



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

Ref: ITS 5.6.2.18(d)

September 16, 2009  
3F0909-01

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

Subject: Crystal River Unit 3 – Core Operating Limits Report, Cycle 16, Revision 4

- References:
1. Crystal River Unit 3 to NRC letter 3F1107-07, "Crystal River Unit 3 – Core Operating Limits Report, Cycle 16, Revision 0 and Revision 1," dated November 28, 2007
  2. Crystal River Unit 3 to NRC letter 3F0108-15, "Crystal River Unit 3 – Core Operating Limits Report, Cycle 16, Revision 2," dated January 23, 2008
  3. Crystal River Unit 3 to NRC letter 3F1208-03, "Crystal River Unit 3 – Core Operating Limits Report, Cycle 16, Revision 3," dated December 10, 2008

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 16, Revision 4, 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, Supervisor, 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 16, Revision 4

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

Ad  
NRR

**PROGRESS ENERGY FLORIDA, INC.**

**CRYSTAL RIVER UNIT 3**

**DOCKET Number 50-302 /License Number DPR-72**

**ATTACHMENT**

**Cycle 16**  
**Core Operating Limits Report**  
**Revision 4**

Progress Energy - Florida  
Crystal River Unit 3

Cycle 16  
**Core Operating Limits Report**  
Revision 4

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. 6, Framatome-ANP, Lynchburg, Virginia, August 2005.

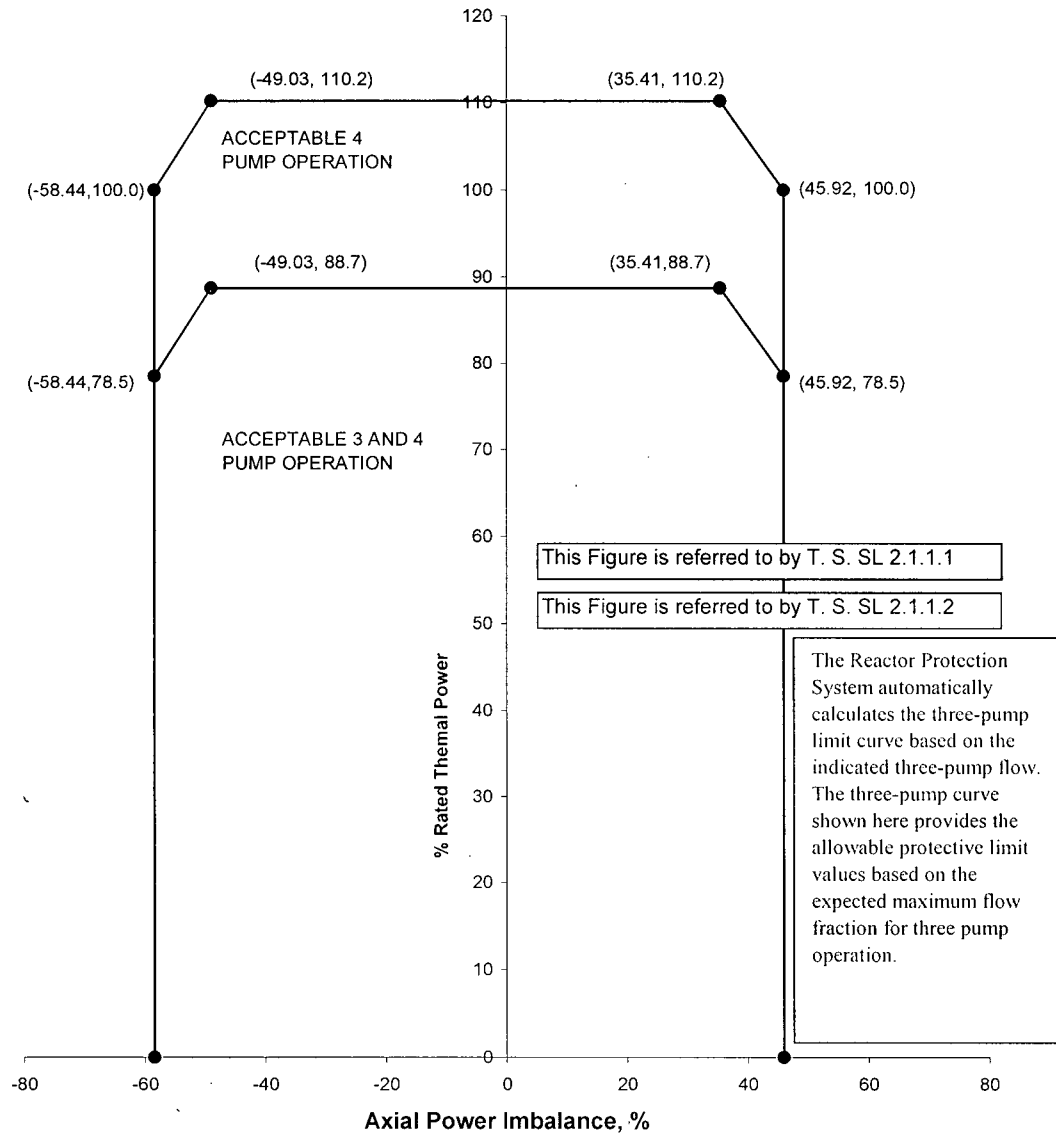
"Crystal River Unit 3 - Issuance of Amendment Re Dual Channel Control Rod Position Indication (TAC No M82990)," Licensing Amendment No 144, letter from H Silver to P M Beard, June 25, 1992.

The Cycle 16 limits generated using the methodologies above are documented in ANP-2651 Rev. 0, "Crystal River Unit 3 Cycle 16 Reload Report", dated August 2007.

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% $\Delta k/k$  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     $SDM \geq 1.0\% \Delta k/k$

These limits are referred to by Technical Specification LCO 3.1.1
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Reference: Improved Technical Specification Bases B3.1.1.

**Moderator Temperature Coefficient Limit (MTC)**

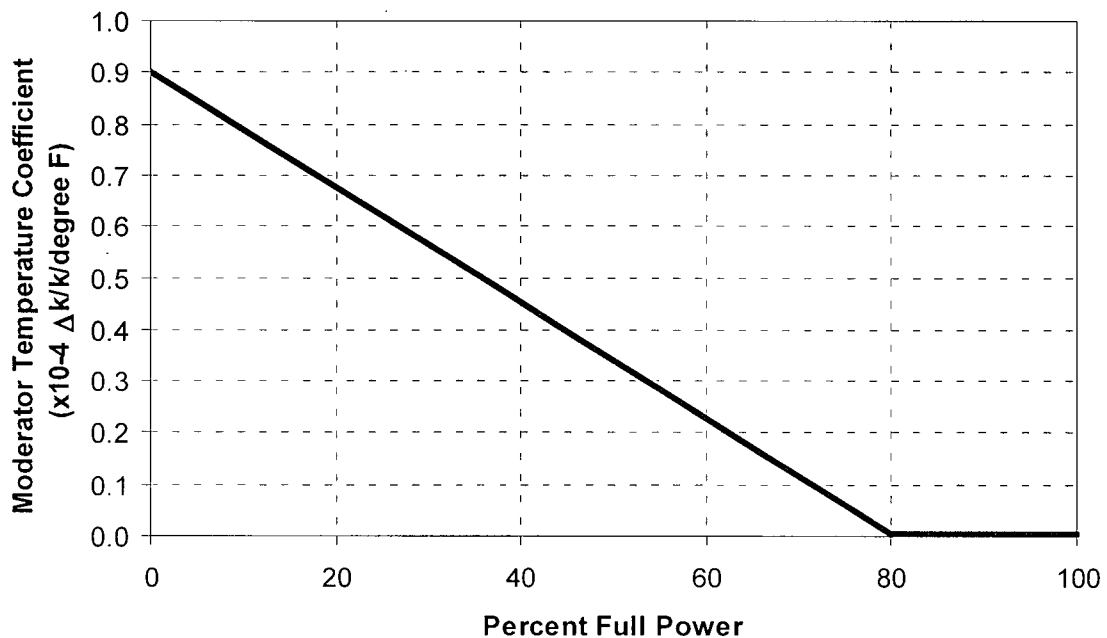
Lower Limit

MTC at HFP >  $-3.58 \times 10^{-4} \Delta k/k/^{\circ}F$

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.

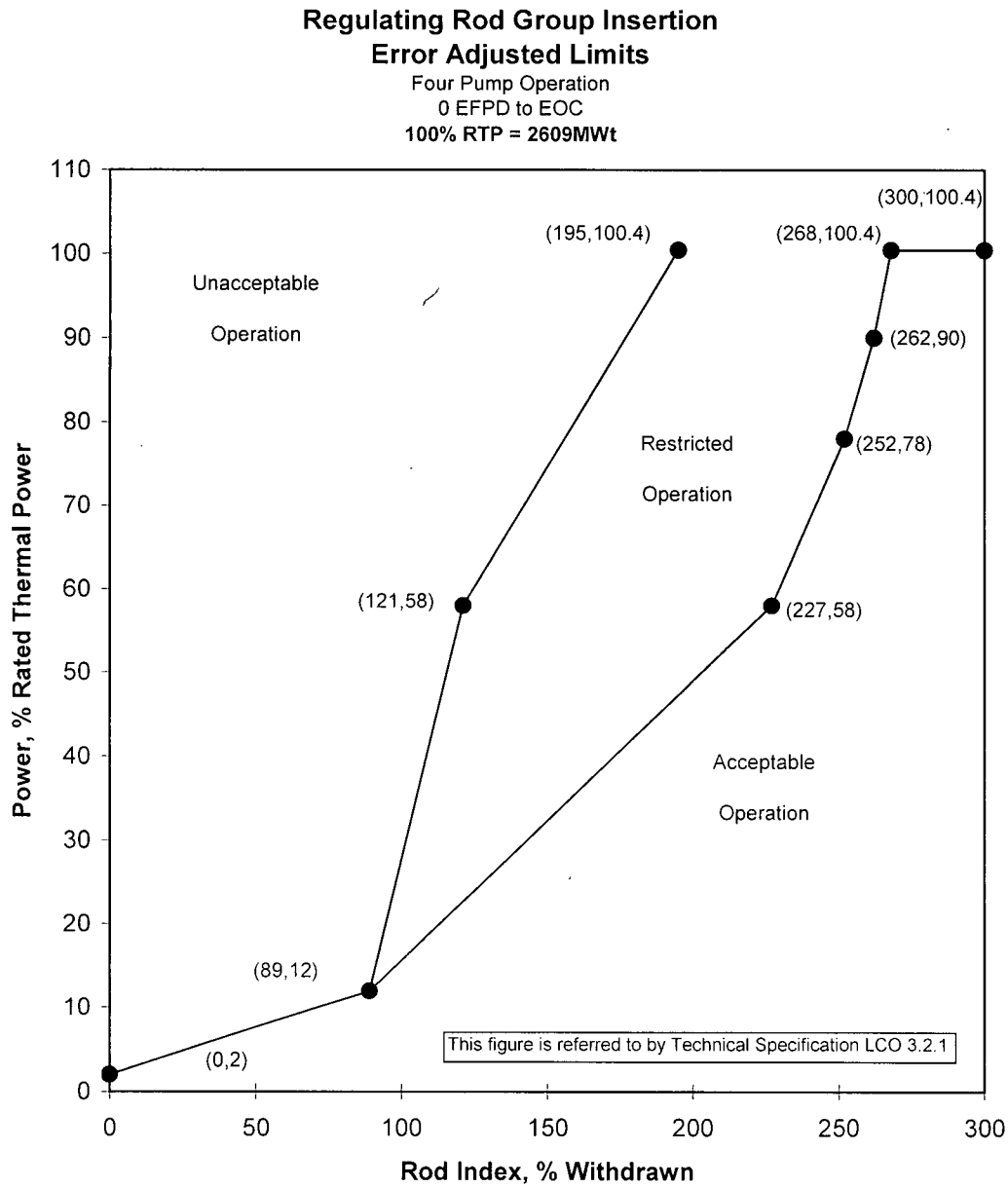
These limits are referred to by Technical Specification SR 3.1.7.1
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Reference: "Crystal River Unit 3 – Issuance of Amendment Re: Dual Channel Control Rod Position Indication (TAC No. M82990)", Licensing Amendment No. 144, Letter from H.S. Silver to P.M. Beard, June 25, 1992.

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).

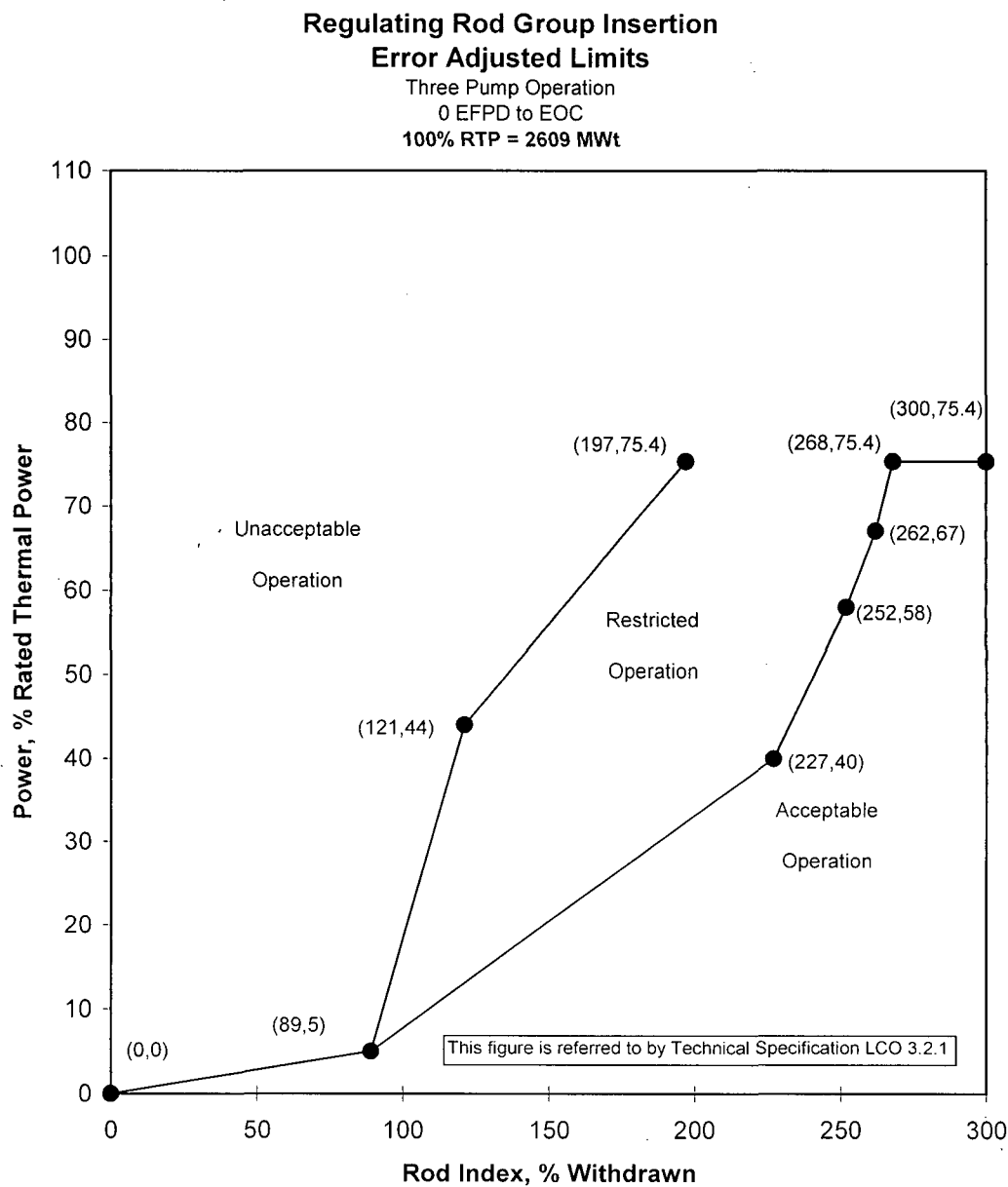


**Regulating Rod Insertion Limits**



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**

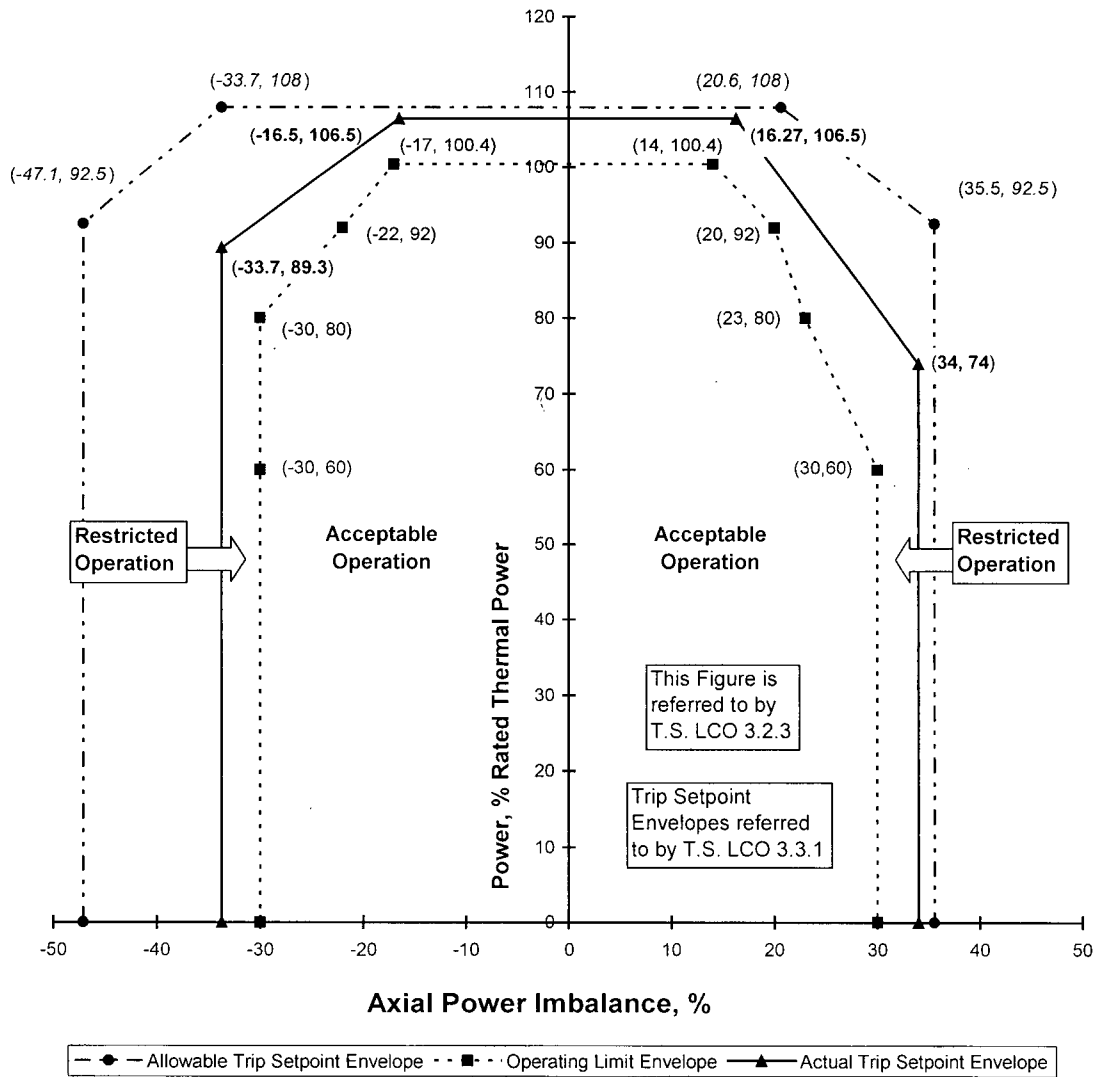
The Axial Power Shaping Rods (APSRs) shall be inserted at the initial startup following fuel reload and may be positioned as necessary during the Power Imbalance Detector Correlation (PIDC) test. The APSRs shall be fully withdrawn from the core before exceeding 4 EFPD and prior to thermal power escalation 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**

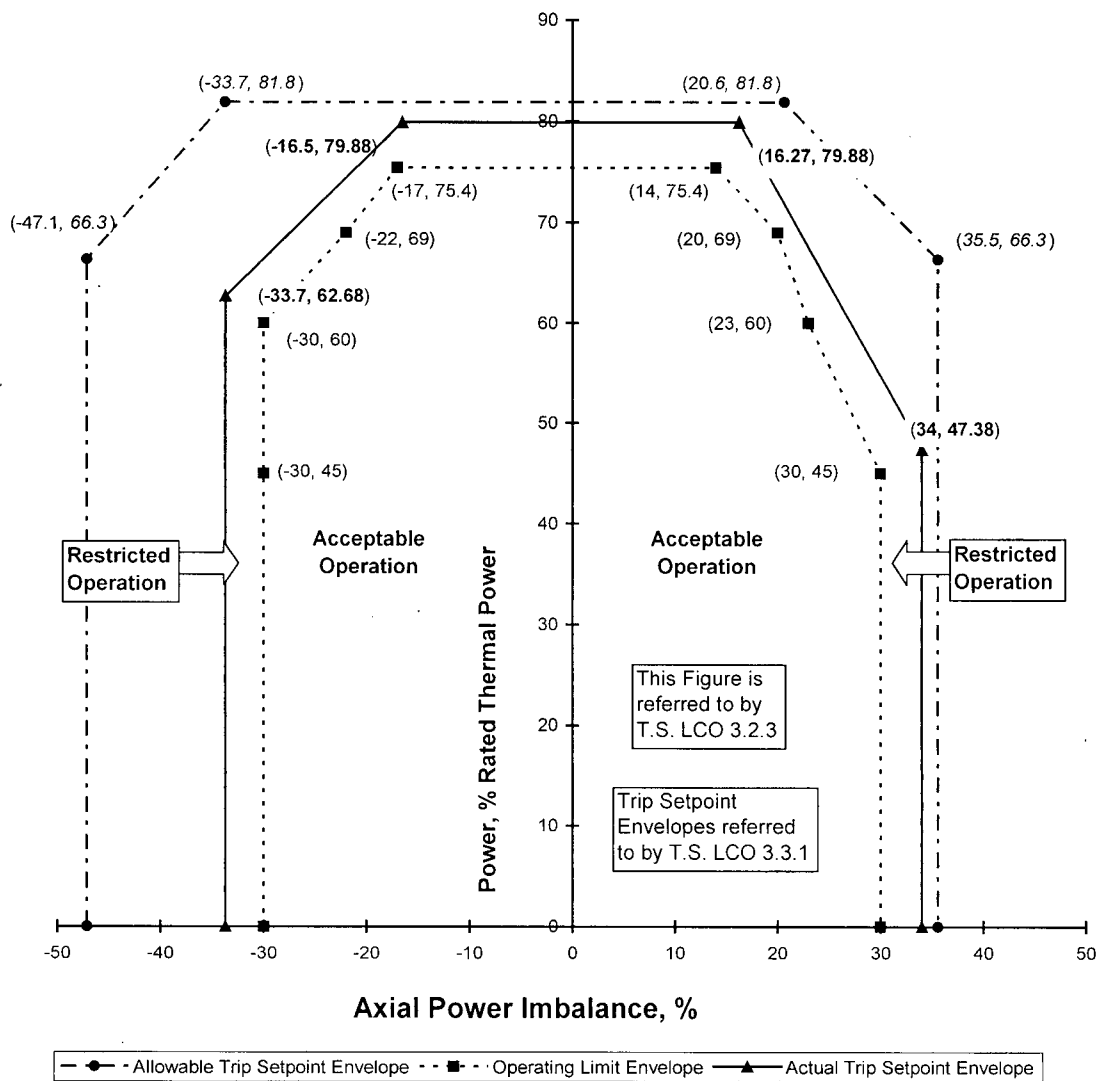
Four Pump Operation  
0 EFPD to EOC  
100% RTP = 2609 MWt



**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 $\leq$ 60%**

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

QUADRANT POWER TILT As Measured By:	STEADY-STATE <u>LIMIT(%)</u>	TRANSIENT <u>LIMIT(%)</u>	MAXIMUM <u>LIMIT(%)</u>
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  
100%RTP = 2609 MWt

QUADRANT POWER TILT As Measured By:	STEADY-STATE <u>LIMIT(%)</u>	TRANSIENT <u>LIMIT(%)</u>	MAXIMUM <u>LIMIT(%)</u>
Symmetrical Incore Detector System	4.29	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

<p>These limits are referred to by Technical Specification LCO 3.2.4</p>
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**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:

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

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

$\text{LHR}^{\text{avg}} = 5.9468 \text{ kW/ft}$  for Batch 16 E2,F2 Mark-B-HTP fuel

$\text{LHR}^{\text{avg}} = 5.9572 \text{ kW/ft}$  for Batch 17 Mark-B-HTP fuel

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

$P$  = ratio of THERMAL POWER / RATED THERMAL POWER

$\text{Bu}$  = fuel burnup (MWd/mtU)

**CR-3 Cycle 16 Reload Allowable LHR Limits  
Batch 16E2,F2 (Mark-B-HTP)  $\text{UO}_2$  Fuel  $\text{LHR}^{\text{allow}}$   
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 16 Reload Allowable LHR Limits**  
**Batch 17A,B,C,D,E (Mark-B-HTP) UO<sub>2</sub> Fuel LHR<sup>allow</sup>**  
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 16 Reload Allowable LHR Limits**  
**Batch 17F (Mark-B-HTP) UO<sub>2</sub> Fuel LHR<sup>allow</sup>**  
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	15.7	15.7	13.9
2.506	16.6	16.6	13.9
4.264	16.7	16.2	13.9
6.021	17.0	17.0	13.9
7.779	17.0	17.0	13.9
9.536	16.7	16.7	13.9
12.000	15.8	15.8	13.9

These tables are referred to  
by Technical Specification.  
LCO 3.2.5



**Power Peaking Factors (Continued)**

**CR-3 Cycle 16 Reload Allowable LHR Limits**  
**Batch 18 (Mark-B-HTP) UO<sub>2</sub> Fuel LHR<sup>allow</sup>**  
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 16 Reload Allowable LHR Limits**  
**Batch 16E2,F2 (Mark-B-HTP) 3 wt% Gadolinia Fuel LHR<sup>allow</sup>**  
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 16 Reload Allowable LHR Limits**  
**Batch 16F2 (Mark-B-HTP) 8 wt% Gadolinia Fuel LHR<sup>allow</sup>**  
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 16 Reload Allowable LHR Limits**  
**Batch 17 (Mark-B-HTP) 2 and 3 wt% Gadolinia Fuel LHR<sup>allow</sup>**  
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 16 Reload Allowable LHR Limits**  
**Batch 17 (Mark-B-HTP) 6 wt% Gadolinia Fuel LHR<sup>allow</sup>**  
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 16 Reload Allowable LHR Limits**  
**Batch 17 (Mark-B-HTP) 8 wt% Gadolinia Fuel LHR<sup>allow</sup>**  
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 16 Reload Allowable LHR Limits  
Batch 18 (Mark-B-HTP) 3 wt% Gadolinia Fuel LHR<sup>allow</sup>  
Allowable Peak LHR for Specified Burnup, kW/ft**

CORE ELEVATION (FT)	0 MWD/MTU	45,000 MWD/MTU	62,000 MWD/MTU
0.000	14.8	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

**CR-3 Cycle 16 Reload Allowable LHR Limits  
Batch 18 (Mark-B-HTP) 6 wt% Gadolinia Fuel LHR<sup>allow</sup>  
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	13.9	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

These tables are referred to  
by Technical Specification.  
LCO 3.2.5

**Power Peaking Factors (Continued)**

**CR-3 Cycle 16 Reload Allowable LHR Limits**  
**Batch 18 (Mark-B-HTP) 8 wt% Gadolinia Fuel LHR<sup>allow</sup>**  
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  $F_{\Delta H}^N$**

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

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

$1/\text{RH} = 0.3$

**Cycle 16 Allowable Radial Peaks (ARP)**

Axial Peak	Axial Location (X/L)	ARP <sup>(1)</sup>	Axial Peak	Axial Location (X/L)	ARP <sup>(1)</sup>	Axial Peak	Axial Location (X/L)	ARP <sup>(1)</sup>
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

<sup>(1)</sup>These limits have been increased to reflect the 3.8% peaking uncertainty treated by SCD.

**Reactor Protection System (RPS) Instrumentation**

**RCS Variable Low Pressure Setpoint Equation**

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

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

**Reactor Coolant System DNB Pressure Limits**

RCS loop pressure  $\geq$  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  $\leq 605.8^{\circ}\text{F}$

(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  $\geq 133.5$  E6 lb/hr with four RCPs operating, or  $\geq 99.7$  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 **2714 ppmB** prior to core alterations that include the introduction of any fuel assemblies not present in the cycle 15 core, subject to the following:

- 1) 2 ppm/EFPD shall be added for each EFPD that the cycle 15 length is less than 653 EFPD (based on 2568 MWt), while 1.0 ppm/EFPD may be deducted for each EFPD that the cycle 15 length is more than 653 EFPD (based on 2568 MWt);
- 2) must be corrected for the actual expected  $^{10}\text{B}$  isotopic atom percent if less than the basis of 19.8  $^{10}\text{B}$  isotopic atom percent;
- 3) no allowance is included for intermediate core locations;
- 4) control rod assemblies and APSRs do not affect the required refueling boron concentration.

The Mode 6 refueling boron concentration must be greater than **1470 ppmB** for the cycle 16 core configuration or during offload of the cycle 16 core, subject to the following:

- 1) allowances are included for a cycle 16 length as short as 609 EFPD;
- 2) must be corrected for the actual expected  $^{10}\text{B}$  isotopic atom percent if less than the basis of 19.8  $^{10}\text{B}$  isotopic atom percent;
- 3) no allowance is included for intermediate cycle 16 core locations;
- 4) 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 2007; Original Cycle 16 COLR.

Revision 1 – November 2007; Changed the title of one table of Allowable LHR Limits within the “Heat Flux Hot Channel Factor FQ” section to specify Batch 17 (Mark-B-HTP) 2 and 3 wt%. Additionally, corrected four Allowable Radial Peak values within the “Enthalpy Rise Hot Channel Factor  $F_{\Delta H}^N$ ” section to reflect maximum allowable value of 2.1798.

Revision 2 – December 2007; Updated the COLR to support operation at 2609 MWt.

Revision 3 – August 2008; Corrected the ARP limits in response to NCR 285176.

Revision 4 – July 2009; Cycle 16 COLR updated to add Mode 6 refueling boron concentration.