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Susquehanna SES Unit 1 Cycle 9

CORE OPERATING LIMITS REPORT

Nuclear Fuels
Engineering

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Pennsylvania Power & Light Company

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**SUSQUEHANNA SES UNIT 1 CYCLE 9
CORE OPERATING LIMITS REPORT**

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Pennsylvania Power & Light Company

**SUSQUEHANNA STEAM ELECTRIC STATION
Unit 1 Cycle 9
CORE OPERATING LIMITS REPORT**

1.0 INTRODUCTION

This CORE OPERATING LIMITS REPORT for Susquehanna Unit 1 Cycle 9 is prepared in accordance with the requirements of Susquehanna Unit 1, 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 1 Cycle 9 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)

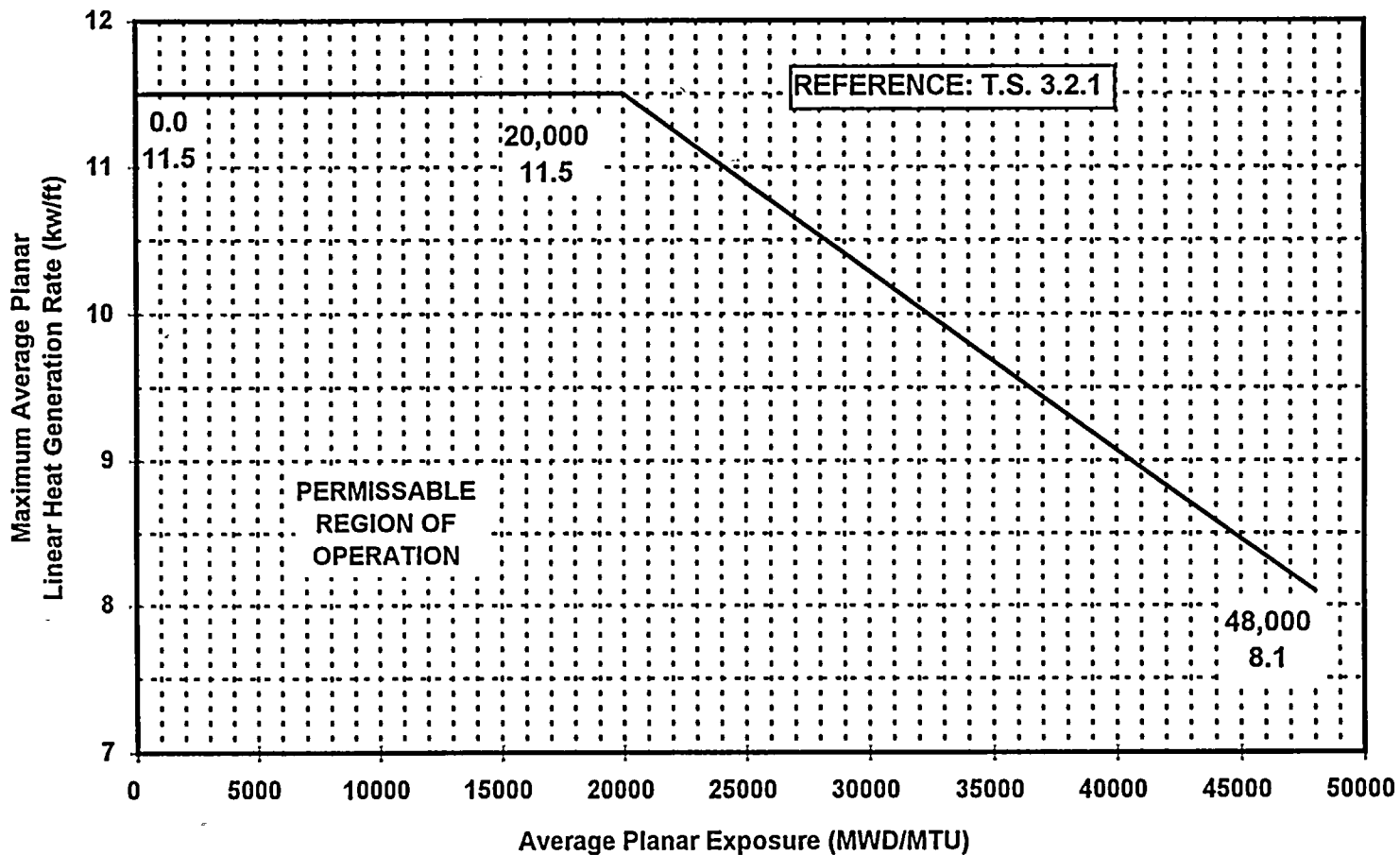
2.1 Technical Specification Reference

Technical Specification 3.2.1

2.2 Description

The APLHGRs for all fuel shall not exceed the limit shown in Figure 2.2-1.

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Average Planar Exposure (MWD/MTU)
MAXIMUM AVERAGE PLANAR LINEAR HEAT
GENERATION RATE (MAPLHGR) VERSUS
AVERAGE PLANAR EXPOSURE
SPC 9X9 FUEL
FIGURE 2.2-1

3.0 LINEAR HEAT GENERATION RATE FOR APRM SETPOINTS

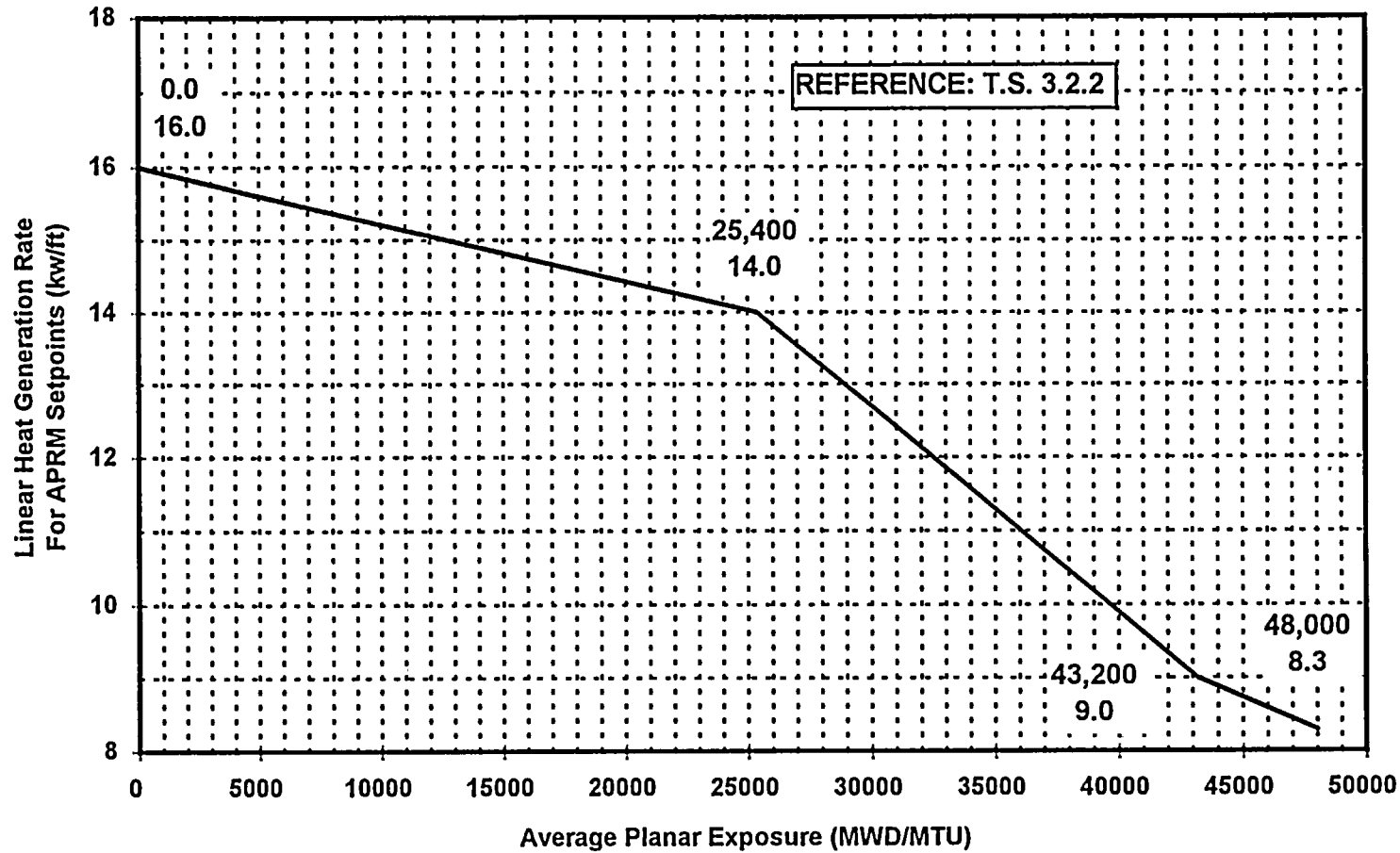
3.1 Technical Specification Reference

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 from Figure 3.2-1.

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

4.0 MINIMUM CRITICAL POWER RATIO (MCPR)

4.1 Technical Specification Reference

Technical Specification 3.2.3

4.2 Description

The MCPR limit is specified as a function of core power, core flow, average scram speed, and plant equipment operability status. The MCPR limit shall be the greater of:

- a) The Flow-Dependent MCPR value determined from Figure 4.2-1B, from Beginning of Cycle (BOC) to 9520 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 9520 MWD/MTU, Figure 4.2-1B may be used.)

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

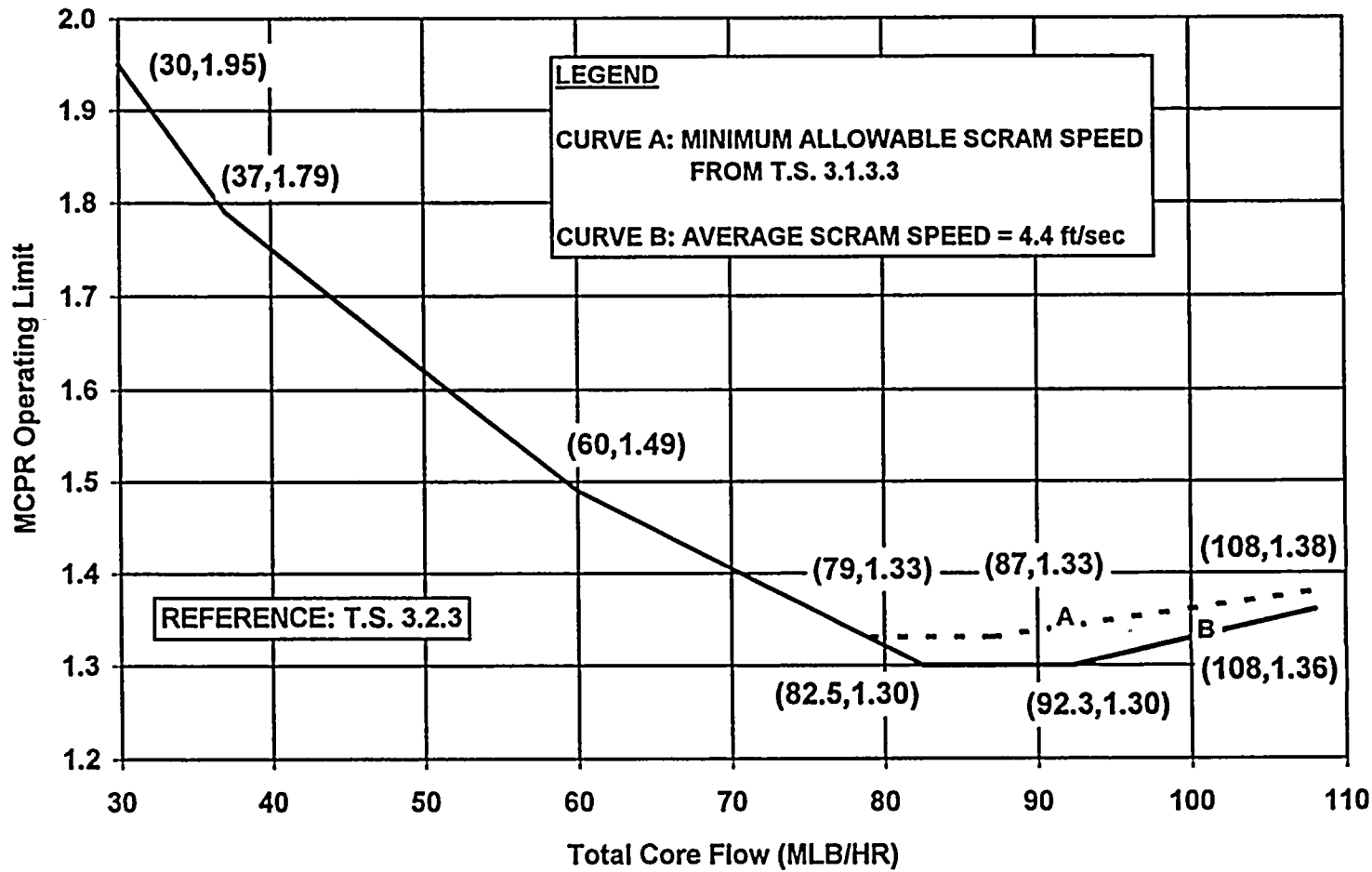
Figure 4.2-2: EOC-RPT and Main Turbine Bypass Operable

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

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

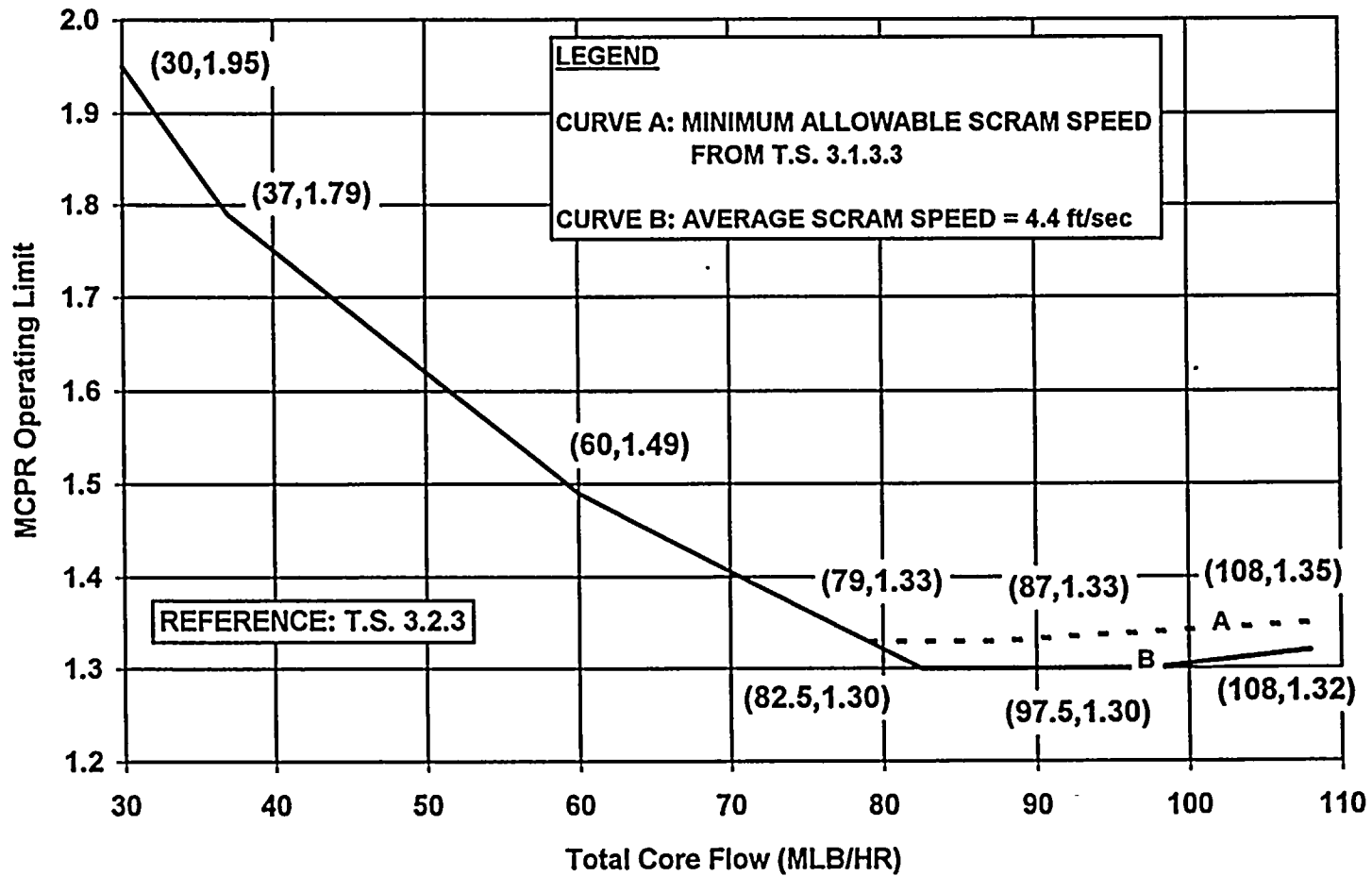
using a linear interpolation between Curve A and Curve B of the appropriate figure, based on the results of each scram time surveillance test required by Technical Specification 4.1.3.3.

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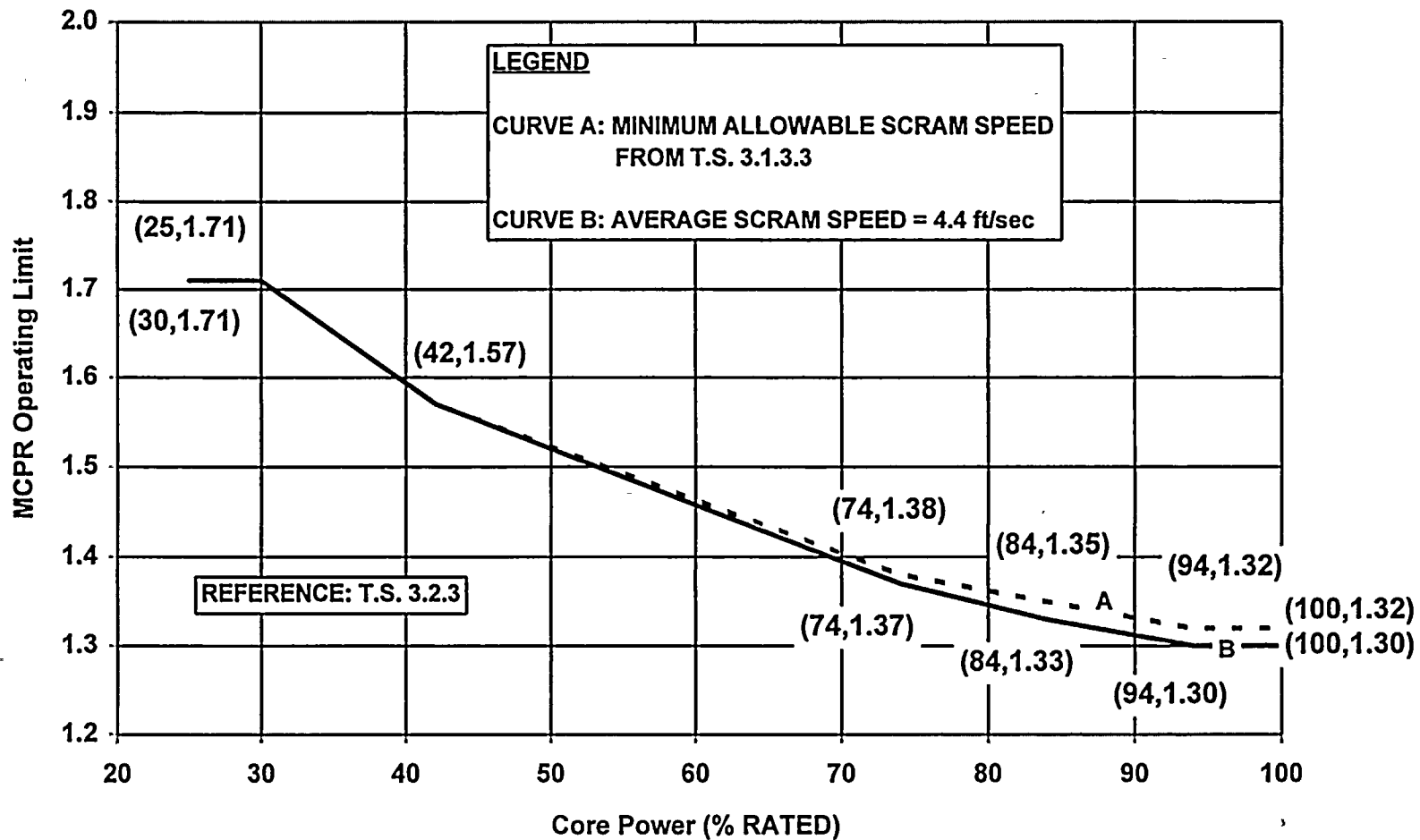
**FLOW DEPENDENT MCPR OPERATING LIMIT
 (BOC TO EOC)
 FIGURE 4.2-1A**

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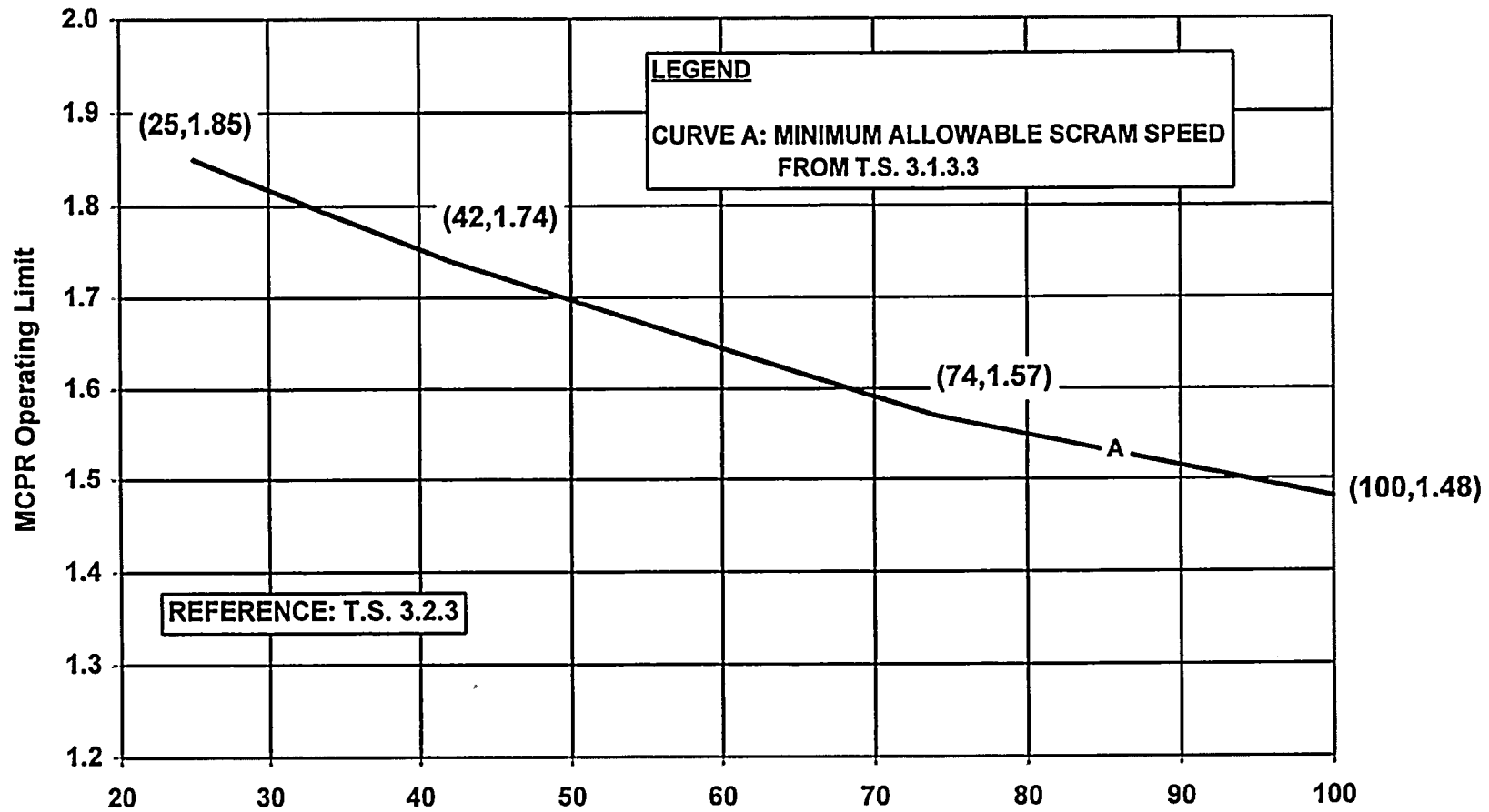
FLOW DEPENDENT MCPR OPERATING LIMIT
(BOC TO 9520 MWD/MTU)
FIGURE 4.2-1B

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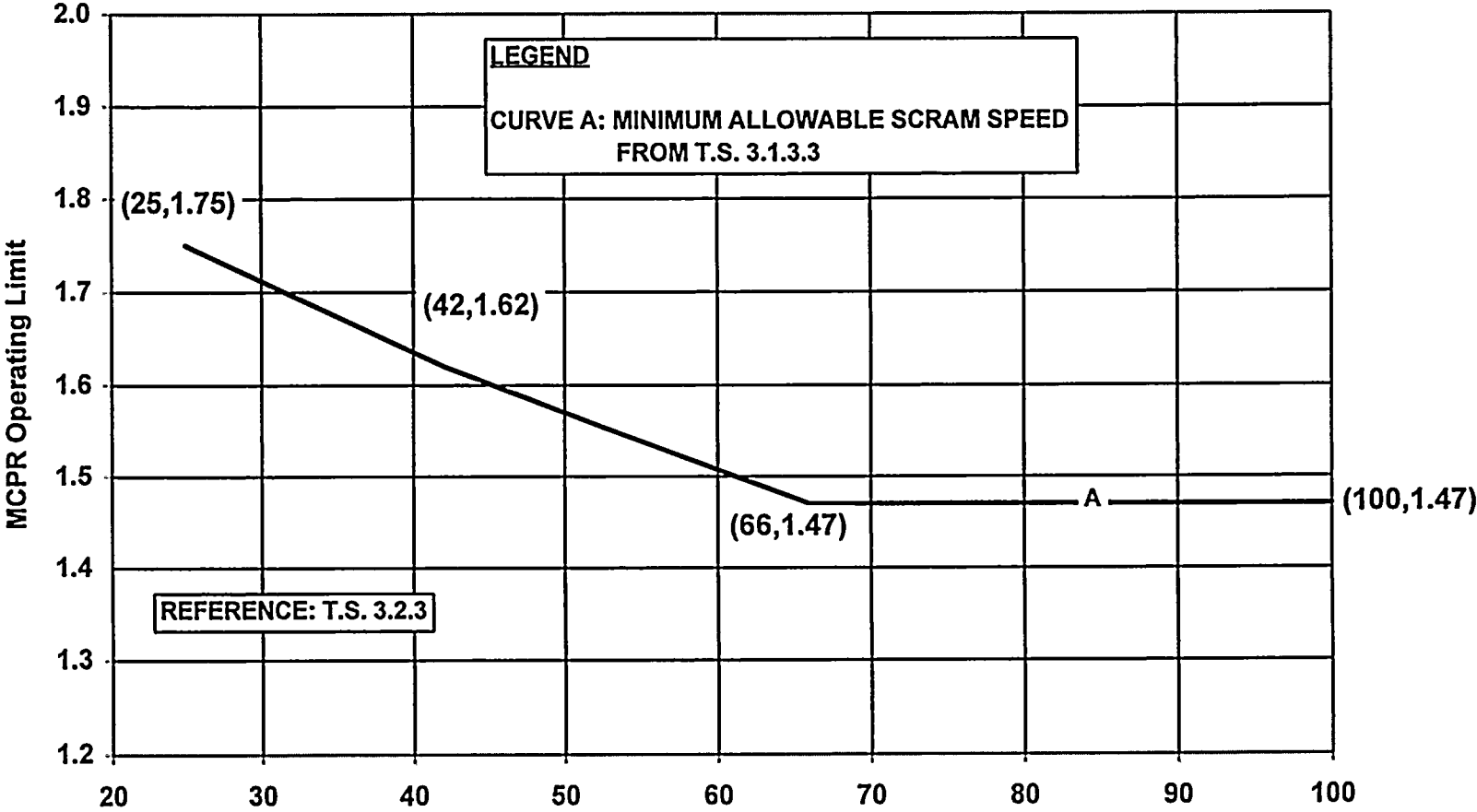
Core Power (% RATED)
POWER DEPENDENT MCPR OPERATING LIMIT
EOC-RPT AND MAIN TURBINE BYPASS OPERABLE
FIGURE 4.2-2

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Core Power (% RATED)
POWER DEPENDENT MCPR OPERATING LIMIT
MAIN TURBINE BYPASS INOPERABLE/EOC-RPT OPERABLE
FIGURE 4.2-3

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Core Power (% RATED)
POWER DEPENDENT MCPR OPERATING LIMIT
EOC-RPT INOPERABLE/MAIN TURBINE BYPASS OPERABLE
FIGURE 4.2-4

5.0 LINEAR HEAT GENERATION RATE (LHGR)

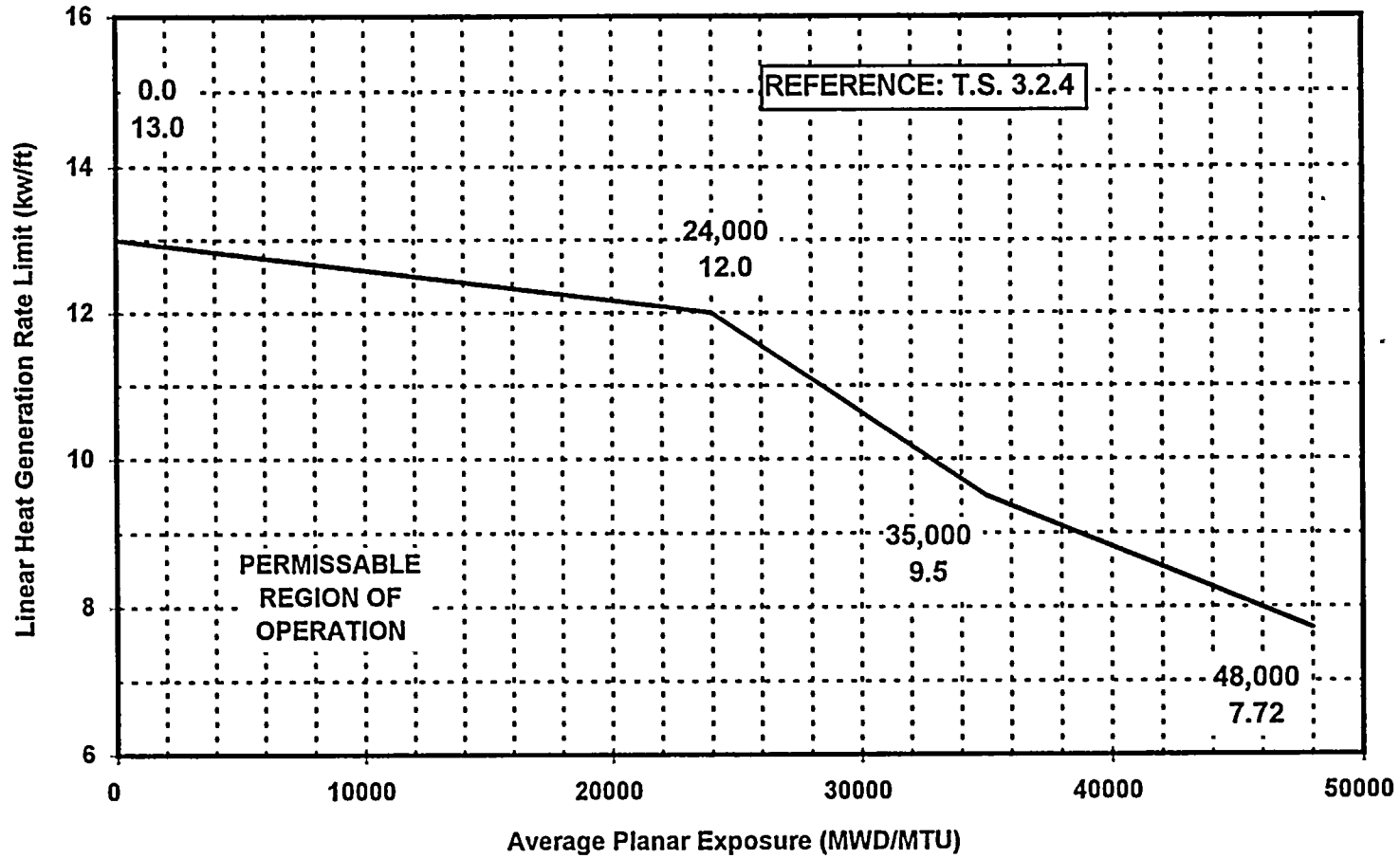
5.1 Technical Specification Reference

Technical Specification 3.2.4

5.2 Description

The LHGR for all fuel shall not exceed the LHGR limit determined from Figure 5.2-1.

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

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-95-001, "Susquehanna SES Unit 1 Cycle 9 Reload Summary Report,"
March, 1995.

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