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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO SHOCK SUPPRESSORS (SNUBBERS)

ARKANSAS POWER & LIGHT COMPANY

ARKANSAS NUCLEAR ONE - UNIT 1

DOCKET NO. 50-313

INTRODUCTION

By letter dated October 1, 1975 and February 11, 1976, Arkansas Power and Light Company (AP&L) requested changes to the Technical Specifications appended to Facility License No. DPR-51 for the Arkansas Nuclear One - Unit 1 (ANO-1) facility. The proposed changes involve establishing limiting conditions for operation and revising surveillance requirements for shock suppressors protecting safety-related systems and components. These requests were in response to our letters of July 11 and December 17, 1975, regarding shock suppressors.

EVALUATION

Shock suppressors are designed to prevent unrestrained pipe motion under dynamic loads as might occur during an earthquake or severe transient while allowing normal thermal movement during startup and shutdown. The consequence of an inoperable shock suppressor is an increase in the probability of structural damage to piping resulting from a seismic or other postulated event which initiates dynamic loads. It is, therefore, necessary that shock suppressors installed to protect safety system piping be operable during reactor operation and be inspected at appropriate intervals to assure their operability.

During the summer of 1973, inspections at two reactor facilities revealed a high incidence of inoperable hydraulic shock suppressors manufactured by Bergen Paterson Pipesupport Corporation. As a result of those findings, the Office of Inspection and Enforcement required each operating reactor licensee to immediately inspect all Bergen Paterson shock suppressors utilized on safety systems and to reinspect them 45 to 90 days after the initial inspection. Shock suppressors supplied by other manufacturers were to be inspected on a lower priority basis.

Examination of defective shock suppressors at reactor facilities has shown that the high incidence of failures observed in the summer of 1973 was caused by severe degradation of seal materials and subsequent leakage of the hydraulic fluid. The basic seal materials used in Bergen Paterson shock suppressors were two types of polyurethane; a millable gum polyester type containing plasticizers and an unadulterated molded type. Material tests performed at several laboratories (Reference 1) established that the millable gum polyurethane deteriorated rapidly under the temperature and moisture conditions present in many shock suppressors locations. Although the molded polyurethane exhibited greater resistance to these conditions, it also may be unsuitable for application in the higher temperature environments. Data are not currently available to precisely define an upper temperature limit for the molded polyurethane. The investigation indicated that seal materials are available, primarily ethylene propylene compounds, which should give satisfactory performance under the most severe conditions expected in reactor installations.

An extensive seal replacement program has been carried out at many reactor facilities. Experience with ethylene propylene seals has been very good with no serious degradation reported thus far. Although the seal replacement program has significantly reduced the incident of shock suppressor failures, some failures continue to occur. These failures have generally been attributed to faulty shock suppressor assembly and installation, loose fittings and connections and excessive pipe vibrations. The failures have been observed in both PWRs and BWRs and have not been limited to units manufactured by Bergen Paterson. Because of the continued incidence of shock suppressor failures, we have concluded that shock suppressor operability and surveillance requirements should be incorporated into the Technical Specifications. We have further concluded that these requirements should be applied to all safety related shock suppressors, regardless of manufacturer, in all light water cooled reactor facilities.

The NRC staff has developed model Technical Specifications and Bases to provide assurance of satisfactory shock suppressor performance and reliability. The licensee was informed of our requirements by letter dated July 11, 1975 and, in revised form, by letter dated December 17, 1975.

The limiting conditions for operations require that shock suppressors be operable during reactor operation and prior to reactor startup (i.e., prior to heatup above 200°F for ANO-1). Because shock suppressor protection is required only during low probability events, a period of 72 hours is allowed for repair or replacement of defective units before the reactor must be shutdown. The licensee will be expected

(1) Report H. R. Erickson, Bergen Paterson to K. R. Goller, NRC, October 7, 1974, Subject: Hydraulic Shock Sway Arrestors

to commence repair or replacement of a failed snubber expeditiously. However, the allowance of 72 hours is consistent with that provided for other safety-related equipment and provides for remedial action to be taken in accordance with 10 CFR 50.36(c)(2). Failure of a pipe, piping system, or major component would not necessarily result from the failure of a single snubber to operate as designed, and even a snubber devoid of hydraulic fluid would provide support for the pipe or component and reduce pipe motion. The likelihood of a seismic event or other initiating event occurring during the time allowed for repair or replacement is very small. Considering the large size and difficult access of some snubber units, repair or replacement in a shorter time period is not practical. Therefore, the 72 hour period provides a reasonable and realistic period for remedial action to be taken. A period of 36 hours is allowed to bring the plant to the cold shutdown condition consistent with our requirements for safe shutdown.

The surveillance requirements provide an inspection program to assure that shock suppressors remain operable. The inspection program includes visual inspection and functional testing of hydraulic shock suppressors.

The visual inspection should include, but not be limited to, inspection of the hydraulic fluid reservoir, fluid connections, and linkage connection to the piping and anchor to verify snubber operability. The visual inspection frequency for hydraulic shock suppressors with compatible seal materials is based upon maintaining a constant level of shock suppressor protection. Thus the required inspection interval varies inversely with the observed hydraulic shock suppressors failures. The longest inspection interval allowed in the Technical Specifications after a record of no shock suppressor failures has been established as nominally 18 months. Experience at operating facilities has shown that the required surveillance program should provide an acceptable level of shock suppressor performance. Shock suppressors containing seal material which has not been demonstrated to be compatible with the operating environment are required to be inspected every 31 days until the compatibility is established or an appropriate seal change is completed.

Hydraulic shock suppressors which were in other respects operable were functionally tested at several facilities to verify proper piston movements, lock up and bleed. Failures were observed. To further increase the level of shock suppressor reliability, the Technical Specifications would require such functional tests of hydraulic shock suppressors at least once each refueling period. The functional test would be performed on a representative sample of hydraulic shock suppressors (10 or 10%, whichever is less). For each failure observed, 10 or 10% more shock suppressors would be tested. Hydraulic shock suppressors located in high radiation areas or in areas where removal

is especially difficult need not be tested provided that operability was previously verified. In addition, shock suppressors of rated capacity greater than 50,000 lb. are exempt from functional testing requirements. These exceptions would be added in consideration of practicality.

We have reviewed the licensee's proposed Technical Specifications and determined that certain modifications are necessary to meet our requirements discussed above. These changes have been discussed with the licensee. We have concluded that the proposed Technical Specifications, as modified, would increase the probability of successful shock suppressor performance, increase reactor safety and we therefore find them acceptable.

ENVIRONMENTAL CONSIDERATION

We have determined that the proposed action does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the proposed action is insignificant from the standpoint of environmental impact and pursuant to 10 CFR §51.5(d)(4) that an environmental impact statement, negative declaration, or environmental impact appraisal need not be prepared in connection with the subsequent issuance of a license amendment to incorporate the provisions of this proposed action in the Technical Specifications for the facility.

CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) because the changes do not involve a significant increase in the probability or consequences of accidents previously considered and do not involve a significant decrease in a safety margin, the changes do 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 a license amendment to incorporate the subject proposed Technical Specification changes will not be inimical to the common defense and security or to the health and safety of the public.

Date: August 10, 1976