Enclosure 2 to DPC Letter LAC-8109

Proposed revised pages to the
LACBWR Technical Specifications

POWER DISTRIBUTION LIMITS

MAXIMUM AVERAGE FUEL ASSEMBLY EXPOSURE

LIMITING CONDITION FOR OPERATION

4.2.4.2.5 The maximum average exposure of any fuel assembly not on the periphery of the core shall be limited to 17,200 MWD/MTU

APPLICABILITY: OPERATIONAL CONDITION 1.

ACTION:

With the maximum average fuel assembly exposure of any non-peripheral assembly greater than 17,200 MWD/MTU, be in at least HOT SHUTDOWN with the main steam line isolation valve closed within 12 hours and in COLD SHUTDOWN within the next 24 hours.

SURVEILLANCE REQUIREMENT

5.2.17.5 The maximum average exposure of each fuel assembly not on the periphery of the core shall be determined to be less than 17,200 MWD/MTU by calculation at least once per 31 EFPD.

POWER DISTRIBUTION LIMITS

BASES FOR SECTIONS 4.2.4.2 and 5.2.17

LINEAR HEAT GENERATION RATE - (Continued)

For Type I and Type II (A-C) fuel, the original design LINEAR HEAT GENERATION RATE specified by the fuel manufacturer was conservatively reduced to 11.94 kw/ft to account for the effects of densification, power spikes and manufacturing factors. For Type III (ENC) fuel, the design LINEAR HEAT GENERATION RATE of 11.52 kw/ft is also calculated with design conservatisms that are larger than the calculated axial densification effects plus manufacturing tolerances and power spike effects, References 6 and 7.

The daily requirement for surveillance of the core LHGR above 25% of RATED THERMAL POWER is sufficient since power distribution shifts are very slow when there have not been significant power or control rod changes. The surveillance of core LHGR after power increases ≥ 15% of RATED THERMAL POWER will assure that significant increases in LHGR are determined.

4.2.4.2.5 and 5.2.17.5 Maximum Average Fuel Assembly Exposure

Fuel cladding integrity is a function of many parameters including fuel exposure, pellet clad interaction, THERMAL POWER, rate of change in power density, coolant chemistry, etc. Therefore, limiting fuel exposure to 17,200 MWD/MTU in the non-peripheral fuel assemblies which experience higher than average power densities and rates of change of power will give additional assurance that the condition of the fuel during operation will be satisfactory. It is not necessary to limit exposure in the peripheral core locations since operating experience at LACBWR has shown that the 28 peripheral fuel assemblies have a much lower rate of failure than the 44 interior fuel assemblies. This trend has been attributed to the lower power density at these locations, and the minimal effects of control rod movements which cause local power peaking in the fuel rods near the tips of the control rods. The outer control rods are fully withdrawn at the beginning of cycle (BOC) and remain withdrawn during normal cycle operations. Minor clad defects that may occur in the peripheral core positions would be expected to develop very slowly, and the consequences of such failures would be minimal. During previous operation with A-C fuel, a number of fuel assemblies have exceeded 17,200 MWD/MTU without any indication of failure and at the end of Cycle 3, (EOC-3), four assemblies had exceeded 18,000 MWD/MTU without failure. The average exposure of the 25 assemblies discharged at EOC-3 was 15,530 MWD/MTU and the peak exposure was 21,532 MWD/MTU. The average exposure of the 32 assemblies discharged at EOC-4 was 16,459 MWD/MTU.

POWER DISTRIBUTION LIMITS

BASES FOR SECTIONS 4.2.4.2 AND 5.2.17

Maximum Average Fuel Assembly Exposure - (Continued)

Pellet-clad interaction is a well known and documented contributing factor to fuel rod failures. The presence of pellet cladding interaction has been identified in post-irradiation examinations of fuel rods removed from LACBWR fuel assemblies. Fuel rods removed from fuel assemblies with average exposure up to 14,700 MWD/MTU have been examined. The strength, ductility, and condition of the cladding in these rods was found to be adequate as determined by mechanical tests. The examination further confirmed that power history of the rods is of prime importance, though not the only factor in contributing to fuel rod failure. A limit of 17,200 MWD/MTU fuel element average exposure is substantiated by examinations of LACBWR fuel assemblies and by operating experience with the improved Type III (Exxon) fuel design. (References 8, 9 and 10).

During future operation the rate of withdrawal of control rods when the THERMAL POWER is above 25% of RATED THERMAL POWER will be reduced from that experienced during operation prior to Cycle 5 which will also significantly reduce the stresses in the fuel clad. Additional surveillance and limitations on coolant and off-gas activity will assure that operation does not continue with grossly failed fuel.

References:

1. "Technical Evaluation Adequacy of La Crosse Boiling Water Reactor Emergency Core Cooling System", Report SS-942, Gulf United Nuclear Corporation, May 31, 1972.

2. "Review of Densification Effects in La Crosse Boiling Water Reactor", Report SS-1085, Gulf United Nuclear Corporation, May 15, 1973.

3. NRC Safety Evaluation Report, Letter, Reid to Madgett, dated August 12, 1976.

4. "ECCS Analysis for Type II and Type III Fuels for the La Crosse Boiling Water Reactor", Exxon Nuclear Company, Inc., XN-NF-77-7, March 1977.

5. "Transient Analysis for LACBWR Reload Fuel", Response to Question 4, Nuclear Energy Services, Inc., Report 81A0025, February 18, 1977.

POWER DISTRIBUTION LIMITS

BASES FOR SECTIONS 4.2.4.2 and 5.2.17

References - (Continued)

6. "Description of Exxon Type III Nuclear Fuel for Batch 1 Reload in the LACBWR", Dairyland Power Cooperative, LAC-3929, May 17, 1976.

7. Exxon Nuclear Co. Letter, J. A. White to C. W. Angle, Subject: MAPLHGR Limits for Type I (Allis-Chalmers) Fuel, dated June 22, 1977.

8. DPC Letter, LAC-6846, Linder to Ziemann, dated April 1, 1980.

9. DPC Letter, LAC-7572, Linder to Crutchfield, dated June 1, 1981.

10. DPC Letter, LAC-8109, Linder to Crutchfield, dated February 23, 1982.

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