

**Bryce L. Shriver**  
Senior Vice President and  
Chief Nuclear Officer

**PPL Susquehanna, LLC**  
769 Salem Boulevard  
Berwick, PA 18603  
Tel. 570.542.3120 Fax 570.542.1504  
blshriver@pplweb.com



SEP 16 2003

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Mail Stop OP1-17  
Washington, DC 20555

**SUSQUEHANNA STEAM ELECTRIC STATION  
PROPOSED AMENDMENT NO. 221 TO UNIT 2  
LICENSE NPF-22: REVISED MCPR SAFETY LIMITS  
PLA-5672**

**Docket No. 50-388**

*Reference: 1) PLA-5467, R. L. Anderson (PPL) to USNRC, "Proposed Amendment No. 211 to Unit 2 License NPF-22: MCPR Safety Limits and Reference Changes," dated July 17, 2002.*

*2) USNRC to B. L. Shriver (PPL), "Susquehanna Steam Electric Station, Unit 2—Issuance of Amendment Regarding Minimum Critical Power Ratio Safety Limits and Reference Changes (TAC No. MB5610)," dated March 4, 2003.*

The purpose of this letter is to propose a change to the Susquehanna Steam Electric Station Unit 2 Technical Specifications. This proposed change consists of a revision to the Unit 2 Cycle 12 (U2C12) Minimum Critical Power Ratio (MCPR) Safety Limits in Section 2.1.1.2. The current MCPR Safety Limits were proposed by Reference 1 and approved as License Amendment 184 in Reference 2.

This change decreases the current Unit 2 MCPR Safety Limits from 1.10 to 1.08 for Two Loop Operation and from 1.11 to 1.09 for Single Loop Operation. These decreases in MCPR Safety Limits are the result of using NRC approved CASMO-4/MICROBURN-B2 methodology, which is based on power distribution uncertainties that are smaller than those used in the previous analysis.

The enclosure to this letter contains PPL's evaluation of this proposed change. It includes a description of the proposed change, technical analysis of the change, regulatory analysis of the change (No Significant Hazards Consideration and the Applicable Regulatory Requirements), and the environmental considerations associated with the change.

Attachment 1 to this letter contains the applicable page of the Susquehanna SES Unit 2 Technical Specifications, marked to show the proposed changes.

A001

Attachment 2 contains the applicable pages of the Susquehanna SES Unit 2 Technical Specifications Bases, marked to show the proposed change.

Attachment 3 contains the "camera ready" version of the revised Unit 2 Technical Specification page.

Attachment 4 is included to identify any regulatory commitments associated with this change.

Attachment 5 has been provided as a description of the U2C12 core composition to assist in your review. This description was previously provided and is not revised as a result of this submittal

The proposed change has been approved by station management as recommended by the Susquehanna SES Plant Operations Review Committee and reviewed by the Susquehanna Review Committee.

Implementation of this proposed change by June of 2004 would allow PPL to recover MCPR operating margin. Therefore, we request NRC complete its review of this change by April 1, 2004 with the changes effective within 60 days of approval.

Any questions regarding this request should be directed to Mr. Duane L. Filchner at (610) 774-7819.

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

Executed on: 9/16/03



B. L. Shriver

Enclosure:  
PPL Evaluation of the Proposed Change

**Attachments:**

- 1. Proposed Technical Specification Change Unit 2, (Mark-up)**
- 2. Proposed Technical Specification Bases Changes Unit 2, (Mark-ups)**
- 3. Proposed Technical Specification Page Unit 2, (Camera Ready)**
- 4. List of Regulatory Commitments**
- 5. Description of U2C12 Core Composition**

**Copy: NRC Region I**

**Mr. S. L. Hansell, NRC Sr. Resident Inspector**

**Mr. R. V. Guzman, NRC Project Manager**

**Mr. R. Janati, DEP/BRP**

---

# **ENCLOSURE to PLA-5672**

## **PPL Evaluation**

### **UNIT 2 CYCLE 12 MCPR SAFETY LIMIT**

---

1. DESCRIPTION
2. PROPOSED CHANGE
3. BACKGROUND
4. TECHNICAL ANALYSIS
5. REGULATORY ANALYSIS
  - 5.1 No Significant Hazards Consideration
  - 5.2 Applicable Regulatory Requirements/Criteria
6. ENVIRONMENTAL CONSIDERATIONS
7. REFERENCES

## **PPL EVALUATION**

**Subject: Unit 2 Cycle 12 MCPR Safety Limit: TS Sections 2.1.1.2.**

### **1.0 DESCRIPTION**

This letter is a request to amend Operating License NPF-22 for PPL Susquehanna, LLC (PPL), Susquehanna Steam Electric Station Unit 2 (SSES).

The proposed changes would revise the Susquehanna Unit 2 Technical Specifications (TS) Section 2.1.1.2 to reflect updated Unit 2 Cycle 12 (U2C12) Minimum Critical Power Ratio (MCPR) Safety Limits for both two-loop and single-loop operation. The change to Section 2.1.1.2 is requested to take advantage of decreased two-loop and single-loop operation MCPR Safety Limit values. The decrease in the MCPR Safety Limit is due to a reduction in power distribution uncertainties consistent with the POWERPLEX<sup>®</sup>-III core monitoring system. The changes are described in detail in Section 4.0.

The requested approval date (April 1, 2004) will provide operational flexibility during a time of peak energy demand.

### **2.0 PROPOSED CHANGE**

Specifically the proposed changes would revise TS 2.1.1.2.

The Minimum Critical Power Ratio (MCPR) Safety Limits (two-loop operation and single-loop operation) are revised from 1.10 (two-loop operation) and 1.11 (single loop operation) to 1.08 (two-loop operation) and 1.09 (single loop operation) to reflect results of revised MCPR Safety Limit analysis for Unit 2 Cycle 12.

TS Bases changes corresponding to the proposed TS changes are included for information.

### **3.0 BACKGROUND**

Excessive thermal overheating of the fuel rod cladding can result in cladding damage and the release of fission products. In order to protect the cladding against thermal overheating due to boiling transition, Safety Limits (Section 2.1.1.2 of the Susquehanna

SES Unit 2 Technical Specifications) were established. The change to Section 2.1.1.2 reflects a revision of the U2C12 MCPR Safety Limits. The revision implements reduced power distribution uncertainties consistent with the POWERPLEX<sup>®</sup>-III core monitoring system.

NUREG-0800, Standard Review Plan Section 4.4, specifies an acceptable, conservative approach to define this Safety Limit. Specifically, a Minimum Critical Power Ratio (MCPR) value is specified such that at least 99.9% of the fuel rods are expected to avoid boiling transition during normal operation or Anticipated Operational Occurrences (AOOs). Boiling transition is predicted using a correlation based on test data (i.e., a Critical Power Correlation). The Safety Limit MCPR calculation accounts for various uncertainties such as feedwater flow, feedwater temperature, pressure, power distribution uncertainties (including the effects of fuel channel bow), and uncertainty in the Critical Power Correlation.

The proposed Safety Limit MCPR values (two-loop and single-loop) were calculated using FANP NRC approved licensing methods with the ANFB-10 critical power correlation for ATRIUM<sup>™</sup>-10 fuel. Input to the U2C12 MCPR Safety Limit analysis, provided by PPL, assumed the rated core thermal power of 3489 Mwth. The proposed Safety Limit MCPR values (two-loop and single-loop) assure that at least 99.9% of the fuel rods are expected to avoid boiling transition during normal operation or anticipated operational occurrences.

The proposed MCPR Safety Limit results are combined with other licensing analyses results (using NRC approved methodology referenced in Technical Specification 5.6.5.b) to generate the MCPR operating limits in the U2C12 COLR. The COLR operating limits thus assure that the MCPR Safety Limit will not be exceeded during normal operation or anticipated operational occurrences, thus providing the required protection for the fuel rod cladding. Postulated accidents are also analyzed and the results shown to be within the NRC approved criteria.

#### **4.0 TECHNICAL ANALYSIS**

This Technical Specification change decreases the Unit 2 Cycle 12 MCPR safety limits from 1.10 to 1.08 for two-loop operation and 1.11 to 1.09 for single loop operation. The MCPR safety limit decrease occurs due to the incorporation of smaller power distribution uncertainties in the MCPR Safety Limit analysis that are based on NRC approved CASMO-4/MICROBURN-B2 methodology (this approved methodology is consistent with implementation of the POWERPLEX<sup>®</sup>-III Core Monitoring System for U2C12).

The NRC approved MCPR Safety Limit methodology referenced in T.S. 5.6.5.b uses radial and local power distribution uncertainties that are based on NRC approved statistical methods and code system benchmarks. For the current Unit 2 Cycle 12 MCPR Safety Limit, radial and local power distribution uncertainties were based on the NRC approved CASMO-3/MICROBURN-B code system that is implemented within the POWERPLEX<sup>®</sup>-II core monitoring system. The POWERPLEX<sup>®</sup>-II core monitoring system was used for the initial portion of Unit 2 Cycle 12 operation, thus the CASMO-3/MICROBURN-B based uncertainties were used. Currently, Unit 2 Cycle 12 is operating with the POWERPLEX<sup>®</sup>-III core monitoring system. Therefore, the revised Unit 2 Cycle 12 MCPR Safety Limit radial and local power distribution uncertainties are based on the NRC approved CASMO-4/MICROBURN-B2 code system that is implemented within the POWERPLEX<sup>®</sup>-III core monitoring system. Radial and local power distribution uncertainties based on the CASMO-4/MICROBURN-B2 code system are smaller than the corresponding uncertainties based on the CASMO-3/MICROBURN-B code system.

The proposed change to the MCPR Safety Limits does not directly or indirectly affect any plant system, equipment, component, or change the processes used to operate the plant. As discussed above, the reload analyses performed prior to U2C12 startup meets all applicable acceptance criteria. Therefore, the proposed changes do not affect the failure modes of any systems or components. Thus, the proposed change does not create the possibility of a previously unevaluated operator error or a new single failure. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

Since the proposed change does not alter any plant system, equipment, or component, the proposed change will not jeopardize or degrade the function or operation of any plant system or component governed by Technical Specifications. The proposed MCPR Safety Limits do not involve a significant reduction in the margin of safety as currently defined in the Bases of the applicable Technical Specification sections, because the MCPR Safety Limits calculated for U2C12 preserve the required margin of safety.

Operator performance and procedures are unaffected by these proposed changes since the changes are essentially transparent to the operators and plant procedures, and do not change the way in which the plant is operated. The revised MCPR Operating Limits will be incorporated in an updated Core Operating Limits Report. The FSAR will be updated to include the POWERPLEX<sup>®</sup>-III core monitoring system uncertainties for Unit 2.

Therefore, the proposed action does not involve an increase in the probability or an increase in the consequences of an accident previously evaluated in the SAR. Thus, the proposed changes are in compliance with applicable regulations. The health and safety of the public is not adversely impacted by operation of SSES as proposed.

## **5.0 REGULATORY SAFETY ANALYSIS**

### **5.1 NO SIGNIFICANT HAZARDS CONSIDERATION**

PPL Susquehanna, LLC (PPL) has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

**1. Does the proposed change involve a significant increase in the probability of occurrence or consequences of an accident previously evaluated?**

Response: No.

The proposed change to the MCPR Safety Limits does not directly or indirectly affect any plant system, equipment, component, or change the processes used to operate the plant. Further, the revised U2C12 MCPR Safety Limits are generated using NRC approved methodology and meet the applicable acceptance criteria. Thus, this proposed amendment does not involve a significant increase in the probability of occurrence of an accident previously evaluated.

The U2C12 licensing analyses were performed (using NRC approved methodology referenced in Technical Specification Section 5.6.5.b) to determine changes in the critical power ratio as a result of anticipated operational occurrences. These results are added to the revised MCPR Safety Limit values proposed herein to generate MCPR operating limits for a revised U2C12 COLR. The COLR operating limits thus assure that the MCPR Safety Limit will not be exceeded during normal operation or anticipated operational occurrences. Postulated accidents were also analyzed and the results shown to be within the NRC approved criteria.

Therefore, this proposed amendment does not involve a significant increase in the probability of occurrence or consequences of an accident previously evaluated.

**2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?**

Response: No.

The change to the MCPR Safety Limits does not directly or indirectly affect any plant system, equipment, or component and therefore does not affect the failure modes of any of these items. Thus, the proposed changes do not create the possibility of a previously unevaluated operator error or a new single failure.

Therefore, this proposed amendment does not create the possibility of a new or different kind of accident from any previously evaluated.

**3. Does the proposed amendment involve a significant reduction in a margin of safety?**

Response: No.

Since the proposed changes do not alter any plant system, equipment, component, or the processes used to operate the plant, the proposed change will not jeopardize or degrade the function or operation of any plant system or component governed by Technical Specifications. The proposed MCPR Safety Limits do not involve a significant reduction in the margin of safety as currently defined in the Bases of the applicable Technical Specification sections, because the MCPR Safety Limits calculated for U2C12 preserve the required margin of safety.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Based upon the above, PPL Susquehanna, LLC (PPL) concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of “no significant hazards consideration” is justified.

**5.2 APPLICABLE REGULATORY REQUIREMENTS/CRITERIA**

Title 10 of the Code of Federal Regulations (10 CFR) establishes the fundamental regulatory requirements with respect to reactivity control systems. Specifically, General Design Criterion 10 (GDC-10), “Reactor design,” in Appendix A, “General Design Criteria for Nuclear Power Plants,” to 10 CFR Part 50 states, in part, that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded.

The proposed MCPR Safety Limit values in TS Section 2.1.1.2 will ensure that 99.9% of the fuel rods in the core are not expected to experience boiling transition. This satisfies the requirements of GDC-10 regarding acceptable fuel design limits.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission’s regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

## **6.0 ENVIRONMENTAL CONSIDERATION**

10 CFR 51.22(c)(9) identifies certain licensing and regulatory actions, which are eligible for categorical exclusion from the requirement to perform an environmental assessment. A proposed amendment to an operating license for a facility does not require an environmental assessment if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant hazards consideration; (2) result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite; or (3) result in a significant increase in individual or cumulative occupational radiation exposure. PPL Susquehanna, LLC has evaluated the proposed changes and has determined that the proposed changes meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Accordingly, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with issuance of the amendment. The basis for this determination, using the above criteria, follows:

### **BASIS**

As demonstrated in the No Significant Hazards Consideration Evaluation, the proposed amendment does not involve a significant hazards consideration.

There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite. The proposed change does not involve any physical alteration of the plant (no new or different type of equipment will be installed) or change in methods governing normal plant operation.

There is no significant increase in individual or cumulative occupational radiation exposure. The proposed change does not involve any physical alteration of the plant (no new or different type of equipment will be installed) or change in methods governing normal plant operation.

## **7.0 REFERENCES**

None.

---

**Attachment 1 to PLA-5672**

**Proposed Technical Specification Changes  
(Markups)**

**(Unit 2)**

---

## 2.0 SAFETY LIMITS (SLs)

---

### 2.1 SLs

#### 2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 785 psig or core flow < 10 million lbm/hr.

THERMAL POWER shall be  $\leq$  25% RTP.

2.1.1.2 With the reactor steam dome pressure  $\geq$  785 psig and core flow  $\geq$  10 million lbm/hr.

MCPR shall be  $\geq$  ~~1.10~~ <sup>1.08</sup> for two recirculation loop operation or  $\geq$  ~~1.11~~ <sup>1.09</sup> for single recirculation loop operation.

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

#### 2.1.2 Reactor Coolant System Pressure SL

Reactor steam dome pressure shall be  $\leq$  1325 psig.

---

### 2.2 SL Violations

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

---

---

**Attachment 2 to PLA-5672**

**Changes to TS Bases Pages  
(Markups)**

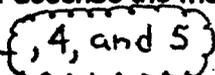
**(Unit 2)**

---

BASES

**APPLICABLE  
SAFETY  
ANALYSES**

2.1.1.2      MCPR    (continued)

that considers the uncertainties in monitoring the core operating state. One specific uncertainty included in the SL is the uncertainty in the critical power correlation. References 2 ~~and 4~~ describe the methodology used in determining the MCPR SL. 

The ANFB-10 critical power correlation is based on a significant body of practical test data. As long as the core pressure and flow are within the range of validity of the correlation (refer to Section B 2.1.1.1), the assumed reactor conditions used in defining the SL introduce conservatism into the limit because bounding high radial power factors and bounding flat local peaking distributions are used to estimate the number of rods in boiling transition. These conservatisms and the inherent accuracy of the ANFB-10 correlation provide a reasonable degree of assurance that during sustained operation at the MCPR SL there would be no transition boiling in the core. If boiling transition were to occur, there is reason to believe that the integrity of the fuel would not be compromised.

Significant test data accumulated by the NRC and private organizations indicate that the use of a boiling transition limitation to protect against cladding failure is a very conservative approach. Much of the data indicate that BWR fuel can survive for an extended period of time in an environment of boiling transition.

SPC ATRIUM-10 fuel is monitored using the ANFB-10 Critical Power Correlation. The effects of channel bow on MCPR are explicitly included in the calculation of the MCPR SL. Explicit treatment of channel bow in the MCPR SL addresses the concerns of the NRC Bulletin No. 90-02 entitled "Loss of Thermal Margin Caused by Channel Box Bow."

Monitoring required for compliance with the MCPR SL is specified in LCO 3.2.2, Minimum Critical Power Ratio.

2.1.1.3      Reactor Vessel Water Level

During MODES 1 and 2 the reactor vessel water level is required to be above the top of the active fuel to provide core cooling capability. With fuel in the reactor vessel during periods when the reactor is shut down, consideration must be given to water level requirements due to the effect of decay heat. If the water level should drop below the top of the active irradiated fuel during this period, the ability to remove decay heat is reduced. This reduction in cooling capability could lead to elevated cladding temperatures and clad perforation in the event that the water level becomes < 2/3 of the core height.

(continued)

BASES

<b>APPLICABLE SAFETY ANALYSES</b>	<u>2.1.1.3</u> <u>Reactor Vessel Water Level (continued)</u>
	The reactor vessel water level SL has been established at the top of the active irradiated fuel to provide a point that can be monitored and to also provide adequate margin for effective action.
<b>SAFETY LIMITS</b>	The reactor core SLs are established to protect the integrity of the fuel clad barrier to the release of radioactive materials to the environs. SL 2.1.1.1 and SL 2.1.1.2 ensure that the core operates within the fuel design criteria. SL 2.1.1.3 ensures that the reactor vessel water level is greater than the top of the active irradiated fuel in order to prevent elevated clad temperatures and resultant clad perforations.
<b>APPLICABILITY</b>	SLs 2.1.1.1, 2.1.1.2, and 2.1.1.3 are applicable in all MODES.
<b>SAFETY LIMIT VIOLATIONS</b>	Exceeding an SL may cause fuel damage and create a potential for radioactive releases in excess of 10 CFR 100, "Reactor Site Criteria," limits (Ref. 3). Therefore, it is required to insert all insertable control rods and restore compliance with the SLs within 2 hours. The 2 hour Completion Time ensures that the operators take prompt remedial action and also ensures that the probability of an accident occurring during this period is minimal.
<b>REFERENCES</b>	<ol style="list-style-type: none"> <li>1. 10 CFR 50, Appendix A, GDC 10.</li> <li>2. ANFB 524 (P)(A), Revision 2, "Critical Power Methodology for Boiling Water Reactors," Supplement 1 Revision 2 and Supplement 2, November 1990.</li> <li>3. 10 CFR 100.</li> <li>4. EMF-1997, Revision 0 (October 1997) and Supplement 1, Revision 0 (January 1998), "ANFB-10 Critical Power Correlation," and associated NRC SER dated 7/17/98.</li> </ol>

5. EMF-2158(P)(A) Rev. 0, "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4 / MICROBURN-B2," October 1999.

---

**Attachment 3 to PLA-5672**

**Proposed Technical Specification Changes  
(Camera Ready)**

**(Unit 2)**

---

## 2.0 SAFETY LIMITS (SLs)

---

### 2.1 SLs

#### 2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 785 psig or core flow < 10 million lbm/hr:

THERMAL POWER shall be  $\leq$  25% RTP.

2.1.1.2 With the reactor steam dome pressure  $\geq$  785 psig and core flow  $\geq$  10 million lbm/hr:

MCPR shall be  $\geq$  1.08 for two recirculation loop operation or  $\geq$  1.09 for single recirculation loop operation.

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

#### 2.1.2 Reactor Coolant System Pressure SL

Reactor steam dome pressure shall be  $\leq$  1325 psig.

---

### 2.2 SL Violations

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

---

---

**Attachment 4 to PLA-5672**

**List of Regulatory Commitments**

**(Unit 2)**

---

**LIST OF REGULATORY COMMITMENTS**

<b>REGULATORY COMMITMENTS</b>	<b>Due Date/Event</b>
There are no new commitments associated with this submittal.	NA

---

**Attachment 5 to PLA-5672**

**Unit 2 Cycle 12 Core Composition**

---

**Unit 2 Cycle 12 Core Composition**

<b>Assembly Type</b>	<b>Operational History</b>	<b>Number of Assemblies</b>
FANP ATRIUM™-10	Fresh	284
FANP ATRIUM™-10	Once-burned	300
FANP ATRIUM™-10	Twice-burned	180