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

**DOCKET NO. 50-255, LICENSE DPR-20, PALISADES PLANT**  
**CORE OPERATING LIMITS REPORT – REVISION 10**

Revision 10 of the Palisades Core Operating Limits Report (COLR) is attached. This revision contains the following changes:

The recently approved Amendment 205 to the Palisades Operating License, which eliminated the use of the "Assembly Radial Peaking Factor;"

An administrative change to Section 2.2, "Regulating Rod Group Position Limits," which clarifies and more logically organizes the section's content;

An editorial change to the radial peaking factor expression (Section 2.4, "Radial Peaking Factors") to more clearly state the acceptable range for the radial peaking factor (" $F_r = \dots$ " is changed to " $F_r \leq \dots$ ") and;

A revision to Table 2.4-2, "Power Distribution Measurement Uncertainty Factors."

This report is submitted in accordance with the requirements of Palisades Technical Specification 5.6.5.d.

**SUMMARY OF COMMITMENTS**

This letter contains no new commitments and no revisions to existing commitments.

*Laurie Lahti*

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cc: Regional Administrator, USNRC, Region III  
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Enclosure

4001

**ENCLOSURE**

**NUCLEAR MANAGEMENT COMPANY  
PALISADES PLANT  
DOCKET 50-255**

**PALISADES CORE OPERATING LIMITS REPORT  
Revision 10**

10 Pages

PALISADES NUCLEAR PLANT

**TITLE: CORE OPERATING LIMITS REPORT**

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Preparer Date

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*J. A. Munn* , 9/26/01 , SDR-2001-0924  
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Consumers Energy Company  
Docket No 50-255  
License No DPR-20

Core Operating Limits Report

1.0 INTRODUCTION

~~This Core Operating Limits Report for Palisades has been prepared in accordance~~  
with the requirements of Technical Specification 5.6.5. The Technical  
Specifications LCOs affected by this report are listed below:

| <u>Section</u> | <u>Title</u>                         | <u>LCO</u> |
|----------------|--------------------------------------|------------|
| 2.1            | SHUTDOWN MARGIN (SDM)                | 3.1.1      |
|                |                                      | 3.1.6      |
|                |                                      | 3.9.1      |
| 2.2            | Regulating Rod Group Position Limits | 3.1.6      |
| 2.3            | Linear Heat Rate (LHR)               | 3.2.1      |
| 2.4            | Radial Peaking Factors               | 3.2.2      |
| 2.5            | AXIAL SHAPE INDEX (ASI)              | 3.2.4      |

## 2.0 OPERATING LIMITS

The cycle specific parameter limits for the specifications listed in Section 1 are presented in the following subsections. These limits have been developed using the NRC-approved methodologies specified in Section 3.0.

### 2.1 SHUTDOWN MARGIN (SDM)

2.1.1 MODES 1 and 2 (LCO 3.1.6 Regulating Rod Group Position Limits) - The minimum SDM requirement is 2% with the most reactive rod fully withdrawn. The rod insertion limit (PDIL) is discussed in Section 2.2 and shown in Figure 2.2-1.

2.1.2 MODES 3, 4 and 5, Loops Filled (LCO 3.1.1 SHUTDOWN MARGIN) - The SDM requirements are given in the following table for normal cooldowns and heatups, ie, non-emergency conditions.

| Average PCS Temperature    | Reactor Core Flow | SDM Requirements |
|----------------------------|-------------------|------------------|
| $\geq 525^{\circ}\text{F}$ | 4 PCPs            | $\geq 2\%$       |
| $\geq 525^{\circ}\text{F}$ | $< 4$ PCPs        | $\geq 2\%$       |
| $< 525^{\circ}\text{F}$    | $\geq 2810$ gpm   | $\geq 2\%^1$     |
| $< 525^{\circ}\text{F}$    | $< 2810$ gpm      | $\geq 3.5\%^1$   |

**NOTE:**

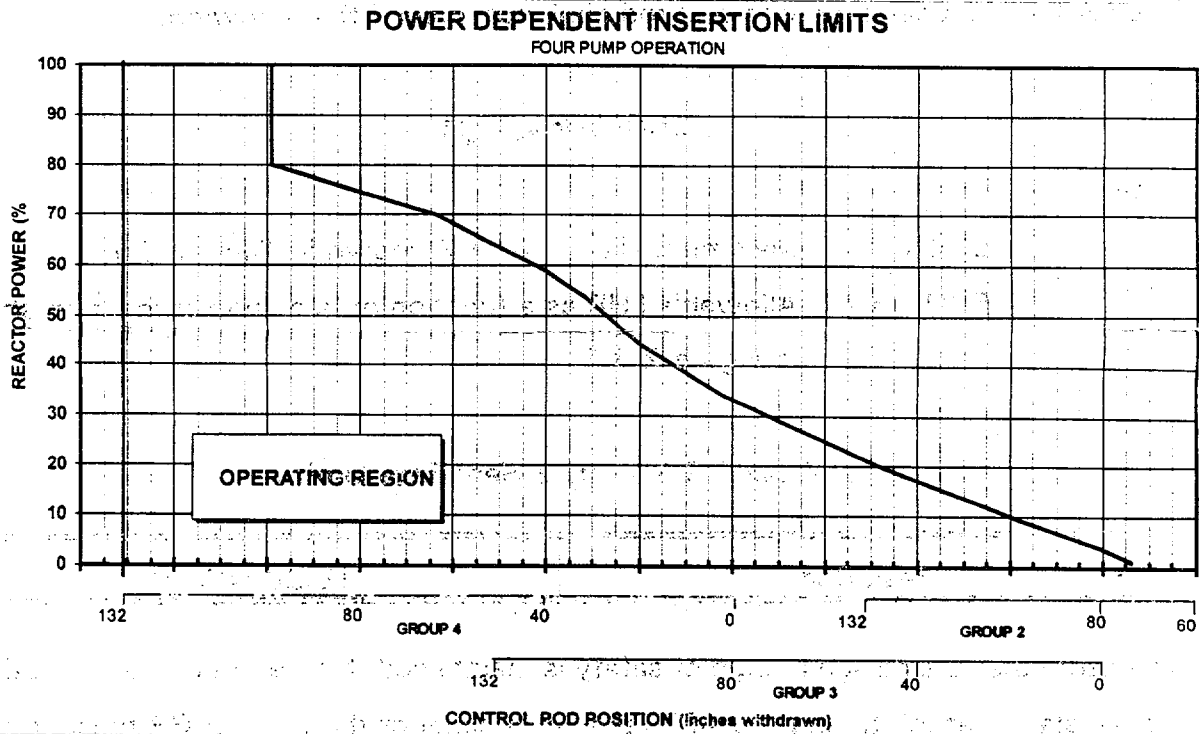
1. SDM assuming  $T_{\text{ave}}$  of  $60^{\circ}\text{F}$ .

2.1.3 MODE 5, Loops Not Filled (LCO 3.1.1 SHUTDOWN MARGIN) - The SDM requirement is  $\geq 3.5\%$  assuming  $T_{\text{ave}}$  of  $60^{\circ}\text{F}$  for normal cooldowns and heatups, ie, non-emergency conditions.

2.1.4 MODE 6 (LCO 3.9.1 Boron Concentration) - The SDM requirement is specified in the definition of REFUELING BORON CONCENTRATION.

## 2.2 Regulating Rod Group Position Limits

- a. If the reactor is critical, to implement the limits on SHUTDOWN MARGIN, individual rod worth and hot channel factors, the limits on control rod regulating group insertion shall be established as shown on Figure 2.2-1.
- b. If the reactor is subcritical, the rod position at which criticality could be achieved if the control rods were withdrawn in normal sequence shall not be lower than Group 2 at 72 inches (ie, ~ 45% control rod insertion)
- c. The sequence of withdrawal of the regulating groups shall be 1, 2, 3, 4.
- d. An overlap of control banks in excess of 40% shall not be permitted.



**Figure 2.2-1 Regulating Rod Group Position Limits**

## 2.3 Linear Heat Rate (LHR)

The LHR in the peak powered fuel rod shall not exceed the following:

$$LHR \leq LHR_{TS} \times F_A(z)$$

Where:

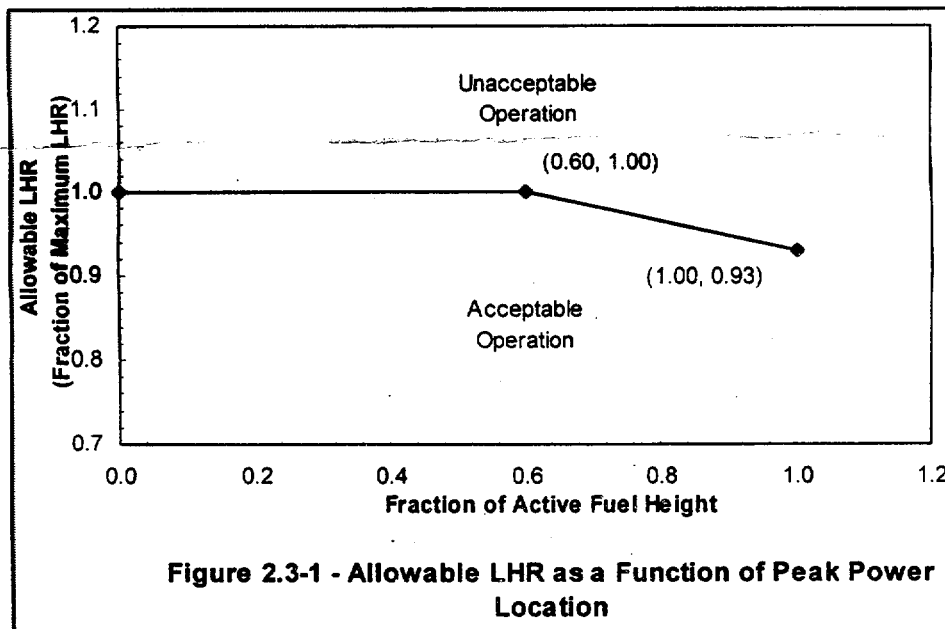
$LHR_{TS}$  = Maximum allowable LHR shown in Table 2.3-1.

$F_A(z)$  = Allowable LHR as a function of peak power location shown in Figure 2.3-1.

**Table 2.3-1 - Linear Heat Rate Limit**

|          |               |
|----------|---------------|
| Peak Rod | 15.28 (kW/ft) |
|----------|---------------|

To ensure that the design margin of safety is maintained, the determination of both the incore alarm setpoints and the APL takes into account the local LHGR measurement uncertainty factors given in Table 2.4-2, an engineering uncertainty factor and a thermal power measurement uncertainty factor (values given in B 3.2.1).





## 2.4 Radial Peaking Factors

The radial peaking factor shall not exceed the following:

for  $P \geq 0.5$

$$F_r \leq F_r^{TS} \times [1.0 + 0.3 \times (1 - P)]$$

and for  $P < 0.5$ ,

$$F_r \leq F_r^{TS} \times 1.15$$

Where:

$F_r$  = Measured  $F_r^T$ ,

$F_r^{TS}$  = Maximum allowable  $F_r^T$  (Table 2.4-1),

$P$  = Fraction of rated power.

Table 2.4-1 - Peaking Factor Limits,  $F_r^{TS}$

| Peaking Factor   | Reload N | All Other Fuel Types |
|------------------|----------|----------------------|
| Peak Rod $F_r^T$ | 1.92     | 2.02                 |

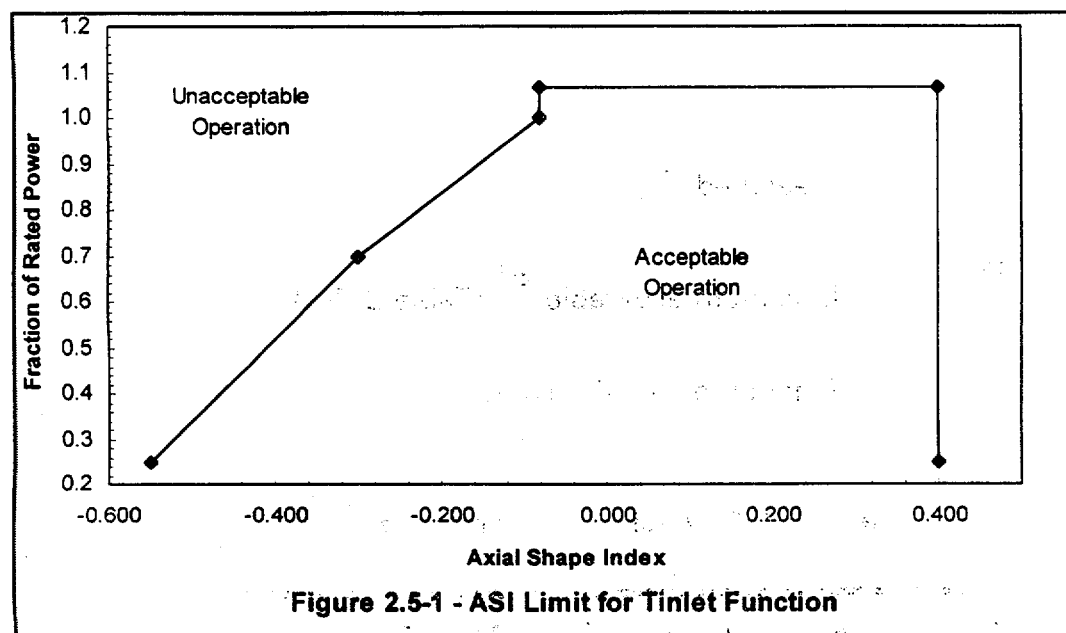
To ensure that the design margin of safety is maintained, the determination of radial peaking factors takes into account the appropriate measurement uncertainty factors given in Table 2.4-2.

**TABLE 2.4-2 POWER DISTRIBUTION MEASUREMENT UNCERTAINTY FACTORS**

|                            | LHR    | $F_r^T$ |
|----------------------------|--------|---------|
| Measurement<br>Uncertainty | 0.0500 | 0.0425  |

## 2.5 AXIAL SHAPE INDEX (ASI)

The ASI limit for the  $T_{inlet}$  function is shown in Figure 2.5-1.



### Break Points:

-0.550, 0.250  
-0.300, 0.700  
-0.080, 1.000  
-0.080, 1.065  
+0.400, 1.065  
+0.400, 0.250

### **3.0 ANALYTICAL METHODS**

The analytical methods used to determine the core operating limits are those previously reviewed and approved by the NRC, specifically those described in the Technical Specification Section 5.6.5 list of methodology documents. Specific application of these methodologies to Palisades is described in the cycle's most current safety analysis reports.

The analytical methods used to determine the radial peaking factor measurement uncertainty factors are described in FSAR, Section 3.3.2.5.