Exelon Generation

Dresden Nuclear Power Station
6500 North Dresden Road
Morris, IL 60450
[illegible]
[illegible]

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Dresden Nuclear Power Station, Unit 2
Renewed Facility Operating License No. DPR-19
NRC Docket No. 50-237

Subject: Core Operating Limits Report for Unit 2 Cycle 24

The purpose of this letter is to transmit the Core Operating Limits Report (COLR) for Dresden Nuclear Power Station (DNPS) Unit 2 operating cycle 24 (D2C24), Revision 2 in accordance with Technical Specifications Section 5.6.5, "CORE OPERATING LIMITS REPORT (COLR)."

The COLRs for DNPS, Unit 2 was updated include the results of a Westinghouse analysis for operation with turbine bypass valve number 8 out of service with a second bypass valve OOS.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this letter, please contact Mr. Glen Morrow at 815-416-2800.

Respectfully,

Shane M Marik
Site Vice President
Dresden Nuclear Power Station

Attachment: Core Operating Limits Report for Dresden Unit 2 Cycle 24 Revision 2

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

A001
NRR

Core Operating Limits Report

For

Dresden Unit 2 Cycle 24

Revision 2

Table of Contents

List of Tables

1. Terms and Definitions

APLHGR	Average planar linear heat generation rate
ASD	Adjustable Speed Drive
CPR	Critical Power Ratio
DLO	Dual loop operation
EFPH	Effective full power hour
EOC	End of cycle
EOOS	Equipment out of service
FWTR	Final feedwater temperature reduction
ICF	Increased core flow
ISS	Intermediate scram speed
LHGR	Linear heat generation rate
LHGRFAC(F)	Flow dependent LHGR multiplier
LHGRFAC(P)	Power dependent LHGR multiplier
LPRM	Local power range monitor
MAPLHGR	Maximum average planar linear heat generation rate
MCPR	Minimum critical power ratio
MCPR(F)	Flow dependent MCPR
MCPR(P)	Power dependent MCPR
MELLLA	Maximum extended load line limit analysis
MSIV	Main steam isolation valve
MWd/MTU	Megawatt days per metric ton Uranium
NFWT	Nominal feedwater temperature
NRC	Nuclear Regulatory Commission
NSS	Nominal scram speed
OLMCPR	Operating limit minimum critical power ratio
OOS	Out of service
OPRM	Oscillation power range monitor
PBDA	Period based detection algorithm
PLUOOS	Power load unbalance out of service
PCOOS	Pressure controller out of service
RFWT	Reduced feedwater temperature
RWE	Rod withdrawal error
SER	Safety evaluation report
SLMCPR	Safety limit minimum critical power ratio
SLO	Single loop operation
TBVOOS	Turbine bypass valves out of service
TBV	Turbine bypass valve
TCV	Turbine control valve
TIP	Traversing incore probe
TMOL	Thermal mechanical operating limit
TSSS	Technical Specification scram speed
TSV	Turbine stop valve

2. General Information

Power and flow dependent limits are listed for various power and flow levels. Linear interpolation is to be used to find intermediate values.

Rated core flow is 98 Mlb/hr. Operation up to 108% rated flow (ICF) is fully evaluated for this cycle, however, flow cannot exceed 103.4% rated flow due to unit specific limitations. Licensed rated thermal power is 2957 MWth. For allowed operating regions, see applicable power/flow map.

Coastdown is defined as any cycle exposure beyond the full power, rated core flow, and all rods out condition with the plant power gradually reducing as available core reactivity diminishes.

MCPR(P) and MCPR(F) values are independent of scram speed.

LHGRFAC(P) and LHGRFAC(F) values are independent of scram speed.

All thermal limits are analyzed to NSS, ISS, and TSSS, except for the special case of Base Case thermal limits with TBV#8 and one additional Turbine Bypass Valve OOS, which is only analyzed for NSS (Reference 23). Only MCPR operating limits vary with scram speed.

For thermal limit monitoring above 100% rated power or 100% rated core flow, the 100% rated power and the 100% core flow thermal limit values, respectively, can be used unless otherwise indicated in the applicable table.

3. Average Planar Linear Heat Generation Rate

For natural uranium lattices, DLO and SLO MAPLHGR values are provided in Table 3-1. For all other lattices, lattice-specific MAPLHGR values for DLO are provided in Tables 3-2 through 3-54. During single loop operation, these limits are multiplied by the SLO multiplier listed in Table 3-55.

Table 3-1 MAPLHGR for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Opt2-4.03-16GZ8.00-14GZ5.50
Opt2-4.07-14G5.50-2GZ5.50
Opt2-4.05-18GZ8.00-14GZ5.50
Opt2-4.05-16GZ8.00-14GZ5.50
Opt2-4.10-14GZ5.50-2GZ5.50
Opt2-4.04-18GZ7.50-14GZ5.50
Opt2-4.01-16GZ7.50-14GZ5.50
Opt2-4.04-14G5.50-2GZ5.50
Lattices 81 and 89
(Reference 3)

Average Planar Exposure (MWd/MTU)	DLO, SLO MAPLHGR (kW/ft)
0	7.50
75000	7.50

Table 3-2 MAPLHGR for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Lattice 95
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.69
2500	8.87
5000	8.99
7500	9.07
10000	9.11
12000	9.16
15000	9.32
17000	9.41
20000	9.58
22000	9.72
24000	9.79
30000	9.70
36000	9.65
42000	9.66
50000	9.73
60000	9.71
72000	9.93

Table 3-3 MAPLHGR for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Lattice 96
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.72
2500	8.90
5000	9.03
7500	9.12
10000	9.17
12000	9.24
15000	9.41
17000	9.51
20000	9.68
22000	9.83
24000	9.88
30000	9.79
36000	9.74
42000	9.74
50000	9.79
60000	9.74
72000	9.97

Table 3-4 MAPLHGR for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Lattice 97
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.70
2500	8.88
5000	9.02
7500	9.13
10000	9.18
12000	9.25
15000	9.42
17000	9.52
20000	9.70
22000	9.85
24000	9.88
30000	9.78
36000	9.73
42000	9.73
50000	9.77
60000	9.73
72000	9.98

Table 3-5 MAPLHGR for bundle/lattice: Opt2-4.02-18GZ8.00-14GZ5.50 Lattice 98
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.82
2500	9.02
5000	9.15
7500	9.28
10000	9.32
12000	9.41
15000	9.59
17000	9.71
20000	10.02
22000	10.09
24000	10.07
30000	9.99
36000	9.94
42000	9.95
50000	9.91
60000	9.91
72000	10.24

Table 3-6 MAPLHGR for bundle/lattice: Opt2-4.02-18GZ8.00-14GZ5.50 Lattice 99
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.87
2500	9.05
5000	9.18
7500	9.26
10000	9.27
12000	9.34
15000	9.52
17000	9.68
20000	10.04
22000	10.06
24000	10.05
30000	9.98
36000	9.92
42000	9.93
50000	9.87
60000	9.88
72000	10.24

Table 3-7 MAPLHGR for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Opt2-4.03-16GZ8.00-14GZ5.50
Lattice 100
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.66
2500	9.79
5000	9.82
7500	9.76
10000	9.70
12000	9.73
15000	10.03
17000	10.19
20000	10.21
22000	10.19
24000	10.18
30000	10.08
36000	10.02
42000	10.02
50000	9.96
60000	9.97
72000	10.32

Table 3-8 MAPLHGR for bundle/lattice:
Opt2-4.03-16GZ8.00-14GZ5.50
Lattice 101
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.97
2500	9.13
5000	9.21
7500	9.25
10000	9.24
12000	9.27
15000	9.39
17000	9.45
20000	9.58
22000	9.70
24000	9.81
30000	9.73
36000	9.68
42000	9.69
50000	9.74
60000	9.71
72000	9.93

Table 3-9 MAPLHGR for bundle/lattice: Opt2-4.03-16GZ8.00-14GZ5.50 Lattice 102
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.02
2500	9.17
5000	9.27
7500	9.31
10000	9.33
12000	9.35
15000	9.47
17000	9.54
20000	9.68
22000	9.81
24000	9.90
30000	9.82
36000	9.78
42000	9.78
50000	9.78
60000	9.74
72000	9.98

Table 3-10 MAPLHGR for bundle/lattice: Opt2-4.03-16GZ8.00-14GZ5.50 Lattice 103
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.01
2500	9.15
5000	9.26
7500	9.33
10000	9.34
12000	9.37
15000	9.49
17000	9.56
20000	9.69
22000	9.83
24000	9.89
30000	9.82
36000	9.77
42000	9.77
50000	9.76
60000	9.73
72000	9.98

Table 3-11 MAPLHGR for bundle/lattice:
Opt2-4.03-16GZ8.00-14GZ5.50
Lattice 104
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.15
2500	9.32
5000	9.41
7500	9.49
10000	9.49
12000	9.54
15000	9.66
17000	9.75
20000	10.00
22000	10.10
24000	10.10
30000	10.03
36000	9.98
42000	9.96
50000	9.90
60000	9.90
72000	10.24

Table 3-12 MAPLHGR for bundle/lattice:
Opt2-4.03-16GZ8.00-14GZ5.50
Lattice 105
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.19
2500	9.35
5000	9.44
7500	9.47
10000	9.45
12000	9.48
15000	9.60
17000	9.71
20000	10.01
22000	10.08
24000	10.08
30000	10.02
36000	9.96
42000	9.92
50000	9.86
60000	9.87
72000	10.25

Table 3-13 MAPLHGR for bundle/lattice:
Opt2-4.07-14G5.50-2GZ5.50
Lattice 106
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.95
2500	9.12
5000	9.25
7500	9.32
10000	9.34
12000	9.37
15000	9.54
17000	9.70
20000	9.86
22000	9.90
24000	9.89
30000	9.79
36000	9.74
42000	9.74
50000	9.79
60000	9.78
72000	9.98

Table 3-14 MAPLHGR for bundle/lattice:
Opt2-4.07-14G5.50-2GZ5.50
Lattice 107
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.00
2500	9.16
5000	9.31
7500	9.39
10000	9.41
12000	9.46
15000	9.64
17000	9.81
20000	9.98
22000	10.01
24000	9.99
30000	9.89
36000	9.83
42000	9.83
50000	9.88
60000	9.81
72000	10.03

Table 3-15 MAPLHGR for bundle/lattice:
Opt2-4.07-14G5.50-2GZ5.50
Lattice 108
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.99
2500	9.15
5000	9.30
7500	9.39
10000	9.42
12000	9.47
15000	9.66
17000	9.82
20000	9.99
22000	10.00
24000	9.98
30000	9.88
36000	9.82
42000	9.82
50000	9.86
60000	9.80
72000	10.03

Table 3-16 MAPLHGR for bundle/lattice:
Opt2-4.07-14G5.50-2GZ5.50
Lattice 109
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.15
2500	9.31
5000	9.47
7500	9.57
10000	9.58
12000	9.66
15000	9.95
17000	10.16
20000	10.24
22000	10.22
24000	10.20
30000	10.11
36000	10.04
42000	10.04
50000	10.02
60000	9.98
72000	10.29

Table 3-17 MAPLHGR for bundle/lattice:
Opt2-4.07-14G5.50-2GZ5.50
Lattice 110
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.18
2500	9.35
5000	9.49
7500	9.53
10000	9.53
12000	9.60
15000	9.95
17000	10.16
20000	10.22
22000	10.20
24000	10.19
30000	10.09
36000	10.03
42000	10.02
50000	9.97
60000	9.96
72000	10.29

Table 3-18 MAPLHGR for bundle/lattice:
Opt2-4.07-14G5.50-2GZ5.50
Lattice 111
(References 16 and 17)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.55
2500	9.68
5000	9.76
7500	9.75
10000	9.68
12000	9.69
15000	9.96
17000	10.15
20000	10.23
22000	10.22
24000	10.20
30000	10.11
36000	10.04
42000	10.04
50000	9.97
60000	9.96
72000	10.30

Table 3-19 MAPLHGR for bundle/lattice:
Opt2-4.05-18GZ8.00-14GZ5.50
Lattice 113
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.67
2500	8.86
5000	8.97
7500	9.04
10000	9.07
12000	9.11
15000	9.26
17000	9.38
20000	9.54
22000	9.69
24000	9.75
30000	9.68
36000	9.64
42000	9.62
50000	9.67
60000	9.66
72000	9.88

Table 3-20 MAPLHGR for bundle/lattice:
Opt2-4.05-18GZ8.00-14GZ5.50
Lattice 114
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.70
2500	8.88
5000	9.02
7500	9.08
10000	9.13
12000	9.18
15000	9.35
17000	9.47
20000	9.65
22000	9.80
24000	9.83
30000	9.76
36000	9.72
42000	9.70
50000	9.70
60000	9.70
72000	9.92

Table 3-21 MAPLHGR for bundle/lattice: Opt2-4.05-18GZ8.00-14GZ5.50 Lattice 115
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.68
2500	8.85
5000	9.01
7500	9.10
10000	9.14
12000	9.21
15000	9.36
17000	9.49
20000	9.66
22000	9.82
24000	9.83
30000	9.76
36000	9.71
42000	9.70
50000	9.68
60000	9.68
72000	9.93

Table 3-22 MAPLHGR for bundle/lattice: Opt2-4.05-18GZ8.00-14GZ5.50 Lattice 116
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.81
2500	9.00
5000	9.14
7500	9.25
10000	9.28
12000	9.36
15000	9.53
17000	9.68
20000	9.99
22000	10.03
24000	10.01
30000	9.97
36000	9.91
42000	9.90
50000	9.82
60000	9.85
72000	10.19

Table 3-23 MAPLHGR for bundle/lattice:
Opt2-4.05-18GZ8.00-14GZ5.50
Lattice 117
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.85
2500	9.03
5000	9.17
7500	9.22
10000	9.22
12000	9.28
15000	9.46
17000	9.64
20000	10.00
22000	10.00
24000	10.00
30000	9.95
36000	9.89
42000	9.87
50000	9.79
60000	9.82
72000	10.19

Table 3-24 MAPLHGR for bundle/lattice:
Opt2-4.05-18GZ8.00-14GZ5.50
Lattice 118
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.66
2500	9.77
5000	9.79
7500	9.71
10000	9.64
12000	9.66
15000	9.95
17000	10.15
20000	10.17
22000	10.16
24000	10.14
30000	10.07
36000	10.01
42000	9.95
50000	9.85
60000	9.90
72000	10.26

Table 3-25 MAPLHGR for bundle/lattice:
Opt2-4.05-16GZ8.00-14GZ5.50
Lattice 119
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.96
2500	9.11
5000	9.19
7500	9.21
10000	9.21
12000	9.23
15000	9.33
17000	9.41
20000	9.54
22000	9.67
24000	9.77
30000	9.72
36000	9.68
42000	9.66
50000	9.67
60000	9.65
72000	9.88

Table 3-26 MAPLHGR for bundle/lattice:
Opt2-4.05-16GZ8.00-14GZ5.50
Lattice 120
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.00
2500	9.15
5000	9.25
7500	9.28
10000	9.28
12000	9.30
15000	9.41
17000	9.50
20000	9.64
22000	9.78
24000	9.86
30000	9.81
36000	9.76
42000	9.75
50000	9.69
60000	9.69
72000	9.93

Table 3-27 MAPLHGR for bundle/lattice:
Opt2-4.05-16GZ8.00-14GZ5.50
Lattice 121
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.99
2500	9.12
5000	9.24
7500	9.29
10000	9.28
12000	9.32
15000	9.42
17000	9.52
20000	9.65
22000	9.79
24000	9.85
30000	9.80
36000	9.76
42000	9.75
50000	9.67
60000	9.67
72000	9.93

Table 3-28 MAPLHGR for bundle/lattice:
Opt2-4.05-16GZ8.00-14GZ5.50
Lattice 122
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.14
2500	9.30
5000	9.40
7500	9.46
10000	9.44
12000	9.48
15000	9.60
17000	9.71
20000	9.96
22000	10.05
24000	10.05
30000	10.01
36000	9.96
42000	9.89
50000	9.80
60000	9.84
72000	10.19

Table 3-29 MAPLHGR for bundle/lattice:
Opt2-4.05-16GZ8.00-14GZ5.50
Lattice 123
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.18
2500	9.33
5000	9.42
7500	9.43
10000	9.39
12000	9.42
15000	9.54
17000	9.67
20000	9.97
22000	10.03
24000	10.03
30000	10.00
36000	9.94
42000	9.85
50000	9.77
60000	9.81
72000	10.20

Table 3-30 MAPLHGR for bundle/lattice:
Opt2-4.05-16GZ8.00-14GZ5.50
Lattice 124
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.66
2500	9.77
5000	9.79
7500	9.71
10000	9.64
12000	9.66
15000	9.95
17000	10.15
20000	10.17
22000	10.16
24000	10.14
30000	10.07
36000	10.01
42000	9.95
50000	9.85
60000	9.90
72000	10.26

Table 3-31 MAPLHGR for bundle/lattice:
Opt2-4.10-14GZ5.50-2GZ5.50
Lattice 125
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.91
2500	9.07
5000	9.20
7500	9.26
10000	9.28
12000	9.31
15000	9.47
17000	9.65
20000	9.82
22000	9.87
24000	9.86
30000	9.79
36000	9.73
42000	9.71
50000	9.75
60000	9.73
72000	9.93

Table 3-32 MAPLHGR for bundle/lattice:
Opt2-4.10-14GZ5.50-2GZ5.50
Lattice 126
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.95
2500	9.11
5000	9.26
7500	9.32
10000	9.34
12000	9.39
15000	9.57
17000	9.76
20000	9.93
22000	9.97
24000	9.95
30000	9.88
36000	9.83
42000	9.80
50000	9.79
60000	9.77
72000	9.98

Table 3-33 MAPLHGR for bundle/lattice:
Opt2-4.10-14GZ5.50-2GZ5.50
Lattice 127
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	8.94
2500	9.10
5000	9.25
7500	9.33
10000	9.36
12000	9.40
15000	9.58
17000	9.77
20000	9.95
22000	9.97
24000	9.95
30000	9.88
36000	9.82
42000	9.79
50000	9.77
60000	9.75
72000	9.98

Table 3-34 MAPLHGR for bundle/lattice:
Opt2-4.10-14GZ5.50-2GZ5.50
Lattice 128
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.10
2500	9.26
5000	9.42
7500	9.52
10000	9.52
12000	9.60
15000	9.87
17000	10.10
20000	10.20
22000	10.19
24000	10.17
30000	10.09
36000	10.03
42000	10.01
50000	9.92
60000	9.93
72000	10.25

Table 3-35 MAPLHGR for bundle/lattice:
Opt2-4.10-14GZ5.50-2GZ5.50
Lattice 129
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.14
2500	9.31
5000	9.44
7500	9.46
10000	9.46
12000	9.53
15000	9.88
17000	10.11
20000	10.19
22000	10.17
24000	10.15
30000	10.08
36000	10.01
42000	9.99
50000	9.88
60000	9.91
72000	10.25

Table 3-36 MAPLHGR for bundle/lattice:
Opt2-4.10-14GZ5.50-2GZ5.50
Lattice 130
(References 9 and 11)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.50
2500	9.63
5000	9.71
7500	9.68
10000	9.61
12000	9.62
15000	9.88
17000	10.09
20000	10.21
22000	10.19
24000	10.18
30000	10.10
36000	10.04
42000	9.98
50000	9.87
60000	9.90
72000	10.25

Table 3-37 MAPLHGR for bundle/lattice:
Opt2-4.04-18GZ7.50-14GZ5.50
Lattice 131
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.21
2500	9.53
5000	9.45
7500	9.38
10000	9.49
12000	9.50
15000	9.55
17000	9.61
20000	9.80
22000	9.89
24000	9.83
30000	9.77
36000	9.71
42000	9.67
50000	9.70
60000	9.81
72000	10.07
75000	10.07

Table 3-38 MAPLHGR for bundle/lattice:
Opt2-4.04-18GZ7.50-14GZ5.50
Lattice 132
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.34
2500	9.62
5000	9.51
7500	9.43
10000	9.55
12000	9.57
15000	9.64
17000	9.73
20000	9.89
22000	10.02
24000	9.94
30000	9.86
36000	9.81
42000	9.74
50000	9.77
60000	9.80
72000	10.10
75000	10.10

Table 3-39 MAPLHGR for bundle/lattice:
Opt2-4.04-18GZ7.50-14GZ5.50
Lattice 133
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.33
2500	9.62
5000	9.57
7500	9.43
10000	9.56
12000	9.62
15000	9.67
17000	9.75
20000	9.98
22000	9.99
24000	9.93
30000	9.85
36000	9.81
42000	9.74
50000	9.75
60000	9.78
72000	9.90
75000	9.90

Table 3-40 MAPLHGR for bundle/lattice:
Opt2-4.04-18GZ7.50-14GZ5.50
Lattice 134
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.46
2500	9.77
5000	9.62
7500	9.52
10000	9.72
12000	9.73
15000	9.83
17000	9.93
20000	10.19
22000	10.19
24000	10.11
30000	10.04
36000	9.97
42000	9.92
50000	9.85
60000	9.88
72000	10.39
75000	10.39

Table 3-41 MAPLHGR for bundle/lattice:
Opt2-4.04-18GZ7.50-14GZ5.50
Lattice 135
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.48
2500	9.76
5000	9.56
7500	9.45
10000	9.55
12000	9.72
15000	9.78
17000	9.94
20000	10.19
22000	10.16
24000	10.11
30000	10.05
36000	9.97
42000	9.93
50000	9.81
60000	9.84
72000	10.25
75000	10.25

Table 3-42 MAPLHGR for bundle/lattice:
Opt2-4.04-18GZ7.50-14GZ5.50
Lattice 136
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	10.21
2500	10.47
5000	10.28
7500	10.05
10000	10.09
12000	10.11
15000	10.22
17000	10.27
20000	10.26
22000	10.29
24000	10.22
30000	10.16
36000	10.09
42000	10.00
50000	9.87
60000	9.90
72000	10.26
75000	10.26

Table 3-43 MAPLHGR for bundle/lattice:
Opt2-4.01-16GZ7.50-14GZ5.50
Lattice 137
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.47
2500	9.76
5000	9.66
7500	9.57
10000	9.64
12000	9.54
15000	9.57
17000	9.60
20000	9.76
22000	9.90
24000	9.84
30000	9.79
36000	9.75
42000	9.70
50000	9.70
60000	9.79
72000	10.07
75000	10.07

Table 3-44 MAPLHGR for bundle/lattice:
Opt2-4.01-16GZ7.50-14GZ5.50
Lattice 138
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.63
2500	9.85
5000	9.81
7500	9.63
10000	9.70
12000	9.70
15000	9.70
17000	9.75
20000	9.89
22000	10.00
24000	9.95
30000	9.89
36000	9.85
42000	9.77
50000	9.70
60000	9.69
72000	10.02
75000	10.02

Table 3-45 MAPLHGR for bundle/lattice:
Opt2-4.01-16GZ7.50-14GZ5.50
Lattice 139
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.62
2500	9.87
5000	9.91
7500	9.63
10000	9.72
12000	9.74
15000	9.73
17000	9.77
20000	9.91
22000	10.00
24000	9.95
30000	9.88
36000	9.85
42000	9.77
50000	9.68
60000	9.68
72000	10.06
75000	10.06

Table 3-46 MAPLHGR for bundle/lattice:
Opt2-4.01-16GZ7.50-14GZ5.50
Lattice 140
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.78
2500	10.04
5000	9.96
7500	9.80
10000	9.89
12000	9.89
15000	9.89
17000	9.94
20000	10.17
22000	10.19
24000	10.14
30000	10.08
36000	10.01
42000	9.92
50000	9.80
60000	9.84
72000	10.25
75000	10.25

Table 3-47 MAPLHGR for bundle/lattice: Opt2-4.01-16GZ7.50-14GZ5.50 Lattice 141
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.80
2500	10.02
5000	9.87
7500	9.76
10000	9.84
12000	9.84
15000	9.83
17000	9.95
20000	10.16
22000	10.15
24000	10.13
30000	10.08
36000	10.00
42000	9.88
50000	9.77
60000	9.71
72000	9.91
75000	9.91

Table 3-48 MAPLHGR for bundle/lattice: Opt2-4.01-16GZ7.50-14GZ5.50 Lattice 142
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	10.22
2500	10.45
5000	10.32
7500	10.07
10000	10.01
12000	10.11
15000	10.23
17000	10.25
20000	10.23
22000	10.23
24000	10.19
30000	10.14
36000	10.07
42000	9.96
50000	9.84
60000	9.87
72000	10.26
75000	10.26

Table 3-49 MAPLHGR for bundle/lattice:
Opt2-4.04-14G5.50-2GZ5.50
Lattice 143
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.48
2500	9.78
5000	9.79
7500	9.59
10000	9.69
12000	9.63
15000	9.75
17000	9.83
20000	10.01
22000	9.95
24000	9.90
30000	9.84
36000	9.79
42000	9.74
50000	9.72
60000	9.77
72000	9.85
75000	9.79

Table 3-50 MAPLHGR for bundle/lattice:
Opt2-4.04-14G5.50-2GZ5.50
Lattice 144
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.55
2500	9.87
5000	10.02
7500	9.74
10000	9.78
12000	9.76
15000	9.89
17000	10.00
20000	10.15
22000	10.07
24000	10.02
30000	9.94
36000	9.91
42000	9.87
50000	9.84
60000	9.94
72000	10.19
75000	10.19

Table 3-51 MAPLHGR for bundle/lattice:
Opt2-4.04-14G5.50-2GZ5.50
Lattice 145
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.54
2500	9.87
5000	10.06
7500	9.85
10000	9.80
12000	9.80
15000	9.91
17000	10.04
20000	10.13
22000	10.07
24000	10.02
30000	9.94
36000	9.91
42000	9.87
50000	9.82
60000	9.94
72000	10.19
75000	10.19

Table 3-52 MAPLHGR for bundle/lattice:
Opt2-4.04-14G5.50-2GZ5.50
Lattice 146
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.70
2500	10.04
5000	10.15
7500	9.87
10000	9.96
12000	9.96
15000	10.18
17000	10.32
20000	10.34
22000	10.26
24000	10.23
30000	10.15
36000	10.09
42000	10.04
50000	9.88
60000	9.88
72000	10.30
75000	10.30

Table 3-53 MAPLHGR for bundle/lattice:
Opt2-4.04-14G5.50-2GZ5.50
Lattice 147
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	9.74
2500	10.06
5000	10.08
7500	9.84
10000	9.92
12000	9.93
15000	10.14
17000	10.31
20000	10.25
22000	10.24
24000	10.20
30000	10.14
36000	10.07
42000	10.00
50000	9.85
60000	9.87
72000	10.25
75000	10.25

Table 3-54 MAPLHGR for bundle/lattice:
Opt2-4.04-14G5.50-2GZ5.50
Lattice 148
(References 3 and 15)

Average Planar Exposure (MWd/MTU)	DLO MAPLHGR (kW/ft)
0	10.14
2500	10.42
5000	10.48
7500	10.06
10000	10.08
12000	10.07
15000	10.15
17000	10.27
20000	10.26
22000	10.30
24000	10.23
30000	10.17
36000	10.10
42000	9.98
50000	9.84
60000	9.77
72000	10.39
75000	10.39

Table 3-55 MAPLHGR Multipliers
(References 3, 11, and 16)

Fuel Type	DLO Multiplier	SLO Multiplier
Optima2 Base	1.00	0.86

4. Operating Limit Minimum Critical Power Ratio

The Operating Limit Minimum Critical Power Ratios (OLMCPRs) for D2C24 were established to protect the Safety Limit Minimum Critical Power Ratio (SLMCPR) for the abnormal operational occurrences. The SLMCPR values for DLO and SLO for D2C24 were determined to be 1.12 and 1.14 (Reference 22), respectively, which are unchanged from the NRC-approved values for the previous operating cycle (i.e., D2C23).

In determining the SLMCPR values for D2C24, Westinghouse applied the methodologies from CENPD-300-P-A, consistent with the manner specified in Limitations 1 through 6 and 8 of the NRC Safety Evaluation Report (SER) approving CENPD-300-P-A (References 12 and 14). The application of these methodologies was previously approved by the NRC in license amendment 224 to Renewed Facility Operating License DPR-19 (Reference 18).

4.1. Manual Flow Control MCPR Limits

The OLMCPR is determined for a given power and flow condition by evaluating the power-dependent MCPR and the flow-dependent MCPR and selecting the greater of the two.

4.1.1. Power-Dependent MCPR

For operation at less than or equal to 38.5% core thermal power, the power dependent OLMCPR is shown in Tables 4-8 and 4-9. For operation at greater than 38.5% core thermal power, the power dependent OLMCPR is determined by multiplying the applicable rated condition OLMCPR limit shown in Tables 4-2 through 4-7 by the applicable OLMCPR multiplier given in Tables 4-8 and 4-9.

4.1.2. Flow-Dependent MCPR

Table 4-10 gives the MCPR(F) limit as a function of the flow based on the applicable plant condition. The MCPR(F) limit determined from this table is the flow dependent OLMCPR.

4.2. Scram Time

TSSS, ISS, and NSS refer to scram speeds. The scram time values associated with these speeds are shown in Table 4-1. The TSSS scram times shown in Table 4-1 are the same as those specified in the Technical Specifications (Reference 5). Reference 22 documents that the TSSS control rod insertion times that were actually used in the transient analysis are conservative with respect to the scram times specified in the Technical Specifications.

To utilize the MCPR limits for Nominal Scram Speed, the average control rod insertion time at each control rod insertion fraction must be equal to or less than the NSS time shown on Table 4-1 below.

To utilize the MCPR limits for Intermediate Scram Speed, the average control rod insertion time at each control rod insertion fraction must be equal to or less than the ISS time shown on Table 4-1 below.

To utilize the MCPR limits for Technical Specification Scram Speed, the average control rod insertion time at each control rod insertion fraction must be equal to or less than the TSSS time shown on Table 4-1 below.

The average control rod insertion time is defined as the average control rod insertion time of all operable control rods based on the sum of the most recent scram time data divided by the number of operable drives. The time for inoperable drives fully inserted (notch 00) can be conservatively included for calculation of core average scram speed. (Reference 22)

Table 4-1 Scram Times
(References 5 and 22)

Control Rod Insertion Fraction (%)	TSSS (seconds)	ISS (seconds)	NSS (seconds)
5	0.48	0.360	0.324
20	0.89	0.720	0.700
50	1.98	1.580	1.510
90	3.44	2.740	2.635

4.3. Recirculation Pump ASD Settings

Cycle 24 was analyzed with a maximum core flow runout of 110%; therefore the recirculation pump ASD must be set to maintain core flow less than 110% (107.8 Mlb/hr) for all runout events (Reference 8). This value is consistent with the analyses in Reference 22.

Table 4-2 MCPR TSSS Based Operating Limits – NFWT
All Fuel Types
(Reference 22)

EOOS Combination	Cycle Exposure	
	≤ 14500 MWd/MTU	> 14500 MWd/MTU
BASE	1.81	1.83
BASE SLO	1.85	1.87
PLUOOS	1.85	1.85
PLUOOS SLO	1.89	1.89
TBVOOS	1.88	1.88
TBVOOS SLO	1.92	1.92
TCV SLOW CLOSURE	1.89	1.90
TCV SLOW CLOSURE SLO	1.93	1.94
TCV STUCK CLOSED	1.81	1.83
TCV STUCK CLOSED SLO	1.85	1.87

Table 4-3 MCPR TSSS Based Operating Limits – RFWT
All Fuel Types
(Reference 22)

EOOS Combination	Cycle Exposure	
	≤ 14500 MWd/MTU	> 14500 MWd/MTU
BASE	1.81	1.83
BASE SLO	1.85	1.87
PLUOOS	1.85	1.85
PLUOOS SLO	1.89	1.89
TBVOOS	1.89	1.89
TBVOOS SLO	1.93	1.93
TCV SLOW CLOSURE	1.89	1.90
TCV SLOW CLOSURE SLO	1.93	1.94
TCV STUCK CLOSED	1.81	1.83
TCV STUCK CLOSED SLO	1.85	1.87

Table 4-4 MCPR ISS Based Operating Limits – NFWT
All Fuel Types
(Reference 22)

EOOS Combination	Cycle Exposure	
	≤ 14500 MWd/MTU	> 14500 MWd/MTU
BASE	1.52	1.54
BASE SLO	1.55	1.57
PLUOOS	1.59	1.61
PLUOOS SLO	1.62	1.64
TBVOOS	1.64	1.68
TBVOOS SLO	1.67	1.71
TCV SLOW CLOSURE	1.61	1.62
TCV SLOW CLOSURE SLO	1.64	1.65
TCV STUCK CLOSED	1.52	1.54
TCV STUCK CLOSED SLO	1.55	1.57

Table 4-5 MCPR ISS Based Operating Limits – RFWT
All Fuel Types
(Reference 22)

EOOS Combination	Cycle Exposure	
	≤ 14500 MWd/MTU	> 14500 MWd/MTU
BASE	1.53	1.54
BASE SLO	1.56	1.57
PLUOOS	1.59	1.61
PLUOOS SLO	1.62	1.64
TBVOOS	1.68	1.73
TBVOOS SLO	1.71	1.77
TCV SLOW CLOSURE	1.61	1.62
TCV SLOW CLOSURE SLO	1.64	1.65
TCV STUCK CLOSED	1.53	1.54
TCV STUCK CLOSED SLO	1.56	1.57

Table 4-6 MCPR NSS Based Operating Limits – NFWT
All Fuel Types
(Reference 22)

EOOS Combination	Cycle Exposure	
	≤ 14500 MWd/MTU	> 14500 MWd/MTU
BASE	1.48	1.49
BASE SLO	1.51	1.52
PLUOOS	1.54	1.56
PLUOOS SLO	1.57	1.59
TBVOOS	1.60	1.62
TBVOOS SLO	1.63	1.65
TCV SLOW CLOSURE	1.57	1.58
TCV SLOW CLOSURE SLO	1.60	1.61
TCV STUCK CLOSED	1.48	1.49
TCV STUCK CLOSED SLO	1.51	1.52

Table 4-7 MCPR NSS Based Operating Limits – RFWT
All Fuel Types
(Reference 22)

EOOS Combination	Cycle Exposure	
	≤ 14500 MWd/MTU	> 14500 MWd/MTU
BASE	1.52	1.52
BASE SLO	1.55	1.55
PLUOOS	1.54	1.56
PLUOOS SLO	1.57	1.59
TBVOOS	1.66	1.67
TBVOOS SLO	1.69	1.70
TCV SLOW CLOSURE	1.57	1.58
TCV SLOW CLOSURE SLO	1.60	1.61
TCV STUCK CLOSED	1.52	1.52
TCV STUCK CLOSED SLO	1.55	1.55

Table 4-8 MCPR(P) for Westinghouse Fuel – NFWT
All Fuel Types
(Reference 22)

EOOS Combination	Core Flow (% of rated)	Core Thermal Power (% of rated)							
		0	25	≤ 38.5	>38.5	50	60	80	100
		Operating Limit MCPR			Operating Limit MCPR Multiplier				
Base	≤ 60	2.85	2.36	2.10	1.25	1.14	1.09	1.03	1.00
	> 60	3.07	2.60	2.35					
Base SLO	≤ 60	2.91	2.41	2.14	1.25	1.14	1.09	1.03	1.00
	> 60	3.13	2.65	2.40					
PLUOOS	≤ 60	2.85	2.36	2.10	1.47	1.37	1.30	1.05	1.00
	> 60	3.07	2.60	2.35					
PLUOOS SLO	≤ 60	2.91	2.41	2.14	1.47	1.37	1.30	1.05	1.00
	> 60	3.13	2.65	2.40					
TBVOOS	≤ 60	3.90	2.95	2.44	1.25	1.14	1.09	1.03	1.00
	> 60	4.44	3.31	2.70					
TBVOOS SLO	≤ 60	3.97	3.01	2.49	1.25	1.14	1.09	1.03	1.00
	> 60	4.52	3.37	2.75					
TCV Slow Closure	≤ 60	2.85	2.36	2.10	1.47	1.37	1.30	1.05	1.00
	> 60	3.07	2.60	2.35					
TCV Slow Closure SLO	≤ 60	2.91	2.41	2.14	1.47	1.37	1.30	1.05	1.00
	> 60	3.13	2.65	2.40					
TCV Stuck Closed	≤ 60	2.85	2.36	2.10	1.25	1.14	1.09	1.03	1.00
	> 60	3.07	2.60	2.35					
TCV Stuck Closed SLO	≤ 60	2.91	2.41	2.14	1.25	1.14	1.09	1.03	1.00
	> 60	3.13	2.65	2.40					

Table 4-9 MCPR(P) for Westinghouse Fuel – RFWT
All Fuel Types
(Reference 22)

EOOS Combination	Core Flow (% of rated)	Core Thermal Power (% of rated)							
		0	25	≤ 38.5	>38.5	50	60	80	100
		Operating Limit MCPR			Operating Limit MCPR Multiplier				
Base	≤ 60	2.85	2.36	2.10	1.27	1.17	1.11	1.04	1.00
	> 60	3.07	2.60	2.35					
Base SLO	≤ 60	2.91	2.41	2.14	1.27	1.17	1.11	1.04	1.00
	> 60	3.13	2.65	2.40					
PLUOOS	≤ 60	2.85	2.36	2.10	1.47	1.37	1.30	1.05	1.00
	> 60	3.07	2.60	2.35					
PLUOOS SLO	≤ 60	2.91	2.41	2.14	1.47	1.37	1.30	1.05	1.00
	> 60	3.13	2.65	2.40					
TBVOOS	≤ 60	4.14	3.10	2.54	1.27	1.17	1.11	1.04	1.00
	> 60	4.46	3.36	2.77					
TBVOOS SLO	≤ 60	4.22	3.16	2.59	1.27	1.17	1.11	1.04	1.00
	> 60	4.54	3.42	2.82					
TCV Slow Closure	≤ 60	2.85	2.36	2.10	1.47	1.37	1.30	1.05	1.00
	> 60	3.07	2.60	2.35					
TCV Slow Closure SLO	≤ 60	2.91	2.41	2.14	1.47	1.37	1.30	1.05	1.00
	> 60	3.13	2.65	2.40					
TCV Stuck Closed	≤ 60	2.85	2.36	2.10	1.27	1.17	1.11	1.04	1.00
	> 60	3.07	2.60	2.35					
TCV Stuck Closed SLO	≤ 60	2.91	2.41	2.14	1.27	1.17	1.11	1.04	1.00
	> 60	3.13	2.65	2.40					

Table 4-10 MCPR(F) for Westinghouse Fuel
All Fuel Types
(Reference 22)

Flow-Dependent MCPR for Base Case and EOOS		
Flow (% of 98 Mlbm/hr)	SVEA-96 Optima2 MCPR	
	DLO	SLO
0	1.98	2.02
100	1.38	1.41
108	1.38	1.41

5. Linear Heat Generation Rate

The thermal mechanical operating limit (TMOL) at rated conditions is established in terms of the maximum LHGR given in Table 5-1, Table 5-2, Table 5-3 or Table 5-4 as a function of rod nodal (pellet) exposure. The Table 5-1 limits apply to fresh Optima2 bundle designs for the Cycle 22 reload, the Table 5-2 limits apply to fresh Optima2 bundle designs for the Cycle 23 reload, and the Table 5-3 limits apply to fresh Optima2 bundle designs for the Cycle 24 reload. The Table 5-4 limits apply to the natural Uranium blankets at the top and bottom of all fuel types. The limits changed for the Cycle 24 fresh fuel due to the reanalysis of the TMOL basis. The natural Uranium lattices 81 and 89 are monitored with the updated TMOL LHGR limit for Gad rods (Reference 21).

The linear heat generation rate (LHGR) limit is the product of the exposure dependent LHGR limit from either Table 5-1, Table 5-2, Table 5-3, or Table 5-4 and the minimum of: the power dependent LHGR Factor, LHGRFAC(P), the flow dependent LHGR Factor, LHGRFAC(F); or the single loop operation (SLO) multiplication factor where applicable. The LHGRFAC(P) is determined from Table 5-5, as applicable. The LHGRFAC(F) is determined from Table 5-6.

Table 5-1 LHGR Limit for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Opt2-4.03-16GZ8.00-14GZ5.50
Opt2-4.07-14G5.50-2GZ5.50
All Lattices except 81 and 89
(Reference 22)

Rod Nodal Exposure (GWd/MTU)	LHGR Limit for All Rods (kW/ft)
0.00	13.11
14.00	13.11
72.00	6.48

Table 5-2 LHGR Limit for bundle/lattice:
Opt2-4.05-18GZ8.00-14GZ5.50
Opt2-4.05-16GZ8.00-14GZ5.50
Opt2-4.10-14GZ5.50-2GZ5.50
All Lattices except 81 and 89
(Reference 22)

Rod Nodal Exposure (GWd/MTU)	LHGR Limit for UO_2 Rods (kW/ft)	LHGR Limit for Gadolinia Rods (kW/ft)
0.00	13.11	11.43
14.00	13.11	11.43
23.00	12.07	10.52
57.00	8.18	8.18
72.00	6.48	6.48

Table 5-3 LHGR Limit for bundle/lattice:
Opt2-4.04-18GZ7.50-14GZ5.50
Opt2-4.01-16GZ7.50-14GZ5.50
Opt2-4.04-14G5.50-2GZ5.50
All Lattices except 81 and 89
(Reference 22)

Rod Nodal Exposure (GWd/MTU)	LHGR Limit for UO_2 Rods (kW/ft)	LHGR Limit for Gadolinia Rods (kW/ft)
0.00	13.72	11.96
14.00	13.11	11.43
23.00	12.22	10.66
57.00	8.87	8.87
62.00	8.38	8.38
75.00	3.43	3.43

Table 5-4 LHGR Limit for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Opt2-4.03-16GZ8.00-14GZ5.50
Opt2-4.07-14G5.50-2GZ5.50
Opt2-4.05-18GZ8.00-14GZ5.50
Opt2-4.05-16GZ8.00-14GZ5.50
Opt2-4.10-14GZ5.50-2GZ5.50
Opt2-4.04-18GZ7.50-14GZ5.50
Opt2-4.01-16GZ7.50-14GZ5.50
Opt2-4.04-14G5.50-2GZ5.50
Lattices 81 and 89
(Reference 21)

Rod Nodal Exposure (GWd/MTU)	LHGR Limit (kW/ft)
0.00	11.96
14.00	11.43
23.00	10.66
57.00	8.87
62.00	8.38
75.00	3.43

Table 5-5 LHGRFAC(P) Multipliers
All Fuel Types
(Reference 22)

EOOS Combination	Core Thermal Power (% of rated)							
	0	25	≤ 38.5	> 38.5	50	60	80	100
Base	0.51	0.63	0.69	0.76	0.82	0.86	0.90	1.00
Base SLO	0.51	0.63	0.69	0.76	0.82	0.86	0.90	1.00
PLUOOS	0.51	0.63	0.69	0.69	0.73	0.80	0.87	1.00
PLUOOS SLO	0.51	0.63	0.69	0.69	0.73	0.80	0.87	1.00
TBVOOS	0.29	0.46	0.55	0.68	0.72	0.74	0.77	1.00
TBVOOS SLO	0.29	0.46	0.55	0.68	0.72	0.74	0.77	1.00
TCV Slow Closure	0.51	0.63	0.69	0.69	0.73	0.80	0.87	1.00
TCV Slow Closure SLO	0.51	0.63	0.69	0.69	0.73	0.80	0.87	1.00
TCV Stuck Closed	0.51	0.63	0.69	0.76	0.82	0.86	0.90	1.00
TCV Stuck Closed SLO	0.51	0.63	0.69	0.76	0.82	0.86	0.90	1.00

Table 5-6 LHGRFAC(F) Multipliers
All Fuel Types
(Reference 22)

EOOS Condition	Flow (% of 98 Mlb/hr)						
	0	20	40	60	80	100	108
Base Case and all EOOS Conditions	0.27	0.43	0.60	0.80	1.00	1.00	1.00

6. Rod Block Monitor

The Rod Block Monitor Upscale Instrumentation Setpoints are determined from the relationships shown below:

Table 6-1 Rod Block Monitor Upscale Instrumentation Setpoints
(Reference 6)

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 RWE analysis because RWE is analyzed unblocked (Reference 22).

W_d – percent of recirculation loop drive flow required to produce a rated core flow of 98.0 Mlb/hr.

7. Stability Protection Setpoints

Table 7-1 OPRM PBDA Trip Settings
(Reference 22)

PBDA Trip Amplitude Setpoint (Sp)	Corresponding Maximum Confirmation Count Setpoint (Np)
1.14	16

The PBDA is the only OPRM setting credited in the safety analysis as documented in the licensing basis for the OPRM system.

The OPRM PBDA trip settings are based, in part, on the cycle specific OLMCPR and the power dependent MCPR limits. Any change to the OLMCPR values and/or the power dependent MCPR limits should be evaluated for potential impact on the OPRM PBDA trip settings.

The OPRM PBDA trip settings are applicable when the OPRM system is declared operable, and the associated Technical Specifications are implemented.

8. Modes of Operation

The allowed modes of operation with combinations of equipment out-of-service are as described below:

Table 8-1 Modes of Operation
(Reference 22,23)

EOOS Options	Thermal Limit Sets
Base	Base (DLO or SLO)
TBV#8 and any one additional TBV OOS	Base (DLO or SLO) with NSS, NFWT
PLUOOS	PLUOOS (DLO or SLO)
TBVOOS	TBVOOS (DLO or SLO) ➢ See Table 8-2 for power restrictions
TCV Slow Closure	TCV Slow Closure (DLO or SLO)
TCV Stuck Closed *	TCV Stuck Closed (DLO or SLO) ➢ Not applicable to combination of one TCV and one TSV Stuck Closed in separate lines ➢ See Table 8-2 for power restrictions
TSV Stuck Closed*	TCV Stuck Closed (DLO or SLO) ➢ Not applicable to combination of one TCV and one TSV Stuck Closed in separate lines ➢ See Table 8-2 for power restrictions
PCOOS	PLUOOS (DLO or SLO)
PCOOS and PLUOOS	PLUOOS (DLO or SLO)
PCOOS and TCV Slow Closure	TCV Slow Closure (DLO or SLO)
PCOOS and TCV Stuck Closed*	PLUOOS (DLO or SLO) ➢ Not applicable to combination of one TCV and one TSV Stuck Closed in separate lines ➢ See Table 8-2 for power restrictions
PLUOOS and TCV Stuck Closed*	PLUOOS (DLO or SLO) ➢ Not applicable to combination of one TCV and one TSV Stuck Closed in separate lines ➢ See Table 8-2 for power restrictions
PCOOS and TSV Stuck Closed*	PLUOOS (DLO or SLO) ➢ Not applicable to combination of one TCV and one TSV Stuck Closed in separate lines ➢ See Table 8-2 for power restrictions
PLUOOS and TSV Stuck Closed*	PLUOOS (DLO or SLO) ➢ Not applicable to combination of one TCV and one TSV Stuck Closed in separate lines ➢ See Table 8-2 for power restrictions

*Also applicable to one TCV and one TSV stuck closed in the same line.

Common Notes – Applicable to both Base Case and all EOOS Combinations for DLO/SLO:

1. All modes are allowed for operation at MELLLA, ICF (up to 108% rated core flow but subject to the restrictions in Section 2), and coastdown subject to restrictions in Table 8-2. Either EOC must be reached or coastdown must begin prior to reaching 16277 MWd/MTU. The licensing analysis remains valid down to a coastdown power level of 70% given all burnup limits are satisfied per Methodology 6. Each OOS Option may be combined with each of the following conditions provided the requirements of References 19 and 20 are met:
   - A maximum of 18 TIP channels OOS (Up to 2 common TIP channels may be OOS, in combination with a maximum of 16 TIP channels OOS in locations outside of the common TIP channel location of 32-33).
   - Up to 50% LPRMs OOS
   - An LPRM calibration frequency of up to 2500 EFPH (2000 EFPH + 25%)

2. Nominal FWT results are valid for application within a +10°F/-30°F temperature band around the nominal FWT curve and operating steam dome pressure region bounded by the maximum value of 1020 psia and the minimum pressure curve (Reference 8). The FWTR results are valid for the minimum FWT curve (Reference 22). For operation outside of NFWT, a FWTR of between 30F and 120F is supported for Base Case and all EOOS DLO/SLO conditions, except for the TBV#8 and one additional TBV OOS EOOS condition, for cycle operation through EOC subject to the restriction in Reference 4 for feedwater temperature reductions of greater than 100 °F. The restriction requires that for a FWT reduction greater than 100F, operation needs to be restricted to less than the 100% load line.

3. All analyses support the fastest Turbine Bypass Valve (assumed to be #1) OOS, with the remaining 8 TBVs meeting the assumed opening profile in Reference 7. The analyses also support Turbine Bypass flow of 3.456 Mlb/hr of vessel rated steam flow, equivalent to one TBV OOS (or partially closed TBVs equivalent to one closed TBV), if the assumed opening profile (Reference 7) for the remaining TBVs is met. The Base Case, NFWT, NSS, analysis supports Turbine Bypass Valve #8 and any one additional Turbine Bypass Valve OOS, with the remaining 7 TBV meeting the assumed opening profile in Reference 7 (Reference 23). If the opening profile is **NOT** met, or if the TBV system cannot pass an equivalent of 3.456 Mlb/hr of vessel rated steam flow and the TBV#8 and any one additional TBVOOS EOOS option is not being used, or if operating with more than one TBV OOS with RFWT, ISS, or TSSS, utilize the TBVOOS condition.

4. If any TBVs are OOS in the pressure control mode the maximum steam flow removal capacity for pressure control needs to be evaluated to ensure that at least the equivalent of two TBVs are capable of being opened for pressure control within the limits of the MCFL. For all cases, except TBVOOS and TBV#8 and any one additional TBV OOS, the equivalent of 8 of 9 TBVs (as stated in Note 3 above) are required to fast open on TSV closure. For TBV#8 and any one additional TBV OOS, the equivalent of 7 of 9 TBVs (as stated in note 3 above) are required to fast open on TSV closure. The TBVOOS condition assumes that all of the TBVs do not fast open on TSV closure or on a TCV fast closure event.

5. A single MSIV may be taken OOS (shut) under all OOS Options, as long as core thermal power is maintained ≤ 75% of 2957 MWth (Reference 22).

Table 8-2 Core Thermal Power Restriction for OOS Conditions
(Reference 22)

EOOS Condition	Core Thermal Power (% of Rated Power)
Base, PLUOOS, TCV Slow Closure, TBV#8 and one additional TBV OOS	≤ 100
One TCV Stuck Closed *	≤ 75**
TBVOOS	See Table 8-3

* Also applicable to one TSV stuck closed or one TCV and TSV stuck closed in the same line (Reference 22).
** Operation above 75% rated power is included as part of the reload analysis. However, operation above 75% power may require raising the MCFL setpoint to increase the available total reactor vessel steam flow capability. Information regarding the steam flow capability necessary to satisfy the reload analysis for operation above 75% power is reported in Reference 22.

Table 8-3 Core Thermal Power Restriction for TBVOOS
(Reference 22)

Number of Safety Valves Available	Cycle Exposure (MWd/MTU)	Core Thermal Power Restriction (% of Rated Power)
9 of 9	Entire Cycle	≤ 100
8 of 9	≤ 12343	≤ 100
8 of 9	> 12343	≤ 97

9. 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. NEDE-24011-P-A-15 (Revision 15), "General Electric Standard Application for Reactor Fuel (GESTAR)," September 2005.
2. NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," August 1996.
3. Westinghouse Report WCAP-15682-P-A, "Westinghouse BWR ECCS Evaluation Model: Supplement 2 to Code Description, Qualification and Application," April 2003.
4. Westinghouse Report WCAP-16078-P-A, "Westinghouse BWR ECCS Evaluation Model: Supplement 3 to Code Description, Qualification and Application to SVEA-96 Optima2 Fuel," November 2004.
5. Westinghouse Report WCAP-16081-P-A, "10x10 SVEA Fuel Critical Power Experiments and CPR Correlation: SVEA-96 Optima2," March 2005.
6. Westinghouse Topical Report CENPD-300-P-A, "Reference Safety Report for Boiling Water Reactor Reload Fuel," July 1996.
7. Westinghouse Topical Report CENPD-390-P-A, "The Advanced PHOENIX and POLCA Codes for Nuclear Design of Boiling Water Reactors," December 2000.
8. Westinghouse Topical Report WCAP-15836-P-A, "Fuel Rod Design Methods for Boiling Water Reactors – Supplement 1," April 2006.
9. Westinghouse Topical Report WCAP-15942-P-A, "Fuel Assembly Mechanical Design Methodology for Boiling Water Reactors Supplement 1 to CENP-287," March 2006.
10. Westinghouse Report WCAP-16081-P-A, Addendum 1-A, Revision 0, "SVEA-96 Optima2 CPR Correlation (D4): High and Low Flow Applications," March 2009.
11. Westinghouse Report WCAP-16081-P-A, Addendum 2-A, Revision 0, "SVEA-96 Optima2 CPR Correlation (D4): Modified R-factors for Part-Length Rods," February 2009.

10. References

1. Exelon Generation Company, LLC, Docket No. 50-237, Dresden Nuclear Power Station, Unit 2 Renewed Facility Operating License, License No. DPR-19.
2. NRC Letter from D. M. Crutchfield to All Power Reactor Licensees and Applicants, Generic Letter 88-16; Removal of Cycle-Specific Parameter Limits from Tech Specs, October 3, 1988.
3. Westinghouse Document NF-BEX-13-111-NP, Rev. 0, "Dresden Nuclear Power Station Unit 2 Cycle 24 MAPLHGR Report," September 2013.
4. Exelon Letter, NF-MW:02-0081, "Approval of GE Evaluation of Dresden and Quad Cities Extended Final Feedwater Temperature Reduction," Carlos de la Hoz to Doug Wise and Alex Misak, August 27, 2002.
5. Exelon Technical Specifications for Dresden 2 and 3, Table 3.1.4-1, "Control Rod Scram Times."
6. GE DRF C51-00217-01, "Instrument Setpoint Calculation Nuclear Instrumentation, Rod Block Monitor, Commonwealth Edison Company, Dresden 2 & 3," December 15, 1999.
7. Exelon TODI OPS Ltr: 13-09, Revision 1, "OPL-W Parameters for Dresden Unit 2 Cycle 24 Transient Analysis," July 10, 2013.
8. Exelon TODI ES1300002, Revision 0, "Dresden Unit 2 Cycle 24 Licensing Generic Inputs Report," March 13, 2013.
9. Westinghouse Document NF-BEX-11-58, "Bundle Design Report for Dresden 2 Cycle 23," April 19, 2011. (Attachment 11 to FCP 377654)
10. Removed.
11. Westinghouse Document NF-BEX-11-101-NP, Rev. 0, "Dresden Nuclear Power Station Unit 2 Cycle 23 MAPLHGR Report," August 2011. (Attachment 18 to FCP 377654)
12. Exelon Letter RS-05-078, "Request for Licensing Amendment Regarding Transition to Westinghouse Fuel," Patrick R. Simpson to U.S. Nuclear Regulatory Commission, June 15, 2005. (Available in EDMS)
13. Removed.
14. Westinghouse Document NF-BEX-13-82, Rev. 0, "Safety Limit MCPR for Dresden Unit 2 Cycle 24," June 7, 2013.
15. Westinghouse Document NF-BEX-13-66, "Bundle Design Report for Dresden 2 Cycle 24," May 3, 2013.
16. Westinghouse Document NF-BEX-09-118 Rev. 5, "Dresden Nuclear Power Station Unit 2 Cycle 22 Reload Licensing Report," June 2011 (TODI ES0900022 Rev. 3). (Attachment 38 to FCP 378107)
17. Westinghouse Document NF-BEX-09-64, "Bundle Design Report for Dresden 2 Cycle 22," April 22, 2009. (Attachment 3 to FCP 373427)
18. NRC Letter, "Dresden Nuclear Power Station, Units 2 and 3 – Issuance of Amendments Regarding Safety Limit Minimum Critical Power Ratio (TAC Nos. MD6013 and MD6602)," Christopher Gratton (NRC) to Charles Pardee, November 6, 2007. (Available in EDMS)
19. Westinghouse Document BTD 09-0311, Revision 1, "Westinghouse CMS – Operation Guidelines for Dresden and Quad Cities Plants," July 20, 2009.

20. Westinghouse Document BTD 09-0723, Revision 0, "Westinghouse CMS – Core Monitoring Strategy for Dresden 3 Cycle 21," July 3, 2009.

21. Westinghouse Document NF-BEX-13-145, Revision 0, "Dresden Unit 2 Cycle 24 Reload Licensing Report Clarification," October 11, 2013.

22. Westinghouse Document NF-BEX-13-110, Revision 0, "Dresden Nuclear Power Station Unit 2 Cycle 24 Reload Licensing Report," September 2013.

23. Westinghouse Document NF-BEX-14-36 Revision 0, "Thermal Limit Evaluation for Dresden Unit 2 Cycle 24 with Two Turbine Bypass Valves Out of Service," March 20, 2014.