ATTACHMENT

Consumers Power Company
Palisades Plant
Docket 50-255

PROPOSED TECHNICAL SPECIFICATIONS PAGE CHANGES

September 1, 1988

20 Pages

TSP0888-0105-NL04

Low Power Physics Testing

Testing performed under approved written procedures to determine control rod worths and other core nuclear properties. Reactor power during these tests shall not exceed 2% of rated power, not including decay heat and primary system temperature and pressure shall be in the range of 260°F to 538°F and 415 psia to 2150 psia, respectively. Certain deviations from normal operating practice which are necessary to enable performing some of these tests are permitted in accordance with the specific provisions therefore in these Technical Specifications.

Shutdown Boron Concentrations

Boron concentration sufficient to provide $k_{eff} \leq 0.98$ with all control rods in the core and the highest worth control rod fully withdrawn.

Refueling Boron Concentration

Boron concentration of coolant at least 1720 ppm (corresponding to a shutdown margin of at least 5% $\Delta\rho$ with all control rods withdrawn).

Quadrant Power Tilt

The difference between nuclear power in any core quadrant and the average in all quadrants.

Assembly Radial Peaking Factor - F_r^A

The assembly radial peaking factor is the maximum ratio of individual fuel assembly power to core average assembly power integrated over the total core height, including tilt.

Interior Fuel Rod

Any fuel rod of any assembly that is not on that assembly's periphery.

Total Interior Rod Radial Peaking Factor - $F_r^{\Delta H}$

The maximum product of the ratio of individual assembly power to core average assembly power times the highest interior local peaking factor integrated over the total core height including tilt.

Amendment No. 31, 43, 54, 57,
~~Corrected~~/10/07/86

1.1 REACTOR OPERATING CONDITIONS (Cont'd)

Axial Offset or Axial Shape Index /

The difference between the power in the lower half of the core and the upper half of the core divided by the sum of the powers in the lower half and upper half of the core.

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Amendment No. ØØ,

3.1 PRIMARY COOLANT SYSTEM

Applicability

Applies to the operable status of the primary coolant system.

Objective

To specify certain conditions of the primary coolant system which must be met to assure safe reactor operation.

Specifications

3.1.1 Operable Components

a. At least one primary coolant pump or one shutdown cooling pump with a flow rate greater than or equal to 2810 gpm shall be in operation whenever a change is being made in the boron concentration of the primary coolant and the plant is operating in cold shutdown or above, except during an emergency loss of coolant flow situation. Under these circumstances, the boron concentration may be increased with no primary coolant pumps or shutdown cooling pumps running.

b. Four primary coolant pumps shall be in operation whenever the reactor is operated above hot shutdown, with the following exception:

   Before removing a pump from service, thermal power shall be reduced as specified in Table 2.3.1 and appropriate corrective action implemented. With one pump out of service, return the pump to service within 12 hours (return to four-pump operation) or be in hot shutdown (or below) with the reactor tripped (from the C-06 panel, opening the 42-01 and 42-02 circuit breakers) within the next 12 hours. Start-up (above hot shutdown) with less than four pumps is not permitted and power operation with less than three pumps is not permitted.

c. The measured four primary coolant pumps operating reactor vessel flow shall be 124.3×10^6 lb/hr or greater, when corrected to 532°F.

d. Both steam generators shall be capable of performing their heat transfer function whenever the average temperature of the primary coolant is above 325°F.

e. Maximum primary system pressure differentials shall not exceed the following:

   (1) Maximum steam generator operating differential of 1380 psi.

3.1.1 Operable Components (Cont'd)

h. A reactor coolant pump shall not be started with one or more of the PCS cold leg temperatures ≤ 250°F unless 1) the pressurizer water volume is less than 700 cubic feet or 2) the secondary water temperature of each steam generator is less than 70°F above each of the PCS cold leg temperatures.

i. The PCS shall not be heated or maintained above 325°F unless a minimum of 375 kW of pressurizer heater capacity is available from both buses 1D and 1E. Should heater capacity from either bus 1D and 1E fall below 375 kW, either restore the inoperable heaters to provide at least 375 kW of heater capacity from both buses 1D and 1E within 72 hours or be in hot shutdown within the next 12 hours.

Basis

When primary coolant boron concentration is being changed, the process must be uniform throughout the primary coolant system volume to prevent stratification of primary coolant at lower boron concentration which could result in a reactivity insertion. Sufficient mixing of the primary coolant is assured if one shutdown cooling or one primary coolant pump is in operation.[1] The shutdown cooling pump will circulate the primary system volume in less than 60 minutes when operated at rated capacity. By imposing a minimum shutdown cooling pump flow rate of 2810 gpm, sufficient time is provided for the operator to terminate the boron dilution under asymmetric flow conditions.[6] The pressurizer volume is relatively inactive, therefore will tend to have a boron concentration higher than rest of the primary coolant system during a dilution operation. Administrative procedures will provide for use of pressurizer sprays to maintain a nominal spread between the boron concentration in the pressurizer and the primary system during the addition of boron.[2]

The FSAR safety analysis was performed assuming four primary coolant pumps were operating for accidents that occur during reactor operation. Therefore, reactor startup above hot shutdown is not permitted unless all four primary coolant pumps are operating. Operation with three primary coolant pumps is permitted for a limited time to allow the restart of a stopped pump or for reactor internals vibration monitoring and testing.

Requiring the plant to be in hot shutdown with the reactor tripped from the C-06 panel, opening the 42-01 and 42-02 circuit breakers, assures an inadvertent rod bank withdrawal will not be initiated by the control room operator. Both steam generators are required to be operable whenever the temperature of the primary coolant is greater than the design temperature of the shutdown cooling system to assure a redundant heat removal system for the reactor.

Basis (Cont'd)

The Axial Shape Index alarm channel is being used to monitor the ASI to ensure that the assumed axial power profiles used in the development of the inlet temperature LCO bound measured axial power profiles. The signal representing core power (Q) is the auctioneered higher of the neutron flux power and the Delta-T power. The measured ASI calculated from the excore detector signals and adjusted for shape annealing (Y_I) and the core power constitute an ordered pair (Q,Y_I). An alarm signal is activated before the ordered pair exceed the boundaries specified in Figure 3.0.

The restrictions on starting a Reactor Coolant Pump with one or more PCS cold legs ≤ 250°F are provided to prevent PCS pressure transients, caused by energy additions from the secondary system, which would exceed the limits of Appendix G to 10 CFR Part 50. The PCS will be protected against overpressure transients and will not exceed the limits of Appendix G by either (1) restricting the water volume in the pressurizer and thereby providing a volume for the primary coolant to expand into or (2) by restricting starting of the RCPs to when the secondary water temperature of each steam generator is less than 70°F above each of the PCS cold leg temperatures.[5]

References

(1) Updated FSAR, Section 14.3.2.
(2) Updated FSAR, Section 4.3.7.
(3) Palisades 1983/1984 Steam Generator Evaluation and Repair Program Report, Section 4, April 19, 1984
(4) ANF-87-150(P), Volume 2, Section 15.0.7.1
(5) "Palisades Plant Overpressurization Analysis," June, 1977, and "Palisades Plant Primary Coolant System Overpressurization Subsystem Description," October, 1977.
(6) ANF-88-108

3.10 CONTROL ROD AND POWER DISTRIBUTION LIMITS

Applicability

Applies to operation of control rods and hot channel factors during operation.

Objective

To specify limits of control rod movement to assure an acceptable power distribution during power operation, limit worth of individual rods to values analyzed for accident conditions, maintain adequate shutdown margin after a reactor trip and to specify acceptable power limits for power tilt conditions.

Specifications

3.10.1 Shutdown Margin Requirements

a. With four primary coolant pumps in operation at hot shutdown and above, the shutdown margin shall be 2%.

b. With less than four primary coolant pumps in operation at hot shutdown and above, boration shall be immediately initiated to increase and maintain the shutdown margin at $\geq$ 3.75%.

c. At less than the hot shutdown condition, with at least one primary coolant pump in operation or at least one shutdown cooling pump in operation, with a flow rate $\geq$ 2810 gpm, the boron concentration shall be greater than the cold shutdown boron concentration for normal cooldowns and heatups, ie, nonemergency conditions. //

During nonemergency conditions, at less than the hot shutdown condition with no operating primary coolant pumps and a primary system recirculating flow rate < 2810 gpm but $\geq$ 650 gpm, then within one hour either: //

1. (a) Establish a shutdown margin of $\geq$ 3.5% and //
   (b) assure two of the three charging pumps are electrically disabled. //

OR //

2. At least every 15 minutes verify that no charging pumps are operating. If one or more charging pumps are determined to be operating in any 15 minute surveillance period, terminate charging pump operation and insure that the shutdown margin requirements are met and maintained. //

3.10.1 Shutdown Margin Requirements (Continued) //

During nonemergency conditions, at less than the hot shutdown condition with no operating primary coolant pumps and a primary system recirculating flow rate less than 650 gpm, within one hour: // // // //

(a) Initiate surveillance at least every 15 minutes to verify that no charging pumps are operating. If one or more charging pumps are determined to be operating in any 15-minute surveillance period, terminate charging pump operation an insure that the shutdown margin requirements are met and maintained. // // // // // //

d. If a control rod cannot be tripped, shutdown margin shall be increased by boration as necessary to compensate for the worth of the withdrawn inoperable rod.

e. The drop time of each control rod shall be no greater than 2.5 seconds from the beginning of rod motion to 90% insertion.

3.10.2 (Deleted) /

3.10.3 Part-Length Control Rods

The part-length control rods will be completely withdrawn from the core (except for control rod exercises and physics tests).

3.10.6 Shutdown Rod Limits

a. All shutdown rods shall be withdrawn before any regulating rods are withdrawn.

b. The shutdown rods shall not be withdrawn until normal water level is established in the pressurizer.

c. The shutdown rods shall not be inserted below their exercise limit until all regulating rods are inserted.

3.10.7 Low Power Physics Testing

Sections 3.10.1.a, 3.10.1.b, 3.10.3, 3.10.4.b, 3.10.5 and 3.10.6 may be deviated from during low power physics testing and CRDM exercises if necessary to perform a test but only for the time necessary to perform the test. /

3.10.8 Center Control Rod Misalignment

The requirements of Specifications 3.10.4.1, 3.10.4.a, and 3.10.5 may be suspended during the performance of physics tests to determine the isothermal temperature coefficient and power coefficient provided that only the center control rod is misaligned and the limits of Specification 3.23 are maintained.

Basis

Sufficient control rods shall be withdrawn at all times to assure that the reactivity decrease from a reactor trip provides adequate shutdown margin. The available worth of withdrawn rods must include the reactivity defect of power and the failure of the withdrawn rod of highest worth to insert. The requirement for a shutdown margin of 2.0% in reactivity with 4-pump operation, and of 3.75% in reactivity with less than 4-pump operation, is consistent with the assumptions used in the analysis of accident conditions (including steam line break) as reported in Reference 1 and 2 and additional analysis. / Requiring the boron concentration to be at cold shutdown boron / concentration at less than hot shutdown assures adequate shutdown / margin exists to ensure a return to power does not occur if an / unanticipated cooldown accident occurs. This requirement applies / to normal operating situations and not during emergency conditions / where it is necessary to perform operations to mitigate the / consequences of an accident. By imposing a minimum shutdown cooling // pump flow rate of 2810 gpm, sufficient time is provided for the // operator to terminate a boron dilution under asymmetric conditions. // For operation with no primary coolant pumps operating and a // recirculating flow rate less than 2810 gpm the increased shutdown // margin and controls on charging pump operability or alternately // the surveillance of the charging pumps will ensure that the // acceptance criteria for an inadvertent boron dilution event will // not be violated.[3] The change in insertion limit with reactor // power shown on Figure 3-6 insures that the shutdown margin requirements for

Basis (Continued)

4-pump operation is met at all power levels. The 2.5-second drop time specified for the control rods is the drop time used in the transient analysis.[2]

The insertion of part-length rods into the core, except for rod exercises or physics tests, is not permitted since it has been demonstrated on other CE plants that design power distribution envelopes can, under some circumstances, be violated by using part-length rods. Further information may justify their use. Part-length rod insertion is permitted for physics tests, since resulting power distributions are closely monitored under test conditions. Part-length rod insertion for rod exercises (approximately 6 inches) is permitted since this amount of insertion has an insignificant effect on power distribution.

For a control rod misaligned up to 8 inches from the remainder of the banks, hot channel factors will be well within design limits. If a control rod is misaligned by more than 8 inches, the maximum reactor power will be reduced so that hot channel factors, shutdown margin and ejected rod worth limits are met. If in-core detectors are not available to measure power distribution and rod misalignments >8 inches exist, then reactor power must not exceed 75% of rated power to insure that hot channel conditions are met.

Continued operation with that rod fully inserted will only be permitted if the hot channel factors, shutdown margin and ejected rod worth limits are satisfied.

In the event a withdrawn control rod cannot be tripped, shutdown margin requirements will be maintained by increasing the boron concentration by an amount equivalent in reactivity to that control rod. The deviations permitted by Specification 3.10.7 are required in order that the control rod worth values used in the reactor physics calculations, the plant safety analysis, and the Technical Specifications can be verified. These deviations will only be in effect for the time period required for the test being performed. The testing interval during which these deviations will be in effect will be kept to a minimum and special operating precautions will be in effect during these deviations in accordance with approved written testing procedures.

Basis (Continued) /

Violation of the power dependent insertion limits, when it is necessary to rapidly reduce power to avoid or minimize a situation harmful to plant personnel or equipment, is acceptable due to the brief period of time that such a violation would be expected to exist, and due to the fact that it is unlikely that core operating limits such as thermal margin and shutdown margin would be violated as a result of the rapid rod insertion. Core thermal margin will actually increase as a result of the rapid rod insertion. In addition, the required shutdown margin will most likely not be violated as a result of the rapid rod insertion because present power dependent insertion limits result in shutdown margin in excess of that required by the safety analysis.

References

(1) XN-NF-77-18 /
(2) ANF-87-150(NP), Volume 2 /
(3) ANF-88-108 //

3.11.2 EXCORE POWER DISTRIBUTION MONITORING SYSTEM

LIMITING CONDITION FOR OPERATION

Basis (Contd)

Surveillance requirements ensure that the instruments are calibrated to agree with the incore measurements and that the target AO is based on the current operating conditions. Updating the Excore Monitoring APL ensures that the core LHR limits are protected within the ±0.05 band on AO. The APL considers LOCA based LHR limits, and factors / are included to account for changes in radial power shape and LHR limits over the calibration interval.

The APL is determined from the following: //

$$APL = \left[\frac{LHR(Z)_{TS}}{LHR(Z)_{Max} \times V(Z) \times 1.02} \right]_{Min} \times \text{Rated Power} \quad (2)$$ //

Where:

(1) $LHR(Z)_{TS}$ is the limiting LHR vs Core Height (from Section 3.23.1),

(2) $LHR(Z)_{Max}$ is the measured peak LHR including uncertainties vs Core Height,

(3) V(Z) is the function (shown in Figure 3.11-1),

(4) The factor of 1.02 is an allowance for the effects of upburn, //

(5) The quantity in brackets is the minimum value for the entire core at any elevation (excluding the top and bottom 10% of core) considering limits for peak rods. If the quantity in brackets is greater than one, the APL shall be the rated power level. // //

References //

(1) XN-NF-80-47
(2) ANF-88-107 //

3.23 POWER DISTRIBUTION LIMITS

3.23.1 LINEAR HEAT RATE (LHR)

LIMITING CONDITION FOR OPERATION

The LHR in the peak power fuel rod at the peak power elevation Z shall not exceed the value in Table 3.23-1 times $F_A(Z)$ [the function $F_A(Z)$ is shown in Figure 3.23-1].

APPLICABILITY: Power operation above 50% of rated power.

ACTION 1:

When using the incore alarm system to monitor LHR, and with four or more coincident incore alarms, initiate within 15 minutes corrective action to reduce the LHR to within the limits and restore the incore readings to less than the alarm setpoints within 1 hour or failing this, be at less than 50% of rated power within the following 2 hours.

ACTION 2:

When using the excore monitoring system to monitor LHR and with the AO deviating from the target AO by more than 0.05, discontinue using the excore monitoring system for monitoring LHR. If the incore alarm system is inoperable, within 2 hours be at 85% (or less) of rated thermal power and follow the procedure in ACTION 3 below.

3.23.1 LINEAR HEAT RATE (LHR)

LIMITING CONDITION FOR OPERATION

ACTION 3:

If the incore alarm system is inoperable and the excore monitoring system is not being used to monitor LHR, operation at less than or equal to 85% of rated power may continue provided that incore readings are recorded manually. Readings shall be taken on a minimum of 10 individual detectors per quadrant (to include 50% of the total number of detectors in a 10-hour period) within 4 hours and at least every 2 hours thereafter. If readings indicate a local power level equal to or greater than the alarm setpoints, the action specified in ACTION 1 above shall be taken.

Basis

The limitation of LHR ensures that, in the event of a LOCA, the peak temperature of the cladding will not exceed 2200°F.[1]

Either of the two core power distribution monitoring systems (the incore alarm system or the excore monitoring system) provides adequate monitoring of the core power distribution and is capable of verifying that the LHR does not exceed its limits. The incore alarm system performs this function by continuously monitoring the local power at many points throughout the core and comparing the measurements to predetermined setpoints above which the limit on LHR could be exceeded. The excore monitoring system performs this function by providing comparison of the measured core AO with predetermined AO limits based on incore measurements. An Excore Monitoring Allowable Power Level (APL), which may be less than rated power, is applied when using the excore monitoring system to ensure that the AO limits adequately restrict the LHR to less than the limiting values.[4]

If the incore alarm system and the excore monitoring system are both inoperable, power will be reduced to provide margin between the actual peak LHR and the LHR limits and the incore readings will be manually collected at the terminal blocks in the control room utilizing a suitable signal detector. If this is not feasible with the manpower available, the reactor power will be reduced to a point below which it is improbable that the LHR limits could be exceeded.

3.23.1 LINEAR HEAT RATE (LHR)

LIMITING CONDITION FOR OPERATION

Basis (Contd)

The time interval of 2 hours and the minimum of 10 detectors per quadrant are sufficient to maintain adequate surveillance of the core power distribution to detect significant changes until the monitoring systems are returned to service.

To ensure that the design margin of safety is maintained, the determination of both the incore alarm setpoints and the APL takes into account a measurement uncertainty factor of 1.10, an engineering uncertainty factor of 1.03, a thermal power measurement uncertainty factor of 1.02 and allowance for quadrant tilt.

References

(1) ANF-88-107 //

(2) (Deleted) /

(3) (Deleted) //

(4) XN-NF-80-47 /

TABLE 3.23-1

LINEAR HEAT RATE LIMITS

	No. of Fuel Rods in Assembly		
	208	216	
Peak Rod	15.28 kW/ft	15.28 kW/ft	/

TABLE 3.23-2

RADIAL PEAKING FACTOR LIMITS, F_L

Peaking Factor	No. of Fuel Rods in Assembly		
	208	216	
Assembly F_r^A	1.48	1.50	/
Interior Rod $F_r^{\Delta H}$	1.70	1.73	/

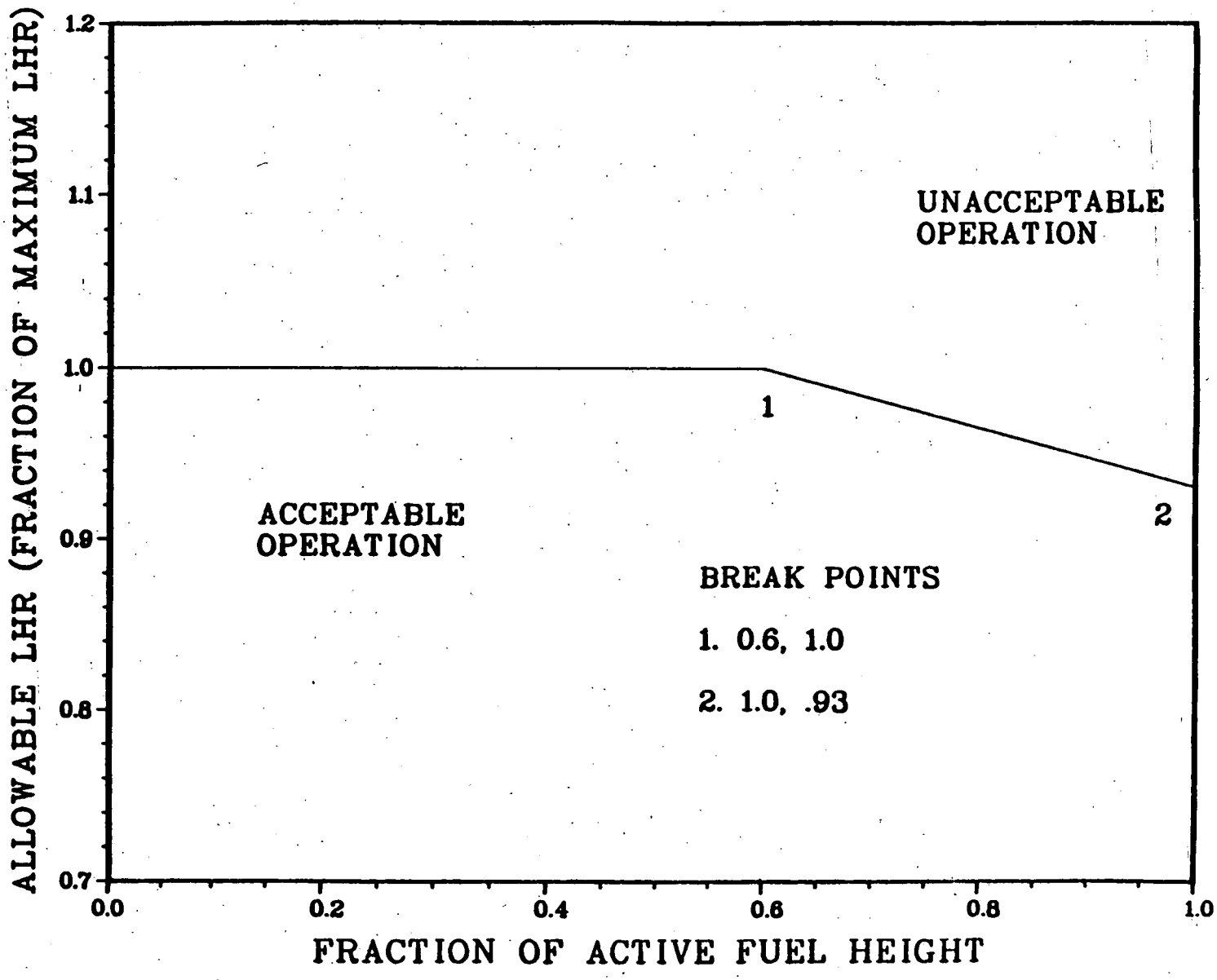

FIGURE 3.23-1 ALLOWABLE LHR AS A FUNCTION OF PEAK POWER LOCATION

FIGURE 3.23-2

(Deleted)

FIGURE 3.23-3

(Deleted)

3.23.2 RADIAL PEAKING FACTORS

LIMITING CONDITION FOR OPERATION

The radial peaking factors F_r^A, and $F_r^{\Delta H}$ shall be less than or equal to the value in Table 3.23-2 times the following quantity. The quantity is [1.0 + 0.3 (1 - P)] for P $\geq$ .5 and the quantitiy is 1.15 for P < .5. P is the core thermal power in fraction of rated power.

APPLICABILITY: Power operation above 25% of rated power.

ACTION:

1. For P < 50% of rated with any radial peaking factor exceeding its limit, be in at least hot shutdown within 6 hours.

2. For P $\geq$ 50% of rated with any radial peaking factor exceeding its limit, reduce thermal power within 6 hours to less than the lowest value of:

$$[1 - 3.33 (\frac{F_r}{F_L} - 1)] \times \text{Rated Power}$$

Where F_r is the measured value of either F_r^A, or $F_r^{\Delta H}$ and F_L is the corresponding limit from Table 3.23-2.

Basis

The limitations on F_r^A, and $F_r^{\Delta H}$ are provided to ensure that assumptions used in the analysis for establishing DNB margin, LHR and the thermal margin/low-pressure and variable high-power trip set points remain valid during operation. Data from the incore detectors are used for determining the measured radial peaking factors. The periodic surveillance requirements for determining the measured radial peaking factors provide assurance that they remain within prescribed limits. Determining the measured radial peaking factors after each fuel loading prior to exceeding 50% of rated power provides additional assurance that the core is properly loaded.

4.19 POWER DISTRIBUTION LIMITS

4.19.2 RADIAL PEAKING FACTORS

SURVEILLANCE REQUIREMENTS

4.19.2.1 The measured radial peaking factors (F_r^A, and $F_r^{\Delta H}$) obtained by using the incore detection system, shall be determined to be less than or equal to the values stated in the LCO at the following intervals:

a After each fuel loading prior to operation above 50% of rated power, and

b. At least once per week of power operation.

Amendment No ~~68~~,