ATTACHMENT TO LICENSE AMENDMENT

AMENDMENT NO. 36 TO FACILITY OPERATING LICENSE NO. DPR-43

DOCKET NO. 50-305

Revise Appendix A as follows:

Remove Pages	Insert Pages
T. S. 3.10-1	T. S. 3.10-1
T. S. 3.10-2	T. S. 3.10-2
	T. S. 3.10-2a
T. S. 3.10-10a	T. S. 3.10-10a
T. S. 3.10-11	T. S. 3.10-11
T. S. 3.10-16	T. S. 3.10-16
T. S. 3.10-17	T. S. 3.10-17
	Fig. T. S. 3.10-7

3.10 CONTROL ROD AND POWER DISTRIBUTION LIMITS

Applicability

Applies to the limits on core fission power distributions and to the limits on control rod operations.

Objective

To ensure 1) core subcriticality after reactor trip, 2) acceptable core power distribution during power operation in order to maintain fuel integrity in normal operation transients associated with faults of moderate frequency, supplemented by automatic protection and by administrative procedures, and to maintain the design basis initial conditions for limiting faults, and 3) limited potential reactivity insertions caused by hypothetical control rod ejection.

Specification

a. Shutdown Reactivity

When the reactor is subcritical prior to reactor startup, the hot shutdown margin shall be at least that shown in Figure TS 3.10-1. Shutdown margin as used here is defined as the amount by which the reactor core would be subcritical at hot shutdown conditions if all control rods were tripped, assuming that the highest worth control rod remained fully withdrawn, and assuming no changes in xenon, boron, or part length rod position.

b. Power Distribution Limits

1. At all times, except during low power physics tests, the hot channel factors defined in the basis must meet the following limits:

   a. $F_Q(Z)$ Limits

      (i) Westinghouse Electric Corporation Fuel

      $F_Q(Z) \leq (2.22/P) \times K(Z)$ for $P > .5$

      $F_Q(Z) \leq (4.44) \times K(Z)$ for $P \leq .5$

      (ii) Exxon Nuclear Company Fuel

      $F_Q(Z) \leq F_Q^T(Ej) \times K(Z)$ for $P > .5$

      $F_Q(Z) \leq (4.42) \times K(Z)$ for $P \leq .5$

where

P is the fraction of full power at which the core is operating

K(Z) is the function given in Figure TS 3.10-2

Z is the core height location F_Q

F_Q^T (Ej) is the function given in Figure TS 3.10-7

E_j is the fuel rod exposure for which F_Q is measured

b. $F_{\Delta H}^N$ Limits

$F_{\Delta H}^N \leq 1.55 \left[1 + 0.2(1-P)\right]$ For 0 to 24,000 MWD/MTU burnup fuel

$F_{\Delta H}^N \leq 1.52 \left[1 + 0.2(1-P)\right]$ For greater than 24,000 MWD/MTU burnup fuel

where P is the fraction of full power at which the core is operating

2. If either measured hot channel factor exceeds the values specified in 3.10.b.1, the reactor power shall be reduced so as not to exceed a fraction of the design value equal to the ratio of the F_Q^N or $F_{\Delta H}^N$ limit to measured value, whichever is less, and the high neutron flux trip setpoint shall be reduced by the same ratio. If subsequent incore mapping cannot, within a 24 hour period, demonstrate that the hot channel factors are met, the overpower ΔT and overtemperature ΔT trip setpoints shall be similarly reduced.

3. Following initial loading and at regular effective full power monthly intervals thereafter, power distribution maps using the movable detection system, shall be made to confirm that the hot channel factor limits of specification 3.10.b.1 are satisfied. For the purpose of this confirmation:

a. The measurement of total peaking factor, F_Q^{Meas}, shall be increased by three percent to account for manufacturing tolerances and further increased by five percent to account for measurement error.

b. The measurement of enthalpy rise hot channel factor, $F_{\Delta H}^N$, shall be increased by four percent to account for measurement error.

4. The reference equilibrium indicated axial flux difference for each excore channel as a function of power level (called the target flux difference) shall be measured at least once per effective full power quarter. If the axial flux difference has not been measured in the last effective full power month, the target flux difference must be updated monthly by linear interpolation using the most recent measured value and the value predicted for the end of the cycle life.

Measurements of the hot channel factors are required as part of startup physics tests, at least each full power month of operation, and whenever abnormal power distribution conditions require a reduction of core power or a level based on measured hot channel factors. The incore map taken following initial loading provides confirmation of the basic nuclear design bases including proper fuel loading patterns. The periodic monthly incore mapping provides additional assurance that the nuclear design bases remain inviolate and identify operational anomalies which would, otherwise, affect these bases.

For normal operation, it is not necessary to measure these quantities. Instead it has been determined that, provided certain conditions are observed, the hot channel factor limits will be met; these conditions are as follows:

1. Control rods in a single bank move together with no individual rod insertion differing by more than 15 inches from the bank demand position.
2. Control rod banks are sequenced with overlapping banks as shown in Figure TS 3.10-4.
3. The control bank insertion limits are not violated.
4. Axial power distribution control specifications which are given in terms of flux difference control and control bank insertion limits are observed. Flux difference refers to the difference in signals between the top and bottom halves of two-section excore neutron detectors. The flux difference is a measure of the axial offset which is defined as the difference in normalized power between the top and bottom halves of the core.

The permitted relaxation in $F^N_{\Delta H}$ allows radial power shape changes with rod insertion to the insertion limits. It has been determined that provided the above conditions 1 through 4 are observed, these hot channel factors limits are met.

The $F_Q(Z)$ limits of specification 3.10.b.1.a include consideration of enhanced fission gas release at high burn up, off-gassing (release of sorbed gases), and other effects in fuel supplied by Exxon Nuclear Company; this results in an additional penalty in the form of the function $BU(E_j)$, as shown in Figure TS 3.10-7, which is applied to Exxon fuel. References 7 and 8 discuss these phenomena.

In specification 3.10.b.1.a, F_Q is arbitrarily limited for $P < 0.5$ (except for low power physics tests).

The specifications for axial power distribution control referred to above are designed to minimize the effects of xenon redistribution on the axial power distribution during load-follow maneuvers.

Conformance with specification 3.10.b.6 through 3.10.b.9 ensures the F_Q upper bound envelope is not exceeded and xenon distributions are not developed which at a later time would cause greater local power peaking, even though the current flux difference is within the limits specified.

The target (or reference) value of flux difference is determined as follows: At any time that equilibrium xenon conditions have been established, the indicated flux difference is noted with part length rods withdrawn from the core and with the full length rod control rod bank more than 190 steps withdrawn (i.e., normal full power operating position appropriate for the time in life, usually withdrawn farther as burnup proceeds). This value, divided by the fraction of full power at which the core was operating is the full power value of the target flux difference. Values for all other core power levels are obtained by multiplying the full power value by the fractional power. Since the indicated equilibrium value was noted, no allowances for excore detector error are necessary and indicated deviation of $\pm$ 5% ΔI are permitted from the indicated reference value. During periods where extensive load following is required, it may be impractical to establish the required core conditions for measuring the target flux difference every month. For this reason, the specification provides two methods for updating the target flux difference. Figure TS 3.10-6 shows a typical construction of the target.

The rod position indicator channel is sufficiently accurate to detect a rod ±7-1/2 inches away from its demand position. If the rod position indicator channel is not operable, the operator will be fully aware of the inoperability of the channel, and special surveillance of core power tilt indications, using established procedures and relying on excore nuclear detectors, and/or movable incore detectors, will be used to verify power distribution symmetry.

One inoperable control rod is acceptable provided the potential consequences of accidents are not worse than the cases analyzed in the safety analysis report. A 30 day period is provided for the re-analysis of all accidents sensitive to the changed initial condition.

The required drop time to dashpot entry is consistent with safety analysis.

The DNB related accident analysis assumed as initial conditions that the T_{inlet} was $4^{o}F$ above nominal design or T_{avg} was $4^{o}F$ above nominal design. The Reactor Coolant System pressure was assumed to be 30 psi below nominal design.

<u>REFERENCES</u>

(1) Section 4.3

(2) Section 4.4

(3) Section 14

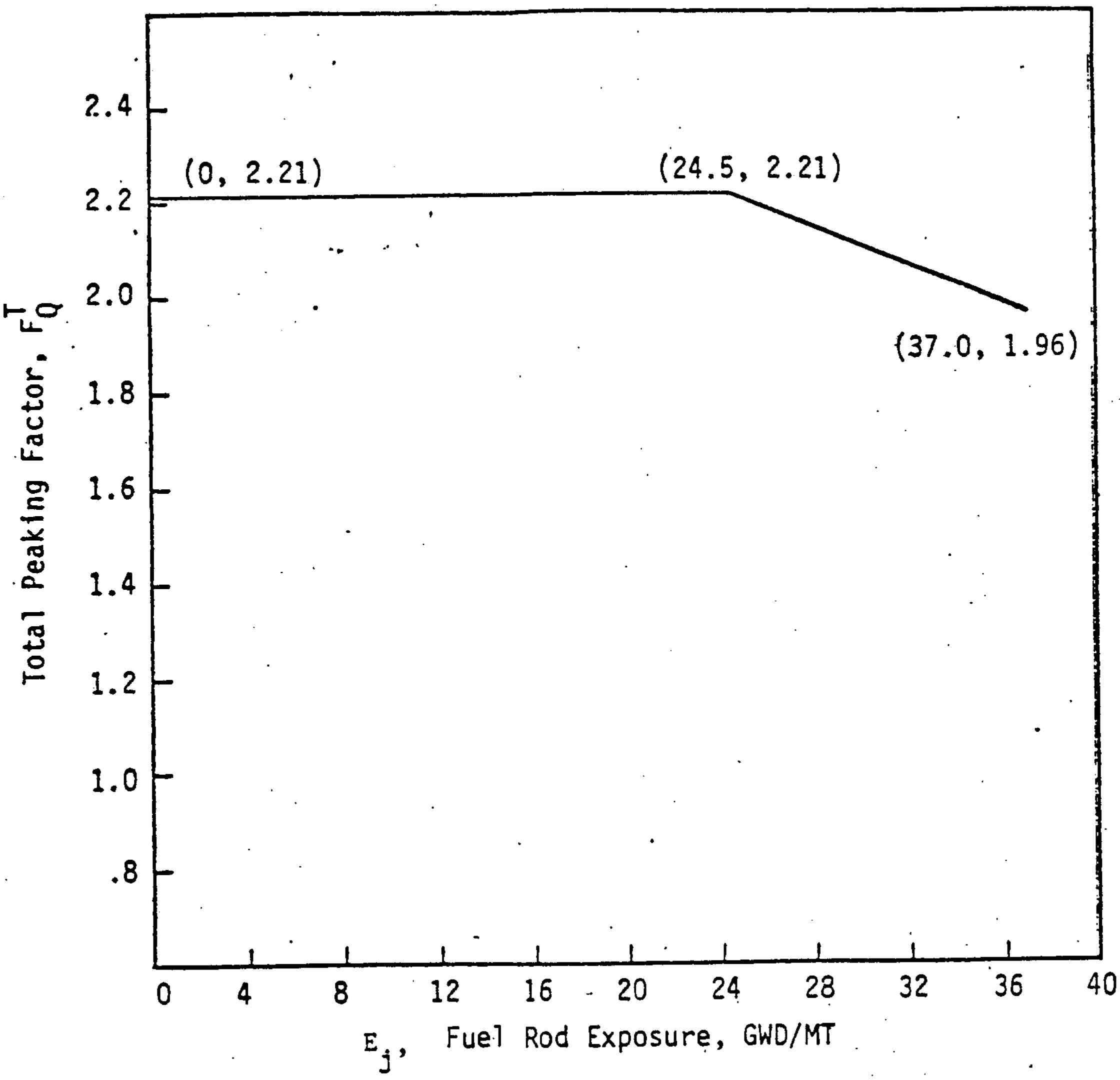
(4)

(5) Letter from E. R. Mathews, (WPSC) to D. G. Eisenhut (NRC) dated January 8, 1980, submitting information on Clad Swelling and Fuel Blockage Models.

(6) Letter from E. R. Mathews (WPSC) to A. Schwencer (NRC) dated December 14, 1979, submitting the ECCS Re-analysis properly accounting for the zirconium/water reaction.

(7) George C. Cooke, Philip J. Valentine; "Exposure Sensitivity Study for ENC XN-1 Reload Fuel at Kewaunee Using the ENC-WREM-IIA PWR Evaluation Model, WN-NF-79-72," Exxon Nuclear Company, October, 1979.

(8) Letter from L. C. O'Mally (Exxon Nuclear Company) to E. D. Novak (WPSC) providing F_Q exposure dependence as a function of rod burnup.



F_Q^T versus Rod Exposure: $F_Q^T(E_j)$

(Reference specification 3.10.b.1.a.(ii))

Figure TS 3.10-7