UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

IOWA ELECTRIC LIGHT AND POWER COMPANY
CENTRAL IOWA POWER COOPERATIVE
CORN BELT POWER COOPERATIVE

DOCKET NO. 50-331

DUANE ARNOLD ENERGY CENTER

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 183
License No. DPR-49

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Iowa Electric Light and Power Company, et al., dated December 30, 1991, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-49 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 183, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. The license amendment is effective as of the date of issuance and shall be implemented within 90 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Clyde Y. Shiraki, Sr. Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV/V
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical Specifications

Date of issuance: June 24, 1992

ATTACHMENT TO LICENSE AMENDMENT NO. 183

FACILITY OPERATING LICENSE NO. DPR-49

DOCKET NO. 50-331

Replace the following pages of the Appendix A Technical Specifications with the enclosed pages. The revised areas are indicated by marginal lines.

| Remove | Insert |
|---|---|
| vii | vii |
| 3.3-6 | 3.3-6 |
| 3.3-7 | 3.3-7 |
| 3.3-7a | 3.3-7a |
| 3.3-7b | 3.3-7b |
| 3.3-13 through 3.3-21 | 3.3-13 through 3.3-16 |
| 3.6-7 | 3.6-7 |
| 3.6-7a | - |
| 3.6-7b | - |
| 3.6-8 | 3.6-8 |
| 3.6-33 | 3.6-33 |
| 3.6-34 | 3.6-34 |
| 3.6-35 | 3.6-35 |
| 3.12-4 | 3.12-4 |
| 3.12-9 | 3.12-9 |
| 6.11-5a | 6.11-5a |

# TECHNICAL SPECIFICATIONS

## LIST OF FIGURES

| LIMITING CONDITIONS FOR OPERATION | SURVEILLANCE REQUIREMENTS |
|---|---|
| 4. If Specification 3.3.D.1, 2 or 3 cannot be met, be in COLD SHUTDOWN within 24 hours. | |
| E. <u>Reactivity Anomalies</u> | E. <u>Reactivity Anomalies</u> |
| The reactivity difference between the actual rod density and predicted rod density shall not exceed 1% Δk/k. | The rod density shall be predicted and compared to the actual rod density: |
| 1. If the reactivity is different by more than 1% Δk/k, perform an analysis to determine and explain the cause of the reactivity difference; operation may continue if the difference is explained and corrected. | 1. during the first startup following CORE ALTERATIONS and<br>2. at least once per full power month. |
| 2. Otherwise be in COLD SHUTDOWN within 24 hours. | |
| F. <u>Recirculation Pumps</u> | F. <u>Recirculation Pumps</u> |
| 1. Whenever the reactor is in the STARTUP or RUN modes, the reactor shall not be operated in natural circulation (no recirculation pumps running). | 1. Not used<br>2. Not used |
| 2. A recirculation pump shall not be started or restarted while the reactor is in natural circulation during REACTOR POWER OPERATION. | |
| 3. Two Loop Operation | 3. Two Loop Operation |
| With two recirculation pumps in operation in Regions 1 or 2 of Figure 3.3-1, operation is permitted provided that: | a. With two recirculation pumps in operation in Regions 1 or 2 of Figure 3.3-1, establish baseline APRM and LPRM* neutron flux noise levels within 2 hours, provided that baseline values have not been previously established since the last core refueling. |
| a. APRM and LPRM* neutron flux levels are ≤ three times (3x) their established baseline values as determined by Surveillance Requirement 4.3.F.3.b. | |
| b. If APRM and/or LPRM* neutron flux noise levels are > three times (3x) their established baseline values, | b. While in Regions 1 or 2 of Figure 3.3-1, determine APRM and LPRM* neutron flux noise levels at the following intervals: |
| (i) immediately initiate corrective action by increasing core flow and/or inserting control rods in an orderly manner, <u>and</u> | (i) within 2 hours of entering the region, <u>and</u><br>(ii) at least once per 8 hours thereafter, <u>and</u><br>(iii) within 30 minutes after the completion of a power increase of ≥ 5% of rated core thermal power. |

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*Detector levels A and C of one LPRM string per core octant plus detector levels A and C of one LPRM string in the center of the core shall be monitored.

LIMITING CONDITIONS FOR OPERATION

(ii) restore the noise levels to ≤ three times (3x) baseline values within 2 hours.

4. Single Loop Operation (SLO)

The reactor may be started and operated, or may continue operating in SLO provided the following restrictions are observed:

a. MAPLHGR multipliers and MCPR adjustment are used in accordance with the CORE OPERATING LIMITS REPORT.

b. Flow Biased APRM setpoints are adjusted for SLO per Specifications 3.1.A and 3.2.C.

c. The idle loop is isolated electrically by disconnecting the breaker to the recirculation pump motor generator (M/G) set drive motor prior to reactor startup, or if disabled during reactor operation, within 24 hours of entering SLO.**

d. Operation in Region 1 of Figure 3.3-1 is not permitted. If inadvertent entry into this region occurs, immediately initiate corrective action by inserting control rods in an orderly manner to exit the region.

e. Operation in Regions 2 or 3 of Figure 3.3-1 is permitted provided that:

(i) APRM and LPRM* neutron flux noise levels are ≤ three times (3x) their established baseline values as determined by Surveillance Requirement 4.3.F.4.c.

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*Detector levels A and C of one LPRM string per core octant plus detector levels A and C of one LPRM string in the center of the core shall be monitored.

**The breaker may be racked in and the M/G set and recirc. pump started under administrative control for testing provided Specification 3.3.F.5 is satisfied.

SURVEILLANCE REQUIREMENTS

4. Single Loop Operation (SLO)

a. Jet Pump baseline data for SLO shall be updated as soon as practical after entering SLO per Specification 4.6.E.4.

b. Prior to SLO operation in Regions 2 or 3 of Figure 3.3-1, establish baseline APRM and LPRM* neutron flux noise levels, provided that baseline values have not been previously established since the last core refueling. Baseline values shall be established during SLO and in the Regions below the 80% load line (Regions 4 or 5).

c. While in Regions 2 or 3 of Figure 3.3-1, determine APRM and LPRM* neutron flux noise levels at the following intervals:

(i) at least once per 8 hours, <u>and</u>

(ii) within 30 minutes after the completion of a power increase of ≥ 5% of rated core thermal power.

LIMITING CONDITIONS FOR OPERATION

(ii) If APRM and/or LPRM* neutron flux noise levels are > three times (3x) their established baseline values,

(a) immediately initiate corrective action by increasing core flow and/or inserting control rods in an orderly manner, and

(b) restore the noise levels to ≤ three times (3x) baseline values within 2 hours.

(iii) If baseline APRM and LPRM* neutron flux noise levels have not been determined,

(a) immediately initiate corrective action by inserting control rods in an orderly manner, and

(b) exit the region (be ≤ 80% load line) within 4 hours.

(iv) If operating in Region 3, also comply with Specification 3.3.F.4.f.

f. Operation in Regions 3 or 4 of Figure 3.3-1 is permitted provided that:

(i) core plate ΔP noise level is ≤ 1.0 psid or < two times (2x) its established baseline value as determined by Surveillance Requirement 4.3.F.4.e.

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*Detector levels A and C of one LPRM string per core octant plus detector levels A and C of one LPRM string in the center of the core shall be monitored.

SURVEILLANCE REQUIREMENTS

d. Prior to SLO operation in Regions 3 or 4 of Figure 3.3-1, establish baseline core plate ΔP noise level, provided that the baseline value has not been previously established since the last core refueling. Baseline value shall be established during SLO and core flow ≤ 45% of rated.

e. While in Regions 3 or 4 of Figure 3.3-1, determine core plate ΔP noise level at the following intervals:

(i) at least once per 8 hours, and

(ii) within 30 minutes after the completion of a power increase of ≥ 5% of rated core thermal power.

LIMITING CONDITIONS FOR OPERATION | SURVEILLANCE REQUIREMENTS

(ii) If core plate ΔP noise level is > 1.0 psid and ≥ two times (2x) its established baseline value,

(a) immediately initiate corrective action by decreasing core flow and/or inserting control rods in an orderly manner, and

(b) restore the noise level to ≤ 1.0 psid or < two times (2x) baseline value within 2 hours.

(iii) If baseline core plate ΔP noise level has not been determined,

(a) immediately initiate corrective action by decreasing core flow, and

(b) exit the region (be ≤ 45% rated core flow) within 4 hours.

(iv) If operating in Region 3, also comply with Specification 3.3.F.4.e.

5. Restoration from SLO

a. Verify the thermal limitations of Specification 3.6.A are met prior to startup of the idle recirculation loop.

b. After startup of the idle recirculation pump, the discharge valve of the lower speed pump may not be opened unless the speed of the faster pump is less than 50% of its rated speed.

The RBM bypass time delay is set low enough to assure minimum rod movement while upscale trips are bypassed.

A Limiting Control Rod Pattern for rod withdrawal error (RWE) exists when (a) core thermal power is greater than or equal to 30% of rated and less than 90% of rated (30% ≤ P < 90%) and the MCPR is less than 1.70, or (b) core thermal power is greater than or equal to 90% of rated (P≥90%) and the MCPR is less than 1.40.

During the use of such patterns, it is judged that testing of the RBM channel (when one channel is inoperable) prior to withdrawal of such rods to assure its operability will assure that improper withdrawal does not occur.

D. Scram Insertion Times

The control rod system is designed to bring the reactor subcritical at a rate fast enough to prevent fuel damage; i.e., to prevent the MCPR from becoming less than the safety limit.

After initial fuel loading and subsequent refuelings when operating above 950 psig, all control rods shall be scram tested within the constraints imposed by the Technical Specifications and before the 40% power level is reached. The requirements for the various scram time measurements ensure that any indication of systematic problems with rod drives will be investigated on a timely basis.

E. Reactivity Anomalies

During each fuel cycle excess operative reactivity varies as fuel depletes and as any burnable poison in supplementary control is burned. The magnitude of this excess reactivity may be inferred from the critical rod configuration. As fuel burnup progresses, anomalous behavior in the excess reactivity may be detected by comparison of the critical rod pattern at selected base states to the predicted rod inventory at that state. Power operating base conditions provide the most sensitive and directly interpretable data relative to core reactivity. Furthermore, using power operating base conditions permits frequent reactivity comparisons.

Requiring a reactivity comparison at the specified frequency assures that a comparison will be made before the core reactivity change exceeds 1% $\Delta k/k$. Deviations in core reactivity greater than 1% $\Delta k/k$ are not expected and require thorough evaluation. One percent reactivity limit is considered safe since an insertion of the reactivity into the core would not lead to transients exceeding design conditions of the reactor system.

F. Recirculation Pumps

APRM and/or LPRM oscillations in excess of those specified in section 3.3.F could be an indication that a condition of thermal hydraulic instability exists and that appropriate remedial action should be taken. Instability can occur in two loop or single loop operation. Therefore, instability monitoring is required in certain regions of Figure 3.3-1.

An evaluation has been provided for ECCS performance during SLO (Sec. 3.12, Ref. 4). Therefore, continuous operation under such conditions is appropriate. By restricting core flow to greater than or equal to 39% of rated in SLO, the region of the power/flow map where these oscillations are most likely to occur is avoided. Individual APRM and/or LPRM channels exhibiting excessive flux noise may be discounted upon verification that a true condition of thermal hydraulic instability does not exist by observation of the remaining available APRM and/or LPRM channels. These specifications are based upon the guidance of GE SIL #380, Rev. 1, 2/10/84.

Above 45% of rated core flow in SLO there is the potential to set up high flow-induced noise in the core. Thus, surveillance of core plate $\Delta P$ noise is required in this region of Figure 3.3-1 to alert the operators to take appropriate remedial action if such a condition exists.

The reactor may be operated in SLO up to 24 hours without electrically isolating the idle loop. This short period of time permits corrective action to be taken to re-activate the idle loop or to implement the necessary changes for continuous SLO. During periods of SLO greater than 24 hours, the idle recirculation loop is isolated by electrically disarming the recirculation pump. This is done to prevent a cold water injection transient caused by an inadvertent pump start-up. It is permissible to leave the suction and discharge valves open during SLO to allow flow through the loop in order to maintain the temperature. However, if for some reason the discharge valve is inoperable it should be closed and electrically disarmed. This is done to prevent degradation of LPCI flow during a LOCA. With the discharge valve disarmed, the temperature in the loop can be maintained by opening the bypass valve, as the loop selection logic will close the bypass valve, isolating the loop, prior to opening the LPCI injection valve.

Requiring the discharge valve of the lower speed pump to remain closed until the speed of the faster pump is below 50% of its rated speed provides assurance when going from one to two pump operation that excessive vibration of the jet pump risers will not occur.

## 3.3 and 4.3 REFERENCES

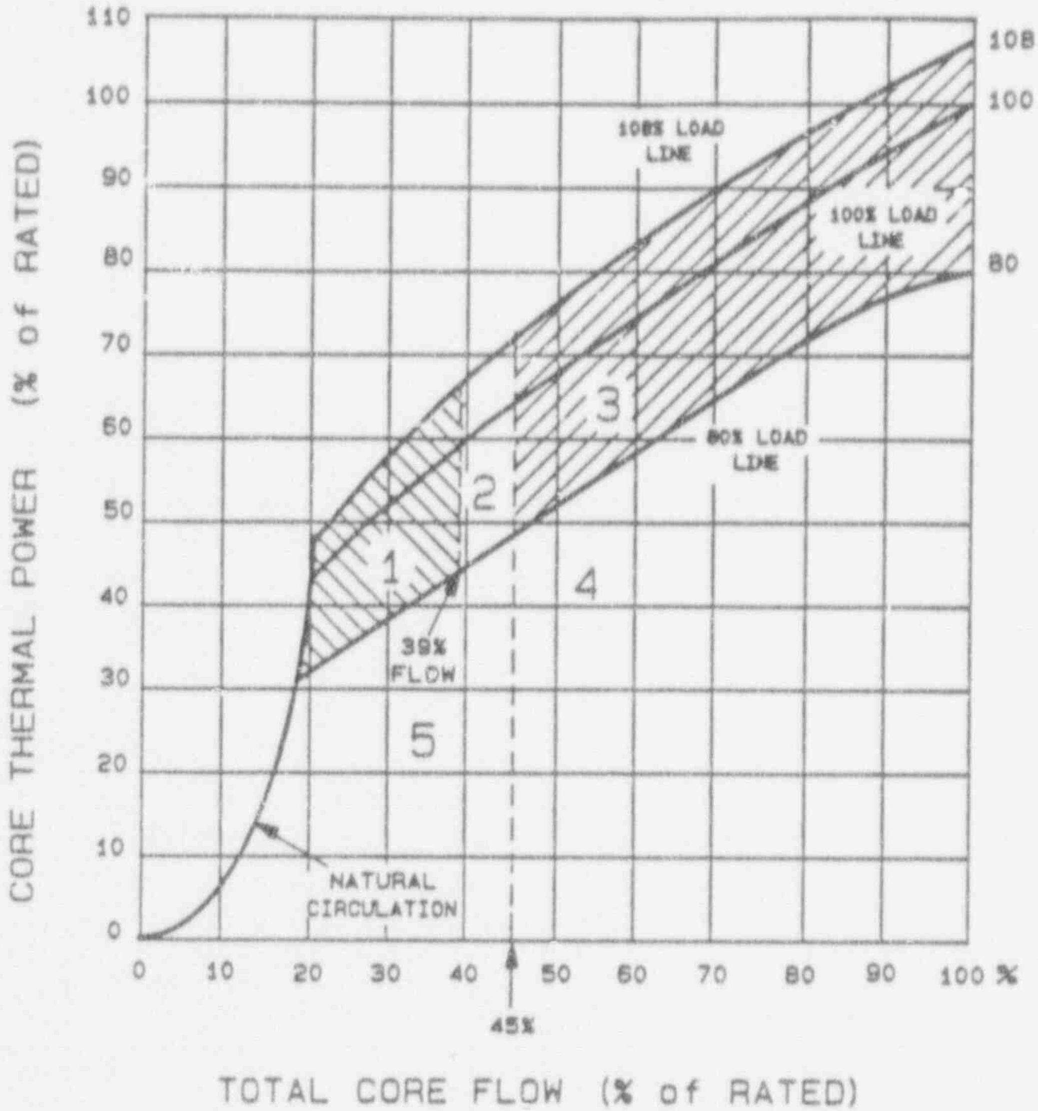
1. Banked Position Withdrawal Sequence, NEDO-21231, January 1977.

2. General Electric Standard Application for Reactor Fuel, NEDE-24011-P-A*.

3. General Electric Service Information Letter (SIL) No. 316, Reduced Notch Worth Procedure, November 1979.

4. Average Power Range Monitor, Rod Block Monitor and Technical Specification Improvement (ARTS) Program for the Duane Arnold Energy Center, NEDC-30813-P, December, 1984.

*Latest NRC-approved revision.




Region 1: Two Loop Surv. Region, SLO Prohibited Region
- requires APRM/LPRM noise monitoring

Region 2: Two Loop & SLO Surv. Region
- requires APRM/LPRM noise monitoring

Region 3: SLO Surv. Region
- requires APRM/LPRM & Core Plate D/P noise monitoring

Region 4: Extended SLO Surv. Region
- requires Core Plate D/P noise monitoring

Region 5: Unrestricted Two Loop & SLO Region

| DAEC<br>Iowa Electric Light and Power Company<br>Technical Specifications |
| --- |
| Thermal Power vs Core Flow Limits<br>for Thermal Hydraulic Stability<br>Surveillance<br>Figure 3.3-1 |

## LIMITING CONDITIONS FOR OPERATION

b. the recirculation pump speed is greater than or equal to 60% of rated, evaluate the reason for the deviation and if the evaluation verifies the jet pump(s) to be INOPERABLE, the reactor shall be placed in COLD SHUTDOWN within 24 hours.

F. Jet Pump Flow Mismatch

1. When both recirculation pumps are in steady state operation, the speed of the faster pump may not exceed 122% of the speed of the slower pump when core power is 80% or more of rated power or 135% of the speed of the slower pump when core power is below 80% of rated power.

2. If Specification 3.6.F.1 cannot be met, one recirculation pump shall be tripped. See Specification 3.3.F.4 for SLO requirements.

## SURVEILLANCE REQUIREMENTS

b. The jet pump loop flow to recirculation pump speed ratio does not vary from the normal expected operating range by more than 5%.

2. Record the individual jet pump ΔP's and verify that the individual jet pump ΔP percent deviation from the average loop ΔP does not vary from its normal expected operating range by more than 20%.

3. The surveillance requirements of 4.6.E.1 and .2 do not apply to the idle recirculation loop and associated jet pumps when in SLO.

4. Following each REFUEL OUTAGE, as soon as practical after reaching 60% of rated pump speed, update the baseline data used to perform the above evaluations. Baseline data for SLO shall be updated as soon as practical after entering SLO.

F. Jet Pump Flow Mismatch

1. Recirculation pump speeds shall be checked and logged at least once per day.

2. See Specification 3.3.F.4 for SLO requirements.

LIMITING CONDITIONS FOR OPERATION

G. Structural Integrity

The structural integrity of the pressure boundaries shall be maintained at the level required by the original acceptance standard throughout the life of the plant.

SURVEILLANCE REQUIREMENTS

G. Structural Integrity

1. In-service inspection of ASME Code Class I, Class II and Class III components shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable Addenda as required by 10CFR50, Section 50.55a(g), except where specific written relief has been granted by the NRC pursuant to 10CFR50, Section 50.55a(g)(6)(i).

a. The second 10-year interval for the inservice inspection program described above commenced on November 1, 1985.

2. In-Service testing of ASME Code Class I, Class II and Class III pumps and valves shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable Addenda as required by 10CFR50, Section 50.55a(g), except where specific written relief has been granted by the NRC pursuant to 10CFR50, Section 50.55a(g)(6)(i).

a. The second 10-year interval for the inservice testing program described above commenced on February 1, 1985.

3.6.F & 4.6.F BASES:

Jet Pump Flow Mismatch

The LPCI loop selection logic has been previously described in the Updated FSAR Section 7.3.1.1.24. For some limited low probability accidents with the recirculation loop operating with large speed differences, it is possible for the logic to select the wrong loop for injection. For these limited conditions the core spray itself is adequate to prevent fuel temperatures from exceeding allowable limits. However, to limit the probability even further, a procedural limitation has been placed on the allowable variation in speed between the recirculation pumps.

The licensee's analyses indicate that above 80% power the loop select logic could be expected to function at a speed differential up to 14% of their average speed. Below 80% power the loop select logic would be expected to function at a speed differential up to 20% of their average speed. This specification provides margin because the limits are set at ±10% and ±15% of the average speed for the above and below 80% power cases, respectively. If the reactor is operating on one recirculation pump, the loop select logic trips that pump before making the loop selection.

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3.6.G & 4.6.G BASES:

REACTOR COOLANT SYSTEM

Structural Integrity

A pre-service inspection of Nuclear Class I Components was conducted to assure freedom from defects greater than code allowance; in addition, this served as a reference base for future inspections. Prior to operation, the reactor coolant system as described in Article IS-120 of Section XI of the ASME Boiler and Pressure Vessel Code was inspected to provide assurance that the system was free of gross defects. In addition, the facility was designed such that gross defects should not occur throughout plant life. The pre-service inspection program was based on the 1970 Section XI of the ASME Code for in-service inspection. This inspection plan was designed to reveal problem areas (should they occur) before a leak in the coolant system could develop. The program was established to provide reasonable assurance that no LOCA would occur at the DAEC as a result of leakage or breach of pressure-containing components and piping of the reactor coolant system, portions of the ECCS, and portions of the reactor coolant associated auxiliary systems.

A pre-service inspection was not performed on Nuclear Class II Components because it was not required at that stage of DAEC construction when it would have been used. For these components, shop and in-plant examination records of components and welds will be used as a basis for comparison with in-service inspection data.

| LIMITING CONDITIONS FOR OPERATION | SURVEILLANCE REQUIREMENTS |
|---|---|

2. Deleted

3. If at any time during REACTOR POWER OPERATION (one or two recirc. loop) at ≥ 25% RATED POWER, it is determined by normal surveillance that the limiting value for MCPR is being exceeded, action shall then be initiated within 15 minutes to restore operation to within the prescribed limits. If the operating MCPR is not returned to within the prescribed limits within two hours, reduce reactor power to ≤ 25% of RATED POWER, or to such a power level that the limits are again being met, within the next 4 hours.

4. If the reactor is being operated in SLO, and cannot be returned to within prescribed limits within this 4 hour period, the reactor shall be brought to a COLD SHUTDOWN condition within 36 hours.

5. For either the one or two recirc. loop operating condition surveillance and corresponding action shall continue until the prescribed action is met.

At thermal power levels less than or equal to 25% of rated thermal power, operating plant experience indicates that the resulting MCPR value is in excess of the requirements by considerable margin. Therefore, monitoring of MCPRs below this power level is unnecessary. The daily monitoring of MCPRs above 25% of rated thermal power is sufficient, since power distribution shifts are very slow, provided that no significant changes in core flow or control rod pattern have taken place.

During SLO, the Operating Limit MCPR must be increased to account for the increased uncertainty in the core flow and Transversing In-Core Probe (TIP) readings used in the statistical analyses to derive the Safety Limit MCPR (see Reference 4 and the CORE OPERATING LIMITS REPORT.)

4.12 BASES: CORE THERMAL LIMITS

C. Minimum Critical Power Ratio (MCPR) - Surveillance Requirement

At core thermal power levels less than or equal to 25%, the reactor will be operating at minimum recirculation pump speed and the moderator void content will be very small. For all designated control rod patterns which may be employed at this point, operating plant experience indicated that the resulting MCPR value is in excess of requirements by a considerable margin. With this low void content, any inadvertent core flow increase would only place operation in a more conservative state relative to MCPR. The daily requirement for calculating MCPR above 25% rated thermal power is sufficient since power distribution shifts are very slow when there have not been significant power or control rod changes.

11.2 CORE OPERATING LIMITS REPORT

a. Core cycle-dependent limits shall be established prior to each reload cycle, or prior to any remaining part of a reload cycle, for the following:

1) Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) - Specification 3.12.A.

2) Linear Heat Generation Rate (LHGR) - Specification 3.12.B.

3) Minimum Critical Power Ratio (MCPR) - Specification 3.12.C.

4) $MAPFAC_f$ and $MAPFAC_p$ Factors which multiply the MAPLHGR limits - Specification 3.3.F.4.a.

These limits shall be documented in the CORE OPERATING LIMITS REPORT.

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC in General Electric Standard Application for Reactor Fuel, NEDE-24011-P-A, (GESTAR II).*

c. The core operating limits shall be determined such that all applicable limits (e.g. fuel thermal-mechanical limits, core thermal hydraulic limits, ECCS limits, nuclear limits such as shutdown margin, and transient and accident analysis limits) of the safety analysis are met.

d. The CORE OPERATING LIMITS REPORT, including any mid-cycle revisions or supplements shall be provided upon issuance, for each reload cycle, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

*Approved revision number at time reload fuel analyses are performed.