Core Operating Limits Report

for

Quad Cities Unit 2, Cycle 18

Revision 0

[[GNF Proprietary Information]]
[[enclosed by double brackets]]

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1. References

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16. GE Document, GE-NE-0000-0023-3737-R0, "ICA Stability Evaluation for Quad Cities Unit 2 Cycle 18," January 2004 (TODI NF0400017 Revision 0).

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2. Definitions

APLHGR	Average planar linear heat generation rate
APRM	Average power range monitor
ATRM9	ATRIUM-9B fuel
BOC	Beginning of cycle
DLO	Dual loop operation
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)
FANP	Framatome Advanced Nuclear Power
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
OLMCPR	Operating limit minimum critical power ratio
PLUOOS	Power load unbalance out of service
PROOS	Pressure regulator out of service
RBM	Rod block monitor
SLMCPR	Safety limit minimum critical power ratio
SLO	Single loop operation
SRVOOS	Safety-relief valve out of service
TBPOOS	Turbine bypass valve out of service
TCV	Turbine control valve
TIP	Transversing 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.

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.

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 Tables 4-1 and 4-2. During single loop operation, these limits are multiplied by the SLO multiplier listed in Table 4-3.

Table 4-1 MAPLHGR for bundle(s):
ATRM9-P9DATB381-13GZ-SPC100T-9WR-144-T6-3919
ATRM9-P9DATB383-11GZ-SPC100T-9WR-144-T6-3918
(Reference 4)

Avg. Planar Exposure (GWd/MT)	MAPLHGR (kW/ft)
0.00	13.52
17.25	13.52
70.00	7.84

Table 4-2 MAPLHGR for bundle(s):
GE14-P10DNAB389-18GZ-100T-145-T6-2650
GE14-P10DNAB418-16GZ-100T-145-T6-2646
GE14-P10DNAB406-16GZ-100T-145-T6-2508
GE14-P10DNAB409-15GZ-100T-145-T6-2507
(References 3 and 4)

Avg. Planar Exposure (GWd/MT)	MAPLHGR (kW/ft)
0.00	11.68
16.00	11.68
22.05	11.34
55.12	8.19
63.50	6.97
70.00	4.36

Table 4-3 MAPLHGR SLO multiplier for GE and FANP Fuel
(Reference 3)

Fuel Type	SLO Multiplier
ATRM9	0.84
GE14	0.77

[[GNF Proprietary Information]]
[[enclosed by double brackets]]

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% core thermal power, the OLMCPR as a function of core thermal power is shown in Table 5-3. For operation at greater than 38.5% 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% core thermal power, the OLMCPR as a function of core thermal power is the higher of either of the two methods evaluated at 38.5% 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 18 Option A MCPR limits utilized a 20% core average insertion time of 0.900 seconds (Reference 6).

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 6). 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 18 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 5). This value is consistent with the analyses of References 3 and 8.

Table 5-1 MCPR Option A Based Operating Limits
(References 3 and 8)

EOOS Combination	Fuel Type	Cycle Exposure < EOR - 2110 MWd/MT	Cycle Exposure ≥ EOR - 2110 MWd/MT
BASE	ATRM9	1.50	1.61
	GE14	1.55	1.65
BASE SLO	ATRM9	1.51	1.62
	GE14	1.56	1.66
PLUOOS	ATRM9	1.57	1.61
	GE14	1.63	1.65
PLUOOS SLO	ATRM9	1.58	1.62
	GE14	1.64	1.66
TBPOOS	ATRM9	1.67	1.69
	GE14	1.73	1.75
TBPOOS SLO	ATRM9	1.68	1.70
	GE14	1.74	1.76
TCV SLOW CLOSURE	ATRM9	1.52	1.61
	GE14	1.58	1.65
TCV SLOW CLOSURE SLO	ATRM9	1.53	1.62
	GE14	1.59	1.66
TCV STUCK CLOSED	ATRM9	1.50	1.61
	GE14	1.55	1.65
TCV STUCK CLOSED SLO	ATRM9	1.51	1.62
	GE14	1.56	1.66

Table 5-2 MCPR Option B Based Operating Limits
(References 3 and 8)

EOOS Combination	Fuel Type	Cycle Exposure < EOR - 2110 MWd/MT	Cycle Exposure ≥ EOR - 2110 MWd/MT
BASE	ATRM9	1.45	1.45
	GE14C	1.45	1.48
BASE SLO	ATRM9	1.46	1.46
	GE14C	1.46	1.49
PLUOOS	ATRM9	1.45	1.45
	GE14C	1.46	1.48
PLUOOS SLO	ATRM9	1.46	1.46
	GE14C	1.47	1.49
TBPOOS	ATRM9	1.50	1.52
	GE14C	1.56	1.58
TBPOOS SLO	ATRM9	1.51	1.53
	GE14C	1.57	1.59
TCV SLOW CLOSURE	ATRM9	1.45	1.45
	GE14C	1.45	1.48
TCV SLOW CLOSURE SLO	ATRM9	1.46	1.46
	GE14C	1.46	1.49
TCV STUCK CLOSED	ATRM9	1.45	1.45
	GE14C	1.45	1.48
TCV STUCK CLOSED SLO	ATRM9	1.46	1.46
	GE14C	1.46	1.49

Table 5-3 MCPR(P) for GE and FANP Fuel
(Reference 8)

EOOS Combination	Core Flow (% of rated)	Core Thermal Power (% of rated) 0	25	38.5	38.5	45	60	70	70	100
		Operating Limit MCPR			Operating Limit MCPR Multiplier, Kp					
Base	≤ 60	3.14	2.56	2.25	1.32	1.28	1.15	[redacted]	[redacted]	1.00
	> 60	3.74	2.96	2.54						
Base SLO	≤ 60	3.15	2.57	2.26	1.32	1.28	1.15	[redacted]	[redacted]	1.00
	> 60	3.75	2.97	2.55						
PLUOOS	≤ 60	5.50	3.74	2.79	1.64	[redacted]	1.45	1.26	1.11	1.00
	> 60	6.73	4.58	3.42						
PLUOOS SLO	≤ 60	5.51	3.75	2.80	1.64	[redacted]	1.45	1.26	1.11	1.00
	> 60	6.74	4.59	3.43						
TBPOOS	≤ 60	5.50	3.74	2.79	1.37	1.28	1.15	[redacted]	[redacted]	1.00
	> 60	6.73	4.58	3.42						
TBPOOS SLO	≤ 60	5.51	3.75	2.80	1.37	1.28	1.15	[redacted]	[redacted]	1.00
	> 60	6.74	4.59	3.43						
TCV Slow Closure	≤ 60	5.50	3.74	2.79	1.64	[redacted]	1.45	1.26	1.11	1.00
	> 60	6.73	4.58	3.42						
TCV Slow Closure SLO	≤ 60	5.51	3.75	2.80	1.64	[redacted]	1.45	1.26	1.11	1.00
	> 60	6.74	4.59	3.43						
TCV Stuck Closed	≤ 60	3.14	2.56	2.25	1.32	1.28	1.15	[redacted]	[redacted]	1.00
	> 60	3.74	2.96	2.54						
TCV Stuck Closed SLO	≤ 60	3.15	2.57	2.26	1.32	1.28	1.15	[redacted]	[redacted]	1.00
	> 60	3.75	2.97	2.55						

Table 5-4 MCPR(F) Limits for GE and FANP Fuel
DLO or SLO Operation
(Reference 10)

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 and FANP Fuel with TCV Stuck Closed
DLO or SLO Operation
(Reference 10)

Flow (% rated)	MCPR(F) Limit
110.0	1.27
108.9	1.27
0.00	1.97

[[GNF Proprietary Information]]
[[enclosed by double brackets]]

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 14):

GE14-P10DNAB409-15GZ-100T-145-T6-2507
GE14-P10DNAB406-16GZ-100T-145-T6-2508
GE14-P10DNAB418-16GZ-100T-145-T6-2646
GE14-P10DNAB389-18GZ-100T-145-T6-2650

The linear heat generation rate (LHGR) limit is the product of the exposure dependent LHGR limit from Tables 6-1 through 6-17 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 6-18. The LHGRFAC(F) is determined from Table 6-19 or 6-20. The SLO multiplication factor can be found in Table 6-21.

Table 6-1: LHGR Limit for GE14-P10DNAB418-16GZ-100T-145-T6-2646
(Reference 9)

Lattices 5963, 5970, 5971, 5974 and 5975 Composite Limit kW/ft **5963: P10DNAL071-NOG-100T-T6-5963** **5970: P10DNAL465-16G7.0-100T-T6-5970** **5971: P10DNAL465-13G7.0/3G6.0-100T-T6-5971** **5974: P10DNAL071-NOG-100T-V-T6-5974** **5975: P10DNAL071-16GE-100T-V-T6-5975**	
UO2 Pellet Burnup (GWd/MTU)	**Composite Limit (kW/ft)**
0.0	13.4
[[	]]

[[GNF Proprietary Information]]
[[enclosed in double brackets]]

Table 6-2: LHGR Limit for: GE14-P10DNAB418-16GZ-100T-145-T6-2646, Lattice 5972
(Reference 9)

Lattice 5972 Composite Limit kW/ft P10DNAL461-12G7.0/3G6.0-100T-E-T6-5972	
UO2 Pellet Burnup (GWd/MTU)	**Composite Limit (kW/ft)**
0.0000	13.4000
[[	]]

Table 6-3: LHGR Limit for: GE14-P10DNAB418-16GZ-100T-145-T6-2646, Lattice 5973
(Reference 9)

Lattice 5973 Composite Limit kW/ft P10DNAL461-12G7.0/3G6.0-100T-V-T6-5973	
UO2 Pellet Burnup (GWd/MTU)	**Composite Limit (kW/ft)**
0.0000	13.4000
[[	]]

Table 6-4: LHGR Limit for GE14-P10DNAB389-18GZ-100T-145-T6-2650
(Reference 9)

Lattices 5963, 5994, 5995, 5998 and 5999 Composite Limit kW/ft 5963: P10DNAL071-NOG-100T-T6-5963 5994: P10DNAL430-17G8.0/1G3.0-100T-T6-5994 5995: P10DNAL431-9G8.0/8G6.0/1G3.0-100T-T6-5995 5998: P10DNAL071-NOG-100T-V-T6-5998 5999: P10DNAL071-18GE-100T-V-T6-5999	
UO2 Pellet Burnup (GWd/MTU)	**Composite Limit (kW/ft)**
0.0	13.4
[[	]]

Table 6-5: LHGR Limit for GE14-P10DNAB389-18GZ-100T-145-T6-2650, Lattice 5996
(Reference 9)

Lattice 5996 Composite Limit kW/ft P10DNAL430-7G8.0/8G6.0-100T-E-T6-5996	
UO2 Pellet Burnup (GWd/MTU)	**Composite Limit (kW/ft)**
0.0000	13.4000
[[	]]

Table 6-6: LHGR Limit for GE14-P10DNAB389-18GZ-100T-145-T6-2650, Lattice 5997
(Reference 9)

Lattice 5997 Composite Limit kW/ft P10DNAL430-7G8.0/8G6.0-100T-V-T6-5997	
UO2 Pellet Burnup (GWd/MTU)	**Composite Limit (kW/ft)**
0.0000	13.4000
[[	]]

[[GNF Proprietary Information]]
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Table 6-7: LHGR Limit for GE14-P10DNAB409-15GZ-100T-145-T6-2507
(References 7 and 9)

Lattices 5254, 5259, and 5260 Composite Limit kW/ft 5254: P10DNAL071-NOG-100T-T6-5254 5259: P10DNAL071-NOG-100T-V-T6-5259 5260: P10DNAL071-15GE-100T-V-T6-5260	
UO2 Pellet Burnup (GWd/MTU)	**Composite Limit (kW/ft)**
0.0	13.4
[[	]]

Table 6-8: LHGR Limit for GE14-P10DNAB409-15GZ-100T-145-T6-2507, Lattice 5255
(Reference 7)

Lattice 5255 Composite Limit kW/ft P10DNAL457-10G7.0/5G6.0-100T-T6-5255	
UO2 Pellet Burnup (GWd/MTU)	**Composite Limit (kW/ft)**
0.0000	13.4000
[[	]]

Table 6-9: LHGR Limit for GE14-P10DNAB409-15GZ-100T-145-T6-2507, Lattice 5256
(Reference 7)

Lattice 5256 Composite Limit kW/ft P10DNAL457-10G7.0/4G6.0-100T-T6-5256	
UO2 Pellet Burnup (GWd/MTU)	**Composite Limit (kW/ft)**
0.0000	13.4000
[[	]]

Table 6-10: LHGR Limit for GE14-P10DNAB409-15GZ-100T-145-T6-2507, Lattice 5257
(Reference 7)

Lattice 5257 Composite Limit kW/ft P10DNAL446-10G7.0/4G6.0-100T-E-T6-5257	
UO2 Pellet Burnup (GWd/MTU)	**Composite Limit (kW/ft)**
0.0000	13.4000
[[	]]

Table 6-11: LHGR Limit for GE14-P10DNAB409-15GZ-100T-145-T6-2507, Lattice 5258
(Reference 7)

Lattice 5258 Composite Limit kW/ft P10DNAL446-10G7.0/4G6.0-100T-V-T6-5258	
UO2 Pellet Burnup (GWd/MTU)	**Composite Limit (kW/ft)**
0.0000	13.4000
[[	]]

[[GNF Proprietary Information]]
[[enclosed in double brackets]]

Table 6-12: LHGR Limit for GE14-P10DNAB406-16GZ-100T-145-T6-2508
(References 7 and 9)

Lattices 5254, 5259, and 5265 Composite Limit kW/ft 5254: P10DNAL071-NOG-100T-T6-5254 5259: P10DNAL071-NOG-100T-V-T6-5259 5265: P10DNAL071-16GE-100T-V-T6-5265	
UO2 Pellet Burnup (GWd/MTU)	Composite Limit (kW/ft)
0.0	13.4
[[	]]

Table 6-13: LHGR Limit for GE14-P10DNAB406-16GZ-100T-145-T6-2508, Lattice 5261
(Reference 7)

Lattice 5261 Composite Limit kW/ft P10DNAL452-12G7.0/4G6.0-100T-T6-5261	
UO2 Pellet Burnup (GWd/MTU)	Composite Limit (kW/ft)
0.0000	13.4000
[[	]]

[[GNF Proprietary Information]]
[[enclosed in double brackets]]

Table 6-14: LHGR Limit for GE14-P10DNAB406-16GZ-100T-145-T6-2508, Lattice 5262
(Reference 7)

Lattice 5262 Composite Limit kW/ft P10DNAL452-12G7.0/2G6.0-100T-T6-5262	
UO2 Pellet Burnup (GWd/MTU)	Composite Limit (kW/ft)
0.0000	13.4000
[[	]]

Table 6-15: LHGR Limit for GE14-P10DNAB406-16GZ-100T-145-T6-2508, Lattice 5263
(Reference 7)

Lattice 5263 Composite Limit kW/ft P10DNAL444-12G7.0/2G6.0-100T-E-T6-5263	
UO2 Pellet Burnup (GWd/MTU)	Composite Limit (kW/ft)
0.0000	13.4000
[[	]]

Table 6-16: LHGR Limit for GE14-P10DNAB406-16GZ-100T-145-T6-2508, Lattice 5264
(Reference 7)

Lattice 5264 Composite Limit kW/ft P10DNAL444-12G7.0/2G6.0-100T-V-T6-5264	
UO2 Pellet Burnup (GWd/MTU)	**Composite Limit (kW/ft)**
0.0000	13.4000
[[	]]

Table 6-17: LHGR Limit for FANP ATRM-9 Fuel
ATRM9-P9DATB383-11GZ-SPC100T-9WR-144-T6-3918
ATRM9-P9DATB381-13GZ-SPC100T-9WR-144-T6-3919
(Reference 11)

Nodal Exposure (GWd/MTU)	LHGR Limit (kW/ft)
0.00	14.40
15.00	14.40
64.30	7.90

Table 6-18 LHGRFAC(P) for GE and FANP Fuel
(Reference 8)

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

[[GNF Proprietary Information]]
[[enclosed in double brackets]]

Table 6-19 LHGRFAC(F) Multipliers, all cases except TCV Stuck Closed
(Reference 8)

Flow (% rated)	LHGRFAC(F) Multiplier
100.00	1.00
80.00	1.00
50.00	0.77
40.00	0.64
30.00	0.55
0.00	0.28

Table 6-20 LHGRFAC(F) Multipliers for TCV Stuck Closed
(Reference 8)

Flow (% rated)	LHGRFAC(F) Multiplier
100.00	1.00
98.30	1.00
80.00	0.86
50.00	0.63
40.00	0.50
30.00	0.41
0.00	0.14

Table 6-21 LHGR SLO multiplier for GE and FANP Fuel
(Reference 3)

Fuel Type	SLO Multiplier
ATRM9	0.84
GE14	0.77

7. Rod Block Monitor

The Rod Block Monitor Upscale Instrumentation Setpoints are determined from the relationships shown below (Reference 12):

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 Mlb/hr.

8. Modes of Operation

The allowed Modes of Operation with the combinations of EOOS are as described below:

	Operating Region			
EOOS Options[1,2,7,8]	**Standard**	**MELLLA**	**ICF[5]**	**Coastdown[3]**
Base, Option A or B	Yes	Yes	Yes	Yes
Base SLO, Option A or B	Yes	Yes	No	Yes
TBPOOS, Option A or B	Yes	Yes	Yes	Yes
TBPOOS SLO, Option A or B	Yes	Yes	No	Yes
PLUOOS[4], Option A or B	Yes	Yes	Yes	Yes
PLUOOS SLO[4], Option A or B	Yes	Yes	No	Yes
TCV Slow Closure[6], Option A or B	Yes	Yes	Yes	Yes
TCV Slow Closure SLO[6], Option A or B	Yes	Yes	No	Yes
TCV Stuck Closed[9], Option A or B	Yes	Yes	Yes	Yes
TCV Stuck Closed SLO[9], Option A or B	Yes	Yes	No	Yes

[1] Each OOS Option may be combined with up to 18 TIP channels OOS (provided the requirements for utilizing SUBTIP methodology are met) with all TIPS available at startup from a refuel outage, a 120°F reduction in feedwater temperature throughout the cycle, which is subject to the restrictions in Reference 15 (Final Feedwater Temperature Reduction or Feedwater Heaters OOS), and up to 50% of the LPRMs OOS with an LPRM calibration frequency of 2500 Effective Full Power Hours (EFPH) (2000 EFPH +25%).

[2] The base case condition requires the opening profile for the Turbine Bypass Valves provided in Reference 6 to be met. The base case condition also supports 1 Turbine Bypass Valve OOS (TBPOOS) if the assumed opening profile (Reference 6) for the remaining group of 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.

[3] 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. Up to a 15% overpower is analyzed per Reference 8.

[4] If the Base Case limit set (DLO only) is being used and the PLU is taken OOS for a surveillance and the surveillance is done at ≥80% rated reactor power and ≥80% rated reactor flow, an administrative limit of 0.99 on FDLRX/MFLPD and 0.95 on MFLCPR for Option A or 0.99 on MFLCPR for Option B can be used instead of the PLUOOS (DLO) thermal limit set.

[5] Operation up to 108% rated core flow is licensed for this cycle.

[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 13 reviewed. PROOS and TCV Slow Closure is not an analyzed out-of-service combination.

[7] 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).

[8] The cycle specific stability analysis may impose restrictions on the Power-to-Flow map and/or restrict the applicable temperature for feedwater temperature reduction. See Reference 16.

[9] For operation with a Turbine Stop Valve out-of-service (TSV OOS), the TCV Stuck Closed limits should be applied (Reference 17). TSV OOS and TCV Stuck Closed is not an analyzed out-of-service combination.

[[GNF Proprietary Information]]
[[enclosed in double brackets]]

9. Methodology

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

1. NEDE-24011-P-A-14 (Revision 14), "General Electric Standard Application for Reactor Fuel (GESTAR-II)," June 2000.

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

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

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

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

6. XN-NF-80-19(P)(A), Volume 1 Supplement 3, Supplement 3 Appendix F, and Supplement 4, "Advanced Nuclear Fuels Methodology for Boiling Water Reactors: Benchmark Results for CASMO-3G/MICROBURN-B Calculation Methodology," November 1990.

7. XN-NF-80-19(P)(A), Volumes 2, 2A, 2B, and 2C, "Exxon Nuclear Methodology for Boiling Water Reactors: EXEM BWR ECCS Evaluation Model," September 1982.

8. 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.

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

10. XN-NF-85-67(P)(A), Revision 1, "Generic Mechanical Design for Exxon Nuclear Jet Pump BWR Reload Fuel," September 1986.

11. XN-NF-82-06(P)(A), Revision 1 and Supplements 2, 4, and 5, "Qualification of Exxon Nuclear Fuel for Extended Burnup," October 1986.

12. XN-NF-82-06(P)(A), Supplement 1 Revision 2, "Qualification of Exxon Nuclear Fuel for Extended Burnup," Supplement 1, "Extended Burnup Qualification of ENC 9x9 BWR Fuel," May 1988.

13. ANF-89-14(P)(A), Revision 1 and Supplements 1 & 2, "Advanced Nuclear Fuels Corporation Generic Mechanical Design for Advanced Nuclear Fuels Corporation 9X9 – IX and 9x9 – 9X BWR Reload Fuel," October 1991.

14. ANF-89-98(P)(A), Revision 1 and Supplement 1, "Generic Mechanical Design Criteria for BWR Fuel Designs," May 1995.

15. XN-NF-79-71(P)(A), Revision 2 and Supplements 1, 2, and 3, "Exxon Nuclear Plant Transient Methodology for Boiling Water Reactors," March 1986.

16. ANF-1125(P)(A) and Supplements 1 and 2, "ANFB Critical Power Correlation," April 1990.

[[GNF Proprietary Information]]
[[enclosed in double brackets]]

17. ANF-1125(P)(A), Supplement 1 Appendix E, "ANFB Critical Power Correlation Determination of ATRIUM-9B Additive Constant Uncertainties," September 1998.

18. ANF-524(P)(A), Revision 2 and Supplements 1 and 2, "ANF Critical Power Methodology for Boiling Water Reactors," November 1990.

19. 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.

20. ANF-91-048(P)(A), "Advanced Nuclear Fuels Corporation Methodology for Boiling Water Reactors EXEM BWR Evaluation Model," January 1993.

21. ANF-91-048(P)(A), Supplements 1 and 2, "BWR Jet Pump Model Revision for RELAX," October 1997.

22. 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.

23. EMF-1125(P)(A), Supplement 1 Appendix C, "ANFB Critical Power Correlation Application for Co-Resident Fuel," August 1997.

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

25. NEDC-32981P, Revision 0, "GEXL96 Correlation for ATRIUM-9B Fuel," September 2000.

Attachment A

GNF Proprietary Information Affidavit

Affidavit

I, Jens G. M. Andersen, state as follows:

(1) I am Fellow and project manager, TRACG Development, Global Nuclear Fuel – Americas, L.L.C. ("GNF-A") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in the attachment, "Core Operating Limits Report for Quad Cities Unit 2 Cycle 18". GNF proprietary information is indicated by enclosing it in double brackets. In each case, the superscript notation [3] refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GNF-A relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4) and 2.790(a)(4) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information," and some portions also qualify under the narrower definition of "trade secret," within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GNF-A's competitors without license from GNF-A constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals cost or price information, production capacities, budget levels, or commercial strategies of GNF-A, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future GNF-A customer–funded development plans and programs, of potential commercial value to GNF-A;

e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b., above.

(5) To address the 10 CFR 2.790 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GNF-A, and is in fact so held. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in (6) and (7) following. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GNF-A, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GNF-A. Access to such documents within GNF-A is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GNF-A are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2) is classified as proprietary because it contains details of GNF-A's fuel design and licensing methodology.

The development of the methods used in these analyses, along with the testing, development and approval of the supporting methodology was achieved at a significant cost, on the order of several million dollars, to GNF-A or its licensor.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GNF-A's competitive position and foreclose or reduce the availability of profit-making opportunities. The fuel design and licensing methodology is part of GNF-A's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC–approved methods.

The research, development, engineering, analytical, and NRC review costs comprise a substantial investment of time and money by GNF-A or its licensor.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GNF-A's competitive advantage will be lost if its competitors are able to use the results of the GNF-A experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GNF-A would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GNF-A of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed at Wilmington, North Carolina, this 19th day of February, 2004.

Jens G. M. Andersen

Jens G. M. Andersen
Global Nuclear Fuel – Americas, LLC