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SUBJECT: Application for amend to license NPF-22, revising ANFB  
critical power correlation & MCPR safety limits.

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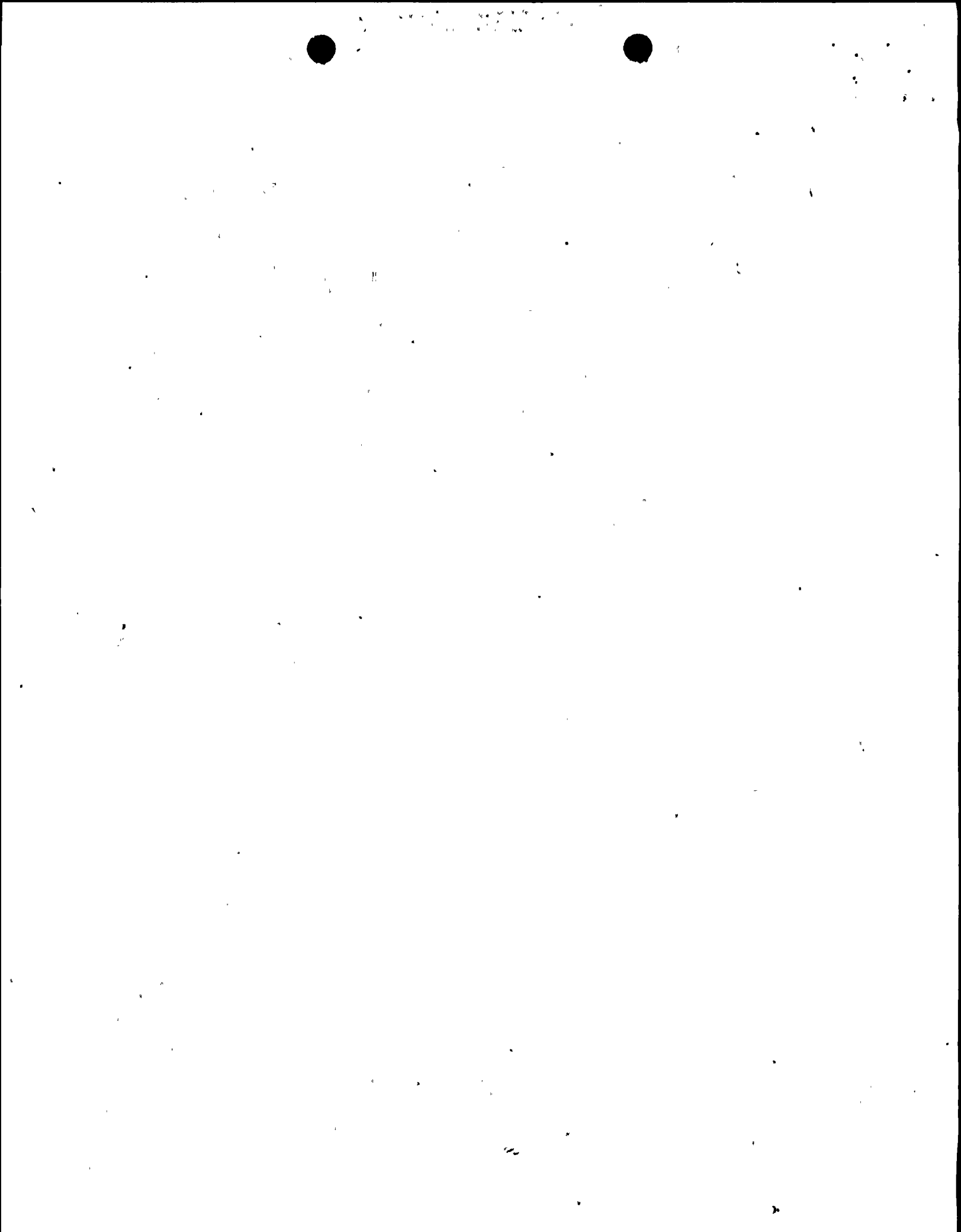
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**SUSQUEHANNA STEAM ELECTRIC STATION  
PROPOSED AMENDMENT NO. 157 TO LICENSE NPF-22:  
ANFB CRITICAL POWER CORRELATION AND  
MCPR SAFETY LIMITS  
PLA-4464**

**FILES R41-1/A17-2**

**Docket No. 50-388**

- Reference: 1.) PLA-4348, R.G. Byram to U.S. NRC, "Request for Review of Topical Report PL-NF-90-001, Supplement 2" dated August 1, 1995.
- 2.) U.S. NRC to R.G. Byram, "Request for Additional Information Related to the Request by Pennsylvania Power and Light Company for Approval of Fuel Topical Report TR PL-NF-90-001, Supplement 2, "Application of Reactor Analyses Methods for BWR Design & Analysis" (TAC Nos. M93267 and M93268), dated 12/5/95.
- 3.) PLA-4404, R.G. Byram to U.S. NRC, "Response to Request for Additional Information Related to the Request for Approval of Fuel Topical Report TR PL-NF-90-001, Supplement 2, "Application of Reactor Analyses Methods for BWR Design and Analysis", dated January 22, 1996.

This letter proposes changes to the Susquehanna Steam Electric Station Unit 2 Technical Specifications. These changes stem from proposed changes in the Critical Power Correlation used to compute the Minimum Critical Power Ratio (MCPR) to substitute the ANFB Critical Power Correlation in place of the XN-3 correlation currently used, as documented in Reference 1. This proposed amendment includes changes to the MCPR Safety Limit values, the addition of methodology references in Section 6.9.3.2, and associated Bases changes.

Enclosure A to this letter is the "Safety Assessment" supporting this change. Enclosure B to this letter is the "No Significant Hazards Considerations" evaluation performed in accordance with the criteria of 10 CFR 50.92. The proposed changes have been approved by the Susquehanna SES Plant Operations Review Committee and reviewed by the Susquehanna Review Committee.

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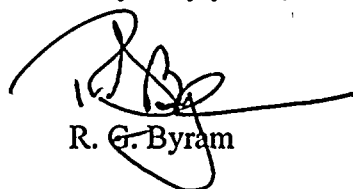
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Enclosure C to this letter is the current pages of the Susquehanna SES Unit 2 Technical Specifications marked to show the proposed changes.

It is PP&L's belief that NRC approval of these proposed changes can be tied directly to the approval of the associated Topical Report (Reference 1), since these changes are simply the incorporation of the described Topical Report (by reference) and the MCPR Safety Limit associated with the new Critical Power Correlation. With this in mind, PP&L requests that NRC complete its review of this change prior to August 1, 1996 in order to support our currently scheduled implementation schedule.

Any questions regarding this request should be directed to Mr. Andrew K. Maron at (610) 774-7727.

Very truly yours,



R. G. Byram

Attachments

copy: NRC Region I  
Mr. C. Poslusny, Jr., NRC Sr. Project Manager - OWFN  
Ms. M. Banerjee, NRC Sr. Resident Inspector - SSES  
Mr. W. P. Dornsife, Pa. DEP

BEFORE THE  
UNITED STATES NUCLEAR REGULATORY COMMISSION

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In the Matter of :  
PENNSYLVANIA POWER & LIGHT COMPANY : Docket No. 50-388

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REVISED PROPOSED AMENDMENT No. 157  
FACILITY OPERATING LICENSE NO. NPF-22  
SUSQUEHANNA STEAM ELECTRIC STATION  
UNIT NO. 2

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Licensee, Pennsylvania Power & Light Company, hereby files proposed Amendment No. 157 to its Facility Operating License No. NPF-22 dated March 23, 1984.

This amendment contains a revision to the Susquehanna SES Unit 2 Technical Specifications.

PENNSYLVANIA POWER & LIGHT COMPANY  
BY:



R. G. Byram  
Sr. Vice President - Nuclear

Sworn to and subscribed before me  
this 20<sup>th</sup> of May, 1996.



Notary Public

Notarial Seal  
Martha C. Sedora, Notary Public  
Allentown, Lehigh County  
My Commission Expires Jan. 15, 1998  
Member, Pennsylvania Association of Notaries



## SAFETY ASSESSMENT

### ANFB CRITICAL POWER CORRELATION AND MCPR SAFETY LIMITS

#### BACKGROUND

Excessive overheating of the fuel rod cladding can result in cladding damage and the release of fission products. In order to protect the cladding against overheating due to boiling transition, the THERMAL POWER, High Pressure and High Flow SAFETY LIMIT (Section 2.1.2 of the Susquehanna Steam Electric Station Technical Specifications) was established.

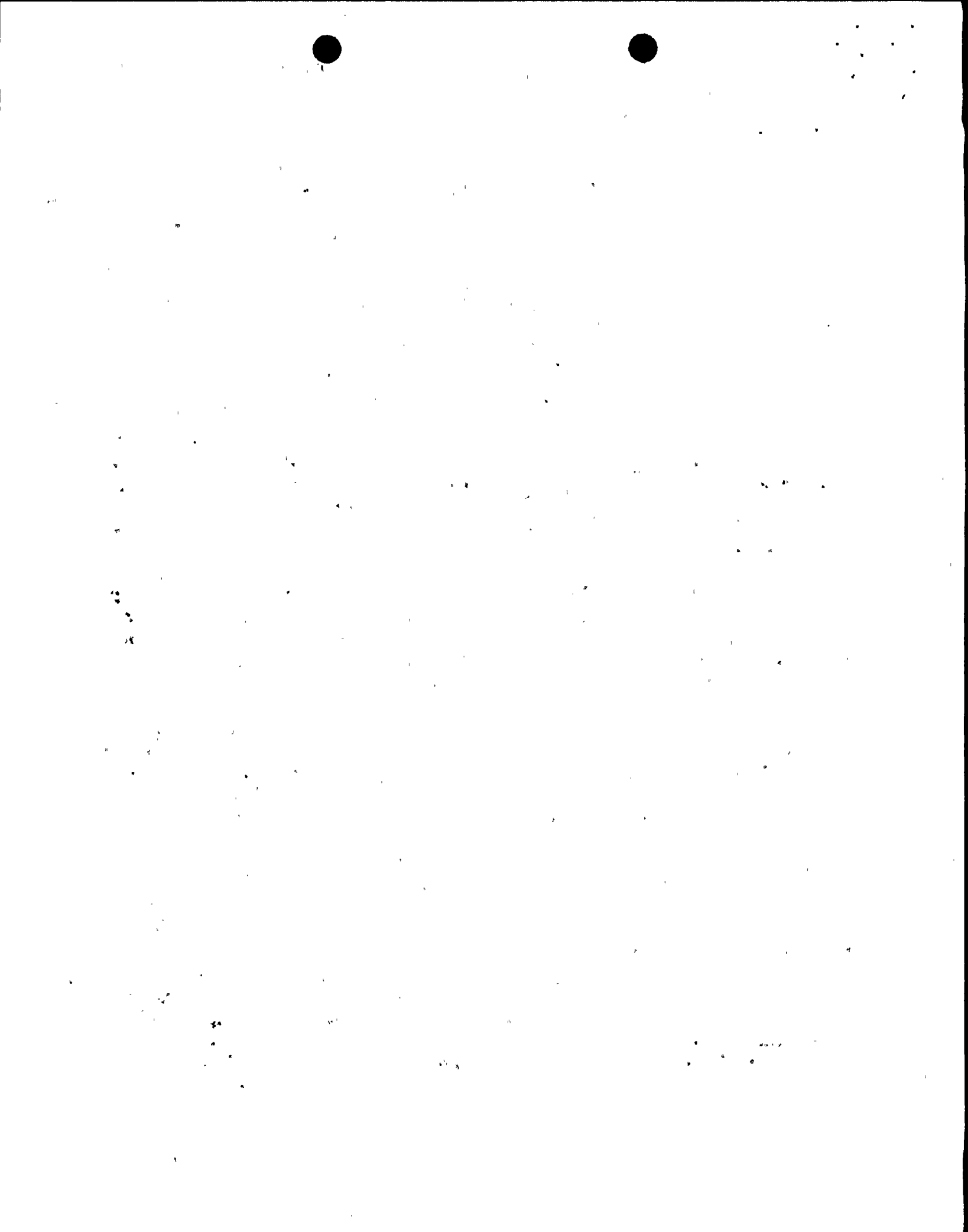
NUREG-0800, Standard Review Plan Section 4.4, specifies an acceptable, conservative approach to define this SAFETY LIMIT. Specifically, a Minimum Critical Power Ratio (MCPR) value is specified such that at least 99.9% of the fuel rods are expected to avoid boiling transition during normal operation or anticipated operational occurrences. Boiling transition is predicted using a correlation based on test data (i.e., a Critical Power Correlation). Currently, the XN-3 Critical Power Correlation is used to monitor the Unit 2 core.

The specific value of MCPR used for the SAFETY LIMIT is calculated using NRC approved licensing methods. The SAFETY LIMIT MCPR calculation combines various uncertainties such as feedwater flow, feedwater temperature, pressure, power distribution uncertainties, and uncertainty in the Critical Power Correlation. The current Susquehanna Steam Electric Station Technical Specification SAFETY LIMITS were derived using the XN-3 Critical Power Correlation developed by Siemens Power Corporation (SPC).

PP&L plans to replace the existing core monitoring system with the more advanced POWERPLEX-II core monitoring system. In order to be able to monitor more advanced fuel designs (such as the SPC ATRIUM-10 design being loaded into Unit 2 in the Spring of 1997), the more advanced ANFB Critical Power Correlation is used in POWERPLEX-II. The ANFB correlation is based on more test data for current and advanced SPC fuel designs than the currently used XN-3 correlation.

Included in the revised Technical Specifications via reference (Section 6.9.3.2) is PL-NF-90-001, Supplement 2. This report reflects modifications to PP&L's licensing methods applicable to the ANFB correlation, as well as the use of the CASMO3G lattice physics code. NRC approval for Supplement 2 is pending.

Thus, this proposed change to the Susquehanna SES Technical Specifications reflects a change in the Critical Power Correlation used to compute the Minimum Critical Power Ratio (MCPR). The changes reflect the substitution of the ANFB Critical Power Correlation in place of the XN-3 correlation currently used.





## AFFECTED TECHNICAL SPECIFICATIONS

The proposed change entails changes to the MCPR Safety Limit values (Sections 2.1 and 3.4.1.1.2), the addition of methodology references in Section 6.9.3.2, and associated BASES changes (BASES Sections 2.1 and 3/4.4).

## SAFETY ANALYSIS

### Analysis

General Design Criterion 10 requires that the specified acceptable fuel design limits are not exceeded during steady state operation, normal operational transients, and anticipated operational occurrences (AOOs). The fuel cladding integrity Safety Limit is set such that no significant fuel damage from cladding overheating is calculated to occur if the limit is not violated. MCPR greater than the specified limit represents a conservative margin relative to the conditions required to maintain fuel cladding integrity.

The MCPR Safety Limit helps ensure sufficient conservatism in the operating MCPR limit such that, in the event of an AOO from the limiting condition of operation, at least 99.9% of the fuel rods in the core would be expected to avoid boiling transition. The margin between calculated boiling transition (i.e., MCPR=1.0) and the MCPR Safety Limit is based on a statistical procedure that considers the uncertainties in monitoring the core operating state. One specific uncertainty included in the Safety Limit is the uncertainty inherent in the critical power correlation.

The critical power correlation is based on a significant body of practical test data, providing a degree of assurance that the critical power, as evaluated by the correlation, is within a small percentage of the actual critical power being estimated. As long as the core pressure and flow are within the range of validity of the correlation, the assumed reactor conditions used in defining the Safety Limit 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.

A cycle specific MCPR Safety Limit analysis was performed for PP&L by SPC. This analysis used NRC approved methods described in the SPC reports: ANF-524(P)(A), Revision 2, and Supplement 1, Revision 2, "Advanced Nuclear Fuels Corporation Critical Power Methodology for Boiling Water Reactors;" and ANF-1125 (P)(A) and Supplement 1, "ANFB Critical Power Correlation." The SAFETY LIMIT MCPR calculation statistically combines uncertainties on feedwater flow, feedwater temperature, core flow, core pressure, core power distribution, and the uncertainty in the Critical Power Correlation. The SPC analysis uses cycle specific power distributions and calculates a value of MCPR such that at least 99.9% of the fuel rods are

expected to avoid boiling transition during normal operation or anticipated operational occurrences. The resulting two-loop and single-loop values (Technical Specification Sections 2.1 and 3.4.1.1.2) are included in the proposed change.

NRC approval of the licensing methodology used to compute the transient  $\Delta$ CPR is currently pending (PL-NF-90-001, Supplement 2). The methods described in PL-NF-90-001, Supplement 2, will be used to generate MCPR Operating Limits for the Unit 2 Core Operating Limits Report.

### **Conclusion**

This proposed change to the Susquehanna SES Technical Specifications reflects a change in the Critical Power Correlation used to compute the Minimum Critical Power Ratio (MCPR). The use of the advanced ANFB Critical Power Correlation in PP&L's licensing methods is a valid means of calculating MCPR Operating Limits. NRC approved methods are used to compute the MCPR Safety Limits and Operating Limits.

Additionally, PP&L's licensing methods, as modified to use ANFB, are valid for advanced fuel types and 24 month cycle operation.

**NO SIGNIFICANT HAZARDS CONSIDERATIONS****ANFB CRITICAL POWER CORRELATION AND MCPR SAFETY LIMITS**

Pennsylvania Power & Light Company has evaluated the proposed Technical Specification change in accordance with the criteria specified by 10 CFR 50.92 and has determined that the proposed change does not involve a significant hazards consideration. The criteria and conclusions of our evaluation are presented below.

- 1. The proposed change does not involve an increase in the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety, as previously evaluated.**

The change to the ANFB correlation and corresponding MCPR Safety Limits does not physically change the plant systems, structures, or components. Thus, the probability of an event evaluated in the SAR is not increased. The acceptance criterion for the MCPR Safety Limit (i.e., 99.9% of the fuel rods expected to avoid boiling transition) is not changed. Only the methodology used to demonstrate compliance is changed. Therefore, the consequences of anticipated operational occurrences (which must show the Safety Limit is not violated) are not changed.

- 2. The Proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.**

As stated above, this methodology change does not impact the acceptance criteria for the MCPR Safety Limits and does not physically change the plant systems, structures, or components. Since no changes to the physical plant are being made, this change does not create the possibility of a new event not previously evaluated in the SAR.

- 3. The proposed change does not involve a significant reduction in a margin of safety.**

A cycle specific MCPR Safety Limit analysis was performed by SPC. This analysis used NRC approved methods described in the SPC report: ANF-524(P)(A), Revision 2 and Supplement 1, Revision 2. The MCPR Safety Limit value is calculated such that at least 99.9% of the fuel rods are expected to avoid boiling transition during normal operation or anticipated operational occurrences. Both the existing analysis using XN-3 and the new analysis using ANFB utilize NRC approved methods to accomplish this same objective. Therefore, the change to an ANFB based Safety Limit does not involve a significant reduction in a margin of safety.

ENVIRONMENTAL CONSEQUENCES

This request is consistent with the Susquehanna design basis, in that the acceptance criterion for the MCPR Safety Limit (i.e., 99.9% of the fuel rods expected to avoid boiling transition) is unchanged. Only the methodology used to demonstrate compliance is changed, however, this methodology is NRC approved. Therefore, no environmental consequences that have not been previously considered are anticipated.

**ENCLOSURE C TO PLA-4464**