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Susquehanna SES
Unit 2 Cycle 8

CORE OPERATING LIMITS REPORT

Nuclear Fuels
Engineering

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PP&L

Pennsylvania Power & Light Company

SUSQUEHANNA SES UNIT 2 CYCLE 8

CORE OPERATING LIMITS REPORT

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PORC Meeting No. — Date

Pennsylvania Power & Light Company

SUSQUEHANNA STEAM ELECTRIC STATION
Unit 2 Cycle 8
CORE OPERATING LIMITS REPORT

1.0 INTRODUCTION

This CORE OPERATING LIMITS REPORT for Susquehanna Unit 2 Cycle 8 is prepared in accordance with the requirements of Susquehanna Unit 2, Technical Specification 6.9.3. As required by Technical Specifications 6.9.3.2 and 6.9.3.3, the core operating limits presented herein were developed using NRC-approved methods and are established such that all applicable limits of the plant safety analysis are met. Results from the reload analysis for Unit 2 Cycle 8 are documented in Reference 1.

The following cycle specific core operating limits are included in this report:

a. Average Planar Linear Heat Generation Rate (APLHGR)
(Technical Specification 3.2.1)

b. Linear Heat Generation Rate for Average Power Range Monitor (APRM) Setpoints
(Technical Specification 3.2.2)

c. Minimum Critical Power Ratio (MCPR)
(Technical Specification 3.2.3)

d. Linear Heat Generation Rate (LHGR)
(Technical Specification 3.2.4)

e. Recirculation Loops - Single Loop Operation
(Technical Specification 3.4.1.1.2)

2.0 AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)

2.1 Technical Specification Reference

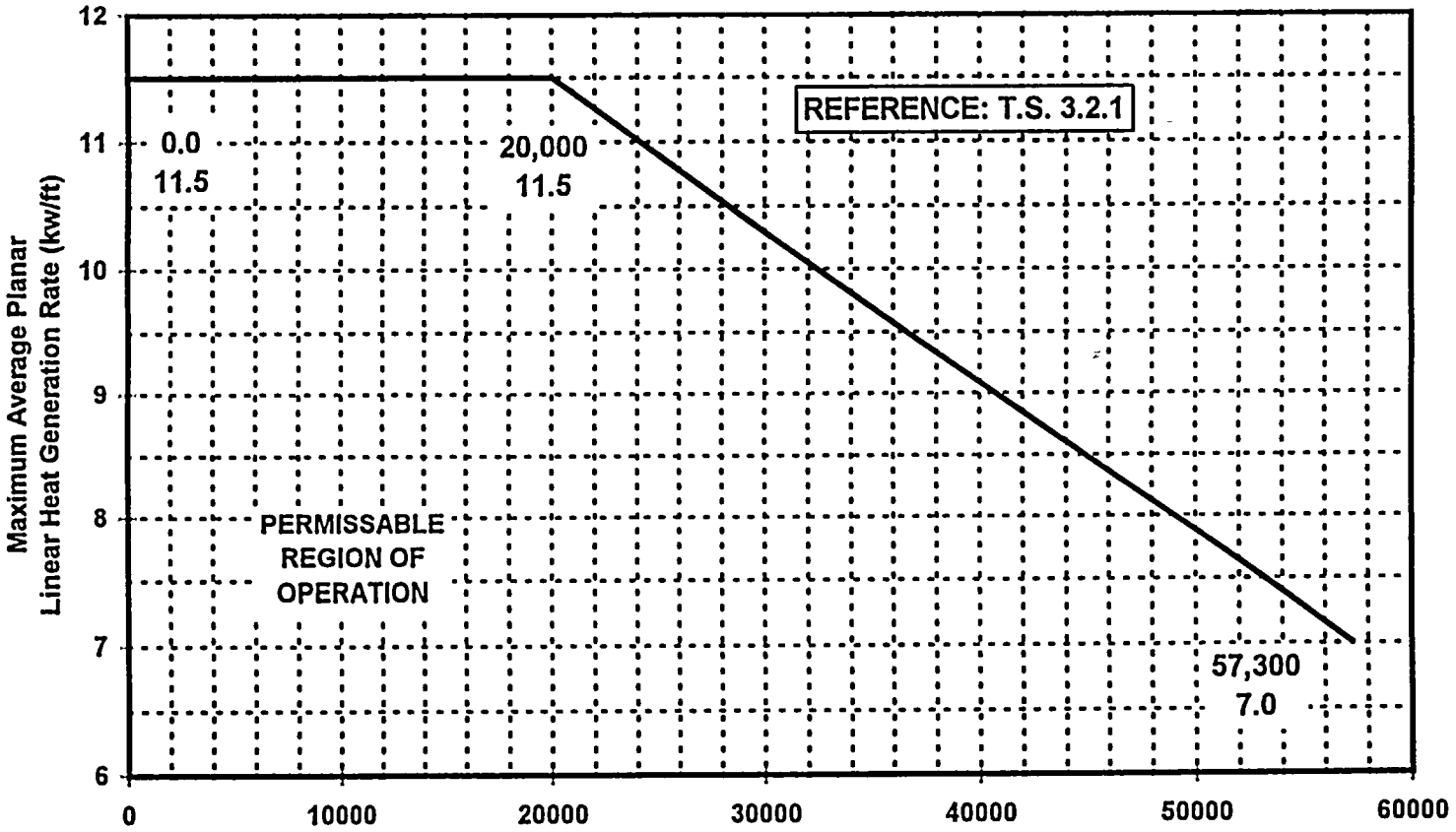
Technical Specification 3.2.1

2.2 Description

The APLHGRs for SPC 9x9-2 fuel shall not exceed the limit shown in Figure 2.2-1.

The APLHGRs for GE12 fuel shall not exceed the limit shown in Figure 2.2-2.

SSES UNIT 2 CYCLE 8



MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
SPC 9X9-2 FUEL
FIGURE 2.2-1

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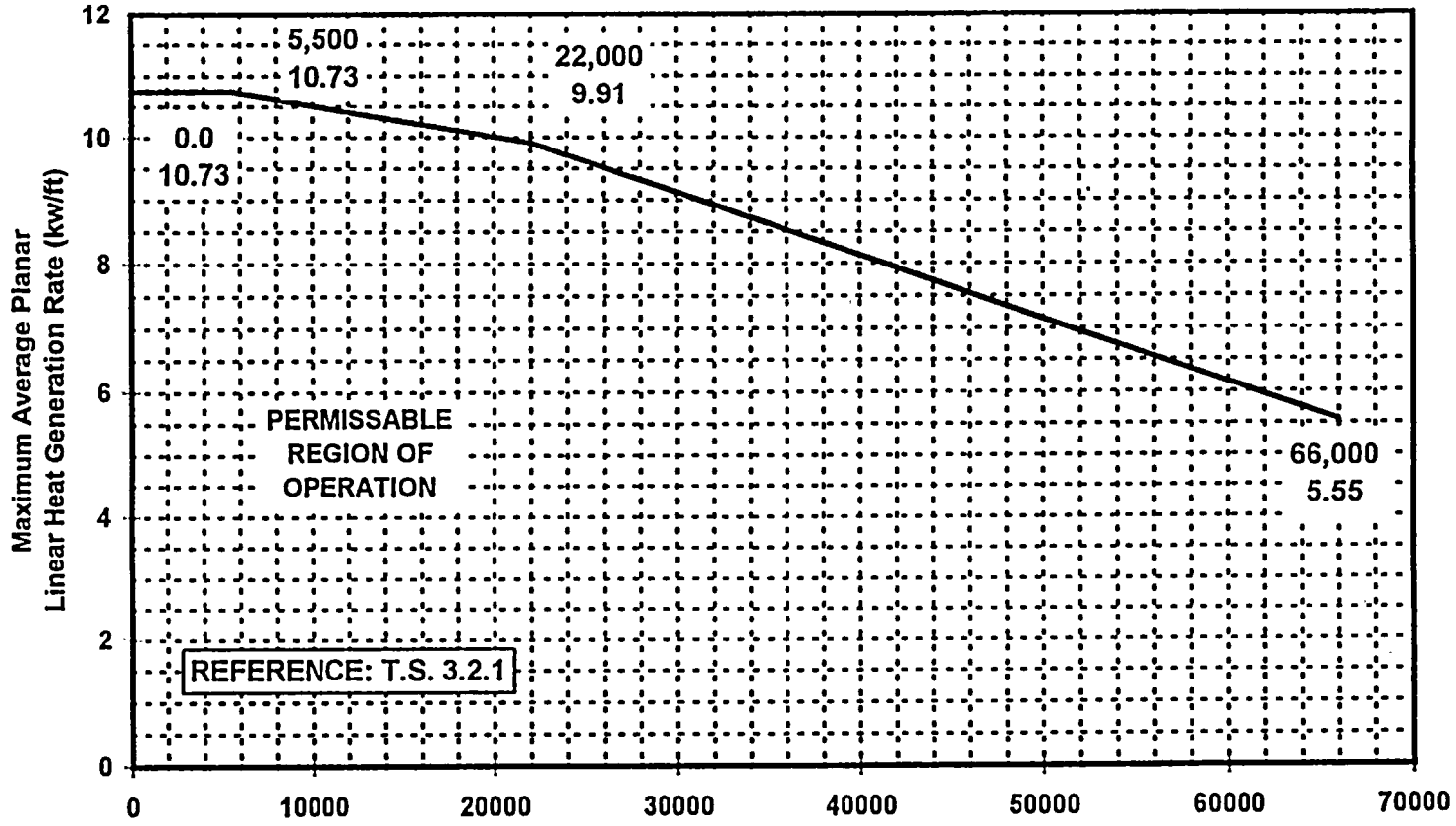
SSES UNIT 2 CYCLE 8



MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
GE12
FIGURE 2.2-2

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3.0 LINEAR HEAT GENERATION RATE FOR APRM SETPOINTS

3.1 Technical Specification Reference

Technical Specification 3.2.2.

3.2 Description

The APRM flow biased simulated thermal power-upscale scram trip setpoint and flow biased neutron flux-upscale control rod block trip setpoint shall be established according to the relationships specified in Technical Specification 3.2.2. For those relationships, the maximum Fraction of Limiting Power Density (FLPD) for use in determination of "T", is the actual LHGR divided by the LHGR limit. The LHGR limit for SPC 9x9-2 fuel shall be taken from Figure 3.2-1. The LHGR limit for GE12 fuel shall be taken from Figure 3.2-2. The final value of "T" shall be the lesser of the "T" values calculated for each fuel type.

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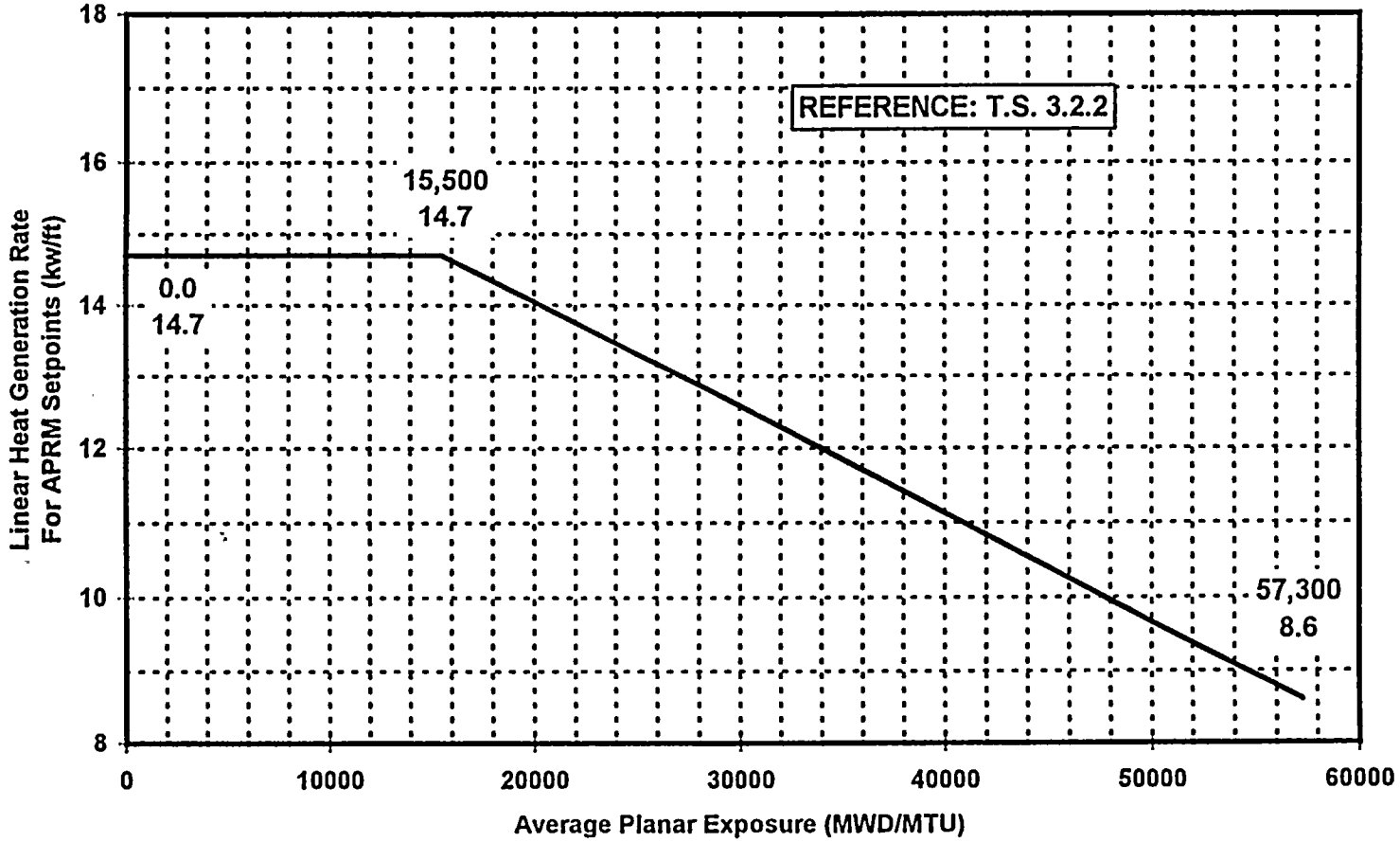

LINEAR HEAT GENERATION RATE FOR APRM SETPOINTS
VERSUS AVERAGE PLANAR EXPOSURE
SPC 9X9-2 FUEL
FIGURE 3.2-1

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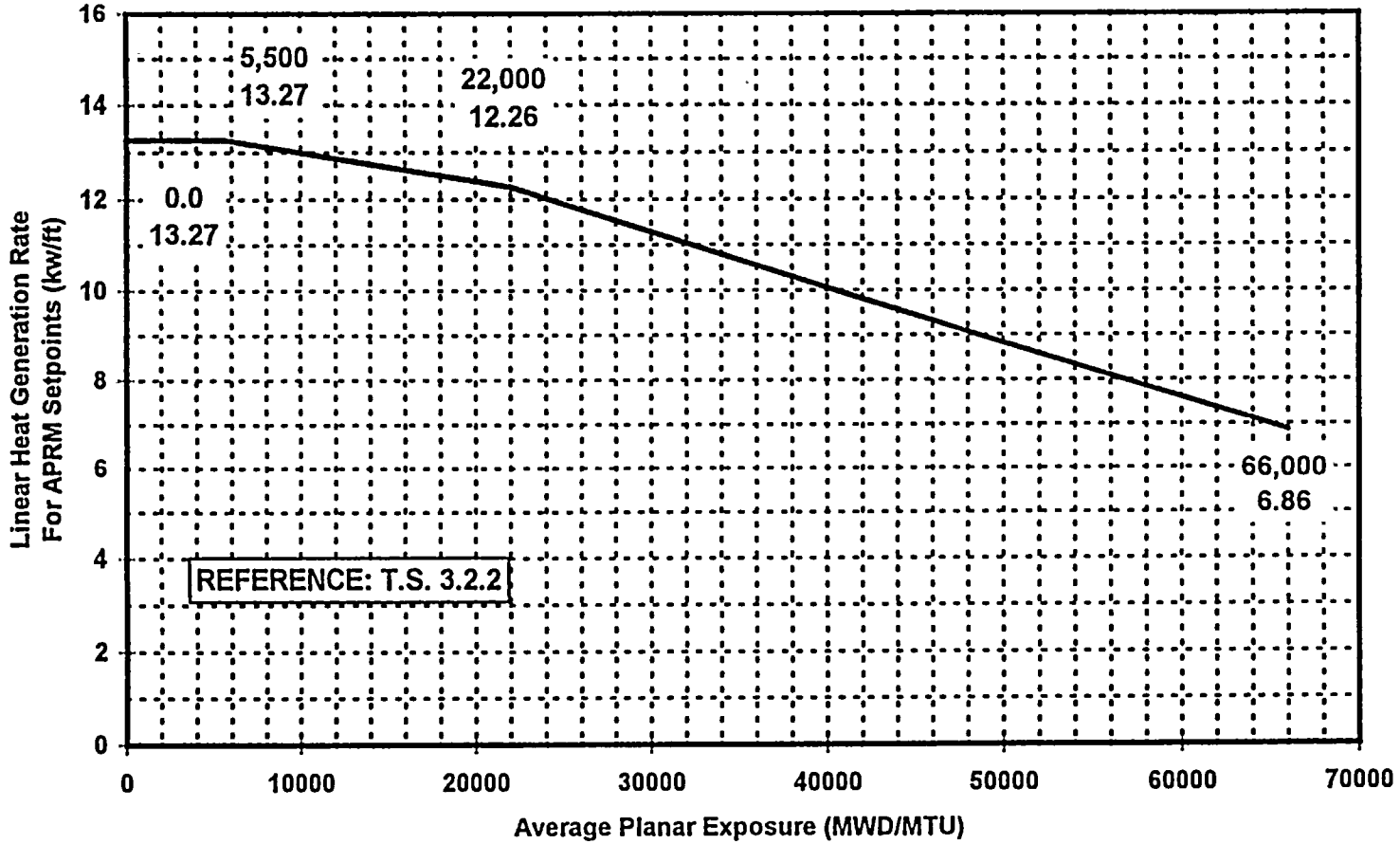
SSES UNIT 2 CYCLE 8



LINEAR HEAT GENERATION RATE FOR APRM SETPOINTS
VERSUS AVERAGE PLANAR EXPOSURE
GE12
FIGURE 3.2-2

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4.0 MINIMUM CRITICAL POWER RATIO (MCPR)

4.1 Technical Specification Reference

Technical Specification 3.2.3.

4.2 Description - SPC 9x9-2 Fuel

The MCPR limit is specified as a function of core power, core flow, average scram speed, plant equipment operability status, and the rod pattern requirements of Section 4.4. The MCPR limit for SPC 9x9-2 fuel shall be the greater of:

a) The Flow-Dependent MCPR value determined from Figure 4.2-1B, from Beginning of Cycle (BOC) to 9600 MWD/MTU cycle exposure or from Figure 4.2-1A from BOC to End of Cycle (EOC).

(Note that even though Figure 4.2-1A is more limiting than Figure 4.2-1B, for cycle exposures between BOC and 9600 MWD/MTU, Figure 4.2-1B may be used.)

b) The Power-Dependent MCPR value determined from one of the following figures, as appropriate:

Figure 4.2-2: EOC-RPT and Main Turbine Bypass Operable

Figure 4.2-3: Main Turbine Bypass Inoperable/EOC-RPT Operable

Figure 4.2-4: EOC-RPT Inoperable/Main Turbine Bypass Operable

using a linear interpolation between Curve A and Curve B of the appropriate figure, based on the results of each scram time surveillance test required by Technical Specification 4.1.3.3.

4.3 Description - GE12 Fuel

The MCPR limit is specified as a function of core power, core flow, average scram speed, plant equipment operability status, and the rod pattern requirements of Section 4.4. The MCPR limit for GE12 fuel shall be the greater of:

a) The Flow-Dependent MCPR value determined from Figure 4.3-1B, from Beginning of Cycle (BOC) to 9600 MWD/MTU cycle exposure or from Figure 4.3-1A from BOC to End of Cycle (EOC).

(Note that even though Figure 4.3-1A is more limiting than Figure 4.3-1B, for cycle exposures between BOC and 9600 MWD/MTU, Figure 4.3-1B may be used.)

b) The Power-Dependent MCPR value determined from one of the following figures, as appropriate:

Figure 4.3-2: EOC-RPT and Main Turbine Bypass Operable

Figure 4.3-3: Main Turbine Bypass Inoperable/EOC-RPT Operable

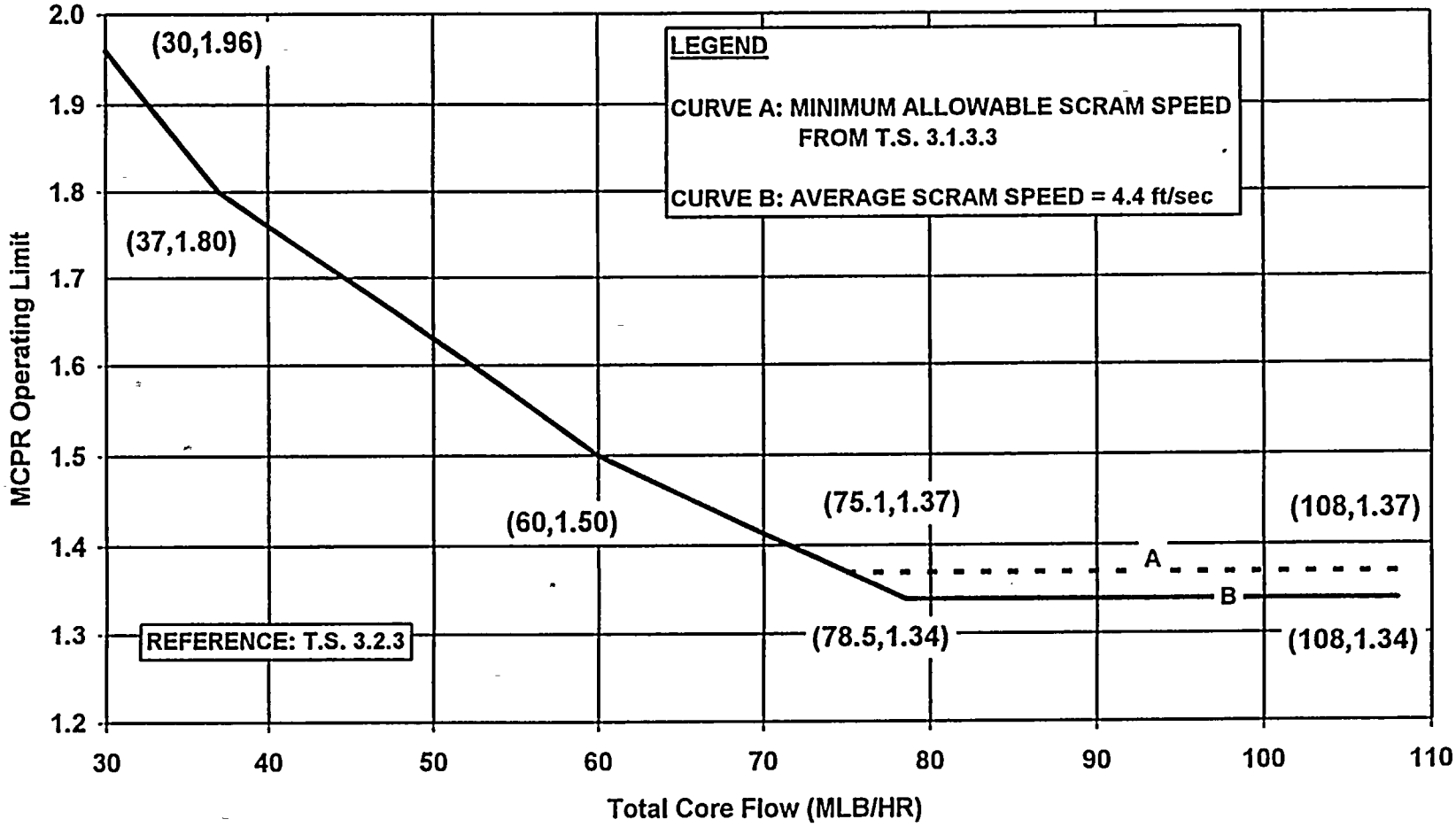
Figure 4.3-4: EOC-RPT Inoperable/Main Turbine Bypass Operable

using a linear interpolation between Curve A and Curve B of the appropriate figure, based on the results of each scram time surveillance test required by Technical Specification 4.1.3.3.

4.4 Control Rod Pattern Requirements

A stubbed control rod pattern with shallow control rods to be provided by Nuclear Fuels Engineering shall be maintained when cycle exposure is greater than or equal to 10070 MWD/MTU.

SSES UNIT 2 CYCLE 8



FLOW DEPENDENT MCPR OPERATING LIMIT
FOR SPC 9X9-2 FUEL
(BOC TO EOC)
FIGURE 4.2-1A

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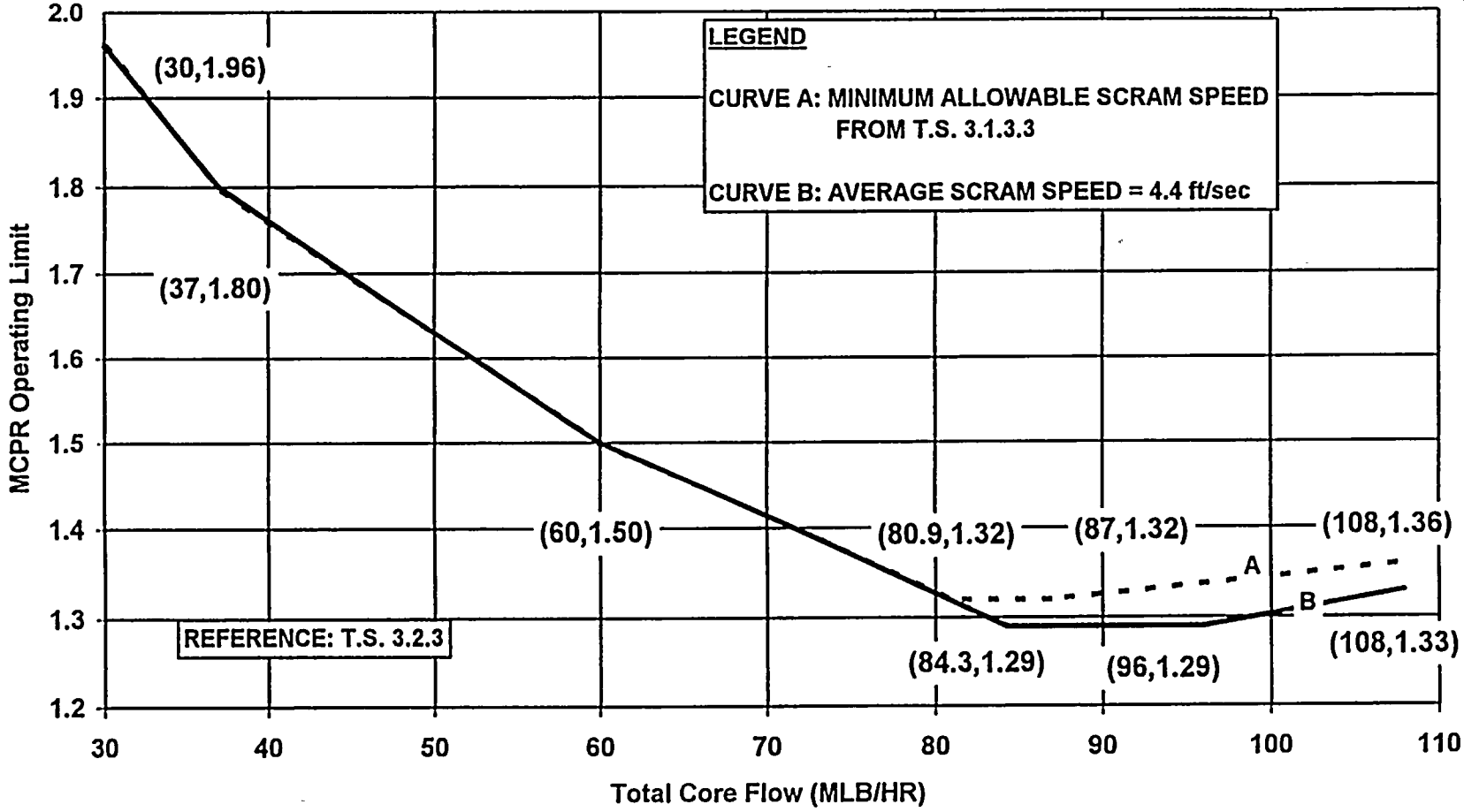
SSES UNIT 2 CYCLE 8



FLOW DEPENDENT MCPR OPERATING LIMIT
FOR SPC 9X9-2 FUEL
(BOC TO 9.60 GWD/MTU)
FIGURE 4.2-1B

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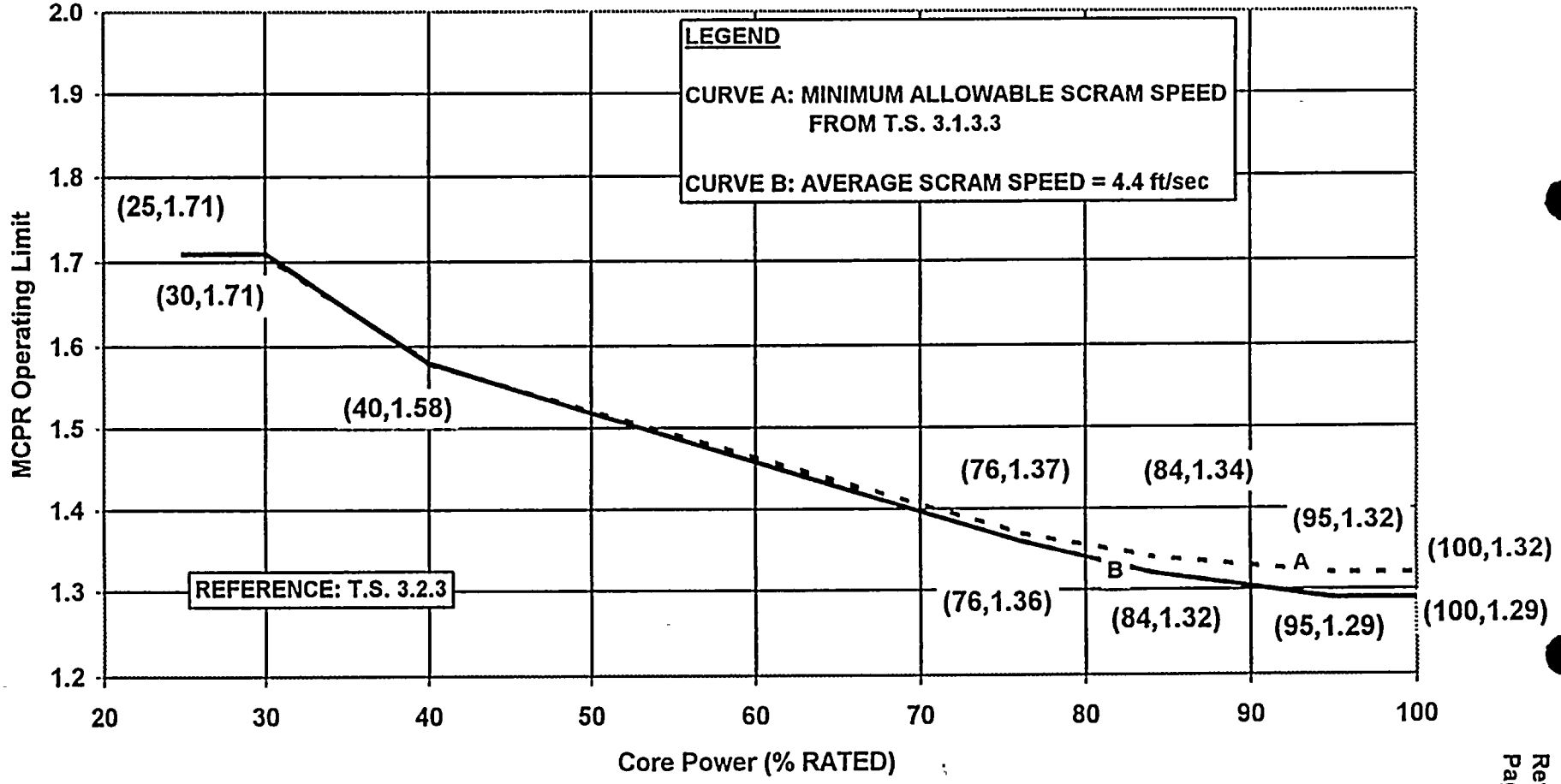
SSES UNIT 2 CYCLE 8



POWER DEPENDENT MCPR OPERATING LIMIT
FOR SPC 9X9-2 FUEL
EOC-RPT AND MAIN TURBINE BYPASS OPERABLE
FIGURE 4.2-2

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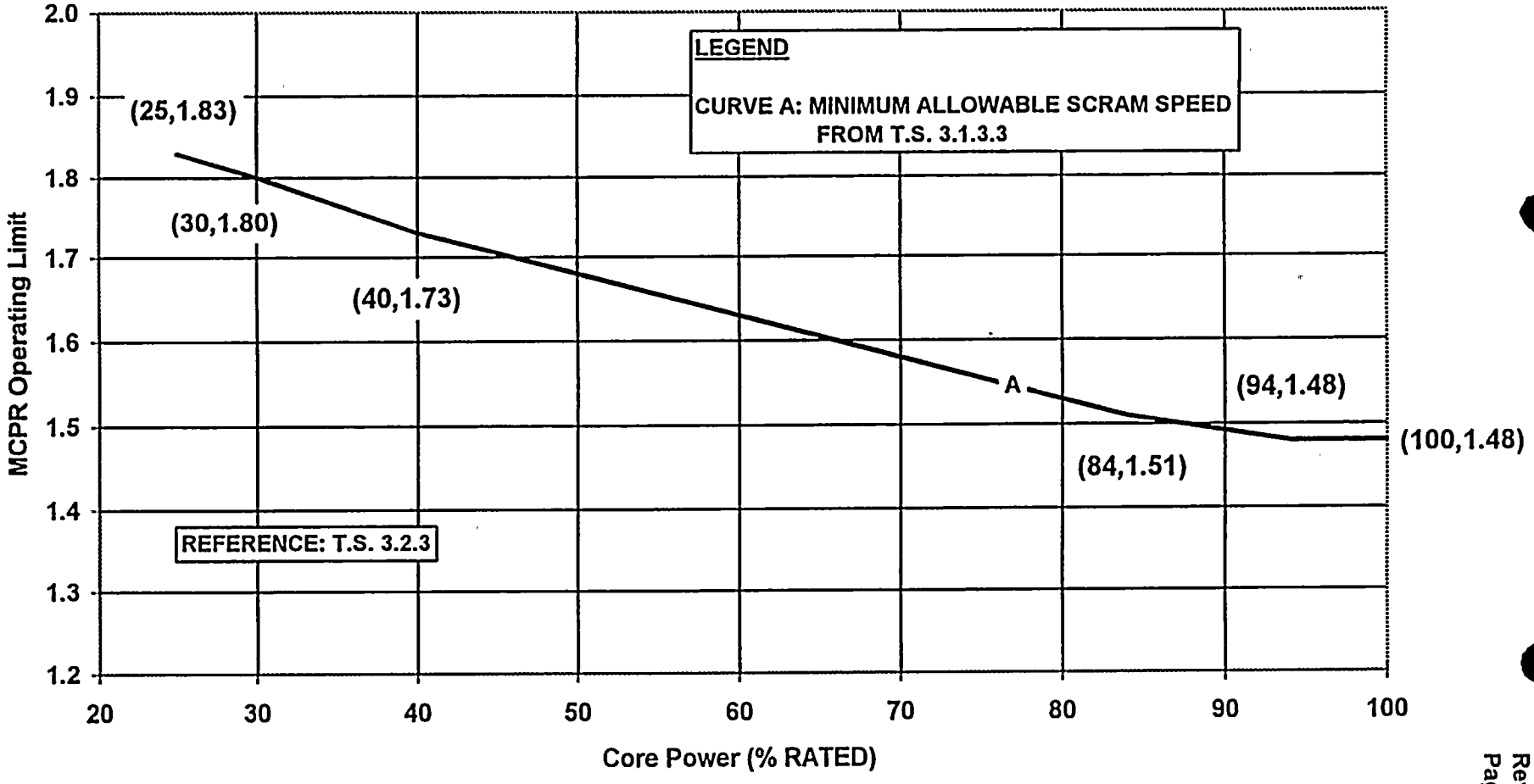
SSES UNIT 2 CYCLE 8



POWER DEPENDENT MCPR OPERATING LIMIT
FOR SPC 9X9-2 FUEL
MAIN TURBINE BYPASS INOPERABLE/EOC-RPT OPERABLE
FIGURE 4.2-3

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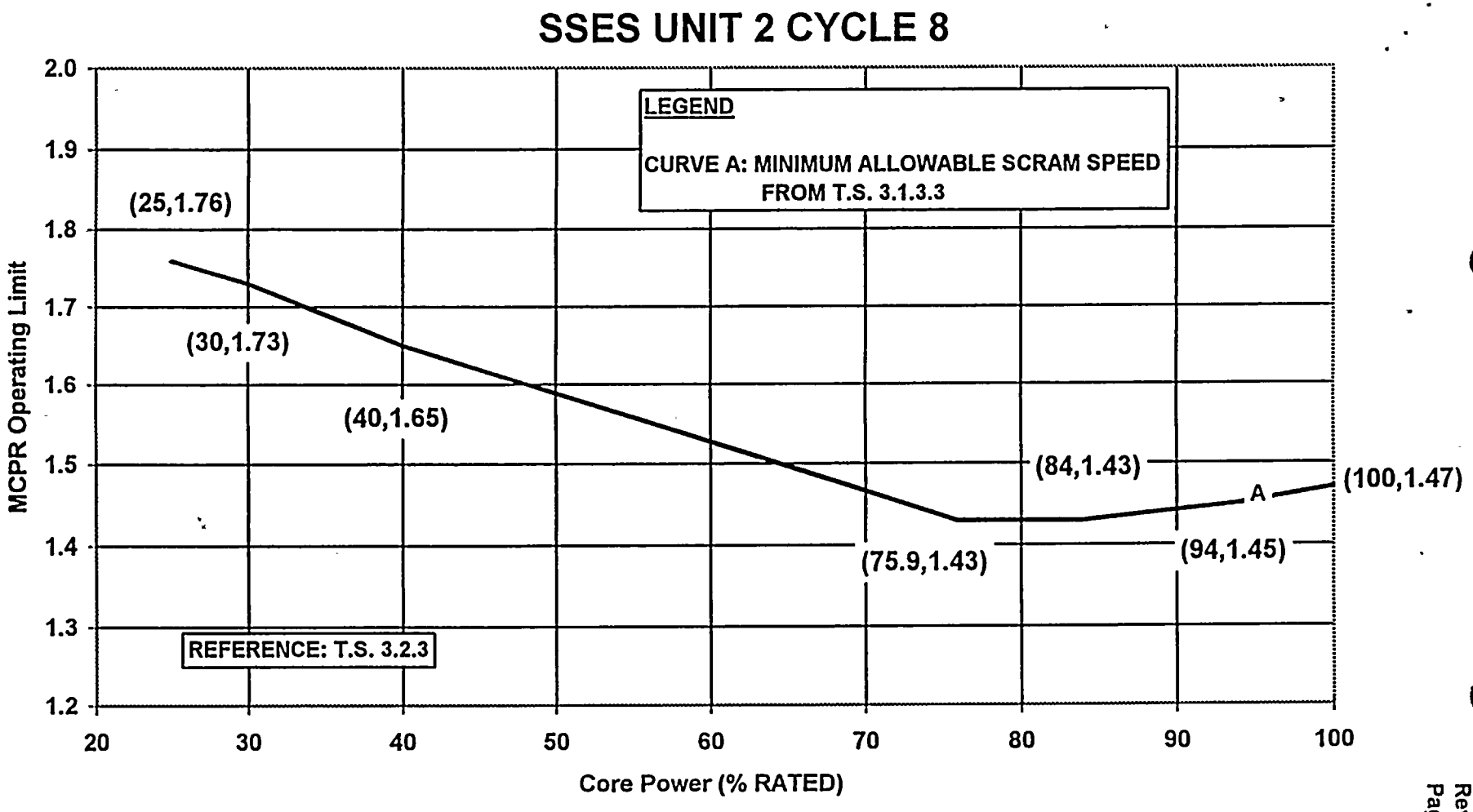

POWER DEPENDENT MCPR OPERATING LIMIT
FOR SPC 9X9-2 FUEL
EOC-RPT INOPERABLE/MAIN TURBINE BYPASS OPERABLE
FIGURE 4.2-4

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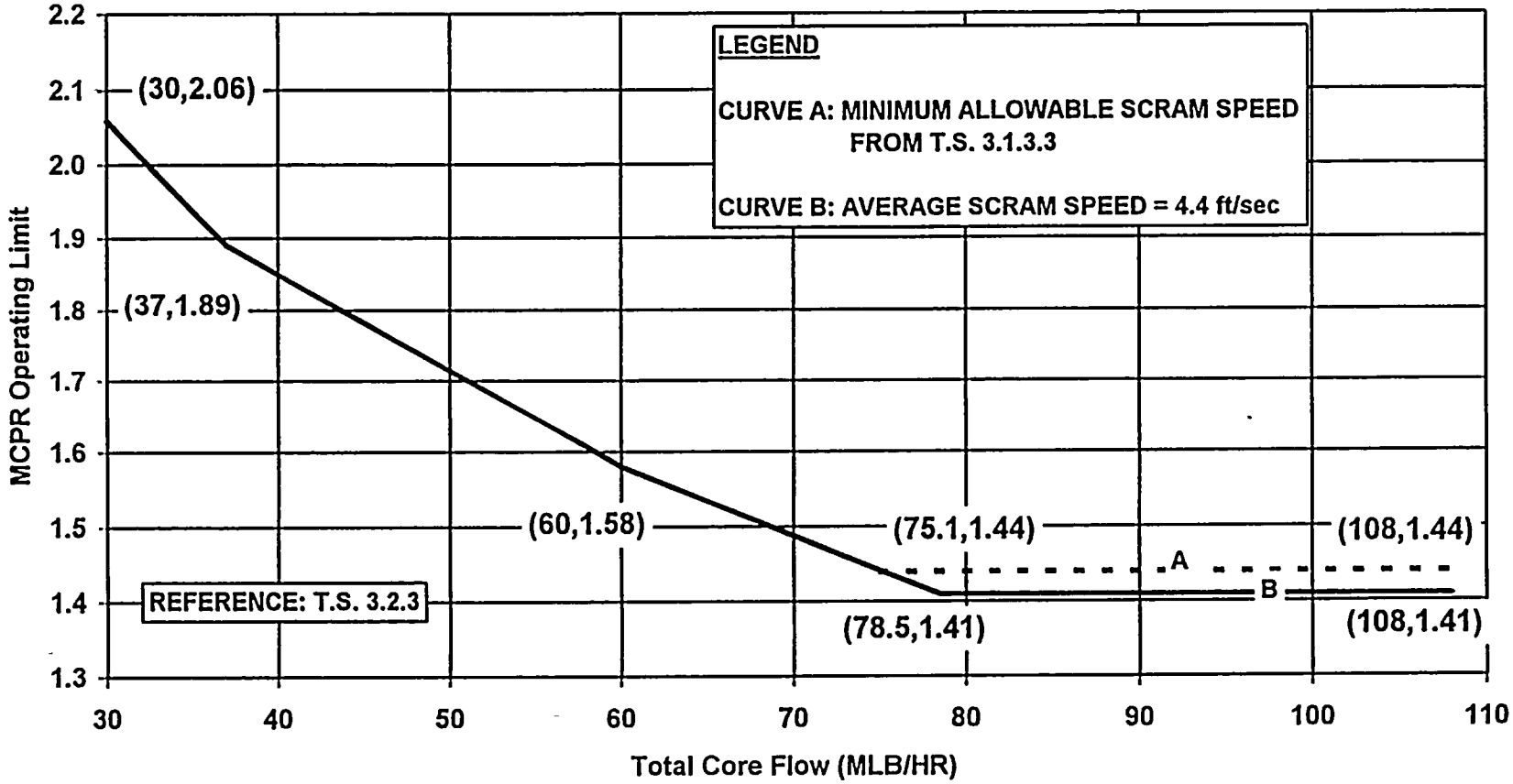
SSES UNIT 2 CYCLE 8



FLOW DEPENDENT MCPR OPERATING LIMIT
FOR GE12 LUA
(BOC TO EOC)
FIGURE 4.3-1A

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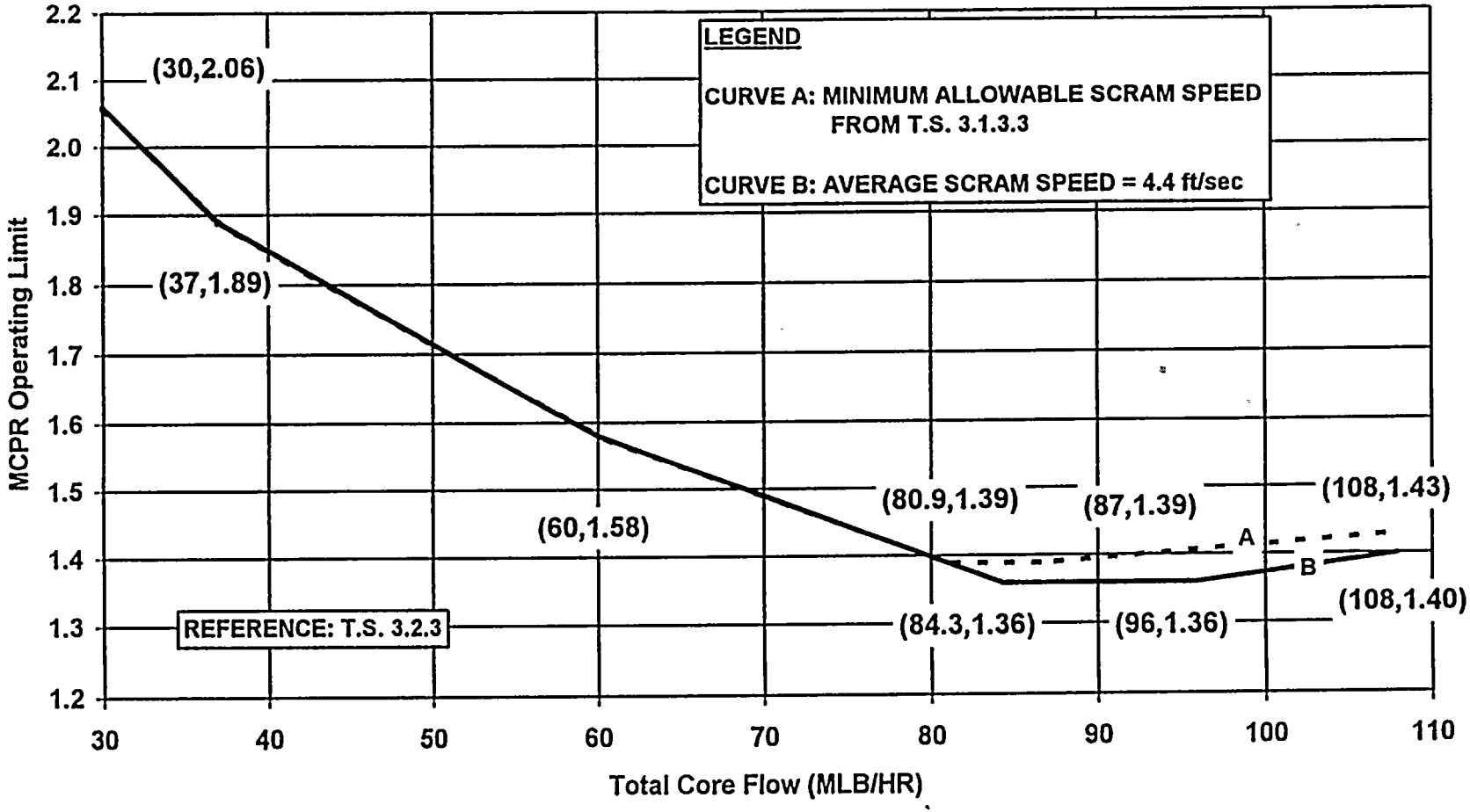
SSES UNIT 2 CYCLE 8



FLOW DEPENDENT MCPR OPERATING LIMIT
FOR GE12 LUA
(BOC TO 9.60 GWD/MTU)
FIGURE 4.3-1B

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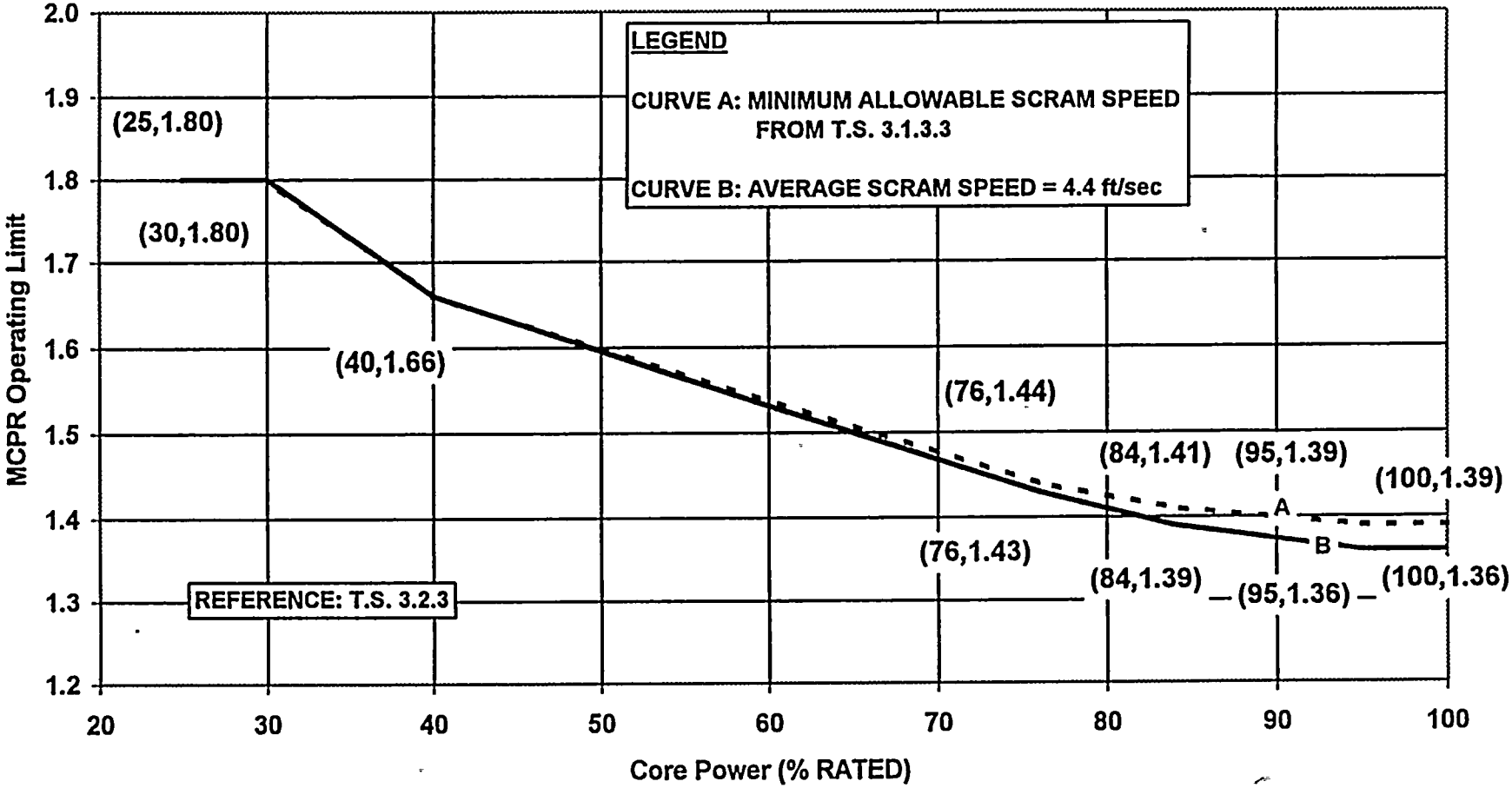
SSES UNIT 2 CYCLE 8



POWER DEPENDENT MCPR OPERATING LIMIT
FOR GE12 LUA
EOC-RPT AND MAIN TURBINE BYPASS OPERABLE
FIGURE 4.3-2

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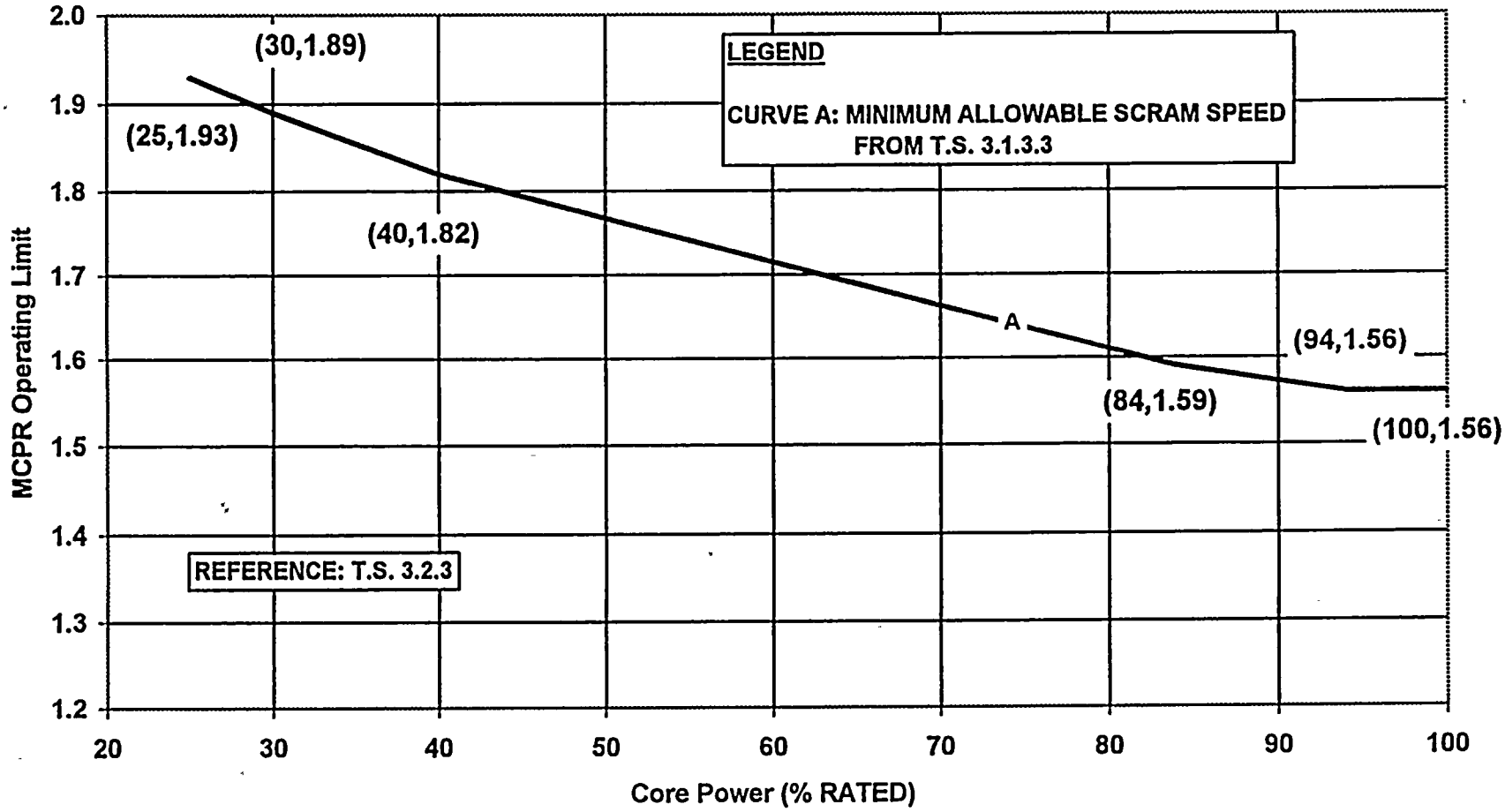
SSES UNIT 2 CYCLE 8



POWER DEPENDENT MCPR OPERATING LIMIT
FOR GE12 LUA
MAIN TURBINE BYPASS INOPERABLE/EOC-RPT OPERABLE
FIGURE 4.3-3

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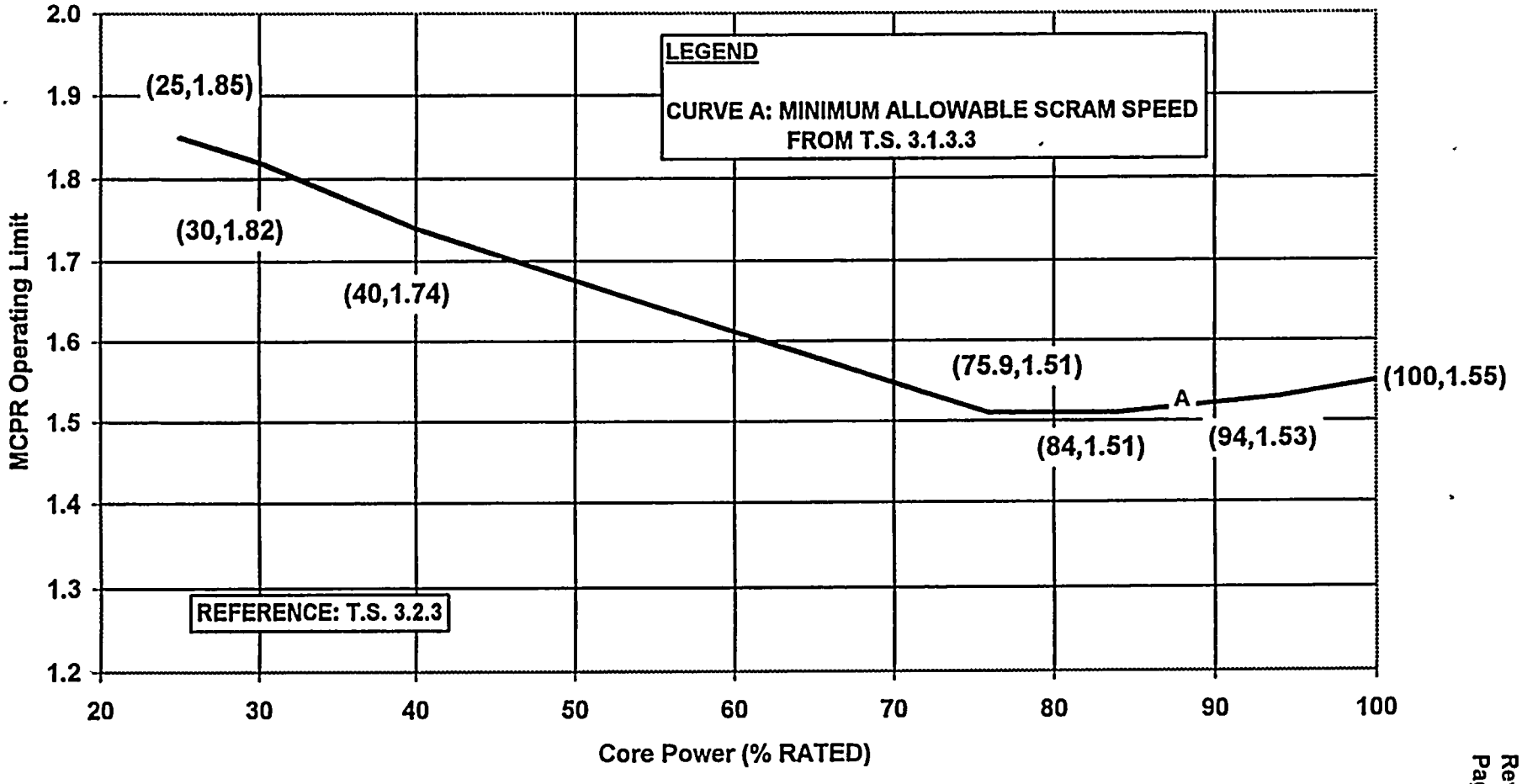
SSES UNIT 2 CYCLE 8



POWER DEPENDENT MCPR OPERATING LIMIT
FOR GE12 LUA
EOC-RPT INOPERABLE/MAIN TURBINE BYPASS OPERABLE
FIGURE 4.3-4

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5.0 LINEAR HEAT GENERATION RATE (LHGR)

5.1 Technical Specification Reference

Technical Specification 3.2.4

5.2 Description

The LHGR for SPC 9x9-2 fuel shall not exceed the LHGR limit determined from Figure 5.2-1.

The LHGR for GE12 fuel shall not exceed the LHGR limit determined from Figure 5.2-2.

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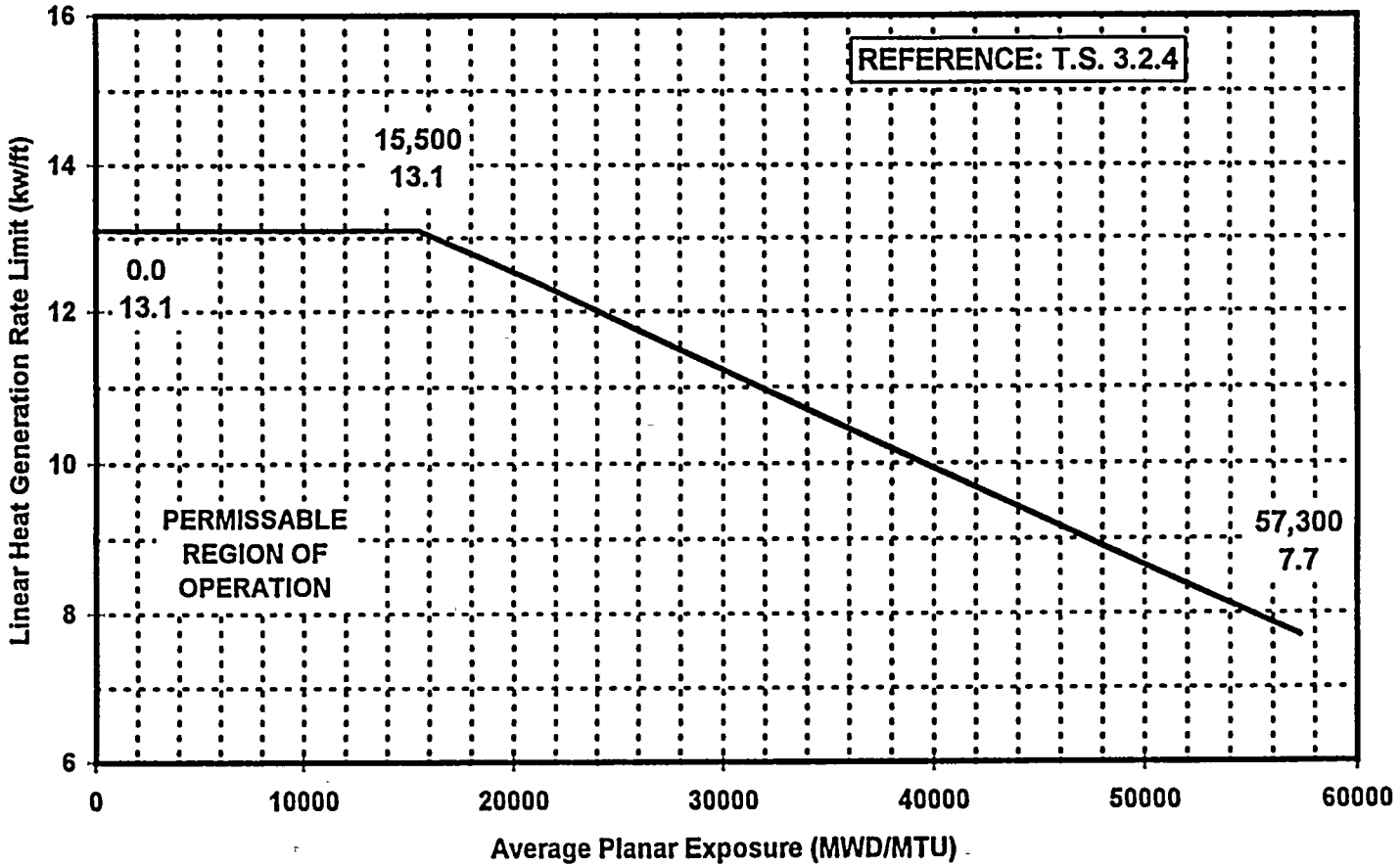

LINEAR HEAT GENERATION RATE (LHGR) LIMIT
VERSUS AVERAGE PLANAR EXPOSURE
SPC 9X9-2 FUEL
FIGURE 5.2-1

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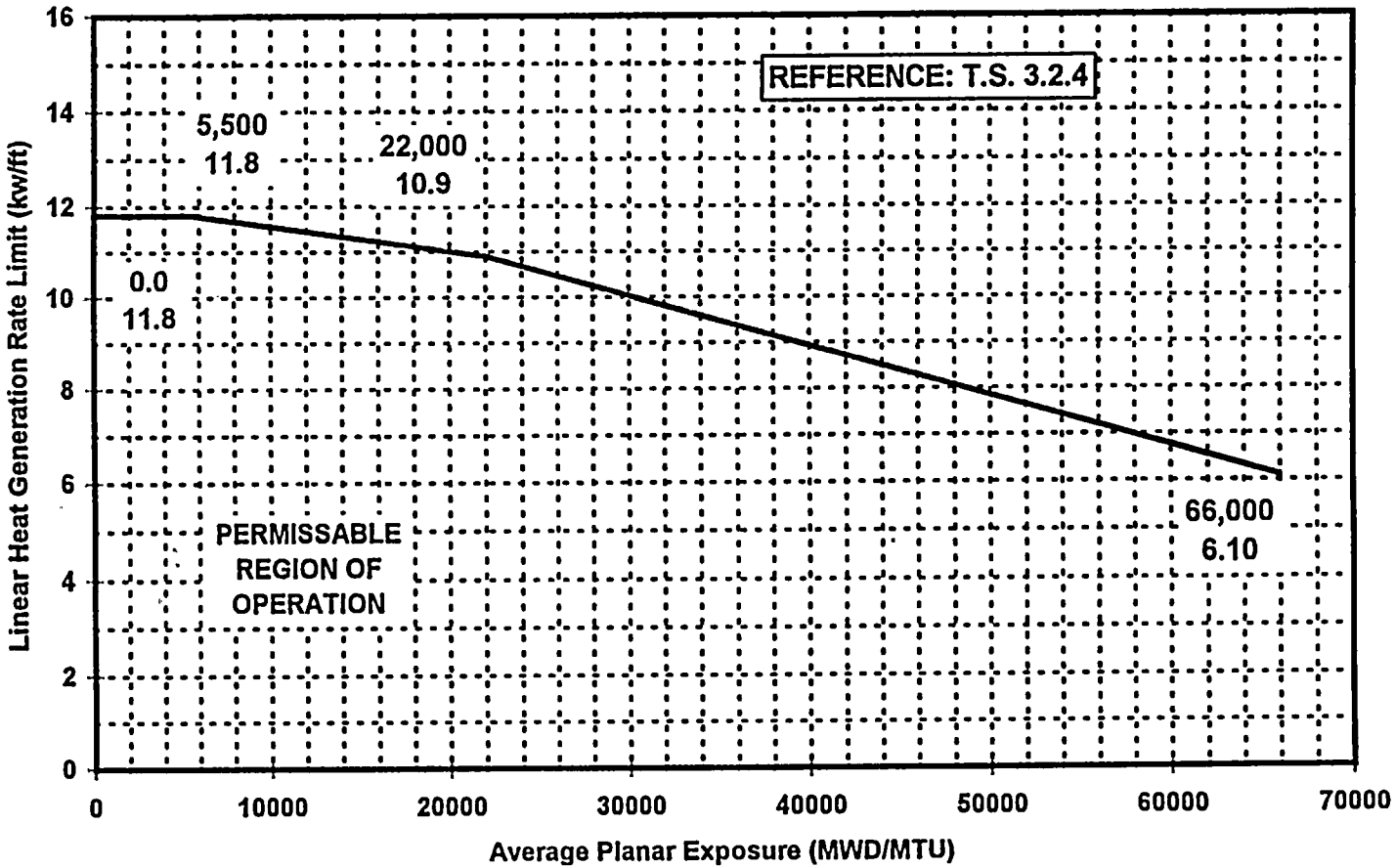
SSES UNIT 2 CYCLE 8



LINEAR HEAT GENERATION RATE (LHGR) LIMIT
VERSUS AVERAGE PLANAR EXPOSURE
GE12
FIGURE 5.2-2

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6.0 RECIRCULATION LOOPS - SINGLE LOOP OPERATION

6.1 Technical Specification Reference

Technical Specification 3.4.1.1.2

6.2 Description

Minimum Critical Power Ratio Limit

The MCPR limit shall be equal to the MCPR limit determined per Section 4.0 of this report, plus 0.01.

Linear Heat Generation Rate Limit

The LHGR limit shall be equal to the LHGR Limit determined per Section 5.0 of this report multiplied by 0.7.

7.0 REFERENCE

1. PL-NF-95-007, "Susquehanna SES Unit 2 Cycle 8 Reload Summary Report," August, 1995.

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