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

Subject: Core Operating Limits Report for Unit 3 Cycle 22, Revision 0

The purpose of this letter is to transmit the Core Operating Limits Report (COLR) for Dresden Nuclear Power Station (DNPS) Unit 3 operating cycle 22 (D3C22), Revision 0, in accordance with Technical Specifications Section 5.6.5, "CORE OPERATING LIMITS REPORT (COLR)."

Due to an error in a Westinghouse approved code, this COLR is only valid to 10,000 MWd/MTU cycle exposure.

There are no regulatory commitments contained in this letter.

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

Respectfully,

Tim Hanley
Site Vice President
Dresden Nuclear Power Station

Attachment: COLR for Dresden Unit 3 Cycle 22, Revision 0

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

A001
NRR

Attachment

COLR

for

Dresden Unit 3 Cycle 22

Revision 0

Core Operating Limits Report

for

Dresden Unit 3 Cycle 22

Revision 0

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1. Terms and Definitions

APLHGR	Average planar linear heat generation rate
DLO	Dual loop operation
EFPH	Effective full power hours
EOC	End of cycle
EOOS	Equipment out of service
FFTR	Final feedwater temperature reduction
FWHOOS	Feedwater heater out of service
FW	Feedwater
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
MELLLA	Maximum extended load line limit analysis
MCPR	Minimum critical power ratio
MCPR(F)	Flow dependent MCPR
MCPR(P)	Power dependent MCPR
MSIV	Main steam isolation valve
NFWT	Nominal feedwater temperature
NRC	Nuclear Regulatory Commission
NSS	Nominal scram speed
OLMCPR	Operating limit minimum critical power ratio
OPRM	Oscillation power range monitor
PBDA	Period based detection algorithm
PLUOOS	Power load unbalance out of service
PCOOS	Pressure controller out of service
RBM	Rod block monitor
RFWT	Reduced feedwater temperature
RWE	Rod withdrawal error
RWCU	Reactor water cleanup
SLMCPR	Safety limit minimum critical power ratio
SLO	Single loop operation
TBVOOS	Turbine bypass valve out of service
TBV	Turbine bypass valve
TCV	Turbine control valve
TIP	Traversing incore probe
TSSS	Technical Specification scram speed
TSV	Turbine stop valve
TSVOOS	Turbine stop valve out of service

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.

The Modes of Operation in section 8 and the limits provided for OLMCPR in section 4 and the OPRM stability protection setpoints in section 7 are only valid to a cycle exposure of 10000 MWd/MTU per reference 3 and reference 22 limitations.

Rated core flow is 98 Mlb/hr. Operation up to 108% rated flow is analyzed but not licensed for this cycle. 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, all rods out condition with plant power slowly lowering to a lesser value while core flow is held constant.

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 either NSS, ISS, or TSSS. Only MCPR limits vary with scram speed.

Westinghouse methods used in slow and fast transient analyses as well as SLMCPR calculations are sufficient to cover the small effect of the asymmetric feedwater temperature for all modes of operation as supported by the reload analysis. Therefore, all thermal limits for all fuel types with all flexibility and EOOS options remain valid with respect to the effect of the asymmetric feedwater temperature. (Reference 3).

3. Average Planar Linear Heat Generation Rate

Lattice-specific exposure-dependent MAPLHGR values are provided in Tables 3-2 through 3-39. The lattice MAPLHGR limit is the product of the exposure dependent MAPLHGR value from Tables 3-2 through 3-39 and the DLO or SLO multiplier listed in Table 3-1.

Table 3-1 MAPLHGR DLO or SLO multiplier
(References 5, 8 and 9)

Fuel Type	DLO Multiplier	SLO Multiplier
Optima2	1.00	0.86

Table 3-2 MAPLHGR for bundle/lattice:
Opt2-3.90-10G8.00/6.00-4GZ8.00-2G6.00
Opt2-3.88-10G8.00/6.00-6GZ8.00-2G6.00
Opt2-3.93-14GZ6.00
Opt2-3.93-16GZ8.00-2G6.00
Opt2-4.03-13G8.00
Opt2-4.02-18GZ8.00-14GZ5.50
Opt2-4.03-16GZ8.00-14GZ5.50
Opt2-4.07-14G5.50-2GZ5.50
Lattices 081 and 089
(Reference 4, 5, 7 and 10)

Lattice 081: Opt2-B0.71 089: Opt2-T0.71	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	7.5
72000	7.5

Table 3-3 MAPLHGR for bundle/lattice:
Opt2-3.90-10G8.00/6.00-4GZ8.00-2G6.00
Lattice 082
(References 9 and 10)

Lattice 082: Opt2-B4.28-12G8.00-2G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	10.19
10000	9.59
20000	9.59
24000	9.74
58000	9.74
70000	8.37

Table 3-4 MAPLHGR for bundle/lattice:
Opt2-3.90-10G8.00/6.00-4GZ8.00-2G6.00
Lattices 083 and 084
(References 9 and 10)

Lattices 083: Opt2-B4.26-14G8.00-2G6.00 084: Opt2-BE4.37-13G8.00-2G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.89
7500	9.47
17500	9.47
24000	9.75
58000	9.75
70000	8.37

Table 3-5 MAPLHGR for bundle/lattice:
Opt2-3.90-10G8.00/6.00-4GZ8.00-2G6.00
Lattices 085 and 086
(References 9 and 10)

Lattices 085: Opt2-M4.37-13G8.00-2G6.00 086: Opt2-ME4.36-11G8.00-2G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	10.16
7500	9.64
17500	9.64
24000	9.88
58000	9.88
70000	8.50

Table 3-6 MAPLHGR for bundle/lattice:
Opt2-3.90-10G8.00/6.00-4GZ8.00-2G6.00
Lattice 087
(References 9 and 10)

Lattice 087: Opt2-T4.36-11G8.00-2G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	10.80
10000	9.95
20000	9.95
24000	10.15
58000	10.15
70000	8.78

Table 3-7 MAPLHGR for bundle/lattice:
Opt2-3.90-10G8.00/6.00-4GZ8.00-2G6.00
Lattice 088
(References 9 and 10)

Lattice 088: Opt2-T4.37-12G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	11.16
7500	10.15
58000	10.15
70000	8.78

Table 3-8 MAPLHGR for bundle/lattice:
Opt2-3.88-10G8.00/6.00-6GZ8.00-2G6.00
Lattice 090
(References 9 and 10)

Lattice 090: Opt2-B4.26-14G8.00-2G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.83
7500	9.43
17500	9.43
24000	9.76
58000	9.76
70000	8.39

Table 3-9 MAPLHGR for bundle/lattice:
Opt2-3.88-10G8.00/6.00-6GZ8.00-2G6.00
Lattices 091 and 092
(References 9 and 10)

Lattices 091: Opt2-B4.24-16G8.00-2G6.00 092: Opt2-BE4.36-14G8.00-2G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.57
7500	9.30
17500	9.30
24000	9.76
58000	9.76
70000	8.39

Table 3-10 MAPLHGR for bundle/lattice:
Opt2-3.88-10G8.00/6.00-6GZ8.00-2G6.00
Lattices 093 and 094
(References 9 and 10)

Lattices 093: Opt2-M4.36-14G8.00-2G6.00 094: Opt2-ME4.35-12G8.00-2G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.92
7500	9.51
17500	9.51
24000	9.89
58000	9.89
70000	8.51

Table 3-11 MAPLHGR for bundle/lattice:
Opt2-3.88-10G8.00/6.00-6GZ8.00-2G6.00
Lattice 095
(References 9 and 10)

Lattice 095: Opt2-T4.35-12G8.00-2G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	10.51
7500	9.87
17500	9.87
24000	10.17
58000	10.17
70000	8.79

Table 3-12 MAPLHGR for bundle/lattice:
Opt2-3.88-10G8.00/6.00-6GZ8.00-2G6.00
Lattice 096
(References 9 and 10)

Lattice 096: Opt2-T4.37-12G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	11.04
7500	10.22
58000	10.22
70000	8.84

Table 3-13 MAPLHGR for bundle/lattice:
Opt2-3.93-14GZ6.00
Lattices 097 and 098
(References 9 and 10)

Lattices 097: Opt2-B4.31-14G6.00 098: Opt2-BE4.41-14G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	10.24
7500	9.77
58000	9.77
70000	8.40

Table 3-14 MAPLHGR for bundle/lattice:
Opt2-3.93-14GZ6.00
Lattices 099 and 100
(References 9 and 10)

Lattices 099: Opt2-M4.41-14G6.00 100: Opt2-ME4.41-12G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	10.40
7500	9.85
58000	9.85
70000	8.48

Table 3-15 MAPLHGR for bundle/lattice:
Opt2-3.93-14GZ6.00
Lattice 101
(References 9 and 10)

Lattice 101: Opt2-T4.41-12G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	11.04
7500	10.16
58000	10.16
70000	8.78

Table 3-16 MAPLHGR for bundle/lattice:
Opt2-3.93-16GZ8.00-2G6.00
Lattice 102
(References 6 and 7)

Lattice 102: Opt2-B4.30-16G8.00-2G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.59
7500	9.44
17500	9.44
24000	9.69
58000	9.69
70000	8.32

Table 3-17 MAPLHGR for bundle/lattice:
Opt2-3.93-16GZ8.00-2G6.00
Lattice 103
(References 6 and 7)

Lattice 103: Opt2-B4.31-14G8.00-2G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.75
7500	9.44
17500	9.44
24000	9.71
58000	9.71
70000	8.34

Table 3-18 MAPLHGR for bundle/lattice:
Opt2-3.93-16GZ8.00-2G6.00
Lattices 104 and 105
(References 6 and 7)

Lattices 104: Opt2-BE4.41-14G8.00-2G6.00 105: Opt2-M4.41-14G8.00-2G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.84
7500	9.52
17500	9.52
24000	9.84
58000	9.84
70000	8.47

Table 3-19 MAPLHGR for bundle/lattice:
Opt2-3.93-16GZ8.00-2G6.00
Lattices 106, 107, and 108
(References 6 and 7)

Lattice 106: Opt2-ME4.39-14G8.00-2G6.00 107: Opt2-T4.39-14G8.00-2G6.00 108: Opt2-T4.39-16G6.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	10.01
7500	9.71
17500	9.71
24000	10.14
58000	10.14
70000	8.77

Table 3-20 MAPLHGR for bundle/lattice:
Opt2-4.03-13G8.00
Lattice 109
(References 6 and 7)

Lattice 109: Opt2-B4.42-13G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	10.16
10000	9.69
58000	9.69
70000	8.31

Table 3-21 MAPLHGR for bundle/lattice:
Opt2-4.03-13G8.00
Lattices 110 and 111
(References 6 and 7)

Lattice 110: Opt2-BE4.52-13G8.00 111: Opt2-M4.52-13G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	10.27
10000	9.80
58000	9.80
70000	8.42

Table 3-22 MAPLHGR for bundle/lattice:
Opt2-4.03-13G8.00
Lattices 112 and 113
(References 6 and 7)

Lattice 112: Opt2-ME4.51-13G8.00 113: Opt2-T4.51-13G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	10.53
10000	10.04
58000	10.04
70000	8.67

Table 3-23 MAPLHGR for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Lattice 114
(References 4 and 5)

Lattice 114: Opt2-B4.43-18G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	8.67
2500	8.85
5000	8.99
7500	9.07
10000	9.11
12000	9.15
15000	9.32
17000	9.40
20000	9.57
22000	9.71
24000	9.76
30000	9.67
36000	9.62
42000	9.62
50000	9.69
60000	9.67
72000	9.88

Table 3-24 MAPLHGR for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Lattice 115
(References 4 and 5)

Lattice 115: Opt2-BE4.52-18G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	8.71
2500	8.87
5000	9.03
7500	9.12
10000	9.17
12000	9.22
15000	9.40
17000	9.49
20000	9.67
22000	9.82
24000	9.84
30000	9.75
36000	9.70
42000	9.70
50000	9.74
60000	9.70
72000	9.93

Table 3-25 MAPLHGR for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Lattice 116
(References 4 and 5)

Lattice 116: Opt2-M4.52-18G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	8.68
2500	8.86
5000	9.01
7500	9.12
10000	9.18
12000	9.23
15000	9.41
17000	9.51
20000	9.69
22000	9.84
24000	9.84
30000	9.74
36000	9.69
42000	9.70
50000	9.72
60000	9.68
72000	9.93

Table 3-26 MAPLHGR for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Lattice 117
(References 4 and 5)

Lattice 117: Opt2-ME4.47-18G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	8.80
2500	8.99
5000	9.14
7500	9.26
10000	9.30
12000	9.38
15000	9.56
17000	9.69
20000	10.00
22000	10.03
24000	10.02
30000	9.94
36000	9.88
42000	9.89
50000	9.84
60000	9.85
72000	10.19

Table 3-27 MAPLHGR for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Lattice 118
(References 4 and 5)

Lattice 118: Opt2-T4.47-18G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	8.85
2500	9.03
5000	9.16
7500	9.23
10000	9.25
12000	9.31
15000	9.50
17000	9.66
20000	10.02
22000	10.01
24000	10.00
30000	9.92
36000	9.87
42000	9.86
50000	9.80
60000	9.82
72000	10.19

Table 3-28 MAPLHGR for bundle/lattice:
Opt2-4.02-18GZ8.00-14GZ5.50
Lattice 119
(References 4 and 5)

Lattice 119: Opt2-T4.50-14G5.50	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.64
2500	9.77
5000	9.81
7500	9.74
10000	9.67
12000	9.70
15000	10.00
17000	10.14
20000	10.16
22000	10.15
24000	10.13
30000	10.03
36000	9.97
42000	9.95
50000	9.89
60000	9.90
72000	10.26

Table 3-29 MAPLHGR for bundle/lattice:
Opt2-4.03-16GZ8.00-14GZ5.50
Lattice 120
(References 4 and 5)

Lattice 120: Opt2-B4.44-16G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	8.96
2500	9.11
5000	9.21
7500	9.25
10000	9.25
12000	9.26
15000	9.38
17000	9.44
20000	9.56
22000	9.69
24000	9.78
30000	9.70
36000	9.65
42000	9.66
50000	9.70
60000	9.66
72000	9.89

Table 3-30 MAPLHGR for bundle/lattice:
Opt2-4.03-16GZ8.00-14GZ5.50
Lattice 121
(References 4 and 5)

Lattice 121: Opt2-BE4.53-16G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.01
2500	9.15
5000	9.26
7500	9.31
10000	9.31
12000	9.34
15000	9.46
17000	9.53
20000	9.66
22000	9.80
24000	9.86
30000	9.79
36000	9.74
42000	9.74
50000	9.75
60000	9.70
72000	9.93

Table 3-31 MAPLHGR for bundle/lattice:
Opt2-4.03-16GZ8.00-14GZ5.50
Lattice 122
(References 4 and 5)

Lattice 122: Opt2-M4.53-16G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	8.99
2500	9.13
5000	9.25
7500	9.32
10000	9.32
12000	9.35
15000	9.47
17000	9.54
20000	9.67
22000	9.81
24000	9.86
30000	9.78
36000	9.73
42000	9.73
50000	9.71
60000	9.68
72000	9.94

Table 3-32 MAPLHGR for bundle/lattice:
Opt2-4.03-16GZ8.00-14GZ5.50
Lattice 123
(References 4 and 5)

Lattice 123: Opt2-ME4.49-16G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.14
2500	9.29
5000	9.40
7500	9.48
10000	9.47
12000	9.52
15000	9.63
17000	9.72
20000	9.98
22000	10.05
24000	10.04
30000	9.98
36000	9.92
42000	9.88
50000	9.83
60000	9.84
72000	10.19

Table 3-33 MAPLHGR for bundle/lattice: Opt2-4.03-16GZ8.00-14GZ5.50 Lattice 124
(References 4 and 5)

Lattice 124: Opt2-T4.49-16G8.00	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.18
2500	9.33
5000	9.43
7500	9.45
10000	9.42
12000	9.45
15000	9.57
17000	9.69
20000	9.99
22000	10.03
24000	10.03
30000	9.97
36000	9.91
42000	9.85
50000	9.79
60000	9.81
72000	10.20

Table 3-34 MAPLHGR for bundle/lattice:
Opt2-4.07-14G5.50-2GZ5.50
Lattice 125
(References 4 and 5)

Lattice 125: Opt2-B4.48-16G5.50	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	8.92
2500	9.08
5000	9.22
7500	9.30
10000	9.33
12000	9.36
15000	9.53
17000	9.68
20000	9.84
22000	9.89
24000	9.87
30000	9.77
36000	9.71
42000	9.71
50000	9.76
60000	9.74
72000	9.94

Table 3-35 MAPLHGR for bundle/lattice:
Opt2-4.07-14G5.50-2GZ5.50
Lattice 126
(References 4 and 5)

Lattice 126: Opt2-BE4.57-16G5.50	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	8.96
2500	9.12
5000	9.28
7500	9.36
10000	9.40
12000	9.44
15000	9.63
17000	9.79
20000	9.96
22000	9.98
24000	9.96
30000	9.86
36000	9.80
42000	9.79
50000	9.84
60000	9.78
72000	9.99

Table 3-36 MAPLHGR for bundle/lattice:
Opt2-4.07-14G5.50-2GZ5.50
Lattice 127
(References 4 and 5)

Lattice 127: Opt2-M4.57-16G5.50	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	8.95
2500	9.11
5000	9.27
7500	9.37
10000	9.40
12000	9.45
15000	9.64
17000	9.81
20000	9.97
22000	9.98
24000	9.96
30000	9.86
36000	9.79
42000	9.79
50000	9.81
60000	9.76
72000	9.99

Table 3-37 MAPLHGR for bundle/lattice:
Opt2-4.07-14G5.50-2GZ5.50
Lattice 128
(References 4 and 5)

Lattice 128: Opt2-ME4.54-16G5.50	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.10
2500	9.27
5000	9.43
7500	9.54
10000	9.55
12000	9.63
15000	9.93
17000	10.13
20000	10.20
22000	10.19
24000	10.16
30000	10.06
36000	9.99
42000	9.99
50000	9.96
60000	9.93
72000	10.25

Table 3-38 MAPLHGR for bundle/lattice:
Opt2-4.07-14G5.50-2GZ5.50
Lattice 129
(References 4 and 5)

Lattice 129: Opt2-T4.54-16G5.50	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.14
2500	9.30
5000	9.45
7500	9.49
10000	9.51
12000	9.57
15000	9.93
17000	10.14
20000	10.19
22000	10.17
24000	10.15
30000	10.05
36000	9.98
42000	9.98
50000	9.92
60000	9.91
72000	10.25

Table 3-39 MAPLHGR for bundle/lattice:
Opt2-4.07-14G5.50-2GZ5.50
Lattice 130
(References 4 and 5)

Lattice 130: Opt2-T4.55-14G5.50	
Average Planar Exposure (MWd/MTU)	**MAPLHGR (kW/ft)**
0	9.50
2500	9.62
5000	9.72
7500	9.70
10000	9.65
12000	9.66
15000	9.94
17000	10.12
20000	10.20
22000	10.19
24000	10.17
30000	10.06
36000	10.00
42000	9.98
50000	9.92
60000	9.91
72000	10.26

4. Operating Limit Minimum Critical Power Ratio

The Operating Limit Minimum Critical Power Ratios (OLMCPRs) for D3C22 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 D3C22 were determined to be 1.12 and 1.14, respectively (Reference 3), which are unchanged from the NRC-approved values for the previous operating cycle (i.e., D3C21).

In determining the SLMCPR values for D3C22, 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 18 and 19). The application of these methodologies was previously approved by the NRC in license amendment 213 to Renewed Facility Operating License DPR-25 (Reference 17).

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 38.5% core thermal power, MCPR(P) is shown in Tables 4-8 and 4-9. For operation at greater than 38.5% core thermal power, MCPR(P) is determined by multiplying the applicable rated condition OLMCPR limit shown in Tables 4-2 through 4-7 by the applicable MCPR multiplier K(P) given in Tables 4-8 and 4-9. For operation at exactly 38.5% core thermal power, MCPR(P) is the higher of either of the two methods evaluated at 38.5% core thermal power.

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. Automatic Flow Control MCPR Limits

Automatic Flow Control MCPR Limits are not provided.

4.3. Scram Time

TSSS, ISS, and NSS refer to scram speeds. TSSS is the Technical Specification Scram Speed, ISS is the Intermediate Scram Speed, and NSS is the Nominal Scram Speed. The scram time values for each of the scram speeds as a function of control rod insertion fraction are shown in Table 4-1.

The NSS scram times are based on a conservative interpretation of scram time surveillance measurements. In the event that plant surveillance shows any of the NSS scram insertion times to be exceeded, the MCPR limits are to default to the values which correspond to the ISS scram time. The ISS times have been chosen to provide an intermediate value between the NSS and TSSS, but the interpolation between these values is not supported by Westinghouse methodology. In the event that any of the ISS times are exceeded, MCPR limits for the TSSS apply.

Table 4-1 Scram Times
(References 3 and 16)

Control Rod Insertion Fraction (% from fully withdrawn)	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

4.4. Recirculation Pump Motor Generator Settings

Cycle 22 was analyzed with a maximum core flow runout of 110%; therefore the recirculation pump motor generator scoop tube mechanical and electrical stops must be set to maintain core flow less than 110% (107.8 Mlb/hr) for all runout events (Reference 12). This value is consistent with the analyses of Reference 3.

Table 4-2 MCPR TSSS Based Operating Limits – NFWT
All Fuel Types
(Reference 3)

EOOS Combination	Cycle Exposure (MWd/MTU)
	≤ 10000
BASE	1.75
BASE SLO	1.79
PLUOOS	1.81
PLUOOS SLO	1.85
TBVOOS	1.92
TBVOOS SLO	1.96
TCV SLOW CLOSURE	1.82
TCV SLOW CLOSURE SLO	1.86
TCV STUCK CLOSED	1.75
TCV STUCK CLOSED SLO	1.79

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

EOOS Combination	Cycle Exposure (MWd/MTU)
	≤ 10000
BASE	1.75
BASE SLO	1.79
PLUOOS	1.81
PLUOOS SLO	1.85
TBVOOS	1.92
TBVOOS SLO	1.96
TCV SLOW CLOSURE	1.82
TCV SLOW CLOSURE SLO	1.86
TCV STUCK CLOSED	1.75
TCV STUCK CLOSED SLO	1.79

Table 4-4 MCPR ISS Based Operating Limits – NFWT
All Fuel Types
(Reference 3)

EOOS Combination	Cycle Exposure (MWd/MTU)
	≤ 10000
BASE	1.44
BASE SLO	1.47
PLUOOS	1.51
PLUOOS SLO	1.54
TBVOOS	1.54
TBVOOS SLO	1.57
TCV SLOW CLOSURE	1.51
TCV SLOW CLOSURE SLO	1.54
TCV STUCK CLOSED	1.44
TCV STUCK CLOSED SLO	1.47

Table 4-5 MCPR ISS Based Operating Limits – RFWT
All Fuel Types
(Reference 3)

EOOS Combination	Cycle Exposure (MWd/MTU)
	≤ 10000
BASE	1.50
BASE SLO	1.53
PLUOOS	1.51
PLUOOS SLO	1.54
TBVOOS	1.59
TBVOOS SLO	1.62
TCV SLOW CLOSURE	1.51
TCV SLOW CLOSURE SLO	1.54
TCV STUCK CLOSED	1.50
TCV STUCK CLOSED SLO	1.53

Table 4-6 MCPR NSS Based Operating Limits – NFWT
All Fuel Types
(Reference 3)

EOOS Combination	Cycle Exposure (MWd/MTU)
	≤ 10000
BASE	1.44
BASE SLO	1.47
PLUOOS	1.49
PLUOOS SLO	1.52
TBVOOS	1.53
TBVOOS SLO	1.56
TCV SLOW CLOSURE	1.49
TCV SLOW CLOSURE SLO	1.52
TCV STUCK CLOSED	1.44
TCV STUCK CLOSED SLO	1.47

Table 4-7 MCPR NSS Based Operating Limits – RFWT
All Fuel Types
(Reference 3)

EOOS Combination	Cycle Exposure (MWd/MTU)
	≤ 10000
BASE	1.48
BASE SLO	1.51
PLUOOS	1.49
PLUOOS SLO	1.52
TBVOOS	1.58
TBVOOS SLO	1.61
TCV SLOW CLOSURE	1.49
TCV SLOW CLOSURE SLO	1.52
TCV STUCK CLOSED	1.48
TCV STUCK CLOSED SLO	1.51

Table 4-8 MCPR(P) – NFWT
All Fuel Types
(Reference 3)

EOOS Combination	Core Flow (% of rated)	Core Thermal Power (% of rated)								
		0	25	38.5	38.5	50	60	80	100	102
		Operating Limit MCPR			Operating Limit MCPR Multiplier, Kp					
Base	≤ 60	2.98	2.44	2.15	1.35	1.24	1.16	1.07	1.00	1.00
	> 60	2.85	2.57	2.42						
Base SLO	≤ 60	3.04	2.49	2.19						
	> 60	2.91	2.62	2.47						
PLUOOS	≤ 60	2.98	2.44	2.15	1.60	1.49	1.33	1.07	1.00	1.00
	> 60	2.85	2.57	2.42						
PLUOOS SLO	≤ 60	3.04	2.49	2.19						
	> 60	2.91	2.62	2.47						
TBVOOS	≤ 60	4.46	3.18	2.49	1.35	1.24	1.16	1.07	1.00	1.00
	> 60	3.86	3.19	2.83						
TBVOOS SLO	≤ 60	4.54	3.24	2.54						
	> 60	3.93	3.25	2.89						
TCV Slow Closure	≤ 60	2.98	2.44	2.15	1.60	1.49	1.34	1.07	1.00	1.00
	> 60	2.85	2.57	2.42						
TCV Slow Closure SLO	≤ 60	3.04	2.49	2.19						
	> 60	2.91	2.62	2.47						
TCV Stuck Closed	≤ 60	2.98	2.44	2.15	1.35	1.24	1.16	1.07	1.00	1.00
	> 60	2.85	2.57	2.42						
TCV Stuck Closed SLO	≤ 60	3.04	2.49	2.19						
	> 60	2.91	2.62	2.47						

Table 4-9 MCPR(P) – RFWT
All Fuel Types
(Reference 3)

EOOS Combination	Core Flow (% of rated)	Core Thermal Power (% of rated)								
		0	25	38.5	38.5	50	60	80	100	102
		Operating Limit MCPR			Operating Limit MCPR Multiplier, Kp					
Base	≤ 60	2.98	2.44	2.15	1.41	1.26	1.18	1.07	1.00	1.00
	> 60	2.85	2.57	2.42						
Base SLO	≤ 60	3.04	2.49	2.19						
	> 60	2.91	2.62	2.47						
PLUOOS	≤ 60	2.98	2.44	2.15	1.60	1.49	1.33	1.07	1.00	1.00
	> 60	2.85	2.57	2.42						
PLUOOS SLO	≤ 60	3.04	2.49	2.19						
	> 60	2.91	2.62	2.47						
TBVOOS	≤ 60	4.69	3.32	2.58	1.41	1.26	1.18	1.07	1.00	1.00
	> 60	4.06	3.32	2.92						
TBVOOS SLO	≤ 60	4.78	3.38	2.63						
	> 60	4.14	3.38	2.98						
TCV Slow Closure	≤ 60	2.98	2.44	2.15	1.60	1.49	1.34	1.07	1.00	1.00
	> 60	2.85	2.57	2.42						
TCV Slow Closure SLO	≤ 60	3.04	2.49	2.19						
	> 60	2.91	2.62	2.47						
TCV Stuck Closed	≤ 60	2.98	2.44	2.15	1.41	1.26	1.18	1.07	1.00	1.00
	> 60	2.85	2.57	2.42						
TCV Stuck Closed SLO	≤ 60	3.04	2.49	2.19						
	> 60	2.91	2.62	2.47						

Table 4-10 MCPR(F) Limits, DLO or SLO Operation
All Fuel Types
(Reference 3)

Flow (% rated)	DLO MCPR(F) Limit	SLO MCPR(F) Limit
110.0	1.38	1.41
100.0	1.38	1.41
0.00	1.98	2.02

5. Linear Heat Generation Rate

The thermal mechanical operating limit at rated conditions is established in terms of the maximum LHGR given in Table 5-1 as a function of rod nodal (pellet) exposure. The limit applies to all Optima2 bundle designs.

The linear heat generation rate (LHGR) limit is the product of the exposure dependent LHGR limit from Table 5-1 and the minimum of: the power dependent LHGR Factor, LHGRFAC(P), or the flow dependent LHGR Factor, LHGRFAC(F). The LHGRFAC(P) is determined from Table 5-2. The LHGRFAC(F) is determined from Table 5-3.

Table 5-1 LHGR Limit
All Fuel Types
(References 3, 6, 9)

Rod Nodal Exposure (MWd/MTU)	LHGR Limit (kW/ft)
0	13.11
14000	13.11
72000	6.48

Table 5-2 LHGRFAC(P) Multipliers
All Fuel Types
(Reference 3)

EOOS Combination	Core Thermal Power (% of rated)								
	0	25	38.5	38.5	50	60	80	100	102
	LHGRFAC(P) Multiplier								
Base	0.51	0.63	0.69	0.73	0.79	0.81	0.87	1.00	1.00
Base SLO									
PLUOOS	0.51	0.63	0.69	0.69	0.73	0.79	0.83	1.00	1.00
PLUOOS SLO									
TBVOOS	0.32	0.45	0.52	0.70	0.76	0.79	0.81	1.00	1.00
TBVOOS SLO									
TCV Slow Closure	0.51	0.63	0.69	0.69	0.73	0.79	0.83	1.00	1.00
TCV Slow Closure SLO									
TCV Stuck Closed	0.51	0.63	0.69	0.73	0.79	0.81	0.87	1.00	1.00
TCV Stuck Closed SLO									

Table 5-3 LHGRFAC(F) Multipliers
All Fuel Types
(Reference 3)

Flow (% rated)	LHGRFAC(F) Multiplier
110.00	1.00
100.00	1.00
80.00	1.00
60.00	0.80
40.00	0.59
20.00	0.43
0.00	0.27

6. Rod Block Monitor

The Rod Block Monitor Upscale Instrumentation Setpoints are determined from the relationships shown below (Reference 13):

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

The setpoint may be lower/higher and will still comply with the rod withdrawal error (RWE) analysis because RWE is analyzed unblocked.

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

7. Stability Protection Setpoints

The OPRM PBDA Trip Settings (Reference 3):

PBDA Trip Amplitude Setpoint (Sp)	Corresponding Maximum Confirmation Count Setpoint (Np)
1.15	16

The OPRM PBDA trip settings are valid to a cycle exposure of 10000 MWd/MTU per Reference 3 limitations.

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:

EOOS Options	Thermal Limit Sets
Base	Base (DLO or SLO)
PLUOOS	PLUOOS (DLO or SLO)
TBVOOS	TBVOOS (DLO or SLO) ➢ See Table 8-1 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 ➢ 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 ➢ See Table 8-2 for power restrictions
PCOOS	TCV Slow Closure (DLO or SLO)
PCOOS and PLUOOS	PLUOOS (DLO or SLO)
PCOOS and TCV Slow Closure	TCV Slow Closure (DLO or SLO)
PCOOS and one TCV/TSV Stuck Closed	➢ Operation is only allowed at or below rated thermal power as specified in Table 8-2 and ➢ The more restrictive of the flow-dependent limits (established by one TCV/TSV Stuck Closed) and power-dependent limits (established by one TCV/TSV Stuck Closed, TCV Slow Closure, and PLUOOS limits) apply.
PLUOOS and one TCV/TSV Stuck Closed	➢ Operation is only allowed at or below rated thermal power as specified in Table 8-2 and ➢ The more restrictive of the flow-dependent limits (established by one TCV/TSV Stuck Closed) and power-dependent limits (established by one TCV/TSV Stuck Closed, TCV Slow Closure, and PLUOOS limits) apply.

Common Notes – Applicable to Base Case and all EOOS Combinations

1. All modes are allowed for full power operation at MELLLA up to a cycle exposure of 10000 MWD/MTU subject to the restrictions in Tables 8-1 and 8-2. Each EOOS Option may be combined with each of the following conditions provided the requirements of References 20 and 21 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 and operating steam dome pressure region bounded by the maximum value of 1020 psia and the minimum pressure curve from Reference 15, while the FWTR results are valid for the minimum FWT curve from Reference 15. For operation outside of NFWT, RFWT from 30 °F to 120°F is also supported for cycle operation through 10000 MWd/MTU cycle energy subject to the restriction in Reference 14 for feedwater temperature reductions of greater than 100 °F. The restriction is to maintain less than 100% rod line. This includes, but is not limited to FWHOOS and FFTR. For a feedwater temperature reduction of between 30°F and 120°F, the RFWT limits should be applied.

3. All analyses support the fastest Turbine Bypass Valve (assumed to be #1) OOS, with the remaining 8 Turbine Bypass Valves meeting the assumed opening profile in Reference 11. 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 Turbine Bypass Valves 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. (Reference 3)

4. For all cases including TBVOOS, equivalent of 2 of the first 3.6 TBVs must be capable of opening via the pressure control system while TBVs #5-9 are allowed to be OOS. For all cases except TBVOOS, the equivalent of 8 of 9 Turbine Bypass Valves (as stated in Note 3 above) are required to trip open on TCV fast closure or on TSV closure. The TBVOOS condition assumes that all of the Turbine Bypass Valves do not trip open on TCV fast closure or on TSV closure. (Reference 3)

5. A single MSIV may be taken OOS (shut) under all EOOS Options, as long as core thermal power is maintained ≤ 75% of 2957 MWth (Reference 3).

Table 8-1 Core Thermal Power Restriction for TBVOOS
(Reference 3)

Core Thermal Power Restriction (% of Rated Power)	Depletion (MWd/MTU)	Number of Safety Valves Available
≤ 100.00	≤ 10000	9 of 9
≤ 100.00	≤ 10000	8 of 9

Table 8-2 Core Thermal Power Restriction for One TCV/TSV Stuck Closed with TBV's Credited to Prevent System Pressurization
(Reference 3)

Core Thermal Power Restriction (% of Rated Power)	Number of TBV's Required to Prevent System Pressurization (3.7% Rated Steam Flow for Each TBV)
≤ 75	1.9
≤ 80	3.4
≤ 85	5.2
≤ 90	6.8

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. Commonwealth Edison Company Topical Report NFSR-0091, "Benchmark of CASMO/MICROBURN BWR Nuclear Design Methods," Revision 0 and Supplements on Neutronics Licensing Analysis (Supplement 1) and La Salle County Unit 2 benchmarking (Supplement 2), December 1991, March 1992, and May 1992, respectively.

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

3. NEDO-32465-A, "BWR Owners' Group Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," August 1996.

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

5. Westinghouse Report WCAP-16081-P-A, "10x10 SVEA Fuel Critical Power Experiments and CPR Correlation: SVEA-96 Optima2," March 2005.

6. Westinghouse Report WCAP-16081-P-A, Addendum 1-A, Revision 0, "SVEA-96 Optima2 CPR Correlation (D4): High and Low Flow Applications," March 2009.

7. 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.

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

9. 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.

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

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

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

10. References

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

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 Technical Specifications," October 3, 1988.

3. Exelon TODI ES1000014 Rev. 1, "Dresden Unit 3 Cycle 22 Reload Licensing Report (RLR) Revision 1", November 8, 2010. (Attachment 25 to FCP 377653)

4. Westinghouse Letter NF-BEX-10-57 "Transmittal of Bundle Design Report for Dresden 3 Cycle 22", April 23, 2010. (Attachment 3 to FCP 377653)

5. Westinghouse Report NF-BEX-10-80-NP Revision 0, "Dresden Nuclear Power Station Unit 3 Cycle 22 MAPLHGR Report", August 2010, Attachment to Westinghouse Letter NF-BEX-10-110 Revision 0, "Dresden Nuclear Power Station Unit 3 Cycle 22 MAPLHGR Report Transmittal", September 2, 2010. (Attachment 14 to FCP 377653)

6. Exelon TODI, ES0800030, Revision 1, "Dresden Unit 3 Cycle 21 Reload Licensing Report (RLR)," December 15, 2009. (Attachment 38 to FCP 373142)

7. Westinghouse letter and report, NF-BEX-08-61 Revision 1, "Final Report for Dresden Unit 3 Cycle 21 Bundle Designs Revision 1", October 30, 2008. (Attachment 29 to FCP 368721)

8. Westinghouse Document NF-BEX-08-94-NP, Revision 0, "Dresden Unit 3 Cycle 21 MAPLHGR Report," September 4, 2008. (Attachment 20 to FCP 368721)

9. Exelon TODI, NF0600300, Revision 2, "Dresden Unit 3 Cycle 20 Reload Licensing Report (RLR), Revision 3," August 1, 2007. (Attachment 6 of FCP 363433-000)

10. Exelon TODI NF0600186, Revision 0, "Dresden 3 Cycle 20 Bundle Designs," July 13, 2006. (Attachment 4 to FCP 358366)

11. Exelon TODI Ops Ltr 10-11, Revision 0, "OPL-W Parameters for Dresden Unit 3 Cycle 22 Transient Analysis", March 8, 2010. (Attachment 6 to FCP 377653).

12. Exelon TODI ES1000001, Revision 0, "Dresden Unit 3 Cycle 22 Licensing Generic Inputs Report", February 5, 2010. (Attachment 5 to FCP 377653)

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

14. 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.

15. Exelon TODI ES1000013, Revision 0, "Dresden Unit 3 Cycle 22 Reload Engineering Report", 10/18/10. (Attachment 18 to FCP 377653)

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

17. NRC Letter, "Dresden Nuclear Power Station, Unit 3 – Issuance of Amendment RE: Minimum Critical Power Ratio Safety Limit (TAC No. MD2706)," John Honcharik (NRC) to Christopher M. Crane, November 7, 2006. (Available in EDMS)

18. Westinghouse Letter NF-BEX-10-88 Revision 1, "Transmittal of Safety Limit MCPR for Dresden Unit 3 Cycle 22", L. Sekkat (Westinghouse) to J. Fisher (Exelon), November 1, 2010. (Attachment 24 to FCP 377653)

19. 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)

20. Westinghouse Document BTD 09-0311, Revision 1, "Westinghouse CMS – Operation guidelines for Dresden and Quad Cities plants," July 20, 2009. (Attachment 34 to FCP 368557)

21. Westinghouse Document BTD 09-0723, Revision 0, "Westinghouse CMS – Core Monitoring Strategy for Dresden 3 Cycle 21," July 3, 2009. (Attachment 35 to FCP 368557)

22. Westinghouse Letter NF-BEX-10-173 Revision 0, "Dresden Unit 3 Cycle 22 Licensing Evaluation for Impact of Loading Pattern Change", November 2010. (Attachment 26 to FCP 377653)