



**PERRY NUCLEAR POWER PLANT**

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October 24, 1996  
PY-CEI/NRR-2104L

United States Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555

Perry Nuclear Power Plant  
Docket No. 50-440  
License Amendment Request Pursuant to 10 CFR 50.90: Proposed Revision of Technical Specification Safety Limit 2.1.1.2, Safety Limits, Reactor Core Safety Limits, Minimum Critical Power Ratio

Ladies and Gentlemen:

Enclosed is a request for amendment of the Facility Operating License NPF-58 Appendix A Technical Specifications for the Perry Nuclear Power Plant (PNPP), Unit Number 1. The proposed amendment would modify the existing Minimum Critical Power Ratio (MCPR) Reactor Core Safety Limit contained in Technical Specification (TS) 2.1.1.2. Specifically, the change would apply additional conservatism by increasing the MCPR Safety Limit values, as calculated by General Electric (GE) for Operating Cycle 6, from 1.07 to 1.09 for two recirculation loop operation, and from 1.08 to 1.10 for single recirculation loop operation.

The need for this change resulted from a discovery by GE Nuclear Energy that the generic MCPR Safety Limit value calculated by GE could be non-conservative when applied to some actual core and fuel designs. GE subsequently reported this condition to the Nuclear Regulatory Commission (NRC) under 10 CFR 21 in a letter to the NRC dated May 24, 1996.

Administrative controls have been established at PNPP to account for the potential non-conservatism of the current generic MCPR Safety Limit value, and no violation of the limits has occurred. The Core Operating Limits Report (COLR) was revised to incorporate a penalty to ensure that the basis for the MCPR Safety Limit would continue to be met during anticipated operational occurrences. The plant core monitoring calculations presently incorporate this penalty, which compensates for the non-conservative generic MCPR Safety Limit.

Attachment 1 provides the Summary, Description of the Proposed Change, Safety Analysis, and Environmental Consideration. Attachment 2 provides the Significant Hazards Consideration. Attachment 3 provides the annotated TS change reflecting the proposed changes.

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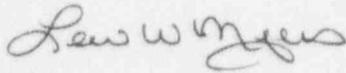
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October 24, 1996

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If you have questions or require additional information, please contact  
Mr. James D. Kloosterman, Manager - Regulatory Affairs, at (216) 280-5833.

Very truly yours,



Lew W. Myers  
Vice President - Nuclear

KMN:sc

Attachments

cc: NRC Project Manager  
NRC Region III  
NRC Resident Inspector  
State of Ohio

I, Lew W. Myers, being duly sworn state that (1) I am Vice President, Nuclear of the Centerior Service Company, (2) I am duly authorized to execute and file this certification on behalf of The Cleveland Electric Illuminating Company and Toledo Edison Company, and as the duly authorized agent for Duquesne Light Company, Ohio Edison Company, and Pennsylvania Power Company, and (3) the statements set forth herein are true and correct to the best of my knowledge, information and belief.

Lew W Myers  
Lew W. Myers

Sworn to and subscribed before me, the 24 day of 10,  
1996.

Jane E Mott  
JANE E. MOTT  
Notary Public, State of Ohio  
My Commission Expires Feb. 20, 2000  
(Recorded in Lake County)

## SUMMARY

This License Amendment Request proposes an amendment of the Facility Operating License NPF-58 Appendix A Technical Specifications for the Perry Nuclear Power Plant (PNPP), Unit Number 1. The proposed amendment would modify the existing Minimum Critical Power Ratio (MCPR) Reactor Core Safety Limit contained in Technical Specification (TS) 2.1.1.2.

The need for the change resulted from a discovery by General Electric (GE) Nuclear Energy that the generic MCPR Safety Limit value calculated by GE could be non-conservative when applied to some actual core and fuel designs. This discovery was made while calculating a cycle-specific MCPR Safety Limit for another utility. GE subsequently reported this condition to the Nuclear Regulatory Commission (NRC) in accordance with 10 CFR 21 in a letter dated May 24, 1996.

## DESCRIPTION OF THE PROPOSED CHANGE

In accordance with 10 CFR 50.90, an amendment to Operating License NPF-58 is proposed to incorporate revised MCPR Safety Limit values in TS 2.1.1.2 (Reactor Core Safety Limits). Specifically, the proposed change would increase the MCPR Safety Limit values from 1.07 to 1.09 for two recirculation loop operation, and from 1.08 to 1.10 for single recirculation loop operation. The following change to the PNPP TS is therefore proposed:

Change TS 2.1.1.2 to read "MCPR shall be  $\geq 1.09$  for two recirculation loop operation or  $\geq 1.10$  for single recirculation loop operation."

The proposed TS change is annotated on the affected page from the PNPP TS in Attachment 3.

## SAFETY ANALYSIS

### **BACKGROUND**

On March 27, 1996, GE notified the NRC that the MCPR Safety Limit generically calculated in accordance with the General Electric Standard Application for Reactor Fuel (GESTAR II) may be non-conservative when applied to some actual core and fuel designs. In addition, this was a reportable condition under 10 CFR 21, and was the subject of a notification from GE to the NRC dated May 24, 1996.

The GE assumptions made for the generic MCPR Safety Limit were not bounding. Since the bounding analysis was originally performed, fuel bundle designs and core loading patterns have changed to incorporate a more uniform core power distribution. The bundle designs and core loading patterns have also been optimized, consequently, many designs do not conform to the original power distribution assumptions. Therefore, fuel bundle and core power distribution assumptions were no longer conservative.

Administrative controls have been established at PNPP to account for the potential non-conservatism of the current, generic MCPR Safety Limit. The Core Operating Limits Report (COLR) was revised to incorporate a penalty to ensure that the MCPR Safety Limit would

continue to be met during anticipated operational occurrences. In addition, plant core monitoring calculations are currently performed incorporating this penalty.

The MCPR Safety Limit is established to ensure fuel cladding integrity is not compromised as a result of overheating. The Safety Limit is defined as the critical power ratio in the limiting fuel assembly for which more than 99.9% of the fuel rods in the core are expected to avoid boiling transition, considering the power distribution within the core and uncertainties. The MCPR Safety Limit provides a 95% probability at the 95% confidence level that following any abnormal operating occurrence, greater than 99.9% of the fuel rods avoid boiling transition.

### **CALCULATING THE MCPR SAFETY LIMIT**

The MCPR Safety Limit is determined using a statistical model that combines the uncertainties in operating parameters and the procedures used to calculate critical power. The probability of the occurrence of boiling transition is determined using the NRC approved GE critical power correlations. The MCPR Safety Limit analysis maximizes the number of fuel rods that are at or near the transition boiling limits. The newer optimized bundle designs and core loading patterns for the uniform core power distribution result in an increased number of bundles with small variations in characteristics. Therefore, there are more bundles available to be at the transition boiling limits. In addition, the uniform power distribution within the bundle causes more fuel rods to be at the same margin to the limit. Therefore, the MCPR Safety Limit must be set higher to meet the probability requirements.

GE's calculation of the revised plant specific MCPR Safety Limit for the PNPP Unit 1, Cycle 6 was based upon NRC approved methods ("General Electric Standard Application for Reactor Fuel," NEDE-24011-P-A-11, and US Supplement, NEDE-24011-P-A-11-US, November 17, 1995) along with NRC approved interim implementing procedures as discussed during the GE meetings with the NRC on April 17, 1996, and May 6 through 10, 1996. This methodology was identical to the generic calculation, except the following cycle specific parameters were used to offset the non-conservatism of the generic MCPR:

1. Actual core loading
2. Conservative variations of projected control blade patterns
3. Actual bundle parameters for R-factor distributions
4. Calculations made for several points in the cycle

### **IMPACT TO OTHER REACTOR PARAMETERS**

The MCPR Safety Limit change has no influence on peak pressures due to MSIV closure, thus there is no influence on the reactor pressure vessel integrity.

The bases for the Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) and Linear Heat Generation Rate (LHGR) are to limit the peak clad temperature during a Loss of Coolant Accident and prevent 1% plastic strain of the clad. The MCPR Safety Limit change has no influence on MAPLHGR or LHGR.

Changing the MCPR Safety Limit has no influence on the nuclear characteristics of the fuel bundle during cold shutdown. Therefore, there is no influence on shutdown margin.

## **CONCLUSION**

This change restores the MCPR Safety Limit to the same margin of safety as described in the PNPP USAR and GESTAR II.

## **ENVIRONMENTAL CONSIDERATION**

The proposed Technical Specification change request was evaluated against the criteria of 10 CFR 51.22 for environmental considerations. The proposed change does not significantly increase individual or cumulative occupational radiation exposures, does not significantly change the types or significantly increase the amounts of effluents that may be released offsite, and as discussed in Attachment 2, does not involve a significant hazards consideration. Based on the foregoing, it has been concluded that the proposed Technical Specification change meets the criteria given in 10 CFR 51.22(c)(9) for a categorical exclusion from the requirement for an Environmental Impact Statement.

## SIGNIFICANT HAZARDS CONSIDERATION

The standards used to arrive at a determination that a request for amendment involves no significant hazards considerations are included in the Commission's Regulations, 10 CFR 50.92, which state that the operation of the facility in accordance with the proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any previously evaluated; or (3) involve a significant reduction in a margin of safety.

The proposed amendment has been reviewed with respect to these three factors and it has been determined that the proposed change does not involve a significant hazard because:

1. The proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

There is no change to any plant equipment. Per USAR Section 4.2.1, the fuel system design bases are provided in General Electric Standard Application for Reactor Fuel (GESTAR II). The new Minimum Critical Power Ratio (MCPR) Safety Limit protects the fuel in accordance with the design basis. Increasing the MCPR Safety Limit limits the bundle power to a smaller fraction of the critical power. The critical power remains unchanged, therefore, there is not an increase in the probability of transition boiling. The basis of the MCPR Safety Limit calculation remains the same, ensuring that greater than 99.9% of all fuel rods in the core avoid transition boiling if the limit is not violated. Therefore, there is no increase in the probability of the occurrence of a previously analyzed accident.

The fundamental sequences of accidents and transients have not been altered. The MCPR Operating Limits are selected such that potentially limiting plant transients and accidents prevent the MCPR from decreasing below the MCPR Safety Limit anytime during the transient. The increased MCPR Safety Limit results in an increased MCPR Operating Limit; therefore, there is no impact on any of the limiting USAR Appendix 15B transients. The radiological consequences are the same as previously stated in the USAR, and as approved in the NRC Safety Evaluation for GESTAR II. The Supplemental Reload Licensing Report documents results of the GESTAR II analysis for Cycle 6. Therefore, the consequences of an accident do not increase over previous evaluations in the USAR.

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

The new MCPR Safety Limit values are designed to ensure that fuel damage from transition boiling does not occur in at least 99.9% of the fuel rods in the core as a result of the limiting postulated accident. The new values are calculated in accordance with GESTAR II and the fuel vendor's interim implementing procedures, which incorporate cycle-specific parameters. The GESTAR II analysis has been accepted by the NRC as comprehensive for ensuring that fuel designs will perform within acceptable bounds. The new MCPR Safety Limit ensures that the fuel is protected in accordance with the design basis. The function, location, operation, and handling of the fuel remain unchanged. In addition, the initiating sequence of events has not changed. Therefore, no new or different kind of accident is created.

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

The new MCPR Safety Limit values do not alter the design or function of any plant system, including the fuel. The new MCPR Safety Limit values were calculated using NRC approved methods described in GESTAR II and the fuel vendor's interim implementing procedures, which incorporate cycle-specific parameters. The new MCPR Safety Limit values are consistent with GESTAR II, the NRC Safety Evaluation of GESTAR II, the NRC Safety Evaluation Report for the Perry Nuclear Power Plant and its Supplements for Section 4.4.1, USAR Sections 4.4.1 and 15.0.3.3.1, and the Technical Specification Bases (Section 2.1.1.2) for the MCPR Safety Limit. This change incorporates a cycle-specific MCPR Safety Limit, as opposed to utilizing the less conservative generic limit. Therefore, the implementation of the proposed change to the MCPR Safety Limit does not involve a reduction in the margin of safety.