Progress Energy

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

Ref: ITS 5.6.2.18(d)

November 29, 2009
3F1109-10

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

Subject: Crystal River Unit 3 – Core Operating Limits Report, Cycle 17, Revision 0

Dear Sir:

Florida Power Corporation (FPC), doing business as Progress Energy Florida, Inc., hereby submits the Crystal River Unit 3 - Core Operating Limits Report, Cycle 17, Revision 0, as required by Improved Technical Specifications (ITS) 5.6.2.18(d).

This correspondence contains no new regulatory commitments.

If you have any questions regarding this submittal, please contact Mr. Dan Westcott, Superintendent, Licensing and Regulatory Programs at (352) 563-4796.

Sincerely,

Stephen J. Cahill
Engineering Manager
Crystal River Nuclear Plant

SJC/pdk

Attachment: Core Operating Limits Report, Cycle 17, Revision 0

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

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

A001
NRR

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET Number 50-302 /License Number DPR-72

ATTACHMENT

Cycle 17
Core Operating Limits Report
Revision 0

Progress Energy - Florida
Crystal River Unit 3

Cycle 17
Core Operating Limits Report
Revision 0

Referencing
Improved Technical Specifications

1.0 Core Operating Limits

The analytical methods used to determine the core protective and operating limits shall be those previously reviewed and approved by the NRC. These methods are documented in the following topical reports and Technical Specification Amendments:

Safety Criteria and Methodology for Acceptable Cycle Reload Analyses, BAW-10179P-A, Rev. 7, AREVA NP, Lynchburg, Virginia, January 2008.

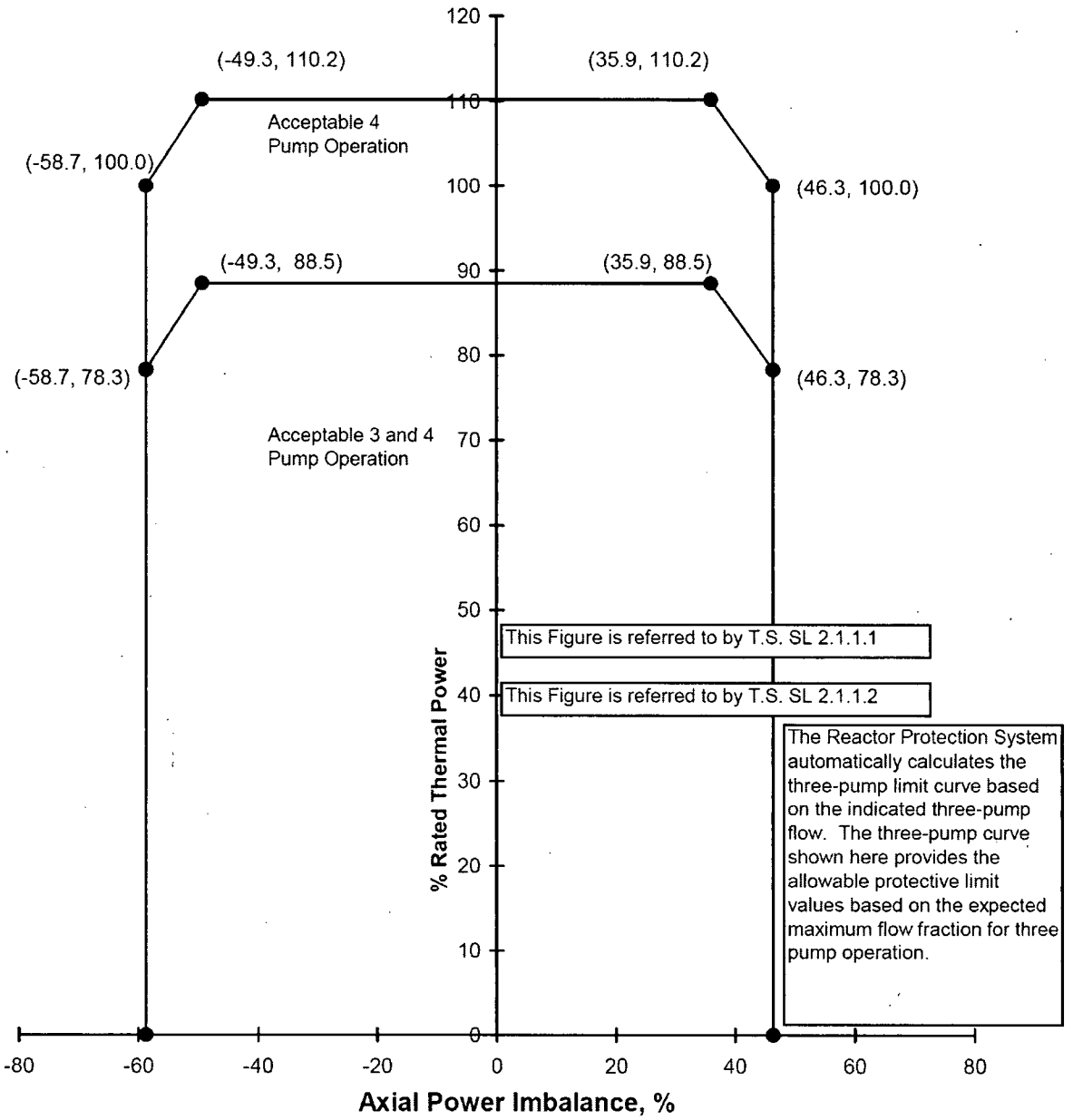
"Crystal River Unit 3 - Issuance of Amendment Re Dual Channel Control Rod Position Indication (TAC No M82990)," Licensing Amendment No 144, letter from H Silver to P M Beard, June 25, 1992.

The Cycle 17 limits generated using the methodologies above are documented in ANP-2842 Rev. 0, "Crystal River Unit 3 Cycle 17 Reload Report", dated October 2009.

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
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	Reactor Coolant System Pressure DNB Limits
SR 3.4.1.2	Reactor Coolant System Temperature DNB Limits
SR 3.4.1.3	Reactor Coolant System Flow DNB Limits
LCO 3.9.1	Boron Concentration

AXIAL POWER IMBALANCE Protective Limits – 2609 MWt



SHUTDOWN MARGIN

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

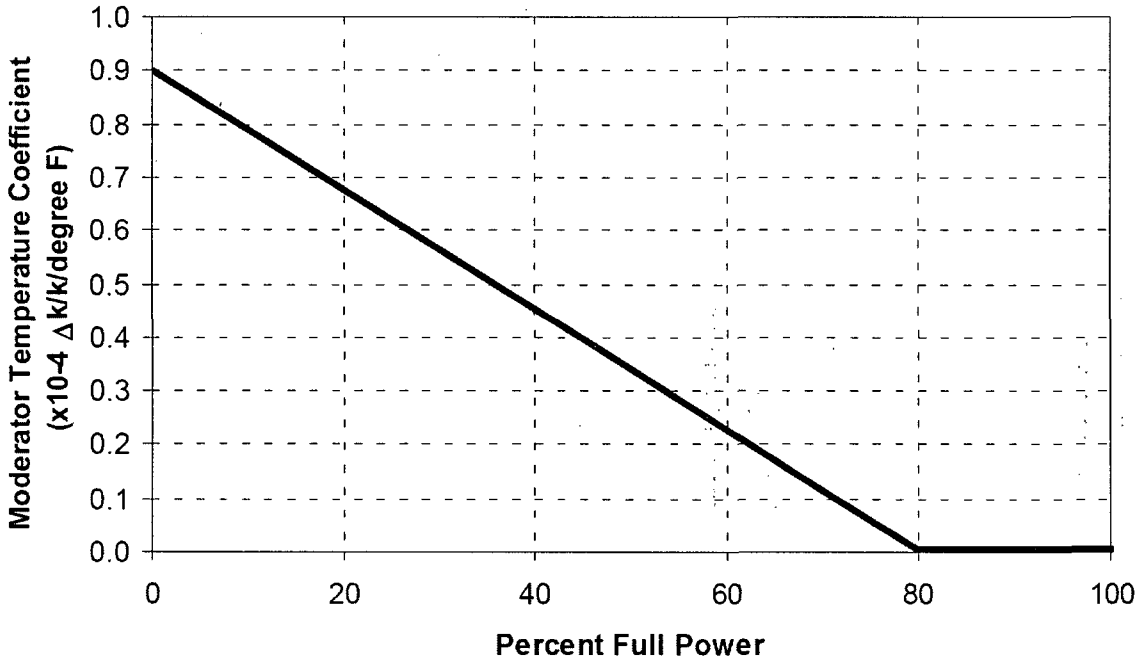
Reference: Improved Technical Specification Bases B3.1.1.

Moderator Temperature Coefficient Limit (MTC)

Lower Limit
MTC at HFP > -3.51×10^{-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

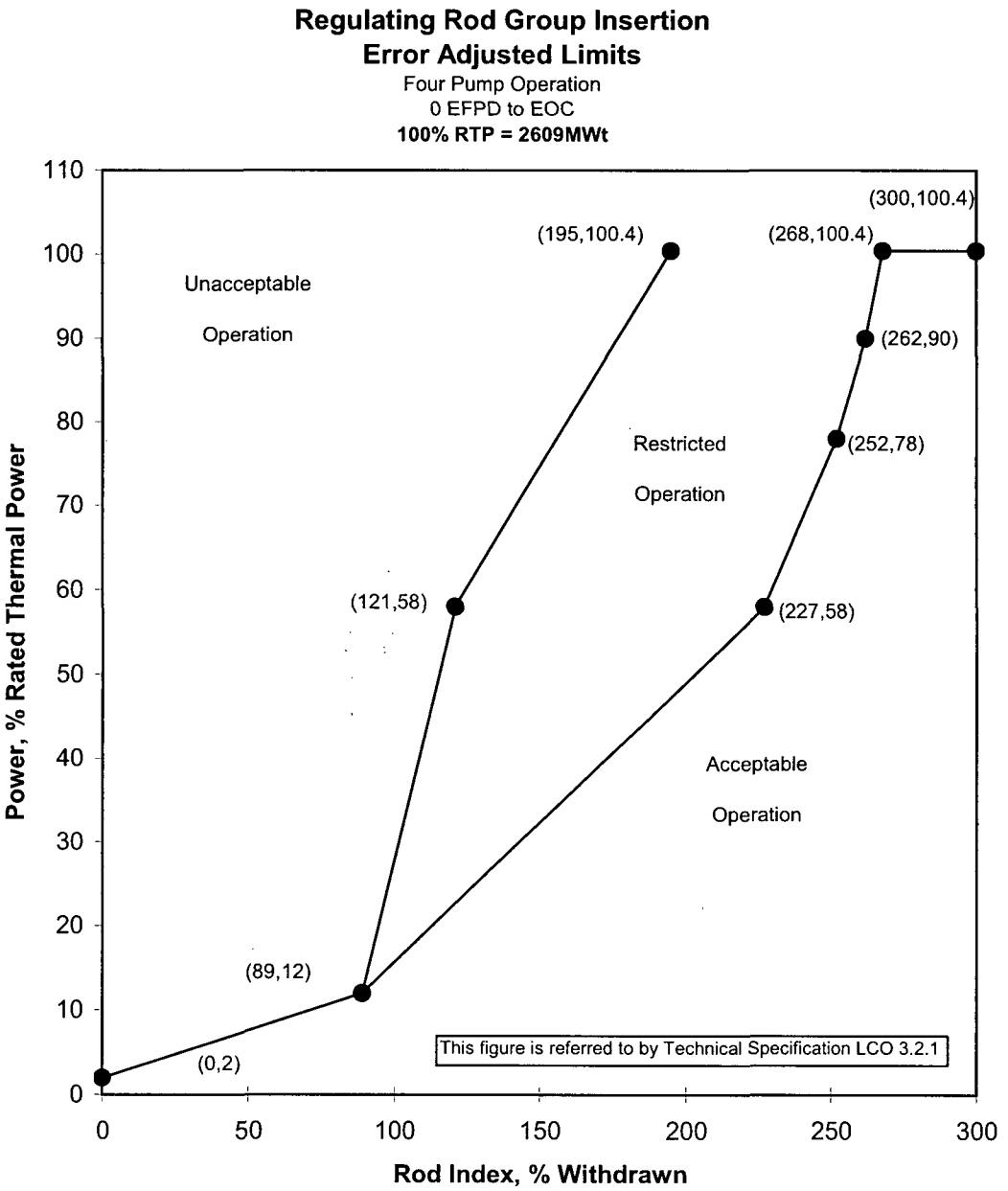
3.5% when the comparison is performed using the panel meters on the main control board.

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.

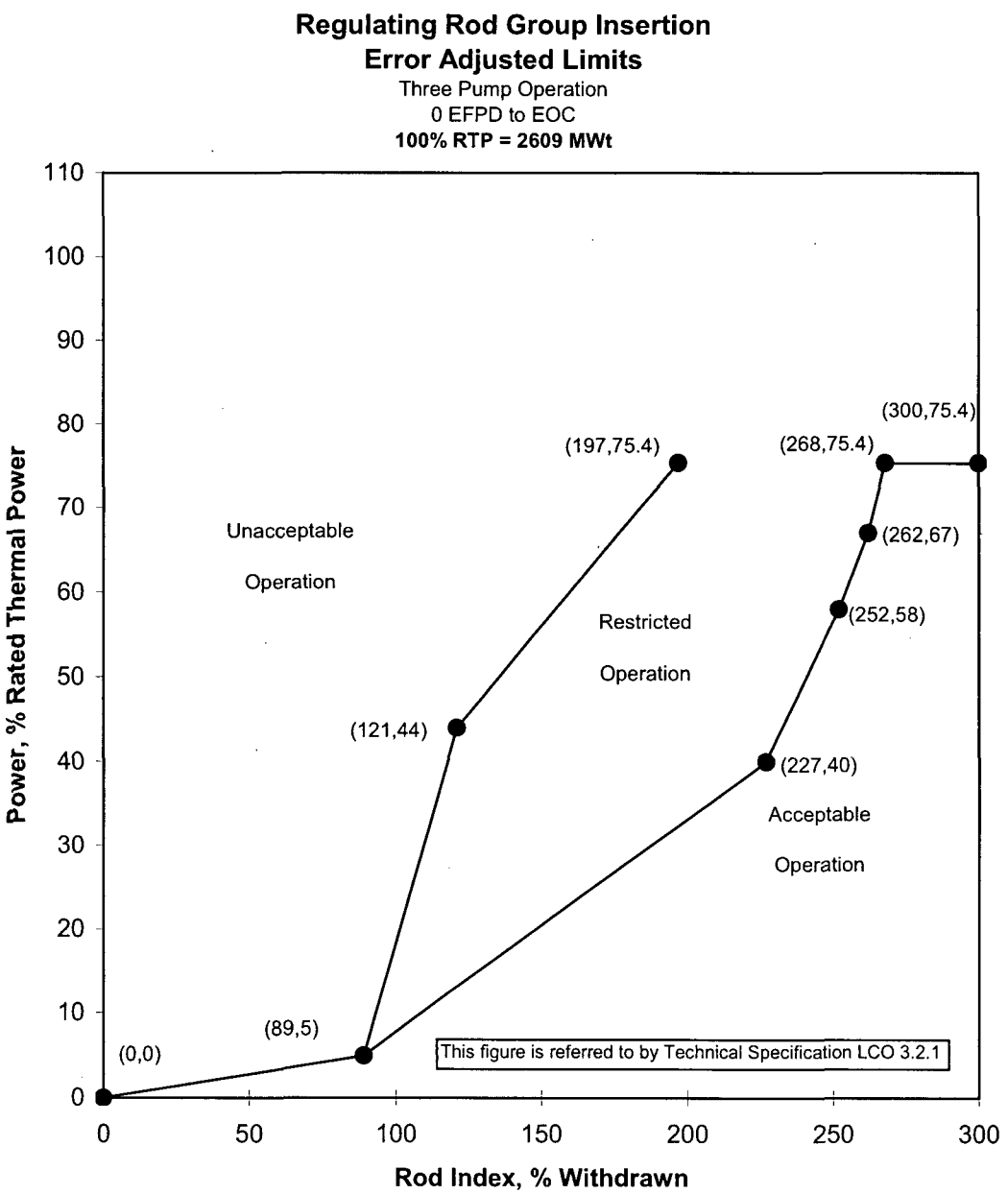
Note 1 If the plant computer is not available, then the following meter models are approved for use: Keithley 2001, Keithley 197, Keithley 197A (Ref. EC 61264).

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.

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.

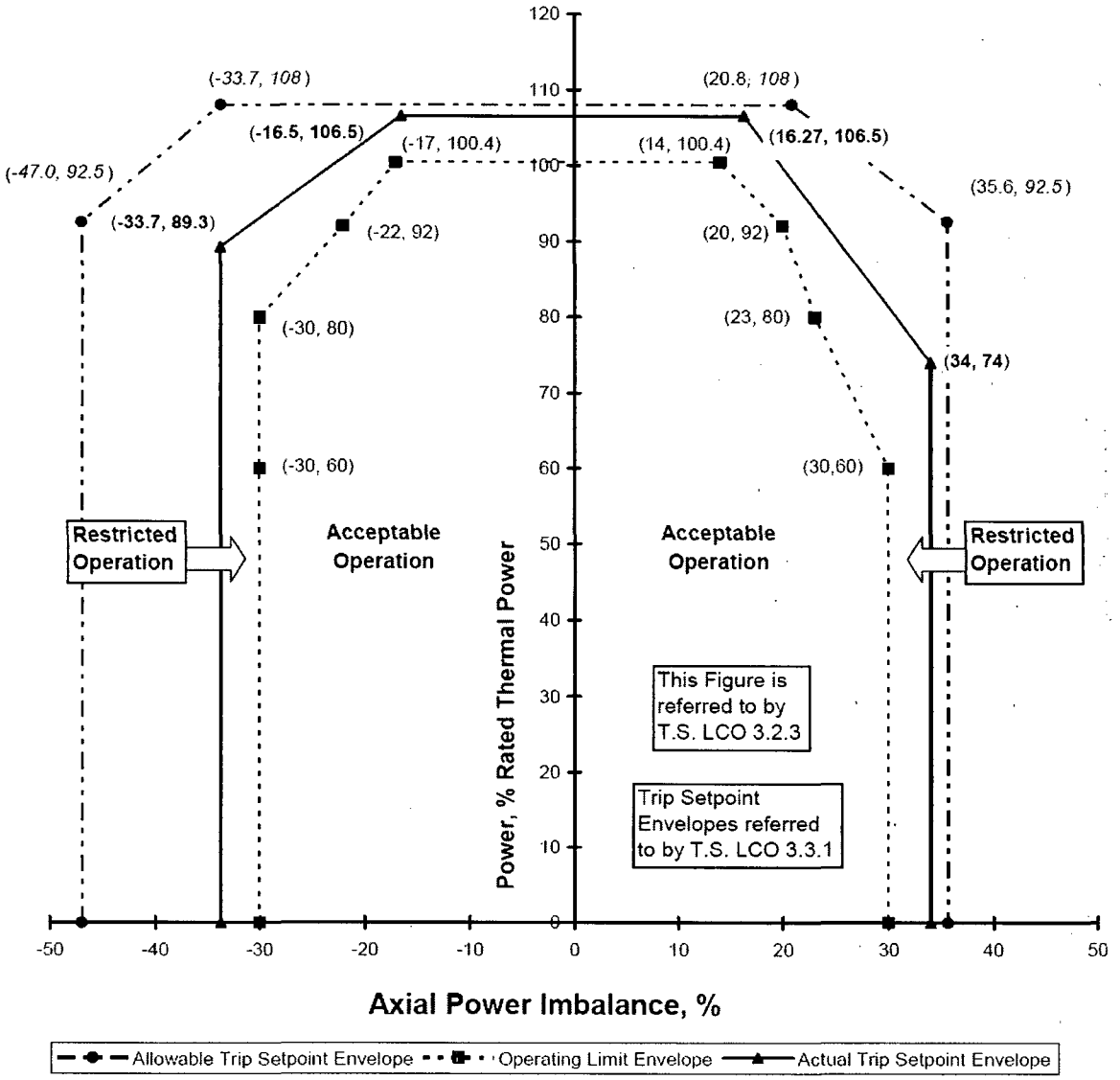
AXIAL POWER SHAPING ROD (APSR) Insertion Limits

The Axial Power Shaping Rods (APSRs) shall be inserted at the initial startup following fuel reload and may be positioned as necessary during the Power Imbalance Detector Correlation (PIDC) test. The APSRs shall be fully withdrawn from the core before exceeding 4 EFPD and prior to thermal power escalation above 80% RTP. Once the APSR pull maneuver has been completed, the APSRs shall not be inserted for the remainder of the fuel cycle during normal operation.

These limits are referred to by Technical Specification LCO 3.2.2

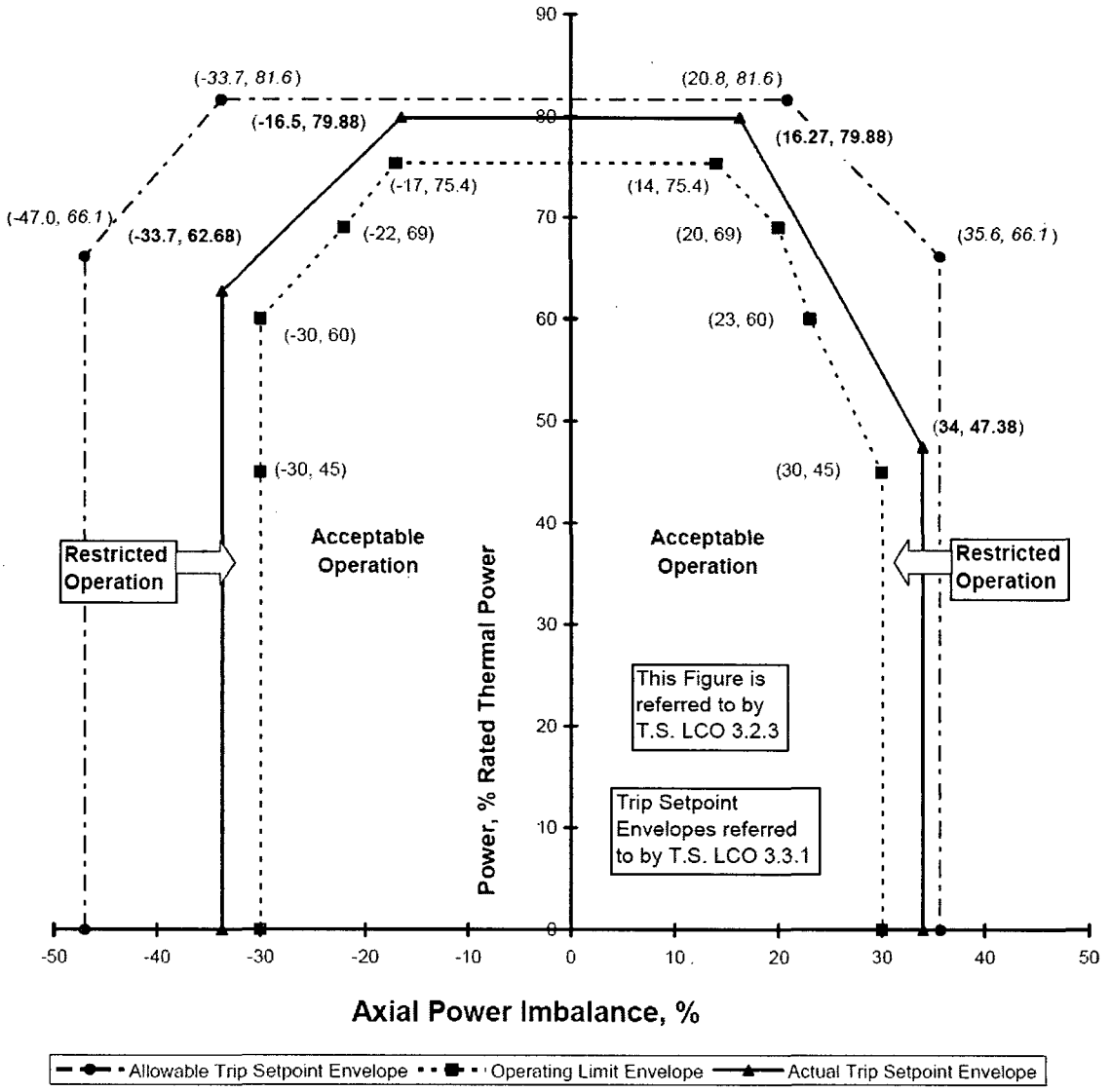
AXIAL POWER IMBALANCE Operating Limits

Axial Power Imbalance Error Adjusted
Operating Limit and Trip Setpoint Envelopes
Four Pump Operation
0 EFPD to EOC
100% RTP = 2609 MWt



AXIAL POWER IMBALANCE Operating Limits (Continued)

Axial Power Imbalance Error Adjusted
Operating Limit and Trip Setpoint Envelopes
Three Pump Operation
0 EFPD to EOC
100% RTP = 2609 MWt



QUADRANT POWER TILT

QUADRANT POWER TILT Limits For Thermal Power ≤ 60%

For Operation from 0 EFPD to EOC
100%RTP = 2609 MWt

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	2.42(a)	4.40	20.0
Measurement System Independent	8.58	11.07	20.0

(a) The limit may be increased to 3.07% if the individual SPNDs affecting the minimum incore tilt calculation have not exceeded 73% depletion.

These limits are referred to by
Technical Specification LCO 3.2.4

QUADRANT POWER TILT (Continued)

QUADRANT POWER TILT Limits For Thermal Power > 60%

For Operation from 0 EFPD to EOC
100%RTP = 2609 MWt

QUADRANT POWER TILT As Measured By:	STEADY-STATE LIMIT(%)	TRANSIENT LIMIT(%)	MAXIMUM LIMIT(%)
Symmetrical Incore Detector System	3.90	10.03	20.0
Power Range Channels	1.96	6.96	20.0
Minimum Incore Detector System	1.50(b)	4.40	20.0
Measurement System Independent	4.92	11.07	20.0

(b) The limit may be increased to 1.90% if the individual SPNDs affecting the minimum incore tilt calculation have not exceeded 73% depletion.

These limits are referred to by
Technical Specification LCO 3.2.4

Power Peaking Factors for FIDMS

These Limits are referred to by Technical Specification LCO 3.2.5

Heat Flux Hot Channel Factor F_Q

100%RTP = 2609 MWt

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} = 5.9468 kW/ft for Batch 16C Mark-B-HTP fuel

LHR^{avg} = 5.9572 kW/ft for Batch 17B, 17C2, and 17D2 Mark-B-HTP fuel

LHR^{avg} = 5.9468 kW/ft for Batch 18 Mark-B-HTP fuel

LHR^{avg} = 5.9468 kW/ft for Batch 19 Mark-B-HTP fuel

P = ratio of THERMAL POWER / RATED THERMAL POWER

Bu = fuel burnup (MWd/mtU)

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 16C (Mark-B-HTP) UO_2 Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	16.0	16.0	14.3
2.506	16.9	16.9	14.3
4.264	17.0	16.5	14.3
6.021	17.3	17.3	14.3
7.779	17.3	17.3	14.3
9.536	17.0	17.0	14.3
12.000	16.1	16.1	14.3

This table is referred to by Technical Specification LCO 3.2.5

Power Peaking Factors (Continued)

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 17B,C2,D2 (Mark-B-HTP) UO_2 Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	16.0	16.0	14.3
2.506	16.9	16.9	14.3
4.264	17.0	16.5	14.3
6.021	17.3	17.3	14.3
7.779	17.3	17.3	14.3
9.536	17.0	17.0	14.3
12.000	16.1	16.1	14.3

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 18 (Mark-B-HTP) UO_2 Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup Range, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	16.0	16.0	14.3
2.506	16.9	16.9	14.3
4.264	17.0	16.5	14.3
6.021	17.3	17.3	14.3
7.779	17.3	17.3	14.3
9.536	17.0	17.0	14.3
12.000	16.1	16.1	14.3

These tables are referred to by Technical Specification. LCO 3.2.5

Power Peaking Factors (Continued)

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 19 (Mark-B-HTP) UO_2 Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	15.9	15.9	14.3
2.506	16.8	16.8	14.3
4.264	16.9	16.4	14.3
6.021	17.3	17.3	14.3
7.779	17.3	17.3	14.3
9.536	17.0	17.0	14.3
12.000	16.1	16.1	14.3

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 17 (Mark-B-HTP) 2 wt% Gadolinia Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup Range, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	14.9	14.9	12.2
2.506	15.7	15.7	12.2
4.264	15.8	15.4	12.2
6.021	16.0	16.0	12.2
7.779	16.0	16.0	12.2
9.536	15.8	15.8	12.2
12.000	15.0	15.0	12.2

These tables are referred to by Technical Specification. LCO 3.2.5

Power Peaking Factors (Continued)

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 17 (Mark-B-HTP) 6 wt% Gadolinia Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	14.0	14.0	11.8
2.506	14.8	14.8	11.8
4.264	14.9	14.5	11.8
6.021	15.2	15.2	11.8
7.779	15.2	15.2	11.8
9.536	14.9	14.9	11.8
12.000	14.1	14.1	11.8

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 17 (Mark-B-HTP) 8 wt% Gadolinia Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup Range, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	13.5	13.5	11.1
2.506	14.3	14.3	11.1
4.264	14.4	14.0	11.1
6.021	14.7	14.7	11.1
7.779	14.7	14.7	11.1
9.536	14.4	14.4	11.1
12.000	13.6	13.6	11.1

These tables are referred to by Technical Specification. LCO 3.2.5

Power Peaking Factors (Continued)

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 18 (Mark-B-HTP) 3 wt% Gadolinia Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	14.9	14.9	12.2
2.506	15.7	15.7	12.2
4.264	15.8	15.4	12.2
6.021	16.0	16.0	12.2
7.779	16.0	16.0	12.2
9.536	15.8	15.8	12.2
12.000	15.0	15.0	12.2

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 18 (Mark-B-HTP) 6 wt% Gadolinia Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup Range, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	14.0	14.0	11.8
2.506	14.8	14.8	11.8
4.264	14.9	14.5	11.8
6.021	15.2	15.2	11.8
7.779	15.2	15.2	11.8
9.536	14.9	14.9	11.8
12.000	14.1	14.1	11.8

These tables are referred to by Technical Specification. LCO 3.2.5

Power Peaking Factors (Continued)

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 18 (Mark-B-HTP) 8 wt% Gadolinia Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	13.5	13.5	11.1
2.506	14.3	14.3	11.1
4.264	14.4	14.0	11.1
6.021	14.7	14.7	11.1
7.779	14.7	14.7	11.1
9.536	14.4	14.4	11.1
12.000	13.6	13.6	11.1

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 19 (Mark-B-HTP) 3 wt% Gadolinia Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup Range, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	14.8	14.8	12.2
2.506	15.6	15.6	12.2
4.264	15.7	15.3	12.2
6.021	16.0	16.0	12.2
7.779	16.0	16.0	12.2
9.536	15.8	15.8	12.2
12.000	15.0	15.0	12.2

These tables are referred to by Technical Specification. LCO 3.2.5

Power Peaking Factors (Continued)

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 19 (Mark-B-HTP) 6 wt% Gadolinia Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	13.9	13.9	11.8
2.506	14.7	14.7	11.8
4.264	14.8	14.4	11.8
6.021	15.2	15.2	11.8
7.779	15.2	15.2	11.8
9.536	14.9	14.9	11.8
12.000	14.1	14.1	11.8

CR-3 Cycle 17 Reload Allowable LHR Limits
Batch 19 (Mark-B-HTP) 8 wt% Gadolinia Fuel LHR^{allow}
Allowable Peak LHR for Specified Burnup, kW/ft

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	13.4	13.4	11.1
2.506	14.2	14.2	11.1
4.264	14.3	13.9	11.1
6.021	14.7	14.7	11.1
7.779	14.7	14.7	11.1
9.536	14.4	14.4	11.1
12.000	13.6	13.6	11.1

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 $F^N_{\Delta H}$

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

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

1/RH = 0.3

Cycle 17 Allowable Radial Peaks (ARP)

Axial Peak	Axial Location (X/L)	ARP[1]	Axial Peak	Axial Location (X/L)	ARP[1]	Axial Peak	Axial Location (X/L)	ARP[1]
1.1	0.01	1.9292	1.4	0.01	2.1798	1.7	0.01	1.9723
1.1	0.14	1.9287	1.4	0.14	2.1798	1.7	0.14	1.9723
1.1	0.2	1.9284	1.4	0.2	2.1798	1.7	0.2	1.9392
1.1	0.3	1.9278	1.4	0.3	2.1162	1.7	0.3	1.8853
1.1	0.4	1.9271	1.4	0.4	2.0509	1.7	0.4	1.8194
1.1	0.5	1.9266	1.4	0.5	1.9779	1.7	0.5	1.7658
1.1	0.6	1.9258	1.4	0.6	1.8969	1.7	0.6	1.6942
1.1	0.7	1.9254	1.4	0.7	1.8263	1.7	0.7	1.6361
1.1	0.8	1.9248	1.4	0.8	1.7407	1.7	0.8	1.5606
1.1	0.89	1.8866	1.4	0.89	1.6847	1.7	0.89	1.5170
1.1	0.99	1.7941	1.4	0.99	1.6141	1.7	0.99	1.4608
1.2	0.01	2.0160	1.5	0.01	2.1798	1.8	0.01	1.8927
1.2	0.14	2.0148	1.5	0.14	2.1467	1.8	0.14	1.8927
1.2	0.2	2.0141	1.5	0.2	2.1100	1.8	0.2	1.8598
1.2	0.3	2.0128	1.5	0.3	2.0385	1.8	0.3	1.8142
1.2	0.4	2.0109	1.5	0.4	1.9680	1.8	0.4	1.7524
1.2	0.5	2.0103	1.5	0.5	1.9053	1.8	0.5	1.7012
1.2	0.6	2.0092	1.5	0.6	1.8262	1.8	0.6	1.6346
1.2	0.7	1.9600	1.5	0.7	1.7594	1.8	0.7	1.5792
1.2	0.8	1.8745	1.5	0.8	1.6766	1.8	0.8	1.5092
1.2	0.89	1.8191	1.5	0.89	1.6259	1.8	0.89	1.4683
1.2	0.99	1.7304	1.5	0.99	1.5625	1.8	0.99	1.4148
1.3	0.01	2.1110	1.6	0.01	2.1352	1.9	0.01	1.8163
1.3	0.14	2.1091	1.6	0.14	2.0562	1.9	0.14	1.8163
1.3	0.2	2.1082	1.6	0.2	2.0239	1.9	0.2	1.7858
1.3	0.3	2.1062	1.6	0.3	1.9604	1.9	0.3	1.7424
1.3	0.4	2.1045	1.6	0.4	1.8919	1.9	0.4	1.6880
1.3	0.5	2.0476	1.6	0.5	1.8341	1.9	0.5	1.6395
1.3	0.6	1.9701	1.6	0.6	1.7578	1.9	0.6	1.5789
1.3	0.7	1.8954	1.6	0.7	1.6952	1.9	0.7	1.5276
1.3	0.8	1.8068	1.6	0.8	1.6166	1.9	0.8	1.4620
1.3	0.89	1.7499	1.6	0.89	1.5695	1.9	0.89	1.4230
1.3	0.99	1.6713	1.6	0.99	1.5100	1.9	0.99	1.3725

[1]These limits have been increased to reflect the 3.8% peaking uncertainty treated by Statistical Core Design (SCD).

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

Reactor Coolant System 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

Reactor Coolant System DNB Temperature Limit

RCS Hot Leg Temperature $\leq 605.8^{\circ}F$

(Assumes 20% OTSG tube plugging).

These limits are referred to by SR 3.4.1.2

Reactor Coolant System 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 Mode 6 refueling boron concentration must be greater than **2906 ppmB** prior to core alterations that include the introduction of any fuel assemblies not present in the cycle 16 core, subject to the following:

1) must be corrected for the actual expected ^{10}B isotopic atom percent if less than the basis of 19.8 ^{10}B isotopic atom percent;

2) no allowance is included for intermediate core locations;

3) control rod assemblies and APSRs do not affect the required refueling boron concentration.

This limit is referred to by
Technical Specification
LCO 3.9.1

Revision History

Revision 0 – October 2009; Original Cycle 17 COLR.