Appendix C)

Flow (% rated)	$MCPR_F$
0	1.74
30	1.56
40	1.50
90.28	1.20
110	1.20

Notes for Table 2-3:

- Values are linearly interpolated between relevant flow values.
- Rated flow is 98 Mlb/hr
- The $MCPR_F$ limits are applicable in all Dual Reactor Recirculation Loop Operation EOOS scenarios.

Table 2-4
$MCPR_F$ for GE and SPC Fuel
Single Reactor Recirculation Loop Operation
(Reference 3 Appendix C)

Flow (% rated)	$MCPR_F$
0	1.76
30	1.58
40	1.52
92.14	1.20
110	1.20

Notes for Table 2-4:

- Values are linearly interpolated between relevant flow values.
- Rated flow is 98 Mlb/hr
- The $MCPR_F$ limits are applicable in all Single Reactor Recirculation Loop Operation EOOS scenarios.

3. Linear Heat Generation Rate (3.2.3 and 3.2.4)

3.1 Technical Specification Reference:

Section 3.2.3 and 3.2.4.

3.2 Description:

The LHGR Steady State and Transient Limits, as applicable, are listed in Tables 3-1, 3-2, 3-3, or 3-4.

Table 3-1
LHGR Limits for GE-14 Fuel
GE14-P10HNAB408-16GZ-100T-145-T6-2483
(Bundle 2483, bundle types 17 & 47)
(Reference 4 Page A5)

Nodal Exposure (GWd/MT)	LHGR Limit (kW/ft)
0.00	13.34
2.20	13.35
3.31	13.28
4.41	13.27
7.72	13.27
8.82	13.29
13.07	13.29
13.23	12.96
14.33	12.56
15.43	12.36
16.53	12.20
18.74	11.82
22.05	11.32
27.56	10.52
33.07	9.77
38.58	9.26
44.09	8.77
49.60	8.28
55.12	7.77
58.30	7.77
59.85	7.00
60.63	5.89
63.61	4.49
65.87	4.49

Table 3-2
LHGR Limits for GE-14 Fuel
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 6 Section 7.2.3 and Reference 10)

Nodal Exposure (GWd/MT)	LHGR Limit (kW/ft)	Transient LHGR Limit (kW/ft)
0.0	14.40	17.28
15.0	14.40	17.28
61.1	8.32	9.98

- Table 3-3 is applicable for 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 6 Section 7.2.3 and Reference 10)

Nodal Exposure (GWd/MT)	LHGR Limit (kW/ft)	Transient LHGR Limit (kW/ft)
0.0	14.50	17.40
5.0	14.50	17.40
25.2	10.80	12.96
48.0	7.20	8.64
55.0	7.20	8.64

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 9 Page 11):

ROD BLOCK MONITOR UPSCALE TRIP FUNCTION	ALLOWABLE VALUE (% RTP)
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 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:

	----------OPERATING REGION---------				
Equipment Out of Service Options[1,2]	**Standard**	**ELLLA**	**ICF[3]**	**Coastdown[5]**	**POWERPLEX Thermal Limit Set Number**
Base Case, Option A	Yes	Yes	Yes	Yes	1
TBPOOS[4], Option A	Yes	Yes	Yes	Yes	2
Base Case, SLO, Option A	Yes	Yes	Yes	Yes	3
TBPOOS[4], SLO, Option A	Yes	Yes	Yes	Yes	4
Base Case, Option B	Yes	Yes	Yes	Yes	5
TBPOOS[4], Option B	Yes	Yes	Yes	Yes	6
Base Case, SLO, Option B	Yes	Yes	Yes	Yes	7
TBPOOS[4], SLO, Option B	Yes	Yes	Yes	Yes	8

[1] Each OOS Option may be combined with one SRV OOS, up to two TIP Machines OOS (or the equivalent number of TIP channels) with all TIPS available at startup from a refuel outage, a 100°F reduction in feedwater temperature throughout the cycle (Final Feedwater Temperature Reduction was analyzed for the entire cycle), and up to 50% of the LPRMs OOS with an LPRM calibration frequency of 2000 Effective Full Power Hours (EFPH) +25%.

[2] Ensure the unit's licensing basis permits operation with 1 SRV OOS or a 100°F decrease in feedwater temperature prior to crediting either flexibility.

[3] ICF is analyzed at 108% core flow; ensure the unit's licensing basis permits operation in this condition prior to crediting this flexibility.

[4] The base case condition supports 1 Turbine Bypass Valve OOS if the assumed opening profile for the 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.

[5] 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 7 Section 4.3.1.2.8).

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," May1988.

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.

15. NEDC-32981PA, "GEXL96 Correlation for ATRIUM 9B Fuel," September 2000.