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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Dresden Nuclear Power Station, Unit 3
Renewed Facility Operating License Nos. DPR-25
NRC Docket No. 50-249

Subject: Core Operating Limits Report for Unit 3 Cycle 25

The purpose of this letter is to transmit the Core Operating Limits Report (COLR) for Dresden Nuclear Power Station (DNPS) Unit 3 operating cycle 25 (D3C25) in accordance with Technical Specifications Section 5.6.5, "CORE OPERATING LIMITS REPORT (COLR)."

There are no regulatory commitments contained in this submittal.

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

Respectfully,

Peter J Karaba
Site Vice President
Dresden Nuclear Power Station

Attachments: Core Operating Limits Report for Dresden Unit 3 Cycle 25, Revision 0

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

A001
NRR

Core Operating Limits Report

For

Dresden Unit 3 Cycle 25

Revision 0

Table of Contents

Record of Dresden 3 Cycle 25 COLR Revisions

Revision	Description
0	Initial issuance for D3C25

List of Tables

1. Terms and Definitions

AOO	Anticipated operational occurrence
APLHGR	Average planar linear heat generation rate
ASD	Adjustable Speed Drive
CAVEX	Core average exposure
CPR	Critical power ratio
CRWE	Control rod withdrawal error
CTP	Core thermal power
EFPD	Effective full power day
EFPH	Effective full power hour
EOC	End of cycle
EOCLB	End of cycle licensing basis
EOFPL	End of full power life
EOFPLB	End of full power licensing basis
EOOS	Equipment out of service
FWT	Feedwater temperature
FHOOS	Feedwater heater out of service
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
NEOC	Near end of cycle
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
SLMCPR	Safety limit minimum critical power ratio
SLO	Single loop operation
SRVOOS	Safety relief valve out of service
TBV	Turbine bypass valve
TCV	Turbine control valve
TIP	Traversing incore probe
TLO	Two loop operation
TMOL	Thermal mechanical operating limit
TSSS	Technical Specification scram speed
TSV	Turbine stop valve

2. General Information

This report is prepared in accordance with Technical Specification 5.6.5. The D3C25 reload is licensed by AREVA. However, some legacy analyses by Westinghouse are still applicable for OPTIMA2 fuel as described in Reference 2.

Licensed rated thermal power is 2957 MWth. Rated core flow is 98 Mlb/hr. Operation up to 108% rated flow is licensed for this cycle. For allowed operating regions, see applicable power/flow map.

The licensing analysis supports full power operation to EOCLB (37,612 MWd/MTU CAVEX). Note that this value includes coastdown, where full power operation is not expected. The transient analysis limits are provided for operation up to specific CAVEX exposures as defined in Section 4.3.

Power and flow dependent limits are listed for various power and flow levels. Linear interpolation on power or flow (as applicable) is to be used to find intermediate values. For cases where an entry in a table is blank and grayed out, values should be determined using linear interpolation between the values on either side of the grayed box.

Coastdown is defined as operation beyond EOFPL with the plant power gradually reducing as available core reactivity diminishes. The D3C25 reload analyses do not credit this reduced power during coastdown and the EOCLB limits remain valid for operation up to rated power. The minimum allowed coastdown power level is 40% rated CTP per Reference 1.

Only $MCPR_p$ varies with scram speed. All other thermal limits are analyzed to NSS, ISS, and TSSS.

For thermal limit monitoring above 100% rated power or 108% rated core flow, the 100% rated power and the 108% core flow thermal limit values, respectively, shall be used.

$LHGRFAC_p$ and $LHGRFAC_f$ are independent of scram speed. $LHGRFAC_f$ is independent of feedwater temperature and EOOS conditions.

3. Average Planar Linear Heat Generation Rate

Technical Specification Sections 3.2.1 and 3.4.1

For OPTIMA2 natural uranium lattices, TLO and SLO MAPLHGR values are provided in Table 3-2. For all other OPTIMA2 lattices, lattice-specific MAPLHGR values for TLO are provided in Tables 3-3 through 3-38.

For ATRIUM 10XM fuel, the MAPLHGR values applicable for all lattices can be found in Table 3-39.

During SLO, these limits are multiplied by the fuel-specific EOOS multiplier listed in Table 3-1. The ATRIUM 10XM multiplier may be applied to OPTIMA2 for SLO conditions, as the ATRIUM 10XM multiplier is more limiting.

Table 3-1: MAPLHGR EOOS Multipliers
(References 2, 5, and 8)

Fuel Type	EOOS Condition	Multiplier
ATRIUM 10XM	SLO	0.80
OPTIMA2	SLO	0.86

Table 3-2: MAPLHGR for OPTIMA2 Lattices 81 and 89
(References 4, 5, and 7)

All OPTIMA2 Bundles Lattices 81: Opt2-B0.71 89: Opt2-T0.71	
Average Planar Exposure (MWd/MTU)	**TLO and SLO MAPLHGR (kW/ft)**
0	7.50
75000	7.50

Table 3-3: MAPLHGR for OPTIMA2 Lattice 131
(References 7 and 8)

Bundle Opt2-4.04-18GZ7.50-14GZ5.50 Lattice 131: Opt2-B4.44-18G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.12
2500	9.44
5000	9.40
7500	9.33
10000	9.46
12000	9.49
15000	9.54
17000	9.61
20000	9.81
22000	9.89
24000	9.84
30000	9.77
36000	9.72
42000	9.68
50000	9.71
60000	9.82
62000	9.82
64000	9.82
72000	9.93

Table 3-4: MAPLHGR for OPTIMA2 Lattice 132
(References 7 and 8)

Bundle Opt2-4.04-18GZ7.50-14GZ5.50 Lattice 132: Opt2-BE4.54-18G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.28
2500	9.56
5000	9.47
7500	9.38
10000	9.53
12000	9.55
15000	9.64
17000	9.73
20000	9.89
22000	10.01
24000	9.94
30000	9.86
36000	9.82
42000	9.75
50000	9.78
60000	9.81
62000	9.87
64000	9.92
72000	9.92

Table 3-5: MAPLHGR for OPTIMA2 Lattice 133
(References 7 and 8)

Bundle Opt2-4.04-18GZ7.50-14GZ5.50 Lattice 133: Opt2-M4.54-18G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.26
2500	9.56
5000	9.53
7500	9.39
10000	9.53
12000	9.59
15000	9.66
17000	9.75
20000	9.97
22000	9.98
24000	9.93
30000	9.86
36000	9.81
42000	9.75
50000	9.76
60000	9.79
62000	9.83
64000	9.86
72000	9.87

Table 3-6: MAPLHGR for OPTIMA2 Lattice 134
(References 7 and 8)

Bundle Opt2-4.04-18GZ7.50-14GZ5.50 Lattice 134: Opt2-ME4.50-18G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.39
2500	9.70
5000	9.57
7500	9.50
10000	9.68
12000	9.70
15000	9.81
17000	9.92
20000	10.17
22000	10.16
24000	10.09
30000	10.03
36000	9.96
42000	9.92
50000	9.85
60000	9.88
62000	9.99
64000	10.12
72000	10.29

Table 3-7: MAPLHGR for OPTIMA2 Lattice 135
(References 7 and 8)

Bundle Opt2-4.04-18GZ7.50-14GZ5.50 Lattice 135: Opt2-T4.50-18G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.42
2500	9.68
5000	9.51
7500	9.41
10000	9.51
12000	9.69
15000	9.75
17000	9.93
20000	10.17
22000	10.14
24000	10.09
30000	10.04
36000	9.96
42000	9.92
50000	9.81
60000	9.84
62000	9.96
64000	10.09
72000	10.32

Table 3-8: MAPLHGR for OPTIMA2 Lattice 136
(References 7 and 8)

Bundle Opt2-4.04-18GZ7.50-14GZ5.50 Lattice 136: Opt2-T4.52-14G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	10.15
2500	10.39
5000	10.24
7500	10.00
10000	10.05
12000	10.08
15000	10.20
17000	10.25
20000	10.24
22000	10.26
24000	10.20
30000	10.14
36000	10.08
42000	9.98
50000	9.87
60000	9.89
62000	10.01
64000	10.14
72000	10.25

Table 3-9: MAPLHGR for OPTIMA2 Lattice 137
(References 7 and 8)

Bundle Opt2-4.05-16GZ7.50-14GZ5.50 Lattice 137: Opt2-B4.45-16G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.44
2500	9.72
5000	9.70
7500	9.50
10000	9.60
12000	9.64
15000	9.60
17000	9.65
20000	9.79
22000	9.93
24000	9.87
30000	9.81
36000	9.76
42000	9.72
50000	9.74
60000	9.81
62000	9.81
64000	9.80
72000	9.93

Table 3-10: MAPLHGR for OPTIMA2 Lattice 138
(References 7 and 8)

Bundle Opt2-4.05-16GZ7.50-14GZ5.50 Lattice 138: Opt2-BE4.55-16G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.59
2500	9.82
5000	9.76
7500	9.57
10000	9.66
12000	9.69
15000	9.70
17000	9.75
20000	9.88
22000	10.02
24000	9.97
30000	9.90
36000	9.86
42000	9.79
50000	9.76
60000	9.80
62000	9.86
64000	9.91
72000	9.99

Table 3-11: MAPLHGR for OPTIMA2 Lattice 139
(References 7 and 8)

Bundle Opt2-4.05-16GZ7.50-14GZ5.50 Lattice 139: Opt2-M4.55-16G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.58
2500	9.83
5000	9.74
7500	9.58
10000	9.68
12000	9.72
15000	9.73
17000	9.77
20000	9.91
22000	10.01
24000	9.96
30000	9.90
36000	9.85
42000	9.78
50000	9.74
60000	9.78
62000	9.82
64000	9.85
72000	9.87

Table 3-12: MAPLHGR for OPTIMA2 Lattice 140
(References 7 and 8)

Bundle Opt2-4.05-16GZ7.50-14GZ5.50 Lattice 140: Opt2-ME4.51-16G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.73
2500	9.99
5000	9.90
7500	9.75
10000	9.84
12000	9.86
15000	9.87
17000	9.93
20000	10.18
22000	10.18
24000	10.13
30000	10.07
36000	10.02
42000	9.95
50000	9.85
60000	9.86
62000	9.98
64000	10.11
72000	10.27

Table 3-13: MAPLHGR for OPTIMA2 Lattice 141
(References 7 and 8)

Bundle Opt2-4.05-16GZ7.50-14GZ5.50 Lattice 141: Opt2-T4.51-16G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.76
2500	9.97
5000	9.81
7500	9.70
10000	9.79
12000	9.81
15000	9.83
17000	9.93
20000	10.17
22000	10.16
24000	10.13
30000	10.08
36000	10.00
42000	9.91
50000	9.80
60000	9.82
62000	9.95
64000	10.07
72000	10.35

Table 3-14: MAPLHGR for OPTIMA2 Lattice 142
(References 7 and 8)

Bundle Opt2-4.05-16GZ7.50-14GZ5.50 Lattice 142: Opt2-T4.52-14G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	10.15
2500	10.39
5000	10.24
7500	10.01
10000	10.05
12000	10.08
15000	10.20
17000	10.25
20000	10.24
22000	10.26
24000	10.20
30000	10.14
36000	10.08
42000	9.98
50000	9.87
60000	9.89
62000	10.01
64000	10.14
72000	10.25

Table 3-15: MAPLHGR for OPTIMA2 Lattice 143
(References 7 and 8)

Bundle Opt2-4.10-14G5.50-2GZ5.50 Lattice 143: Opt2-B4.50-16G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.24
2500	9.54
5000	9.47
7500	9.37
10000	9.47
12000	9.52
15000	9.67
17000	9.78
20000	9.95
22000	9.98
24000	9.94
30000	9.85
36000	9.81
42000	9.75
50000	9.77
60000	9.86
62000	9.85
64000	9.83
72000	9.86

Table 3-16: MAPLHGR for OPTIMA2 Lattice 144
(References 7 and 8)

Bundle Opt2-4.10-14G5.50-2GZ5.50 Lattice 144: Opt2-BE4.60-16G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.29
2500	9.64
5000	9.61
7500	9.61
10000	9.55
12000	9.61
15000	9.79
17000	9.93
20000	10.10
22000	10.10
24000	10.05
30000	9.97
36000	9.92
42000	9.88
50000	9.83
60000	9.86
62000	9.90
64000	9.92
72000	9.82

Table 3-17: MAPLHGR for OPTIMA2 Lattice 145
(References 7 and 8)

Bundle Opt2-4.10-14G5.50-2GZ5.50 Lattice 145: Opt2-M4.60-16G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.28
2500	9.65
5000	9.65
7500	9.62
10000	9.57
12000	9.63
15000	9.81
17000	9.96
20000	10.13
22000	10.10
24000	10.05
30000	9.97
36000	9.92
42000	9.89
50000	9.81
60000	9.84
62000	9.87
64000	9.90
72000	9.83

Table 3-18: MAPLHGR for OPTIMA2 Lattice 146
(References 7 and 8)

Bundle Opt2-4.10-14G5.50-2GZ5.50 Lattice 146: Opt2-ME4.57-16G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.44
2500	9.82
5000	9.79
7500	9.70
10000	9.73
12000	9.81
15000	10.08
17000	10.23
20000	10.34
22000	10.28
24000	10.23
30000	10.16
36000	10.10
42000	10.00
50000	9.94
60000	9.93
62000	10.03
64000	10.18
72000	10.31

Table 3-19: MAPLHGR for OPTIMA2 Lattice 147
(References 7 and 8)

Bundle Opt2-4.10-14G5.50-2GZ5.50 Lattice 147: Opt2-T4.57-16G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.48
2500	9.83
5000	9.80
7500	9.59
10000	9.69
12000	9.77
15000	10.03
17000	10.22
20000	10.27
22000	10.26
24000	10.21
30000	10.15
36000	10.08
42000	10.02
50000	9.90
60000	9.89
62000	10.02
64000	10.12
72000	10.39

Table 3-20: MAPLHGR for OPTIMA2 Lattice 148
(References 7 and 8)

Bundle Opt2-4.10-14G5.50-2GZ5.50 Lattice 148: Opt2-T4.58-14G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.86
2500	10.16
5000	10.16
7500	9.92
10000	9.87
12000	9.87
15000	10.05
17000	10.19
20000	10.28
22000	10.30
24000	10.24
30000	10.18
36000	10.11
42000	10.02
50000	9.90
60000	9.89
62000	10.01
64000	10.12
72000	10.41

Table 3-21: MAPLHGR for OPTIMA2 Lattice 149
(References 4 and 5)

Bundle Opt2-4.04-18GZ7.50-14GZ5.50 Lattice 149: Opt2-B4.44-18G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.14
2500	9.45
5000	9.41
7500	9.35
10000	9.48
12000	9.50
15000	9.55
17000	9.62
20000	9.82
22000	9.90
24000	9.85
30000	9.78
36000	9.72
42000	9.68
50000	9.70
60000	9.80
62000	9.85
64000	9.92
72000	10.05
75000	10.05

Table 3-22: MAPLHGR for OPTIMA2 Lattice 150
(References 4 and 5)

Bundle Opt2-4.04-18GZ7.50-14GZ5.50 Lattice 150: Opt2-BE4.54-18G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.29
2500	9.57
5000	9.48
7500	9.39
10000	9.54
12000	9.56
15000	9.65
17000	9.74
20000	9.90
22000	10.02
24000	9.95
30000	9.86
36000	9.82
42000	9.75
50000	9.77
60000	9.80
62000	9.89
64000	9.95
72000	10.10
75000	10.10

Table 3-23: MAPLHGR for OPTIMA2 Lattice 151
(References 4 and 5)

Bundle Opt2-4.04-18GZ7.50-14GZ5.50 Lattice 151: Opt2-M4.54-18G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.28
2500	9.57
5000	9.55
7500	9.41
10000	9.54
12000	9.60
15000	9.68
17000	9.76
20000	10.00
22000	9.99
24000	9.93
30000	9.86
36000	9.82
42000	9.74
50000	9.75
60000	9.78
62000	9.87
64000	9.94
72000	10.10
75000	10.10

Table 3-24: MAPLHGR for OPTIMA2 Lattice 152
(References 4 and 5)

Bundle Opt2-4.04-18GZ7.50-14GZ5.50 Lattice 152: Opt2-ME4.50-18G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.40
2500	9.72
5000	9.58
7500	9.49
10000	9.70
12000	9.72
15000	9.82
17000	9.93
20000	10.19
22000	10.17
24000	10.11
30000	10.03
36000	9.98
42000	9.91
50000	9.83
60000	9.89
62000	9.98
64000	10.11
72000	10.34
75000	10.34

Table 3-25: MAPLHGR for OPTIMA2 Lattice 153
(References 4 and 5)

Bundle Opt2-4.04-18GZ7.50-14GZ5.50 Lattice 153: Opt2-T4.50-18G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.43
2500	9.70
5000	9.52
7500	9.42
10000	9.52
12000	9.70
15000	9.77
17000	9.94
20000	10.18
22000	10.15
24000	10.10
30000	10.04
36000	9.97
42000	9.92
50000	9.80
60000	9.85
62000	9.95
64000	10.09
72000	10.34
75000	10.34

Table 3-26: MAPLHGR for OPTIMA2 Lattice 154
(References 4 and 5)

Bundle Opt2-4.04-18GZ7.50-14GZ5.50 Lattice 154: Opt2-T4.52-14G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	10.17
2500	10.41
5000	10.26
7500	10.02
10000	10.06
12000	10.09
15000	10.22
17000	10.26
20000	10.26
22000	10.28
24000	10.22
30000	10.15
36000	10.09
42000	9.98
50000	9.86
60000	9.91
62000	10.01
64000	10.15
72000	10.40
75000	10.40

Table 3-27: MAPLHGR for OPTIMA2 Lattice 155
(References 4 and 5)

Bundle Opt2-4.01-16GZ7.50-14GZ5.50 Lattice 155: Opt2-B4.41-16G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.40
2500	9.68
5000	9.63
7500	9.53
10000	9.61
12000	9.54
15000	9.58
17000	9.61
20000	9.78
22000	9.90
24000	9.86
30000	9.81
36000	9.76
42000	9.70
50000	9.69
60000	9.71
62000	9.79
64000	9.88
72000	10.05
75000	10.05

Table 3-28: MAPLHGR for OPTIMA2 Lattice 156
(References 4 and 5)

Bundle Opt2-4.01-16GZ7.50-14GZ5.50 Lattice 156: Opt2-BE4.51-16G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.58
2500	9.81
5000	9.78
7500	9.60
10000	9.68
12000	9.70
15000	9.71
17000	9.76
20000	9.91
22000	10.00
24000	9.96
30000	9.90
36000	9.86
42000	9.78
50000	9.70
60000	9.70
62000	9.79
64000	9.91
72000	10.09
75000	10.09

Table 3-29: MAPLHGR for OPTIMA2 Lattice 157
(References 4 and 5)

Bundle Opt2-4.01-16GZ7.50-14GZ5.50 Lattice 157: Opt2-M4.51-16G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.57
2500	9.82
5000	9.87
7500	9.60
10000	9.70
12000	9.74
15000	9.73
17000	9.78
20000	9.92
22000	10.01
24000	9.96
30000	9.89
36000	9.85
42000	9.78
50000	9.68
60000	9.68
62000	9.77
64000	9.91
72000	10.09
75000	10.09

Table 3-30: MAPLHGR for OPTIMA2 Lattice 158
(References 4 and 5)

Bundle Opt2-4.01-16GZ7.50-14GZ5.50 Lattice 158: Opt2-ME4.46-16G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.72
2500	9.98
5000	9.92
7500	9.77
10000	9.86
12000	9.87
15000	9.88
17000	9.95
20000	10.17
22000	10.18
24000	10.13
30000	10.07
36000	10.01
42000	9.91
50000	9.79
60000	9.84
62000	9.95
64000	10.10
72000	10.34
75000	10.34

Table 3-31: MAPLHGR for OPTIMA2 Lattice 159
(References 4 and 5)

Bundle Opt2-4.01-16GZ7.50-14GZ5.50 Lattice 159: Opt2-T4.46-16G7.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.75
2500	9.96
5000	9.83
7500	9.73
10000	9.80
12000	9.80
15000	9.83
17000	9.95
20000	10.16
22000	10.15
24000	10.12
30000	10.08
36000	10.00
42000	9.87
50000	9.76
60000	9.73
62000	9.74
64000	9.79
72000	10.29
75000	10.29

Table 3-32: MAPLHGR for OPTIMA2 Lattice 160
(References 4 and 5)

Bundle Opt2-4.01-16GZ7.50-14GZ5.50 Lattice 160: Opt2-T4.47-14G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	10.18
2500	10.39
5000	10.27
7500	10.04
10000	10.01
12000	10.09
15000	10.23
17000	10.24
20000	10.23
22000	10.22
24000	10.19
30000	10.14
36000	10.07
42000	9.94
50000	9.82
60000	9.88
62000	9.99
64000	10.13
72000	10.40
75000	10.40

Table 3-33: MAPLHGR for OPTIMA2 Lattice 161
(References 4 and 5)

Bundle Opt2-4.10-14G5.50-2GZ5.50 Lattice 161: Opt2-B4.50-16G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.25
2500	9.56
5000	9.49
7500	9.38
10000	9.49
12000	9.53
15000	9.68
17000	9.79
20000	9.96
22000	9.99
24000	9.94
30000	9.87
36000	9.82
42000	9.74
50000	9.76
60000	9.85
62000	9.88
64000	9.97
72000	10.10
75000	10.10

Table 3-34: MAPLHGR for OPTIMA2 Lattice 162
(References 4 and 5)

Bundle Opt2-4.10-14G5.50-2GZ5.50 Lattice 162: Opt2-BE4.60-16G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.31
2500	9.66
5000	9.62
7500	9.62
10000	9.56
12000	9.62
15000	9.80
17000	9.94
20000	10.13
22000	10.11
24000	10.06
30000	9.98
36000	9.94
42000	9.88
50000	9.83
60000	9.85
62000	9.93
64000	9.99
72000	10.14
75000	10.14

Table 3-35: MAPLHGR for OPTIMA2 Lattice 163
(References 4 and 5)

Bundle Opt2-4.10-14G5.50-2GZ5.50 Lattice 163: Opt2-M4.60-16G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.30
2500	9.67
5000	9.66
7500	9.63
10000	9.58
12000	9.64
15000	9.82
17000	9.96
20000	10.17
22000	10.12
24000	10.06
30000	9.98
36000	9.94
42000	9.89
50000	9.80
60000	9.82
62000	9.92
64000	9.99
72000	10.15
75000	10.15

Table 3-36: MAPLHGR for OPTIMA2 Lattice 164
(References 4 and 5)

Bundle Opt2-4.10-14G5.50-2GZ5.50 Lattice 164: Opt2-ME4.57-16G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.46
2500	9.83
5000	9.80
7500	9.71
10000	9.74
12000	9.83
15000	10.09
17000	10.24
20000	10.41
22000	10.29
24000	10.24
30000	10.18
36000	10.11
42000	10.00
50000	9.93
60000	9.95
62000	10.04
64000	10.17
72000	10.39
75000	10.39

Table 3-37: MAPLHGR for OPTIMA2 Lattice 165
(References 4 and 5)

Bundle Opt2-4.10-14G5.50-2GZ5.50 Lattice 165: Opt2-T4.57-16G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.50
2500	9.85
5000	9.81
7500	9.60
10000	9.70
12000	9.78
15000	10.04
17000	10.24
20000	10.28
22000	10.27
24000	10.23
30000	10.16
36000	10.09
42000	10.02
50000	9.89
60000	9.91
62000	10.01
64000	10.16
72000	10.39
75000	10.39

Table 3-38: MAPLHGR for OPTIMA2 Lattice 166
(References 4 and 5)

Bundle Opt2-4.10-14G5.50-2GZ5.50 Lattice 166: Opt2-T4.58-14G5.50	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	9.88
2500	10.18
5000	10.18
7500	9.94
10000	9.87
12000	9.89
15000	10.06
17000	10.20
20000	10.29
22000	10.32
24000	10.26
30000	10.19
36000	10.12
42000	10.02
50000	9.88
60000	9.91
62000	10.01
64000	10.15
72000	10.39
75000	10.39

Table 3-39: MAPLHGR for ATRIUM 10XM
(Reference 2)

All ATRIUM 10XM Lattices	
Average Planar Exposure (MWd/MTU)	**TLO MAPLHGR (kW/ft)**
0	11.50
20000	11.50
25000	10.70
67000	7.01

4. Operating Limit Minimum Critical Power Ratio

Technical Specification Sections 3.2.2, 3.4.1, and 3.7.7

The OLMCPRs for D3C25 are established so that less than 0.1% of the fuel rods in the core are expected to experience boiling transition during an AOO initiated from rated or off-rated conditions and are based on the Technical Specifications SLMCPR values (Reference 2).

Tables 4-3 through 4-27 include MCPR limits for various specified EOOS conditions. The EOOS conditions separated by "/" in these tables represent each individual EOOS condition, not any combination of slash-separated EOOS conditions. The word "and" indicates that any single EOOS condition prior to the word "and" can be combined with the single EOOS condition after the word "and." Refer to Section 8 for a detailed explanation of allowable combined EOOS conditions.

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

The OLMCPR as a function of core thermal power ($MCPR_p$) is shown in Tables 4-3 through 4-26. $MCPR_p$ limits are dependent on scram times as described in Section 4.2, exposure as described in Section 4.3, fuel type, FWT, and whether the plant is in TLO or SLO. TLO limits for ATRIUM 10XM fuel are given in Tables 4-3 through 4-11 and SLO limits for ATRIUM 10XM fuel are given in Tables 4-21 through 4-23. TLO limits for OPTIMA2 fuel are given in Tables 4-12 through 4-20 and SLO limits for OPTIMA2 fuel are given in Tables 4-24 through 4-26.

4.1.2. Flow-Dependent MCPR

Table 4-27 gives the OLMCPR limit as a function of the flow ($MCPR_f$) based on the applicable plant condition. These values are applicable to both ATRIUM 10XM and OPTIMA2 fuel.

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 15).

To utilize the OLMCPR limits for NSS in Tables 4-3, 4-6, 4-9, 4-12, 4-15, 4-18, 4-21, and 4-24, 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 OLMCPR limits for ISS in Tables 4-4, 4-7, 4-10, 4-13, 4-16, 4-19, 4-22, and 4-25, 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.

The "Average Control Rod Insertion Time" is defined as the sum of the control rod insertion times of all operable control rods divided by the number of operable control rods. Conservative adjustments to the NSS and ISS scram speeds were made to the analysis inputs to appropriately account for the effects of 1 stuck control rod and one additional control rod that is assumed to fail to scram (Reference 2).

To utilize the OLMCPR limits for TSSS in Tables 4-5, 4-8, 4-11, 4-14, 4-17, 4-20, 4-23, and 4-26, the control rod insertion time of each operable control rod at each control rod insertion fraction must be less than equal to the TSSS time shown on Table 4-1. The Technical Specifications allow operation with up to 12 "slow" and 1 stuck control rod. One additional control rod is assumed to fail to scram for the system transient analyses performed to establish $MCPR_p$ limits (Reference 2). Conservative adjustments to the TSSS scram speeds were made to the analysis inputs to appropriately account for the effects of the slow and stuck rods on scram reactivity (Reference 2).

For cases below 38.5% power (P_{bypass}), the results are relatively insensitive to scram speed, and only TSSS analyses were performed (Reference 2).

Table 4-1: Scram Times
(References 2 and 15)

Control Rod Insertion Fraction (%)	NSS (seconds)	ISS (seconds)	TSSS (seconds)
5	0.324	0.36	0.48
20	0.700	0.72	0.89
50	1.510	1.58	1.98
90	2.635	2.74	3.44

4.3. Exposure Dependent MCPR Limits

Exposure-dependent $MCPR_p$ limits were established to support operation from BOC to NEOC (CAVEX of 35,677 MWd/MTU), NEOC to EOFPLB (CAVEX of 36,814 MWd/MTU), and EOFPLB to EOCLB (CAVEX of 37,612 MWd/MTU) as defined by the CAVEX values listed in Table 4-2. Note that the thermal limits are based on CAVEX. The limits at a later exposure range can be used earlier in the cycle as they are the same or more conservative.

Table 4-2: Exposure Basis for Transient Analysis
(Reference 2)

Core Average Exposure (MWd/MTU)	Description
35,677	Break point for exposure-dependent $MCPR_p$ limits (NEOC)
36,814	Design basis rod patterns to EOFPL + 25 EFPD (EOFPLB)
37,612	EOCLB – Maximum licensing core exposure, including coastdown

4.4. Recirculation Pump ASD Settings

Technical Requirement Manual 2.1.a.1

Cycle 25 was analyzed with a slow flow excursion event assuming a failure of the recirculation flow control system such that the core flow increases slowly to the maximum flow physically permitted by the equipment, assumed to be 110% of rated core flow (Reference 2); therefore the recirculation pump ASD must be set to maintain core flow less than 110% (107.8 Mlb/hr) for all runout events.

Table 4-3: ATRIUM 10XM TLO MCPR$_p$ Limits for NSS Insertion Times, BOC to NEOC (35,677 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.51	2.51	2.22	1.97		1.46
	> 60	2.61	2.61	2.29			
TBVOOS	≤ 60	3.48	3.48	2.66	2.02		1.49
	> 60	3.53	3.53	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.52	2.52	2.29	2.27	1.95	1.46
	> 60	2.62	2.62	2.29			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.07		1.46
	> 60	2.69	2.69	2.32			
TBVOOS and FHOOS	≤ 60	3.60	3.60	2.75	2.11		1.49
	> 60	3.64	3.64	2.81			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.27	1.95	1.46
	> 60	2.69	2.69	2.32			

Table 4-4: ATRIUM 10XM TLO MCPR$_p$ Limits for ISS Insertion Times, BOC to NEOC (35,677 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.51	2.51	2.22	1.97		1.46
	> 60	2.61	2.61	2.29			
TBVOOS	≤ 60	3.48	3.48	2.66	2.02		1.49
	> 60	3.53	3.53	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.52	2.52	2.29	2.28	1.95	1.47
	> 60	2.62	2.62	2.29			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.08		1.46
	> 60	2.69	2.69	2.32			
TBVOOS and FHOOS	≤ 60	3.60	3.60	2.75	2.12		1.49
	> 60	3.64	3.64	2.81			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.28	1.95	1.47
	> 60	2.69	2.69	2.32			

Table 4-5: ATRIUM 10XM TLO $MCPR_p$ Limits for TSSS Insertion Times, BOC to NEOC (35,677 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	**25**	**≤ 38.5**	**> 38.5**	**70**	**100**
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.51	2.51	2.22	2.01		1.47
	> 60	2.61	2.61	2.29			
TBVOOS	≤ 60	3.48	3.48	2.66	2.04		1.52
	> 60	3.53	3.53	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.52	2.52	2.29	2.29	1.98	1.50
	> 60	2.62	2.62	2.29			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.15		1.49
	> 60	2.69	2.69	2.32			
TBVOOS and FHOOS	≤ 60	3.60	3.60	2.75	2.15		1.53
	> 60	3.64	3.64	2.81			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.29	1.98	1.50
	> 60	2.69	2.69	2.32			

Table 4-6: ATRIUM 10XM TLO $MCPR_p$ Limits for NSS Insertion Times, NEOC to EOFPLB (36,814 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	**25**	**≤ 38.5**	**> 38.5**	**70**	**100**
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.51	2.51	2.22	1.97		1.46
	> 60	2.61	2.61	2.29			
TBVOOS	≤ 60	3.48	3.48	2.66	2.02		1.49
	> 60	3.53	3.53	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.52	2.52	2.29	2.27	1.95	1.47
	> 60	2.62	2.62	2.29			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.07		1.46
	> 60	2.69	2.69	2.32			
TBVOOS and FHOOS	≤ 60	3.60	3.60	2.75	2.11		1.49
	> 60	3.64	3.64	2.81			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.27	1.95	1.47
	> 60	2.69	2.69	2.32			

Table 4-7: ATRIUM 10XM TLO $MCPR_p$ Limits for ISS Insertion Times, NEOC to EOFPLB (36,814 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.51	2.51	2.22	1.97		1.46
	> 60	2.61	2.61	2.29			
TBVOOS	≤ 60	3.48	3.48	2.66	2.02		1.49
	> 60	3.53	3.53	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.52	2.52	2.29	2.28	1.95	1.47
	> 60	2.62	2.62	2.29			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.08		1.46
	> 60	2.69	2.69	2.32			
TBVOOS and FHOOS	≤ 60	3.60	3.60	2.75	2.12		1.49
	> 60	3.64	3.64	2.81			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.28	1.95	1.47
	> 60	2.69	2.69	2.32			

Table 4-8: ATRIUM 10XM TLO $MCPR_p$ Limits for TSSS Insertion Times, NEOC to EOFPLB (36,814 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.51	2.51	2.22	2.01		1.47
	> 60	2.61	2.61	2.29			
TBVOOS	≤ 60	3.48	3.48	2.66	2.04		1.52
	> 60	3.53	3.53	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.52	2.52	2.29	2.29	1.98	1.50
	> 60	2.62	2.62	2.29			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.15		1.49
	> 60	2.69	2.69	2.32			
TBVOOS and FHOOS	≤ 60	3.60	3.60	2.75	2.15		1.53
	> 60	3.64	3.64	2.81			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.29	1.98	1.50
	> 60	2.69	2.69	2.32			

Table 4-9: ATRIUM 10XM TLO $MCPR_p$ Limits for NSS Insertion Times, EOFPLB to EOCLB (37,612 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.51	2.51	2.22	1.97		1.46
	> 60	2.61	2.61	2.29			
TBVOOS	≤ 60	3.48	3.48	2.66	2.02		1.49
	> 60	3.53	3.53	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.52	2.52	2.29	2.27	1.95	1.47
	> 60	2.62	2.62	2.29			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.07		1.46
	> 60	2.69	2.69	2.32			
TBVOOS and FHOOS	≤ 60	3.60	3.60	2.75	2.11		1.49
	> 60	3.64	3.64	2.81			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.27	1.95	1.47
	> 60	2.69	2.69	2.32			

Table 4-10: ATRIUM 10XM TLO $MCPR_p$ Limits for ISS Insertion Times, EOFPLB to EOCLB (37,612 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.51	2.51	2.22	1.97		1.46
	> 60	2.61	2.61	2.29			
TBVOOS	≤ 60	3.48	3.48	2.66	2.02		1.49
	> 60	3.53	3.53	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.52	2.52	2.29	2.28	1.95	1.48
	> 60	2.62	2.62	2.29			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.08		1.46
	> 60	2.69	2.69	2.32			
TBVOOS and FHOOS	≤ 60	3.60	3.60	2.75	2.12		1.49
	> 60	3.64	3.64	2.81			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.28	1.95	1.48
	> 60	2.69	2.69	2.32			

Table 4-11: ATRIUM 10XM TLO $MCPR_p$ Limits for TSSS Insertion Times, EOFPLB to EOCLB (37,612 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.51	2.51	2.22	2.01		1.48
	> 60	2.61	2.61	2.29			
TBVOOS	≤ 60	3.48	3.48	2.66	2.04		1.52
	> 60	3.53	3.53	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.52	2.52	2.29	2.29	1.98	1.50
	> 60	2.62	2.62	2.29			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.15		1.49
	> 60	2.69	2.69	2.32			
TBVOOS and FHOOS	≤ 60	3.60	3.60	2.75	2.15		1.53
	> 60	3.64	3.64	2.81			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.69	2.69	2.32	2.29	1.98	1.50
	> 60	2.69	2.69	2.32			

Table 4-12: OPTIMA2 TLO $MCPR_p$ Limits for NSS Insertion Times, BOC to NEOC (35,677 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.39	2.39	2.10	1.96		1.44
	> 60	2.59	2.59	2.33			
TBVOOS	≤ 60	3.21	3.21	2.47	2.03		1.46
	> 60	3.42	3.42	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.39	2.39	2.33	2.31	1.98	1.47
	> 60	2.59	2.59	2.33			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.53	2.53	2.17	2.08		1.44
	> 60	2.66	2.66	2.33			
TBVOOS and FHOOS	≤ 60	3.33	3.33	2.54	2.14		1.48
	> 60	3.54	3.54	2.82			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.53	2.53	2.33	2.31	1.98	1.47
	> 60	2.66	2.66	2.33			

Table 4-13: OPTIMA2 TLO $MCPR_p$ Limits for ISS Insertion Times, BOC to NEOC (35,677 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.39	2.39	2.10	1.97		1.44
	> 60	2.59	2.59	2.33			
TBVOOS	≤ 60	3.21	3.21	2.47	2.03		1.47
	> 60	3.42	3.42	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.39	2.39	2.33	2.31	1.98	1.48
	> 60	2.59	2.59	2.33			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.53	2.53	2.17	2.08		1.44
	> 60	2.66	2.66	2.33			
TBVOOS and FHOOS	≤ 60	3.33	3.33	2.54	2.14		1.48
	> 60	3.54	3.54	2.82			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.53	2.53	2.33	2.31	1.98	1.48
	> 60	2.66	2.66	2.33			

Table 4-14: OPTIMA2 TLO $MCPR_p$ Limits for TSSS Insertion Times, BOC to NEOC (35,677 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.39	2.39	2.10	1.99		1.48
	> 60	2.59	2.59	2.33			
TBVOOS	≤ 60	3.21	3.21	2.47	2.06		1.52
	> 60	3.42	3.42	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.39	2.39	2.33	2.33	2.01	1.51
	> 60	2.59	2.59	2.33			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.53	2.53	2.17	2.14		1.48
	> 60	2.66	2.66	2.33			
TBVOOS and FHOOS	≤ 60	3.33	3.33	2.54	2.17		1.52
	> 60	3.54	3.54	2.82			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.53	2.53	2.33	2.33	2.01	1.51
	> 60	2.66	2.66	2.33			

Table 4-15: OPTIMA2 TLO $MCPR_p$ Limits for NSS Insertion Times, NEOC to EOFPLB (36,814 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.39	2.39	2.10	1.96		1.46
	> 60	2.59	2.59	2.33			
TBVOOS	≤ 60	3.21	3.21	2.47	2.03		1.49
	> 60	3.42	3.42	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.39	2.39	2.34	2.31	1.98	1.50
	> 60	2.59	2.59	2.34			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.53	2.53	2.17	2.08		1.46
	> 60	2.66	2.66	2.33			
TBVOOS and FHOOS	≤ 60	3.33	3.33	2.54	2.14		1.50
	> 60	3.54	3.54	2.82			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.53	2.53	2.34	2.31	1.98	1.50
	> 60	2.66	2.66	2.34			

Table 4-16: OPTIMA2 TLO $MCPR_p$ Limits for ISS Insertion Times, NEOC to EOFPLB (36,814 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.39	2.39	2.10	1.97		1.47
	> 60	2.59	2.59	2.33			
TBVOOS	≤ 60	3.21	3.21	2.47	2.03		1.50
	> 60	3.42	3.42	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.39	2.39	2.34	2.31	1.99	1.50
	> 60	2.59	2.59	2.34			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.53	2.53	2.17	2.08		1.47
	> 60	2.66	2.66	2.33			
TBVOOS and FHOOS	≤ 60	3.33	3.33	2.54	2.14		1.50
	> 60	3.54	3.54	2.82			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.53	2.53	2.34	2.31	1.99	1.50
	> 60	2.66	2.66	2.34			

Table 4-17: OPTIMA2 TLO $MCPR_p$ Limits for TSSS Insertion Times, NEOC to EOFPLB (36,814 MWd/MTU CAVEX)

(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.39	2.39	2.10	1.99		1.50
	> 60	2.59	2.59	2.33			
TBVOOS	≤ 60	3.21	3.21	2.47	2.06		1.53
	> 60	3.42	3.42	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.39	2.39	2.34	2.34	2.02	1.53
	> 60	2.59	2.59	2.34			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.53	2.53	2.17	2.14		1.50
	> 60	2.66	2.66	2.33			
TBVOOS and FHOOS	≤ 60	3.33	3.33	2.54	2.17		1.54
	> 60	3.54	3.54	2.82			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.53	2.53	2.34	2.34	2.02	1.53
	> 60	2.66	2.66	2.34			

Table 4-18: OPTIMA2 TLO $MCPR_p$ Limits for NSS Insertion Times, EOFPLB to EOCLB (37,612 MWd/MTU CAVEX)

(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.39	2.39	2.10	1.96		1.47
	> 60	2.59	2.59	2.34			
TBVOOS	≤ 60	3.21	3.21	2.47	2.03		1.50
	> 60	3.42	3.42	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.39	2.39	2.34	2.31	1.99	1.51
	> 60	2.59	2.59	2.34			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.53	2.53	2.17	2.08		1.47
	> 60	2.66	2.66	2.34			
TBVOOS and FHOOS	≤ 60	3.33	3.33	2.54	2.14		1.50
	> 60	3.54	3.54	2.82			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.53	2.53	2.34	2.31	1.99	1.51
	> 60	2.66	2.66	2.34			

Table 4-19: OPTIMA2 TLO MCPR$_p$ Limits for ISS Insertion Times, EOFPLB to EOCLB (37,612 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.39	2.39	2.10	1.97		1.48
	> 60	2.59	2.59	2.34			
TBVOOS	≤ 60	3.21	3.21	2.47	2.03		1.51
	> 60	3.42	3.42	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.39	2.39	2.34	2.31	2.00	1.51
	> 60	2.59	2.59	2.34			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.53	2.53	2.17	2.08		1.48
	> 60	2.66	2.66	2.34			
TBVOOS and FHOOS	≤ 60	3.33	3.33	2.54	2.14		1.51
	> 60	3.54	3.54	2.82			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.53	2.53	2.34	2.31	2.00	1.51
	> 60	2.66	2.66	2.34			

Table 4-20: OPTIMA2 TLO MCPR$_p$ Limits for TSSS Insertion Times, EOFPLB to EOCLB (37,612 MWd/MTU CAVEX)
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (% rated)					
		0	25	≤ 38.5	> 38.5	70	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	2.39	2.39	2.10	1.99		1.52
	> 60	2.59	2.59	2.34			
TBVOOS	≤ 60	3.21	3.21	2.47	2.06		1.55
	> 60	3.42	3.42	2.75			
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	2.39	2.39	2.34	2.34	2.03	1.55
	> 60	2.59	2.59	2.34			
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	2.53	2.53	2.17	2.14		1.52
	> 60	2.66	2.66	2.34			
TBVOOS and FHOOS	≤ 60	3.33	3.33	2.54	2.17		1.55
	> 60	3.54	3.54	2.82			
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	2.53	2.53	2.34	2.34	2.03	1.55
	> 60	2.66	2.66	2.34			

Table 4-21: ATRIUM 10XM SLO $MCPR_p$ Limits for NSS Insertion Times, All Exposures
(Reference 2)

EOOS Condition	Core Power (% rated)				
	0	25	≤ 38.5	> 38.5	50
Base/TCV Stuck Closed/MSIVOOS	2.53	2.53	2.24	2.11	2.11
TBVOOS	3.50	3.50	2.68	2.11	2.11
TCV Slow Closure/PLUOOS/PCOOS	2.54	2.54	2.31	2.29	2.18
Base/TCV Stuck Closed/MSIVOOS and FHOOS	2.71	2.71	2.34	2.11	2.11
TBVOOS and FHOOS	3.62	3.62	2.77	2.13	2.11
TCV Slow Closure/PLUOOS/ PCOOS and FHOOS	2.71	2.71	2.34	2.29	2.18

Table 4-22: ATRIUM 10XM SLO $MCPR_p$ Limits for ISS Insertion Times, All Exposures
(Reference 2)

EOOS Condition	Core Power (% rated)				
	0	25	≤ 38.5	> 38.5	50
Base/TCV Stuck Closed/MSIVOOS	2.53	2.53	2.24	2.11	2.11
TBVOOS	3.50	3.50	2.68	2.11	2.11
TCV Slow Closure/PLUOOS/PCOOS	2.54	2.54	2.31	2.30	2.18
Base/TCV Stuck Closed/MSIVOOS and FHOOS	2.71	2.71	2.34	2.11	2.11
TBVOOS and FHOOS	3.62	3.62	2.77	2.14	2.11
TCV Slow Closure/PLUOOS/ PCOOS and FHOOS	2.71	2.71	2.34	2.30	2.18

Table 4-23: ATRIUM 10XM SLO $MCPR_p$ Limits for TSSS Insertion Times, All Exposures
(Reference 2)

EOOS Condition	Core Power (% rated)				
	0	25	≤ 38.5	> 38.5	50
Base/TCV Stuck Closed/MSIVOOS	2.53	2.53	2.24	2.11	2.11
TBVOOS	3.50	3.50	2.68	2.11	2.11
TCV Slow Closure/PLUOOS/PCOOS	2.54	2.54	2.31	2.31	2.20
Base/TCV Stuck Closed/MSIVOOS and FHOOS	2.71	2.71	2.34	2.17	2.11
TBVOOS and FHOOS	3.62	3.62	2.77	2.17	2.11
TCV Slow Closure/PLUOOS/ PCOOS and FHOOS	2.71	2.71	2.34	2.31	2.20

Table 4-24: OPTIMA2 SLO $MCPR_p$ Limits for NSS Insertion Times, All Exposures
(Reference 2)

EOOS Condition	Core Power (% rated)				
	0	25	≤ 38.5	> 38.5	50
Base/TCV Stuck Closed/MSIVOOS	2.41	2.41	2.14	2.14	2.14
TBVOOS	3.23	3.23	2.49	2.14	2.14
TCV Slow Closure/PLUOOS/PCOOS	2.41	2.41	2.36	2.33	2.22
Base/TCV Stuck Closed/MSIVOOS and FHOOS	2.55	2.55	2.19	2.14	2.14
TBVOOS and FHOOS	3.35	3.35	2.56	2.16	2.14
TCV Slow Closure/PLUOOS/ PCOOS and FHOOS	2.55	2.55	2.36	2.33	2.22

Table 4-25: OPTIMA2 SLO $MCPR_p$ Limits for ISS Insertion Times, All Exposures
(Reference 2)

EOOS Condition	Core Power (% rated)				
	0	25	≤ 38.5	> 38.5	50
Base/TCV Stuck Closed/MSIVOOS	2.41	2.41	2.14	2.14	2.14
TBVOOS	3.23	3.23	2.49	2.14	2.14
TCV Slow Closure/PLUOOS/PCOOS	2.41	2.41	2.36	2.33	2.22
Base/TCV Stuck Closed/MSIVOOS and FHOOS	2.55	2.55	2.19	2.14	2.14
TBVOOS and FHOOS	3.35	3.35	2.56	2.16	2.14
TCV Slow Closure/PLUOOS/ PCOOS and FHOOS	2.55	2.55	2.36	2.33	2.22

Table 4-26: OPTIMA2 SLO $MCPR_p$ Limits for TSSS Insertion Times, All Exposures
(Reference 2)

EOOS Condition	Core Power (% rated)				
	0	25	≤ 38.5	> 38.5	50
Base/TCV Stuck Closed/MSIVOOS	2.41	2.41	2.14	2.14	2.14
TBVOOS	3.23	3.23	2.49	2.14	2.14
TCV Slow Closure/PLUOOS/PCOOS	2.41	2.41	2.36	2.36	2.25
Base/TCV Stuck Closed/MSIVOOS and FHOOS	2.55	2.55	2.19	2.16	2.14
TBVOOS and FHOOS	3.35	3.35	2.56	2.19	2.14
TCV Slow Closure/PLUOOS/ PCOOS and FHOOS	2.55	2.55	2.36	2.36	2.25

Table 4-27: ATRIUM 10XM and OPTIMA2 $MCPR_f$ Limits
(Reference 2)

EOOS Condition*	Core Flow (% rated)	$MCPR_f$ Limit
Base Case/FHOOS/ PCOOS/PLUOOS/PCOOS+PLUOOS/TCV Slow Closure*	0	1.70
	35	1.70
	108	1.19
Any Scenario** with One MSIVOOS	0	1.88
	35	1.88
	108	1.19
Any Scenario** with TBVOOS	0	1.90
	35	1.90
	108	1.35
Any Scenario** with 1 Stuck Closed TCV/TSV	0	1.70
	35	1.70
	108	1.19

*See Section 8 for further operating restrictions.
**"Any Scenario" implies any other combination of allowable EOOS conditions that is not otherwise covered by this table.

5. Linear Heat Generation Rate

Technical Specification Sections 3.2.3 and 3.4.1

The TMOL at rated conditions for the OPTIMA2 and ATRIUM 10XM fuel is established in terms of the maximum LHGR as a function of peak pellet exposure. The LHGR limits for OPTIMA2 fuel are presented in Tables 5-1 through 5-8. The limits in Table 5-1 apply to OPTIMA2 lattices that do not require Gadolinia set down penalties. The limits in Tables 5-2 through 5-7 apply to OPTIMA2 lattices that do require Gadolinia set down penalties. The limits in Table 5-8 apply to the OPTIMA2 natural U blankets in lattices 81 and 89. The LHGR limits for ATRIUM 10XM fuel are presented in Table 5-9.

The power- and flow-dependent LHGR multipliers ($LHGRFAC_p$ and $LHGRFAC_f$) are applied directly to the LHGR limits to protect against fuel melting and overstraining of the cladding during an AOO (Reference 2). In all conditions, the margin to the LHGR limits is determined by applying the lowest multiplier from the applicable $LHGRFAC_p$ and $LHGRFAC_f$ multipliers for the power/flow statepoint of interest to the steady state LHGR limit (Reference 2).

$LHGRFAC_p$ and $LHGRFAC_f$ multipliers were established to support base case and all EOOS conditions for all Cycle 25 exposures and scram speeds. The $LHGRFAC_p$ multipliers for ATRIUM 10XM and OPTIMA2 are presented in Table 5-10 and Table 5-11, respectively. The $LHGRFAC_f$ multipliers for ATRIUM 10XM and OPTIMA2 are presented in Table 5-12 and Table 5-13, respectively.

Table 5-1: LHGR Limits for OPTIMA2 Lattices 137, 138, 139, 143, 144, 145, 146, 147, 148, 155, 156, 157, 161, 162, 163, 164, 165, 166
(References 22 and 24)

Peak Pellet Exposure (GWd/MTU)	LHGR Limit (kW/ft)
0.00	13.72
14.00	13.11
23.00	12.22
57.00	8.87
62.00	8.38
75.00	3.43

Table 5-2: LHGR Limits for OPTIMA2 Lattices 135, 141
(Reference 24)

Peak Pellet Exposure (GWd/MTU)	LHGR Limit (kW/ft)
0.000	13.72
14.000	13.11
23.000	12.22
23.001	12.09
32.000	11.21
32.001	11.33
57.000	8.87
62.000	8.38
75.000	3.43

Table 5-3: LHGR Limits for OPTIMA2 Lattices 131, 132, 133, 136, 140, 142
(Reference 24)

Peak Pellet Exposure (GWd/MTU)	LHGR Limit (kW/ft)
0.000	13.72
14.000	13.11
15.000	13.01
15.001	12.75
23.000	11.97
46.000	9.75
46.001	9.95
57.000	8.87
62.000	8.38
75.000	3.43

Table 5-4: LHGR Limits for OPTIMA2 Lattice 134
(Reference 24)

Peak Pellet Exposure (GWd/MTU)	LHGR Limit (kW/ft)
0.000	13.72
14.000	13.11
15.000	13.01
15.001	12.61
23.000	11.85
33.000	10.89
33.001	11.23
57.000	8.87
62.000	8.38
75.000	3.43

Table 5-5: LHGR Limits for OPTIMA2 Lattices 153, 159
(Reference 22)

Peak Pellet Exposure (GWd/MTU)	LHGR Limit (kW/ft)
0.000	13.72
14.000	13.11
23.000	12.22
23.001	12.10
33.000	11.12
33.001	11.23
57.000	8.87
62.000	8.38
75.000	3.43

Table 5-6: LHGR Limits for OPTIMA2 Lattices 149, 150, 151, 154, 158, 160
(Reference 22)

Peak Pellet Exposure (GWd/MTU)	LHGR Limit (kW/ft)
0.000	13.72
14.000	13.11
14.001	12.85
23.000	11.98
46.000	9.75
46.001	9.95
57.000	8.87
62.000	8.38
75.000	3.43

Table 5-7: LHGR Limits for OPTIMA2 Lattice 152
(Reference 22)

Peak Pellet Exposure (GWd/MTU)	LHGR Limit (kW/ft)
0.000	13.72
14.000	13.11
15.000	13.01
15.001	12.62
23.000	11.85
33.000	10.90
33.001	11.23
57.000	8.87
62.000	8.38
75.000	3.43

Table 5-8: LHGR Limits for OPTIMA2 Lattices 81, 89
(Reference 3)

Peak Pellet Exposure (GWd/MTU)	LHGR Limit (kW/ft)
0.000	11.96
14.000	11.43
23.000	10.66
57.000	8.87
62.000	8.38
75.000	3.43

Table 5-9: LHGR Limits for ATRIUM 10XM
(Reference 2)

Peak Pellet Exposure (GWd/MTU)	LHGR Limit (kW/ft)
0.0	14.1
18.9	14.1
74.4	7.4

Table 5-10: ATRIUM 10XM $LHGRFAC_p$ Multipliers
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (%rated)						
		0	25	≤ 38.5	> 38.5	50	90	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	0.52	0.52	0.60	0.65	0.70	0.95	1.00
	> 60	0.52	0.52	0.60				
TBVOOS	≤ 60	0.42	0.42	0.55	0.65	0.70	0.95	0.95
	> 60	0.39	0.39	0.50				
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	0.52	0.52	0.60	0.65	0.70	0.95	1.00
	> 60	0.52	0.52	0.60				
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	0.49	0.49	0.57	0.65	0.70	0.95	1.00
	> 60	0.49	0.49	0.57				
TBVOOS and FHOOS	≤ 60	0.37	0.37	0.54	0.65	0.70	0.95	0.95
	> 60	0.37	0.37	0.48				
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	0.49	0.49	0.57	0.65	0.70	0.95	1.00
	> 60	0.49	0.49	0.57				

Table 5-11: OPTIMA2 $LHGRFAC_p$ Multipliers
(Reference 2)

EOOS Condition	Core Flow (% rated)	Core Power (%rated)								
		0	25	≤ 38.5	> 38.5	50	60	70	80	100
Base/TCV Stuck Closed/MSIVOOS	≤ 60	0.62	0.62	0.68	0.72	0.76	0.81		0.85	1.00
	> 60	0.58	0.58	0.63						
TBVOOS	≤ 60	0.45	0.45	0.52	0.68	0.74	0.74		0.77	1.00
	> 60	0.44	0.44	0.52						
TCV Slow Closure/ PLUOOS/PCOOS	≤ 60	0.62	0.62	0.63	0.63	0.69		0.73	0.83	1.00
	> 60	0.58	0.58	0.63						
Base/TCV Stuck Closed/MSIVOOS and FHOOS	≤ 60	0.61	0.61	0.65	0.68	0.76	0.81		0.85	1.00
	> 60	0.58	0.58	0.63						
TBVOOS and FHOOS	≤ 60	0.44	0.44	0.52	0.67	0.74	0.74		0.77	1.00
	> 60	0.43	0.43	0.51						
TCV Slow Closure/ PLUOOS/PCOOS and FHOOS	≤ 60	0.61	0.61	0.63	0.63	0.69		0.73	0.83	1.00
	> 60	0.58	0.58	0.63						

Table 5-12: ATRIUM 10XM $LHGRFAC_f$ Multipliers
(Reference 2)

Core Flow (% rated)	$LHGRFAC_f$
0.0	0.57
35.0	0.57
75.0	1.00
108.0	1.00

Table 5-13: OPTIMA2 $LHGRFAC_f$ Multipliers
(Reference 2)

Core Flow (% rated)	$LHGRFAC_f$
0.0	0.27
20.0	0.43
40.0	0.60
80.0	1.00
100.0	1.00
108.0	1.00

6. Control Rod Block Setpoints

Technical Specification Sections 3.3.2.1 and 3.4.1

The Rod Block Monitor Upscale Instrumentation Setpoints are determined from the relationships shown in Table 6-1:

Table 6-1: Rod Block Monitor Upscale Instrumentation Setpoints
(Reference 17)

ROD BLOCK MONITOR UPSCALE TRIP FUNCTION	ALLOWABLE VALUE
Two Recirculation Loop Operation	$0.65\ W_d + 55.0\%$
Single Recirculation Loop Operation	$0.65\ W_d + 51.0\%$

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

The setpoint may be lower/higher and will still comply with the CRWE analysis because CRWE is analyzed unblocked (Reference 2).

7. Stability Protection Setpoints

Technical Specifications Section 3.3.1.3

The OPRM PBDA Trip Settings are provided in Table 7-1.

Table 7-1: OPRM PBDA Trip Settings
(Reference 2)

PBDA Trip Amplitude Setpoint (Sp)	Corresponding Maximum Confirmation Count Setpoint (Np)
1.13	15

The PBDA is the only OPRM setting credited in the safety analysis as documented in the licensing basis for the OPRM system (Methodology 3).

The OPRM PBDA trip settings are based, in part, on the cycle specific OLMCPR and the power/flow-dependent MCPR limits. Any change to the OLMCPR values and/or the power/flow-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 in Table 8-1.

Note that the following EOOS options have operational restrictions: all SLO, all EOOS options with 1 TCV/TSV stuck closed, and MSIVOOS. See Table 8-2 for specific restrictions.

Table 8-1: Modes of Operation
(Reference 2)

EOOS Option	Thermal Limit Set
Base Case	Base Case ➢ TLO or SLO ➢ Nominal FWT or FHOOS
PLUOOS	PLUOOS/TCV Slow Closure ➢ TLO or SLO ➢ Nominal FWT or FHOOS
TBVOOS	TBVOOS ➢ TLO or SLO ➢ Nominal FWT or FHOOS
TCV Slow Closure	PLUOOS/TCV Slow Closure ➢ TLO or SLO ➢ Nominal FWT or FHOOS
1 TCV/TSV Stuck Closed	Base Case ➢ TLO or SLO ➢ Nominal FWT or FHOOS
PLUOOS and 1 TCV/TSV Stuck Closed	PLUOOS/TCV Slow Closure ➢ TLO for Nominal FWT or FHOOS ➢ SLO for Nominal FWT*
PCOOS	PLUOOS/TCV Slow Closure ➢ TLO or SLO ➢ Nominal FWT or FHOOS
PCOOS + PLUOOS	PLUOOS/TCV Slow Closure ➢ TLO for Nominal FWT or FHOOS ➢ SLO for Nominal FWT*
PCOOS and 1 TCV/TSV Stuck Closed	PLUOOS/TCV Slow Closure ➢ TLO for Nominal FWT or FHOOS ➢ SLO for Nominal FWT*
One MSIVOOS	MSIVOOS ➢ TLO or SLO ➢ Nominal FWT or FHOOS

*FHOOS cannot be applied to SLO for the case of PLUOOS and 1 TCV/TSV stuck closed, PCOOS and PLUOOS, or PCOOS and 1 TCV/TSV stuck closed.

Common Notes:

1. All modes are allowed for operation at MELLLA, ICF (up to 108% rated core flow), and coastdown subject to the power restrictions in Table 8-2 (Reference 2). The licensing analysis supports full power operation to EOCLB (37,612 MWd/MTU CAVEX). Note that this value includes coastdown, where full power operation is not expected. The minimum coastdown power level cannot exceed 40% per Reference 1. Each OOS Option may be combined with each of the following conditions (Reference 2):
    a. Up to 40% of the TIP channels OOS or the equivalent number of TIP channels, using the guidance in Reference 19 for startup with TIP machines OOS
    b. Up to 50% of the LPRMs OOS
    c. An LPRM calibration frequency of up to 2500 EFPH

2. Nominal FWT results are valid for application within a +10°F/-30°F temperature band around the nominal FWT curve (Reference 2). For operation outside of nominal FWT, a FWT reduction of between 30°F and 120°F is supported for all FHOOS conditions listed in Table 8-1 for cycle operation through EOCLB (Reference 2). The restriction requires that for a FWT reduction greater than 100°F, operation needs to be restricted to less than the 100% load line.

3. The base case and EOOS limits and multipliers support operation with 8 of the 9 turbine bypass valves operational (i.e., one bypass valve out of service) with the exception of the TBVOOS condition in which all bypass valves are inoperable (Reference 2). Use of the response curve in TRM Appendix H supports operation with any single TBV OOS. TRM Appendix H facilitates analysis with one valve OOS in that the capacity at 0.5 seconds from start of TSV closure is equivalent to the total capacity with eight out of the nine valves in service (Reference 9). The analyses also support Turbine Bypass flow of 29.8% of vessel rated steam flow, equivalent to one TBV OOS (or partially closed TBVs equivalent to one closed TBV), if the assumed opening profile for the remaining TBVs is met. If the opening profile is NOT met, or if the TBV system CANNOT pass an equivalent of 29.8% of vessel rated steam flow, utilize the TBVOOS condition.

4. TBVOOS assumes that all the TBVs do <u>not</u> trip open on TCV fast closure or TSV closure and that all TBVs are <u>not</u> capable of opening via the pressure control system (Reference 6). Steam relief capacity is defined in Reference 9.

Table 8-2: Core Operational Restrictions for EOOS Conditions
(Reference 2)

EOOS Condition	Core Flow (% of Rated)	Core Thermal Power (% of Rated Power)	Rod Line (%)
1 TCV Stuck Closed*, PCOOS and 1 TCV Stuck Closed*, PLUOOS and 1 TCV Stuck Closed*	N/A	< 75	< 80
One MSIVOOS	N/A	< 75	N/A
SLO	< 51	< 50	N/A

* Also applicable to one TSV stuck closed.

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. Removed.

2. GE Topical Report NEDE-24011-P-A, Revision 15, "General Electric Standard Application for Reactor Fuel (GESTAR)," September 2005.

3. GE Topical Report NEDO-32465-A, Revision 0, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," August 1996.

4. Westinghouse Topical Report CENPD-300-P-A, Revision 0, "Reference Safety Report for Boiling Water Reactor Reload Fuel," July 1996.

5. Removed.

6. Westinghouse Report WCAP-15682-P-A, Revision 0, "Westinghouse BWR ECCS Evaluation Model: Supplement 2 to Code Description, Qualification and Application," April 2003.

7. Westinghouse Report WCAP-16078-P-A, Revision 0, "Westinghouse BWR ECCS Evaluation Model: Supplement 3 to Code Description, Qualification and Application to SVEA-96 Optima2 Fuel," November 2004.

8. Westinghouse Topical Report WCAP-15836-P-A, Revision 0, "Fuel Rod Design Methods for Boiling Water Reactors – Supplement 1," April 2006.

9. Westinghouse Topical Report WCAP-15942-P-A, Revision 0, "Fuel Assembly Mechanical Design Methodology for Boiling Water Reactors Supplement 1 to CENP-287," March 2006.

10. Westinghouse Topical Report CENPD-390-P-A, Revision 0, "The Advanced PHOENIX and POLCA Codes for Nuclear Design of Boiling Water Reactors," December 2000.

11. Removed.

12. Removed.

13. Removed.

14. Exxon Nuclear Company Report XN-NF-81-58(P)(A), Revision 2 and Supplements 1 and 2, "RODEX2 Fuel Rod Thermal-Mechanical Response Evaluation Model," March 1984.

15. Advanced Nuclear Fuels Corporation Report ANF-89-98(P)(A), Revision 1 and Supplement 1, "Generic Mechanical Design Criteria for BWR Fuel Designs," May 1995.

16. Siemens Power Corporation Report EMF-85-74(P), Revision 0 Supplement 1 (P)(A) and Supplement 2 (P)(A), "RODEX2A (BWR) Fuel Rod Thermal-Mechanical Evaluation Model," February 1998.

17. AREVA NP Topical Report BAW-10247PA, Revision 0, "Realistic Thermal-Mechanical Fuel Rod Methodology for Boiling Water Reactors," February 2008.

18. Exxon Nuclear Company Topical Report XN-NF-80-19(P)(A), Volume 1 Revision 0 and Supplements 1 and 2, "Exxon Nuclear Methodology for Boiling Water Reactors – Neutronic Methods for Design and Analysis," March 1983.

19. Exxon Nuclear Company Topical Report XN-NF-80-19(P)(A), Volume 4 Revision 1, "Exxon Nuclear Methodology for Boiling Water Reactors: Application of the ENC Methodology for BWR Reloads," June 1986.

20. Exxon Nuclear Company Topical Report XN-NF-80-19(P)(A), Volume 3 Revision 2, "Exxon Nuclear Methodology for Boiling Water Reactors, THERMEX: Thermal Limits Methodology Summary Description," January 1987.

21. Siemens Power Corporation Topical Report EMF-2158(P)(A), Revision 0, "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2," October 1999.

22. Siemens Power Corporation Report EMF-2245(P)(A), Revision 0, "Application of Siemens Power Corporation's Critical Power Correlations to Co-Resident Fuel," August 2000.

23. AREVA NP Report EMF-2209(P)(A), Revision 3, "SPCB Critical Power Correlation," September 2009.

24. AREVA Topical Report ANP-10298P-A, Revision 1, "ACE/ATRIUM 10XM Critical Power Correlation," March 2014.

25. AREVA NP Topical Report ANP-10307PA, Revision 0, "AREVA MCPR Safety Limit Methodology for Boiling Water Reactors," June 2011.

26. Exxon Nuclear Company Report XN-NF-84-105(P)(A), Volume 1 Revision 0 and Volume 1 Supplements 1 and 2, "XCOBRA-T: A Computer Code for BWR Transient Thermal-Hydraulic Core Analysis," February 1987.

27. Advanced Nuclear Fuels Corporation Report ANF-913(P)(A), Volume 1 Revision 1 and Volume 1 Supplements 2, 3, and 4, "COTRANSA2: A Computer Program for Boiling Water Reactor Transient Analyses," August 1990.

28. Framatome ANP Report EMF-2361(P)(A), Revision 0, "EXEM BWR-2000 ECCS Evaluation Model," May 2001.

29. Siemens Power Corporation Report EMF-2292 (P)(A), Revision 0, "ATRIUM™-10: Appendix K Spray Heat Transfer Coefficients," September 2000.

30. Framatome ANP Topical Report ANF-1358(P)(A), Revision 3, "The Loss of Feedwater Heating Transient in Boiling Water Reactors," September 2005.

31. Siemens Power Corporation Topical Report EMF-CC-074(P)(A), Volume 4 Revision 0, "BWR Stability Analysis: Assessment of STAIF with Input from MICROBURN-B2," August 2000.

10. References

1. Exelon Generation Company, LLC, Docket No. 50-249, Dresden Nuclear Power Station, Unit 3, Renewed Facility Operating License, License No. DPR-25.

2. AREVA Report ANP-3516P Revision 0, "Dresden Unit 3 Cycle 25 Reload Safety Analysis," September 2016.

3. Westinghouse Report NF-BEX-14-94, "Dresden Nuclear Power Station Unit 3 Cycle 24 Reload Licensing Report", September 2014.

4. Westinghouse Letter NF-BEX-14-50 "Bundle Design Report for Dresden 3 Cycle 24", April 8, 2014.

5. Westinghouse Report NF-BEX-14-77-NP Revision 0, "Dresden Nuclear Power Station Unit 3 Cycle 24 MAPLHGR Report", September 2014.

6. Exelon TODI ES1500011 Revision 0, "Equipment Out of Service Description for Transition to AREVA Fuel – Dresden," May 20, 2015.

7. Westinghouse Letter NF-BEX-12-66 "Bundle Design Report for Dresden 3 Cycle 23," April 11, 2012.

8. Westinghouse Report NF-BEX-12-100-NP Revision 1, "Dresden Nuclear Power Station Unit 3 Cycle 23 MAPLHGR Report", May 2015.

9. Exelon TODI ES1600005 Revision 1, "Dresden Unit 3 Cycle 25 Plant Parameters Document," June 17, 2016.

10. Removed.

11. Removed.

12. Removed.

13. Removed.

14. Removed.

15. Exelon Technical Specifications for Dresden 2 and 3, Table 3.1.4-1, "Control Rod Scram Times."

16. Removed.

17. GE Nuclear Energy Design Analysis GE DRF C51-00217-01, "Instrument Setpoint Calculation Nuclear Instrumentation Rod Block Monitor," July 30, 2012.

18. Removed.

19. FANP Letter, NJC:04:031/FAB04-496, "Startup with TIP Equipment Out of Service," April 20, 2004. (Exelon EC 348897-000)

20. Removed.

21. 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.

22. Westinghouse Letter NF-BEX-15-82, "Linear Heat Generation Rate Limits for Fuel Loaded in Dresden Unit 3 Cycle 24," May 12, 2015.

23. Removed.

24. Exelon Design Analysis DRE16-0006 Revision 0, "LHGR Penalties for Fuel Loaded in D3C23," March 1, 2016.