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TRM1 - TECHNICAL REQUIREMENTS MANUAL UNIT 1

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Manual Title: TECHNICAL REQUIREMENTS MANUAL UNIT 1

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3.2 Core Operating Limits Report (COLR)

3.2.1 Core Operating Limits Report (COLR)

TRO 3.2.1 The Core Operating Limits specified in the attached COLR shall be met.

APPLICABILITY: Specified in the referenced Technical Specifications.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Core Operating Limits not met.	A.1 Perform action(s) described in referenced Technical Specification.	Specified in referenced Technical Specifications.

TECHNICAL REQUIREMENT SURVEILLANCE

SURVEILLANCE	FREQUENCY
----------NOTE---------- No associated Surveillances. Surveillances are implemented in the applicable Technical Specifications. ----------	N/A

Susquehanna SES
Unit 1 Cycle 19

CORE OPERATING LIMITS REPORT

Nuclear Fuels Engineering

April 2014

CORE OPERATING LIMITS REPORT
REVISION DESCRIPTION INDEX

Rev. No.	Affected Sections	Description/Purpose of Revision
0	ALL	Issuance of this COLR is in support of Unit 1 Cycle 19 operation.

SUSQUEHANNA STEAM ELECTRIC STATION
Unit 1 Cycle 19
CORE OPERATING LIMITS REPORT

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1.0 INTRODUCTION

This CORE OPERATING LIMITS REPORT for Susquehanna Unit 1 Cycle 19 is prepared in accordance with the requirements of Susquehanna Unit 1, Technical Specification 5.6.5. As required by Technical Specifications 5.6.5, core shutdown margin, the core operating limits, RBM setpoints, and OPRM setpoints presented herein were developed using NRC-approved methods and are established such that all applicable limits of the plant safety analysis are met.

2.0 DEFINITIONS

Terms used in this COLR but not defined in Section 1.0 of the Technical Specifications or Section 1.1 of the Technical Requirements Manual are provided below.

2.1 The AVERAGE PLANAR EXPOSURE at a specified height shall be equal to the total energy produced per unit length at the specified height divided by the total initial weight of uranium per unit length at that height.

2.2 The PELLET EXPOSURE shall be equal to the total energy produced per unit length of fuel rod at the specified height divided by the total initial weight of uranium per unit length of that rod at that height.

2.3 FDLRX is the ratio of the maximum LHGR calculated by the core monitoring system for each fuel bundle divided by the LHGR limit for the applicable fuel bundle type.

2.4 $LHGRFAC_f$ is a multiplier applied to the LHGR limit when operating at less than 108 Mlbm/hr core flow. The $LHGRFAC_f$ multiplier protects against both fuel centerline melting and cladding strain during anticipated system transients initiated from core flows less than 108 Mlbm/hr.

2.5 $LHGRFAC_p$ is a multiplier applied to the LHGR limit when operating at less than RATED THERMAL POWER. The $LHGRFAC_p$ multiplier protects against both fuel centerline melting and cladding strain during anticipated system transients initiated from partial power conditions.

2.6 MFLCPR is the ratio of the applicable MCPR operating limit for the applicable fuel bundle type divided by the MCPR calculated by the core monitoring system for each fuel bundle.

2.7 MAPRAT is the ratio of the maximum APLHGR calculated by the core monitoring system for each fuel bundle divided by the APLGHR limit for the applicable fuel bundle type.

2.8 OPRM is the Oscillation Power Range Monitor. The Oscillation Power Range Monitor (OPRM) will reliably detect and suppress anticipated stability related power oscillations while providing a high degree of confidence that the MCPR safety limit is not violated.

2.9 N_P is the OPRM setpoint for the number of consecutive confirmations of oscillation half-cycles that will be considered evidence of a stability related power oscillation.

2.10 S_P is the OPRM trip setpoint for the peak to average OPRM signal.

2.11 F_P is the core flow, in Mlbm / hr, below which the OPRM RPS trip is activated.

3.0 SHUTDOWN MARGIN

3.1 Technical Specification Reference

Technical Specification 3.1.1

3.2 Description

The SHUTDOWN MARGIN shall be equal to or greater than:

a) 0.38% $\Delta k/k$ with the highest worth rod analytically determined

OR

b) 0.28% $\Delta k/k$ with the highest worth rod determined by test

Since core reactivity will vary during the cycle as a function of fuel depletion and poison burnup, Beginning of Cycle (BOC) SHUTDOWN MARGIN (SDM) tests must also account for changes in core reactivity during the cycle. Therefore, the SDM measured at BOC must be equal to or greater than the applicable requirement from either 3.2.a or 3.2.b plus an adder, "R". The adder, "R", is the difference between the calculated value of maximum core reactivity (that is, minimum SDM) during the operating cycle and the calculated BOC core reactivity. If the value of "R" is zero (that is, BOC is the most reactive point in the cycle) no correction to the BOC measured value is required.

The SHUTDOWN MARGIN limits provided in 3.2a and 3.2b are applicable in MODES 1, 2, 3, 4, and 5. This includes core shuffling.

4.0 AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)

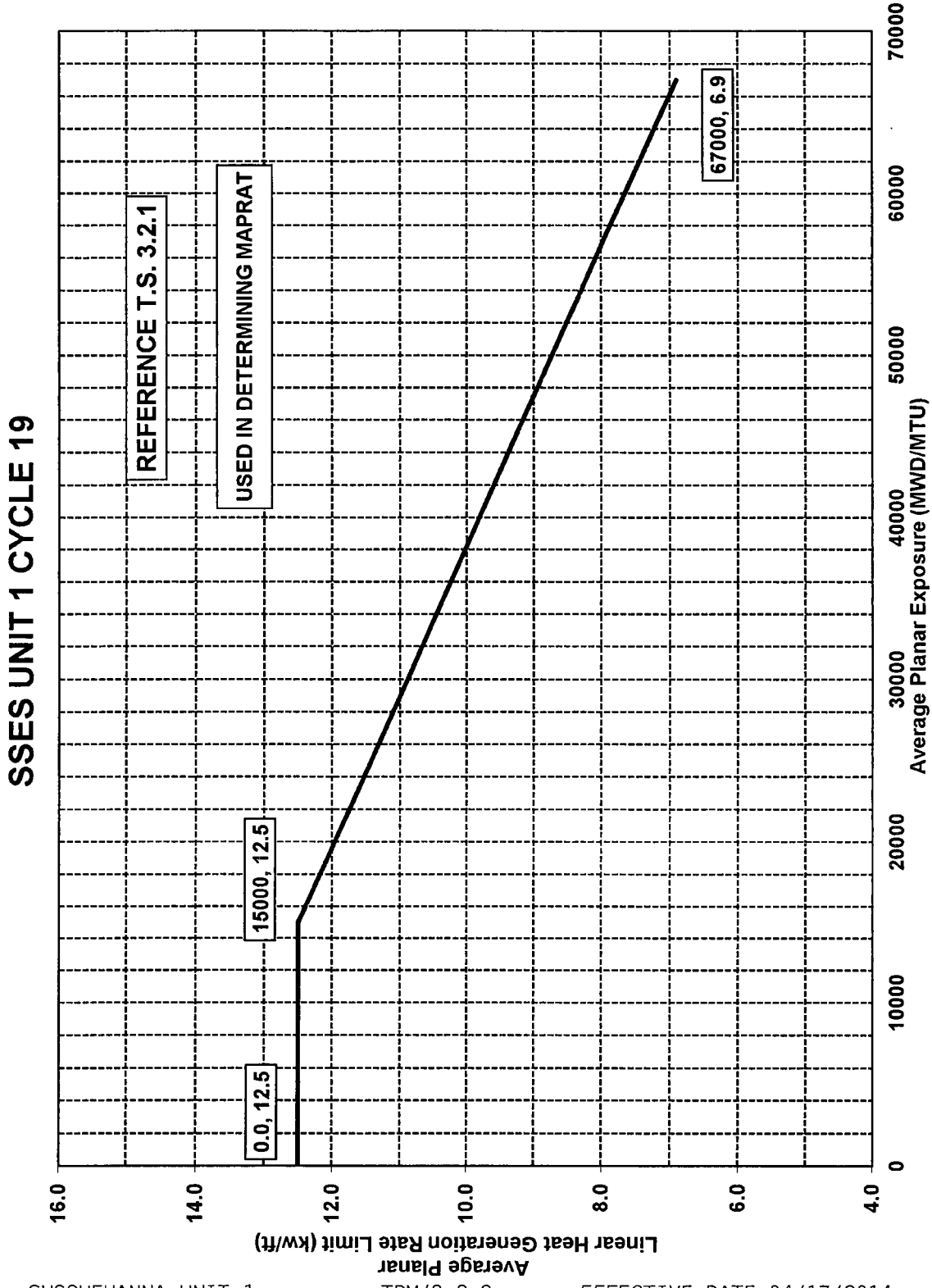
4.1 Technical Specification Reference

Technical Specification 3.2.1

4.2 Description

The APLHGRs for ATRIUM™-10 fuel shall not exceed the limit shown in Figure 4.2-1.

The APLHGR limits in Figure 4.2-1 are valid for Main Turbine Bypass Operable and Inoperable, EOC-RPT Operable and Inoperable, and Backup Pressure Regulator Operable and Inoperable in Two Loop operation. The APLHGR limits for Single Loop operation are provided in Section 8.0.



AVERAGE PLANAR LINEAR HEAT GENERATION RATE LIMIT VERSUS
AVERAGE PLANAR EXPOSURE - TWO LOOP OPERATION
ATRIUM™-10 FUEL
FIGURE 4.2-1

5.0 MINIMUM CRITICAL POWER RATIO (MCPR)

5.1 Technical Specification Reference

Technical Specification 3.2.2, 3.3.4.1, 3.7.6, and 3.7.8

5.2 Description

The MCPR limit is specified as a function of core power, core flow, average scram insertion time per Section 5.3 and plant equipment operability status. The MCPR limits for all fuel types (ATRIUM™-10) shall be the greater of the Flow-Dependent or the Power-Dependent MCPR, depending on the applicable equipment operability status.

a) Main Turbine Bypass / EOC-RPT / Backup Pressure Regulator Operable

Figure 5.2-1: Flow-Dependent MCPR value determined from BOC to EOC

Figure 5.2-2: Power-Dependent MCPR value determined from BOC to EOC

b) Main Turbine Bypass Inoperable

Figure 5.2-3: Flow-Dependent MCPR value determined from BOC to EOC

Figure 5.2-4: Power-Dependent MCPR value determined from BOC to EOC

c) EOC-RPT Inoperable

Figure 5.2-5: Flow-Dependent MCPR value determined from BOC to EOC

Figure 5.2-6: Power-Dependent MCPR value determined from BOC to EOC

d) Backup Pressure Regulator Inoperable

Figure 5.2-7: Flow-Dependent MCPR value determined from BOC to EOC

Figure 5.2-8: Power Dependent MCPR value determined from BOC to EOC

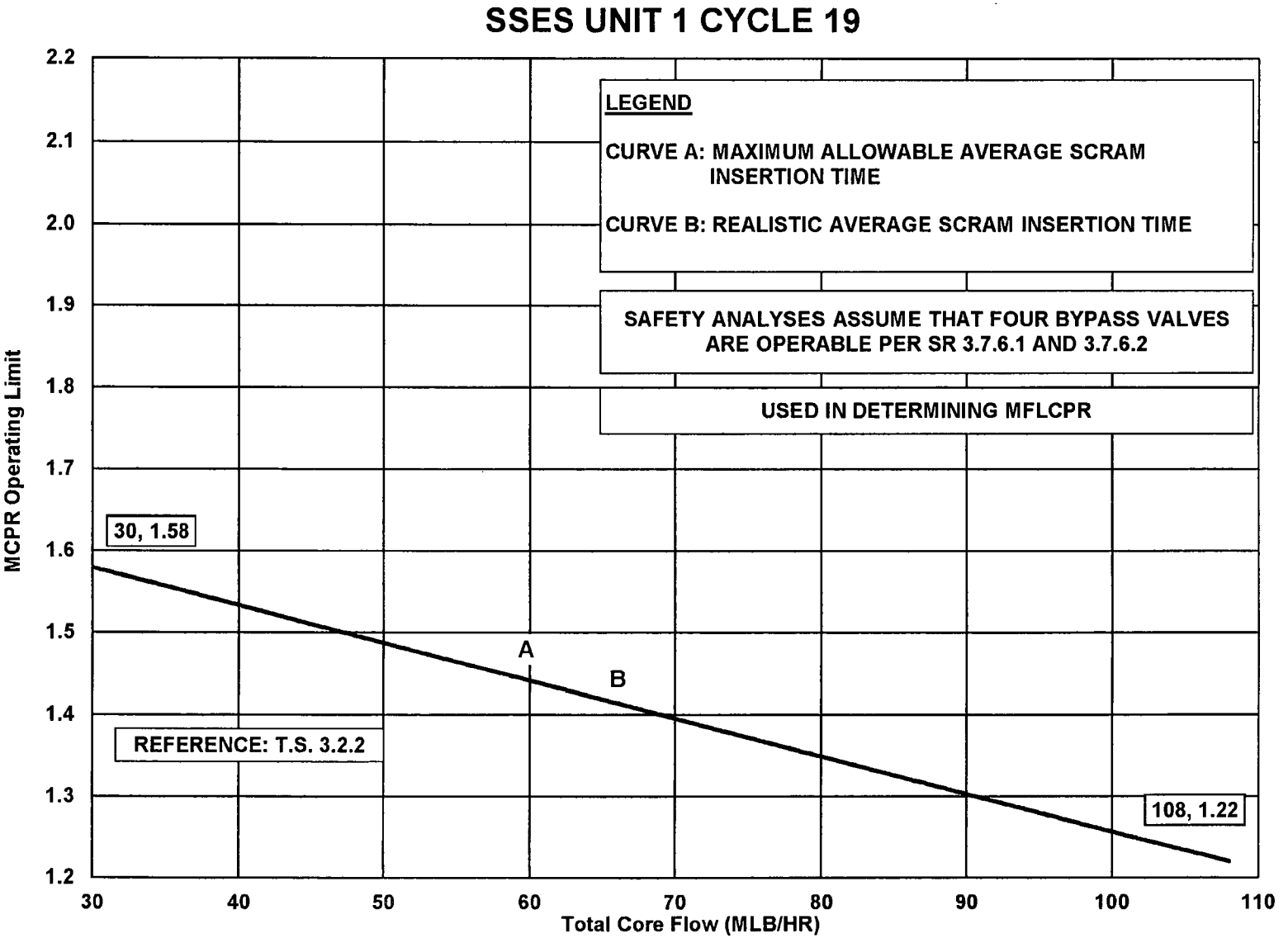
The MCPR limits in Figures 5.2-1 through 5.2-8 are valid for Two Loop operation.

The MCPR limits for Single Loop operation are provided in Section 8.0.

5.3 Average Scram Time Fraction

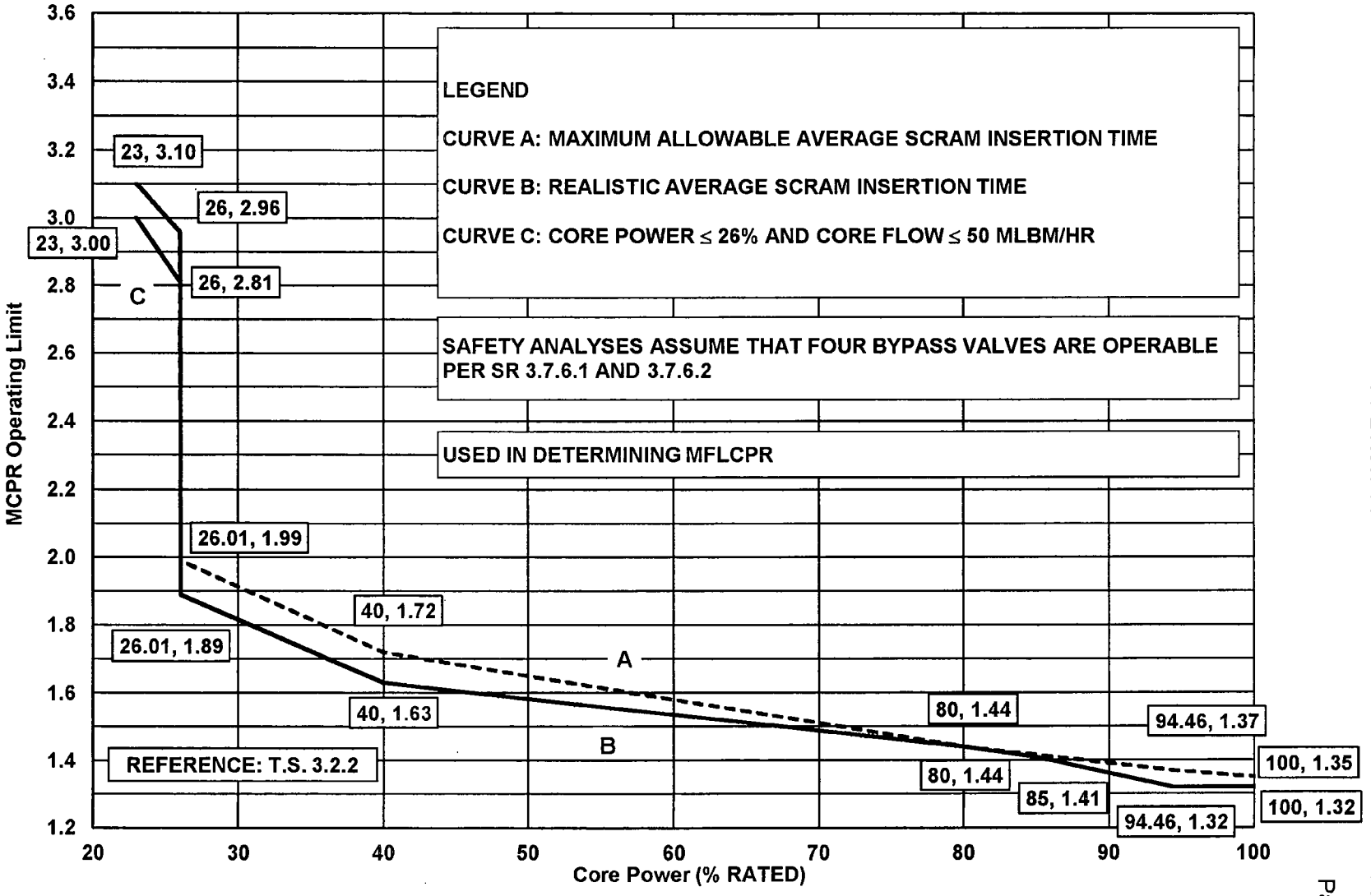
If the average measured scram times are greater than the Realistic Scram times listed in Table 5.3-1 then the MCPR operating limits corresponding to the Maximum Allowable Average Scram Insertion Time must be implemented. Determining MCPR operating limits based on interpolation between scram insertion times is not permitted. The evaluation of scram insertion time data, as it relates to the attached table should be performed per Reactor Engineering procedures.

Main Turbine Bypass / EOC-RPT / Backup Pressure Regulator Operable



MCPR OPERATING LIMIT VERSUS TOTAL CORE FLOW
MAIN TURBINE BYPASS / EOC-RPT / BACKUP PRESSURE REGULATOR OPERABLE
TWO LOOP OPERATION (BOC TO EOC)
FIGURE 5.2-1

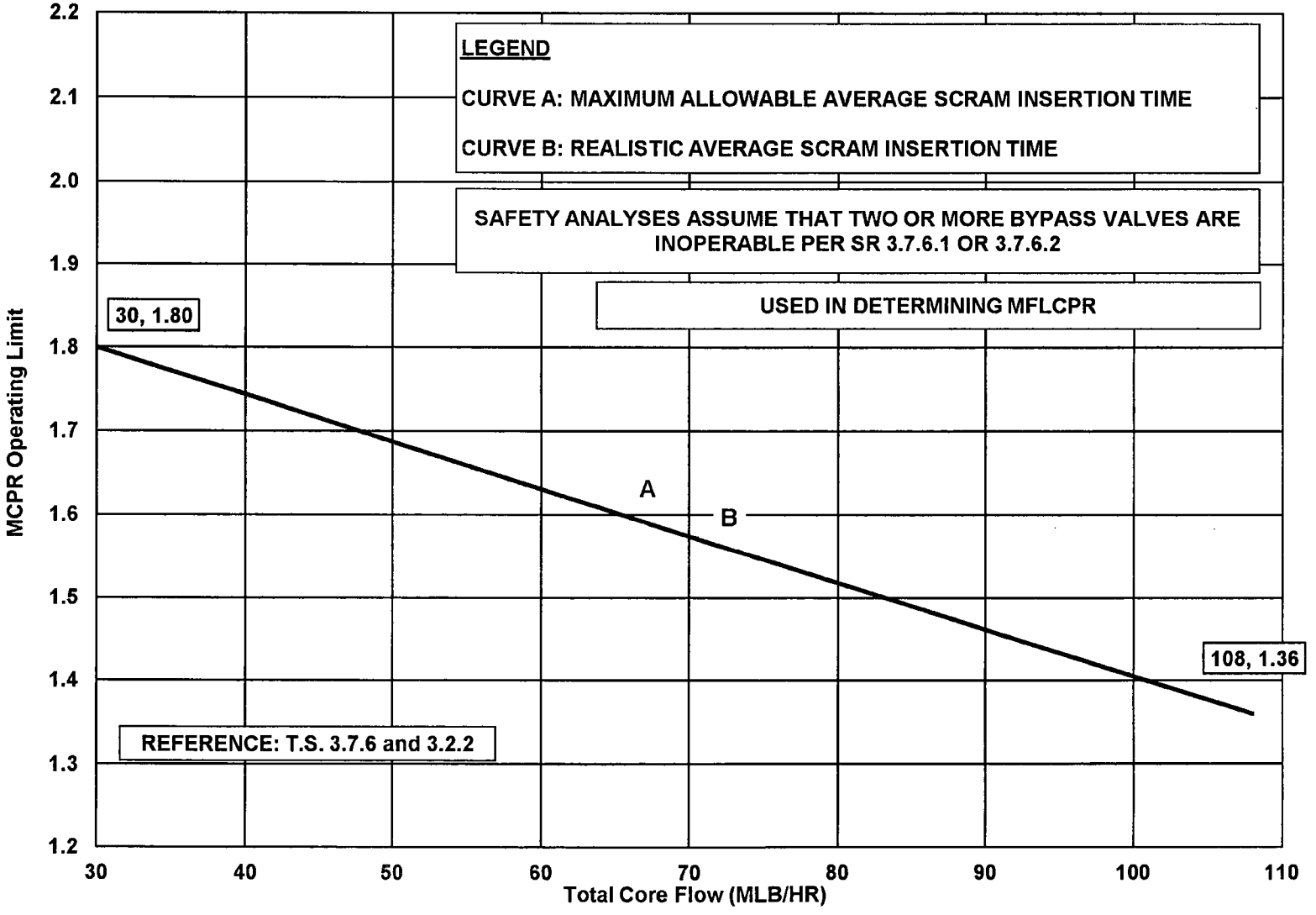
SSES UNIT 1 CYCLE 19



MCPR OPERATING LIMIT VERSUS CORE POWER
MAIN TURBINE BYPASS / EOC-RPT / BACKUP PRESSURE REGULATOR OPERABLE
TWO LOOP OPERATION (BOC TO EOC)
FIGURE 5.2-2

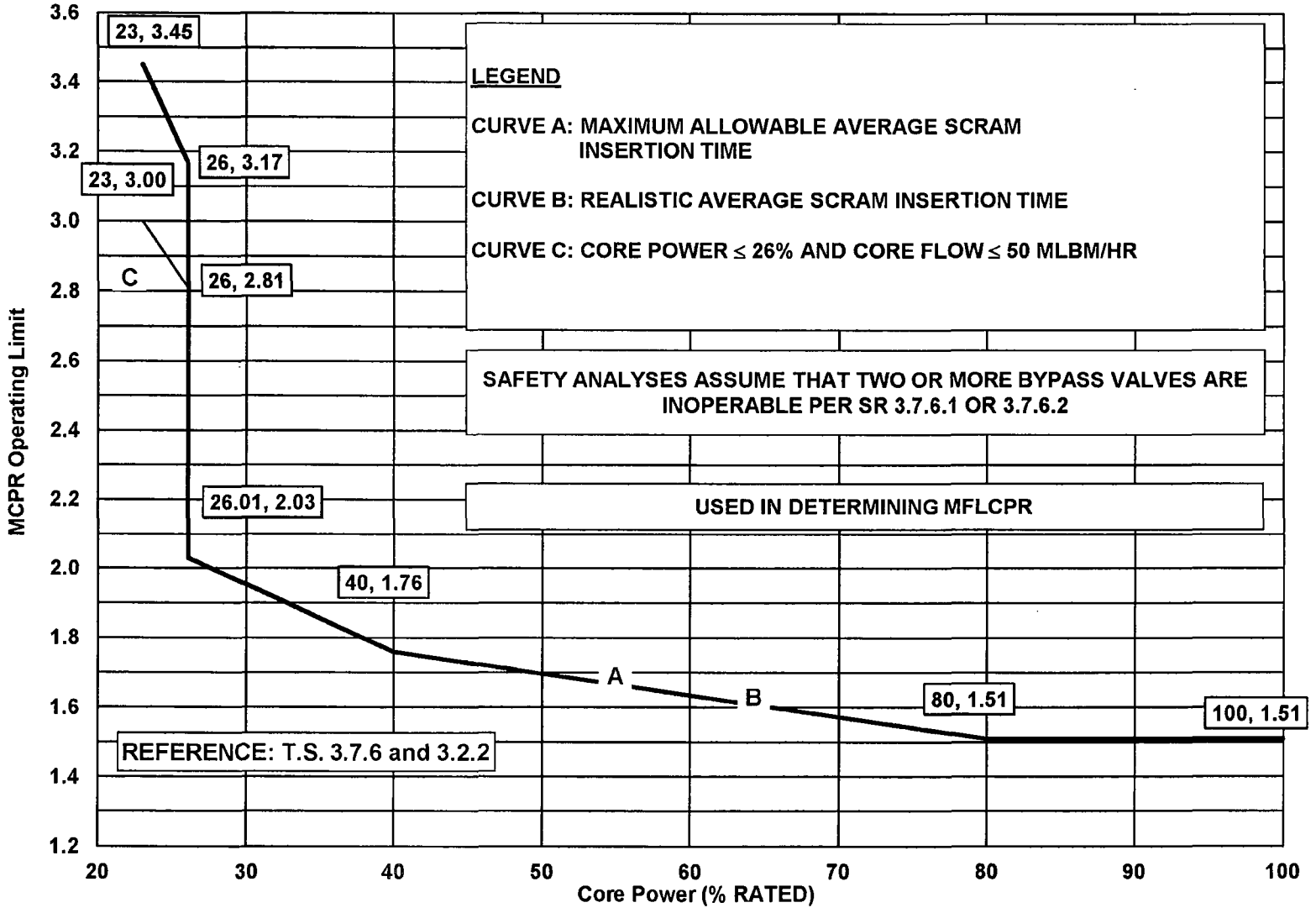
Main Turbine Bypass Inoperable

SSES UNIT 1 CYCLE 19



MCPR OPERATING LIMIT VERSUS TOTAL CORE FLOW
MAIN TURBINE BYPASS INOPERABLE
TWO LOOP OPERATION (BOC TO EOC)
FIGURE 5.2-3

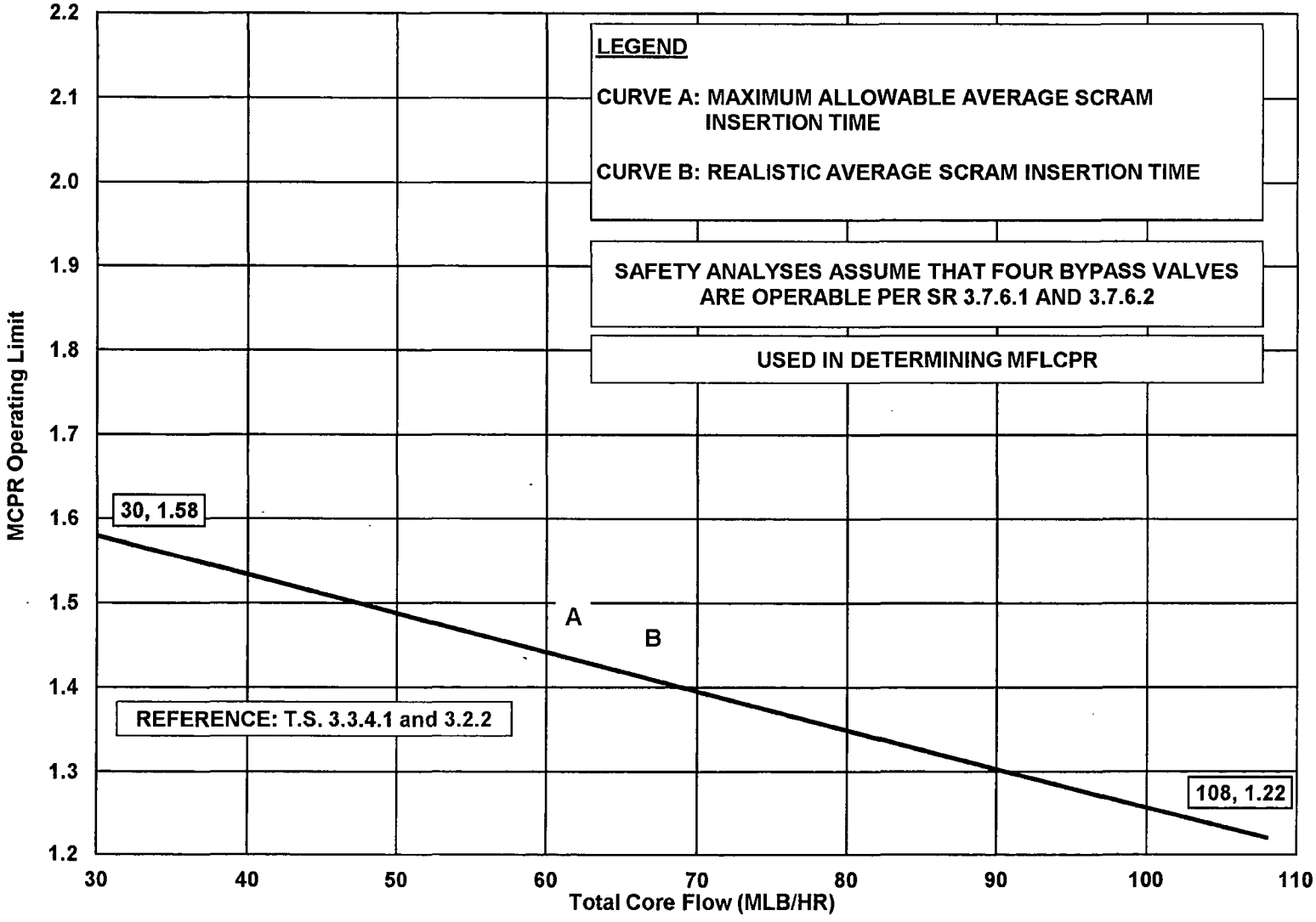
SSES UNIT 1 CYCLE 19



MCPR OPERATING LIMIT VERSUS CORE POWER
MAIN TURBINE BYPASS INOPERABLE
TWO LOOP OPERATION (BOC to EOC)
FIGURE 5.2-4

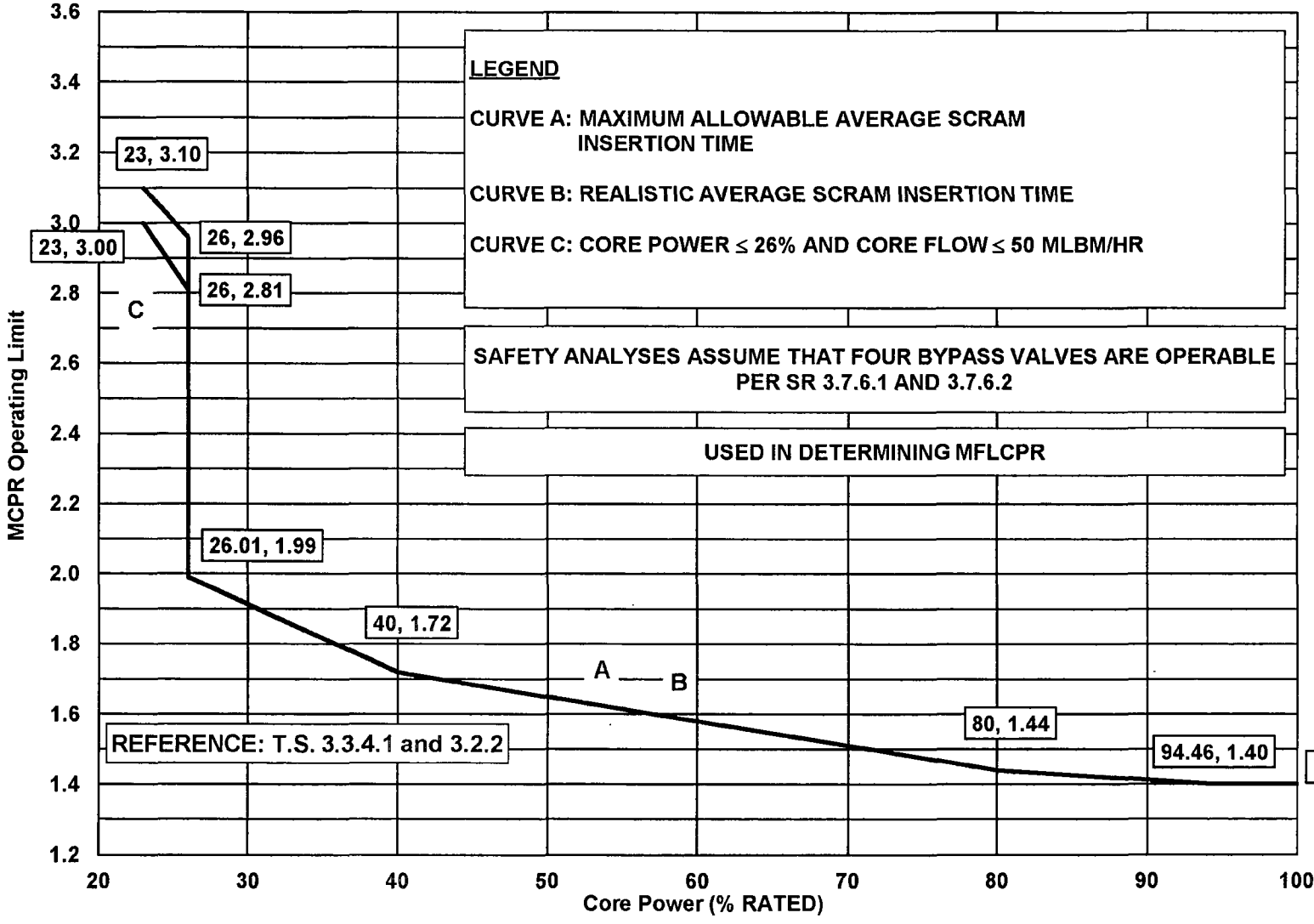
EOC-RPT
Inoperable

SSES UNIT 1 CYCLE 19



MCPR OPERATING LIMIT VERSUS TOTAL CORE FLOW
EOC-RPT INOPERABLE
TWO LOOP OPERATION (BOC TO EOC)
FIGURE 5.2-5

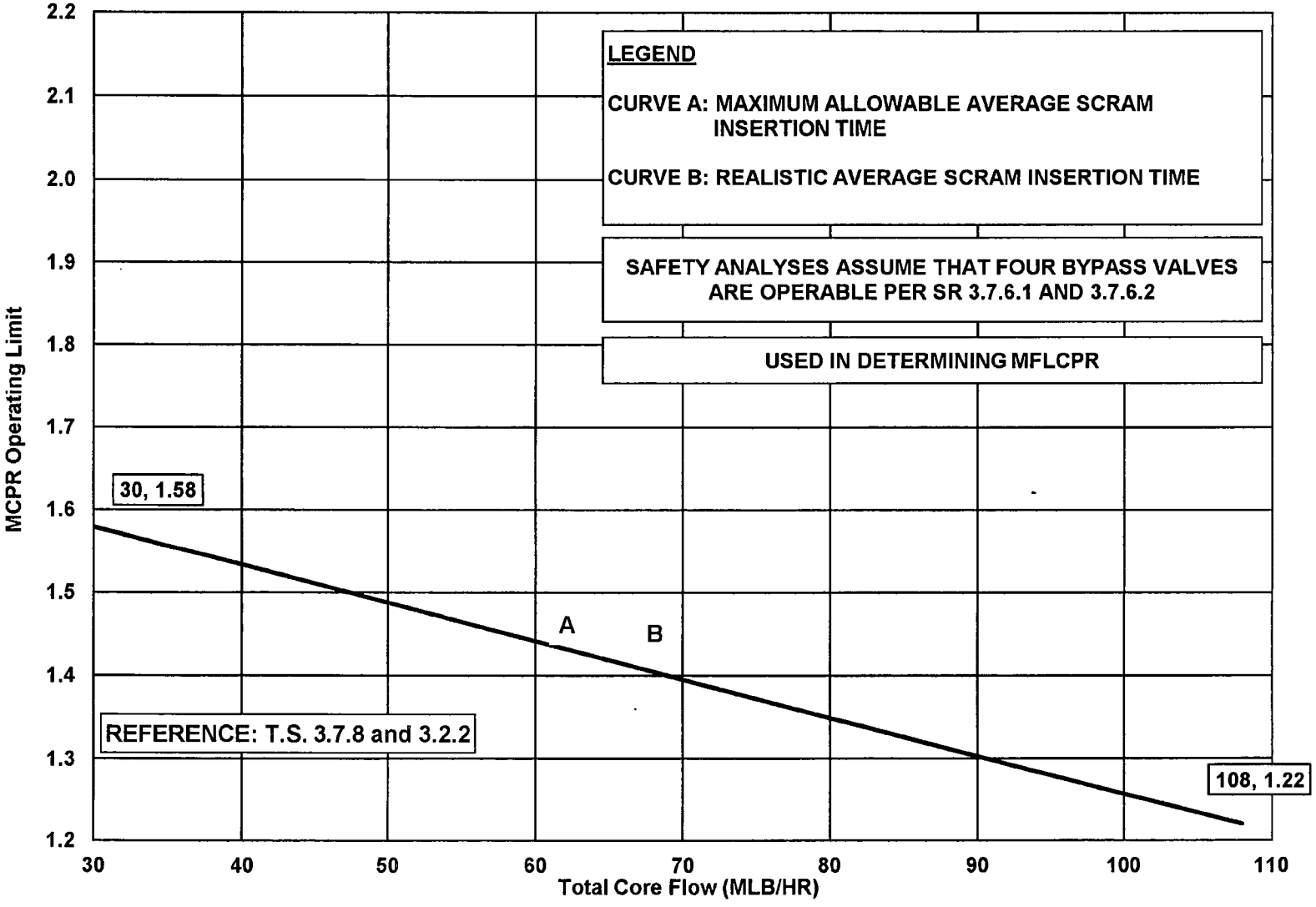
SSES UNIT 1 CYCLE 19



MCPR OPERATING LIMIT VERSUS CORE POWER
EOC-RPT INOPERABLE
TWO LOOP OPERATION (BOC to EOC)
FIGURE 5.2-6

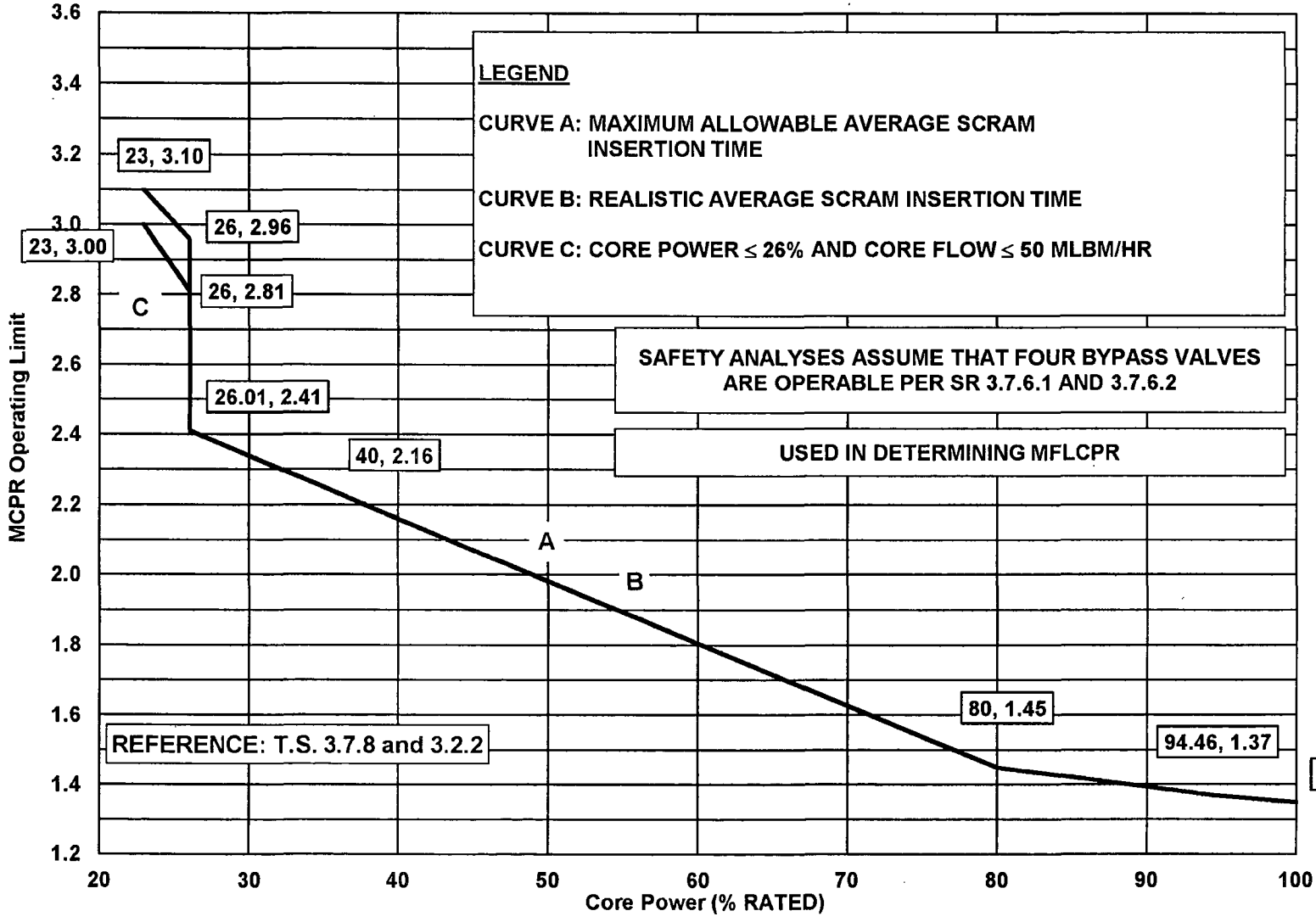
Backup Pressure Regulator Inoperable

SSES UNIT 1 CYCLE 19



MCPR OPERATING LIMIT VERSUS TOTAL CORE FLOW
BACKUP PRESSURE REGULATOR INOPERABLE
TWO LOOP OPERATION (BOC TO EOC)
FIGURE 5.2-7

SSES UNIT 1 CYCLE 19



MCPR OPERATING LIMIT VERSUS CORE POWER
BACKUP PRESSURE REGULATOR INOPERABLE
TWO LOOP OPERATION (BOC to EOC)
FIGURE 5.2-8

Table 5.3-1

Average Scram Time Fraction Table For Use With Scram Time Dependent MCPR Operating Limits

Control Rod Position	Average Scram Time to Position (seconds)		
45	0.470		0.520
39	0.630		0.860
25	1.500		1.910
5	2.700		3.440
Average Scram Insertion Time	Realistic		Maximum Allowable

6.0 LINEAR HEAT GENERATION RATE (LHGR)

6.1 Technical Specification Reference

Technical Specification 3.2.3, 3.3.4.1, 3.7.6, and 3.7.8

6.2 Description

The maximum LHGR for ATRIUM™-10 fuel shall not exceed the LHGR limit determined from Figure 6.2-1. The LHGR limit in Figure 6.2-1 is valid for Main Turbine Bypass Operable and Inoperable, EOC-RPT Operable and Inoperable, and Backup Pressure Regulator Operable and Inoperable.

To protect against both fuel centerline melting and cladding strain during anticipated system transients initiated from reduced power and flow conditions, power and flow dependent LHGR limit multipliers are provided. The following figures are applicable to EOC-RPT Operable and Inoperable and Backup Pressure Regulator Operable and Inoperable:

a) Main Turbine Bypass Operable

Figure 6.2-2: Flow-Dependent LHGR Limit Multiplier

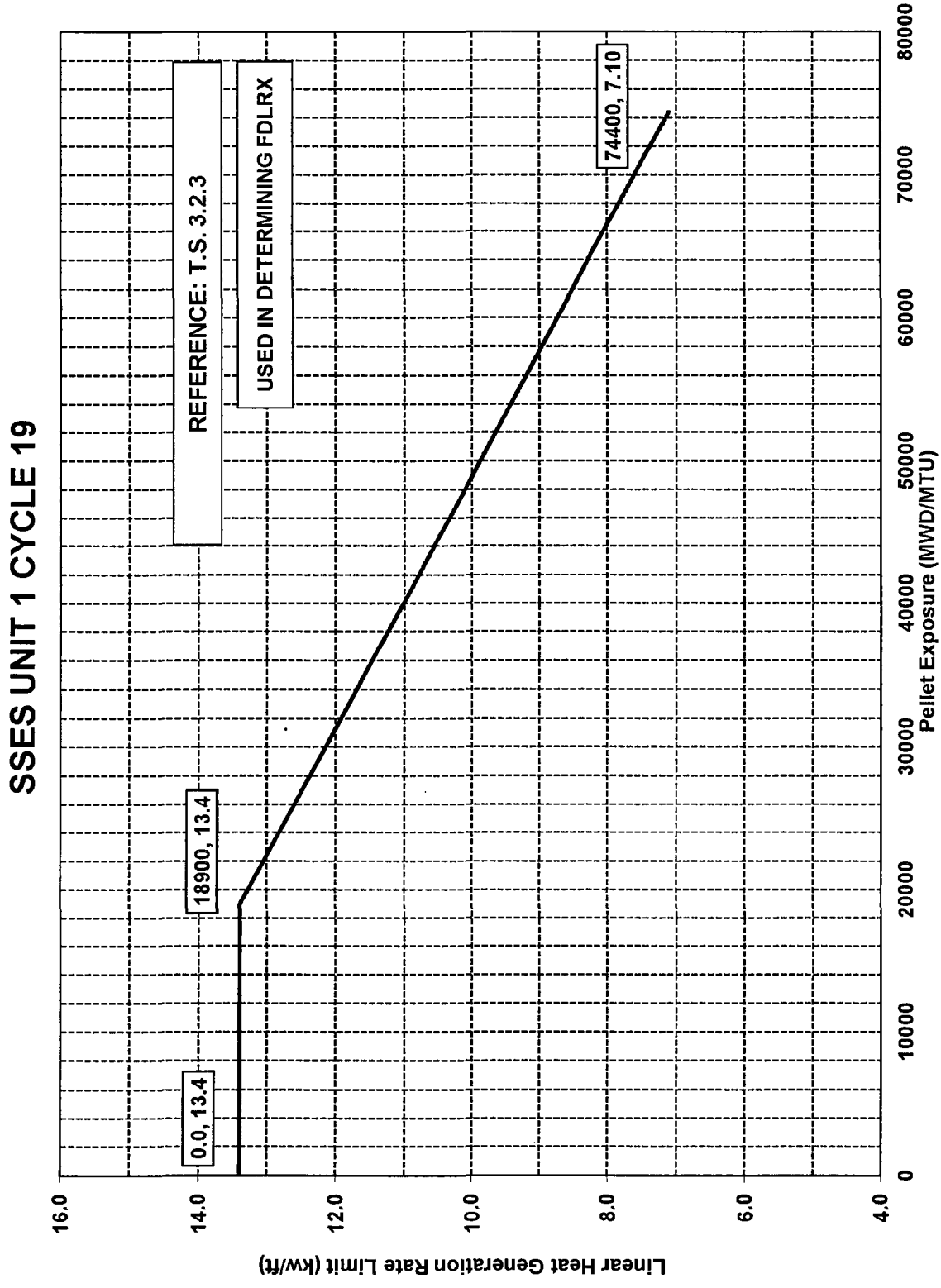
Figure 6.2-3: Power-Dependent LHGR Limit Multiplier

b) Main Turbine Bypass Inoperable

Figure 6.2-4: Flow-Dependent LHGR Limit Multiplier

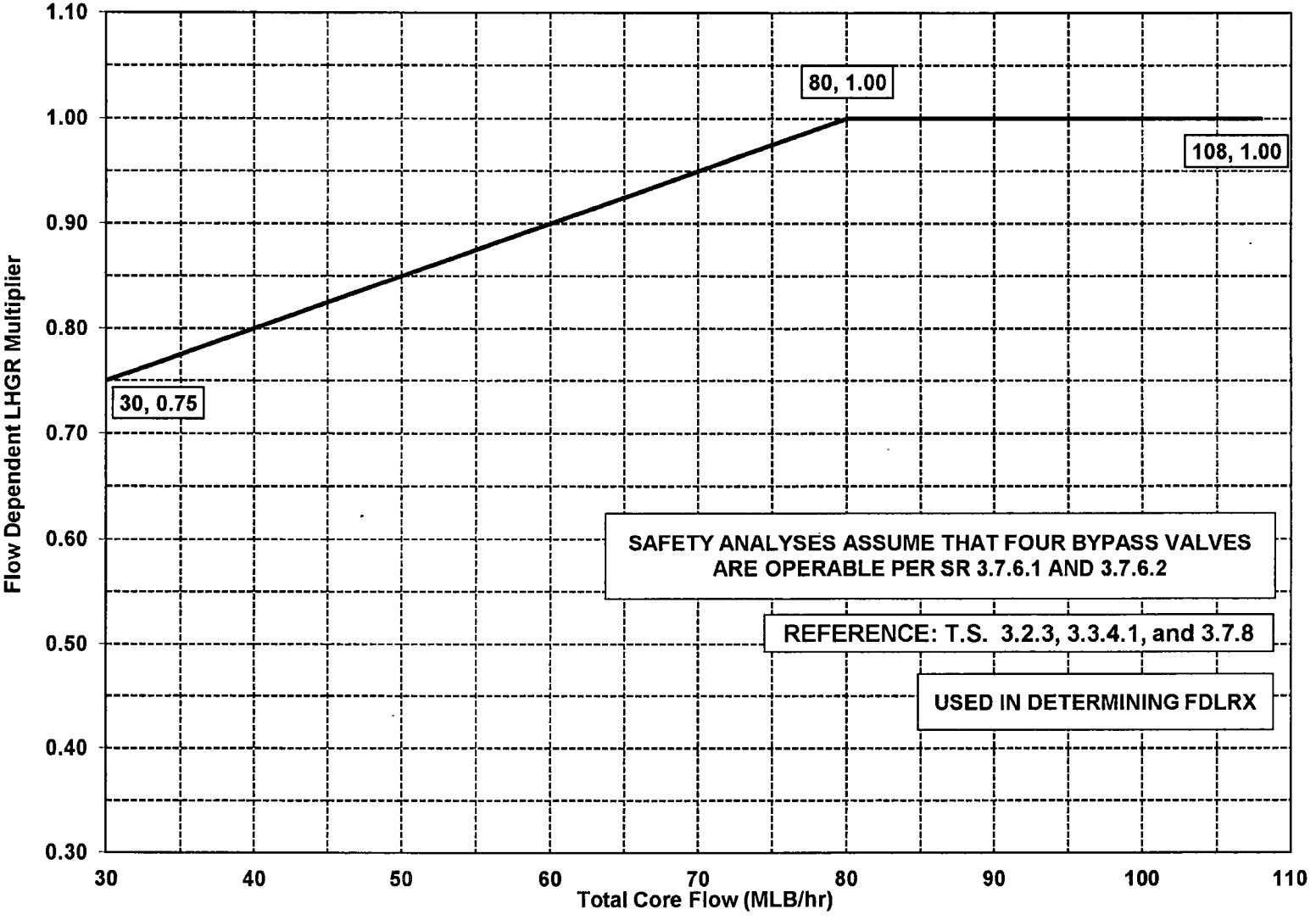
Figure 6.2-5: Power-Dependent LHGR Limit Multiplier

The LGHR limit and LHGR limit multipliers in Figures 6.2-1 through 6.2-5 are valid for both Two Loop and Single Loop operation.

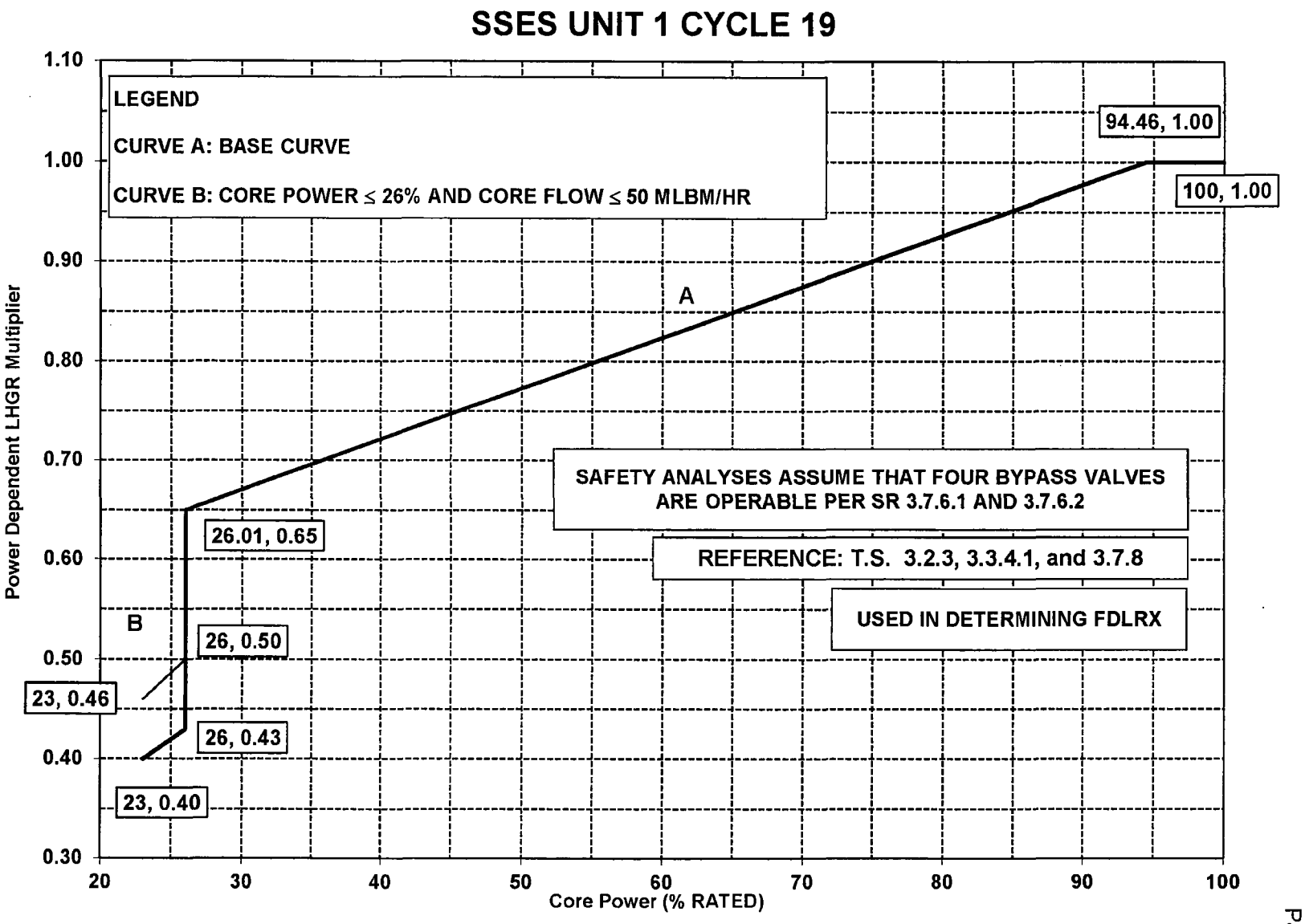


LINEAR HEAT GENERATION RATE LIMIT VERSUS PELLET EXPOSURE
ATRIUM™-10 FUEL
FIGURE 6.2-1

Main Turbine Bypass Operable

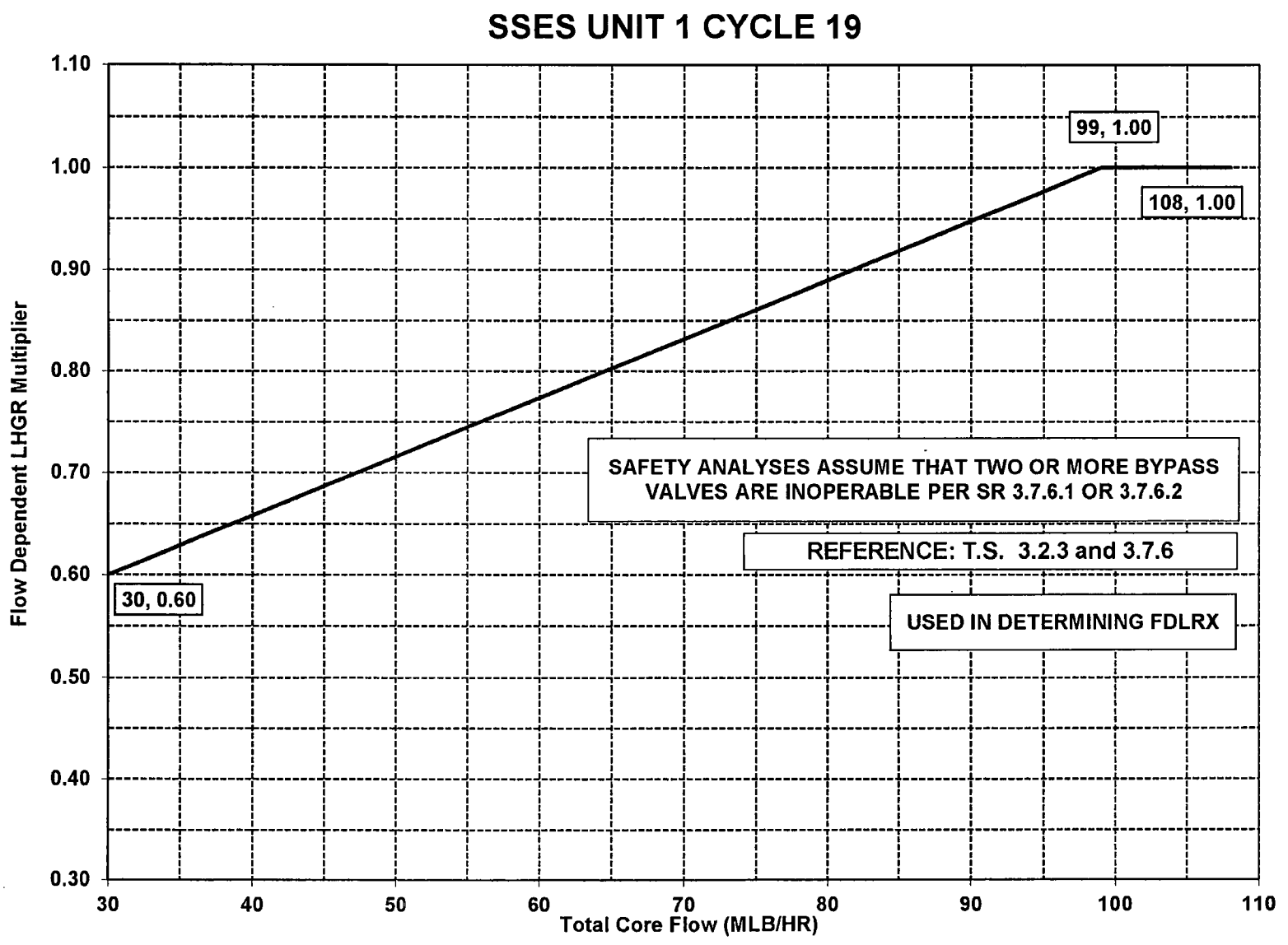


FLOW DEPENDENT LHGR LIMIT MULTIPLIER
MAIN TURBINE BYPASS OPERABLE
ATRIUM™-10 FUEL
FIGURE 6.2-2

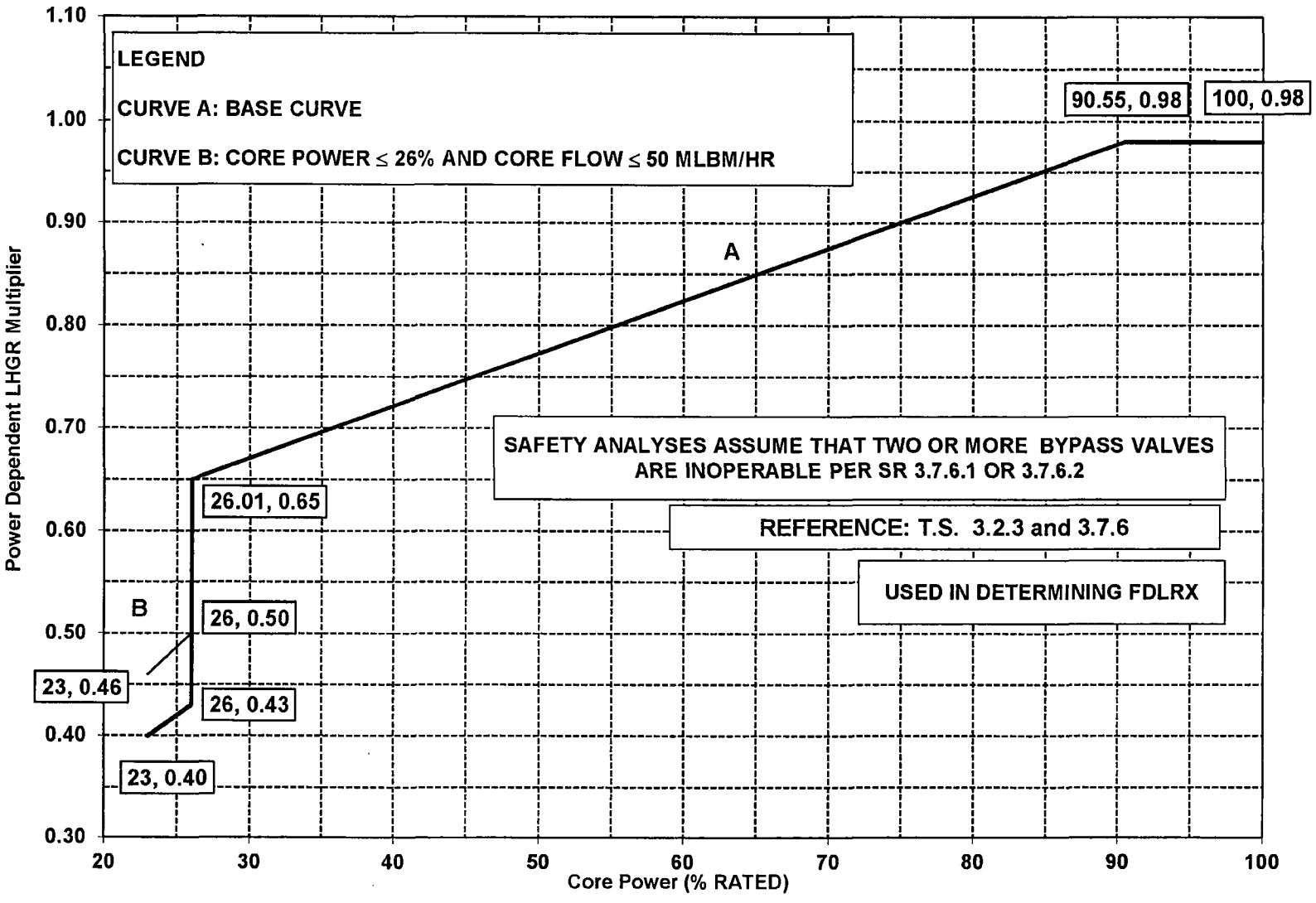


POWER DEPENDENT LHGR LIMIT MULTIPLIER
MAIN TURBINE BYPASS OPERABLE
ATRIUM™-10 FUEL
FIGURE 6.2-3

Main Turbine Bypass Inoperable



FLOW DEPENDENT LHGR LIMIT MULTIPLIER
MAIN TURBINE BYPASS INOPERABLE
ATRIUM™-10 FUEL
FIGURE 6.2-4



POWER DEPENDENT LHGR LIMIT MULTIPLIER
MAIN TURBINE BYPASS INOPERABLE
ATRIUM™-10 FUEL
FIGURE 6.2-5

7.0 ROD BLOCK MONITOR (RBM) SETPOINTS AND OPERABILITY REQUIREMENTS

7.1 Technical Specification Reference

Technical Specification 3.3.2.1

7.2 Description

The RBM Allowable Value and Trip Setpoints for;

a) Low Power Range Setpoint,
b) Intermediate Power Range Setpoint,
c) High Power Range Setpoint,
d) Low Power Range - Upscale,
e) Intermediate Power Range - Upscale, and
f) High Power Range - Upscale

shall be established as specified in Table 7.2-1. The RBM setpoints are valid for Two Loop and Single Loop Operation, Main Turbine Bypass Operable and Inoperable, EOC-RPT Operable and Inoperable, and Backup Pressure Regulator Operable and Inoperable.

The RBM system design objective is to block erroneous control rod withdrawal initiated by the operator before fuel design limits are violated. If the full withdrawal of any control rod would not violate a fuel design limit, then the RBM system is not required to be operable. Table 7.2-2 provides RBM system operability requirements to ensure that fuel design limits are not violated.

Table 7.2-1
RBM Setpoints

Function	Allowable Value[1]	Nominal Trip Setpoint
Low Power Range Setpoint	28.0	24.9
Intermediate Power Range Setpoint	63.0	61.0
High Power Range Setpoint	83.0	81.0
Low Power Range – Upscale	123.4	123.0
Intermediate Power Range - Upscale	117.4	117.0
High Power Range – Upscale	107.6	107.2

(1) Power setpoint function (Low, Intermediate, and High Power Range Setpoints) determined in percent of RATED THERMAL POWER. Upscale trip setpoint function (Low, Intermediate, and High Power Range - Upscale) determined in percent of reference level.

Table 7.2-2
RBM System Operability Requirements

Thermal Power (% of Rated)	MCPR [2,3]
≥ 28 and < 90	< 1.76
≥ 90 and < 95	< 1.47
≥ 95	< 1.70

(2) Applicable to Main Turbine Bypass Operable and Inoperable, EOC-RPT Operable and Inoperable, and Backup Pressure Regulator Operable and Inoperable.

(3) Applicable to both Two Loop and Single Loop Operation.

8.0 RECIRCULATION LOOPS - SINGLE LOOP OPERATION

8.1 Technical Specification Reference

Technical Specification 3.2.1, 3.2.2, 3.2.3, 3.3.4.1, 3.4.1, 3.7.6, and 3.7.8

8.2 Description

APLHGR

The APLHGR limit for ATRIUM™-10 fuel shall be equal to the APLHGR Limit from Figure 8.2-1.

The APLHGR limits in Figure 8.2-1 are valid for Main Turbine Bypass Operable and Inoperable, EOC-RPT Operable and Inoperable, and Backup Pressure Regulator Operable and Inoperable in Single Loop operation.

Minimum Critical Power Ratio Limit

The MCPR limit is specified as a function of core power, core flow, and plant equipment operability status. The MCPR limits for all fuel types (ATRIUM™-10) shall be the greater of the Flow-Dependent or the Power-Dependent MCPR, depending on the applicable equipment operability status.

a) Main Turbine Bypass / EOC-RPT / Backup Pressure Regulator Operable

Figure 8.2-2: Flow-Dependent MCPR value determined from BOC to EOC

Figure 8.2-3: Power-Dependent MCPR value determined from BOC to EOC

b) Main Turbine Bypass Inoperable

Figure 8.2-4: Flow-Dependent MCPR value determined from BOC to EOC

Figure 8.2-5: Power-Dependent MCPR value determined from BOC to EOC

c) EOC-RPT Inoperable

Figure 8.2-6: Flow-Dependent MCPR value determined from BOC to EOC

Figure 8.2-7: Power-Dependent MCPR value determined from BOC to EOC

d) Backup Pressure Regulator Inoperable

Figure 8.2-8: Flow-Dependent MCPR value determined from BOC to EOC

Figure 8.2-9: Power-Dependent MCPR value determined from BOC to EOC

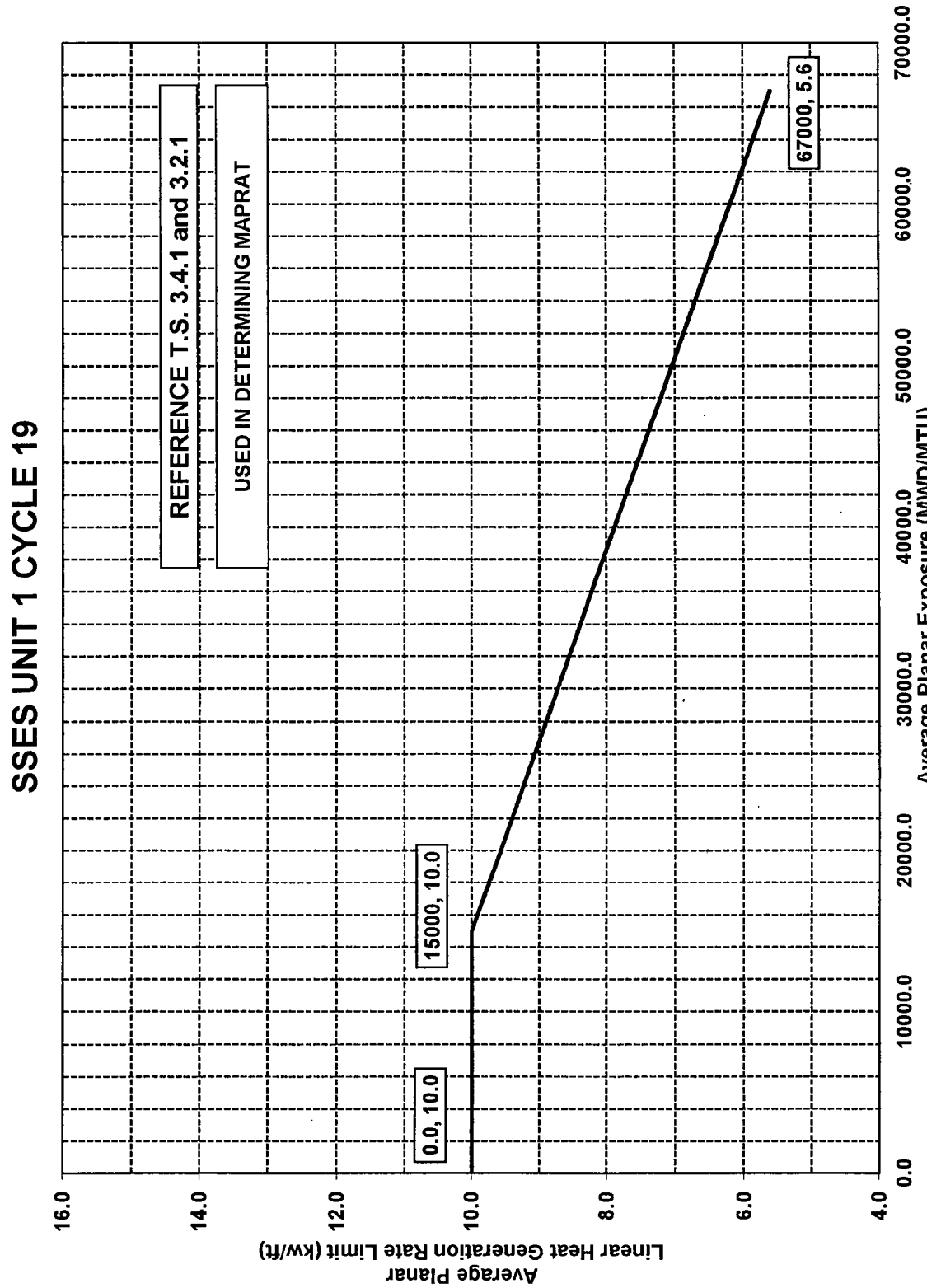
The MCPR limits in Figures 8.2-2 through 8.2-9 are valid only for Single Loop operation.

Linear Heat Generation Rate Limit

The LHGR limits for Single Loop Operation are defined in Section 6.0.

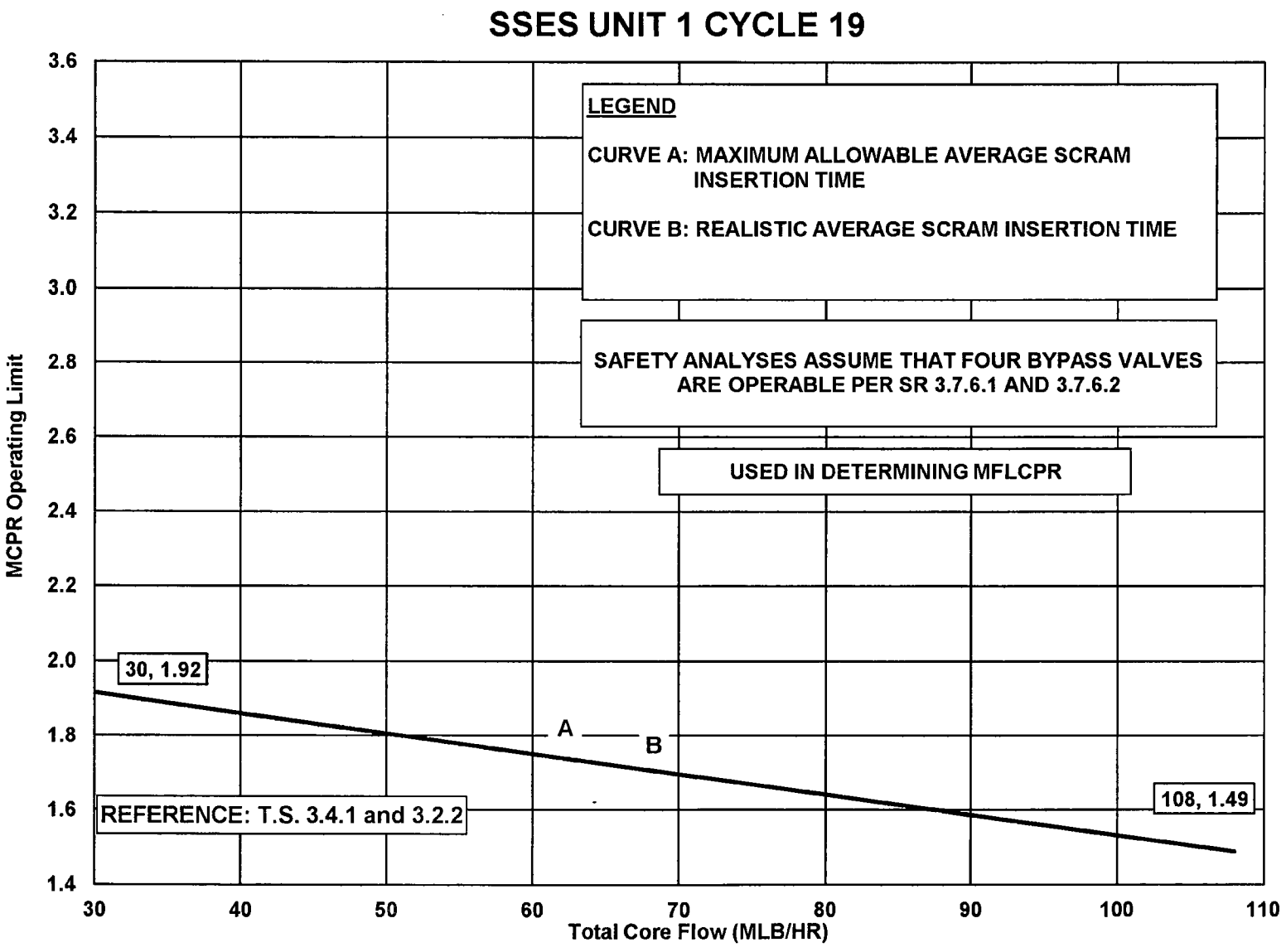
RBM Setpoints and Operability Requirements

The RBM setpoints and operability requirements for Single Loop Operation are defined in Section 7.0.



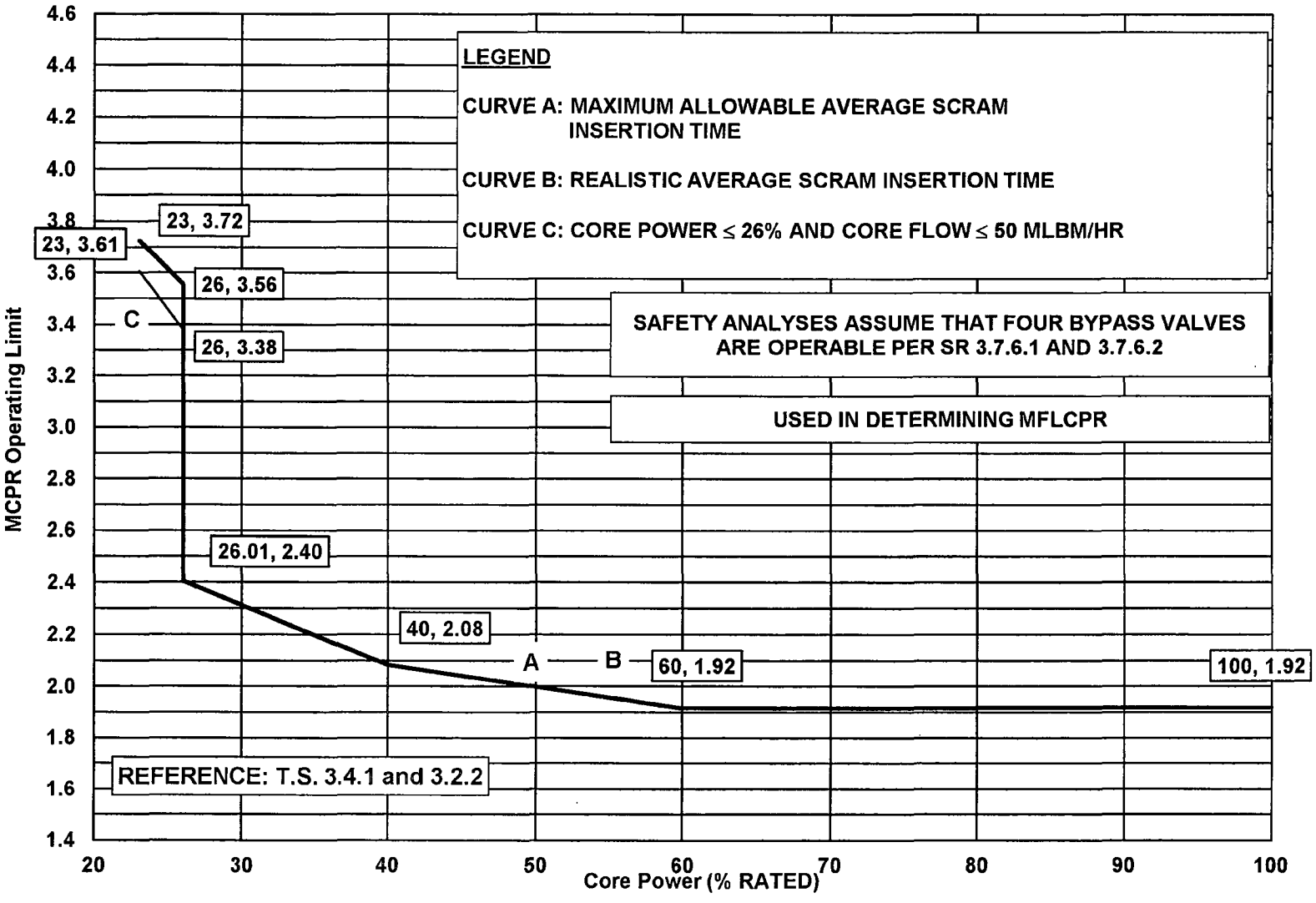
AVERAGE PLANAR LINEAR HEAT GENERATION RATE LIMIT VERSUS
AVERAGE PLANAR EXPOSURE - SINGLE LOOP OPERATION
ATRIUM™-10 FUEL
FIGURE 8.2-1

Main Turbine Bypass / EOC-RPT / Backup Pressure Regulator Operable



MCPR OPERATING LIMIT VERSUS TOTAL CORE FLOW
MAIN TURBINE BYPASS / EOC-RPT / BACKUP PRESSURE REGULATOR OPERABLE
SINGLE LOOP OPERATION (BOC to EOC)
FIGURE 8.2-2

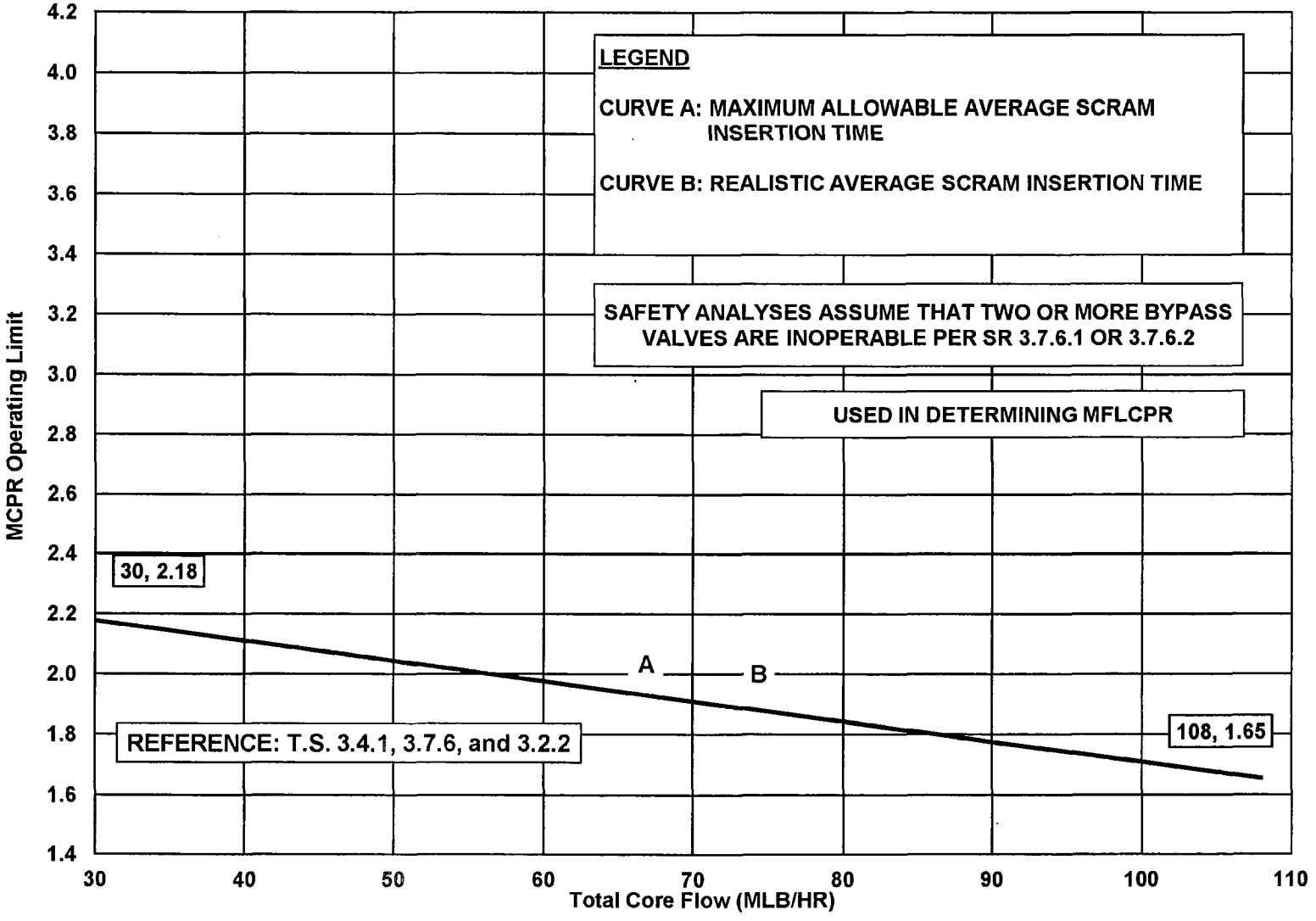
SSES UNIT 1 CYCLE 19



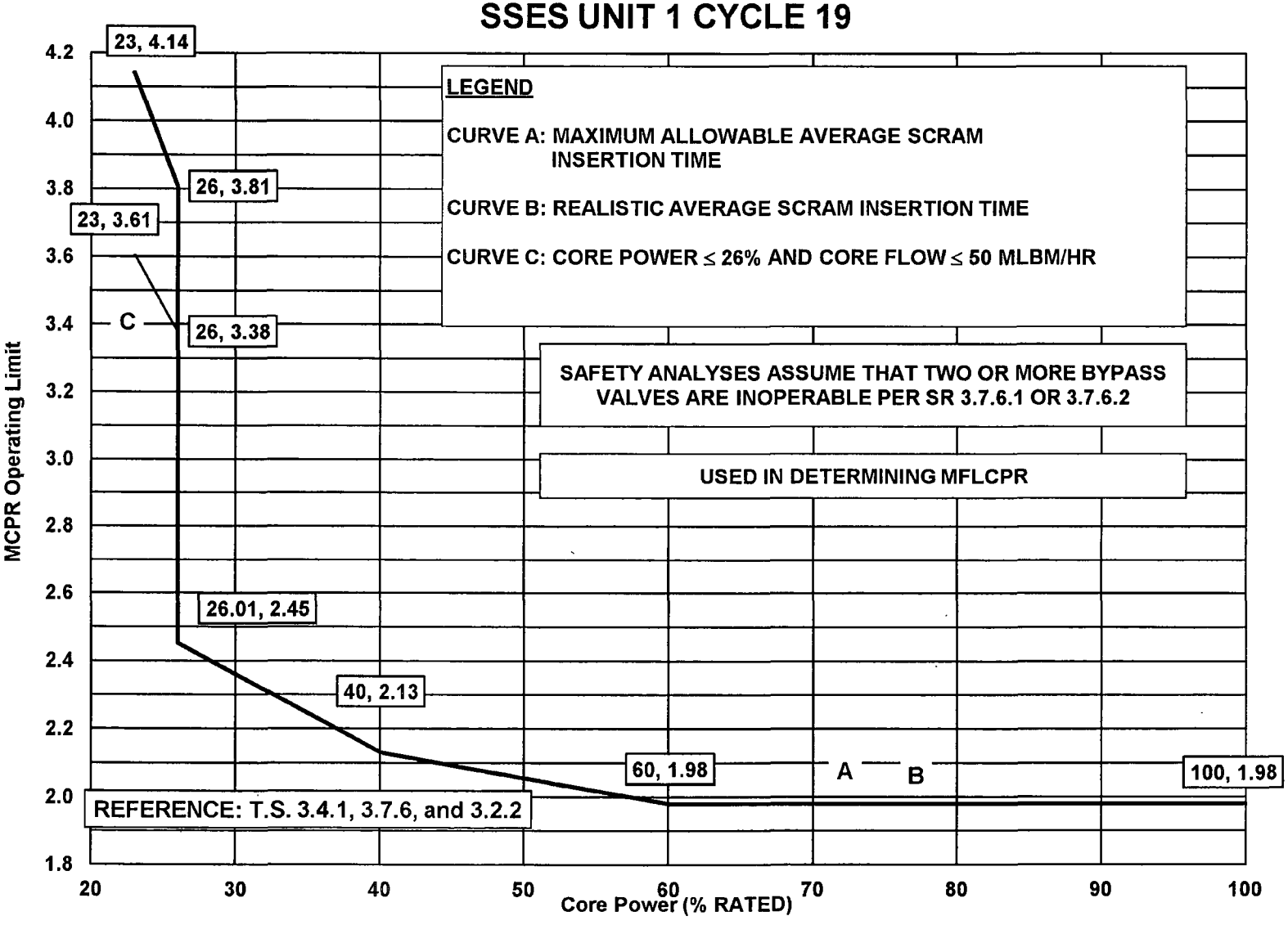
MCPR OPERATING LIMIT VERSUS CORE POWER
MAIN TURBINE BYPASS / EOC-RPT / BACKUP PRESSURE REGULATOR OPERABLE
SINGLE LOOP OPERATION (BOC to EOC)
FIGURE 8.2-3

Main Turbine Bypass Inoperable

SSES UNIT 1 CYCLE 19

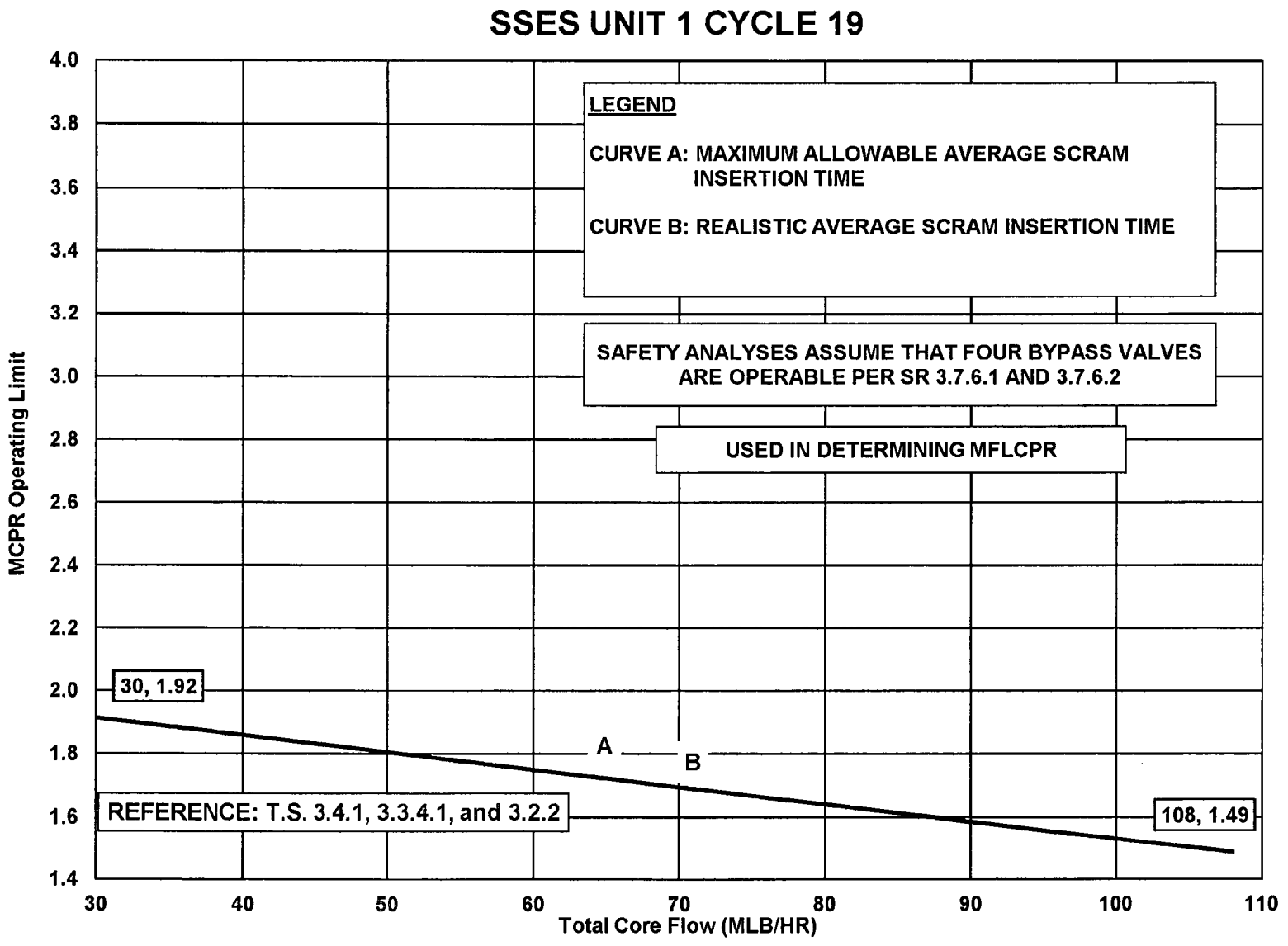


MCPR OPERATING LIMIT VERSUS TOTAL CORE FLOW
MAIN TURBINE BYPASS INOPERABLE
SINGLE LOOP OPERATION (BOC to EOC)
FIGURE 8.2-4



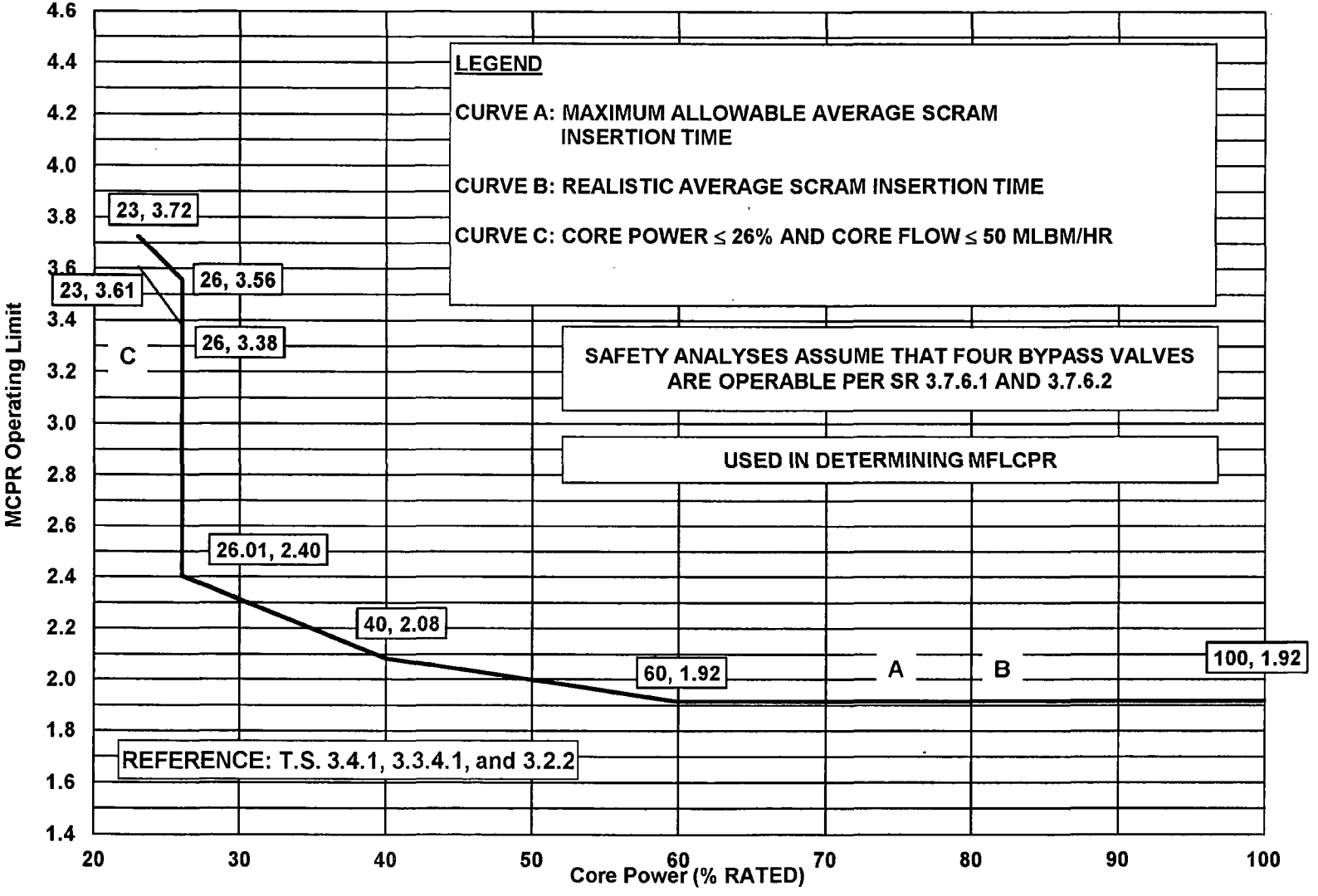
MCPR OPERATING LIMIT VERSUS CORE POWER
MAIN TURBINE BYPASS INOPERABLE
SINGLE LOOP OPERATION (BOC to EOC)
FIGURE 8.2-5

EOC-RPT
Inoperable



MCPR OPERATING LIMIT VERSUS TOTAL CORE FLOW
EOC-RPT INOPERABLE
SINGLE LOOP OPERATION (BOC to EOC)
FIGURE 8.2-6

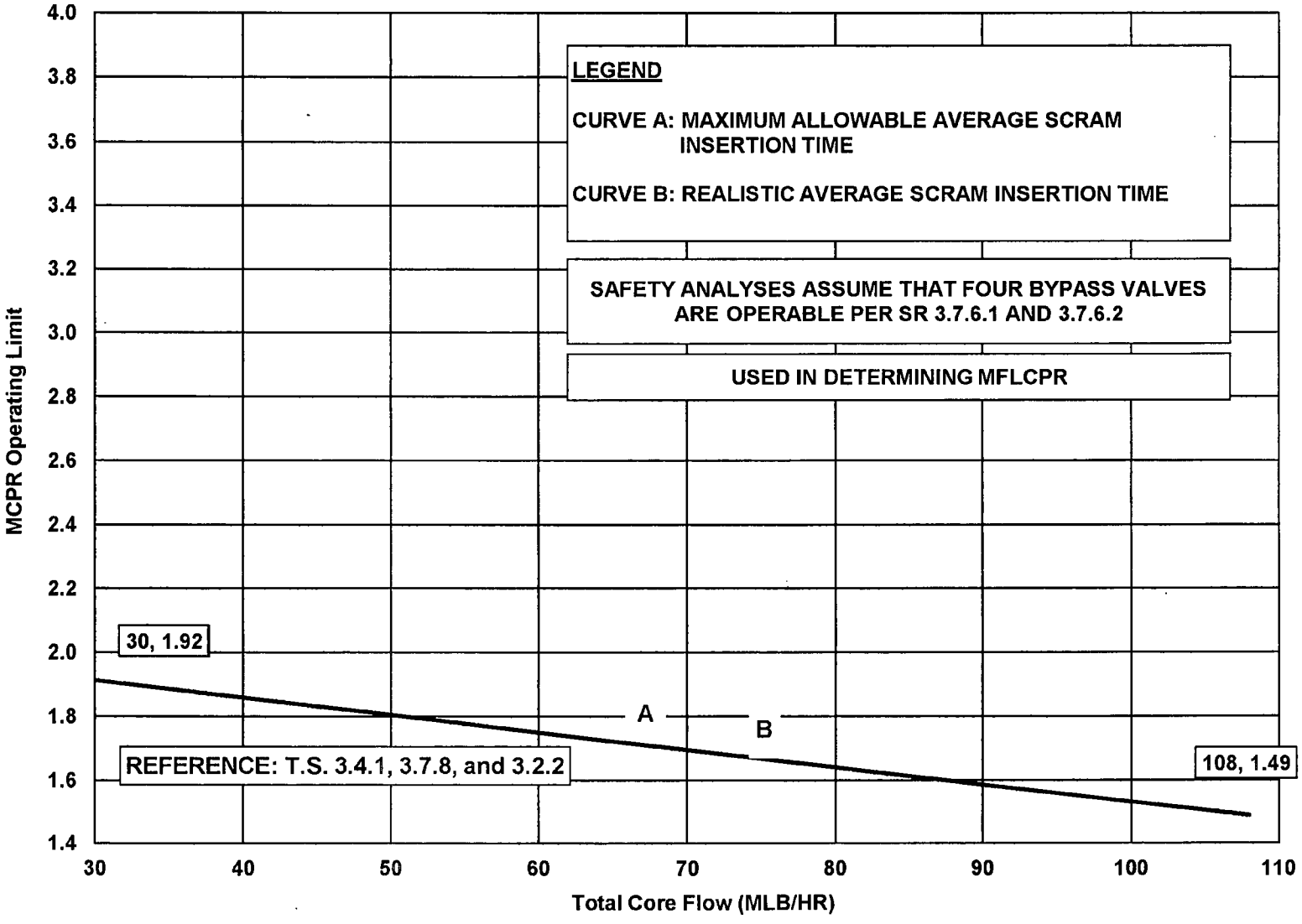
SSES UNIT 1 CYCLE 19



MCPR OPERATING LIMIT VERSUS CORE POWER
EOC-RPT INOPERABLE
SINGLE LOOP OPERATION (BOC to EOC)
FIGURE 8.2-7

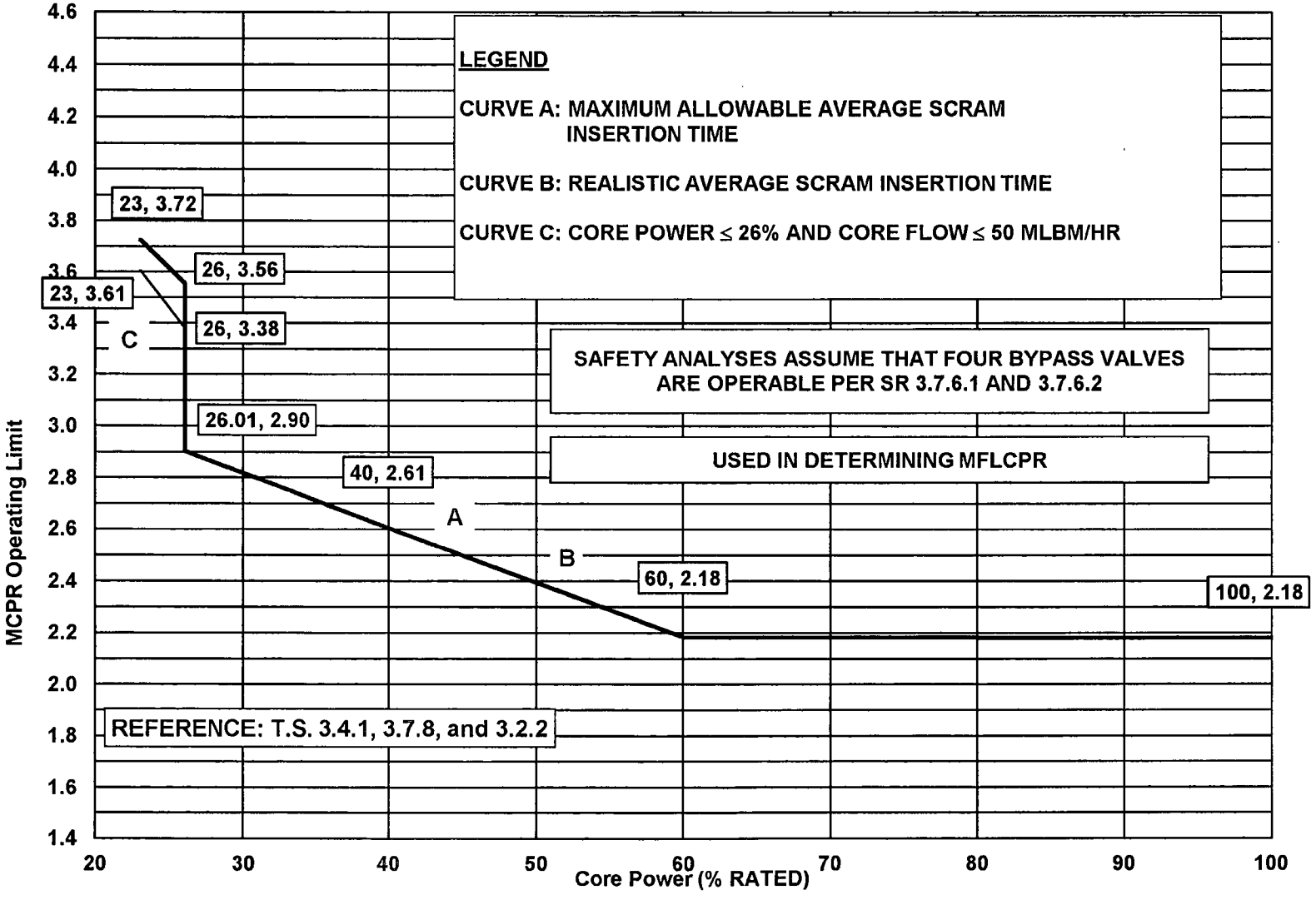
Backup Pressure Regulator Inoperable

SSES UNIT 1 CYCLE 19



MCPR OPERATING LIMIT VERSUS TOTAL CORE FLOW
BACKUP PRESSURE REGULATOR INOPERABLE
SINGLE LOOP OPERATION (BOC to EOC)
FIGURE 8.2-8

SSES UNIT 1 CYCLE 19



MCPR OPERATING LIMIT VERSUS CORE POWER
BACKUP PRESSURE REGULATOR INOPERABLE
SINGLE LOOP OPERATION (BOC to EOC)
FIGURE 8.2-9

9.0 POWER / FLOW MAP

9.1 Technical Specification Reference

Technical Specification 3.3.1.1

9.2 Description

Monitor reactor conditions to maintain THERMAL POWER / core flow outside of Stability Regions I and II of the Power / Flow map, Figure 9.1.

If the OPRM Instrumentation is OPERABLE per TS 3.3.1.1, Region I of the Power / Flow map is considered an immediate exit region.

If the OPRM Instrumentation is inoperable per TS 3.3.1.1, Region I of the Power / Flow map is considered an immediate scram region.

Region II of the Power / Flow map is considered an immediate exit region regardless of the operability of the OPRM Instrumentation.

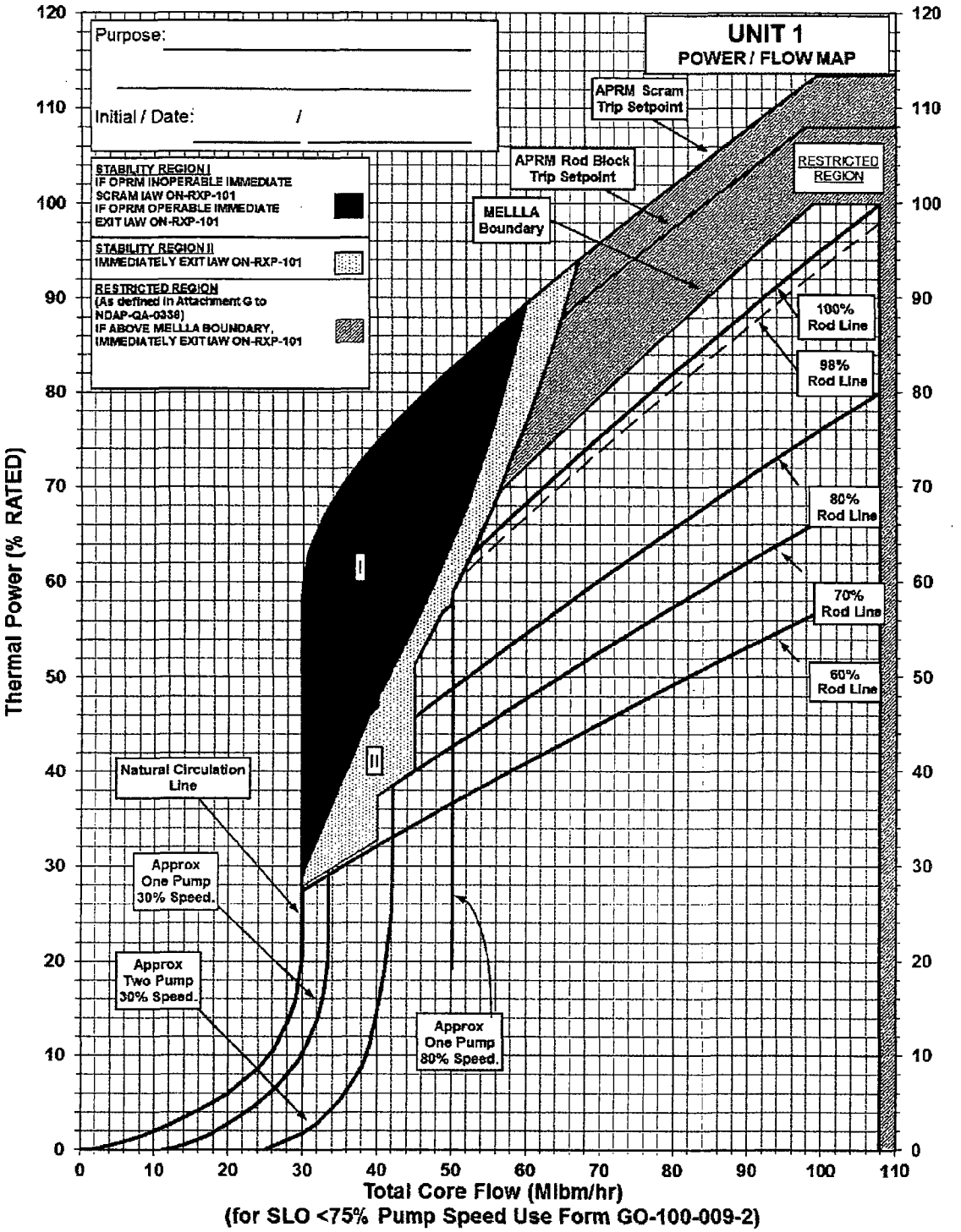


Figure 9.1
SSES Unit 1 Cycle 19 Power / Flow Map

10.0 OPRM SETPOINTS

10.1 Technical Specification Reference

Technical Specification 3.3.1.1

10.2 Description

Setpoints for the OPRM Instrumentation are established that will reliably detect and suppress anticipated stability related power oscillations while providing a high degree of confidence that the MCPR Safety limit is not violated. The setpoints are described in Section 2.0 and are listed below:

S_P = 1.11

N_P = 15

F_P = 60 Mlbm / hr

11.0 REFERENCES

11.1 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," Exxon Nuclear Company, March 1984.

2. EMF-2361(P)(A), Revision 0, "EXEM BWR-2000 ECCS Evaluation Model," Framatome ANP, May 2001.

3. EMF-2292(P)(A), Revision 0, "ATRIUM™-10: Appendix K Spray Heat Transfer Coefficients," Siemens Power Corporation, September 2000.

4. XN-NF-84-105(P)(A), Volume 1 and Volume 1 Supplements 1 and 2, "XCOBRA-T: A Computer Code for BWR Transient Thermal-Hydraulic Core Analysis," Exxon Nuclear Company, February 1987.

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," Exxon Nuclear Company, March 1983.

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

7. XN-NF-80-19(P)(A), Volume 3 Revision 2 "Exxon Nuclear Methodology for Boiling Water Reactors Thermex: Thermal Limits Methodology Summary Description," Exxon Nuclear Company, January 1987.

8. 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," Exxon Nuclear Company, June 1986.

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

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

11. NE-092-001A, Revision 1, "Licensing Topical Report for Power Uprate With Increased Core Flow," Pennsylvania Power & Light Company, December 1992 and NRC SER (November 30, 1993).

13. EMF-2209(P)(A), Revision 3, "SPCB Critical Power Correlation," AREVA NP, September 2009.

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

15. 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.

16. EMF-CC-074(P)(A), Volume 4, Revision 0, "BWR Stability Analysis - Assessment of STAIF with Input from MICROBURN-B2," Siemens Power Corporation, August 2000.

17. NEDO-32465-A, "BWROG Reactor Core Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," August 1996.

18. 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," Advanced Nuclear Fuels Corporation, August 1990.

19. ANF-1358(P)(A), Revision 3, "The Loss of Feedwater Heating Transient in Boiling Water Reactors," Framatome ANP, September 2005.

3.3 Instrumentation

3.3.6 TRM Isolation Actuation Instrumentation

TRO 3.3.6 The TRM containment isolation instrumentation for each Function in Table 3.3.6-1 shall be OPERABLE.

APPLICABILITY: As specified in Table 3.3.6-1

ACTIONS

---------- NOTES ----------

1. Penetration flow paths isolated to comply with Action C may be unisolated intermittently under administrative controls.
2. Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required channels inoperable	A.1 Place channel in trip.	12 hours for Function 2.a AND 24 hours for Functions other than Function 2.a
B. One or more Functions with isolation capability not maintained.	B.1 Restore isolation capability.	1 hour
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Initiate appropriate compensatory measures for the degraded condition.	24 hours

TECHNICAL REQUIREMENT SURVEILLANCE

---------- NOTES ----------

1. Refer to Table 3.3.6-1 to determine which TRSs apply for each TRM Isolation Actuation Instrumentation Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated function maintains isolation capability.

SURVEILLANCE	FREQUENCY
TRS 3.3.6.1 Perform CHANNEL CHECK	12 hours
TRS 3.3.6.2 Perform CHANNEL FUNCTIONAL TEST	92 days
TRS 3.3.6.3 Perform CHANNEL CALIBRATION	92 days
TRS 3.3.6.4 Perform CHANNEL CALIBRATION	24 months
TRS 3.3.6.5 Perform LOGIC SYSTEM FUNCTIONAL TEST	24 months
TRS 3.3.6.6 Perform RESPONSE TIME TEST	24 months on a staggered test basis

TABLE 3.3.6-1 (Page 1 of 2)
PRIMARY CONTAINMENT ISOLATION INSTRUMENTATION

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Main Steam Line Isolation				
a. Turbine Building Main Steam Line Tunnel Temperature - High	1,2,3	2	TRS 3.3.6.2 TRS 3.3.6.3 TRS 3.3.6.5	≤ 200°F
2. Primary Containment Isolation				
a. Main Steam Line Radiation - High, High	1,2,3	2	TRS 3.3.6.1 TRS 3.3.6.2 TRS 3.3.6.4 TRS 3.3.6.5 TRS 3.3.6.6[(a)]	≤ 21 x full power background without hydrogen injection
3. Shutdown Cooling System Isolation (b)				
a. RHR Flow - High	3,4,5	1[(c)]	TRS 3.3.6.1 TRS 3.3.6.2 TRS 3.3.6.4 TRS 3.3.6.5	≤ 26,000 gpm

(a) Radiation detectors are exempt from response time testing.

(b) Not required when the penetration is isolated from the reactor vessel via manual isolation valve, blind flange, or deactivated auto isolation valve.

(c) Only one trip system required in MODES 4 and 5 when RHR Shutdown Cooling System integrity maintained. System integrity is maintained provided the piping is intact and no maintenance is being performed that has the potential for draining the reactor vessel through the system.

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3.6 Containment

3.6.2 Suppression Chamber-to-Drywell Vacuum Breaker Position Indication

TRO 3.6.2 The Suppression Chamber-to-Drywell Vacuum Breaker Position Indication shall be OPERABLE

APPLICABILITY: MODES 1, 2, and 3

ACTIONS

---------- NOTE ----------
Separate condition entry is allowed for each instrument.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more position indicators of any suppression chamber - drywell vacuum breaker inoperable	A.1.1 Verify that the associated suppression chamber - drywell vacuum breaker is closed. OR A.1.2 Enter CONDITION B of LCO 3.6.1.6 AND	2 hours AND Once per 12 hours thereafter Immediately (continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.2 Restore the suppression chamber – drywell vacuum breaker indication to OPERABLE status.	72 hours OR At the next outage with containment entry, not to exceed the next refueling outage for in-accessible containment components. AND Initiate a CR for tracking and trending.

TECHNICAL REQUIREMENT SURVEILLANCE

SURVEILLANCE		FREQUENCY
TRS 3.6.2.1	Observe expected actuation of both valve position indicators during the Technical Specification Functional cycling.	As required by SR 3.6.1.6.2
TRS 3.6.2.2	Perform a CHANNEL CALIBRATION on each vacuum breaker position indicator.	24 months

B 3.1.1 Anticipated Transient Without Scram Alternate Rod Injection (ATWS-ARI) Instrumentation

BASES

TRO

The ATWS-ARI System actuates a scram initiation signal to the Control Rod Drive Hydraulic System (CRDHS) either automatically (on failure to scram as indicated by high reactor pressure or low reactor water Level 2), or manually (by operator action). This function adds negative reactivity, following events in which a scram does not (but should) occur. The ATWS-ARI System is diverse from and redundant to the Reactor Protection System.
(References 1 and 2)

The ATWS-ARI System includes sensors and relays to cause initiation of a reactor scram. When the setpoint is reached, the channels actuate the ATWS-ARI solenoid pilot valves, which vent the scram air header. For the purpose of this requirement, the term OPERABLE shall mean that the system or system component is capable of performing its function as required to provide compliance with 10 CFR 50.62.

The ATWS-ARI consists of two independent trip systems, with two channels of Reactor Steam Dome Pressure High and two channels of Reactor Vessel Water Level Low, Level 2 in each trip system, and manual initiation capability. Each ATWS-ARI trip system is a two-out-of-two logic for each function. Each system must actuate to effect a reactor scram. The ARI trip system shall be considered to be inoperable with the manual trip channel inoperable. The ARI trip system shall also be considered to be inoperable if any other component that is necessary to energize, and maintain energized, the ARI trip system for the period of time necessary to complete a scram via the ARI trip system (nominally 25 sec.) is not OPERABLE.

(continued)

B 3.1.1 Anticipated Transient Without Scram Alternate Rod Injection (ATWS-ARI) Instrumentation

BASES (continued)

ACTIONS

The Actions are defined to ensure proper corrective measures are taken in response to the inoperable components. ARI trip system diversity from the reactor protection system is required by the ATWS Rule. The Rule also requires functional redundancy with the Reactor Protection System in order to maximize the advantage of this diversity. Should the ARI trip system be inoperable, the corrective action period is based on this loss of diversity, not on the loss of the function. The redundant and diverse RPS trip system is Tech Spec controlled such that continued operation in the required operating condition is not allowed with loss of the RPS trip functions comparable to the ARI trip functions.

Since the ARI trip system is required only for mitigation of a specific class of ATWS events, and since the purpose of the ARI trip system is to provide diversity where redundancy otherwise exists, then an extended period for corrective action is justified for loss of the ARI trip function.

Unit operation without an OPERABLE ARI trip function is acceptable for a longer period of time than is allowed for the ATWS-RPT system by LCO 3.3.4.2. 14 days is considered to be an adequate period of system repair or component replacement.

TRS

The TRSs are defined to be performed at the specified Frequency to ensure that the ATWS-ARI Function is maintained OPERABLE.

ATWS - ARI surveillances are performed consistent with the bases for surveillances for LCO 3.3.4.2 "ATWS-RPT Instrumentation."

The Technical Requirement Surveillances (TRS) are modified by two Notes.

Note 1 states that the TRSs for each ATWS-ARI instrumentation Function are located in the SR column of Table 3.1.1-1.

(continued)

B 3.1.1 Anticipated Transient Without Scram Alternate Rod Injection (ATWS-ARI) Instrumentation

BASES

TRS (continued) Note 2 modifies the Surveillances to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided RPS is OPERABLE. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken.

REFERENCES

1. 10 CFR 50.62 ATWS Rule
2. NEDO-31096-A Response to the ATWS Rule
3. NRC Inspection and Enforcement Manual, Part 9900: Technical Guidance, Standard Technical Specification Section 1.0 Definitions, Issue dated 12/8/86.

B 3.7.3.4 Halon Systems

BASES

TRO

The OPERABILITY of the fire suppression Halon systems is one part of ensuring that adequate fire suppression capability is available to confine and extinguish fires occurring in any portion of the facility where safety related equipment is located. The fire suppression system consists of the water supply system, spray and sprinkler systems, CO_2 systems, Halon systems, fire hose stations, and fire hydrants. The collective capability of the fire suppression systems is adequate to minimize potential damage to safety related equipment and is a major element in the facility fire protection program.

An OPERABLE Halon system will have storage tanks with at least 95% of full charge weight and 90% of full charge pressure.

An OPERABLE Halon system will have storage tanks with at least covered with a blank to keep the Halon System OPERABLE. Removal of any PGCC Floor panel or opening of any PGCC panel door causes the affected PGCC module Halon system to become inoperable if the floor panel or panel door must be left open and unattended or cannot be immediately closed.

The basis for those systems included within the scope of this TRO includes both Safety Related and Safe Shutdown system protection. The Halon systems are described in FPRR.

ACTIONS

The Actions are defined to ensure proper corrective measures and compensatory actions are taken in response to the inoperable systems or components.

Hourly Firewatch Patrols shall be completed once each clock hour. Individual zones on the hourly firewatch patrol shall be toured at intervals (i.e. - zone A and back to zone A) of sixty minutes with a margin of fifteen minutes.

A Continuous Firewatch must remain in the specified area at all times and must patrol the required fire zones in the specified area at least once per fifteen minutes with a margin of five minutes. Areas exist within the plant

(continued)

B 3.7.3.4 Halon Systems

BASES (continued)

ACTIONS (continued)

where the posting of a firewatch does not provide acceptable radiological ALARA practices. For these inaccessible areas, alternate measures should be taken to assure an adequate level of fire protection is maintained. The specified area can be as small as one fire zone or as large as a firewatch can reasonably patrol within the fifteen minute time period. The specified area is limited to two floors of the Control Structure or Reactor Buildings. The floors must be adjacent or served by an operable elevator.

TRS

The TRSs provide assurances that the minimum OPERABILITY requirements of the fire suppression Halon systems are met. An allowance is made for ensuring a sufficient volume of Halon in the Halon storage tanks by verifying the weight and pressure of the tanks. Tank level measurement may be used to confirm full charge weight when supported by engineering analysis.

The Surveillances are modified by a Note to indicate that when a system is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 1 hour. Upon completion of the test, or expiration of the 1 hour allowance, the system must be restored to an operable condition, or the applicable Condition entered and 1 hour Required Action(s) completed. The 1 hour allowance is a reasonable out of service time based on prior plant test performance. This allowance also does not result in an increased risk of a fire. Required Surveillances include those surveillances under other subsections of TRM 3.7.3.

TRS 3.7.3.4.3

The purpose of the flow test is to verify that there are no obstructions/blockages in the Halon system headers or nozzles. The use of air or nitrogen is acceptable for use in the performance of the flow test.

REFERENCES

1. FPRR Section 4.9