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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555-0001

Re: Turkey Point Unit 4
Docket No. 50-251
Core Operating Limits Report

In accordance with Technical Specification 6.9.1.7, the attached Core Operating Limits Report (COLR) is provided for Turkey Point Unit 4. The COLR is applicable for Unit 4 Cycle 28.

Should there be any questions, please contact Robert Tomonto, Licensing Manager, at 305-246-7327.

Very truly yours,

Michael Kiley
Site Vice President
Turkey Point Nuclear Plant

Attachment

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant

A001
NRR

Turkey Point Unit 4 Cycle 28
Core Operating Limits Report (COLR)

TURKEY POINT UNIT 4 CYCLE 28 COLR

1.0 INTRODUCTION

This Core Operating Limits Report for Turkey Point Unit 4 Cycle 28 has been prepared in accordance with the requirements of Technical Specification 6.9.1.7.

The Technical Specifications (TS) affected by this report are listed below with the section and page for each one of the TS addressed in this COLR document.

Section	Technical Specification		Page
2.1	2.1.1	Reactor Core Safety Limits	14B-A3
2.2	2.2.1	Reactor Trip System Instrumentation Setpoints, Table 2.2-1, Notes 1 & 3	14B-A3-14B-A4
2.3	3.1.1.1	Shutdown Margin Limit for MODES 1, 2, 3, 4	14B-A4
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2.0 OPERATING LIMITS

The cycle-specific parameter limits for the specifications listed in the Introduction are presented below and listed sequentially by Technical Specification (TS). These limits have been developed using the NRC-approved methodologies specified in TS 6.9.1.7.

2.1 Reactor Core Safety Limits – Three Loops in Operation (TS 2.1.1)

- Figure A1(page 14B-A7) — In Modes 1 and 2, the combination of Thermal Power, reactor coolant system highest loop average temperature and pressurizer pressure shall not exceed the limits in Figure A1.

2.2 Reactor Trip System Instrumentation Setpoints (TS 2.2.1)

NOTE 1 on TS Table 2.2-1 Overtemperature ΔT

- $\tau_1 = 0s$, $\tau_2 = 0s$ — Lead/Lag compensator on measured ΔT
- $\tau_3 = 2s$ — Lag compensator on measured ΔT
- $K_1 = 1.31$
- $K_2 = 0.023/°F$
- $\tau_4 = 25s$, $\tau_5 = 3s$ — Time constants utilized in the lead-lag compensator for T_{avg}
- $\tau_6 = 2s$ — Lag compensator on measured T_{avg}
- $T' \leq 583.0\ °F$ — Indicated Loop T_{avg} at RATED THERMAL POWER
- $K_3 = 0.00116/psi$
- $P' \geq 2235$ psig — Nominal RCS operating pressure
- $f_1(\Delta I) = 0$ for $q_t - q_b$ between – 18% and + 7%.

  For each percent that the magnitude of $q_t - q_b$ exceeds – 18%, the ΔT Trip Setpoint shall be automatically reduced by 3.51% of its value at RATED THERMAL POWER; and

  For each percent that the magnitude of $q_t - q_b$ exceeds + 7%, the ΔT Trip Setpoint shall be automatically reduced by 2.37% of its value at RATED THERMAL POWER.

  Where q_t and q_b are percent RATED THERMAL POWER in the top and bottom halves of the core respectively, and $q_t + q_b$ is total THERMAL POWER in percent of RATED THERMAL POWER.

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NOTE 2 on TS Table 2.2-1 Overtemperature ΔT (Not affected by COLR, included for completeness)

The Overtemperature ΔT function Allowable Value shall not exceed the nominal trip setpoint by more than 0.5% ΔT span for the ΔT channel, 0.2% ΔT span for the Pressurizer Pressure channel, and 0.4% ΔT span for the f(ΔI) channel. No separate Allowable Value is provided for T_{avg} because this function is part of the ΔT value.

NOTE 3 on TS Table 2.2-1 Overpower ΔT

- $K_4 = 1.10$
- $K_5 \geq 0.0/°F$ For increasing average temperature
- $K_5 = 0.0/°F$ For decreasing average temperature
- $\tau_7 \geq 0$ s Time constants utilized in the lead-lag compensator for T_{avg}
- $K_6 = 0.0016/°F$ For $T > T''$
- $K_6 = 0.0$ For $T \leq T''$
- $T'' \leq 583.0°F$ Indicated Loop T_{avg} at RATED THERMAL POWER
- $f_2(\Delta I) = 0$ For all ΔI

NOTE 4 on TS Table 2.2-1 Overpower ΔT (Not affected by COLR, included for completeness)

The Overpower ΔT function Allowable Value shall not exceed the nominal trip setpoint by more than 0.5% ΔT span for the ΔT channel. No separate Allowable Value is provided for T_{avg} because this function is part of the ΔT value.

2.3 Shutdown Margin Limit for MODES 1, 2, 3 and 4 (TS 3.1.1.1)

- Figure A2 (page 14B-A8)

2.4 Shutdown Margin Limit for MODE 5 (TS 3.1.1.2)

- $\geq$ 1.77% Δk/k

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2.5 Moderator Temperature Coefficient (MTC) (TS 3.1.1.3)

- $\leq + 5.0 \times 10^{-5}$ Δk/k/°F	BOL, HZP, ARO and from HZP to 70% Rated Thermal Power (RTP)
- From 70% RTP to 100% RTP the MTC decreasing linearly from $\leq + 5.0 \times 10^{-5}$ Δk/k/°F to $\leq 0.0 \times 10^{-5}$ Δk/k/°F	
- Less negative than -41.0×10^{-5} Δk/k/°F	EOL, RTP, ARO

2.6 MTC Surveillance at 300 ppm (TS 4.1.1.3)

- Less negative than -35.0×10^{-5} Δk/k/°F	Within 7 EFPD of reaching equilibrium boron concentration of 300 ppm.
-	

2.7 Analog Rod Position Indication System (TS 3.1.3.2)

- Figure A3 (page 14B-A9)	The All Rods Out (ARO) position for all shutdown Banks and Control Banks is defined to be 228 steps withdrawn.

2.8 Control Rod Insertion Limits (TS 3.1.3.6)

- Figure A3 (page 14B-A9)	The control rod banks shall be limited in physical insertion as specified in Figure A3 for ARO =228 steps withdrawn.

2.9 Axial Flux Difference (TS 3.2.1)

- Figure A4 (page 14B-A10)

2.10 Heat Flux Hot Channel Factor $F_Q(Z)$ (TS 3.2.2)

- $[F_Q]^L = 2.30$	
- K(z) = 1.0	For 0′ ≤ z ≤ 12′ where z is core height in ft

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2.11 Nuclear Enthalpy Rise Hot Channel Factor (TS 3.2.3)

- $F_{\Delta H}^{RTP} = 1.600$ $PF_{\Delta H} = 0.3$

2.12 DNB Parameters (TS 3.2.5)

- RCS Tavg $\leq$ 585.0 °F
- Pressurizer Pressure $\geq$ 2204 psig

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FIGURE A1
Reactor Core Safety Limit – Three Loops in Operation

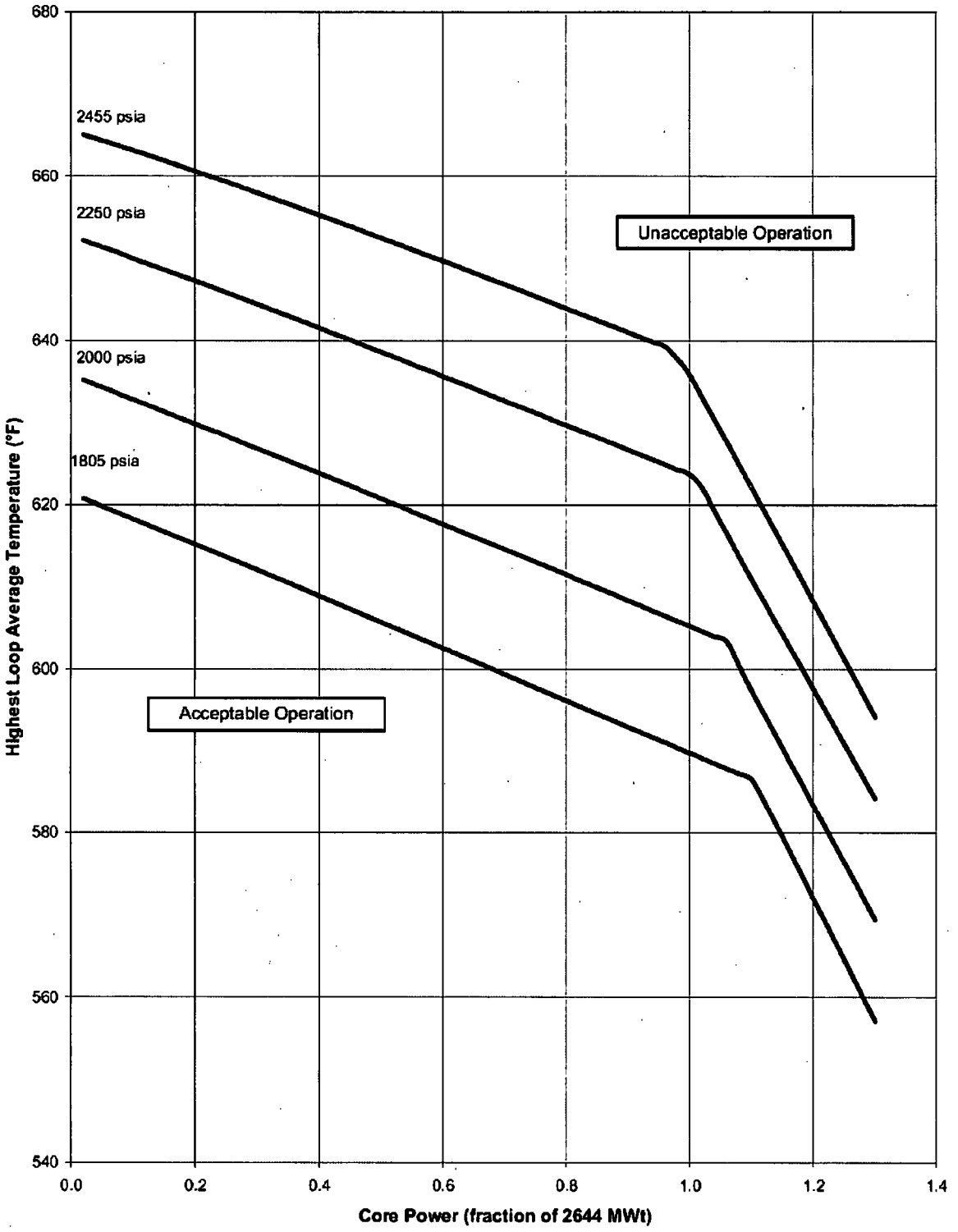

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FIGURE A2

Required Shutdown Margin vs Reactor Coolant Boron Concentration

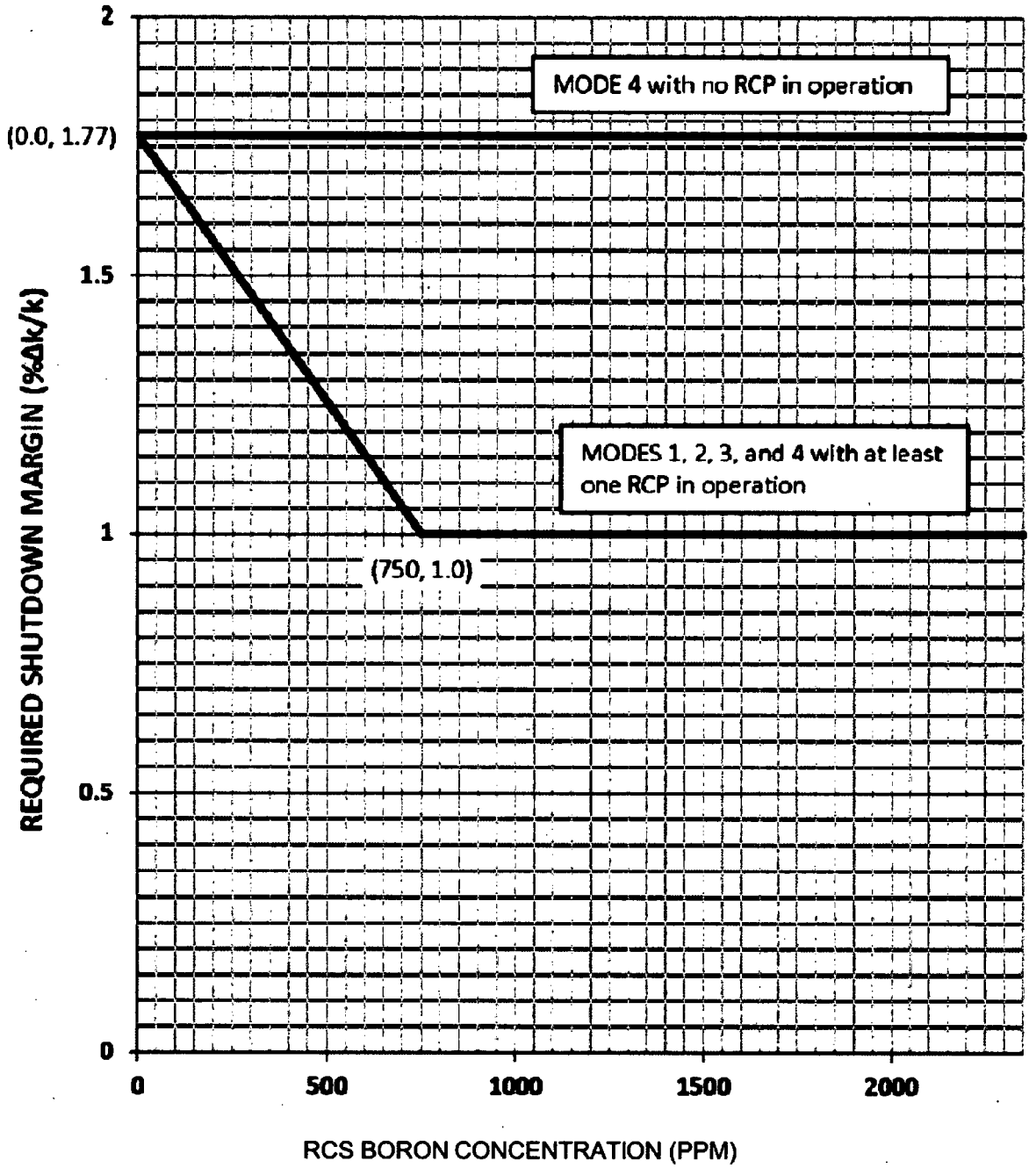

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FIGURE A3

Turkey Point Unit 4 Cycle 28 Rod Insertion Limits vs Thermal Power
ARO = 228 Steps Withdrawn, Overlap = 100 Steps

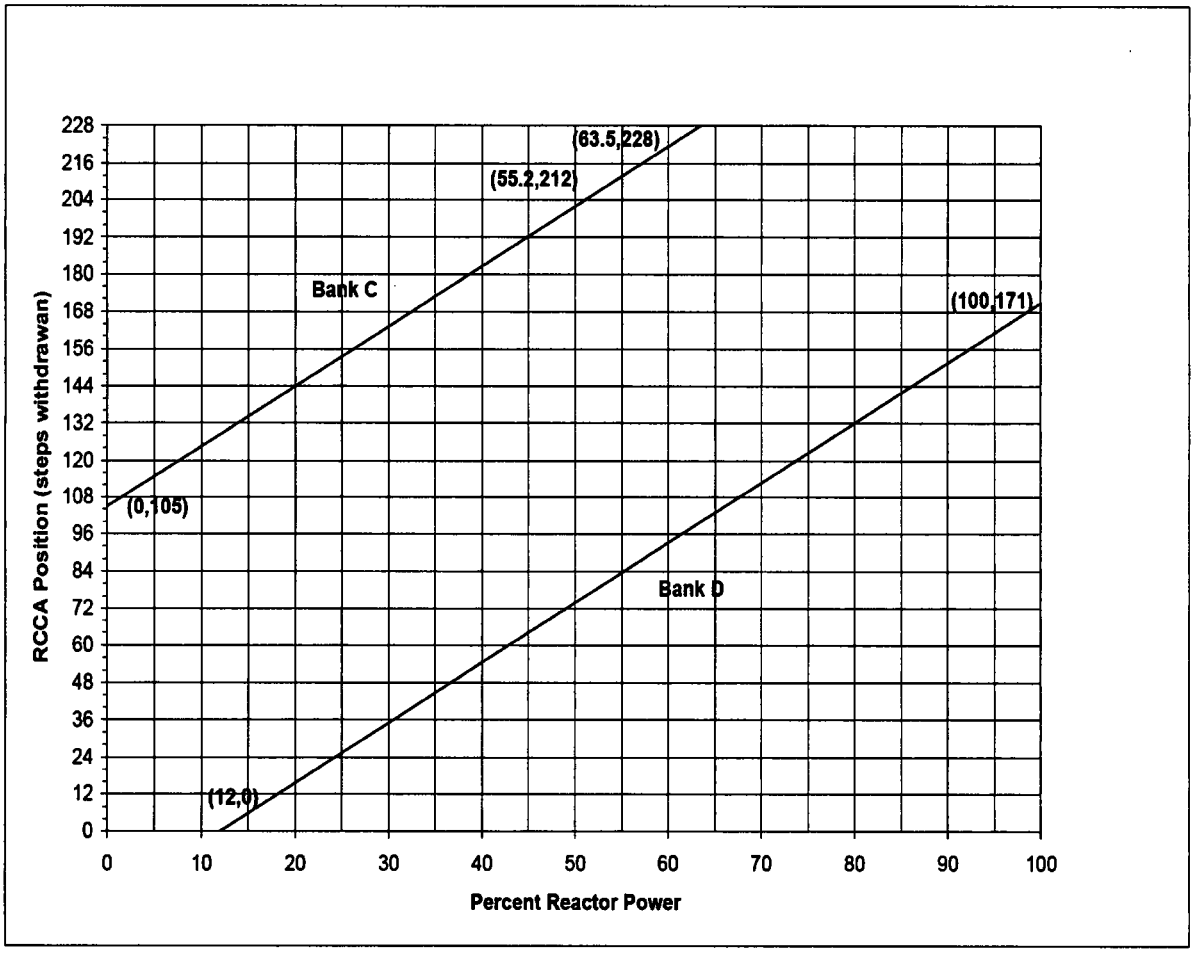

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FIGURE A4

Axial Flux Difference as a Function of Rated Thermal Power
Turkey Point Unit 4 Cycle 28