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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ARKANSAS NUCLEAR ONE, UNIT 2

DOCKET NO. 50-368

SEISMIC QUALIFICATION OF THE

AUXILIARY FEEDWATER SYSTEM

## Introduction

Since the accident at Three Mile Island attention has been focused on the ability of pressurized water reactors to provide reliable decay heat removal. While it is recognized that alternate methods may be available to remove decay heat following transients or accidents, heat removal via the steam generators is the first choice for accomplishing a safe shutdown of the plant. Therefore, there should be reasonable assurance that the auxiliary feedwater system (AFW) can withstand the postulated Safe Shutdown Earthquake (SSE), consistent with other safety-related systems in the plant.

To address this concern, the NRC developed and initiated Multiplant Action C-14, "Seismic Qualification of Auxiliary Feedwater Systems." The objective of this plant is to increase, to the extent practicable, the capability of those plants without seismically qualified AFW to withstand earthquakes up to the SSE level. This program was implemented with the issuance of NRC Generic Letter 81-14, dated February 10, 1981. Our review of the licensee's responses to this letter is the subject of this evaluation. Hereafter, in this evaluation, the Auxiliary Feedwater System will be referred to as the Emergency Feedwater (EFW) System.

## Evaluation

The enclosed Technical Evaluation Report (TER) dated September 24, 1982, was prepared by our consultant, Lawrence Livermore National Laboratory. The TER provides their technical evaluation of the licensee's conformance to the requirements of Generic Letter 81-14. We have reviewed the consultant's report.

In the TER, the consultant concludes that the EFW system is seismically qualified for the safe shutdown earthquake, with one exception. This exception involves the concern that the EFW system boundary may not fully conform to the definition specified in Generic Letter 81-14 regarding double isolation valves on the EFW system branch lines connecting to nonseismic Category I systems. This concern has been resolved as discussed below.

Subsequent to issuance of the consultant's TER, we obtained additional information regarding the EFW system boundary. The licensee stated in a letter dated August 17, 1983 that those portions of the EFW system pressure boundary that do not include double isolation valves are (1) vent and drain connections of one inch nominal pipe size or smaller, and (2) the EFW pumps recirculation and test loop lines.

With regard to the vents and drains, the licensee stated that each vent and drain is isolated by a single, normally closed manual valve designed and constructed in accordance with seismic Catefory I requirements. The licensee has reviewed these branch lines as a part of their single failure analysis and has concluded that no single open vent or drain could disable both EFW trains. Also, each vent and drain valves is verified closed before startup from each refueling outage, and the accessible vent and drain valves are verified closed during monthly EFW pump testing. We find this acceptable.

With regard to the EFW pump recirculation lines, the licensee stated that each EFW pump recirculation line is orificed to provide a minimum flow path for pump protection. The orifice and a single manual isolation valve in each recirculation line are within the seismic Category I boundary of the EFWS. A single locked-closed manual valve is installed within the seismic Category I boundary of each EFW pump test loop. The licensee has analyzed the effects of failure of the nonseismic recirculation

piping downstream of the manual isolation valve and determined that its rupture will not affect the functional capability of the EFW system assuming a single failure in one train. This analysis indicated that the seismic Category I orifice prevents loss of flow to the steam generators sufficient to preclude decay heat removal assuming failure of one EFW pump. Therefore, acceptable pressure boundary protection is provided.

Based on the above, we conclude that adequate protection is provided for the EFW system pressure boundary to assure performance of the EFW safety function following the occurrence of a safe shutdown earthquake. The concern identified in the TER is therefore considered resolved.

In addition to the items discussed above, we note that contrary to a statement in the TER, the primary source of water for the EFW system is the nonseismic Category I condensate storage tank. A backup source of 100,000 gallons of water is also available from a nonseismic Category I swing startup and blowdown demineralizer effluent tank. Upon indication of low EFW pump suction pressure to the operating pump(s), the suction supply is automatically aligned to the safety-related seismic Category I service water system. We consider this design feature acceptable.

## CONCLUSION

**The staff and its consultant, Lawrence Livermore National Laboratory (LLNL) have reviewed the licensee's submittals for ANO-2 in response to Generic Letter 81-14. As a result of its review, LLNL has issued the attached TER. The staff has reviewed the TER and concurs with its findings. The TER is part of this safety evaluation report. Subsequent to the consultant's technical review, the staff obtained additional information from the licensee regarding the open issue identified in the TER. Based on our review of the consultant's TER and the additional information provided by the licensee, we conclude that there is reasonable assurance that the emergency feedwater system at ANO-2 has sufficient capability to withstand a safe shutdown earthquake and accomplish its safety function. Accordingly, we are not contemplating requiring any seismic upgrading of the ANO-2 EFW system under Multiplant Action C-14.**

Attachment:
LLNL Technical Evaluation Report