Progress Energy

Crystal River Nuclear Plant
Docket No. 50-302
Operating License No. DPR-72

Ref: ITS 5.6.2.18(d)

October 24, 2003
3F1003-13

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

Subject: Crystal River Unit 3 – Core Operating Limits Report, Cycle 14, Revision 0 and Revision 1

Dear Sir:

Progress Energy Florida, Inc. (PEF) hereby submits the Crystal River Unit 3 Core Operating Limits Report (COLR), Cycle 14, Revision 0 and Revision 1, as required by Improved Technical Specifications (ITS) 5.6.2.18(d). Revision 0 and Revision 1 are identical except that Revision 0 contained a caution in Section 1.0 stating:

> "Since Licensing Condition 2.C.(12) has not yet been issued by the NRC, COLR Limits based on the above combination of methodologies are not approved for Revision 0 of the Cycle 14 COLR. Therefore, the only applicable COLR limit values for Revision 0 are SHUTDOWN MARGIN (SDM) and Refueling Boron Concentration which were performed using BAW-10179PA Rev. 4, which has been previously approved by the NRC. Specification of these two limits in the COLR allow for entry into Modes 6, 5, 4 or 3."

Revision 0 was needed in order to utilize the Cycle 14 refueling boron concentration and shutdown margin values prior to receipt of a license amendment that approved analyses for other parameters in the Cycle 14 COLR. Amendment 211 was received on October 16, 2003, allowing the issuance of the COLR, Revision 1, which does not contain the above caution.

No new regulatory commitments are made in this letter.

If you have any questions regarding this submittal, please contact Mr. Sid Powell, Supervisor, Licensing and Regulatory Programs at (352) 563-4883.

Sincerely,

James H. Terry
Engineering Manager

JHT/pei

Attachment 1: Core Operating Limits Report, Cycle 14, Revision 0
Attachment 2: Core Operating Limits Report, Cycle 14, Revision 1

xc: NRR Project Manager
Regional Administrator, Region II
Senior Resident Inspector

A001

Progress Energy Florida, Inc.
Crystal River Nuclear Plant
15760 W. Powerline Street
Crystal River, FL 34428

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50 - 302 / LICENSE NUMBER DPR - 72

ATTACHMENT 1

Core Operating Limits Report (COLR)
Cycle 14, Revision 0

Progress Energy - Florida
Crystal River Unit 3

Cycle 14
Core Operating Limits Report
Revision 0

Referencing
Improved Technical Specifications

1.0 Core Operating Limits

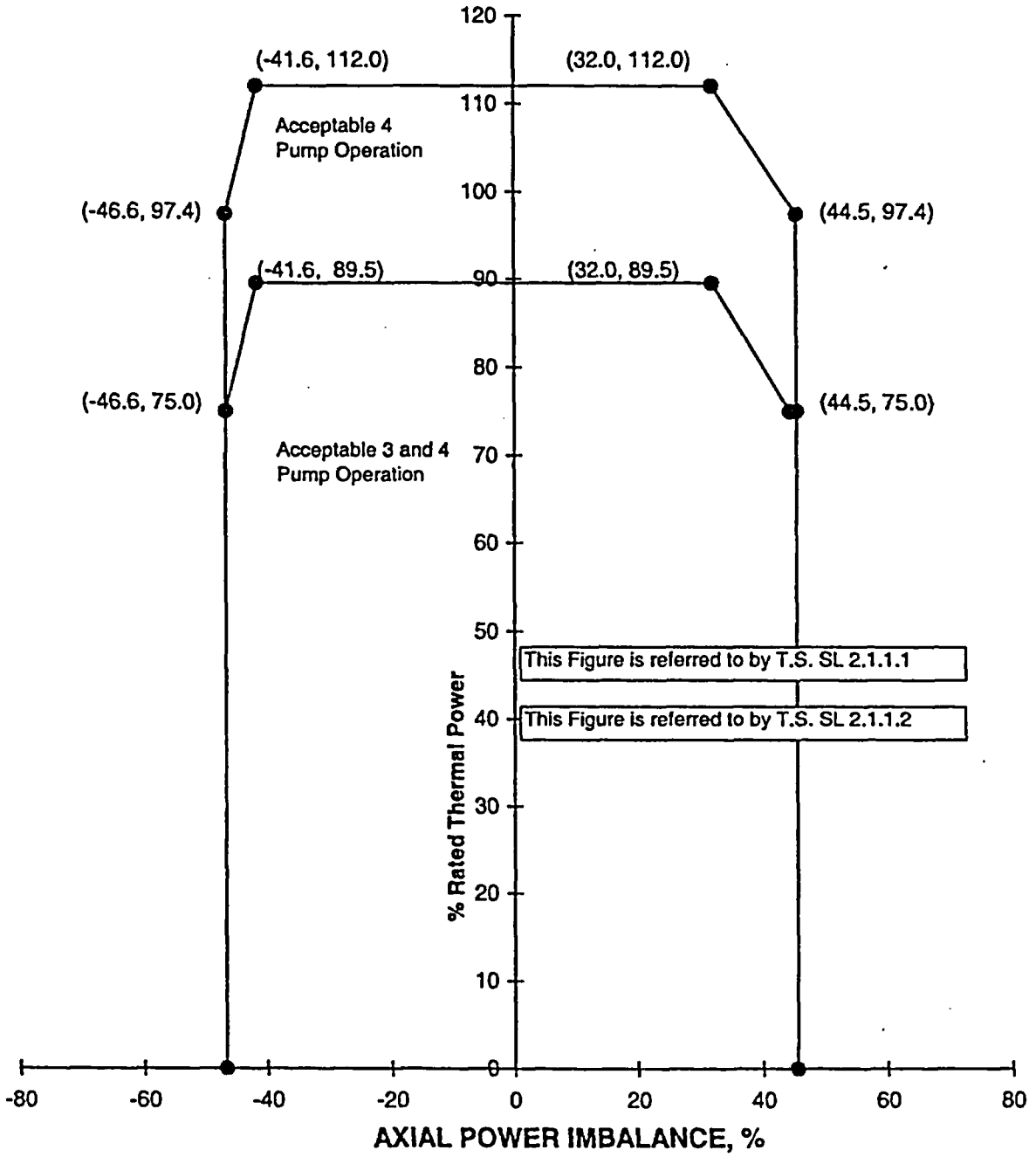
This Core Operating Limits Report for CR3 Cycle 14 has been prepared in accordance with the requirements of Technical Specification Section 1.1 and 5.6.2.18. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC. Per ITS 5.6.2.18, the approved COLR methodology is BAW-10179PA Rev. 4, "Safety Criteria and Methodology for Acceptable Cycle Reload Analysis" which is supplemented by Licensing Condition 2.C.(12) and License Amendment 144, dated June 25, 1992. The Licensing Condition 2.C.(12) includes BAW-10164PA Rev. 4, "RELAP/MOD2-B&W – An Advanced Computer Program for Light Water Reactor LOCA and Non-LOCA Transient Analysis" and BAW-10241P Rev. 0, "BHTP DNB Correlation Applied with LYNXT." License Amendment 144 SER methodology is used to specify the API/RPI Agreement Limits for SR 3.1.7.1. The Cycle 14 limits generated using the methodologies above are documented in BAW-2448 Revision 0,"Crystal River Unit 3 Cycle 14 Reload Report", dated August 2003.

CAUTION
Since Licensing Condition 2.C.(12) has not yet been issued by the NRC, COLR Limits based on the above combination of methodologies are not approved for Revision 0 of the Cycle 14 COLR. Therefore, the only applicable COLR limit values for Revision 0 are SHUTDOWN MARGIN (SDM) and Refueling Boron Concentration which were performed using BAW-10179PA Rev. 4, which has been previously approved by the NRC. Specification of these two limits in the COLR allow for entry into Modes 6, 5, 4 or 3.

The following limits are included in this report.

SL 2.1.1.1	AXIAL POWER IMBALANCE Protective Limits
SL 2.1.1.2	AXIAL POWER IMBALANCE Protective Limits
LCO 3.1.1	SHUTDOWN MARGIN (SDM)
LCO 3.1.3	Moderator Temperature Coefficient (MTC)
SR 3.1.7.1	API/RPI Position Indication Agreement
LCO 3.2.1	Regulating Rod Insertion Limits
LCO 3.2.2	AXIAL POWER SHAPING ROD (APSR) Insertion Limits
LCO 3.2.3	AXIAL POWER IMBALANCE Operating Limits
LCO 3.2.4	QUADRANT POWER TILT
LCO 3.2.5	Power Peaking Factors
LCO 3.3.1	Reactor Protection System (RPS) Instrumentation
SR 3.4.1.1	RCS Pressure DNB Limits
SR 3.4.1.2	RCS Temperature DNB Limits
SR 3.4.1.3	RCS Flow Rate DNB Limits
LCO 3.9.1	Refueling Boron Concentration

AXIAL POWER IMBALANCE Protective Limits



SHUTDOWN MARGIN (SDM)

Normal operating procedures require RCS boration to 1.0%Δk/k Subcritical at 73°F prior to bypassing EFIC actuation on low steam generator pressure, or when high steam generator levels exist during secondary system chemistry control and steam generator cleaning in MODES 3, 4, and 5,
therefore
Mode 3,4,5 SDM $\geq$ 1.0% Δk/k

These limits are referred to by Technical Specification LCO 3.1.1

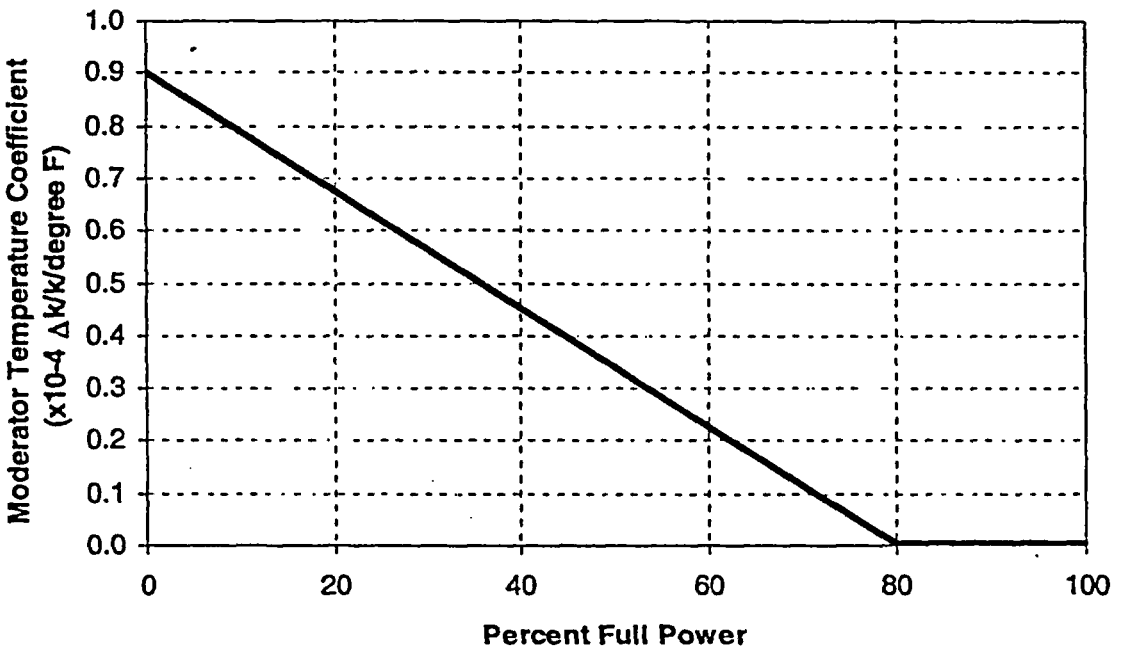
Reference: Improved Technical Specification Bases B3.1.1.

Moderator Temperature Coefficient Limit (MTC)

Lower Limit
MTC at HFP > -3.58×10^{-4} Δ k/k/^{o}F

Upper Limit
MTC $\leq$ The curve below:

The following Upper Limits may not be exceeded (Limits ensure the validity of the ECCS analysis is preserved) for operation in MODES 1 and 2:



These limits are referred to by Technical Specification LCO 3.1.3

Absolute Position Indicator (API)/ Relative Position Indicator (RPI) Agreement Limits

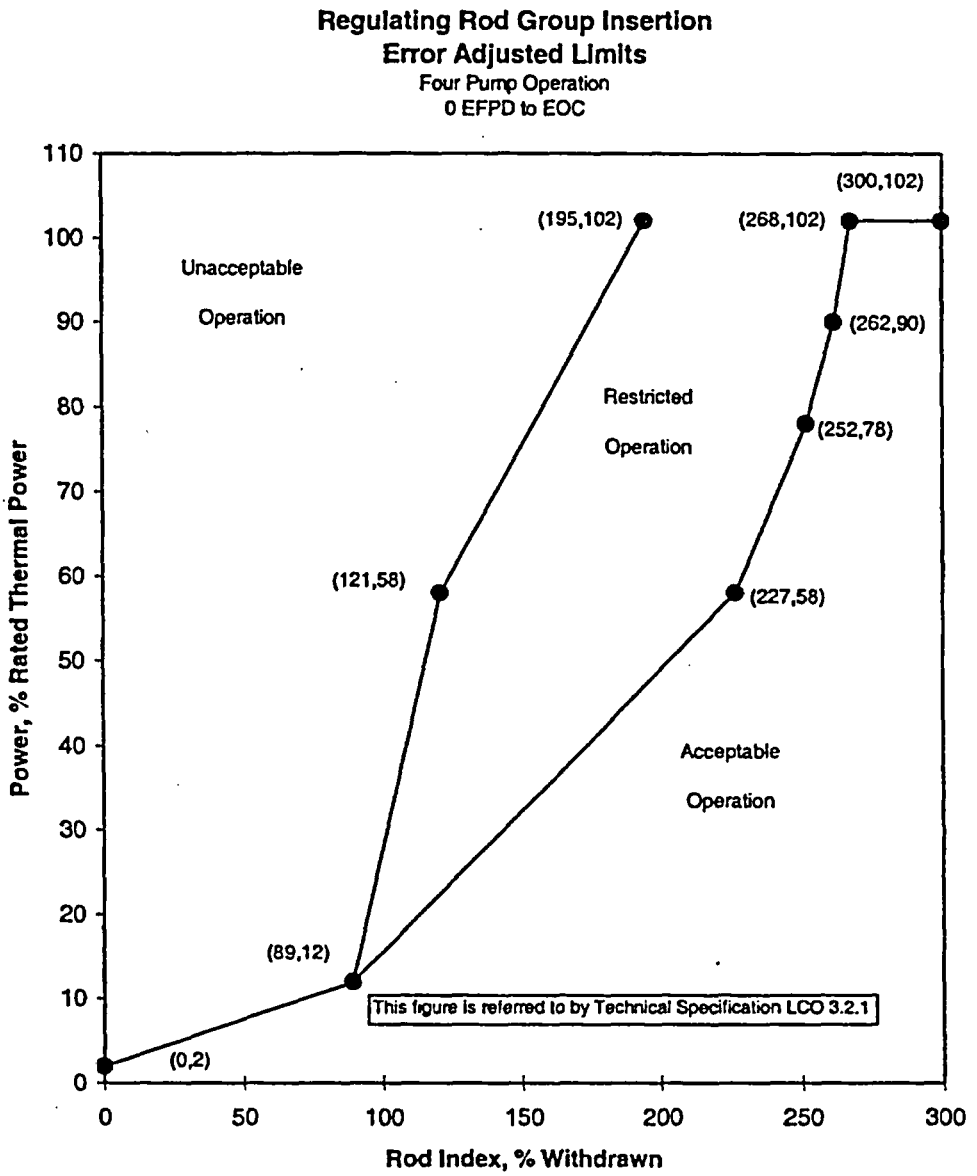
2.7% when the comparison is performed using the plant computer, or

3.5% when the comparison is performed using the panel meters on the main control board.

These limits are referred to by Technical Specification SR 3.1.7.1

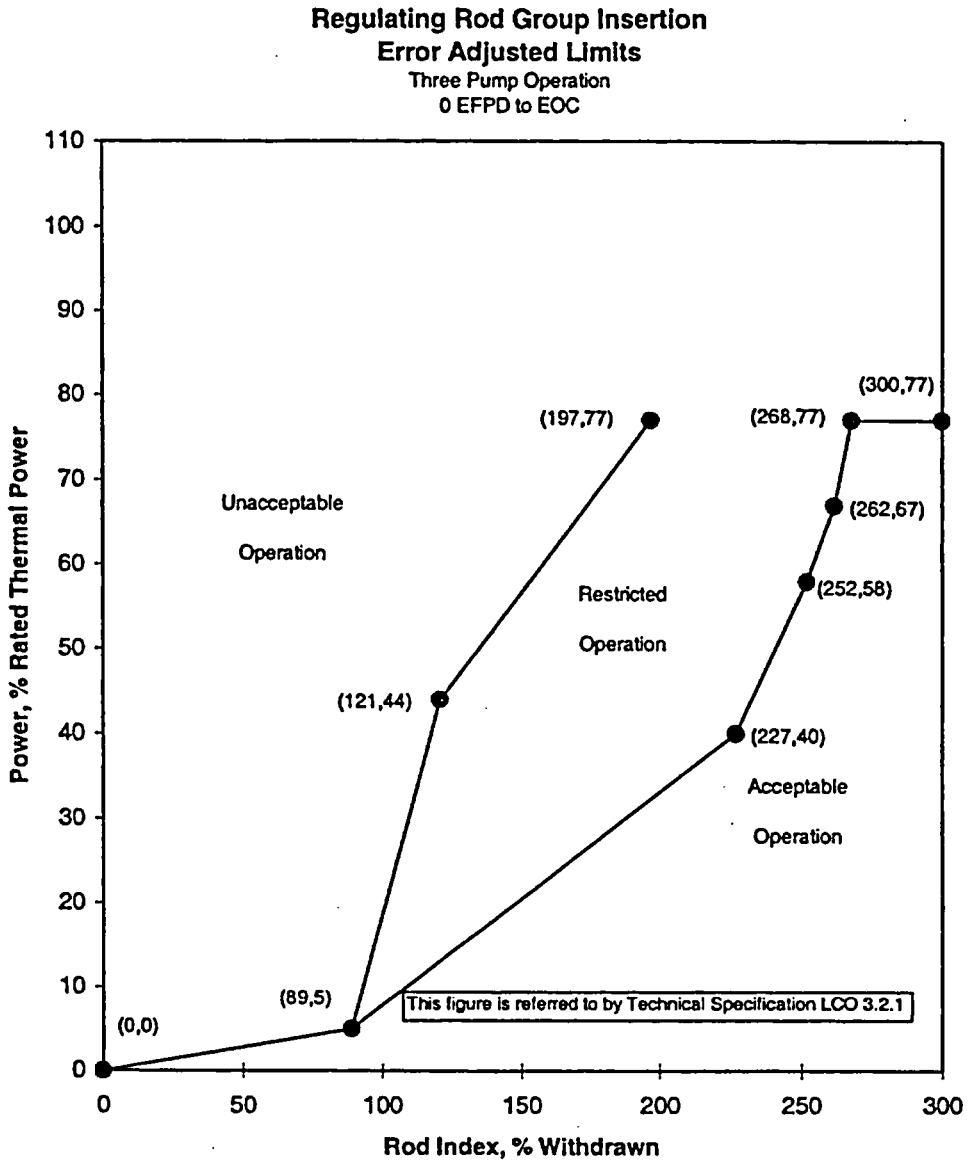
Reference: "Crystal River Unit 3 - Issuance of Amendment Re: Dual Channel Control Rod Position Indication (TAC No. M82990)", Licensing Amendment No. 144, Letter from H.S. Silver to P.M. Beard, June 25, 1992.

Regulating Rod Insertion Limits



Note 1: A Rod group overlap of 25 ±5% between sequential groups 5 and 6, and 6 and 7 shall be maintained
Note 2: This figure shall be used up to, during, and after APSR withdrawal per LCO 3.2.2

Regulating Rod Insertion Limits (Continued)



Note 1: A Rod group overlap of 25 ±5% between sequential groups 5 and 6, and 6 and 7 shall be maintained
Note 2: This figure shall be used up to, during, and after APSR withdrawal per LCO 3.2.2

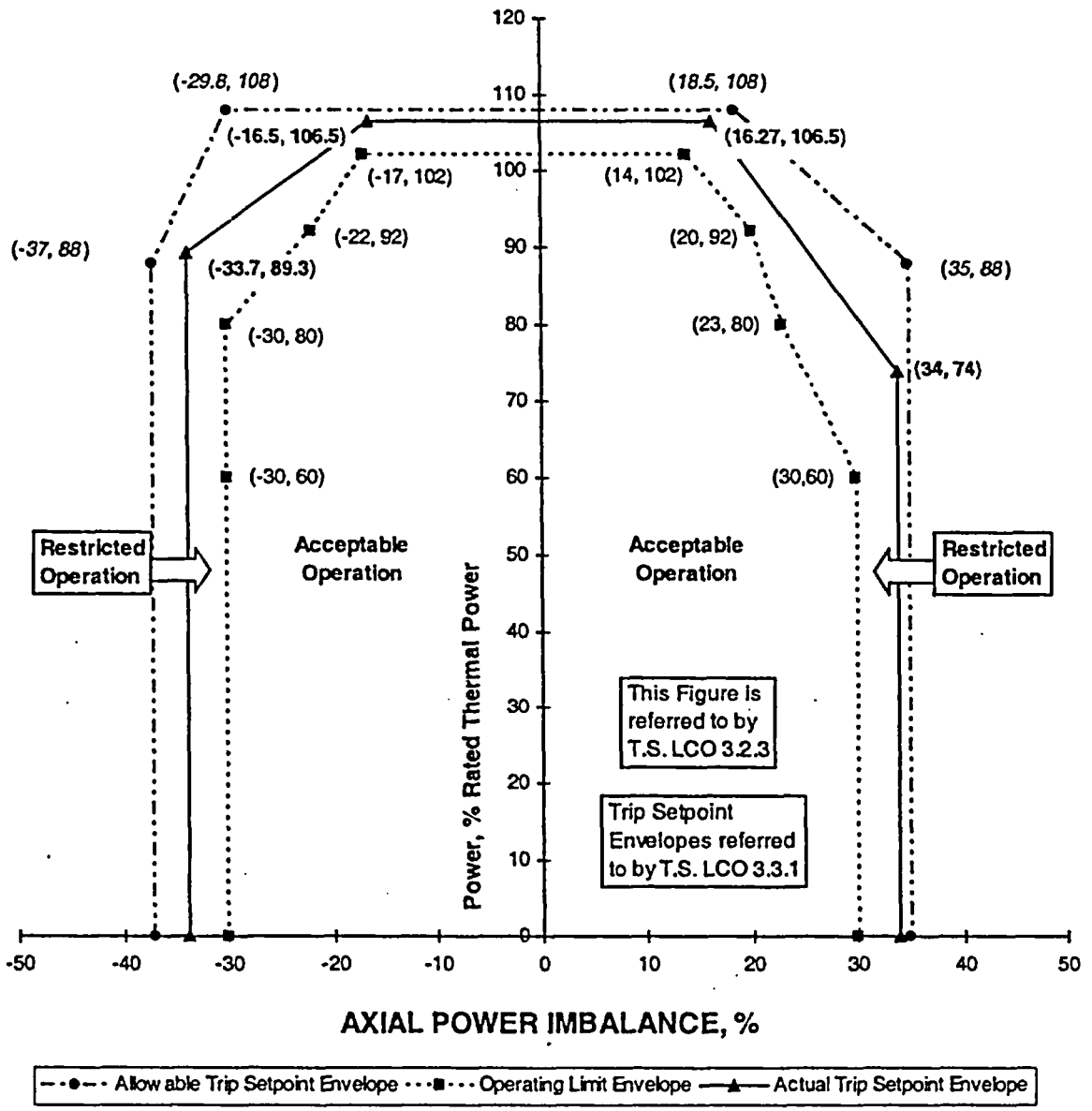
AXIAL POWER SHAPING ROD (APSR) Insertion Limits

Up to 643 EFPD the APSRs may be positioned as necessary. The APSRs shall be completely withdrawn (100%) by 663 EFPD. Between 643 and 663 EFPD, the APSRs may be withdrawn. However, once withdrawn during this period, the APSRs shall not be reinserted.

These limits are referred to by Technical Specification LCO 3.2.2

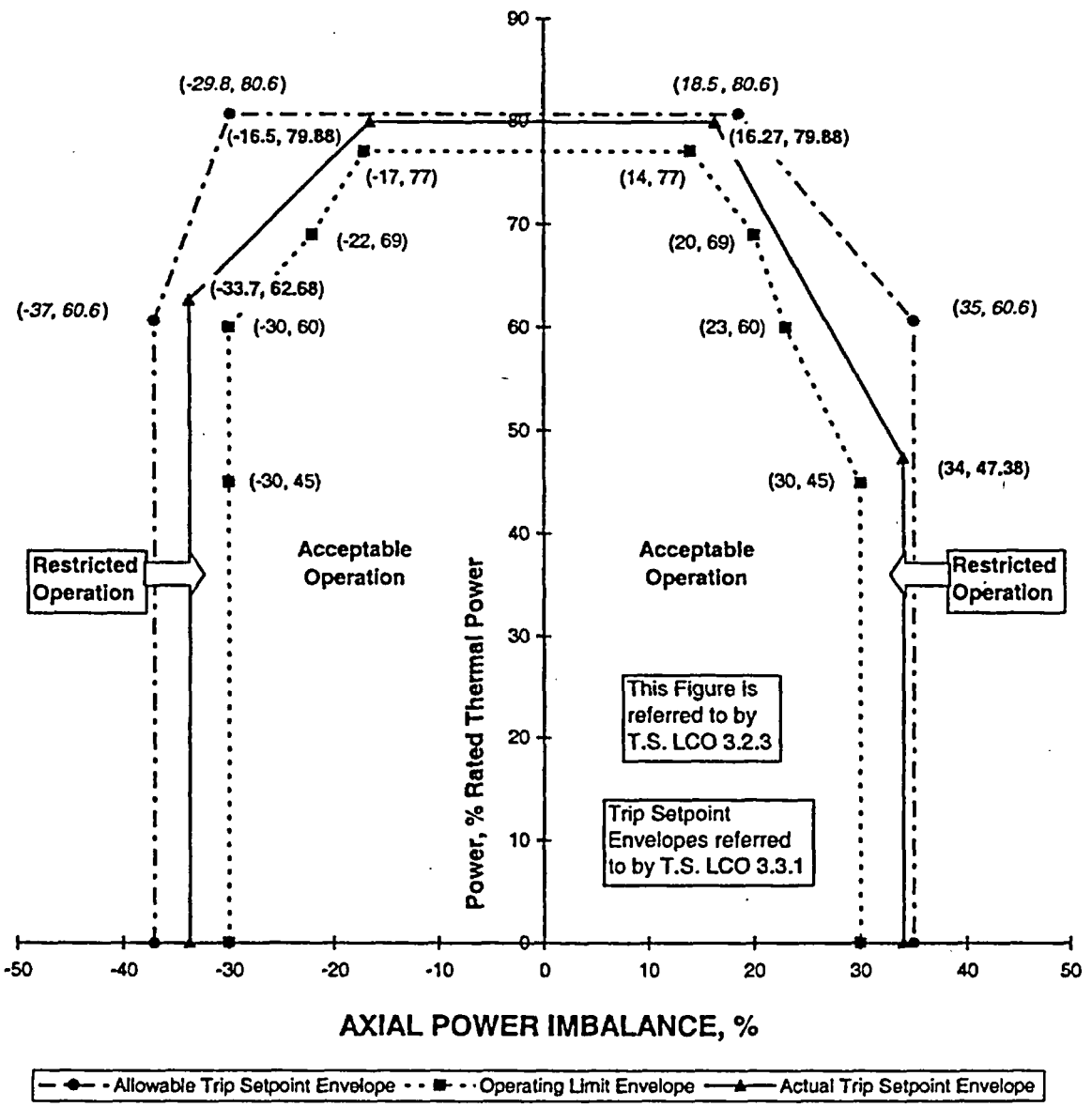
AXIAL POWER IMBALANCE Operating Limits

AXIAL POWER IMBALANCE Error Adjusted
Operating Limit and Trip Setpoint Envelopes
Four Pump Operation
0 EFPD to EOC



AXIAL POWER IMBALANCE Operating Limits (Continued)

AXIAL POWER IMBALANCE Error Adjusted Operating Limit and Trip Setpoint Envelopes
Three Pump Operation
0 EFPD to EOC



QUADRANT POWER TILT

QUADRANT POWER TILT Limits For Thermal Power $\leq$ 60%

For Operation from 0 EFPD to EOC

QUADRANT POWER TILT As Measured By:	STEADY-STATE LIMIT(%)	TRANSIENT LIMIT(%)	MAXIMUM LIMIT(%)
Symmetrical Incore Detector System	7.50	10.03	20.0
Power Range Channels	4.94	6.96	20.0
Minimum Incore Detector System	3.07	4.40	20.0
Measurement System Independent	8.58	11.07	20.0

QUADRANT POWER TILT Limits For Thermal Power > 60%

For Operation from 0 EFPD to EOC

QUADRANT POWER TILT As Measured By:	STEADY-STATE LIMIT(%)	TRANSIENT LIMIT(%)	MAXIMUM LIMIT(%)
Symmetrical Incore Detector System	4.53	10.03	20.0
Power Range Channels	1.96	6.96	20.0
Minimum Incore Detector System	1.90	4.40	20.0
Measurement System Independent	4.92	11.07	20.0

These limits are referred to by Technical Specification LCO 3.2.4

Power Peaking Factors

These Limits are referred to by Technical Specification LCO 3.2.5

Heat Flux Hot Channel Factor F_Q (for NAS)

F_Q shall be limited by the following relationships:

$F_Q \leq LHR^{allow}(Bu) / [LHR^{avg} * P]$ (for $P \leq 1.0$)

$LHR^{allow}(Bu)$ = See the following table

LHR^{avg} = 5.9535 kW/ft for Mark-B10ZL fuel

LHR^{avg} = 5.9476 kW/ft for Mark-B10E and Mk-B10I fuel

LHR^{avg} = 5.8533 kW/ft for Mark-B-HTP fuel

P = ratio of THERMAL POWER / RATED THERMAL POWER

Bu = fuel burnup (MWd/mtU)

CR-3 Cycle 14 Reload Allowable LHR Limits
Batch 16 (Mark-B-HTP) LHR^{allow}
Allowable Peak LHR for Specified Burnup, kW/ft

NAS Level	0-703 EFPD 15503 – 36971 MWd/mtU
1	15.3
2	15.6
3	16.2
4	16.2
5	16.4
6	16.2
7	15.6
8	15.4

This table is referred to by Technical Specification LCO 3.2.5

Power Peaking Factors (Continued)

This Limit is referred to by Technical Specification LCO 3.2.5

Enthalpy Rise Hot Channel Factor $F^N_{\Delta H}$ (for NAS)

$F^N_{\Delta H} \leq ARP\ [1 + (1/RH)(1- P/P_m)]$

ARP = Allowable Radial Peak, See the following table

P = ratio of THERMAL POWER / RATED THERMAL POWER and $P \leq 1.0$

P_m = 1.0 for 4-RCP operation

P_m = 0.75 for 3-RCP operation

RH = 3.34

Cycle 14 Allowable Radial Peaks (ARP)

Axial Peak	Axial Location[1] (X/L)	ARP	Axial Peak	Axial Location[1] (X/L)	ARP
1.1	0.00	1.9281	1.5	0.00	1.9790
1.1	0.10	1.9264	1.5	0.10	1.9041
1.1	0.14	1.9262	1.5	0.14	1.8847
1.1	0.20	1.9254	1.5	0.20	1.9034
1.1	0.40	1.9240	1.5	0.40	1.9694
1.1	0.60	1.9229	1.5	0.60	1.8275
1.1	0.80	1.9224	1.5	0.80	1.6786
1.1	0.88	1.9000	1.5	0.88	1.6328
1.1	0.90	1.8798	1.5	0.90	1.6358
1.1	1.00	1.8000	1.5	1.00	1.5712
1.2	0.00	2.0085	1.7	0.00	1.7737
1.2	0.10	2.0050	1.7	0.10	1.6867
1.2	0.14	2.0046	1.7	0.14	1.6635
1.2	0.20	2.0035	1.7	0.20	1.6795
1.2	0.40	2.0008	1.7	0.40	1.7622
1.2	0.60	1.9993	1.7	0.60	1.6947
1.2	0.80	1.8783	1.7	0.80	1.5617
1.2	0.88	1.8304	1.7	0.88	1.5218
1.2	0.90	1.8185	1.7	0.90	1.5308
1.2	1.00	1.7394	1.7	1.00	1.4687
1.3	0.00	2.0936	1.9	0.00	1.6083
1.3	0.10	2.0878	1.9	0.10	1.5149
1.3	0.14	2.0874	1.9	0.14	1.4891
1.3	0.20	2.0858	1.9	0.20	1.5027
1.3	0.40	2.0827	1.9	0.40	1.5812
1.3	0.60	1.9721	1.9	0.60	1.5791
1.3	0.80	1.8095	1.9	0.80	1.4620
1.3	0.88	1.7599	1.9	0.88	1.4259
1.3	0.90	1.7547	1.9	0.90	1.4364
1.3	1.00	1.6824	1.9	1.00	1.3811

[1]Based on an active core height of 143.0 inches. Linear interpolation is acceptable.

Reactor Protection System (RPS) Instrumentation

RCS Variable Low Pressure Setpoint Equation

$P_{Trip} \geq (11.59 * T_{HOT} - 5037.8)$ psig

This limit is referred to by
ITS Table 3.3.1-1, Item 5

RCS DNB Pressure Limits

RCS loop pressure ≥ 2064 psig

(Assumes 20% tube plugging and bounds either four or three RCPs operating).

These limits are referred to by SR 3.4.1.1

RCS DNB Temperature Limit

RCS Hot Leg Temperature ≤ 605.8°F

(Assumes 20% OTSG tube plugging).

These limits are referred to by SR 3.4.1.2

RCS DNB Flow Rate Limits

RCS total flow rate ≥ 133.5 E6 lb/hr with four RCPs operating, or ≥ 99.7 E6 lb/hr with three RCPs operating.

(Assumes 20% OTSG tube plugging).

These limits are referred to by SR 3.4.1.3

Refueling Boron Concentration

The boron concentration must be greater than 2860 ppmB.

The value includes 1%Δk/k for uncertainties and is based on a 685 EFPD cycle 13. The refueling boron concentration must be increased by 2 ppm for each EFPD that the cycle 13 length is less than 685 EFPD, and 1 ppm/EFPD may be deducted for each EFPD that the cycle 13 length is more than 685 EFPD.

This limit is referred to by Technical Specification LCO 3.9.1

Revision History

Revision 0 – October 2003; Original Cycle 14 COLR.

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50 - 302 / LICENSE NUMBER DPR - 72

ATTACHMENT 2

Core Operating Limits Report (COLR)
Cycle 14, Revision 1

Progress Energy - Florida
Crystal River Unit 3

Cycle 14
Core Operating Limits Report
Revision 1

Referencing
Improved Technical Specifications

1.0 Core Operating Limits

This Core Operating Limits Report for CR3 Cycle 14 has been prepared in accordance with the requirements of Technical Specification Section 1.1 and 5.6.2.18. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC. Per ITS 5.6.2.18, the approved COLR methodology is BAW-10179PA Rev. 4, "Safety Criteria and Methodology for Acceptable Cycle Reload Analysis" which is supplemented by Licensing Condition 2.C.(12) and License Amendment 144, dated June 25, 1992. The Licensing Condition 2.C.(12) includes BAW-10164PA Rev. 4, "RELAP/MOD2-B&W – An Advanced Computer Program for Light Water Reactor LOCA and Non-LOCA Transient Analysis" and BAW-10241P Rev. 0, "BHTP DNB Correlation Applied with LYNXT." License Amendment 144 SER methodology is used to specify the API/RPI Agreement Limits for SR 3.1.7.1. The Cycle 14 limits generated using the methodologies above are documented in BAW-2448 Revision 0,"Crystal River Unit 3 Cycle 14 Reload Report", dated August 2003.

The following limits are included in this report.

SL 2.1.1.1	AXIAL POWER IMBALANCE Protective Limits
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LCO 3.1.3	Moderator Temperature Coefficient (MTC)
SR 3.1.7.1	API/RPI Position Indication Agreement
LCO 3.2.1	Regulating Rod Insertion Limits
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LCO 3.2.3	AXIAL POWER IMBALANCE Operating Limits
LCO 3.2.4	QUADRANT POWER TILT
LCO 3.2.5	Power Peaking Factors
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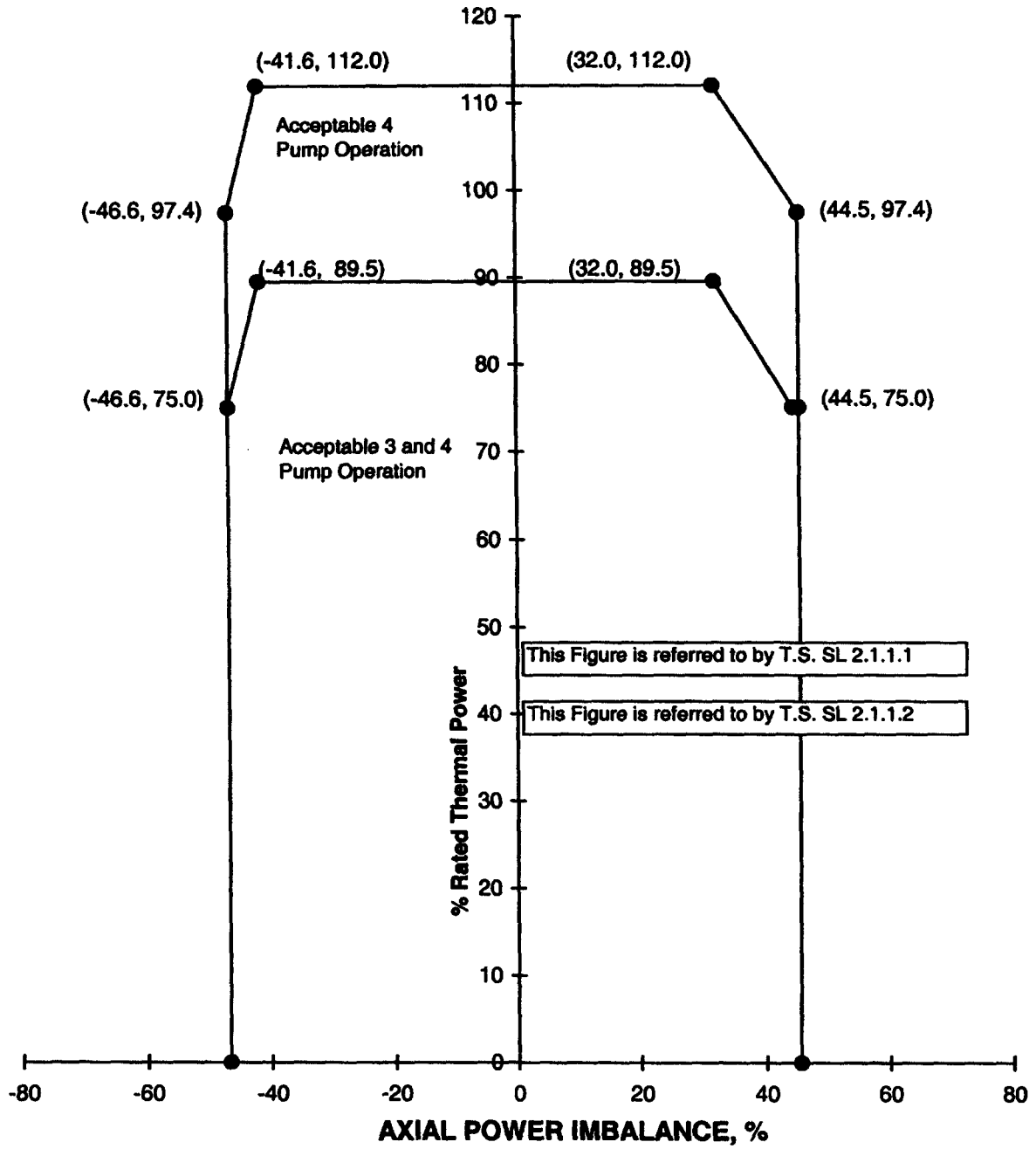
LCO 3.9.1	Refueling Boron Concentration

AXIAL POWER IMBALANCE Protective Limits



SHUTDOWN MARGIN (SDM)

Normal operating procedures require RCS boration to 1.0%Δk/k Subcritical at 73°F prior to bypassing EFIC actuation on low steam generator pressure, or when high steam generator levels exist during secondary system chemistry control and steam generator cleaning in MODES 3, 4, and 5,
therefore
Mode 3,4,5 SDM $\geq$ 1.0% Δk/k

These limits are referred to by Technical Specification LCO 3.1.1

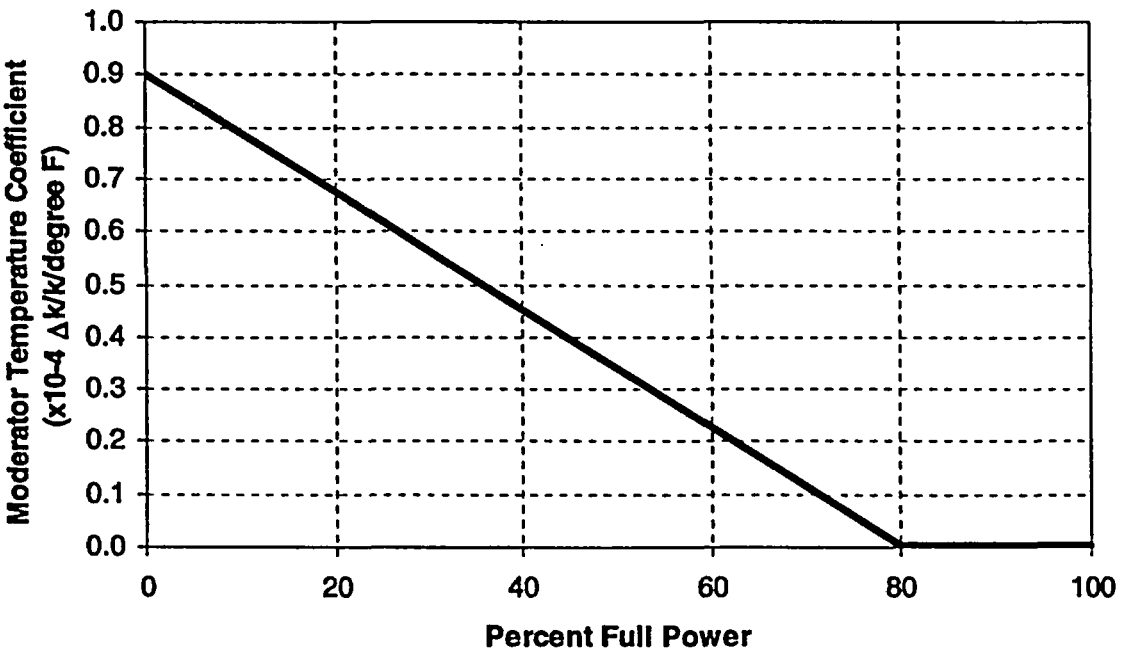
Reference: Improved Technical Specification Bases B3.1.1.

Moderator Temperature Coefficient Limit (MTC)

Lower Limit
MTC at HFP > -3.58×10^{-4} Δ k/k/^{o}F

Upper Limit
MTC $\leq$ The curve below:

The following Upper Limits may not be exceeded (Limits ensure the validity of the ECCS analysis is preserved) for operation in MODES 1 and 2:



These limits are referred to by Technical Specification LCO 3.1.3

Absolute Position Indicator (API)/ Relative Position Indicator (RPI) Agreement Limits

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3.5% when the comparison is performed using the panel meters on the main control board.

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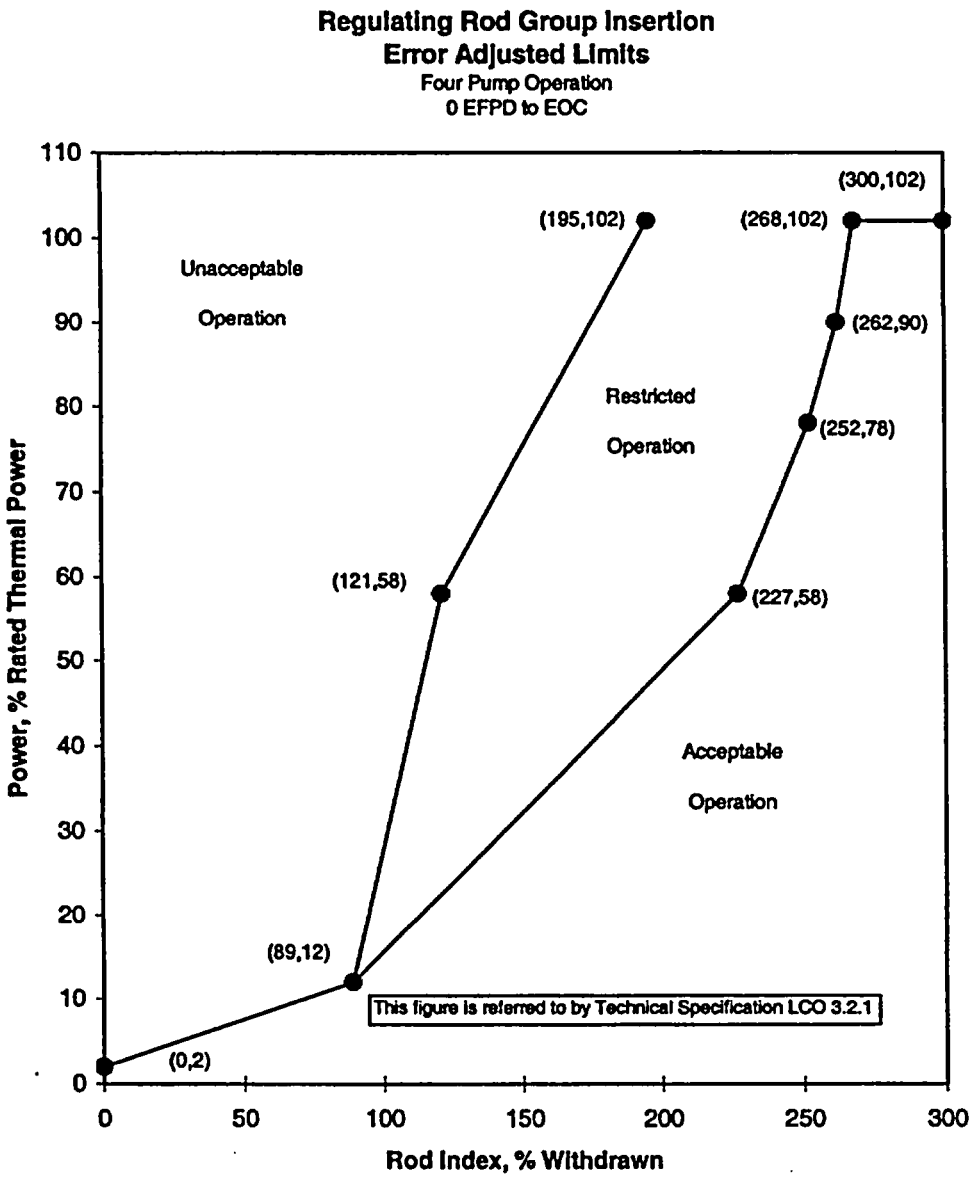
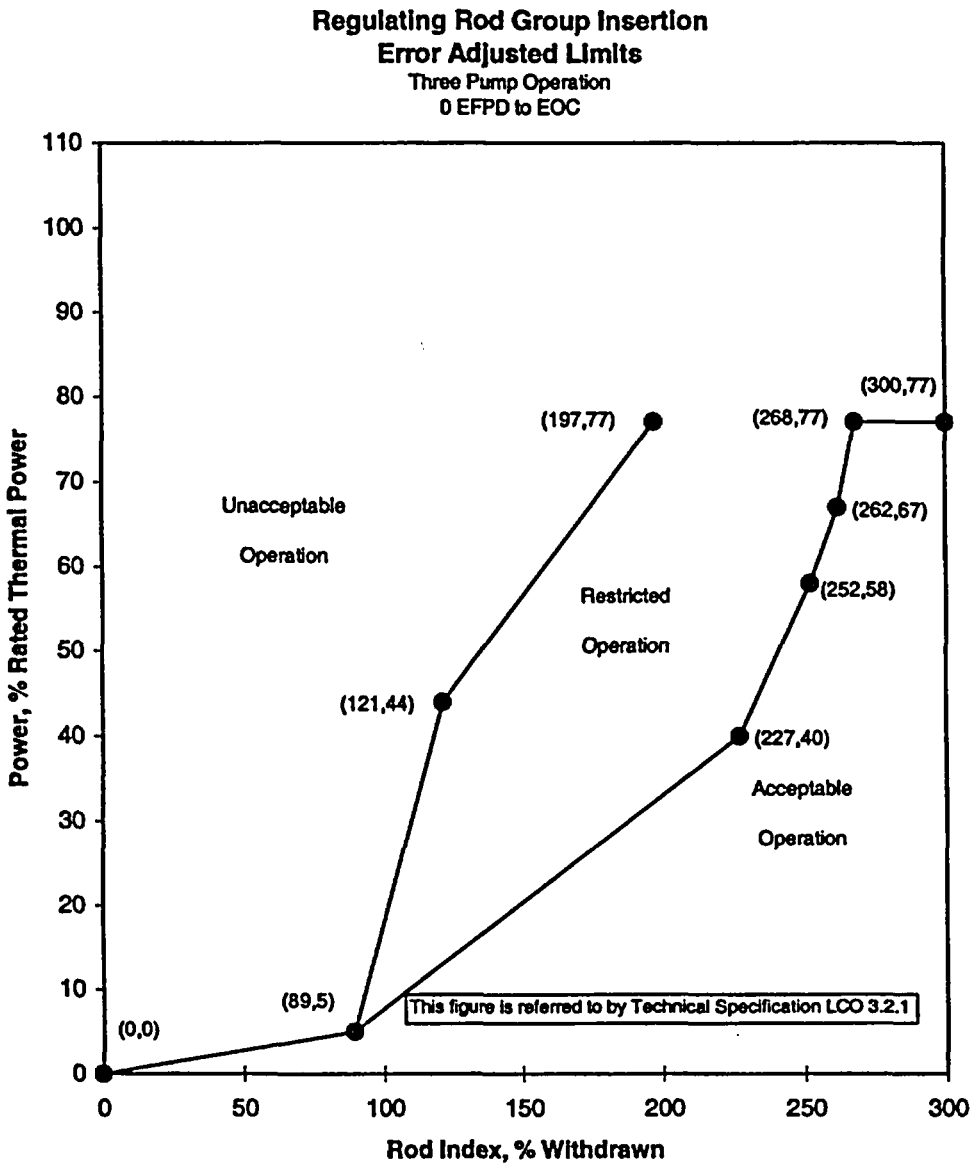
Reference: "Crystal River Unit 3 – Issuance of Amendment Re: Dual Channel Control Rod Position Indication (TAC No. M82990)", Licensing Amendment No. 144, Letter from H.S. Silver to P.M. Beard, June 25, 1992.

Regulating Rod Insertion Limits



Note 1: A Rod group overlap of 25 ±5% between sequential groups 5 and 6, and 6 and 7 shall be maintained
Note 2: This figure shall be used up to, during, and after APSR withdrawal per LCO 3.2.2

Regulating Rod Insertion Limits (Continued)



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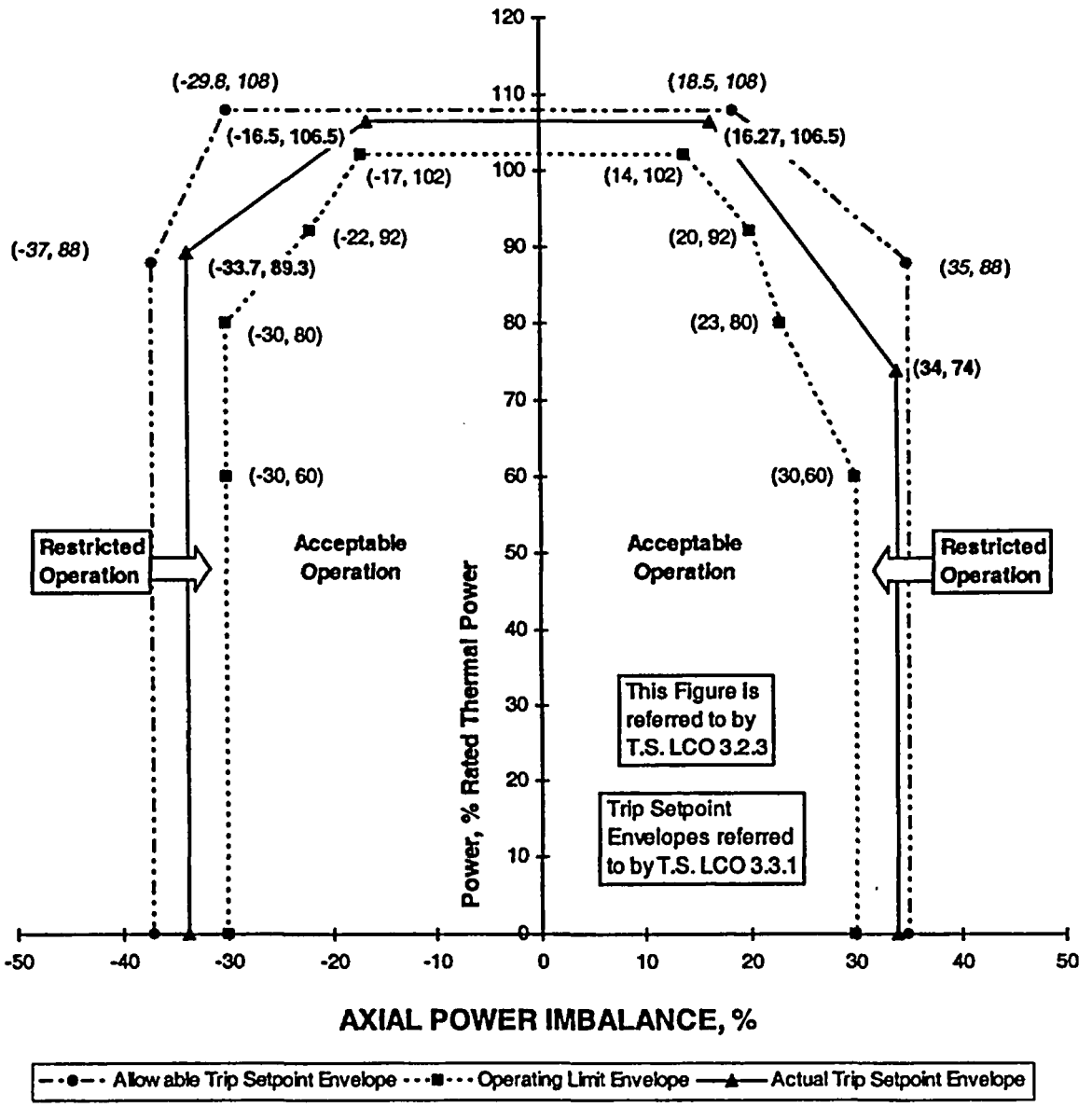
AXIAL POWER SHAPING ROD (APSR) Insertion Limits

Up to 643 EFPD the APSRs may be positioned as necessary. The APSRs shall be completely withdrawn (100%) by 663 EFPD. Between 643 and 663 EFPD, the APSRs may be withdrawn. However, once withdrawn during this period, the APSRs shall not be reinserted.

These limits are referred to by Technical Specification LCO 3.2.2

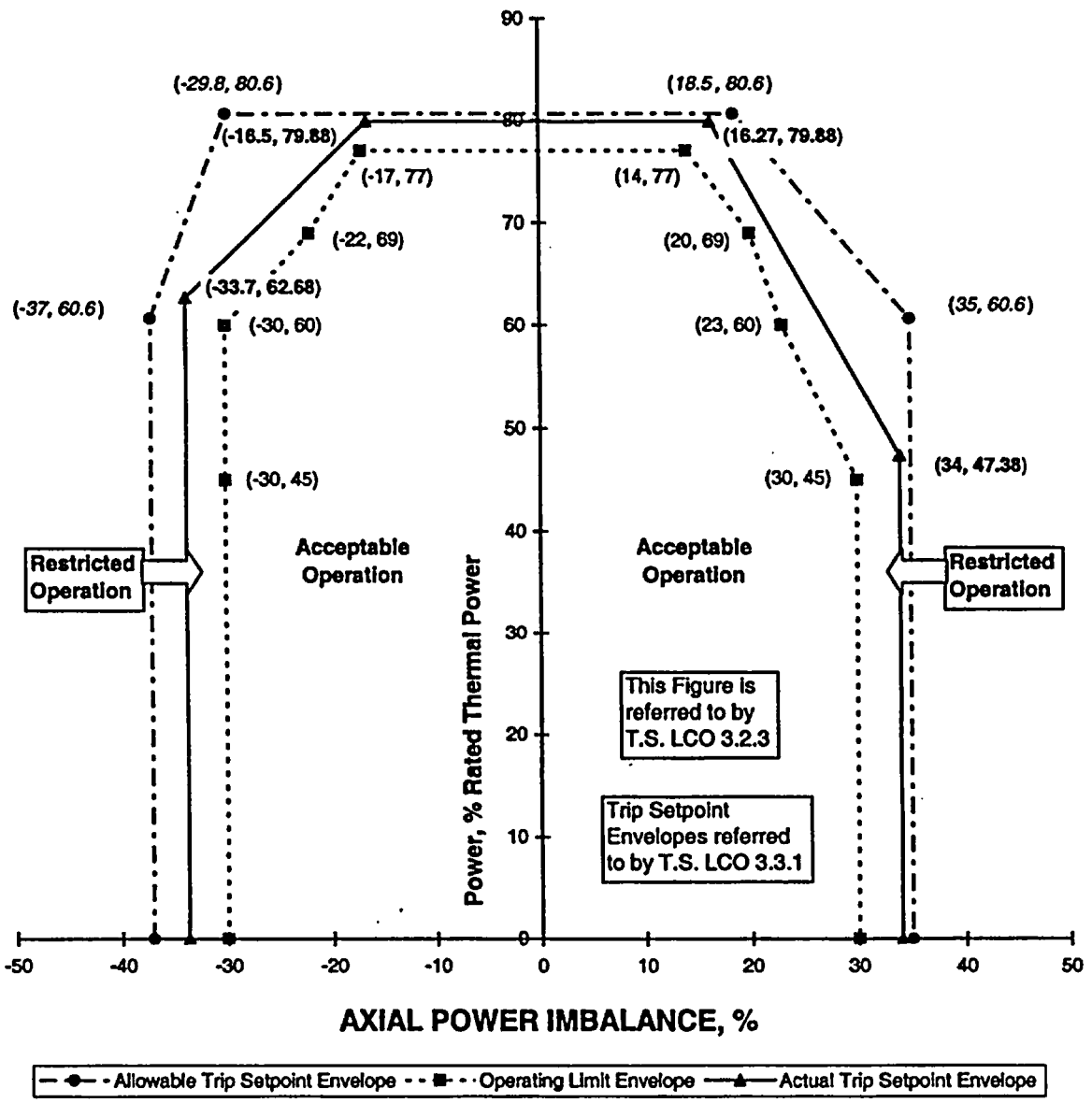
AXIAL POWER IMBALANCE Operating Limits

AXIAL POWER IMBALANCE Error Adjusted
Operating Limit and Trip Setpoint Envelopes
Four Pump Operation
0 EFPD to EOC



AXIAL POWER IMBALANCE Operating Limits (Continued)

AXIAL POWER IMBALANCE Error Adjusted
Operating Limit and Trip Setpoint Envelopes
Three Pump Operation
0 EFPD to EOC



QUADRANT POWER TILT

QUADRANT POWER TILT Limits For Thermal Power $\leq$ 60%

For Operation from 0 EFPD to EOC

QUADRANT POWER TILT As Measured By:	STEADY-STATE LIMIT(%)	TRANSIENT LIMIT(%)	MAXIMUM LIMIT(%)
Symmetrical Incore Detector System	7.50	10.03	20.0
Power Range Channels	4.94	6.96	20.0
Minimum Incore Detector System	3.07	4.40	20.0
Measurement System Independent	8.58	11.07	20.0

QUADRANT POWER TILT Limits For Thermal Power > 60%

For Operation from 0 EFPD to EOC

QUADRANT POWER TILT As Measured By:	STEADY-STATE LIMIT(%)	TRANSIENT LIMIT(%)	MAXIMUM LIMIT(%)
Symmetrical Incore Detector System	4.53	10.03	20.0
Power Range Channels	1.96	6.96	20.0
Minimum Incore Detector System	1.90	4.40	20.0
Measurement System Independent	4.92	11.07	20.0

These limits are referred to by Technical Specification LCO 3.2.4

Power Peaking Factors

These Limits are referred to by Technical Specification LCO 3.2.5

Heat Flux Hot Channel Factor F_Q (for NAS)

F_Q shall be limited by the following relationships:

$F_Q \leq LHR^{allow}(Bu) / [LHR^{avg} * P]$ (for $P \leq 1.0$)

$LHR^{allow}(Bu)$ = See the following table

LHR^{avg} = 5.9535 kW/ft for Mark-B10ZL fuel

LHR^{avg} = 5.9476 kW/ft for Mark-B10E and Mk-B10I fuel

LHR^{avg} = 5.8533 kW/ft for Mark-B-HTP fuel

P = ratio of THERMAL POWER / RATED THERMAL POWER

Bu = fuel burnup (MWd/mtU)

CR-3 Cycle 14 Reload Allowable LHR Limits
Batch 16 (Mark-B-HTP) LHR^{allow}
Allowable Peak LHR for Specified Burnup, kW/ft

NAS Level	0-703 EFPD 15503 - 36971 MWd/mtU
1	15.3
2	15.6
3	16.2
4	16.2
5	16.4
6	16.2
7	15.6
8	15.4

This table is referred to by Technical Specification LCO 3.2.5

Power Peaking Factors (Continued)

CR-3 Cycle 14 Reload Allowable LHR Limits
Batch 15B (Mark-B10E) LHR^{allow}
Allowable Peak LHR for Specified Burnup Range, kW/ft

NAS Level	0-471 EFPD 15503 – 29886 MWd/mtU	471-550 EFPD 29886 – 32299 MWd/mtU	550-600 EFPD 32299 – 33826 MWd/mtU	600-653 EFPD 33826 – 35445 MWd/mtU	653-703 EFPD 35445 – 36971 MWd/mtU
1	15.4	14.7	14.3	13.9	13.5
2	15.6	14.9	14.5	14.0	13.6
3	16.2	15.4	14.9	14.4	13.9
4	16.3	15.4	14.9	14.4	13.9
5	16.4	15.5	15.0	14.5	14.0
6	16.2	15.4	14.9	14.4	13.9
7	15.6	14.9	14.5	14.0	13.6
8	15.4	14.7	14.3	13.9	13.5

CR-3 Cycle 14 Reload Allowable LHR Limits
Batch 15 A, C, D, E (Mark-B10I) LHR^{allow}
Allowable Peak LHR for Specified Burnup Range, kW/ft

NAS Level	0-373 EFPD 15503 – 26893 MWd/mtU	373-500 EFPD 26893 – 30772 MWd/mtU	500-600 EFPD 30772 – 33826 MWd/mtU	600-653 EFPD 33826 – 35445 MWd/mtU	653-703 EFPD 35445 – 36971 MWd/mtU
1	15.4	14.3	13.5	13.0	12.6
2	15.6	14.4	13.6	13.1	12.6
3	16.2	14.8	13.8	13.3	12.8
4	16.3	14.9	13.8	13.3	12.8
5	16.4	15.0	13.9	13.4	12.9
6	16.2	14.8	13.8	13.3	12.8
7	15.6	14.4	13.6	13.1	12.6
8	15.4	14.3	13.5	13.0	12.6

These tables are referred to by Technical Specification. LCO 3.2.5

Power Peaking Factors (Continued)

CR-3 Cycle 14 Reload Allowable LHR Limits
Batch 14B (Mark-B10E) & Batch 14C (Mark-B10I) LHR^{allow}
Allowable Peak LHR for Specified Burnup Range, kW/ft

NAS Level	0-200 EFPD 15503 – 21610 MWd/mtU	200-400 EFPD 21610 – 27718 MWd/mtU	400-550 EFPD 27718 - 32299 MWd/mtU	550-653 EFPD 32299 – 35445 MWd/mtU	653-703 EFPD 35445 – 36971 MWd/mtU
1	13.4	13.1	12.9	12.8	12.7
2	13.5	13.2	13.0	12.8	12.7
3	13.7	13.4	13.2	13.0	12.9
4	13.7	13.4	13.2	13.0	12.9
5	13.8	13.5	13.3	13.1	13.0
6	13.7	13.5	13.2	13.0	12.9
7	13.5	13.2	13.0	12.8	12.7
8	13.4	13.1	12.9	12.8	12.7

CR-3 Cycle 14 Reload Allowable LHR Limits
Batch 12A4 (Mark-B10ZL) LHR^{allow}
Allowable Peak LHR for Specified Burnup Range, kW/ft

NAS Level	0-93 EFPD 15503 – 18343 MWd/mtU	93-300 EFPD 18343 – 24664 MWd/mtU	300-500 EFPD 24664 – 30772 MWd/mtU	500-653 EFPD 30772 – 35445 MWd/mtU	653-703 EFPD 35445 – 36971 MWd/mtU
1	15.4	14.9	14.3	13.6	13.3
2	15.6	15.1	14.4	13.7	13.4
3	16.2	15.6	14.8	14.0	13.7
4	16.3	15.7	14.9	14.0	13.7
5	16.4	15.8	15.0	14.1	13.8
6	16.2	15.6	14.8	14.0	13.7
7	15.6	15.1	14.4	13.7	13.4
8	15.4	14.9	14.3	13.6	13.3

These tables are referred to by Technical Specification LCO 3.2.5

Power Peaking Factors (Continued)

This Limit is referred to by Technical Specification LCO 3.2.5

Enthalpy Rise Hot Channel Factor $F^N_{\Delta H}$ (for NAS)

$F^N_{\Delta H} \leq ARP\ [1 + (1/RH)(1- P/P_m)]$

ARP = Allowable Radial Peak, See the following table

P = ratio of THERMAL POWER / RATED THERMAL POWER and $P \leq 1.0$

P_m = 1.0 for 4-RCP operation

P_m = 0.75 for 3-RCP operation

RH = 3.34

Cycle 14 Allowable Radial Peaks (ARP)

Axial Peak	Axial Location[1] (X/L)	ARP	Axial Peak	Axial Location[1] (X/L)	ARP
1.1	0.00	1.9281	1.5	0.00	1.9790
1.1	0.10	1.9264	1.5	0.10	1.9041
1.1	0.14	1.9262	1.5	0.14	1.8847
1.1	0.20	1.9254	1.5	0.20	1.9034
1.1	0.40	1.9240	1.5	0.40	1.9694
1.1	0.60	1.9229	1.5	0.60	1.8275
1.1	0.80	1.9224	1.5	0.80	1.6786
1.1	0.88	1.9000	1.5	0.88	1.6328
1.1	0.90	1.8798	1.5	0.90	1.6358
1.1	1.00	1.8000	1.5	1.00	1.5712
1.2	0.00	2.0085	1.7	0.00	1.7737
1.2	0.10	2.0050	1.7	0.10	1.6867
1.2	0.14	2.0046	1.7	0.14	1.6635
1.2	0.20	2.0035	1.7	0.20	1.6795
1.2	0.40	2.0008	1.7	0.40	1.7622
1.2	0.60	1.9993	1.7	0.60	1.6947
1.2	0.80	1.8783	1.7	0.80	1.5617
1.2	0.88	1.8304	1.7	0.88	1.5218
1.2	0.90	1.8185	1.7	0.90	1.5308
1.2	1.00	1.7394	1.7	1.00	1.4687
1.3	0.00	2.0936	1.9	0.00	1.6083
1.3	0.10	2.0878	1.9	0.10	1.5149
1.3	0.14	2.0874	1.9	0.14	1.4891
1.3	0.20	2.0858	1.9	0.20	1.5027
1.3	0.40	2.0827	1.9	0.40	1.5812
1.3	0.60	1.9721	1.9	0.60	1.5791
1.3	0.80	1.8095	1.9	0.80	1.4620
1.3	0.88	1.7599	1.9	0.88	1.4259
1.3	0.90	1.7547	1.9	0.90	1.4364
1.3	1.00	1.6824	1.9	1.00	1.3811

[1]Based on an active core height of 143.0 inches. Linear interpolation is acceptable.

Reactor Protection System (RPS) Instrumentation

RCS Variable Low Pressure Setpoint Equation

$P_{Trip} \geq (11.59 * T_{HOT} - 5037.8)$ psig

This limit is referred to by
ITS Table 3.3.1-1, Item 5

RCS DNB Pressure Limits

RCS loop pressure ≥ 2064 psig

(Assumes 20% tube plugging and bounds either four or three RCPs operating).

These limits are referred to by SR 3.4.1.1

RCS DNB Temperature Limit

RCS Hot Leg Temperature ≤ 605.8°F

(Assumes 20% OTSG tube plugging).

These limits are referred to by SR 3.4.1.2

RCS DNB Flow Rate Limits

RCS total flow rate ≥ 133.5 E6 lb/hr with four RCPs operating, or ≥ 99.7 E6 lb/hr with three RCPs operating.

(Assumes 20% OTSG tube plugging).

These limits are referred to by SR 3.4.1.3

Refueling Boron Concentration

The boron concentration must be greater than 2860 ppmB.

The value includes 1%Δk/k for uncertainties and is based on a 685 EFPD cycle 13. The refueling boron concentration must be increased by 2 ppm for each EFPD that the cycle 13 length is less than 685 EFPD, and 1 ppm/EFPD may be deducted for each EFPD that the cycle 13 length is more than 685 EFPD.

This limit is referred to by Technical Specification LCO 3.9.1

Revision History

Revision 0 – October 2003; Original Cycle 14 COLR.

Revision 1 – October 2003; Cycle 14 COLR update to implementation of Licensing Condition 2.C.(12) allowing entry into Mode 2.