Exelon Generation Company, LLC
Quad Cities Nuclear Power Station
22710 206th Avenue North
Cordova, IL 61242-9740

www.exeloncorp.com

Nuclear

SVP-05-043

May 31, 2005

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

Quad Cities Nuclear Power Station, Unit 1
Renewed Facility Operating License No. DPR-29
NRC Docket Number 50-254

Subject: Core Operating Limits Report for Quad Cities Unit 1 Cycle 19 (Revision 1)

Reference: Letter from Timothy J. Tulon (Exelon Generation Company, LLC) to U. S. NRC, "Core Operating Limits Report for Quad Cities Unit 1 Cycle 19," dated April 15, 2005

In accordance with Technical Specifications Section 5.6.5.d, enclosed is Revision 1 of the Core Operating Limits Report (COLR) for Quad Cities Unit 1 Cycle 19.

On May 28, 2005, Quad Cities Nuclear Power Station (QCNPS) Unit 1 was shutdown for a maintenance outage (Q1M18) to replace the reactor pressure vessel steam dryer. Revision 1 of the COLR for Unit 1 Cycle 19 reflects the results of further licensing analyses that were recently performed to support continued cycle operation with the replacement steam dryer.

Should you have any questions concerning this letter, please contact Mr. W. J. Beck at (309) 227-2800.

Respectfully,

Timothy J. Tulon
Site Vice President
Quad Cities Nuclear Power Station

Attachment: Core Operating Limits Report for Quad Cities Unit 1 Cycle 19 (Revision 1)

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

A001

Attachment

Core Operating Limits Report

for

Quad Cities Unit 1 Cycle 19

(Revision 1)

Quad Cities Unit 1 Cycle 19

Core Operating Limits Report

Revision 1

Table of Contents

List of Tables

1. References

1. Exelon Generation Company, LLC, Docket No. 50-254, Quad Cities Nuclear Power Station, Unit 1 Facility Operating License, License No. DPR-29.
2. Letter from D. M. Crutchfield to All Power Reactor Licensees and Applicants, Generic Letter 88-16; Concerning the Removal of Cycle-Specific Parameter Limits from Tech Specs, October 3, 1988.
3. GNF Document, 0000-0028-1626-SRLR, Rev. 1, "Supplemental Reload Licensing Report for Quad Cities 1 Reload 18 Cycle 19," May 2005 (TODI NF0500036, Revision 1).
4. GE Document, GE-NE-J11-03912-00-01-R2, "Dresden 2 and 3 Quad Cities 1 and 2 Equipment Out-Of-Service and Legacy Fuel Transient Analysis," September 2003 (TODI NFM0100091 Sequence 02).
5. GNF Letter, FRL02EX-013, "Quad Cities Unit 1 Cycle 18 and Dresden Unit 3 Cycle 18 Pellet Based LHGR Limits", September 30, 2002.
6. GE DRF C51-00217-01, "Instrument Setpoint Calculation Nuclear Instrumentation, Rod Block Monitor, Commonwealth Edison Company, Quad Cities 1 & 2," December 14, 1999.
7. Quad Cities TODI QDC-04-31.02, "OPL-3 for Quad Cities Unit 1 Cycle 19 (Revision 2)," May 5, 2005.
8. GE Design Basis Document, DB-0012.03, Revision 0, "Fuel-Rod Thermal-Mechanical Performance Limits for GE14C," May 2000.
9. NF Calculation, BNDG:02-001, Revision 0, "Determination of Generic $MCPR_F$ Limits," May 17, 2002.
10. GE Document, NEDE-24011-P-A-14, "General Electric Standard Application for Reactor Fuel," June 2000.
11. Nuclear Fuels TODI NF0400194, Revision 1, "Q1C19 FRED," April 29, 2005.
12. Nuclear Fuels Letter, NF-MW:02-0413, "Approval of GE Evaluation of Dresden and Quad Cities Pressure Regulator Out of Service Analysis," October 22, 2002.
13. Nuclear Fuels Letter, NF-MW:02-0081, "Approval of GE Evaluation of Dresden and Quad Cities Extended Final Feedwater Temperature Reduction," August 27, 2002.
14. GNF Letter, MJM-EXN-EE1-04-036, "QC1 C18A Pellet Based LHGR Limits for the Fresh Fuel Bundle Type 2647," November 17, 2004.
15. Nuclear Fuels Letter, NF-MW:03-069, "Dresden and Quad Cities Operation with One TSV OOS," July 28, 2003.
16. GNF Letter, MJM-EXN-EE1-04-047, "TSD B207: Quad Cities 1 C19 LHGR Limits", December 17, 2004.
17. GNF Document 0000-0014-8357-SRLR, Rev. 0, "Supplemental Reload Licensing Report for Quad Cities 1 Q1M16 Cycle 18A", May 2003 (TODI NF0300045, Revision 0).
18. GE Document, GE-NE-0000-0034-6539-R0, "Dresden/Quad Cities Clarification on Required Turbine Bypass Capacity for PRC 04-23 Issue", November 17, 2004.
19. GNF Letter, MJM-EXN-EX0-04-038, "Exelon Power Load Unbalance (PLU) Evaluation – Final", November 22, 2004.
20. FANP Letter, NJC:04:031/FAB04-496, "Startup with TIP Equipment Out of Service," April 20, 2004 (EC 348897-00)
21. Nuclear Fuels TODI NF0500090, Revision 0, "Quad Cities Unit 1 OPRM Trip Setpoints", April 19, 2005.
22. GE Document, NEDO-33187 Revision 1, DRF 0000-0038-8843, "Safety Evaluation in Support of the New Steam Dryer for Quad Cities Unit 1 & 2," May 2005.

2. Terms and Definitions

APLHGR	Average planar linear heat generation rate
APRM	Average power range monitor
BOC	Beginning of cycle
DLO	Dual loop operation
ELLLA	Extended load line limit analysis
EOC	End of cycle
EOOS	Equipment out of service
EOR	End of rated conditions (i.e. cycle exposure at 100% power, 100% flow, all-rods-out)
FFTR	Final Feedwater Temperature Reduction
FWHOOS	Feedwater heater out of service
GE14	GE14C fuel
GNF	Global Nuclear Fuel
ICF	Increased core flow
LHGR	Linear heat generation rate
LHGRFAC(F)	Flow dependent LHGR multiplier
LHGRFAC(P)	Power dependent LHGR multiplier
LPRM	Local power range monitor
MAPFAC(F)	Flow dependent MAPLHGR multiplier
MAPFAC(P)	Power dependent MAPLHGR multiplier
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
OLMCPR	Operating limit minimum critical power ratio
OPRM	Oscillation power range monitor
PBDA	Period based detection algorithm
PLUOOS	Power load unbalance out of service
PROOS	Pressure regulator out of service
RBM	Rod block monitor
RPTOOS	Recirculation Pump Trip Out of Service
SLMCPR	Safety limit minimum critical power ratio
SLO	Single loop operation
SRVOOS	Safety-relief valve out of service
TBPOOS	Turbine bypass system out of service
TCV	Turbine control valve
TCVOOS	Turbine control valve out of service
TIP	Traversing Incore Probe
TSV	Turbine Stop Valve
TSVOOS	Turbine Stop Valve out of service
TIP	Traversing Incore Probe

3. General Information

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

Rated core flow is 98 Mlb/hr. Operation up to 108% rated flow is licensed for this cycle. Licensed rated thermal power is 2957 MWth.

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

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

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

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.

4. Average Planar Linear Heat Generation Rate

The MAPLHGR values for the most limiting lattice (excluding natural uranium) of each fuel type as a function of average planar exposure is given in Table 4-1. During single loop operation, these limits are multiplied by the SLO multiplier listed in Table 4-2.

Table 4-1 MAPLHGR for bundle(s):
GE14-P10DNAB409-17GZ-100T-145-T6-2825
GE14-P10DNAB408-15GZ-100T-145-T6-2826
GE14-P10DNAB194-4G7.0-100T-145-T6-2647
GE14-P10DNAB411-14GZ-100T-145-T6-2564
GE14-P10DNAB409-15GZ-100T-145-T6-2565
(References 3 and 17)

Avg. Planar Exposure (GWd/MT)	MAPLHGR (kW/ft)
0.00	11.68
16.00	11.68
44.09	9.16
55.12	8.09
63.50	6.97
70.00	4.36

Table 4-2 MAPLHGR SLO multiplier
(Reference 3)

Fuel Type	SLO Multiplier
GE14	0.77

5. Operating Limit Minimum Critical Power Ratio

5.1. 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.

5.1.1. Power-Dependent MCPR

For operation at less than 38.5% of rated core thermal power, the OLMCPR as a function of core thermal power (MCPR(P)) is shown in Table 5-3. For operation at greater than 38.5% of rated core thermal power, the OLMCPR as a function of core thermal power is determined by multiplying the applicable rated condition OLMCPR limit shown in Table 5-1 or 5-2 by the applicable MCPR multiplier K(P) given in Table 5-3. For operation at exactly 38.5% of rated core thermal power, the OLMCPR as a function of core thermal power is the maximum of either of the two aforementioned methods evaluated at 38.5% of rated core thermal power.

5.1.2. Flow-Dependent MCPR

Tables 5-4 and 5-5 give the MCPR(F) limit as a function of the flow based on the applicable plant condition. The MCPR(F) limit determined from these tables is the flow dependent OLMCPR.

5.2. Automatic Flow Control MCPR Limits

Automatic Flow Control MCPR Limits are not provided.

5.3. Scram Time

Option A and Option B refer to scram speeds.

Option A scram speed is the Improved Technical Specification scram speed. The core average scram speed insertion time for 20% insertion must be less than or equal to the Technical Specification scram speed to utilize Option A MCPR limits. Reload analyses performed by (GNF) for Cycle 19 Option A MCPR limits utilized a 20% core average insertion time of 0.900 seconds (Reference 7).

To utilize the MCPR limits for the Option B scram speed, the core average scram insertion time for 20% insertion must be less than or equal to 0.694 seconds (Reference 7). If the core average scram insertion time does not meet the Option B criteria, but is within the Option A criteria, the appropriate MCPR value may be determined from a linear interpolation between the Option A and B limits with standard mathematical rounding to two decimal places. When performing a linear interpolation to determine MCPR limits, ensure that the time used for Option A is 0.900 seconds.

5.4. Recirculation Pump Motor Generator Settings

Cycle 19 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 11). This value is consistent with the analyses of References 3 and 4.

Table 5-1 MCPR Option A Based Operating Limits
(References 3 and 4)

EOOS Combination	Fuel Type	Cycle Exposure	
		< EOR - 2659 MWd/MT	≥ EOR - 2659 MWd/MT
BASE	GE14	1.57	1.67
BASE SLO	GE14	1.58	1.68
TBPOOS	GE14	1.75	1.77
TBPOOS SLO	GE14	1.76	1.78
TCV SLOW CLOSURE	GE14	1.62	1.67
TCV SLOW CLOSURE SLO	GE14	1.63	1.68
PLUOOS	GE14	1.65	1.67
PLUOOS SLO	GE14	1.66	1.68
TCV STUCK CLOSED	GE14	1.57	1.67
TCV STUCK CLOSED SLO	GE14	1.58	1.68

Table 5-2 MCPR Option B Based Operating Limits
(References 3 and 4)

EOOS Combination	Fuel Type	Cycle Exposure	
		< EOR - 2659 MWd/MT	≥ EOR - 2659 MWd/MT
BASE	GE14	1.46	1.50
BASE SLO	GE14	1.47	1.51
TBPOOS	GE14	1.58	1.60
TBPOOS SLO	GE14	1.59	1.61
TCV SLOW CLOSURE	GE14	1.46	1.50
TCV SLOW CLOSURE SLO	GE14	1.47	1.51
PLUOOS	GE14	1.48	1.50
PLUOOS SLO	GE14	1.49	1.51
TCV STUCK CLOSED	GE14	1.46	1.50
TCV STUCK CLOSED SLO	GE14	1.47	1.51

Table 5-3 MCPR(P) for GE Fuel
(Reference 4)

EOOS Combination	Core Flow (% Rated)	Core Thermal Power (% Rated)								
		0	25	38.5	38.5	45	60	70	70	100
		Operating Limit MCPR			Operating Limit MCPR Multiplier, K_P					
Base Case	≤60	3.16	2.58	2.27	1.32	1.28	1.15			1.00
	>60	3.77	2.99	2.56						
Base Case SLO	≤60	3.17	2.59	2.28	1.32	1.28	1.15			1.00
	>60	3.78	3.00	2.57						
TBPOOS	≤60	5.55	3.77	2.82	1.37	1.28	1.15			1.00
	>60	6.79	4.62	3.45						
TBPOOS SLO	≤60	5.56	3.78	2.83	1.37	1.28	1.15			1.00
	>60	6.80	4.63	3.46						
TCV Slow Closure	≤60	5.55	3.77	2.82	1.64		1.45	1.26	1.11	1.00
	>60	6.79	4.62	3.45						
TCV Slow Closure SLO	≤60	5.56	3.78	2.83	1.64		1.45	1.26	1.11	1.00
	>60	6.80	4.63	3.46						
PLUOOS	≤60	5.55	3.77	2.82	1.64		1.45	1.26	1.11	1.00
	>60	6.79	4.62	3.45						
PLUOOS SLO	≤60	5.56	3.78	2.83	1.64		1.45	1.26	1.11	1.00
	>60	6.80	4.63	3.46						
TCV Stuck Closed	≤60	3.16	2.58	2.27	1.32	1.28	1.15			1.00
	>60	3.77	2.99	2.56						
TCV Stuck Closed SLO	≤60	3.17	2.59	2.28	1.32	1.28	1.15			1.00
	>60	3.78	3.00	2.57						

Table 5-4 MCPR(F) Limits for GE Fuel
All EOOS except TCV Stuck Closed
DLO or SLO Operation
(Reference 9)

Flow (% rated)	MCPR(F) Limit
110.0	1.22
100.0	1.22
0.0	1.86

Table 5-5 MCPR(F) Limits for GE Fuel
with TCV Stuck Closed
DLO or SLO Operation
(Reference 9)

Flow (% rated)	MCPR(F) Limit
110.0	1.27
108.9	1.27
0.0	1.97

6. Linear Heat Generation Rate

The maximum LHGR shall not exceed the zero exposure limit of 13.4 KW/ft for the following fuel bundles (Reference 8).

GE14-P10DNAB409-17GZ-100T-145-T6-2825
GE14-P10DNAB408-15GZ-100T-145-T6-2826
GE14-P10DNAB194-4G7.0-100T-145-T6-2647
GE14-P10DNAB411-14GZ-100T-145-T6-2564
GE14-P10DNAB409-15GZ-100T-145-T6-2565

The linear heat generation rate (LHGR) limit is the product of the exposure dependent LHGR limit from Tables 6-1 through 6-11 and the minimum of: the power dependent LHGR Factor, LHGRFAC(P), the flow dependent LHGR Factor, LHGRFAC(F), or the single loop operation (SLO) multiplication factor where applicable. The LHGRFAC(P) is determined from Table 6-12. The LHGRFAC(F) is determined from Table 6-13 or 6-14. The SLO multiplication factor can be found in Table 6-15.

Table 6-1: LHGR Limit for GE14- P10DNAB411-14GZ-100T-145-T6-2564
(Reference 5)

Lattices 5567, 5568, 5569, 5570, 5572 and 5573 LHGR Limit kW/ft

5567: P10DNAL071-NOG-100T-T6-5567
5568: P10DNAL458-6G7.0/8G6.0-100T-T6-5568
5569: P10DNAL458-6G7.0/7G6.0-100T-T6-5569
5570: P10DNAL451-6G7.0/7G6.0-100T-E-T6-5570
5572: P10DNAL071-NOG-100T-V-T6-5572
5573: P10DNAL071-14GE-100T-V-T6-5573

UO2 Pellet Burnup (GWd/MTU)	LHGR Limit (kW/ft)
0.0000	13.4000
16.0000	13.4000
63.5000	8.0000
70.0000	5.0000

Table 6-2: LHGR Limit for GE14-P10DNAB409-15GZ-100T-145-T6-2565
(Reference 5)

Lattice 5567, 5574, 5575, 5572, and 5578 LHGR Limit kW/ft 5567: P10DNAL071-NOG-100T-T6-5567 5574: P10DNAL456-13G7.0/2G6.0-100T-T6-5574 5575: P10DNAL456-12G7.0/2G6.0-100T-T6-5575 5572: P10DNAL071-NOG-100T-V-T6-5572 5578: P10DNAL071-15GE-100T-V-T6-5578	
UO2 Pellet Burnup (GWd/MTU)	LHGR Limit (kW/ft)
0.0000	13.4000
16.0000	13.4000
63.5000	8.0000
70.0000	5.0000

Table 6-3: LHGR Limit for GE14-P10DNAB194-4G7.0-100T-145-T6-2647
(Reference 14)

Lattices 5976, 5978, 5979, 5980, 5981 and 5982 LHGR Limit kW/ft 5976: P10DNAL071-NOG-100T-T6-5976 5978: P10DNAL212-4G7.0-100T-T6-5978 5979: P10DNAL216-4G7.0-100T-E-T6-5979 5980: P10DNAL256-4G7.0-100T-V-T6-5980 5981: P10DNAL071-NOG-100T-V-T6-5981 5982: P10DNAL071-4GE-100T-V-T6-5982	
UO2 Pellet Burnup (GWd/MTU)	LHGR Limit (kW/ft)
0.0000	13.4000
16.0000	13.4000
63.5000	8.0000
70.0000	5.0000

Table 6-4: LHGR Limit for GE14-P10DNAB409-17GZ-100T-145-T6-2825
(Reference 16)

Lattice 6824, 6825, 6826, 6827, 6829, and 6830 LHGR Limit kW/ft 6824: P10DNAL071-NOG-100T-T6-6824 6825: P10DNAL456-4G7.0/11G6.0/2G3.0-100T-T6-6825 6826: P10DNAL456-4G7.0/10G6.0/2G3.0-100T-T6-6826 6827: P10DNAL448-14G6.0/2G3.0-100T-E-T6-6827 6829: P10DNAL071-NOG-100T-V-T6-6829 6830: P10DNAL071-17GE-100T-V-T6-6830	
UO2 Pellet Burnup (GWd/MTU)	LHGR Limit (kW/ft)
0.0000	13.4000
16.0000	13.4000
63.5000	8.0000
70.0000	5.0000

Table 6-5: LHGR Limit for GE14-P10DNAB408-15GZ-100T-145-T6-2826
(Reference 16)

Lattice 6824, 6832, 6833, 6835, and 6836 LHGR Limit kW/ft 6824: P10DNAL071-NOG-100T-T6-6824 6832: P10DNAL455-14G6.0/1G3.0-100T-T6-6832 6833: P10DNAL448-13G6.0/1G3.0-100T-E-T6-6833 6835: P10DNAL071-NOG-100T-V-T6-6835 6836: P10DNAL071-15GE-100T-V-T6-6836	
UO2 Pellet Burnup (GWd/MTU)	LHGR Limit (kW/ft)
0.0000	13.4000
16.0000	13.4000
63.5000	8.0000
70.0000	5.0000

Table 6-6: LHGR Limit for GE14-P10DNAB194-4G7.0-100T-145-T6-2647, Lattice 5977
(Reference 14)

Lattice 5977 LHGR Limit kW/ft 5977: P10DNAL179-4G7.0-100T-T6-5977	
UO2 Pellet Burnup (GWd/MTU)	LHGR Limit (kW/ft)
0.0	13.4000
13.2416	13.4000
14.4581	13.1829
15.6627	12.9384
16.8610	12.9122
18.0548	12.9207
19.2449	12.9377
21.6161	12.7615
22.2852	12.6855
28.3952	11.9909
34.7442	11.2691
41.2946	10.5244
47.9999	9.7621
54.8153	8.9873
61.7044	8.2041
68.6395	5.6279
70.0000	5.0000

Table 6-7: LHGR Limit for GE14-P10DNAB409-17GZ-100T-145-T6-2825, Lattice 6828
(Reference 16)

Lattice 6828 LHGR Limit kW/ft 6828: P10DNAL448-14G6.0/2G3.0-100T-V-T6-6828	
UO2 Pellet Burnup (GWd/MTU)	LHGR Limit (kW/ft)
0.0	13.40
15.0498	13.40
16.3328	13.3622
17.6026	13.2178
18.8592	13.0750
20.1044	12.9334
22.5708	12.6530
26.2373	12.2362
32.2831	11.5489
38.2384	10.8718
44.0904	10.2066
49.8351	9.5415
55.4794	8.8812
61.0422	8.2765
66.5524	6.5912
70.0	5.00

Table 6-8: LHGR Limit for GE14-P10DNAB408-15GZ-100T-145-T6-2826, Lattice 6834
(Reference 16)

Lattice 6834 LHGR Limit kW/ft 6834: P10DNAL448-13G6.0/1G3.0-100T-V-T6-6834	
UO2 Pellet Burnup (GWd/MTU)	LHGR Limit (kW/ft)
0.0	13.40
14.7557	13.40
16.0380	13.3957
17.3111	13.2510
18.5741	13.1074
19.8276	12.9649
22.3110	12.6825
25.9974	12.2635
32.0720	11.5729
38.0552	10.8927
43.9337	10.2244
49.7028	9.5685
55.3685	8.9194
60.9492	8.2886
66.4736	6.6276
70.0	5.00

Table 6-9: LHGR Limit for GE14-P10DNAB411-14GZ-100T-145-T6-2564, Lattice 5571
(Reference 5)

Lattice 5571 LHGR Limit kW/ft 5571: P10DNAL451-6G7.0/7G6.0-100T-V-T6-5571	
UO2 Pellet Burnup (GWd/MTU)	**LHGR Limit (kW/ft)**
0.0	13.4000
15.9983	13.4000
17.2727	13.2553
18.5367	13.1116
19.7907	12.9691
22.2716	12.6870
25.9479	12.2691
32.0006	11.5810
37.9622	10.9032
43.8209	10.2372
49.5719	9.5726
55.2216	8.8106
60.7884	8.1396
66.3010	6.7072
70.0000	5.0000

Table 6-10: LHGR Limit for GE14-P10DNAB409-15GZ-100T-145-T6-2565, Lattice 5577
(Reference 5)

Lattice 5577 LHGR Limit kW/ft 5577: P10DNAL448-12G7.0/2G6.0-100T-V-T6-5577	
UO2 Pellet Burnup (GWd/MTU)	**LHGR Limit (kW/ft)**
0.0	13.4000
14.8933	13.4000
16.1803	13.3795
17.4565	13.2344
18.7218	13.0906
19.9762	12.9480
22.4568	12.6660
26.1333	12.2480
32.1885	11.5596
38.1530	10.8816
44.0146	10.2152
49.7684	9.3907
55.4205	8.7352
60.9892	8.1212
66.5031	6.6140
70.0000	5.0000

Table 6-11: LHGR Limit for GE14-P10DNAB409-15GZ-100T-145-T6-2565, Lattice 5576
(Reference 5)

Lattice 5576 LHGR Limit kW/ft 5576: P10DNAL448-12G7.0/2G6.0-100T-E-T6-5576	
UO2 Pellet Burnup (GWd/MTU)	**LHGR Limit (kW/ft)**
0.0	13.4000
14.9599	13.4000
16.2535	13.3712
17.5365	13.2253
18.8087	13.0807
20.0704	12.9373
22.5658	12.6536
26.2623	12.2333
32.3461	11.5417
38.3361	10.8607
44.2214	10.1917
49.9984	9.4847
55.6748	8.8349
61.2700	8.2535
66.8131	6.4709
70.0000	5.0000

Table 6-12 LHGRFAC(P) for GE Fuel
(Reference 4)

EOOS Combination	Core Flow (% Rated)	Core Thermal Power (% Rated)							
		0	25	38.5	38.5	70	70	80	100
		LHGRFAC(P) Multiplier							
Base Case	All	0.50	0.56	0.59	0.68			0.86	1.00
Base Case SLO	All	0.50	0.56	0.59	0.68			0.86	1.00
TBPOOS	≤60	0.22	0.39	0.48	0.54				1.00
	>60	0.33	0.39	0.42					
TBPOOS SLO	≤60	0.22	0.39	0.48	0.54				1.00
	>60	0.33	0.39	0.42					
TCV Slow Closure	≤60	0.22	0.39	0.48	0.54	0.73	0.78		1.00
	>60	0.33	0.39	0.42					
TCV Slow Closure SLO	≤60	0.22	0.39	0.48	0.54	0.73	0.78		1.00
	>60	0.33	0.39	0.42					
PLUOOS	≤60	0.22	0.39	0.48	0.54	0.73	0.78		1.00
	>60	0.33	0.39	0.42					
PLUOOS SLO	≤60	0.22	0.39	0.48	0.54	0.73	0.78		1.00
	>60	0.33	0.39	0.42					
TCV Stuck Closed	All	0.50	0.56	0.59	0.68			0.86	1.00
TCV Stuck Closed SLO	All	0.50	0.56	0.59	0.68			0.86	1.00

Table 6-13 LHGRFAC(F) Multipliers, All Cases except TCV Stuck Closed
(Reference 4)

Flow (% rated)	LHGRFAC(F) Multiplier
100.0	1.00
80.0	1.00
50.0	0.77
40.0	0.64
30.0	0.55
0.0	0.28

Table 6-14 LHGRFAC(F) Multipliers for TCV Stuck Closed
(Reference 4)

Flow (% rated)	LHGRFAC(F) Multiplier
100.0	1.00
98.3	1.00
80.0	0.86
50.0	0.63
40.0	0.50
30.0	0.41
0.0	0.14

Table 6-15 LHGR SLO Multiplier
(Reference 3)

Fuel Type	SLO Multiplier
GE14	0.77

7. Rod Block Monitor

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

ROD BLOCK MONITOR UPSCALE TRIP FUNCTION	ALLOWABLE VALUE
Two Recirculation Loop Operation	$0.65\ W_d + 56.1\%$
Single Recirculation Loop Operation	$0.65\ W_d + 51.4\%$

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

The allowable value is clamped with a maximum value not to exceed the allowable value for a recirculation loop drive flow (W_d) of 100%

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

8. Stability Protection Setpoints

The OPRM PBDA Trip Settings (Reference 21):

PBDA Trip Amplitude Setpoint (Sp)	Corresponding Maximum Confirmation Count Setpoint (Np)
1.12	14

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.

9. Modes of Operation

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

Equipment Out of Service Options[1,2,3]	Standard	ICF[5]	MELLLA	Coastdown[4]
Base Case	Yes	Yes	Yes	Yes
Base Case SLO	Yes	No	Yes	Yes
TBPOOS	Yes	Yes	Yes	Yes
TBPOOS SLO	Yes	No	Yes	Yes
TCV Slow Closure[6]	Yes	Yes	Yes	Yes
TCV Slow Closure SLO[6]	Yes	No	Yes	Yes
PLUOOS[7]	Yes	Yes	Yes	Yes
PLUOOS SLO[7]	Yes	No	Yes	Yes
TCV Stuck Closed[8]	Yes	Yes	Yes	Yes
TCV Stuck Closed SLO[8]	Yes	No	Yes	Yes

1. Each OOS Option may be combined with up to 18 TIP channels OOS provided the requirements (as clarified in Reference 20) for utilizing SUBTIP methodology are met and up to 50% of the LPRMs OOS with an LPRM calibration frequency of 2500 Effective Full Power Hours (EFPH) (2000 EFPH +25%). For operation under all limit sets a 120°F reduction in feedwater temperature throughout the cycle was analyzed and is subject to the restrictions in Reference 13 (Final Feedwater Temperature Reduction or Feedwater Heaters OOS).
2. A single MSIV may be taken OOS (shut) under any and all OOS Options, so long as core thermal power is maintained ≤75% of 2957 MWth (Reference 3).
3. Each EOOS option except TBPOOS requires the opening profile for the Turbine Bypass Valves provided in Reference 7 to be met. These conditions also support 1 Turbine Bypass Valve OOS if the assumed opening profile (Reference 7) for the remaining 8 Turbine Bypass Valves is met. If the opening profile is not met with 8 or 9 operating Turbine Bypass Valves, or if more than one Turbine Bypass Valve is OOS, utilize the TBPOOS condition. For operation with three or more Turbine Bypass Valves OOS, utilize the TBPOOS condition above 42% rated power and the PLUOOS condition at or below 42% of rated power (References 18 and 19).
4. Coastdown operation is defined as any cycle exposure beyond the full power, all rods out condition with plant power slowly lowering to a lesser value while core flow is held constant (Reference 10 Section 4.3.1.2.8). Up to a 15% overpower is analyzed per Reference 4.
5. Increased Core Flow (ICF) is supported to 108% of rated core flow.
6. For operation with a pressure regulator out-of-service (PROOS), the TCV Slow Closure limits should be applied (Reference 3) and the operational notes from Reference 12 reviewed. PROOS and TCV Slow Closure is not an analyzed out-of-service combination.
7. If the Base Case limit set is being used and the PLU is taken OOS for surveillance and the reactor is maintained at ≥80% rated core thermal power and ≥80% of rated core flow during the PLUOOS period, an administrative limit on MFLPD and MFLCPR can be used instead of the PLUOOS thermal limit set. The MFLPD administrative limit to be used is 0.98 for all scram speeds. The MFLCPR administrative limit is 0.94 for Option A scram times, 0.97 for Option B scram times, and 0.97 for scram times less than or equal to 0.714 seconds but greater than the Option B time.
8. For operation with a Turbine Stop Valve out-of-service (TSVOOS), the TCV Stuck Closed limits should be applied (Reference 15). TSVOOS and TCV Stuck Closed is not an analyzed out-of-service combination.

10. Methodology

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

1. NEDE-24011-P-A-14, June 2000 and the U.S. Supplement NEDE-24011-P-A-US, June 2000, "General Electric Standard Application for Reactor Fuel".

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

3. Commonwealth Edison Topical Report NFSR-0085, Revision 0, "Benchmark of BWR Nuclear Design Methods," November 1990.

4. Commonwealth Edison Topical Report NFSR-0085, Supplement 1 Revision 0, "Benchmark of BWR Nuclear Design Methods - Quad Cities Gamma Scan Comparisons," April 1991.

5. Commonwealth Edison Topical Report NFSR-0085, Supplement 2 Revision 0, "Benchmark of BWR Nuclear Design Methods – Neutronic Licensing Analyses," April 1991.

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