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November 26, 2003

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

LaSalle County Station, Unit 2
Facility Operating License No. NPF-18
NRC Docket No. 50-374

Subject: Unit 2 Cycle 10 Core Operating Limits Report (COLR)

Exelon Generation Company (EGC), LLC, in accordance with LaSalle County Station Technical Specifications (TS) Section 5.6.5, "Core Operating Limits Report," is submitting a revision to the Core Operating Limits Report (COLR). The revision is due to the implementation of new operating limits in the LaSalle Unit 2 Cycle 10 core beyond the first sequence exchange. The control blade history effects on fresh fuel are incorporated in the minimum critical power ratio (MCPR) operating limits and power-dependent limiting heat generation rate (LHGR) limit penalties. The penalties are applied to specific core locations to ensure that control blade history effects on fresh fuel assemblies are properly accounted for in the calculation of maximum nodal LHGR and MCPR.

Additionally, associated administrative changes have also been incorporated.

Should you have any questions concerning this submittal, please contact Mr. Glen Kaegi, Regulatory Assurance Manager, at (815) 415-2800.

Respectfully,

George P. Barnes

George P. Barnes
Site Vice President
LaSalle County Station

Attachment

cc: Regional Administrator - NRC Region III
NRC Senior Resident Inspector - LaSalle County Station

A001

Section 1

Core Operating Limits Report

for

LaSalle Unit 2 Cycle 10

Issuance of Changes Summary

Affected Section	Affected Pages	Summary of Changes	Revision	Date
All	All	Original Issue (Cycle 10)	0	2/2003
References, Section 1, 2, 3 and 6	iv, 1-1, 2-1 thru 2-18, 3-1 thru 3-11, and 6-1 thru 6-3	Incorporate the thermal limits for L2C10 cycle operation through EOC. Title changes to tables in sections 1, 2 and 3. Incorporate CBH penalties. Updated EOOS options. Attach supporting licensing analysis	1	8/2003

Technical Requirements Manual – Appendix J
L2C10 Core Operating Limits Report

Table of Contents

References

1. Exelon Generation Company, LLC, Docket No. 50-374 LaSalle County Station, Unit 2, Facility Operating License, License No. NPF-18.

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. EMF-2830 Revision 1, "LaSalle Unit 2 Cycle 10 Reload Analysis," Framatome ANP, Inc., April 2003.

4. Letter from A. Giancatarino to J. Nugent, "LaSalle Unit 1 and Unit 2 Rod Block Monitor COLR Setpoint Change," NFM:MW:01-0106, April 3, 2001.

5. Letter from D. Garber to R. Chin, "POWERPLEX-II CMSS Startup Testing", DEG:00:254, December 5, 2000.

6. Letter from D. Garber to R. Chin "POWERPLEX-II CMSS Startup Testing", DEG:00:256, December 6, 2000.

7. Letter from J.H. Riddle to R. Chin "TIP Symmetry Testing", JHR:97:021, January 20, 1997 and letter from D.Garber to R. Chin "TIP Symmetry Testing", DEG:99:085, March 23, 1999.

8. EMF-2700 Revision 0, "LaSalle Unit 2 Cycle 10 Principal Transient Analysis Parameters," June 2002.

9. "Transient Analysis Evaluation for LaSalle 3 TCV Operation at Power Uprate and MELLLA Conditions," NFM:BSA:00-025, R.W. Tsai to D. Bost, April 13, 2000.

10. Letter from C. de la Hoz to K. W. Peterman, "LaSalle Units 1 and 2 Operation with One MSIV Closed", NF-MW:03-015, January 15, 2003.

11. "LaSalle Units 1 and 2 Operation with One TSV OOS", EC Number 344312, August 18, 2003.

12. LaSalle County Station Power Uprate Project, Task 201: Reactor Power/Flow Map, GE-NE-A1300384-07-01, Revision 1, September 1999.

13. "Operation with a Pressure Regulator Out of Service at LaSalle," NF-MW:03-0063, Carlos de la Hoz to Kirk Peterman, February 7, 2003.

14. Letter from A. W. Will to F. W. Trikur, "LaSalle Unit 2 Control Blade History Study - Revised", AWW:03:074, June 26, 2003.

Technical Requirements Manual – Appendix J
L2C10 Core Operating Limits Report

1. Average Planar Linear Heat Generation Rate (3.2.1)

1.1 Technical Specification Reference:

Section 3.2.1.

1.2 Description:

Tables 1-1 and 1-2 are used to determine the maximum average planar linear heat generation rate (MAPLHGR) limit for each fuel type. Limits given in Tables 1-1 and 1-2 are for Dual Reactor Recirculation Loop Operation.

For Single Reactor Recirculation Loop Operation (SLO), the MAPLHGR limits given in Tables 1-1 and 1-2 must be multiplied by a SLO MAPLHGR multiplier. The SLO MAPLHGR multiplier for ATRIUM-10 and ATRIUM-9B fuel is 0.90 (Reference 3 Section 7.2.1).

Table 1-1
Maximum Average Planar Linear Heat Generation Rate
(MAPLHGR) for ATRIUM-10 Fuel
A10-4025B-15GV80-100M
A10-3982B-15GV80-100M
A10-1786B-0GV-100M
(Reference 3 Section 7.2.1)

Average Planar Exposure (GWd/MT)	MAPLHGR (kW/ft)
0.0	12.5
15.0	12.5
55.0	9.1
64.0	7.6

Table 1-2
Maximum Average Planar Linear Heat Generation Rate
(MAPLHGR) for ATRIUM-9B Fuel
A9-381B-13GZ7-80M
A9-384B-11GZ6-80M
A9-391B-14G8.0-100M
A9-410B-19G8.0-100M
A9-383B-16G8.0-100M
A9-396B-12GZ-100M
(Reference 3 Section 7.2.1)

Planar Average Exposure (GWd/MT)	MAPLHGR (kW/ft)
0.0	13.5
20.0	13.5
64.3	9.07

2. Minimum Critical Power Ratio (3.2.2)

2.1 Technical Specification Reference:

Section 3.2.2.

2.2 Description:

MCPR limits from BOC to End of Full Power are applicable up to a core average exposure of 30,317.0 MWd/MTU (which is the full power licensing basis exposure used by FANP). (Reference 3 Section 4.2.1). Limits beyond the EOC exposure are not provided.

2.2.1 Manual Flow Control MCPR Limits

The Operating Limit MCPR (OLMCPR) is determined from either section 2.2.1.1 or 2.2.1.2, whichever is greater at any given power and flow condition.

2.2.1.1 Power-Dependent MCPR

The power-dependent MCPR value, $MCPR_P$, is determined from Tables 2-1 through 2-16, and is dependent on fuel type and scram speed, in addition to power level. Tables 2-1 through 2-6 and Tables 2-9 through 2-14 are applicable to ATRIUM-10 fuel. Tables 2-7, 2-8, 2-15 and 2-16 are applicable to ATRIUM-9B fuel.

2.2.1.2 Flow-Dependent MCPR

The flow dependent MCPR value, $MCPR_F$, is determined from Table 2-17 for all fuel types in Cycle 10.

2.2.2 Automatic Flow Control MCPR Limits

Automatic Flow Control is not supported for L2C10.

2.2.3 Nominal Scram Speeds

To utilize the MCPR limits for Nominal Scram Speeds (NSS), the core average scram speed insertion time must be equal to or less than the following values (Reference 8 Section 7.7).

Notch Position	Time (sec)
45	0.380
39	0.680
25	1.680
05	2.680

Table 2-1
$MCPR_P$

For BOC to 4,970 MWd/MT Cycle Exposure -Applicable to all ATRIUM-10 Fuel

From 4,970 to 16,116 MWd/MT Cycle Exposure
Applicable to all ATRIUM-10 Fuel Except Those Located in Cells 7B(FT36), 7C(FT37), 8A(FT39), 8B (FT43), 9B(FT30), 9C(FT31), 9D(FT32), 10A(FT33) and 10B(FT34)

Nominal Scram Speeds (NSS)
(Reference 3 Table 5.1)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.70	2.20	1.98	1.45			1.40
FHOOS Only	2.84	2.34	2.34	1.54			1.40
EOOS Case 1	2.84	2.34	2.34	1.54			1.40
EOOS Case 2	2.84	2.34	2.34		1.72	1.50	1.44
TBVOOS AND 1 Stuck closed TCV	2.84	2.34	2.34	1.60			1.46
Single Loop Operation (SLO)	2.71	2.21	1.99	1.46			1.41
SLO with FHOOS Only	2.85	2.35	2.35	1.55			1.41
SLO with EOOS Case 1	2.85	2.35	2.35	1.55			1.41
SLO with EOOS Case 2	2.85	2.35	2.35		1.73	1.51	1.45
SLO with TBVOOS AND 1 Stuck closed TCV	2.85	2.35	2.35	1.61			1.47

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-2
$MCPR_P$

For 4,970 to 16,116 MWd/MT Cycle Exposure
For ATRIUM-10 Fuel Located in 9B(FT30), 9C(FT31), 9D(FT32), and 10A(FT33) Cells

Nominal Scram Speeds (NSS)
(Reference 3 Table 5.1, Reference 14 Table 4.3)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.72	2.22	2.00	1.47			1.42
FHOOS Only	2.86	2.36	2.36	1.56			1.42
EOOS Case 1	2.86	2.36	2.36	1.56			1.42
EOOS Case 2	2.86	2.36	2.36		1.74	1.52	1.46
TBVOOS AND 1 Stuck closed TCV	2.86	2.36	2.36	1.62			1.48
Single Loop Operation (SLO)	2.73	2.23	2.01	1.48			1.43
SLO with FHOOS Only	2.87	2.37	2.37	1.57			1.43
SLO with EOOS Case 1	2.87	2.37	2.37	1.57			1.43
SLO with EOOS Case 2	2.87	2.37	2.37		1.75	1.53	1.47
SLO with TBVOOS AND 1 Stuck closed TCV	2.87	2.37	2.37	1.63			1.49

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-3
$MCPR_P$

For 4,970 to 16,116 MWd/MT Cycle Exposure
For ATRIUM-10 Fuel Located in 7B(FT36), 7C(FT37), 8A(FT39), 8B (FT43) and 10B(FT34) Cells

Nominal Scram Speeds (NSS)
(Reference 3 Table 5.1, Reference 14 Table 4.3)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.76	2.26	2.04	1.51	[redacted]	[redacted]	1.46
FHOOS Only	2.90	2.40	2.40	1.60	[redacted]	[redacted]	1.46
EOOS Case 1	2.90	2.40	2.40	1.60	[redacted]	[redacted]	1.46
EOOS Case 2	2.90	2.40	2.40	[redacted]	1.78	1.56	1.50
TBVOOS AND 1 Stuck closed TCV	2.90	2.40	2.40	1.66	[redacted]	[redacted]	1.52
Single Loop Operation (SLO)	2.77	2.27	2.05	1.52	[redacted]	[redacted]	1.47
SLO with FHOOS Only	2.91	2.41	2.41	1.61	[redacted]	[redacted]	1.47
SLO with EOOS Case 1	2.91	2.41	2.41	1.61	[redacted]	[redacted]	1.47
SLO with EOOS Case 2	2.91	2.41	2.41	[redacted]	1.79	1.57	1.51
SLO with TBVOOS AND 1 Stuck closed TCV	2.91	2.41	2.41	1.67	[redacted]	[redacted]	1.53

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-4
$MCPR_P$

For BOC to 4,970 MWd/MT Cycle Exposure -Applicable to all ATRIUM-10 Fuel

From 4,970 to 16,116 MWd/MT Cycle Exposure
Applicable to all ATRIUM-10 Fuel Except Those Located in Cells 7B(FT36), 7C(FT37), 8A(FT39), 8B (FT43), 9B(FT30), 9C(FT31), 9D(FT32), 10A(FT33) and 10B(FT34)

Technical Specification Scram Speeds (TSSS)
(Reference 3 Table 5.2)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.70	2.20	2.05	1.48	[redacted]	[redacted]	1.40
FHOOS Only	2.92	2.42	2.42	1.60	[redacted]	[redacted]	1.40
EOOS Case 1	2.92	2.42	2.42	1.60	[redacted]	[redacted]	1.42
EOOS Case 2	2.92	2.42	2.42	[redacted]	1.72	1.52	1.48
TBVOOS AND 1 stuck closed TCV	2.92	2.42	2.42	1.60	[redacted]	[redacted]	1.47
Single Loop Operation (SLO)	2.71	2.21	2.06	1.49	[redacted]	[redacted]	1.41
SLO with FHOOS Only	2.93	2.43	2.43	1.61	[redacted]	[redacted]	1.41
SLO with EOOS Case 1	2.93	2.43	2.43	1.61	[redacted]	[redacted]	1.43
SLO with EOOS Case 2	2.93	2.43	2.43	[redacted]	1.73	1.53	1.49
SLO with TBVOOS AND 1 stuck closed TCV	2.93	2.43	2.43	1.61	[redacted]	[redacted]	1.48

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-5
$MCPR_P$

For 4,970 to 16,116 MWd/MT Cycle Exposure
For ATRIUM-10 Fuel Located in 9B(FT30), 9C(FT31), 9D(FT32), and 10A(FT33) Cells

Technical Specification Scram Speeds (TSSS)
(Reference 3 Table 5.2, Reference 14 Table 4.3)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.72	2.22	2.07	1.50			1.42
FHOOS Only	2.94	2.44	2.44	1.62			1.42
EOOS Case 1	2.94	2.44	2.44	1.62			1.44
EOOS Case 2	2.94	2.44	2.44		1.74	1.54	1.50
TBVOOS AND 1 stuck closed TCV	2.94	2.44	2.44	1.62			1.49
Single Loop Operation (SLO)	2.73	2.23	2.08	1.51			1.43
SLO with FHOOS Only	2.95	2.45	2.45	1.63			1.43
SLO with EOOS Case 1	2.95	2.45	2.45	1.63			1.45
SLO with EOOS Case 2	2.95	2.45	2.45		1.75	1.55	1.51
SLO with TBVOOS AND 1 stuck closed TCV	2.95	2.45	2.45	1.63			1.50

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-6
$MCPR_P$

For 4,970 to 16,116 MWd/MT Cycle Exposure
For ATRIUM-10 Fuel Located in 7B(FT36), 7C(FT37), 8A(FT39), 8B (FT43) and 10B(FT34) Cells

Technical Specification Scram Speeds (TSSS)
(Reference 3 Table 5.2, Reference 14 Table 4.3)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.76	2.26	2.11	1.54	[redacted]	[redacted]	1.46
FHOOS Only	2.98	2.48	2.48	1.66	[redacted]	[redacted]	1.46
EOOS Case 1	2.98	2.48	2.48	1.66	[redacted]	[redacted]	1.48
EOOS Case 2	2.98	2.48	2.48	[redacted]	1.78	1.58	1.54
TBVOOS AND 1 stuck closed TCV	2.98	2.48	2.48	1.66	[redacted]	[redacted]	1.53
Single Loop Operation (SLO)	2.77	2.27	2.12	1.55	[redacted]	[redacted]	1.47
SLO with FHOOS Only	2.99	2.49	2.49	1.67	[redacted]	[redacted]	1.47
SLO with EOOS Case 1	2.99	2.49	2.49	1.67	[redacted]	[redacted]	1.49
SLO with EOOS Case 2	2.99	2.49	2.49	[redacted]	1.79	1.59	1.55
SLO with TBVOOS AND 1 stuck closed TCV	2.99	2.49	2.49	1.67	[redacted]	[redacted]	1.54

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-7
$MCPR_P$

For BOC to 16,116 MWd/MT Cycle Exposure
For ATRIUM-9B Fuel

Nominal Scram Speeds (NSS)
(Reference 3 Table 5.1)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.70	2.20	1.91	1.45			1.40
FHOOS Only	2.73	2.23	2.23	1.53			1.40
EOOS Case 1	2.73	2.23	2.23	1.54			1.40
EOOS Case 2	2.73	2.23	2.23		1.74	1.54	1.48
TBVOOS AND 1 Stuck closed TCV	2.73	2.23	2.23	1.54			1.41
Single Loop Operation (SLO)	2.71	2.21	1.92	1.46			1.41
SLO with FHOOS Only	2.74	2.24	2.24	1.54			1.41
SLO with EOOS Case 1	2.74	2.24	2.24	1.55			1.41
SLO with EOOS Case 2	2.74	2.24	2.24		1.75	1.55	1.49
SLO with TBVOOS AND 1 Stuck closed TCV	2.74	2.24	2.24	1.55			1.42

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-8
$MCPR_P$

For BOC to 16,116 MWd/MT Cycle Exposure
For ATRIUM-9B Fuel

Technical Specification Scram Speeds (TSSS)
(Reference 3 Table 5.2)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.70	2.20	1.97	1.49			1.40
FHOOS Only	2.79	2.29	2.29	1.56			1.40
EOOS Case 1	2.79	2.29	2.29	1.58			1.41
EOOS Case 2	2.79	2.29	2.29		1.75	1.57	1.50
TBVOOS AND 1 stuck closed TCV	2.79	2.29	2.29	1.58			1.42
Single Loop Operation (SLO)	2.71	2.21	1.98	1.50			1.41
SLO with FHOOS Only	2.80	2.30	2.30	1.57			1.41
SLO with EOOS Case 1	2.80	2.30	2.30	1.59			1.42
SLO with EOOS Case 2	2.80	2.30	2.30		1.76	1.58	1.51
SLO with TBVOOS AND 1 stuck closed TCV	2.80	2.30	2.30	1.59			1.43

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-9
$MCPR_P$

For 16,116 MWd/MT Cycle Exposure to Coastdown (EOC)
Applicable for all ATRIUM-10 Fuel Except Those Located in Cells 7B(FT36), 7C(FT37), 8A(FT39), 8B (FT43), 9B(FT30), 9C(FT31), 10A(FT33) and 10B(FT34)

Nominal Scram Speeds (NSS)
(Reference 3 Table 5.3)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.70	2.20	1.98	1.45	[redacted]	[redacted]	1.40
FHOOS Only	2.84	2.34	2.34	1.54	[redacted]	[redacted]	1.40
EOOS Case 1	2.84	2.34	2.34	1.54	[redacted]	[redacted]	1.41
EOOS Case 2	2.84	2.34	2.34	[redacted]	1.72	1.55	1.55
TBVOOS AND 1 Stuck closed TCV	2.84	2.34	2.34	1.60	[redacted]	[redacted]	1.46
Single Loop Operation (SLO)	2.71	2.21	1.99	1.46	[redacted]	[redacted]	1.41
SLO with FHOOS Only	2.85	2.35	2.35	1.55	[redacted]	[redacted]	1.41
SLO with EOOS Case 1	2.85	2.35	2.35	1.55	[redacted]	[redacted]	1.42
SLO with EOOS Case 2	2.85	2.35	2.35	[redacted]	1.73	1.56	1.56
SLO with TBVOOS AND 1 Stuck closed TCV	2.85	2.35	2.35	1.61	[redacted]	[redacted]	1.47

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-10
$MCPR_P$

For 16,116 MWd/MT Cycle Exposure to Coastdown (EOC)
For ATRIUM-10 Fuel Located in 9B(FT30), 9C(FT31), 10A(FT33), and 10B(FT34) Cells

Nominal Scram Speeds (NSS)
(Reference 3 Table 5.3, Reference 14 Table 4.3)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.73	2.23	2.01	1.48	[redacted]	[redacted]	1.43
FHOOS Only	2.87	2.37	2.37	1.57	[redacted]	[redacted]	1.43
EOOS Case 1	2.87	2.37	2.37	1.57	[redacted]	[redacted]	1.44
EOOS Case 2	2.87	2.37	2.37	[redacted]	1.75	1.58	1.58
TBVOOS AND 1 Stuck closed TCV	2.87	2.37	2.37	1.63	[redacted]	[redacted]	1.49
Single Loop Operation (SLO)	2.74	2.24	2.02	1.49	[redacted]	[redacted]	1.44
SLO with FHOOS Only	2.88	2.38	2.38	1.58	[redacted]	[redacted]	1.44
SLO with EOOS Case 1	2.88	2.38	2.38	1.58	[redacted]	[redacted]	1.45
SLO with EOOS Case 2	2.88	2.38	2.38	[redacted]	1.76	1.59	1.59
SLO with TBVOOS AND 1 Stuck closed TCV	2.88	2.38	2.38	1.64	[redacted]	[redacted]	1.50

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-11
$MCPR_P$

For 16,116 MWd/MT Cycle Exposure to Coastdown (EOC)
For ATRIUM-10 Fuel Located in 7B(FT36), 7C(FT37), 8A(FT39), and 8B (FT43) Cells

Nominal Scram Speeds (NSS)
(Reference 3 Table 5.3, Reference 14 Table 4.3)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.76	2.26	2.04	1.51			1.46
FHOOS Only	2.90	2.40	2.40	1.60			1.46
EOOS Case 1	2.90	2.40	2.40	1.60			1.47
EOOS Case 2	2.90	2.40	2.40		1.78	1.61	1.61
TBVOOS AND 1 Stuck closed TCV	2.90	2.40	2.40	1.66			1.52
Single Loop Operation (SLO)	2.77	2.27	2.05	1.52			1.47
SLO with FHOOS Only	2.91	2.41	2.41	1.61			1.47
SLO with EOOS Case 1	2.91	2.41	2.41	1.61			1.48
SLO with EOOS Case 2	2.91	2.41	2.41		1.79	1.62	1.62
SLO with TBVOOS AND 1 Stuck closed TCV	2.91	2.41	2.41	1.67			1.53

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-12
$MCPR_P$

For 16,116 MWd/MT Cycle Exposure to Coastdown (EOC)
Applicable to all ATRIUM-10 Fuel Except Those Located in Cells 7B(FT36), 7C(FT37), 8A(FT39), 8B (FT43), 9B(FT30), 9C(FT31), 10A(FT33) and 10B(FT34)

Technical Specification Scram Speeds (TSSS)
(Reference 3 Table 5.4)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.70	2.20	2.05	1.48			1.42
FHOOS Only	2.92	2.42	2.42	1.60			1.42
EOOS Case 1	2.92	2.42	2.42	1.60			1.44
EOOS Case 2	2.92	2.42	2.42		1.72	1.58	1.58
TBVOOS AND 1 stuck closed TCV	2.92	2.42	2.42	1.60			1.47
Single Loop Operation (SLO)	2.71	2.21	2.06	1.49			1.43
SLO with FHOOS Only	2.93	2.43	2.43	1.61			1.43
SLO with EOOS Case 1	2.93	2.43	2.43	1.61			1.45
SLO with EOOS Case 2	2.93	2.43	2.43		1.73	1.59	1.59
SLO with TBVOOS AND 1 stuck closed TCV	2.93	2.43	2.43	1.61			1.48

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-13
$MCPR_P$

For 16,116 MWd/MT Cycle Exposure to Coastdown (EOC)
For ATRIUM-10 Fuel Located in 9B(FT30), 9C(FT31), 10A(FT33), and 10B(FT34) Cells

Technical Specification Scram Speeds (TSSS)
(Reference 3 Table 5.4, Reference 14 Table 4.3)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.73	2.23	2.08	1.51			1.45
FHOOS Only	2.95	2.45	2.45	1.63			1.45
EOOS Case 1	2.95	2.45	2.45	1.63			1.47
EOOS Case 2	2.95	2.45	2.45		1.75	1.61	1.61
TBVOOS AND 1 stuck closed TCV	2.95	2.45	2.45	1.63			1.50
Single Loop Operation (SLO)	2.74	2.24	2.09	1.52			1.46
SLO with FHOOS Only	2.96	2.46	2.46	1.64			1.46
SLO with EOOS Case 1	2.96	2.46	2.46	1.64			1.48
SLO with EOOS Case 2	2.96	2.46	2.46		1.76	1.62	1.62
SLO with TBVOOS AND 1 stuck closed TCV	2.96	2.46	2.46	1.64			1.51

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-14
$MCPR_P$

For 16,116 MWd/MT Cycle Exposure to Coastdown (EOC)
For ATRIUM-10 Fuel Located in 7B(FT36), 7C(FT37), 8A(FT39) and 8B (FT43) Cells

Technical Specification Scram Speeds (TSSS)
(Reference 3 Table 5.4, Reference 14 Table 4.3)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.76	2.26	2.11	1.54			1.48
FHOOS Only	2.98	2.48	2.48	1.66			1.48
EOOS Case 1	2.98	2.48	2.48	1.66			1.50
EOOS Case 2	2.98	2.48	2.48		1.78	1.64	1.64
TBVOOS AND 1 stuck closed TCV	2.98	2.48	2.48	1.66			1.53
Single Loop Operation (SLO)	2.77	2.27	2.12	1.55			1.49
SLO with FHOOS Only	2.99	2.49	2.49	1.67			1.49
SLO with EOOS Case 1	2.99	2.49	2.49	1.67			1.51
SLO with EOOS Case 2	2.99	2.49	2.49		1.79	1.65	1.65
SLO with TBVOOS AND 1 stuck closed TCV	2.99	2.49	2.49	1.67			1.54

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-15
$MCPR_P$

For 16,116 MWd/MT Cycle Exposure to Coastdown (EOC)
For ATRIUM-9B Fuel

Nominal Scram Speeds (NSS)
(Reference 3 Table 5.3)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.70	2.20	1.91	1.48			1.41
FHOOS Only	2.73	2.23	2.23	1.54			1.41
EOOS Case 1	2.73	2.23	2.23	1.56			1.43
EOOS Case 2	2.73	2.23	2.23		1.76	1.58	1.55
TBVOOS AND 1 Stuck closed TCV	2.73	2.23	2.23	1.56			1.44
Single Loop Operation (SLO)	2.71	2.21	1.92	1.49			1.42
SLO with FHOOS Only	2.74	2.24	2.24	1.55			1.42
SLO with EOOS Case 1	2.74	2.24	2.24	1.57			1.44
SLO with EOOS Case 2	2.74	2.24	2.24		1.77	1.59	1.56
SLO with TBVOOS AND 1 Stuck closed TCV	2.74	2.24	2.24	1.57			1.45

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-16
$MCPR_P$

For 16,116 MWd/MT Cycle Exposure to Coastdown (EOC)
For ATRIUM-9B Fuel

Technical Specification Scram Speeds (TSSS)
(Reference 3 Table 5.4)

EOOS Combination	Core Thermal Power (% of rated)						
	0	25	25(25.01)	60	80	80(80.01)	100
	$MCPR_P$						
Base Case Operation	2.70	2.20	1.97	1.49	[redacted]	[redacted]	1.44
FHOOS Only	2.79	2.29	2.29	1.56	[redacted]	[redacted]	1.44
EOOS Case 1	2.79	2.29	2.29	1.58	[redacted]	[redacted]	1.46
EOOS Case 2	2.79	2.29	2.29	[redacted]	1.77	1.61	1.61
TBVOOS AND 1 stuck closed TCV	2.79	2.29	2.29	1.58	[redacted]	[redacted]	1.46
Single Loop Operation (SLO)	2.71	2.21	1.98	1.50	[redacted]	[redacted]	1.45
SLO with FHOOS Only	2.80	2.30	2.30	1.57	[redacted]	[redacted]	1.45
SLO with EOOS Case 1	2.80	2.30	2.30	1.59	[redacted]	[redacted]	1.47
SLO with EOOS Case 2	2.80	2.30	2.30	[redacted]	1.78	1.62	1.62
SLO with TBVOOS AND 1 stuck closed TCV	2.80	2.30	2.30	1.59	[redacted]	[redacted]	1.47

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $MCPR_P$ should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 2-17
$MCPR_F$ limits for All Fuel
(Reference 3 Figure 5.1)

Flow (% of rated)	$MCPR_F$
105	1.11
100	1.19
30	1.63
0	1.63

- Values are interpolated between relevant flow values.
- Values are applicable to all Operating Domains and EOOS conditions in Section 6.
- For thermal limit monitoring at greater than 105% rated core flow, utilize the $MCPR_F$ limit for 105% rated core flow.

3. Linear Heat Generation Rate (3.2.3)

3.1 Technical Specification Reference:

Section 3.2.3.

3.2 Description:

The LHGR Limit is the product of the LHGR Limit from Tables 3-1a, 3-1b, 3-1c or 3-2 and the minimum of either the power dependent LHGR Factor, $LHGRFAC_P$, or the flow dependent LHGR Factor, $LHGRFAC_F$. The applicable power dependent LHGR Factor ($LHGRFAC_P$) is determined from Table 3-3, 3-4, 3-7 or 3-8 for ATRIUM-10 fuel or Table 3-5, 3-6, 3-9 or 3-10 for ATRIUM-9B fuel. The applicable flow dependent LHGR Factor ($LHGRFAC_F$) is determined from Table 3-11 for all fuel types.

Table 3-1a
Steady-State LHGR Limits for all ATRIUM-10 Fuel
Except when table 3-1b or 3-1c are applicable
A10-4025B-15GV80-100M
A10-3982B-15GV80-100M
A10-1786B-0GV-100M
(Reference 3 Section 7.2.3)

Average Planar Exposure (GWd/MT)	LHGR Limit (kW/ft)
0.0	13.4
15.0	13.4
55.0	9.1
64.0	7.3

Table 3-1b
Steady-State LHGR Limits for ATRIUM-10 Fuel
Located in Cell Locations 7B(FT36), 7C(FT37), 8A(FT39), 8B (FT43), 9B(FT30), 9C(FT31), 9D(FT32), 10A(FT33) and 10B(FT34)
Applicable from 4,970 to 16,116 MWd/MT
A10-4025B-15GV80-100M
A10-3982B-15GV80-100M
A10-1786B-0GV-100M
(Reference 3 Section 7.2.3, Reference 14 Table 4.2)
(For applicability see COLR Section 6, Note 4)

Average Planar Exposure (GWd/MT)	LHGR Limit (kW/ft)
0.0	12.75
15.0	12.75
55.0	8.45
64.0	6.65

Table 3-1c
Steady-State LHGR Limits for ATRIUM-10 Fuel
Located in Cell Locations 7B(FT36), 8B (FT43), 9B(FT30), 10A(FT33) and 10B(FT34)
Applicable from 16,116 MWd/MT to Coastdown (EOC)
A10-4025B-15GV80-100M
A10-3982B-15GV80-100M
A10-1786B-0GV-100M
(Reference 3 Section 7.2.3, Reference 14 Table 4.2)
(For applicability see COLR Section 6, Note 4)

Average Planar Exposure (GWd/MT)	LHGR Limit (kW/ft)
0.0	12.75
15.0	12.75
55.0	8.45
64.0	6.65

Table 3-2
Steady-State LHGR Limits for ATRIUM-9B Fuel
A9-381B-13GZ7-80M
A9-384B-11GZ6-80M
A9-391B-14G8.0-100M
A9-410B-19G8.0-100M
A9-383B-16G8.0-100M
A9-396B-12GZ-100M
(Reference 3 Section 7.2.3)

Average Planar Exposure (GWd/MT)	LHGR Limit (kW/ft)
0.0	14.4
15.0	14.4
64.3	7.9

Table 3-3
$LHGRFAC_P$

For BOC to 16,116 MWd/MT Cycle Exposure
For ATRIUM-10 Fuel

Nominal Scram Speeds (NSS)
(Reference 3 Table 5.1)

EOOS Combination	Core Thermal Power (% of rated)					
	0	25	60	80	80 (80.01)	100
	$LHGRFAC_P$ multiplier					
Base Case Operation	0.79	0.79	1.00			1.00
FHOOS Only	0.66	0.66	0.98			1.00
EOOS Case 1	0.66	0.66	0.98			1.00
EOOS Case 2	0.66	0.66		0.92	0.97	0.97
TBVOOS AND 1 stuck closed TCV	0.66	0.66	0.80	0.80		0.85
Single Loop Operation (SLO)	0.79	0.79	1.00			1.00
SLO with FHOOS Only	0.66	0.66	0.98			1.00
SLO with EOOS Case 1	0.66	0.66	0.98			1.00
SLO with EOOS Case 2	0.66	0.66		0.92	0.97	0.97
TBVOOS AND 1 stuck closed TCV	0.66	0.66	0.80	0.80		0.85

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $LHGRFAC_P$ multiplier should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 3-4
$LHGRFAC_P$

For BOC to 16,116 MWd/MT Cycle Exposure
For ATRIUM-10 Fuel

Technical Specification Scram Speeds (TSSS)
(Reference 3 Table 5.2)

EOOS Combination	Core Thermal Power (% of rated)					
	0	25	60	80	80 (80.01)	100
	$LHGRFAC_P$ multiplier					
Base Case Operation	0.78	0.78	1.00			1.00
FHOOS Only	0.65	0.65	0.95			1.00
EOOS Case 1	0.65	0.65	0.95			1.00
EOOS Case 2	0.65	0.65		0.91	0.93	0.95
TBVOOS AND 1 stuck closed TCV	0.65	0.65	0.80	0.80		0.85
Single Loop Operation (SLO)	0.78	0.78	1.00			1.00
SLO with FHOOS Only	0.65	0.65	0.95			1.00
SLO with EOOS Case 1	0.65	0.65	0.95			1.00
SLO with EOOS Case 2	0.65	0.65		0.91	0.93	0.95
TBVOOS AND 1 stuck closed TCV	0.65	0.65	0.80	0.80		0.85

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $LHGRFAC_P$ multiplier should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 3-5
$LHGRFAC_P$

For BOC to 16,116 MWd/MT Cycle Exposure
For ATRIUM-9B Fuel

Nominal Scram Speeds (NSS)
(Reference 3 Table 5.1)

EOOS Combination	Core Thermal Power (% of rated)					
	0	25	60	80	80 (80.01)	100
	$LHGRFAC_P$ multiplier					
Base Case Operation	0.79	0.79	1.00			1.00
FHOOS Only	0.68	0.68	0.95			1.00
EOOS Case 1	0.68	0.68	0.95			1.00
EOOS Case 2	0.68	0.68		0.79	0.87	0.90
TBVOOS AND 1 stuck closed TCV	0.68	0.68	0.79	0.79		0.85
Single Loop Operation (SLO)	0.79	0.79	1.00			1.00
SLO with FHOOS Only	0.68	0.68	0.95			1.00
SLO with EOOS Case 1	0.68	0.68	0.95			1.00
SLO with EOOS Case 2	0.68	0.68		0.79	0.87	0.90
TBVOOS AND 1 stuck closed TCV	0.68	0.68	0.79	0.79		0.85

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $LHGRFAC_P$ multiplier should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 3-6
$LHGRFAC_P$

For BOC to 16,116 MWd/MT Cycle Exposure
For ATRIUM-9B Fuel

Technical Specification Scram Speeds (TSSS)
(Reference 3 Table 5.2)

EOOS Combination	Core Thermal Power (% of rated)					
	0	25	60	80	80 (80.01)	100
	$LHGRFAC_P$ multiplier					
Base Case Operation	0.78	0.78	1.00			1.00
FHOOS Only	0.67	0.67	0.93			1.00
EOOS Case 1	0.67	0.67	0.93			1.00
EOOS Case 2	0.67	0.67		0.79	0.86	0.90
TBVOOS AND 1 stuck closed TCV	0.67	0.67	0.79	0.79		0.85
Single Loop Operation (SLO)	0.78	0.78	1.00			1.00
SLO with FHOOS Only	0.67	0.67	0.93			1.00
SLO with EOOS Case 1	0.67	0.67	0.93			1.00
SLO with EOOS Case 2	0.67	0.67		0.79	0.86	0.90
TBVOOS AND 1 stuck closed TCV	0.67	0.67	0.79	0.79		0.85

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $LHGRFAC_P$ multiplier should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 3-7
$LHGRFAC_P$

For 16,116 MWd/MT Cycle Exposure to Coastdown (EOC)
For ATRIUM-10 Fuel

Nominal Scram Speeds (NSS)
(Reference 3 Table 5.3)

EOOS Combination	Core Thermal Power (% of rated)					
	0	25	60	80	80 (80.01)	100
	$LHGRFAC_P$ multiplier					
Base Case Operation	0.79	0.79	1.00			1.00
FHOOS Only	0.66	0.66	0.98			1.00
EOOS Case 1	0.66	0.66	0.98			1.00
EOOS Case 2	0.66	0.66		0.86	0.86	0.86
TBVOOS AND 1 stuck closed TCV	0.66	0.66	0.79	0.79		0.83
Single Loop Operation (SLO)	0.79	0.79	1.00			1.00
SLO with FHOOS Only	0.66	0.66	0.98			1.00
SLO with EOOS Case 1	0.66	0.66	0.98			1.00
SLO with EOOS Case 2	0.66	0.66		0.86	0.86	0.86
TBVOOS AND 1 stuck closed TCV	0.66	0.66	0.79	0.79		0.83

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $LHGRFAC_P$ multiplier should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 3-8
$LHGRFAC_P$

For 16,116 MWd/MT Cycle Exposure to Coastdown (EOC)
For ATRIUM-10 Fuel

Technical Specification Scram Speeds (TSSS)
(Reference 3 Table 5.4)

EOOS Combination	Core Thermal Power (% of rated)					
	0	25	60	80	80 (80.01)	100
	$LHGRFAC_P$ multiplier					
Base Case Operation	0.78	0.78	1.00			1.00
FHOOS Only	0.65	0.65	0.95			1.00
EOOS Case 1	0.65	0.65	0.95			1.00
EOOS Case 2	0.65	0.65		0.84	0.84	0.84
TBVOOS AND 1 stuck closed TCV	0.65	0.65	0.79	0.79		0.83
Single Loop Operation (SLO)	0.78	0.78	1.00			1.00
SLO with FHOOS Only	0.65	0.65	0.95			1.00
SLO with EOOS Case 1	0.65	0.65	0.95			1.00
SLO with EOOS Case 2	0.65	0.65		0.84	0.84	0.84
TBVOOS AND 1 stuck closed TCV	0.65	0.65	0.79	0.79		0.83

- *Values are interpolated between relevant power levels.*
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $LHGRFAC_P$ multiplier should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 3-9
$LHGRFAC_P$

For 16,116 MWd/MT Cycle Exposure to Coastdown (EOC)
For ATRIUM-9B Fuel

Nominal Scram Speeds (NSS)
(Reference 3 Table 5.3)

EOOS Combination	Core Thermal Power (% of rated)					
	0	25	60	80	80 (80.01)	100
	$LHGRFAC_P$ multiplier					
Base Case Operation	0.79	0.79	1.00			1.00
FHOOS Only	0.68	0.68	0.95			1.00
EOOS Case 1	0.68	0.68	0.94			0.97
EOOS Case 2	0.68	0.68		0.79	0.80	0.80
TBVOOS AND 1 stuck closed TCV	0.68	0.68	0.79	0.79		0.83
Single Loop Operation (SLO)	0.79	0.79	1.00			1.00
SLO with FHOOS Only	0.68	0.68	0.95			1.00
SLO with EOOS Case 1	0.68	0.68	0.94			0.97
SLO with EOOS Case 2	0.68	0.68		0.79	0.80	0.80
TBVOOS AND 1 stuck closed TCV	0.68	0.68	0.79	0.79		0.83

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $LHGRFAC_P$ multiplier should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 3-10
$LHGRFAC_P$

For 16,116 MWd/MT Cycle Exposure to Coastdown (EOC)
For ATRIUM-9B Fuel

Technical Specification Scram Speeds (TSSS)
(Reference 3 Table 5.4)

EOOS Combination	Core Thermal Power (% of rated)					
	0	25	60	80	80 (80.01)	100
	$LHGRFAC_P$ multiplier					
Base Case Operation	0.78	0.78	1.00			1.00
FHOOS Only	0.67	0.67	0.93			1.00
EOOS Case 1	0.67	0.67	0.93			0.98
EOOS Case 2	0.67	0.67		0.78	0.78	0.78
TBVOOS AND 1 stuck closed TCV	0.67	0.67	0.79	0.79		0.83
Single Loop Operation (SLO)	0.78	0.78	1.00			1.00
SLO with FHOOS Only	0.67	0.67	0.93			1.00
SLO with EOOS Case 1	0.67	0.67	0.93			0.98
SLO with EOOS Case 2	0.67	0.67		0.78	0.78	0.78
TBVOOS AND 1 stuck closed TCV	0.67	0.67	0.79	0.79		0.83

- Values are interpolated between relevant power levels.
- For thermal limit monitoring at greater than 100% core thermal power, the 100% core thermal power $LHGRFAC_P$ multiplier should be applied.
- Allowable EOOS conditions are listed in Section 6.

Table 3-11
$LHGRFAC_F$ multipliers for All Fuel
(Reference 3 Figure 5.2)

Flow (% of rated)	$LHGRFAC_F$ Multiplier
105	1.00
60	1.00
30	0.85
0	0.85

- Values are interpolated between relevant flow values.
- For thermal limit monitoring above 105% rated core flow, utilize the 105% rated core flow $LHGRFAC_F$ multiplier.
- Values are applicable to all Operating Domains and EOOS conditions in Section 6.

4. Control Rod Withdrawal Block Instrumentation (3.3.2.1)

4.1 Technical Specification Reference:

Table 3.3.2.1-1

4.2 Description:

The Rod Block Monitor Upscale Instrumentation Setpoints are determined from the relationships shown below (Reference 4):

ROD BLOCK MONITOR UPSCALE TRIP FUNCTION	ALLOWABLE VALUE
Two Recirculation Loop Operation	0.66 W_d + 54%
Single Recirculation Loop Operation	0.66 W_d + 48.7%

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 flow (W_d) of 100%.

W_d – percent of recirculation loop flow required to produce a rated core flow of 108.5 Mlb/hr.

5. Traversing In-Core Probe System (3.2.1, 3.2.2, 3.2.3)

5.1 Technical Specification Reference:

Technical Specification Sections 3.2.1, 3.2.2, 3.2.3 for thermal limits require the TIP system for recalibration of the LPRM detectors and monitoring thermal limits.

5.2 Description:

When the traversing in-core probe (TIP) system (for the required measurement locations) is used for recalibration of the LPRM detectors and monitoring thermal limits, the TIP system shall be operable with the following:

1. movable detectors, drives and readout equipment to map the core in the required measurement locations, and

2. indexing equipment to allow all required detectors to be calibrated in a common location.

The following applies for use of the SUBTIP methodology:

With one or more TIP measurement locations inoperable, the TIP data for an inoperable measurement location may be replaced by data obtained from a 3-dimensional BWR core monitoring software system adjusted using the previously calculated uncertainties, provided the following conditions are met:

1. All TIP traces have previously been obtained at least once in the current operating cycle when the reactor core was operating above 20% power, (References 5, 6 and 7) and

2. The total number of simulated channels (measurement locations) does not exceed 42% (18 channels).

Otherwise, with the TIP system inoperable, suspend use of the system for the above applicable monitoring or calibration functions.

5.3 Bases:

The operability of the TIP system with the above specified minimum complement of equipment ensures that the measurements obtained from use of this equipment accurately represent the spatial neutron flux distribution of the reactor core. The normalization of the required detectors is performed internal to the core monitoring software system.

Substitute TIP data, if needed, is 3-dimensional BWR core monitoring software calculated data which is adjusted based on axial and radial factors calculated from previous TIP sets. Since the simulation and adjustment process could introduce uncertainty, a maximum of 18 channels may be simulated to ensure that the uncertainties assumed in the substitution process methodology remain valid.

6. Allowed Modes of Operation (B 3.2.2, B 3.2.3)

The Allowed Modes of Operation with combinations of Equipment Out-of-Service are as described below:

	---------OPERATING REGION---------				
Equipment Out of Service Options[1,4,10]	**MELLLA Region**	**Standard[9] Power-Flow Region (100% Rod Line)**	**ICF[7]**	**Coastdown[3]**	**POWERPLEX Thermal Limit Set Number[4]**
Base Case Operation – NSS	Yes	Yes	Yes	No	1, 21, 41
FHOOS[5] Only – NSS	No[8]	Yes	Yes	No	2, 22, 42
EOOS Case 1 – NSS TBVOOS[2] ,or FHOOS[5]	Yes No[8]	Yes	Yes	No	3, 23, 43
EOOS Case 2 – NSS Any combination of TCV slow closure [12], no RPT, or FHOOS[5]	Yes No[8]	Yes	Yes	No	4, 24, 44
TBVOOS AND 1 stuck closed TCV[2]- NSS	Yes	Yes	Yes	No	5, 25, 45
Single Loop Operation (SLO) – NSS	No[6]	Yes	N/A	No	6, 26, 46
SLO FHOOS[5] Only – NSS	No[6]	Yes	N/A	No	7, 27, 47
SLO with EOOS Case 1 – NSS TBVOOS[2] or FHOOS[5]	No[6]	Yes	N/A	No	8, 28, 48
SLO with EOOS Case 2 – NSS Any combination of TCV slow closure[12], no RPT, or FHOOS[5]	No[6]	Yes	N/A	No	9, 29, 49
SLO with TBVOOS AND 1 stuck closed TCV[2]- NSS	No[6]	Yes	N/A	No	10, 30, 50
Base Case Operation – TSSS	Yes	Yes	Yes	No	11, 31, 51
FHOOS[5] Only - TSSS	No[8]	Yes	Yes	No	12, 32, 52
EOOS Case 1 – TSSS TBVOOS[2] or FHOOS[5]	Yes No[8]	Yes	Yes	No	13, 33, 53
EOOS Case 2 – TSSS Any combination of TCV slow closure[12], no RPT, or FHOOS[5]	Yes No[8]	Yes	Yes	No	14, 34, 54
TBVOOS AND 1 stuck closed TCV[2]- TSSS	Yes	Yes	Yes	No	15, 35, 55

	----------OPERATING REGION----------				
Equipment Out of Service Options[1,4,10]	**MELLLA Region**	**Standard[9] Power-Flow Region (100% Rod Line)**	**ICF[7]**	**Coastdown[3]**	**POWERPLEX Thermal Limit Set Number[4]**
Single Loop Operation (SLO) – TSSS	No[6]	Yes	N/A	No	16, 36, 56
SLO FHOOS[5] Only - TSSS	No[6]	Yes	N/A	No	17, 37, 57
SLO with EOOS Case 1 – TSSS TBVOOS[2],or FHOOS[5]	No[6]	Yes	N/A	No	18, 38, 58
SLO with EOOS Case 2 – TSSS Any combination of TCV slow closure[12], no RPT, or FHOOS[5]	No[6]	Yes	N/A	No	19, 39, 59
SLO with TBVOOS AND 1 stuck closed TCV[2] - TSSS	No[6]	Yes	N/A	No	20, 40, 60
One TSVOOS [11]	Yes	Yes	Yes	No	See Note 11

Key: NSS – Nominal Scram Speed, TSSS – Tech Spec Scram Speed, OOS – Equipment Out of Service, FHOOS – Feedwater Heater OOS, TBVOOS – Turbine Bypass Valve OOS, TCV – Turbine Control Valve, RPT – Recirculation Pump Trip, MELLLA – Maximum Extended Load Line Limit Analysis [above 100% Load Line (Flow Control Line, FCL) to MELLLA boundary], ICF – Increased Core Flow (>100% core flow).

[1] Each OOS Option may be combined with 1 SRVOOS, 1 TCV stuck closed (except EOOS Case 1 TBVOOS), a 20°F reduction in feedwater temperature (without feedwater heaters considered OOS), up to 2 TIP OOS (or the equivalent number of TIP channels, i.e., 42% of the total number of channels with 100% available at startup), and up to 50% of the LPRMs OOS with an LPRM calibration frequency of 1250 Effective Full Power Hours (EFPH) (1000 EFPH +25%).

[2] All EOOS options support 1 TCV stuck closed except EOOS Case 1 TBVOOS. A separate equipment out-of-service analysis was provided for the combination of TBVOOS and 1 TCV stuck closed.

[3] Coastdown limits are not provided. Coastdown limits will not be required based on current burnup projections. However, thermal limits for coastdown are provided in Reference 3. Feedwater heaters OOS (FHOOS) may be intentionally entered to maintain core thermal power provided the end of cycle exposure corresponding to a core average exposure of 30,317.0 MWd/MTU is not exceeded.

[4] Three sets of thermal limits are provided. The first set of thermal limits, from 1 through 20, are provided for use from the beginning of cycle until the first sequence exchange (from A2 to A1) at approximately 4,970 +/- 200 MWd/MT. The second set of thermal limits, from 21 through 40, are provided for use from the first sequence exchange (from A2 to A1) at approximately 4,970 MWd/MT until 16,116 MWd/MT (defined as the middle of cycle (MOC) licensing basis. The third set of thermal limits, from 41 through 60, are applicable from 16,116 MWd/MT defined as the middle of cycle licensing basis to the licensing basis end of cycle burnup corresponding to a core average exposure of 30,317 MWd/MTU. Note that the thermal limit sets 41-60 can be implemented at exposures between 14,290 and 16,116 MWd/MT.

[5] Feedwater heaters OOS (FHOOS) supports a reduction of up to 100°F in feedwater temperature. FHOOS may be an intentionally entered mode of operation or an actual OOS condition. Feedwater heaters OOS (FHOOS) may be intentionally entered to maintain core thermal provided the end of cycle exposure corresponding to a core average exposure of 30,317 MWd/MTU is not exceeded.

[6] The SLO boundary was not moved up with the incorporation of MELLLA and power uprate. The 100% rod line (FCL) bounds this value.

[7] ICF is analyzed up to 105% rated core flow.

[8] If operating with FHOOS (alone or in combination with other EOOS), operation in the MELLLA region is supported by current transient analyses (UFSAR Chapter 15), but is administratively limited to less than 100% rod line (FCL) due to thermal-hydraulic stability concerns.

[9] The Standard Power-Flow Region is that part of the Power-Flow map region below 100% rod line (FCL) up to 100% core flow.

[10] A single MSIV may be taken OOS (shut) under any and all OOS options as long as core thermal power is maintained ≤ 75% of 3489 MWt (Reference 10).

[11] A TSV may be taken OOS (shut) and is bounded by operation with 1 TCV stuck closed (Reference 11).

[12] For temporary operation with a pressure regulator out of service (PROOS), the TCV slow closure limits should be applied (Reference 13).

7. Methodology (5.6.5)

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

2. Letter from Ashok C. Thadini (NRC) to R.A. Copeland (SPC), "Acceptance for Referencing of ULTRAFLOW™ Spacer on 9x9-IX/X BWR Fuel Design," July 28, 1993.

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

4. 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.

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

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

7. XN-NF-84-105 (P)(A), Volume 1 and Volume 1 Supplements 1 and 2; Volume 1 Supplement 4, "XCOBRA-T: A Computer Code for BWR Transient Thermal-Hydraulic Core Analysis," February 1987 and June 1988, respectively.

8. ANF-89-014 (P)(A) Revision 1 and Supplements 1 & 2, "Generic Mechanical Design for Advanced Nuclear Fuels Corporation 9X9 – IX and 9x9 – 9X BWR Reload Fuel," October 1991.

9. EMF-2209 (P)(A), Revision 1, "SPCB Critical Power Correlation," July 2000.

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

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

12. 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.

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

14. EMF-CC-074 (P) Volume 4 Revision 0, "BWR Stability Analysis: Assessment of STAIF with Input from MICROBURN-B2, August 2000.

15. ANF-1125 (P)(A) and ANF-1125(P)(A) Supplements 1 and 2, "ANFB Critical Power Correlation," Advanced Nuclear Fuels Corporation, April 1990.

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

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

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

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

20. ANF-CC-33 (P)(A) Supplement 1 Revision 1 and Supplement 2, "HUXY: A Generalized Multirod Heatup Code with 10CFR50, Appendix K Heatup Option," August 1986 and January 1991, respectively.

21. 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.

22. 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.

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

24. 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.

25. 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.

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