Technical Requirements Manual

Appendix J

(Amendment 46)

LaSalle Unit 2 Cycle 9

Core Operating Limits Report

and

Reload Transient Analysis Results

May 2001

Section 1

LaSalle Unit 2 Cycle 9

Core Operating Limits Report

May 2001

Issuance of Changes Summary

Affected Section	Affected Pages	Summary of Changes	Date
All	All	Original Issue (Cycle 9)	11/00
References; 6	iii; 6-1	Revised Requirements for Use of SUBTIP Methodology	12/00
All	All	ITS changes, RBM trip setpoint and allowable value changes, TIP symmetry Chi-Squared testing, incorporated results of revised thermal limits with correct thermal conductivities, and other necessary administrative changes	5/01

Table of Contents

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1. Average Planar Linear Heat Generation Rate (APLHGR) (3.2.1)

1.1 Tech Spec Reference:

Tech Spec 3.2.1

1.2 Description:

For operation without a full TIP set from BOC to 500 MWd/MT a penalty of 11.01% must be applied to all APLHGR limits.

1.2.1 GE Fuel

The MAPLHGR Limit is determined using the applicable Lattice-Type MAPLHGR limits from Tables 1.2-1 and 1.2-2. For Single Reactor Recirculation Loop Operation, the MAPLHGR limits in Tables 1.2-1 and 1.2-2 are multiplied by the MAPFAC multipliers provided in Figures 1.2-1 and 1.2-2.

1.2.2 SPC Fuel

The MAPLHGR Limit is the Lattice-Type MAPLHGR Limit. The Lattice-Type MAPLHGR limits are determined from the table given below:

Fuel Type	Cycle First Inserted
SPCA9-381B-13GZ7-80M	8
SPCA9-384B-11GZ6-80M	8
SPC-A9-391B-14G8.0-100M	9
SPC-A9-410B-19G8.0-100M	9
SPC-A9-383B-16G8.0-100M	9
SPC-A9-396B-12GZ-100M	9

(References 2 and 3)

Planar Average Exposure (GWd/MTU)	MAPLHGR (kW/ft) (all Siemens fuel types)
0.0	13.5
20.0	13.5
61.1	9.39

(References 3 and 6)

For single loop operation, the MAPLHGR limits from the table above are multiplied by the MAPLHGR multiplier. The MAPLHGR multiplier for SPC fuel is 0.90. (References 3, 5 and 6)

Table 1.2-1
Maximum Average Planar Linear Heat Generation Rate (MAPLHGR)
vs.
Average Planar Exposure for Fuel Type
GE9B-P8CWB322-11GZ-100M-150-CECO

(Reference 9 and 19)

Exposure (MWD/ST)	Exposure (MWD/MT)	Lattice-Type MAPLHGR (kW/ft)					
		P8CWL07 1 NOG	P8CWL345 5G5.0/4G4.0	P8CWL362 9G4.0	P8CWL362 2G5.0/9G4.0	P8CWL345 9G4.0	P8CWL071 11GE
0	0	12.74	12.09	11.65	11.25	12.11	12.74
200	220.5	12.67	12.13	11.70	11.32	12.15	12.67
1000	1102.3	12.48	12.22	11.83	11.46	12.25	12.48
2000	2204.6	12.42	12.35	12.00	11.61	12.39	12.42
3000	3306.9	12.41	12.48	12.14	11.77	12.54	12.41
4000	4409.2	12.44	12.62	12.28	11.94	12.70	12.44
5000	5511.6	12.46	12.77	12.43	12.11	12.86	12.46
6000	6613.9	12.49	12.90	12.58	12.29	13.02	12.49
7000	7716.2	12.51	13.03	12.73	12.46	13.19	12.51
8000	8818.5	12.54	13.16	12.88	12.64	13.33	12.54
9000	9920.8	12.55	13.30	13.01	12.82	13.43	12.55
10000	11023.1	12.57	13.42	13.12	12.98	13.44	12.57
12500	13778.9	12.41	13.41	13.08	13.04	13.40	12.41
15000	16534.7	12.04	13.05	12.78	12.77	13.06	12.04
20000	22046.2	11.27	12.38	12.16	12.16	12.40	11.27
25000	27557.8	10.49	11.74	11.51	11.51	11.76	10.49
27215.6	30000	12.314	12.314	12.314	12.314	12.314	12.314
48080.8	53000	10.800	10.800	10.800	10.800	10.800	10.800
58967.1	65000	6.000	6.000	6.000	6.000	6.000	6.000
Lattice No.		733	1817	1818	1819	1820	1821

Table 1.2-2
Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) vs. Average Planar Exposure for Fuel Type GE9B-P8CWB320-9GZ3-100M-150-CECO

(Reference 9 and 19)

Exposure (MWD/ST)	Exposure (MWD/MT)	Lattice-Type MAPLHGR (kW/ft)					
		P8CWL07 1 NOG	P8CWL346 4G5.0/3G4.0	P8CWL358 7G4.0	P8CWL358 2G5.0/7G4.0	P8CWL346 7G4.0	P8CWL071 9GE2
0	0	12.74	12.05	11.62	11.10	12.09	12.74
200	220.5	12.67	12.09	11.64	11.15	12.14	12.67
1000	1102.3	12.48	12.19	11.73	11.27	12.25	12.48
2000	2204.6	12.42	12.32	11.86	11.44	12.39	12.42
3000	3306.9	12.41	12.44	11.99	11.62	12.53	12.41
4000	4409.2	12.44	12.57	12.13	11.80	12.67	12.44
5000	5511.6	12.46	12.70	12.27	11.96	12.81	12.46
6000	6613.9	12.49	12.83	12.42	12.09	12.89	12.49
7000	7716.2	12.51	12.97	12.54	12.23	12.98	12.51
8000	8818.5	12.54	13.07	12.62	12.37	13.07	12.54
9000	9920.8	12.55	13.15	12.70	12.51	13.15	12.55
10000	11023.1	12.57	13.20	12.77	12.66	13.22	12.57
12500	13778.9	12.41	13.19	12.70	12.67	13.20	12.41
15000	16534.7	12.04	12.89	12.40	12.40	12.90	12.04
20000	22046.2	11.27	12.29	11.82	11.82	12.30	11.27
25000	27557.8	10.49	11.69	11.25	11.25	11.70	10.49
27215.6	30000	12.314	12.314	12.314	12.314	12.314	12.314
48080.8	53000	10.800	10.800	10.800	10.800	10.800	10.800
58967.1	65000	6.000	6.000	6.000	6.000	6.000	6.000
Lattice No.		733	1812	1813	1814	1815	1816

Figure 1.2-1 Power-Dependent SLO MAPLHGR Multipliers for GE Fuel ($MAPFAC_P$)
(References 8 and 19)

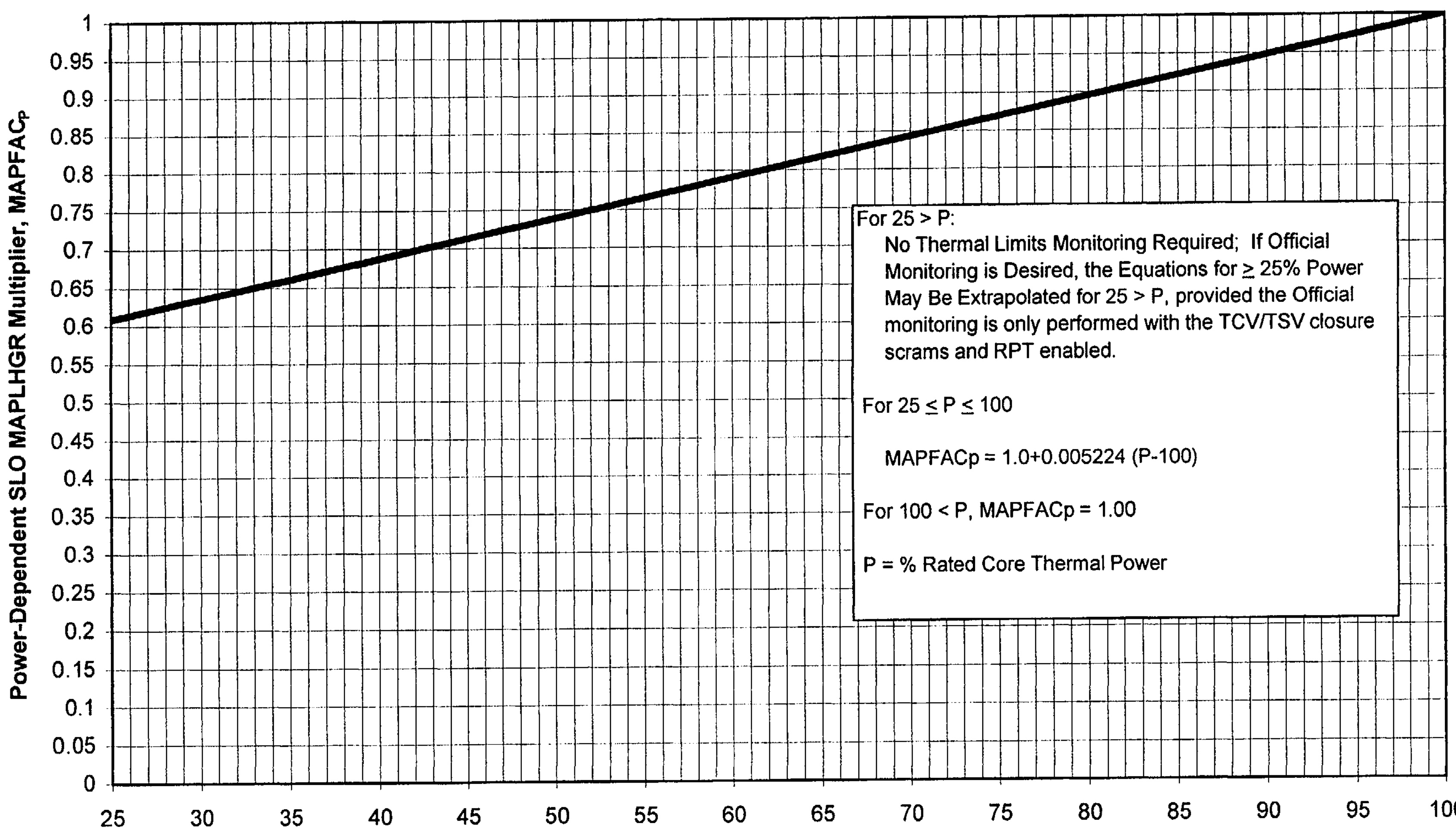
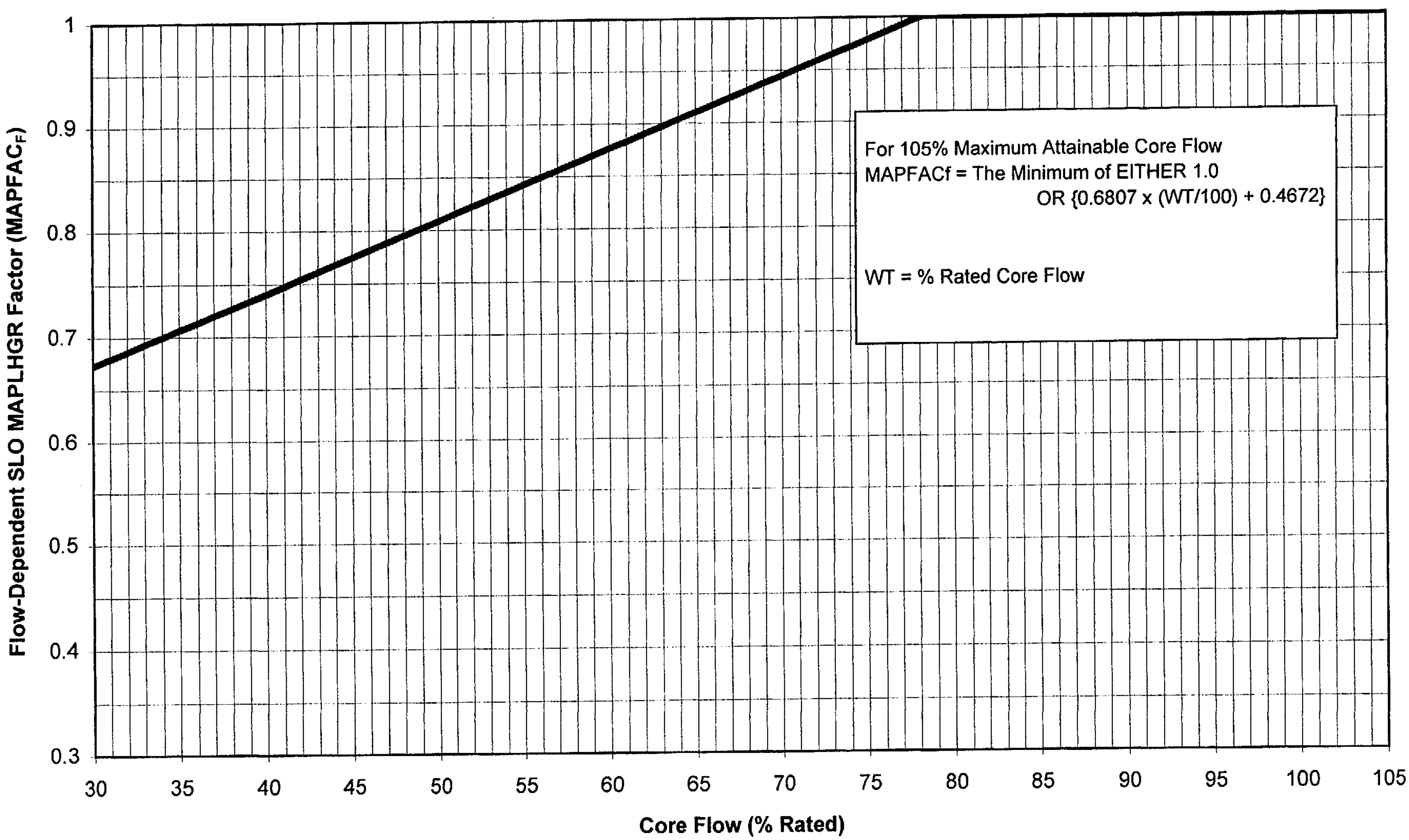


Figure 1.2-2 Flow-Dependent SLO MAPLHGR Multiplier ($MAPFAC_F$) for GE Fuel
(References 8, 18, and 19)



2. Minimum Critical Power Ratio (3.2.2)

2.1 Tech Spec Reference:

Tech Spec 3.2.2.

2.2 Description:

Prior to initial scram time testing for an operating cycle, the MCPR operating limit is based on the Technical Specification Scram Times. For Technical Specification requirements refer to Technical Specification table 3.1.4-1.

TIP Symmetry Chi-squared testing shall be performed prior to reaching 500 MWd/MTU to validate the MCPR calculation.

MCPR limits from BOC to Coastdown are applicable up to a core average exposure of 30,266.2 MWd/MTU (which is the licensing basis exposure used by SPC). (Reference 3)

2.2.1 Manual Flow Control MCPR Limits

The Governing MCPR Operating Limit while in Manual Flow Control is either determined from 2.2.1.1 or 2.2.1.2, whichever is greater at any given power, flow condition.

2.2.1.1 Power-Dependent MCPR ($MCPR_P$)*

2.2.1.1.1 GE Fuel

Table 2-1 gives the $MCPR_P$ limit as a function of core thermal power for Tech Spec Scram Times.

2.2.1.1.2 Siemens Fuel

Table 2-2 gives the $MCPR_P$ limit as a function of core thermal power for Tech Spec Scram Times.

2.2.1.2 Flow-Dependent MCPR ($MCPR_F$)

Table 2-3 gives the $MCPR_F$ limit as a function of flow.

2.2.2 Automatic Flow Control MCPR Limits

Automatic Flow Control MCPR Limits are not provided for L2C9.

* For thermal limit monitoring at greater than 100%P, the 100% power MCPRp limits should be applied.

Table 2-1
$MCPR_p$ for GE Fuel
(References 2, 3, and 51)

Operation from BOC to Coastdown**

Percent Core Thermal Power*

EOOS Combination	0	25	25	60	80	80	100
No EOOS	2.70	2.20	2.01	1.53			1.51
Single RR Loop only	2.71	2.21	2.02	1.54			1.52
EOOS***	2.85	2.35	2.24		1.96	1.86	1.63
EOOS***/Single RR Loop	2.86	2.36	2.25		1.97	1.87	1.64

* Values are interpolated between relevant power levels. For operation at exactly 25% or 80% CTP, the more limiting value is used. 3489 MWt is rated power

** Coastdown thermal limits are not provided in this COLR

*** Allowable EOOS conditions are listed in Section 5.

Table 2-2
$MCPR_P$ for Siemens Fuel
(References 2, 3, 21, and 51)

For all Siemens fuel <u>EXCEPT</u> Fuel Type 18 in 10B cell locations from BOC to Coastdown.**

Percent Core Thermal Power*

EOOS Combination	0	25	25	60	80	80	100
No EOOS	2.70	2.20	1.93	1.48			1.41
Single RR Loop only	2.71	2.21	1.94	1.49			1.42
EOOS***	2.85	2.35	2.17		1.70	1.62	1.53
EOOS***/Single RR Loop	2.86	2.36	2.18		1.71	1.63	1.54

For <u>ONLY</u> Siemens Fuel Type 18 in 10B cell locations for operation with rod pattern targeted from BOC to Coastdown**

Percent Core Thermal Power*

EOOS Combination	0	25	25	60	80	80	100
No EOOS	2.72	2.22	1.95	1.50			1.43
Single RR Loop only	2.73	2.23	1.96	1.51			1.44
EOOS***	2.87	2.37	2.19		1.72	1.64	1.55
EOOS***/Single RR Loop	2.88	2.38	2.20		1.73	1.65	1.56

* Values are interpolated between relevant power levels. For operation at exactly 25% or 80% CTP, the more limiting value is used. 3489 MWt is rated power.

** Coastdown thermal limits are not provided in this COLR

*** Allowable EOOS conditions are listed in Section 5.

Table 2-3
$MCPR_F$ for GE and Siemens Fuel

(Reference 3)

$MCPR_F$ limits for 105% Maximum Attainable Core Flow

Flow (% rated)	$MCPR_F$ ATRIUM-9B	$MCPR_F$ GE9
0	1.60	1.66
30	1.60	1.66
105	1.11	1.11

The $MCPR_F$ limits are applicable from BOC through coastdown and in all EOOS scenarios.

3. Linear Heat Generation Rate (3.2.3)

3.1 Tech Spec Reference:

Tech Spec 3.2.3.

3.2 Description:

For operation without a full TIP set from BOC to 500 MWd/MT a penalty of 11.01% must be applied to all LHGR limits.

3.2.1 GE Fuel

The LHGR Limit is the product of the LHGR Limit in the following tables and the minimum of either the power dependent LHGR Factor*, $LHGRFAC_P$, or the flow dependent LHGR Factor, $LHGRFAC_F$. The LHGR Factors ($LHGRFAC_P$ and $LHGRFAC_F$) for the GE fuel are determined from Figures 3.2-1 through 3.2-3. The following GE LHGR limits apply for the entire cycle exposure range: (References 2, 8, 10 and 19)

1. GE9B-P8CWB322-11GZ-100M-150-CECO (bundle 3861 in Reference 2)

Nodal Exposure (GWd/MT)	LHGR Limit (KW/ft)
0	13.75
13.06	13.75
27.80	11.75
50.31	10.31
60.89	6.00

2. GE9B-P8CWB320-9GZ-100M-150-CECO (bundle 3860 in Reference 2)

Nodal Exposure (GWd/MT)	LHGR Limit (KW/ft)
0.00	14.25
12.14	14.25
26.19	12.18
48.16	10.80
59.93	6.00

3.2.2 Siemens Fuel

The LHGR Limit is the product of the Steady-State LHGR Limit (given below from Reference 3) and the minimum of either the power dependent LHGR Factor*, $LHGRFAC_P$, or the flow dependent LHGR Factor, $LHGRFAC_F$. $LHGRFAC_P$ is determined from Table 3-1. $LHGRFAC_F$ is determined from Table 3-2. SPC LHGRFAC multipliers from BOC to Coastdown are applicable up to a core average exposure of 30,266.2 MWd/MTU (which is the licensing basis exposure used by SPC). (Reference 3)

Planar Average Exposure (GWd/MTU)	LHGR limit (kW/ft)
0.0	14.4
15.0	14.4
61.1	8.32

* For thermal limit monitoring at greater than 100%P, the 100% power LHGRFACp limits should be applied.

Figure 3.2-1 Power-Dependent LHGR Multipliers for GE Fuel (Formerly $MAPFAC_P$)
(References 8 and 19)

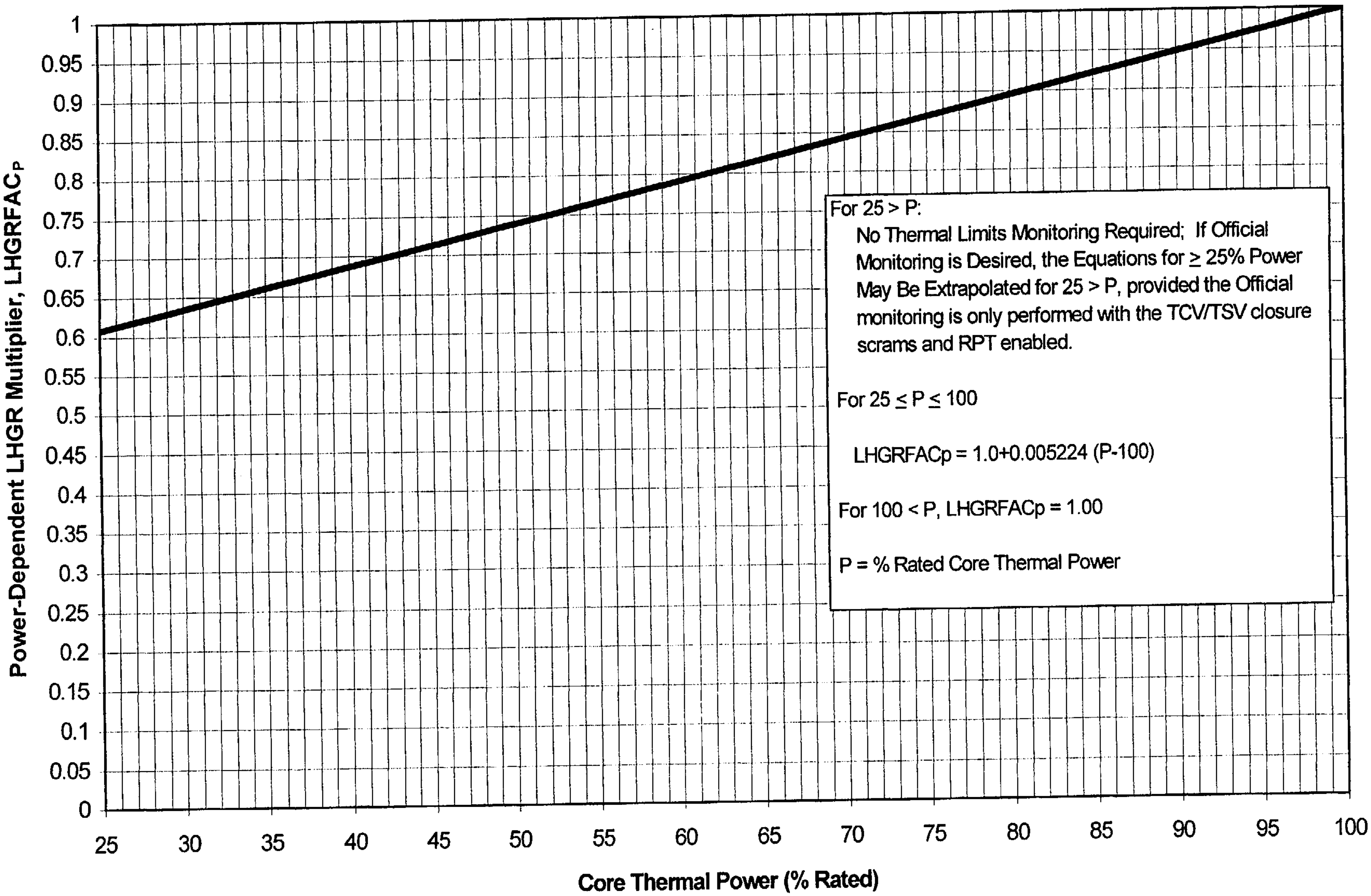


Figure 3.2-2 Power-Dependent LHGR Multiplier for GE Fuel (TCV(s) Slow Closure) (formerly $MAPFAC_P$)

(References 11 and 19)

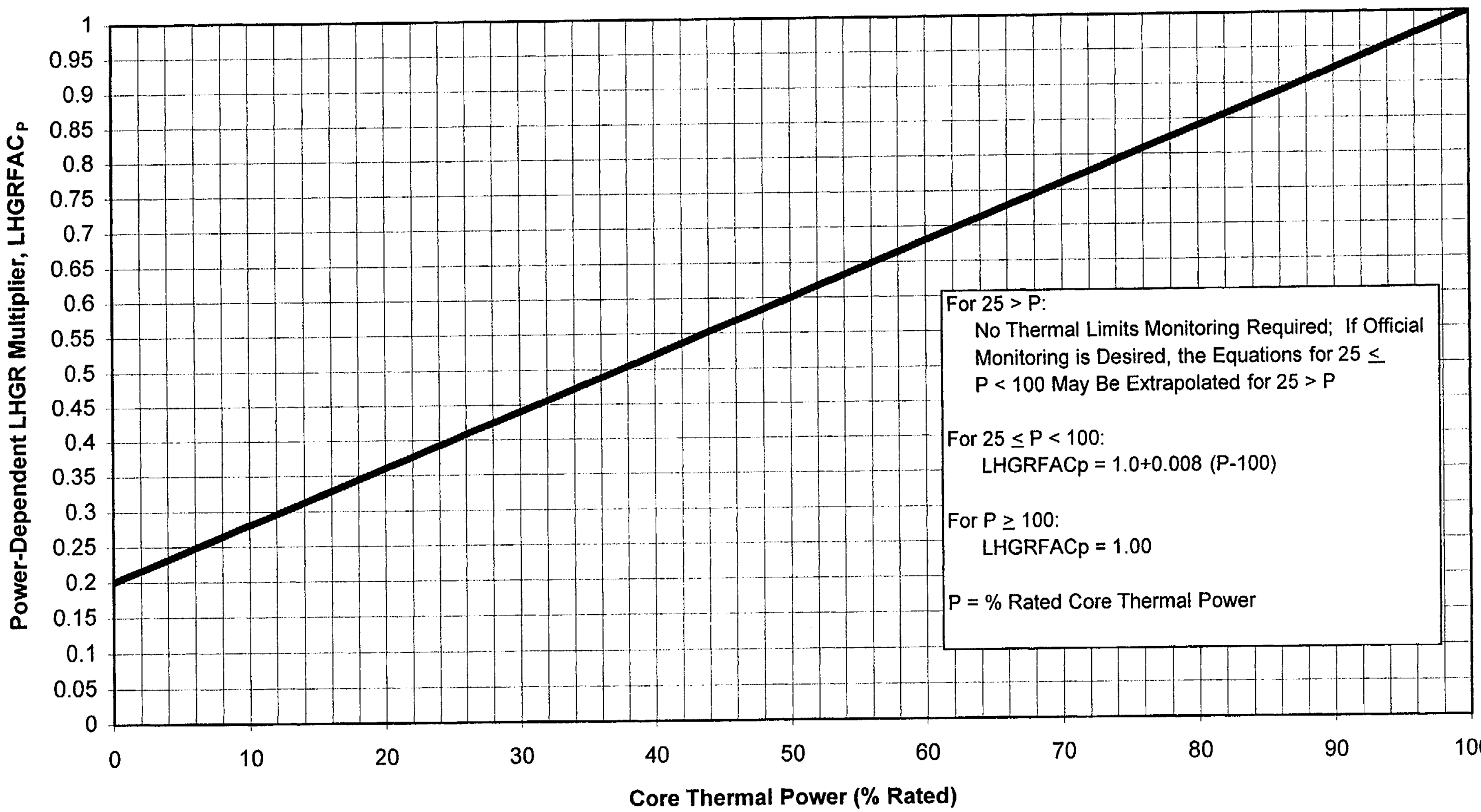


Figure 3.2-3 Flow-Dependent LHGR Multiplier for GE Fuel (formerly $MAPFAC_F$)
(References 8, 13, 18, and 19)

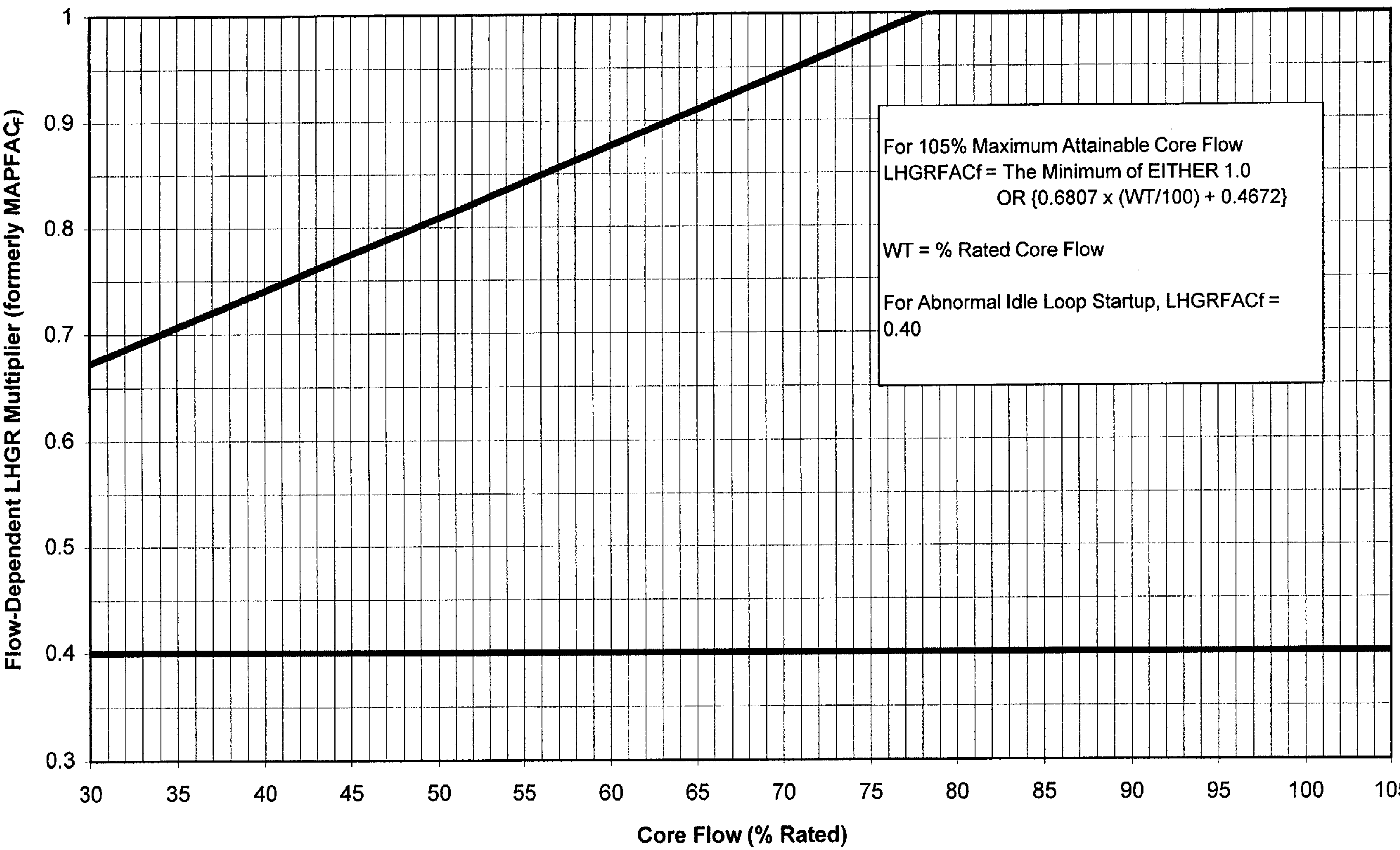


Table 3-1
LHGRFAC$_p$ for Siemens Fuel

(References 3 and 51)

Operation from BOC to Coastdown**

Percent Core Thermal Power*

EOOS Combination	0	25	25	60	80	80	100
No EOOS	0.77	0.77	0.77	1.00			1.00
Single RR Loop only	0.77	0.77	0.77	1.00			1.00
EOOS***	0.67	0.67	0.67		0.85	0.89	0.89
EOOS***/Single RR Loop	0.67	0.67	0.67		0.85	0.89	0.89

* Values are interpolated between relevant power levels. For operation at exactly 25% or 80% CTP, the more limiting value is used. 3489 MWt is rated power.

** Coastdown thermal limits are not provided in this COLR

*** Allowable EOOS conditions are listed in Section 5.

Table 3-2
LHGRFAC$_F$ for Siemens Fuel

(Reference 3)

Values Applicable for up to 105% Maximum Attainable Core Flow

Flow (% rated)	LHGRFAC$_F$ ATRIUM-9B
0	0.69
30	0.69
76	1.00
105	1.00

These LHGRFAC$_f$ multipliers apply from BOC through coastdown and in all EOOS scenarios.

4. Control Rod Withdrawal Block Instrumentation (3.3.2.1)

4.1 Tech Spec Reference:

Tech Spec Table 3.3.2.1-1.

4.2 Description:

The Rod Block Monitor Upscale Instrumentation Setpoints are determined from the relationships shown below:

ROD BLOCK MONITOR UPSCALE TRIP FUNCTION	TRIP SETPOINT	ALLOWABLE VALUE
Two Recirculation Loop Operation*	0.66 W + 51%**	0.66 W + 54%**
Single Recirculation Loop Operation*	0.66 W + 45.7%**	0.66 W + 48.7%**

* This setpoint may be lower/higher and will still comply with the RWE Analysis, because RWE is analyzed unblocked.

** Clamped, with an allowable value not to exceed the allowable value for recirculation loop flow (W) of 100%.

5. 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:

Equipment Out of Service Options[1]	Standard	MELLLA	ICF[7]	Coastdown[9]
	----------OPERATING REGION---------			
None	Yes	Yes	Yes	No
Feedwater Heaters[2] (Reference 8)	Yes	No[3]	Yes	No
Single RR Loop[10] (Reference 8)	Yes	No[8]	N/A	No
Turbine Bypass Valves (Reference 8)	Yes	Yes	Yes	No
EOC Recirculation Pump Trip (Reference 8)	Yes	Yes	Yes	No
TCV Slow Closure/EOC Recirculation Pump Trip (Reference11)	Yes	Yes	Yes	No
TCV Slow Closure/EOC Recirculation Pump Trip / Feedwater Heaters [2] (References 11, 16, and 17)	Yes	No[3]	Yes	No
Turbine Bypass Valves / Feedwater Heaters [2] (Reference 8)	No	No	No[5]	No
EOC Recirculation Pump Trip / Feedwater Heaters [2] (Reference 8)	Yes[4]	No[3]	Yes[4]	No
TCV Stuck Closed[6] (Reference 12)	Yes	Yes	Yes	No

1. Each EOOS condition may be combined with one SRV OOS, up to two TIP Machines OOS or the equivalent number of TIP channels (100% available at startup from a refuel outage), a 20°F reduction in feedwater temperature (without Feedwater Heaters considered OOS), cycle startup with uncalibrated LPRMs (BOC to 500 MWd/MTU), and/or up to 50% of the LPRMs out of service.
2. Up to 100°F Reduction in Feedwater Temperature Allowed with Feedwater Heaters Out-of-Service. Feedwater Heaters OOS may be an actual OOS condition, or an intentionally entered mode of operation to extend the cycle energy.
3. If operating with Feedwater Heaters Out-of-Service, operation in MELLLA is supported by current transient analyses, but administratively prohibited due to core stability concerns.
4. EOC Recirculation Pump Trip OOS/Feedwater Heaters OOS is allowed during non-coastdown operation using the TCV Slow Closure/EOC Recirculation Pump Trip OOS/Feedwater Heaters OOS operating limits.
5. Only when operating in coastdown, otherwise this combination is not allowed.
6. Operation is only allowed when less than 10.5 million lbm/hr steam flow and when average position of 3 open TCVs is less than 50% open, with FCL <103%, and the MCFL setpoint ≥ 120%. TCV Stuck Closed may be in combination with any EOOS except TBVOOS or TCV Slow Closure. If in combination with other EOOS(s), thermal limits may require adjustment for the other EOOS(s) as designated in Sections 1, 2, and 3.
7. ICF is analyzed for up to 105% core flow.
8. The SLO boundary was not moved up with the incorporation of MELLLA. The flow boundary for SLO at uprated conditions remains the ELLLA boundary for pre-uprate conditions. (Reference 20)
9. Coastdown is defined to begin at a core average exposure of 30,266.2 MWd/MTU (which is the licensing basis exposure used by SPC). (Reference 3)
10. Single loop operation is allowed with any of the EOOS options listed in this table.

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

6.1 Tech Spec Reference:

Tech Spec 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.

6.2 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.

For BOC to BOC + 500 MWD/MT, cycle analyses support thermal limit monitoring without the use of the TIPs.

Following the first TIP set (required prior to BOC + 500 MWD/MT), 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 14, 15 and 23) 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.

6.3 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 uncertainty could be introduced by the simulation and adjustment process, a maximum of 18 channels may be simulated to ensure that the uncertainties assumed in the substitution process methodology remain valid.

Section 2

LaSalle Unit 2 Cycle 9

Reload Transient Analysis Results

May 2001

Technical Requirements Manual - Appendix J
L2C9 Reload Transient Analysis Results

Table of Contents

Attachment 1

LaSalle Unit 2 Cycle 9

Neutronics Licensing Report

NJB

DocID# DG00-001303

NUCLEAR FUEL MANAGEMENT
TRANSMITTAL OF DESIGN INFORMATION

☐ SAFETY RELATED ☐ NON-SAFETY RELATED ☐ REGULATORY RELATED	Originating Organization ☒ Nuclear Fuel Management ☐ Other (specify) ______	NFM ID# NFM0000115 Sequence 0 Page 1 of 21

Station: LaSalle   Unit: 2   Cycle: 9   Generic: ______

To: Jeffery K. Nugent (LS)

Subject: LaSalle Unit 2 Cycle 9 Neutronics Licensing Report

Ming-Yuan Hsiao Preparer	Ming-Yuan Hsiao Preparer's Signature	9-15-00 Date
Peter A. Weggeman Reviewer	Peter A. W[...] Reviewer's Signature	9-15-00 Date
Adelmo S. pallotta NFM Department Head	[signature] Approver's Signature	10/5/00 Date

Status of Information: ☐ Verified ☐ Unverified ☐ Engineering Judgement

Action Tracking # for Method and Schedule of Verification for Unverified DESIGN INFORMATION : ______

Description of Information: Provide the station and BSS group LaSalle Unit 2 Cycle 9 Neutronics Licensing Report (NLR).

Purpose of Information:

Seq. 0: Provide the station and BSS group LaSalle Unit 2 Cycle 9 Neutronics Licensing Report (NLR).

Source of Information: As referenced

Supplemental Distribution: Danny Bost (LS), John J. Reimer (LS), Amy Goss (LS), Edward A. McVey, Thomas J. Rausch, R. W. Tsai, Adelmo S. Pallotta, Ming Y. Hsiao, LaSalle Central File, Downers Grove Central File

COMMONWEALTH EDISON COMPANY
NUCLEAR FUEL SERVICES

NEUTRONICS LICENSING REPORT

for

LaSalle Unit 2 Cycle 9

preparer: MYH, 8-31-00

reviewer PAW 8.31.00

Licensing Basis

This document, in conjunction with the references 1, 2 and 4 in Section VIII provide the licensing basis for LaSalle Unit 2 Reload 8, Cycle 9.

Table of Contents

I. Nuclear Design Analysis

I.1 Fuel Bundle Nuclear Design Analysis

Assembly Average Enrichment (ATRIUM-9B), w/o U-235

SPCA9-391B-14G8.0-100M	3.91
SPCA9-410B-19G8.0-100M	4.10
SPCA9-383B-16G8.0-100M	3.83
SPCA9-396B-12GZ-100M	3.96

Axial Enrichment and Burnable Poison Distribution

SPCA9-391B-14G8.0-100M	Figure 1
SPCA9-410B-19G8.0-100M	Figure 1
SPCA9-383B-16G8.0-100M	Figure 2
SPCA9-396B-12GZ-100M	Figure 2

Radial Enrichment and Burnable Poison Distribution

SPCA9-4.53L-11G8.0-100M	Figure 3
SPCA9-4.56L-12G8.0-100M	Figure 4
SPCA9-4.21L-13G8.0-100M	Figure 5
SPCA9-4.27L-12G8.0-100M	Figure 6
SPCA9-3.96L-8G5.0-100M	Figure 7
SPCA9-4.58L-8G6.0-100M	Figure 8
SPCA9-4.58L-8G6.0/4G3.0-100M	Figure 9

preparer: MYH, 8-31-00 reviewer PAW 8-31-00

I.2 Core Nuclear Design Analysis

I.2.1 Core Configuration and Licensing Exposure Limits

Bundle Type	Cycle Loaded	Number in Core
GE9B-P8CWB322-11GZ-100M-150-CECO	7	84
GE9B-P8CWB320-9GZ-100M-150-CECO	7	76
SPCA9-381B-13GZ7-80M	8	128
SPCA9-384B-11GZ6-80M	8	128
SPCA9-391B-14G8.0-100M	9	40
SPCA9-410B-19G8.0-100M	9	120
SPCA9-383B-16G8.0-100M	9	132
SPCA9-396B-12GZ-100M	9	56

Licensing Exposure Limits

Value of Interest	Core Average Exposure (MWD/MT)	Cycle Incremental Exposure (MWD/MT)
Nominal EOC 8 Exposure	27892	13750
Short EOC 8 Exposure	27392	13250
Minimum EOC 8 Energy for which C9 Neutronic Licensing Analyses are Valid	27392	13250
BOC 9 Exposure *(assuming nominal EOC 8 energy)*	11799	0
BOC 9 Exposure *(assuming short EOC 8 energy)*	11470	0
Nominal EOC 9 Exposure *(assuming nominal EOC 8 energy)*	29598	17800

Core UO_2 Weights

Cycle of Interest	UO_2 Total Weight (MT)
Cycle 8	135.11
Cycle 9	133.50

preparer: MYH, 9-1-00 reviewer PAW 9-1-00

I.2.2 Core Reactivity Characteristics

All values reported below are with zero xenon and are for 68°F moderator temperature. The MICROBURN-B cold BOC best estimate K-effective bias is 1.004 at BOC. The shutdown margin calculations are based on the short EOC8 energy given in Section I.2.1.

BOC Cold K-Effective, All Rods Out	1.11257
BOC Cold K-Effective All Rods In	0.95674
BOC Cold K-Effective, Strongest Rod Out	0.99360
BOC Shutdown Margin, % ΔK	1.040
Minimum Shutdown Margin, % ΔK	1.020
Reactivity Defect (R-value), % ΔK	0.020
Cycle Incremental Exposure Corresponding to Minimum Shutdown Margin R-Value (MWD/MTU)	250
Standby Liquid Control System Shutdown Margin, Cold Condition, (% ΔK)	17.8

LaSalle station has upgraded its Standby Liquid Control System so that the B-10 enrichment has been increased from 18.9% to 45%. The above SBLC analysis assumes 660 ppm with the boron enriched to 45% B-10.

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II. Control Rod Withdrawal Error

The control rod withdrawal error event is analyzed at 100% of rated power, 100% of rated flow and unblocked conditions only.

Distance Withdrawn (ft)	ΔCPR
12 (Unblocked)	0.30

The design complies with the SPC 1% plastic strain and centerline melt criteria via conformance to the PAPT (Protection Against Power Transient) LHGR limits. The design complies with the GE centerline melt criteria via conformance to the GE thermal overpower protection (TOP) criteria. The design complies with the GE 1% plastic strain criteria via conformance to the GE mechanical overpower protection (MOP) criteria..

III. Fuel Loading Error

The Fuel Loading Error, including fuel mislocation and misorientation, is classified as an accident. By demonstrating that the Fuel Loading Error meets the more stringent Anticipated Operational Occurrence (AOO) requirements, the offsite dose requirement is assured to be met. Because the events listed below result in a ΔCPR value that is less than that of the limiting transient, the AOO requirements and hence off-site dose requirements are met for the Fuel Loading Error.

III.1 Fuel Mislocation Error

The following value bounds both the SPC and the co-resident GE fuel types.

Event	ΔCPR
Mislocated Bundle	0.23

III.2 Fuel Misrotation Error

The following value bounds both the SPC and the co-resident GE fuel types.

Event	ΔCPR
Misoriented Bundle	0.15

IV. Control Rod Drop Accident

LaSalle is a banked position withdrawal sequence plant. In order to allow the site the option of inserting control rods using the simplified control rod sequence shown in Table 1, a control rod drop accident analysis was performed for the simplified sequence. The results from this simplified sequence analysis bound those where BPWS guidelines are followed. The results demonstrate that the simplified shutdown sequence meets the Technical Specification limit of 280 cal/g for a control rod drop accident. Therefore, the simplified sequence is valid for for control rod insertion for shutdown.

An adder of 0.32 %ΔK is incorporated in this analysis (for other than 00 to 48 control rod drops) to account for possible rod mispositioning errors as well as clumping effects.

Maximum Dropped Control Rod Worth, %ΔK	1.375
Doppler Coefficient, Δk/k/°F	-9.50E-06
Effective Delayed Neutron Fraction used	0.0053
Four-Bundle Local Peaking Factor	1.281
Maximum Deposited Fuel Rod Enthalpy, (cal/g)	222
Number of Rods Greater than 170 cal/g	266

Note that the limit on maximum deposited fuel rod enthalpy is 280 cal/g and the limit on the number of rods greater than 170 cal/g (failed rods) is 770 for the GE 8x8 fuel and 850 for the SPC ATRIUM-9B fuel (in LaSalle UFSAR).

V. Loss of Feedwater Heating

The loss of feedwater heating event is analyzed at 100% of rated power for 81%, 100% and 105% of rated flow and an assumed inlet temperature decrease of 145°F. The event was analyzed from BOC to EOC. The ΔCPR value reported below is bounding for both the SPC and the co-resident GE fuel types and all the analyzed flows.

Event	ΔCPR
Loss of Feedwater Heating	0.23

The design complies with the SPC 1% plastic strain and centerline melt criteria via conformance to the PAPT (Protection Against Power Transient) LHGR limits. The design complies with the GE

preparer: MYH, 10-4-00 reviewer PAW 10-4-00

1% plastic strain criteria via conformance to the mechanical overpower protection (MOP) limit. The design does not meet the GE thermal overpower protection (TOP) criteria during a loss of feedwater heating event; hence, the LHGR values in the COLR for the affected lattice are adjusted accordingly (References 9, 13 and 14) as follows:

GE9B-P8CWB322-11GZ-100M-150-CECO Bundle (Fuel Type 1)
LHGR Limits for L2C9

Nodal Exposure (GWD/ST)	Nodal Exposure (GWD/MT)	LHGR Limit
0	0	13.75
11.8459	13.06	13.75
25.2182	27.80	11.75
45.6410	50.31	10.31
55.2370	60.89	6.00

GE9B-P8CWB320-9GZ-100M-150-CECO Bundle (Fuel Type 2)
LHGR Limits for L2C9

Nodal Exposure (GWD/ST)	Nodal Exposure (GWD/MT)	LHGR Limit
0	0	14.25
11.0152	12.14	14.25
23.7593	26.19	12.18
43.6866	48.16	10.80
54.3675	59.93	6.00

VI. Maximum Exposure Limit Compliance

Note that the following exposures are based on a nominal Cycle 8 EOC exposure of 13750 MWD/MT and a nominal Cycle 9 exposure of 17800 MWD/MT. If Cycle 9 reaches it's long window (approximately 500 MWD/MTU beyond the nominal Cycle 9 energy), the exposure limits will still be met.

Exposure (MWD/MT)	GE9B Projected (MWD/MT)	GE9B Limit (MWD/MT)	ATRIUM-9B Projected (MWD/MT)	ATRIUM-9B Limit* (MWD/MT)
Peak Batch	39989	42000	36794	NA
Peak Assembly	45399	NA	39460	48000
Peak Rod	NA	NA	43243	55000
Peak Pellet	62595	65000	54918	66000

*The ATRIUM-9B exposure limits identified are not applicable until document EMF-85-74 is added to the Technical Specifications (Tech Specs). Until this document is added to the Tech Specs, the ATRIUM-9B exposure limits are 48.0 GWD/MT for Peak Fuel Assembly (no change), 50.0 GWD/MT for Peak Fuel Rod and 60.0 GWD/MT for Peak Fuel Pellet.

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VII. Spent Fuel Pool and Fresh Fuel Vault Criticality Compliance

For the L2C9 reload, there are four new SPC ATRIUM-9B assembly types consisting of seven unique enriched lattices, as identified in **I.1 Fuel Bundle Nuclear Design Analysis.**

VII.1 Fresh Fuel Vault Criticality Compliance

The fuel storage vault criticality analysis that is detailed in Reference 5 remains valid for the above lattices. All the new (ATRIUM-9B) assemblies comply with the fresh fuel vault criticality limits, i.e., all lattices have an enrichment of less than 5.00 wt % U-235 and a gadolinia content that is greater than 6 rods at 3.0 wt% Gd_2O_3.

Note that the new fuel vault is a moderation-controlled area which implies that hydrogenous materials will be limited within the new fuel storage array. Administrative controls as generally defined in GE SIL No. 152 (dated March 31,1976) must be incorporated for the area.

VII.2 L1 Spent Fuel Pool Criticality Compliance

The LaSalle Unit 1 spent fuel pool criticality analysis that is detailed in Reference 6 remains valid for the above lattices. All the new (ATRIUM-9B) assemblies comply with the spent fuel pool criticality limits, i.e., all lattices have an enrichment of less than 4.60 wt % U-235 and a gadolinia content that is greater than 8 rods at 3.0 wt% Gd_2O_3.

VII.3 L2 Spent Fuel Pool Criticality Compliance

The LaSalle Unit 2 spent fuel pool criticality analysis that is detailed in Reference 7 remains valid for the above lattices. As shown below, all the new (ATRIUM-9B) assemblies comply with the LaSalle Unit 2 spent fuel pool criticality limit of
k-eff < 0.95.

Lattice Type	Maximum k-inf*	Maximum in-Rack k-eff**	Spent Fuel Pool k-eff Limit
SPCA9-4.21L-13G8.0-100M	1.169	< 0.85	0.95
SPCA9-4.27L-12G8.0-100M	1.180	< 0.85	0.95
SPCA9-4.53L-11G8.0-100M	1.192	< 0.85	0.95
SPCA9-4.56L-12G8.0-100M	1.187	< 0.85	0.95
SPCA9-3.96L-8G5.0-100M	1.231	< 0.86	0.95
SPCA9-4.58L-8G6.0/4G3.0-100M	1.233	< 0.86	0.95
SPCA9-4.58L-8G6.0-100M	1.236	< 0.86	0.95

* From 68 °F, uncontrolled CASMO-3G results.
** From Figure 6.1 of Reference 7.

preparer: MYH, 9-15-00 reviewer DBW 9-15-00

VIII. References

1. "LaSalle Unit 2 Cycle 9 Reload Analysis", Siemens Power Corporation, EMF-2437, Latest Revision.

2. "LaSalle Unit 2 Cycle 9 Plant Transient Analysis", Siemens Power Corporation, EMF-2440, Latest Revision.

3. "LaSalle 2 cycle 9 Core Design," NDIT NFM0000056 Seq. 1, April 7, 2000 and "L2C9 FLLP," BNDL:00-005, Revision 0, 4/7/2000.

4. Commonwealth Edison, Nuclear Fuel Services, NFSR-0091, "Benchmark of CASMO/MICROBURN BWR Nuclear Design Methods", as supplemented and approved.

5. "Criticality Safety Analysis for ATRIUM-9B Fuel, LaSalle Units 1 and 2 New Fuel Storage Vault," Siemens Power Corporation, EMF-95-134(P), December 1995. [NDIT 960089, Rev. 0]

6. "Criticality Safety Analysis for ATRIUM-9B Fuel, LaSalle Unit 1 Spent Fuel Storage Pool (BORAL Rack)," Siemens Power Corporation, EMF-96-117(P), April 1996. [NDIT 960087, Rev. 0]

7. "Criticality Safety Analysis for ATRIUM-9B Fuel, LaSalle Unit 2 Spent Fuel Storage Pool (Boraflex Rack)," Siemens Power Corporation, EMF-95-088(P), February 1996. [NDIT 960088, Rev. 0]

8. "L2C9 Standby Liquid Control System Worth Calculations," BNDL:00-028, Revision 0, July 14, 2000.

9. "L2C9 Loss of Feedwater Heating Licensing Analysis," BNDL:00-024, Revision 0, July 13, 2000.

10. "LaSalle Unit 2 Cycle 9 RWE - delta CPR," BNDL:00-026, Revision 0, August 23, 2000.

11. "L2C9 Rod Withdrawal Error MOP/TOP Analysis," BNDL:00-023, Revision 0, August 17, 2000.

12. "LaSalle Unit 2 Cycle 9 Neutronic Licensing Shutdown Margin Calculation," BNDL:00-032, Revision 0, August 17, 2000.

13. "LaSalle 2 Cycle 9 LFWH TOP Violation and LHGR Limit Calculation," Letter NFM:BND:00-050, July 13, 2000.

14. "LaSalle 2 Cycle 9 GE9 Curve Adjustment for LFWH TOP Violation," GE Letter KF-00-063, August 24, 2000.

15. "LaSalle 2 Cycle 9 LFWH TOP Violation and LHGR Limit Calculation," Letter NFM:BND:00-050, July 13, 2000.

16. "L2C9 Mislocation Licensing Analysis," BNDL:00-025, September 2000.

17. "L2C9 Bundle Misorientation Analysis," BNDL:00-030, September 2000.

preparer: MYH, 8-31-00 reviewer PAW 8.31.00

Table 1

L2C9 Simplified Shutdown Sequence

Shutdown From an A1 Sequence

Rod Group*	Insertion (Bank)	Comments**
7 or 8	48-00	Either Group 7 or 8 may be inserted first.
10	48-00	Groups 7 and 8 must be fully inserted prior to inserting any Group 10 rod.
9	48-00	Group 10 must be fully inserted prior to inserting any Group 9 rod.
5 or 6	48-00	Groups 5 and 6 may be inserted without banking anytime after Groups 7 and 8 have been inserted and before Group 4 is inserted.
4	48-00	Groups 5 through 10 must be fully inserted prior to inserting any Group 4 rod.
3	48-00	Group 4 must be fully inserted prior to inserting any Group 3 rod.
2	48-00	Group 3 must be fully inserted prior to inserting any Group 2 rod.
1	48-00	Group 2 must be fully inserted prior to inserting any Group 1 rod.

Shutdown from an A2 Sequence

Rod Group*	Insertion (Bank)	Comments**
9 or 10	48-00	Either Group 9 or 10 may be inserted first.
8	48-00	Groups 9 and 10 must be fully inserted prior to inserting any Group 8 rod.
7	48-00	Group 8 must be fully inserted prior to inserting any Group 7 rod.
5 or 6	48-00	Groups 5 and 6 may be inserted without banking anytime after Groups 9 and 10 have been inserted and before Group 4 is inserted.
4	48-00	Groups 5 through 10 must be fully inserted prior to inserting any Group 4 rod.
3	48-00	Group 4 must be fully inserted prior to inserting any Group 3 rod.
2	48-00	Group 3 must be fully inserted prior to inserting any Group 2 rod.
1	48-00	Group 2 must be fully inserted prior to inserting any Group 1 rod.

*Group definitions are from LAP-100-13 Revision 21.

** The standard BPWS rules concerning out-of-service rods apply to the shutdown sequences.

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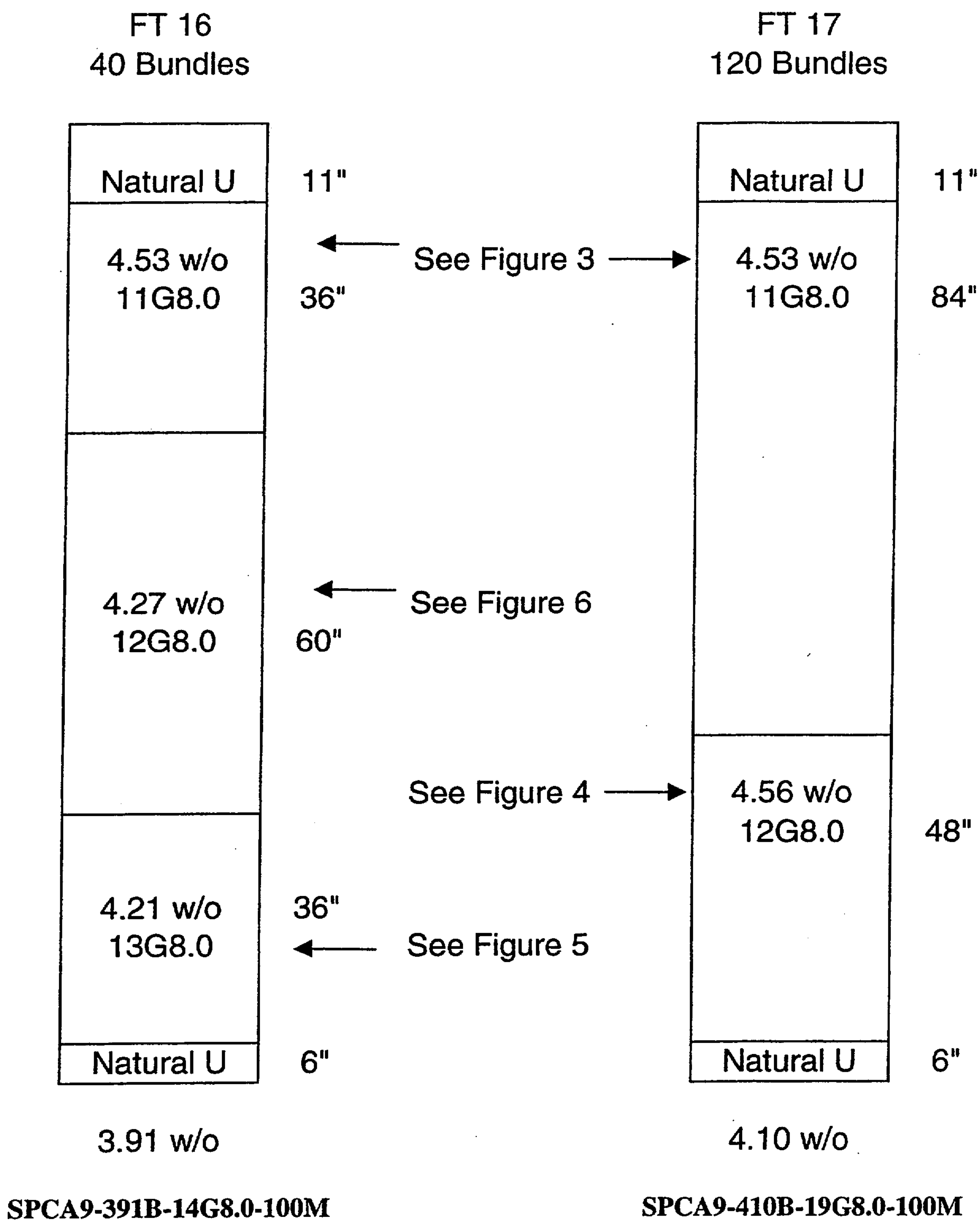

Figure 1. L2C9 Bundle Design (Fuel Types 16 and 17)

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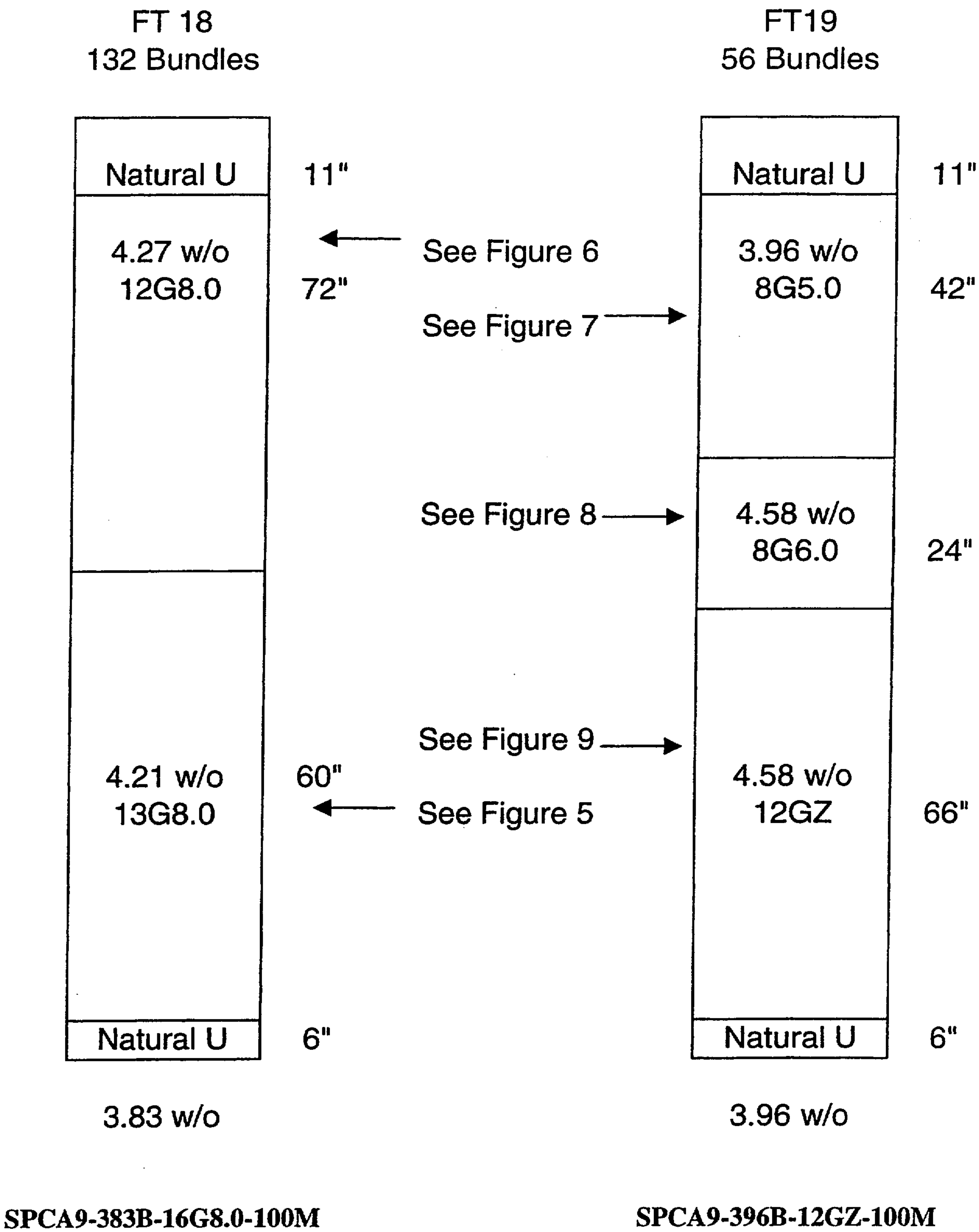

Figure 2. L2C9 Bundle Design (Fuel Types 18 and 19)

preparer: MYH, 8-31-00

reviewer PAW 8-31-00

1 3.00	2 3.60	3 4.40	5 4.70	4 4.95	5 4.70	3 4.40	2 3.60	1 3.00
2 3.60	8 4.40 8.00	4 4.95	4 4.95	8 4.40 8.00	4 4.95	4 4.95	8 4.40 8.00	2 3.60
3 4.40	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	3 4.40
5 4.70	4 4.95	4 4.95	Internal Water Channel			8 4.40 8.00	4 4.95	4 4.95
4 4.95	8 4.40 8.00	4 4.95				4 4.95	8 4.40 8.00	4 4.95
5 4.70	4 4.95	4 4.95				4 4.95	4 4.95	4 4.95
3 4.40	4 4.95	4 4.95	8 4.40 8.00	4 4.95	4 4.95	8 4.40 8.00	4 4.95	3 4.40
2 3.60	8 4.40 8.00	4 4.95	4 4.95	8 4.40 8.00	4 4.95	4 4.95	8 4.40 8.00	2 3.60
1 3.00	2 3.60	3 4.40	4 4.95	4 4.95	4 4.95	3 4.40	2 3.60	1 3.00

TYPE	#	ENR	GD
1	4	3.00	0
2	8	3.60	0
3	8	4.40	0
4	37	4.95	0
5	4	4.70	0
6	0		0
7	0		0
8	11	4.40	8.00
9	0	0.00	0

Figure 3. SPCA9-4.53L-11G8.0-100M Lattice Enrichment Distribution

preparer: MYH, 8-31-00 reviewer PAW 8-31-00

1 3.00	2 4.00	3 4.70	4 4.95	4 4.95	4 4.95	3 4.70	2 4.00	1 3.00
2 4.00	2 4.00	G1 4.20	4 4.95	G2 4.70	4 4.95	G1 4.20	2 4.00	2 4.00
3 4.70	G1 4.20	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	G1 4.20	3 4.70
4 4.95	4 4.95	4 4.95				4 4.95	4 4.95	4 4.95
4 4.95	G2 4.70	4 4.95		Internal Water Channel		4 4.95	G2 4.70	4 4.95
4 4.95	4 4.95	4 4.95				4 4.95	4 4.95	4 4.95
3 4.70	G1 4.20	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	G1 4.20	3 4.70
2 4.00	2 4.00	G1 4.20	4 4.95	G2 4.70	4 4.95	G1 4.20	2 4.00	2 4.00
1 3.00	2 4.00	3 4.70	4 4.95	4 4.95	4 4.95	3 4.70	2 4.00	1 3.00

1	Rods (4)	3.00 w/o U-235
2	Rods (12)	4.00 w/o U-235
3	Rods (8)	4.70 w/o U-235
4	Rods (36)	4.95 w/o U-235
G1	Rods (8)	4.20 w/o U-235+8.0 w/o Gd2O3
G2	Rods (4)	4.70 w/o U-235+8.0 w/o Gd2O3

Figure 4. SPCA9-4.56L-12G8.0-100M Lattice Enrichment Distribution

preparer: MYH, 8-31-00 reviewer PAW 8.31.00

1 2.60	2 3.20	3 4.00	3 4.00	5 4.40	3 4.00	3 4.00	2 3.20	1 2.60
2 3.20	8 4.40 8.00	4 4.70	4 4.70	8 4.40 8.00	4 4.70	8 4.40 8.00	3 4.00	2 3.20
3 4.00	4 4.70	4 4.70	4 4.70	4 4.70	4 4.70	4 4.70	8 4.40 8.00	3 4.00
3 4.00	4 4.70	4 4.70				8 4.40 8.00	4 4.70	4 4.70
5 4.40	8 4.40 8.00	4 4.70		Internal Water Channel		4 4.70	8 4.40 8.00	4 4.70
3 4.00	4 4.70	4 4.70				4 4.70	4 4.70	4 4.70
3 4.00	8 4.40 8.00	4 4.70	8 4.40 8.00	4 4.70	4 4.70	8 4.40 8.00	4 4.70	3 4.00
2 3.20	3 4.00	8 4.40 8.00	4 4.70	8 4.40 8.00	4 4.70	4 4.70	8 4.40 8.00	2 3.20
1 2.60	2 3.20	3 4.00	4 4.70	4 4.70	4 4.70	3 4.00	2 3.20	1 2.60

TYPE	#	ENR	GD
1	4	2.60	0
2	8	3.20	0
3	14	4.00	0
4	31	4.70	0
5	2	4.40	0
6	0		0
7	0		0
8	13	4.40	8.00
9	0	0.00	0

Figure 5. SPCA9-4.21L-13G8.0-100M Lattice Enrichment Distribution

preparer: MYH, 8-31-00

reviewer PAW 8.31.00

1 2.60	2 3.20	3 4.00	5 4.40	4 4.70	5 4.40	3 4.00	2 3.20	1 2.60
2 3.20	8 4.40 8.00	4 4.70	4 4.70	8 4.40 8.00	4 4.70	4 4.70	8 4.40 8.00	2 3.20
3 4.00	4 4.70	8 4.40 8.00	4 4.70	4 4.70	4 4.70	4 4.70	4 4.70	3 4.00
5 4.40	4 4.70	4 4.70				8 4.40 8.00	4 4.70	4 4.70
4 4.70	8 4.40 8.00	4 4.70		Internal Water Channel		4 4.70	8 4.40 8.00	4 4.70
5 4.40	4 4.70	4 4.70				4 4.70	4 4.70	4 4.70
3 4.00	4 4.70	4 4.70	8 4.40 8.00	4 4.70	4 4.70	8 4.40 8.00	4 4.70	3 4.00
2 3.20	8 4.40 8.00	4 4.70	4 4.70	8 4.40 8.00	4 4.70	4 4.70	8 4.40 8.00	2 3.20
1 2.60	2 3.20	3 4.00	4 4.70	4 4.70	4 4.70	3 4.00	2 3.20	1 2.60

TYPE	#	ENR	GD
1	4	2.60	0
2	8	3.20	0
3	8	4.00	0
4	36	4.70	0
5	4	4.40	0
6	0		0
7	0		0
8	12	4.40	8.00
9	0	0.00	0

Figure 6. SPCA9-4.27L-12G8.0-100M Lattice Enrichment Distribution

preparer: MYH, 8-31-00 reviewer PAW 8-31-00

1 2.60	2 3.40	3 3.80	4 4.40	4 4.40	4 4.40	3 3.80	2 3.40	1 2.60
2 3.40	2 3.40	4 4.40	G1 3.40	4 4.40	G1 3.40	4 4.40	2 3.40	2 3.40
3 3.80	4 4.40	4 4.40	4 4.40	4 4.40	4 4.40	4 4.40	4 4.40	3 3.80
4 4.40	G1 3.40	4 4.40				4 4.40	G1 3.40	4 4.40
4 4.40	4 4.40	4 4.40		Internal Water Channel		4 4.40	4 4.40	4 4.40
4 4.40	G1 3.40	4 4.40				4 4.40	G1 3.40	4 4.40
3 3.80	4 4.40	4 4.40	4 4.40	4 4.40	4 4.40	4 4.40	4 4.40	3 3.80
2 3.40	2 3.40	4 4.40	G1 3.40	4 4.40	G1 3.40	4 4.40	2 3.40	2 3.40
1 2.60	2 3.40	3 3.80	4 4.40	4 4.40	4 4.40	3 3.80	2 3.40	1 2.60

1	Rods (4)	2.60 w/o U-235
2	Rods (12)	3.40 w/o U-235
3	Rods (8)	3.80 w/o U-235
4	Rods (40)	4.40 w/o U-235
G1	Rods (8)	3.40 w/o U-235+5.0 w/o Gd2O3

Figure 7. SPCA9-3.96L-8G5.0-100M Lattice Enrichment Distribution

preparer: MYH, 8-31-00 reviewer PAW 8.31-00

1 3.00	2 4.00	3 4.70	4 4.95	4 4.95	4 4.95	3 4.70	2 4.00	1 3.00
2 4.00	2 4.00	4 4.95	G1 4.20	4 4.95	G1 4.20	4 4.95	2 4.00	2 4.00
3 4.70	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	3 4.70
4 4.95	G1 4.20	4 4.95				4 4.95	G1 4.20	4 4.95
4 4.95	4 4.95	4 4.95		Internal Water Channel		4 4.95	4 4.95	4 4.95
4 4.95	G1 4.20	4 4.95				4 4.95	G1 4.20	4 4.95
3 4.70	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	3 4.70
2 4.00	2 4.00	4 4.95	G1 4.20	4 4.95	G1 4.20	4 4.95	2 4.00	2 4.00
1 3.00	2 4.00	3 4.70	4 4.95	4 4.95	4 4.95	3 4.70	2 4.00	1 3.00

1	Rods (4)	3.00 w/o U-235
2	Rods (12)	4.00 w/o U-235
3	Rods (8)	4.70 w/o U-235
4	Rods (40)	4.95 w/o U-235
G1	Rods (8)	4.20 w/o U-235+6.0 w/o Gd2O3

Figure 8. SPCA9-4.58L-8G6.0-100M Lattice Enrichment Distribution

preparer: mYH, 8-31-00

reviewer PAW 8-31-00

1 3.00	2 4.00	3 4.70	4 4.95	4 4.95	4 4.95	3 4.70	2 4.00	1 3.00
2 4.00	G2 4.00	4 4.95	G1 4.20	4 4.95	G1 4.20	4 4.95	G2 4.00	2 4.00
3 4.70	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	3 4.70
4 4.95	G1 4.20	4 4.95				4 4.95	G1 4.20	4 4.95
4 4.95	4 4.95	4 4.95		Internal Water Channel		4 4.95	4 4.95	4 4.95
4 4.95	G1 4.20	4 4.95				4 4.95	G1 4.20	4 4.95
3 4.70	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	4 4.95	3 4.70
2 4.00	G2 4.00	4 4.95	G1 4.20	4 4.95	G1 4.20	4 4.95	G2 4.00	2 4.00
1 3.00	2 4.00	3 4.70	4 4.95	4 4.95	4 4.95	3 4.70	2 4.00	1 3.00

1	Rods (4)	3.00 w/o U-235
2	Rods (8)	4.00 w/o U-235
3	Rods (8)	4.70 w/o U-235
4	Rods (40)	4.95 w/o U-235
G1	Rods (8)	4.20 w/o U-235+6.0 w/o Gd_2O_3
G2	Rods (4)	4.00 w/o U-235+3.0 w/o Gd_2O_3

Figure 9. SPCA9-4.58L-8G6.0/4G3.0-100M Lattice Enrichment Distribution

preparer: MYH, 8-31-00

reviewer PAW 8-31-00