

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 6 TO FACILITY LICENSE NO. DPR-51

CHANGE NO. 6 TO TECHNICAL SPECIFICATIONS

ARKANSAS POWER AND LIGHT COMPANY

ARKANSAS NUCLEAR ONE - UNIT 1

DOCKET NO. 50-313

Introduction

By letter dated March 26, 1975, the Nuclear Regulatory Commission informed Arkansas Power and Light Company (the licensee) that deficiencies had been identified in the ejected rod calculations on which the control rod limits for the Arkansas Nuclear One Station - Unit 1 were based. This letter stated that, following control rod interchange*, potential ejected control rod worths greater than 1% delta k/k could result with the plant in the hot zero power condition, which would exceed the limit specified in Tech. Spec. 3.5.2.3. The licensee was therefore requested to submit either the results of analysis to show that the existing rod withdrawal limits were adequate to assure that ejected rod worths were less than the allowable limits after rod interchange, or submit revised rod position limits in the form of proposed Tech. Specs. to maintain ejected rod worths below these limits.

In response to this request, by letter dated August 15, 1975, the licensee submitted the results of their evaluation, together with proposed changes to the Technical Specifications for Arkansas Nuclear One - Unit 1.

Discussion

The proposed change would (1) incorporate an additional restriction on the regulating control rod positions prior to criticality, (2) delete the separate specification on inserted control rod worth and include these requirements in a set of rod withdrawal limit curves, and

* Control rod interchange is a process in which control rods are resequenced for operation during the latter part of the fuel cycle.

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(3) modify the rod withdrawal limits for Arkansas Nuclear One - Unit 1 after control rod interchange to assure that the hot zero power ejected rod worths following interchange do not exceed 1% $\Delta k/k$.

The additional restriction on regulating rod withdrawal during an approach to criticality would require that these rods be positioned within the limits defined by the rod withdrawal limit curves prior to deboration to assure that the shutdown margin and ejected rod worth limits at hot zero power are maintained.

Historically, for Babcock and Wilcox reactors, the rod insertion limits have been derived on the basis of LOCA-limited power peaking considerations. Shutdown margin and ejected rod worth criteria have been addressed in separate specifications which must be met in addition to the rod withdrawal limit specification. In order to provide for a more direct application of the Tech. Specs., revised rod withdrawal limits have been proposed which will assure, by use of the rod withdrawal limits alone, compliance with the three subject criteria (LOCA-limited power peaking, shutdown margin, and ejected rod worth).

Evaluation

We have reviewed the proposed changes to the Arkansas Nuclear One Station - Unit 1 Tech. Specs. Revised rod withdrawal limits have been proposed since the hot zero power ejected rod worths after control rod interchange are predicted to exceed 1% delta k/k (the present limit) for certain control rod positions allowed by the present Tech. Spec. 3.5.2.5. The revised rod withdrawal limits have been established such that potential ejected rod worths, including an allowance for calculational uncertainties, will be less than 1% delta k/k at zero power and less than 0.65% delta k/k at full power. These reactivity values are those previously used in the analysis of a postulated rod ejection accident, including fuel densification effects, and found to have acceptable consequences⁽¹⁾. The revised rod withdrawal limits will maintain potential ejected rod worths below these limiting values, and are therefore acceptable.

The licensee's proposal involves operating limits in a different form than presently existing (i.e., a revised insertion limit curve), but does not involve changes to the bases on which safety margins are based or to safety margins themselves. The new curves and limitations will maintain ejected rod worths below the established maximums after control rod interchange, and in addition factor in other current limitations governing shutdown margin and LOCA limited power peaking restrictions.

(1) Supplement No. 1 to the Safety Evaluation, May 9, 1974.

In incorporating the limits on LOCA power peaking, shutdown margin, and ejected rod worth into one new curve, the proposed change would permit rod position limits to be exceeded for a period of up to four hours. This is identical to the existing specification which governs LOCA power peaking limits and was previously found acceptable on the basis of the exceedingly low probability of the occurrence of a LOCA in this limited time interval and the fact that a deliberate, controlled return to the normal insertion limits provides less occasion for further operating error or system malfunction than would alternate responses (e.g., immediate shutdown and startup). The proposed change would make a similar 4-hour allowance for ejected rod worth limits. Normal load demand changes on the electrical system result in control rod motion which is necessary to regulate reactor output in response to the load changes. This is done either automatically by the rod drive control system or manually by the operator. Following load changes, the reactor coolant boron concentration is adjusted, if necessary, in order to allow control rods to be placed in the desired position. For slower load changes, boron concentration can be adjusted coincident with the load change, and thus control rod position can be maintained where desired. For more rapid load changes in which boron concentration cannot be changed quickly enough, control rod motion is necessary. This could result in temporarily crossing the rod withdrawal limit due to normal control action, and can be subsequently corrected by dilution or boration of the reactor coolant to restore proper rod position. Crossing of the limit line is thus not intentional, but results from normal and necessary control action to avoid other operating limits. If this should occur, the licensee is required by Tech. Specs. to undertake corrective action immediately, and achieve compliance with the limit curve within four hours. The four hour period is sufficient to allow a careful, controlled return to the normal limits, and the amount of deviation is limited by the requirement that the shutdown margin be continuously maintained.

In consideration of the above, and the fact that the very low probability of a rod ejection accident occurring in this limited time is similar to that of a LOCA (for which the 4-hour allowance was previously approved), we find that the proposed maximum 4-hour exception to the rod withdrawal limit requirement to be acceptable.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the change does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the change does

not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Date: OCT 02 1975