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AUG 12 2003

U. S. Nuclear Regulatory Commission  
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**SUSQUEHANNA STEAM ELECTRIC STATION  
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION  
AND REVISION TO PROPOSED AMENDMENT NO. 254 TO  
LICENSE NPF-14 AND PROPOSED AMENDMENT NO. 219  
TO LICENSE NPF-22:  
REVISED RESPONSE TO GL 94-02:  
LONG-TERM STABILITY SOLUTION  
PLA-5653**

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**Docket Nos. 50-387  
and 50-388**

*Reference: 1) PLA-5620, B. L. Shriver (PPL) to USNRC, "Proposed Amendment No. 254 to License NPF-14 and Proposed Amendment No. 219 to License NPF-22: Revised response to GL 94-02: Long Term Stability Solution," dated May 6, 2003.*

*2) USNRC to B. L. Shriver (PPL), "Request for Additional Information (RAI) - Susquehanna Steam Electric Station Units 1 and 2 (SSES 1 and 2) - Long term stability solution (TAC Nos. MB9008 and MB 9009)," dated July 7, 2003.*

The purposes of this letter are to provide a response to a NRC Request for Additional Information (RAI), (Reference 2) and to propose a resulting change to the Technical Specification (TS) amendments submitted by PLA-5620 (Reference 1). The RAI refers to PPL's proposed amendments (Reference 1) to the Susquehanna Steam Electric Station Units 1 and 2 (SSES) TS. It was proposed in Reference 1 to delete TS 3.3.1.3, "Oscillation Power Range Monitor (OPRM) Instrumentation," which has not yet been implemented, and revise TS 3.4.1, "Recirculation Loops Operating."

Attachment 1 to this letter contains the RAI questions and PPL responses. These questions and responses were previously discussed via telecon between NRC and PPL on July 10, 2003.

Attachment 2 contains marked up TS pages from TS's 3.4.1 "Recirculation Loops Operating" and 5.6.5 "Core Operating Limits Report (COLR)" that reflect the changes that resulted from the discussion with NRC relative to the RAI responses provided in Attachment 1.

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The proposed changes to TS 3.4.1 and TS 5.6.5, provided in Attachment 2, are administrative in nature and therefore a revision to the No Significant Hazards Consideration (submitted with Reference 1) is not necessary.

These administrative changes involve relocating the information contained in TS Figure 3.4.1-1 (Thermal Power Stability Restrictions) to the Core Operating Limits Report (COLR) and including a reference in TS Section 5.6.5 which describes the NRC approved methodology for performing stability calculations using the STAIF computer code. Since this reference is NRC approved and simply documents a currently used model, (Ref. FSAR Section 4.4.4.6.4 "Mathematical Models"), its inclusion in this TS section is administrative.

For the TS 3.4.1 changes, please remove Unit 1 and Unit 2 TS 3.4.1 Inserts 1 through 5, previously submitted with Reference 1, and replace them with the Inserts 1 through 5 markups included in Attachment 2. For the TS 5.6.5 changes, please replace Unit 1 and Unit 2 TS pages 5.0-21 and 5.0-23 with the markups in Attachment 2.


Attachment 3 contains retyped pages of the proposed TS 3.4.1 and TS 5.6.5 changes.

PPL is currently required to implement the approved amendment to TS Section 3.3.1.3 on November 1, 2003. We request an October 1, 2003 approval date for the TS amendments proposed by Reference 1, as revised herein, to allow for orderly implementation of the change.

Any questions regarding this additional information should be directed to Mr. Michael Crowthers at (610) 774-7766.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on:



B. L. Shriver

Attachment 1 - Response to NRC's Request for Additional Information  
Attachment 2 - Revised TS 3.4.1 Markups from PLA-5620 (Reference 1) and New  
Markups to TS 5.6.5

copy: NRC Region I  
Mr. R. V. Guzman, NRC Project Manager  
Mr. S. Hansell, NRC Sr. Resident Inspector  
Mr. R. Janati, DEP/BRP

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**Attachment 1 to PLA-5653**  
**Response to NRC's**  
**Request for Additional Information**

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## **Attachment 1 – Response to RAI**

### **Request for Additional Information for Proposed Amendment No. 254 to License NFP-14 and Proposed Amendment No. 219 to License NFP-22: Revised Response to GL 94-02: Long-Term Stability Solution**

#### **NRC Question 1:**

According to guidance specified in Generic Letter 94-02, both SSES Units 1 and 2 are Long-Term Stability Option III - OPRM system plants. OPRM Instrumentation should be included in TSs based on Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.36 to meet requirements stated in General Design Criterion (GDC) 10, 12 and 13 of 10 CFR Part 50, Appendix A. Provide the technical basis for the proposed deletion of TS 3.3.1.3 and the regulatory basis for a conclusion that you still meet the requirements stated in GDC 10, 12, and 13.

#### **PPL Response:**

The Part 21 Report issued by GE on August 31, 2001 identifies that the basis for the OPRM setpoint is invalid and may not provide adequate MCPR protection. Therefore, the basis for the TS is technically invalid and may not provide the intended margin of safety. Accordingly, implementation of LCO 3.3.1.3 (currently required prior to November 1, 2003) would concurrently require declaring the OPRM system inoperable. Thus, both SSES Unit 1 and Unit 2 would be placed in a 120-day limitation prior to requiring shutdown. The two unit shutdown would be required to be in effect until the OPRM system could be declared OPERABLE. Current PPL and BWROG plans to resolve the Part 21 issue will not support implementation by PPL in time to prevent the two-unit shutdown. Thus, it is proposed to delete TS 3.3.1.3 at this time, and to return to the previous detect and suppress approach to mitigating the potential for instability events.

The proposed replacements for previously approved TS 3.4.1 (Amendments 178 and 151, Units 1 and 2 respectively) and TS 5.6.5 (Unit 1 Amendments 194 and 209, Unit 2 Amendments 169 and 184) are included as markups in Attachment 2. These changes are administrative in nature, and are provided to reflect the use of the Core Operating Limits Report (COLR) for administrative control of cycle specific stability limits. They include

the BWROG Interim Corrective Actions (ICA's) augmented by cycle specific calculated stability regions which provide a high degree of assurance that an instability event will not occur. The method of detecting and suppressing power oscillations has proven to provide adequate core protection since implementation in November 1989. The SSES operators are trained on this method.

This approach will continue to meet the applicable GDC's as it has since its inception.

**NRC Question 2:**

Describe in detail the current implementation status of the OPRM system including system calibration and trip set-point based on the approach stated in NEDO-32465-A "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," or based on the approach of using plant-specific data. Also, provide detailed results of the system tests.

**PPL Response:**

The OPRM hardware and software is running well and as designed. PPL will continue to monitor its performance. The system is ready to be armed when a valid setpoint is developed and supporting administrative activities (e.g. procedure changes, operator training) are completed.

**Note that questions 3 and 4 will be addressed together.**

**NRC Question 3:**

Describe in detail the alternate method to detect and suppress thermal-hydraulic instability oscillations. Justify that the alternate method is an adequate means for safe operation under extended power uprate conditions without an operable OPRM system.

**NRC Question 4:**

Clarify whether Figure 3.4.1-1, "Thermal Power Stability Restrictions" of TS 3.4.1 is a permanent core flow map for Susquehanna plant operation, or is cycle dependent. Also, justify that the alternative method is updated to correspond to changes in core/fuel design and power operation and is sufficient to detect and suppress thermal-hydraulic instability oscillation under all possible operating conditions.

**PPL Response:**

PPL has not implemented extended power uprate to date (i.e. 10-15% power increase range). PPL has implemented an approximately 5% power uprate and a 1.4% power uprate. We have also transitioned to ATRIUM™-10 cores. The impact of these changes on the ICA Stability Region boundaries has been assessed on a cycle-specific basis and adjustments have been made as required by the SSES FSAR Section 4.4.4.6.6.

As described in Attachment 2, PPL proposes to locate the cycle specific restricted region curves in the COLR. Accordingly, the NRC approved analysis methodology utilized is proposed to be added as a new reference to TS 5.6.5 "Core Operating Limits Report (COLR)." Also added to TS 5.6.5 is Item a.6 entitled "The Stability Related Regions of the Power Flow Map for Specification 3.4.1."

**NRC Question 5:**

The generic solution to deal with 10 CFR Part 21 on the non-conservative generic DIVOM (Delta critical power ratio [CPR] to Initial CPR vs. Oscillation Magnitude) curve has been an open end issue for at least the last two years. It is the individual utility's responsibility to make sure that their own long-term stability option is working rather than waiting for a final unpredicted result. Current operating experience at other BWRs demonstrates that a plant specific input for the OPRM trip set-point works well. Provide the rationale why, the OPRM system for SSES was never armed.

**PPL Response:**

The OPRM system for SSES has not been armed. Initially, hardware and software issues impacted system performance. These issues have been resolved.

The current rationale is that the basis for the approved but not implemented Technical Specification changes has been shown to be invalid based on the GE Part 21 Report. Therefore, the proposed setpoint may not provide adequate MCPR protection. Upon resolution of the Part 21 issues, PPL is ready to arm the system.

In the interim, we believe it is acceptable to continue to use the proven detect and suppress approach, enhanced through the use of Core Operating Limits Report administrative controls to mitigate the potential for instability events.

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**Attachment 2 to PLA-5653**  
**Revised TS 3.4.1 Markups**  
**New TS 5.6.5 Markups**  
**(Units 1 & 2)**

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### 3.4 REACTOR COOLANT SYSTEM (RCS)

#### 3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation with a THERMAL POWER/core flow condition outside of Regions I and II of ~~Figure 3.4.1.1, the Power Flow map as Specified in the COLR.~~  
OR

One recirculation loop may be in operation provided the following limits are applied when the associated LCO is applicable with a THERMAL POWER/core flow condition outside of Regions I and II of ~~Figure 3.4.1.1, the Power Flow map as Specified in the COLR.~~

- a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;
- b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR;
- c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," single loop operation limits specified in the COLR, and
- d. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Simulated Thermal Power—High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation.
- e. Recirculation pump speed is  $\leq 80\%$ .

-----Note-----  
Required limit and setpoint resets for single recirculation loop operation may be delayed for up to 12 hours after transition from two recirculation loop operation to single recirculation loop operation.  
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APPLICABILITY: MODES 1 and 2.

# INSERT 2 (UNIT 1)

Recirculation Loops Operating  
3.4.1

## ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>A. Total core flow as a function of THERMAL POWER within Region I of <del>Figure 3.4.1-1, the Power Flow map as specified in the COLD</del> <u>OR</u></p> <p>No recirculation loops operating while in MODE 1</p>	<p>A.1 Place reactor mode switch in the shutdown position.</p>	<p>Immediately</p>
<p>B. -----NOTE----- Only applicable when in Region II of the <del>Figure 3.4.1-1 Flow map as specified in the COLD</del> <u>Power as specified in the COLD</u></p> <p>Two or more APRM readings oscillating with one or more oscillating <math>\geq 10\%</math> of RTP peak-to-peak.</p> <p><u>OR</u></p> <p>Two or more LPRM upscale alarms activating and deactivating with a period <math>\geq 1</math> second and <math>\leq 5</math> seconds.</p> <p><u>OR</u></p> <p>Sustained LPRM oscillations <math>&gt; 10</math> w/cm<sup>2</sup> peak-to-peak with a period <math>\geq 1</math> second and <math>\leq 5</math> seconds.</p> <p><u>OR</u></p>	<p>B.1 Place the reactor mode switch in the shutdown position.</p>	<p>Immediately</p> <p>(continued)</p>

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)  Less than 50% of required LPRM upscale alarms OPERABLE		
C. Total core flow as a function of THERMAL POWER within Region II of <del>Figure 3.4.1-1</del> the <i>Power Flow map as specified in the COLR.</i>	C.1 Initiate action to restore total core flow as a function of THERMAL POWER outside of Region II.	Immediately
D. Recirculation loop flow mismatch not within limits.	D.1 Declare the recirculation loop with lower flow to be "not in operation."	2 hours
E. No recirculation loops in operation while in MODE 2  <u>OR</u>  Single Recirculation Loop required limits and setpoints not established within required time.	E.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.4.1.1 -----NOTE-----                      Not required to be performed until 24 hours after both recirculation loops are in operation.                      -----</p> <p>Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation is:</p> <p>a. <math>\leq 10</math> million lbm/hr when operating at <math>&lt; 75</math> million lbm/hr total core flow; and</p> <p>b. <math>\leq 5</math> million lbm/hr when operating at <math>\geq 75</math> million lbm/hr total core flow.</p>	<p>24 hours</p>
<p>SR 3.4.1.2 Verify total core flow as a function of THERMAL POWER is outside of Region I and II of <del>Figure 3.4.1-1</del>, the Power Flow map as Specified in the COLR.</p>	<p>24 hours</p>
<p>SR 3.4.1.3 -----NOTE-----                      Only required to be met during single loop operations.                      -----</p> <p>Verify recirculation pump speed is within the limit specified in the LCO.</p>	<p>24 hours</p>

INSERT 5 (UNIT 1)

~~(Figure 3.4.1-1)~~

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5.6 Reporting Requirements (continued)

5.6.4 Monthly Operating Reports

Routine reports of operating statistics and shutdown experience, including documentation of all challenges to the main steam safety/relief valves, shall be submitted on a monthly basis no later than the 15<sup>th</sup> of each month following the calendar month covered by the report.

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

- a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:
  1. The Average Planar Linear Heat Generation Rate for Specification 3.2.1;
  2. The Minimum Critical Power Ratio for Specification 3.2.2;
  3. The Linear Heat Generation Rate for Specification 3.2.3;
  4. The Average Power Range Monitor (APRM) Gain and Setpoints for Specification 3.2.4; and
  5. The Shutdown Margin for Specification 3.1.1.

- b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC.

When an initial assumed power level of 102 percent of rated power is specified in a previously approved method, this refers to the power level associated with the design basis analyses, or 3510 MWt. The power level of 3510 MWt is 100.6% of the rated thermal power level of 3489 MWt. The RTP of 3489 MWt may only be used when feedwater flow measurement (used as input to the reactor thermal power measurement) is provided by the Leading Edge Flow Meter (LEFM<sup>TM</sup>) as described in the LEFM<sup>TM</sup> Topical Report and supplement referenced below. When feedwater flow measurements from the LEFM<sup>TM</sup> system are not available, the core thermal power level may not exceed the originally approved RTP of 3441 MWt, but the value of 3510 MWt

6. The stability related regions of the Power Flow map for Specification 3.4.1.

(continued)

5.6 Reporting Requirements

5.6.5 COLR (continued)

9. ANF-91-048(P)(A), "Advanced Nuclear Fuels Corporation Methodology for Boiling Water Reactors EXEM BWR Evaluation Model.
10. XN-NF-80-19(P)(A), "Exxon Nuclear Methodology for Boiling Water Reactors.
11. XN-NF-79-71(P)(A), "Exxon Nuclear Plant Transient Methodology for Boiling Water Reactors."
12. EMF-1997(P)(A), "ANFB-10 Critical Power Correlation."
13. Caldon, Inc., "TOPICAL REPORT: Improving Thermal Power Accuracy and Plant Safety While Increasing Operating Power Level Using the LEFM<sup>✓</sup>™ System," Engineering Report - 80P.
14. Caldon, Inc., "Supplement to Topical Report ER-80P: Basis for a Power Uprate with the LEFM<sup>✓</sup>™ or LEFM CheckPlus™ System," Engineering Report ER-160P.
15. EMF-85-74(P), "RODEX 2A (BWR) Fuel Rod Thermal-Mechanical Evaluation Model."
- c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.
- d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

16. EMF-CC-074(P)(A), Volume 4, "BWR Stability Analysis: Assessment of STAF with Input from MICROBURN-B2."

(continued)

### 3.4 REACTOR COOLANT SYSTEM (RCS)

#### 3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation with a THERMAL POWER/core flow condition outside of Regions I and II of ~~Figure 3.4.1-1~~ *the Power Flow map as specified in the COLR.*  
OR

*Flow map as specified in the COLR* } One recirculation loop may be in operation with a THERMAL POWER/core flow condition outside of Regions I and II of *the Power* ~~Figure 3.4.1-1~~ provided the following limits are applied when the associated LCO is applicable:

- a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;
- b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR;
- c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," single loop operation limits specified in the COLR, and
- d. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Simulated Thermal Power-High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation.
- e. Recirculation pump speed is  $\leq 80\%$

-----Note-----  
Required limit and setpoint resets for single recirculation loop operation may be delayed for up to 12 hours after transition from two recirculation loop operation to single recirculation loop operation.  
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APPLICABILITY: MODES 1 and 2.



ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>A. Total core flow as a function of THERMAL POWER within Region I of <del>Figure 3.4.1-1, the Power Flow map as specified in the COLR.</del></p> <p><u>OR</u></p> <p>No recirculation loops operating while in MODE 1</p>	<p>A.1 Place reactor mode switch in the shutdown position.</p>	<p>Immediately</p>
<p>B. -----NOTE----- Only applicable when in Region II of the <del>Power Flow map Figure 3.4.1-1 as specified in the COLR.</del></p> <p>Two or more APRM readings oscillating with one or more oscillating <math>\geq 10\%</math> of RTP peak-to-peak.</p> <p><u>OR</u></p> <p>Two or more LPRM upscale alarms activating and deactivating with a period <math>\geq 1</math> second and <math>\leq 5</math> seconds.</p> <p><u>OR</u></p> <p>Sustained LPRM oscillations <math>&gt; 10</math> w/cm<sup>2</sup> peak-to-peak with a period <math>\geq 1</math> second and <math>\leq 5</math> seconds.</p> <p><u>OR</u></p>	<p>B.1 Place the reactor mode switch in the shutdown position.</p>	<p>Immediately</p> <p>(continued)</p>

INSERT 3 (Unit 2) Recirculation Loops Operating  
3.4.1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)  Less than 50% of required LPRM upscale alarms OPERABLE		
C. Total core flow as a function of THERMAL POWER within Region II of Figure 3.4.1-1, the <i>Power Flow map as specified in the Core.</i>	C.1 Initiate action to restore total core flow as a function of THERMAL POWER outside of Region II.	Immediately
D. Recirculation loop flow mismatch not within limits.	D.1 Declare the recirculation loop with lower flow to be "not in operation."	2 hours
E. No recirculation loops in operation while in MODE 2  <u>OR</u>  Single Recirculation Loop required limits and setpoints not established within required time.	E.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.4.1.1 -----NOTE-----                      Not required to be performed until 24 hours after both recirculation loops are in operation.                      -----</p> <p>Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation is:</p> <p>a. <math>\leq 10</math> million lbm/hr when operating at <math>&lt; 75</math> million lbm/hr total core flow; and</p> <p>b. <math>\leq 5</math> million lbm/hr when operating at <math>\geq 75</math> million lbm/hr total core flow.</p>	<p>24 hours</p>
<p>SR 3.4.1.2 Verify total core flow as a function of THERMAL POWER is outside of Region I and II of Figure 3.4.1-1, the Power Flow map as specified in the COLR.</p>	<p>24 hours</p>
<p>SR 3.4.1.3 -----NOTE-----                      Only required to be met during single loop operations.                      -----</p> <p>Verify recirculation pump speed is within the limits specified in the LCO.</p>	<p>24 hours</p>

INSERT 5. (UNIT 2)

~~(Figure 3.4.1.1)~~

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## 5.6 Reporting Requirements (continued)

### 5.6.4 Monthly Operating Reports

Routine reports of operating statistics and shutdown experience, including documentation of all challenges to the main steam safety/relief valves, shall be submitted on a monthly basis no later than the 15th of each month following the calendar month covered by the report.

### 5.6.5 CORE OPERATING LIMITS REPORT (COLR)

- a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

1. The Average Planar Linear Heat Generation Rate for Specification 3.2.1;
2. The Minimum Critical Power Ratio for Specification 3.2.2;
3. The Linear Heat Generation Rate for Specification 3.2.3;
4. The Average Power Range Monitor (APRM) Gain and Setpoints for Specification 3.2.4; and
5. The Shutdown Margin for Specification 3.1.1.

- b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC.

When an initial assumed power level of 102 percent of rated power is specified in a previously approved method, this refers to the power level associated with the design basis analyses, or 3510 MWt. The power level of 3510 MWt is 100.6% of the rated thermal power level of 3489 MWt. The RTP of 3489 MWt may only be used when feedwater flow measurement (used as input to the reactor thermal power measurement) is provided by the Leading Edge Flow Meter (LEFM™) as described in the LEFM™ Topical Report and supplement referenced below. When feedwater flow measurements from the LEFM™ system are not available, the

6. The Stability related regions of the Power Flow map for Specification 3.4.1. (continued)

## 5.6 Reporting Requirements

### 5.6.5 COLR (continued)

11. Caldon, Inc., "Supplement to Topical Report ER-80P: Basis for a Power Uprate with the LEFM<sup>✓</sup>™ or LEFM CheckPlus™ System," Engineering Report ER-160P.
  12. EMF-85-74(P)(A), "RODEX 2A (BWR) Fuel Rod Thermal-Mechanical Evaluation Model."
  13. EMF-2158(P)(A), "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/Microburn-B2," Siemens Power Corporation.
- c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.
- d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

### 5.6.6 EDG Failures Report

If an individual emergency diesel generator (EDG) experiences four or more valid failures in the last 25 demands, these failures and any nonvalid failures experienced by that EDG in that time period shall be reported within 30 days. Reports on EDG failures shall include the information recommended in Regulatory Guide 1.9, Revision 3, Regulatory Position C.4.

### 5.6.7 PAM Report

When a report is required by Condition B or F of LCO 3.3.3.1, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

14. EMF-CC-074(PXA), Volume 4, "BWR Stability Analysis: Assessment of STAF with Input from MICROBURN-B2."

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**Attachment 3 to PLA-5653**  
**Proposed TS 3.4.1 and TS 5.6.5 Changes**  
**(Retyped)**  
**(Units 1 & 2)**

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### 3.4 REACTOR COOLANT SYSTEM (RCS)

#### 3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation with a THERMAL POWER/core flow condition outside of Regions I and II of the Power Flow Map as specified in the COLR.

OR

One recirculation loop may be in operation provided the following limits are applied when the associated LCO is applicable with a THERMAL POWER/core flow condition outside of Regions I and II of the Power Flow Map as specified in the COLR.

- a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;
- b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR;
- c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," single loop operation limits specified in the COLR, and
- d. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Simulated Thermal Power—High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation.
- e. Recirculation pump speed is  $\leq 80\%$ .

-----Note-----

Required limit and setpoint resets for single recirculation loop operation may be delayed for up to 12 hours after transition from two recirculation loop operation to single recirculation loop operation.

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APPLICABILITY: MODES 1 and 2.



ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>A. Total core flow as a function of THERMAL POWER within Region I of the Power Flow Map as specified in the COLR.</p> <p><u>OR</u></p> <p>No recirculation loops operating while in MODE 1.</p>	<p>A.1 Place reactor mode switch in the shutdown position.</p>	<p>Immediately</p>
<p>B. -----NOTE----- Only applicable when in Region II of the Power Flow Map as specified in the COLR. -----</p> <p>Two or more APRM readings oscillating with one or more oscillating <math>\geq 10\%</math> of RTP peak-to-peak.</p> <p><u>OR</u></p> <p>Two or more LPRM upscale alarms activating and deactivating with a period <math>\geq 1</math> second and <math>\leq 5</math> seconds.</p> <p><u>OR</u></p> <p>Sustained LPRM oscillations <math>&gt; 10 \text{ w/cm}^2</math> peak-to-peak with a period <math>\geq 1</math> second and <math>\leq 5</math> seconds.</p> <p><u>OR</u></p>	<p>B.1 Place the reactor mode switch in the shutdown position.</p>	<p>Immediately</p> <p>(continued)</p>

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued) Less than 50% of required LPRM upscale alarms OPERABLE.		
C. Total core flow as a function of THERMAL POWER within Region II of the Power Flow Map as specified in the COLR.	C.1 Initiate action to restore total core flow as a function of THERMAL POWER outside of Region II.	Immediately
D. Recirculation loop flow mismatch not within limits.	D.1 Declare the recirculation loop with lower flow to be "not in operation."	2 hours
E. No recirculation loops in operation while in MODE 2.  <u>OR</u>  Single Recirculation Loop required limits and setpoints not established within required time.	E.1 Be in MODE 3.	12 hours

# SURVEILLANCE REQUIREMENTS

SURVEILLANCE			FREQUENCY
SR	3.4.1.1	<p>-----NOTE-----</p> <p>Not required to be performed until 24 hours after both recirculation loops are in operation.</p> <p>-----</p> <p>Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation is:</p> <p>a.     <math>\leq</math> 10 million lbm/hr when operating at &lt; 75 million lbm/hr total core flow; and</p> <p>b.     <math>\leq</math> 5 million lbm/hr when operating at <math>\geq</math> 75 million lbm/hr total core flow.</p>	24 hours
SR	3.4.1.2	Verify total core flow as a function of THERMAL POWER is outside of Region I and II of the Power Flow Map as specified in the COLR.	24 hours
SR	3.4.1.3	<p>-----NOTE-----</p> <p>Only required to be met during single loop operations.</p> <p>-----</p> <p>Verify recirculation pump speed is within the limit specified in the LCO.</p>	24 hours

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5.6 Reporting Requirements (continued)

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5.6.4 Monthly Operating Reports

Routine reports of operating statistics and shutdown experience, including documentation of all challenges to the main steam safety/relief valves, shall be submitted on a monthly basis no later than the 15<sup>th</sup> of each month following the calendar month covered by the report.

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

- a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:
  - 1. The Average Planar Linear Heat Generation Rate for Specification 3.2.1;
  - 2. The Minimum Critical Power Ratio for Specification 3.2.2;
  - 3. The Linear Heat Generation Rate for Specification 3.2.3;
  - 4. The Average Power Range Monitor (APRM) Gain and Setpoints for Specification 3.2.4; and
  - 5. The Shutdown Margin for Specification 3.1.1.
  - 6. The stability related regions of the Power Flow Map for Specification 3.4.1.
- b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC.

When an initial assumed power level of 102 percent of rated power is specified in a previously approved method, this refers to the power level associated with the design basis analyses, or 3510 MWt. The power level of 3510 MWt is 100.6% of the rated thermal power level of 3489 MWt. The RTP of 3489 MWt may only be used when feedwater flow measurement (used as input to the reactor thermal power measurement) is provided by the Leading Edge Flow Meter (LEFM<sup>✓</sup>™) as described in the LEFM<sup>✓</sup>™ Topical Report and supplement referenced below. When feedwater flow measurements from the LEFM<sup>✓</sup>™ system are not available, the core thermal power level may not exceed the originally approved RTP of 3441 MWt, but the value of 3510 MWt.

(continued)

5.6 Reporting Requirements

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5.6.5 COLR (continued)

9. ANF-91-048(P)(A), "Advanced Nuclear Fuels Corporation Methodology for Boiling Water Reactors EXEM BWR Evaluation Model.
  10. XN-NF-80-19(P)(A), "Exxon Nuclear Methodology for Boiling Water Reactors.
  11. XN-NF-79-71(P)(A), "Exxon Nuclear Plant Transient Methodology for Boiling Water Reactors."
  12. EMF-1997(P)(A), "ANFB-10 Critical Power Correlation."
  13. Caldon, Inc., "TOPICAL REPORT: Improving Thermal Power Accuracy and Plant Safety While Increasing Operating Power Level Using the LEFM<sup>✓</sup>™ System," Engineering Report - 80P.
  14. Caldon, Inc., "Supplement to Topical Report ER-80P: Basis for a Power Uprate with the LEFM<sup>✓</sup>™ or LEFM CheckPlus™ System," Engineering Report ER-160P.
  15. EMF-85-74(P), "RODEX 2A (BWR) Fuel Rod Thermal-Mechanical Evaluation Model."
  16. EMF-CC-074(P)(A), Volume 4, "BWR Stability Analysis: Assessment of STAIF with Input from MICROBURN-B2."
- c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.
- d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

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### 3.4 REACTOR COOLANT SYSTEM (RCS)

#### 3.4.1 Recirculation Loops Operating

LCO 3.4.1 Two recirculation loops with matched flows shall be in operation with a THERMAL POWER/core flow condition outside of Regions I and II of the Power Flow Map as specified in the COLR.

OR

One recirculation loop may be in operation with a THERMAL POWER/core flow condition outside of Regions I and II of the Power Flow Map as specified in the COLR, provided the following limits are applied when the associated LCO is applicable:

- a. LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," single loop operation limits specified in the COLR;
- b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," single loop operation limits specified in the COLR;
- c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," single loop operation limits specified in the COLR, and
- d. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Function 2.b (Average Power Range Monitors Flow Biased Simulated Thermal Power—High), Allowable Value of Table 3.3.1.1-1 is reset for single loop operation.
- e. Recirculation pump speed is  $\leq 80\%$ .

-----Note-----  
Required limit and setpoint resets for single recirculation loop operation may be delayed for up to 12 hours after transition from two recirculation loop operation to single recirculation loop operation.  
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APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>A. Total core flow as a function of THERMAL POWER within Region 1 of the Power Flow Map as specified in the COLR.</p> <p><u>OR</u></p> <p>No recirculation loops operating while in MODE 1.</p>	<p>A.1 Place reactor mode switch in the shutdown position.</p>	<p>Immediately</p>
<p>B. -----NOTE----- Only applicable when in Region II of the Power Flow Map as specified in the COLR. -----</p> <p>Two or more APRM readings oscillating with one or more oscillating <math>\geq 10\%</math> of RTP peak-to-peak.</p> <p><u>OR</u></p> <p>Two or more LPRM upscale alarms activating and deactivating with a period <math>\geq 1</math> second and <math>\leq 5</math> seconds.</p> <p><u>OR</u></p> <p>Sustained LPRM oscillations <math>&gt; 10 \text{ w/cm}^2</math> peak-to-peak with a period <math>\geq 1</math> second and <math>\leq 5</math> seconds.</p> <p><u>OR</u></p>	<p>B.1 Place the reactor mode switch in the shutdown position.</p>	<p>Immediately</p> <p>(continued)</p>



ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued) Less than 50% of required LPRM upscale alarms OPERABLE.		
C. Total core flow as a function of THERMAL POWER within Region II of the Power Flow Map as specified in the COLR.	C.1 Initiate action to restore total core flow as a function of THERMAL POWER outside of Region II.	Immediately
D. Recirculation loop flow mismatch not within limits.	D.1 Declare the recirculation loop with lower flow to be "not in operation."	2 hours
E. No recirculation loops in operation while in MODE 2.  <u>OR</u>  Single Recirculation Loop required limits and setpoints not established within required time.	E.1 Be in MODE 3.	12 hours

**SURVEILLANCE REQUIREMENTS**

SURVEILLANCE			FREQUENCY
SR	3.4.1.1	<p>-----NOTE-----</p> <p>Not required to be performed until 24 hours after both recirculation loops are in operation.</p> <p>-----</p> <p>Verify recirculation loop jet pump flow mismatch with both recirculation loops in operation is:</p> <p>a.     <math>\leq 10</math> million lbm/hr when operating at <math>&lt; 75</math> million lbm/hr total core flow; and</p> <p>b.     <math>\leq 5</math> million lbm/hr when operating at <math>\geq 75</math> million lbm/hr total core flow.</p>	24 hours
SR	3.4.1.2	Verify total core flow as a function of THERMAL POWER is outside of Region I and II of the Power Flow Map as specified in the COLR.	24 hours
SR	3.4.1.3	<p>-----NOTE-----</p> <p>Only required to be met during single loop operations.</p> <p>-----</p> <p>Verify recirculation pump speed is within the limit specified in the LCO.</p>	24 hours

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## 5.6 Reporting Requirements

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### 5.6.4 Monthly Operating Reports

Routine reports of operating statistics and shutdown experience, including documentation of all challenges to the main steam safety/relief valves, shall be submitted on a monthly basis no later than the 15th of each month following the calendar month covered by the report.

### 5.6.5 CORE OPERATING LIMITS REPORT (COLR)

- a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:
  1. The Average Planar Linear Heat Generation Rate for Specification 3.2.1;
  2. The Minimum Critical Power Ratio for Specification 3.2.2;
  3. The Linear Heat Generation Rate for Specification 3.2.3;
  4. The Average Power Range Monitor (APRM) Gain and Setpoints for Specification 3.2.4; and
  5. The Shutdown Margin for Specification 3.1.1.
  6. The stability related regions of the Power Flow Map for Specification 3.4.1.
- b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC.

When an initial assumed power level of 102 percent of rated power is specified in a previously approved method, this refers to the power level associated with the design basis analyses, or 3510 MWt. The power level of 3510 MWt is 100.6% of the rated thermal power level of 3489 MWt. The RTP of 3489 MWt may only be used when feedwater flow measurement (used as input to the reactor thermal power measurement) is provided by the Leading Edge Flow Meter (LEFM<sup>✓</sup><sup>TM</sup>) as described in the LEFM<sup>✓</sup><sup>TM</sup> Topical Report and supplement referenced below. When feedwater flow measurements from the LEFM<sup>✓</sup><sup>TM</sup> system are not available, the core thermal power level may not exceed the originally approved RTP of 3441 MWt, but the value of 3510 MWt (102% of 3441 MWt) remains the initial power level for the bounding licensing analysis.

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## 5.6 Reporting Requirements

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### 5.6.5 COLR (continued)

11. Caldon, Inc., "Supplement to Topical Report ER-80P: Basis for a Power Uprate with the LEFM<sup>✓</sup>™ or LEFM CheckPlus™ System," Engineering Report ER-160P.
  12. EMF-85-74(P)(A), "RODEX 2A (BWR) Fuel Rod Thermal-Mechanical Evaluation Model."
  13. EMF-2158(P)(A), "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/Microburn-B2," Siemens Power Corporation.
  14. EMF-CC-074(P)(A), Volume 4, "BWR Stability Analysis: Assessment of STAIF with Input from MICROBURN-B2."
- c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.
- d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

### 5.6.6 EDG Failures Report

If an individual emergency diesel generator (EDG) experiences four or more valid failures in the last 25 demands, these failures and any nonvalid failures experienced by that EDG in that time period shall be reported within 30 days. Reports on EDG failures shall include the information recommended in Regulatory Guide 1.9, Revision 3, Regulatory Position C.4.

### 5.6.7 PAM Report

When a report is required by Condition B or F of LCO 3.3.3.1, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

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