Entergy

Indian Point Energy Center
450 Broadway, GSB
P.O. Box 249
Buchanan, N.Y. 10511-0249
Tel (914) 734-6710

Robert Walpole
Licensing Manager

NL-10-070

July 7, 2010

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

SUBJECT: Revised Core Operating Limits Report for Indian Point Unit 3 – Mid-Cycle Revision
Docket No. 50-286
License No. DPR-64

Dear Sir or Madam:

Please find attached Core Operating Limits Report (COLR) for Indian Point Unit 3 in accordance with the Indian Point 3 Technical Specifications 5.6.5.d. Enclosure 1 provides a mid-cycle revision to the Cycle 16 COLR.

There are no new commitments being made in this submittal. If you have any questions or require additional information, please contact my office at (914) 734-6710.

Sincerely,

RW/dmt

Enclosure: 1. Indian Point 3 COLR – Mid-Cycle Revision for Cycle 16

cc: Mr. John Boska, NRR Senior Project Manager
Mr. Marc Dapas, Acting Regional Administrator, NRC Region I
IPEC NRC Resident Inspector's Office
Mr. Paul Eddy, New York State Department of Public Service (w/o enclosure)
Mr. Francis J. Murray, President and CEO, NYSERDA (w/o enclosure)

A001
NRR

ENCLOSURE 1 TO NL-10-070

Indian Point 3 COLR – Mid-Cycle Revision for Cycle 16

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 3
DOCKET NO. 50-286
LICENSE NO. DPR-64

Entergy
Nuclear Northeast

One Site, One Team, One Fleet
Indian Point Energy Center

Procedure Use Is:

☑ Continuous

☐ Reference

☐ Information

Control Copy: _____

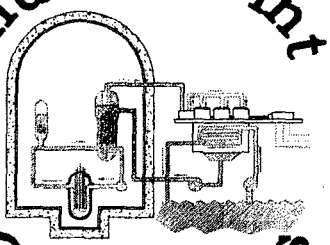
Effective Date: 6/30/2010

3-GRAPH-RPC-16 , Revision: 2

CORE OPERATING LIMITS REPORT

3

Indian Point Operations



Approved By:

T E Ganclin 1/6/22/10

Procedure Sponsor, DM/Designee Date

Team 3B

Procedure Owner

EDITORIAL REVISION

REVISION SUMMARY

(Page 1 of 1)

1.0 REASON FOR REVISION

1.1 This revision corrects an editorial error in COLR.

2.0 SUMMARY OF CHANGES

2.1 This revision corrects an editorial error in the COLR. The Indian Point Unit 3 Cycle 16 COLR text for "TS 2.1.1 Reactor Core SLs" has been revised for consistency with "Figure 1 Reactor Core Safety Limit – Four Loops in Operation" in COLR, as well as the Indian Point Unit 3 Technical Specifications. This revision is not considered a significant safety concern. The guidance that was presented in the COLR text would have resulted in a conservative determination of a safety limit being exceeded when applied to the COLR Figure 1 since Reactor Vessel average temperatures would have been compared to limits on Reactor Vessel inlet temperatures.

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NOTE

- The Technical Specification references shown next to each Factor OR Limit in this COLR are there to identify the corresponding sections in the Technical Specifications that refer to the COLR.
- The COLR, including any midcycle revisions or supplements, shall be provided for each reload cycle to the NRC. **{T.S. 5.6.5d.}**
- The data presented in this report applies to Cycle 16 ONLY and may NOT be used for other cycles of operation. Also, it applies only to operation at a maximum power level of 3188.4 MWt. Any technical change to this document requires a Safety Evaluation to be performed in accordance with 10CFR50.59.

TS 2.1.1 Reactor Core SLs

In MODE 1 and 2, the combination of thermal power level, pressurizer pressure, and Reactor Vessel inlet temperature SHALL not exceed the limits shown in Figure 1. The safety limit is exceeded if the point defined by the combination of Reactor Vessel inlet temperature and power level is at any time above the appropriate pressure line.

TS 3.1.1 Shutdown Margin (SDM)

The shutdown margin SHALL be greater than or equal to 1.3% $\Delta k/k$.

TS 3.1.3 Moderator Temperature Coefficient (MTC)

The MTC upper limit SHALL be < 0.0 $\Delta k/k/°F$ at hot zero power.

The MTC lower limit SHALL be less negative than or equal to:

-38.0 pcm/ºF	@	300 ppm
-44.5 pcm/ºF	@	60 ppm
-47.0 pcm/ºF	@	0 ppm

TS 3.1.5 Shutdown Bank Insertion Limits

The Shutdown Banks SHALL be fully withdrawn when the reactor is in MODE 1 and MODE 2. Shutdown Banks with a group step counter demand position ≥ 225 steps are considered fully withdrawn because the bank demand position is above the top of the active fuel.

TS 3.1.6 Control Bank Insertion Limits

The Control Bank Insertion Limits for MODE 1 and MODE 2 with $k_{eff} \geq 1.0$ are as indicated in Figure 2. Control Bank Insertion Limits apply to the step counter demand position.

Each control bank shall be considered fully withdrawn at ≥ 230 steps.

TS 3.2.1 Heat Flux Hot Channel Factor (FQ(Z))

NOTE

- P is the fraction of Rated Thermal Power (RTP) at which the core is operating.
- K(Z) is the fraction given in Figure 3 and Z is the core height location of FQ.

IF $P > .5$, $F_Q(Z) \leq (2.50 / P) \times K(Z)$

IF $P \leq .5$, $F_Q(Z) \leq (5.00) \times K(Z)$

TS 3.2.2 Nuclear Enthalpy Rise Hot Channel Factor $F^N_{\Delta H}$

NOTE

P is the fraction of Rated Thermal Power (RTP) at which the core is operating.

$F^N_{\Delta H} \leq 1.70 \{ 1 + 0.3 (1 - P) \}$

TS 3.2.3 Axial Flux Difference (AFD) (Constant Axial Offset Control (CAOC) Methodology)

The Indicated limit is the Target Band; i.e., the Target ± 5%

The AFD shall be maintained within the ACCEPTABLE OPERATION portion of Figure 4, as required by TS 3.2.3.

TS 3.3.1 RPS Instrumentation

1. Overtemperature ΔT — Allowable Value as referenced in Technical Specifications Table 3.3.1-1, Function 5, Note 1
   Refer to Attachment 1

2. Overpower ΔT — Allowable Value as referenced in Technical Specifications Table 3.3.1-1, Function 6, Note 2
   Refer to Attachment 2

TS 3.4.1 RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits

The following DNB related parameters are applicable in MODE 1:

a. Reactor Coolant System loop $T_{avg} \leq 576.7°F$ for full-power $T_{avg} = 572.0°F$
b. Pressurizer Pressure ≥ 2204 psig
c. Reactor Coolant System Total Flow Rate ≥ 364,700 gpm

TS 3.9.1 Refueling Boron Concentration

When required by Technical Specification 3.9.1, the minimum boron concentration in the RCS, Refuel Canal, and Reactor Cavity SHALL be the more restrictive of either ≥ 2050 ppm or that which is sufficient to provide a shutdown margin ≥ 5% Δk/k.

Attachment 1

OVERTEMPERATURE ΔT

The Overtemperature ΔT Function Allowable Value SHALL not exceed the following:

Note: For limitations on the maximum trip Setpoint, see Technical Specification 3.3.1.

$$\Delta T \leq \Delta T_o [K_1 - K_2 [(1 + \tau_1 s)/(1 + \tau_2 s)] (T - T') + K_3 (P - P') - f_1(\Delta I)]$$

Where: ΔT is measured RCS ΔT, °F (measured by hot leg and cold leg RTDs).
ΔT_o is the loop specific indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T′ is the loop specific indicated T at RTP, °F ≤ 572.0°F.
P is the measured pressurizer pressure, psig.
P′ is the nominal RCS operating pressure, ≥ 2235 psig.

$K_1 \leq 1.26$ $K_2 \geq 0.022/°F$ $K_3 \geq 0.00070/psi$
$\tau_1 \geq 25.0$ sec $\tau_2 \leq 3.0$ sec

$f_1(\Delta I) =$ 4.00[-15.75 - (qt - qb)] when qt - qb ≤ - 15.75% RTP
0% of RTP when -15.75% RTP < qt - qb ≤ 6.9% RTP
+3.33[(qt - qb) – 6.9]} when qt - qb > 6.9% RTP

Where qt and qb are percent RTP in the upper and lower halves of the core, respectively, and qt + qb is the total THERMAL POWER in percent RTP.

Attachment 2

OVERPOWER ΔT

The Overpower ΔT Function Allowable Value SHALL not exceed the following:

Note: For limitations on the maximum trip Setpoint, see Technical Specification 3.3.1.

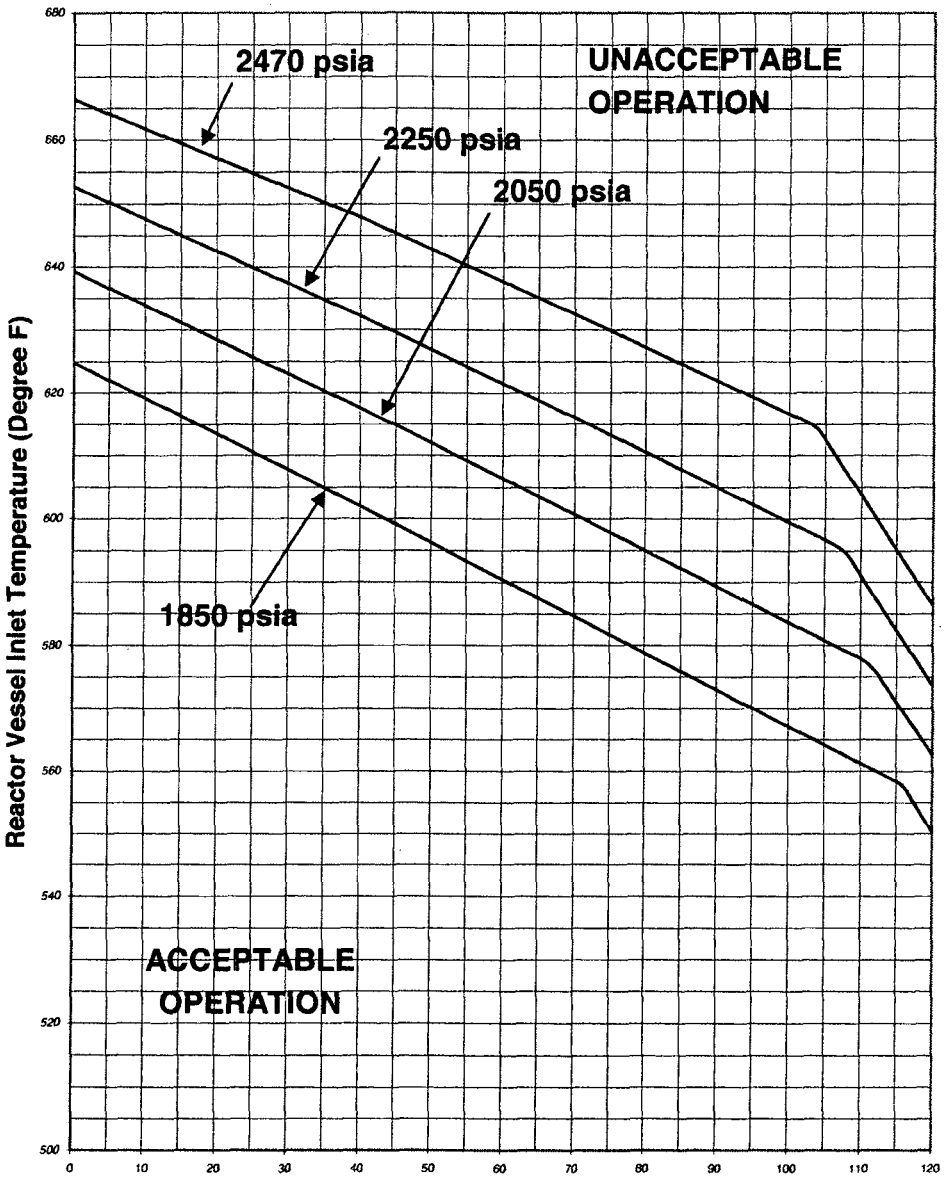
$$\Delta T \leq \Delta T_o [K_4 - K_5 [(\tau_3 s)/(1 + \tau_3 s)](T) - K_6(T - T'') - f_2(\Delta I)]$$

Where: ΔT is measured RCS ΔT, °F (measured by hot leg and cold leg RTDs).
ΔT_o is the loop specific indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T'' is the loop specific indicated T at RTP, °F ≤ 572.0°F.

$K_4 \leq 1.10$ $K_5 \geq 0.0175$/°F for increasing T, 0/°F for decreasing T $K_6 \geq 0.0015$/°F when $T > T''$, 0/°F when $T \leq T''$

$\tau_3 \geq 10$ sec
$f_2(\Delta I) = 0$

Figure 1
Reactor Core Safety Limit – Four Loops in Operation



[Conservative relative to 3188.4 MWt; use as-is for operation at 3188.4 MWt]

Figure 2
Rod Bank Insertion Limits
(Four Loop Operation)
104 Step Overlap

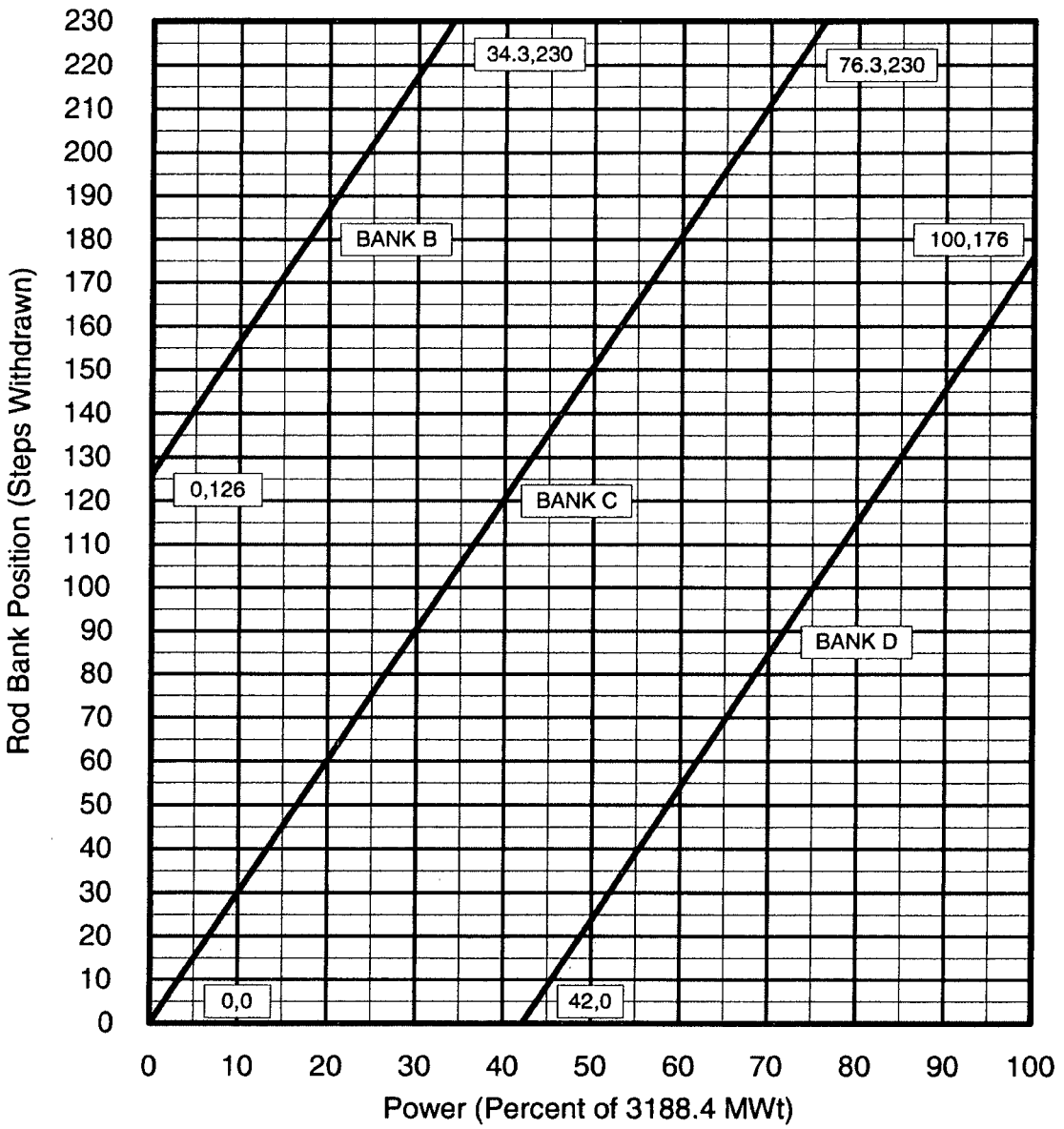


Figure 3
Hot Channel Factor Normalized Operating Envelope

(For S. G. Tube Plugging up to 10%)

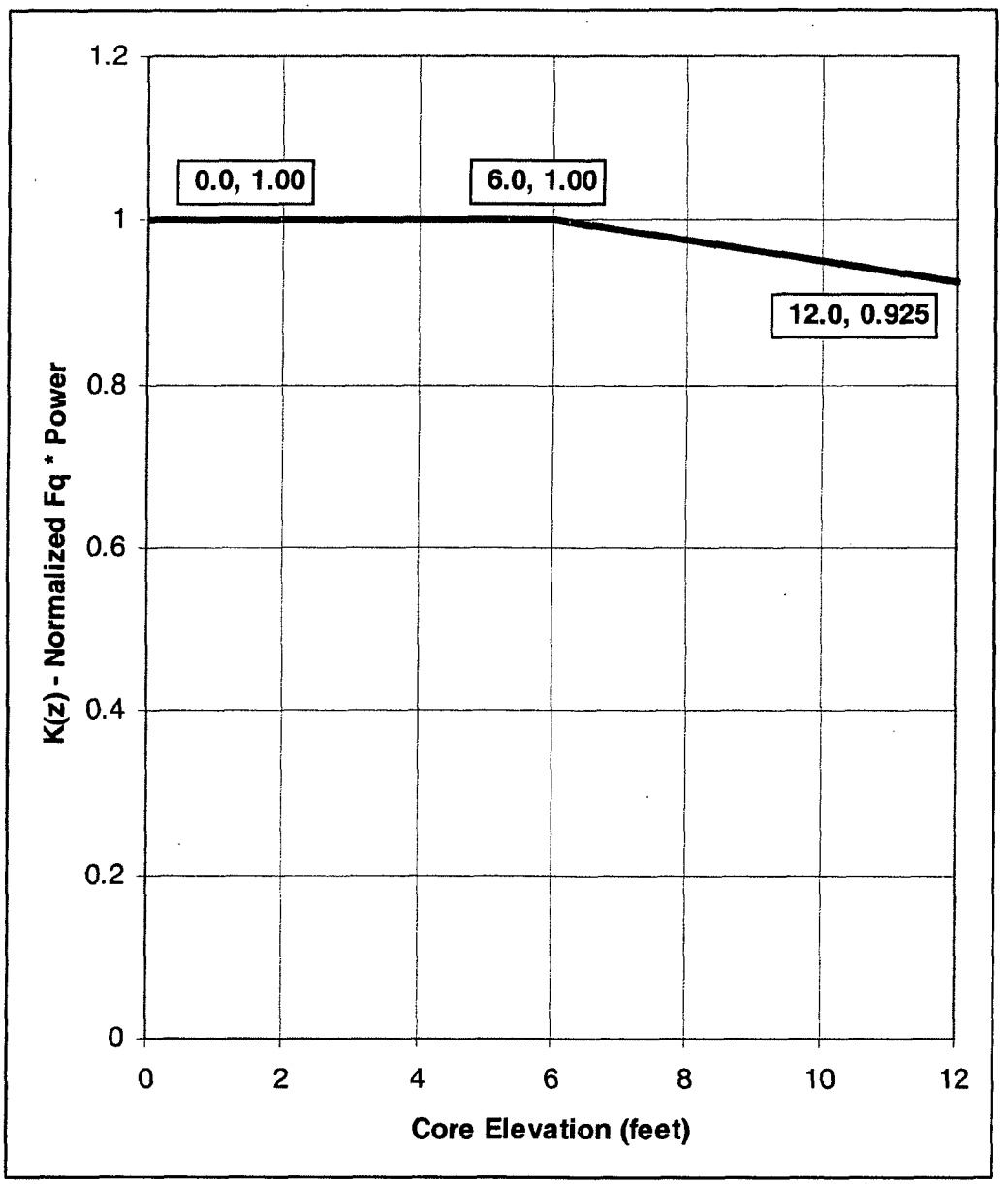


Figure 4
Axial Flux Difference Envelope Limits