



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

SAFETY EVALUATION REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
CONCERNING  
SEISMIC QUALIFICATION OF EMERGENCY FEEDWATER SYSTEMS  
FOR  
ARKANSAS NUCLEAR ONE, UNIT NO. 1  
DOCKET NO. 50-313

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 program 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 report dated September 24, 1982, was prepared by our consultant, Lawrence Livermore National Laboratory. The report 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 Technical Evaluation Report (TER), the consultant concludes that the EFW system is seismically qualified for the safe shutdown earthquake, with three exceptions. The three exceptions are, (1) some components of the initiation/control system are currently nonseismic, (2) the licensee did not

report the results of a walkdown of the nonseismically qualified portion of the EFW system, and (3) the EFW system boundary does not fully conform to the definition specified in Generic Letter 81-14 regarding double isolation valves on the EFW system branch lines. These concerns have been resolved as discussed below.

By letter dated August 7, 1981, the licensee committed to upgrade the EFW initiation/control system to seismic Category 1 requirements during the next refueling outage scheduled for October 1984. We find this commitment and schedule acceptable.

In addition, subsequent to the consultant's technical review, we initiated a telephone conference call with the licensee (5/22/84, M. Snow), in which we were informed that the licensee had completed a walkdown of those areas of the EFW system that are not presently seismically qualified. This involved only the EFW initiation/control system as portions of it are the only nonseismically qualified items. As indicated by the licensee's letter of August 7, 1981, and supplemented by letter dated May 28, 1982, the initiation/control system (including those portions which were identified as nonseismically qualified as a result of the walkdown and which will remain in the final upgraded EFW system) will be upgraded to seismic Category I criteria during the next refueling outage scheduled for October 1984. Therefore, concerns 1 and 2 above are considered resolved.

Regarding the EFWS boundary concern, the licensee stated in letters dated July 29, 1983 and March 16, 1984 that those portions of the EFW 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. The licensee further stated that the vents and drains are each isolated by a single, normally closed manual valve designed and constructed in accordance with seismic Category I requirements. The licensee has reviewed these valves 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 valve is verified closed before startup from each refueling outage and the accessible vent and drain valves are verified closed during monthly EFW pump testing. Further, 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. Similarly, a single locked-closed manual valve is installed within the seismic Category I boundary of each EFW pump test loop. This valve provides acceptable pressure boundary protection. 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. This concern is therefore considered resolved.

#### CONCLUSION

The staff and its consultant, Lawrence Livermore National Laboratory (LLNL) have reviewed the licensee's submittals for ANO-1 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-1 will have sufficient capability to withstand a safe shutdown earthquake and accomplish its safety function following the EFW upgrade modification. Accordingly, we are not contemplating requiring any seismic upgrading of the ANO-1 EFW system under Multiplant Action C-14.

TECHNICAL EVALUATION REPORT  
ARKANSAS NUCLEAR ONE UNIT 1

SEISMIC QUALIFICATION OF AUXILIARY FEEDWATER SYSTEM

1. INTRODUCTION

Since the accident at Three Mile Island, considerable attention has been focused on the capability of nuclear power plants to reliably remove decay heat. The NRC has recently undertaken Multiplant Action Plan C-14 "Seismic Qualification of AFW Systems" [Ref. 1], which is the subject of this evaluation.

To implement the first phase of Action Plan C-14, the NRC issued Generic Letter No. 81-14 "Seismic Qualification of AFW Systems" [Ref. 2], dated February 10, 1981, to all operating PWR licensees. This letter requested each licensee (1) to conduct a walk-down of non-seismically qualified portions of the AFW system and identify deficiencies amenable to simple actions to improve seismic resistance, and (2) to provide design information regarding the seismic capability of the AFW system to facilitate NRC backfit decisions.

The licensee of Arkansas Nuclear One, Unit 1 responded with a letter dated August 7, 1981 (Ref. 3). The licensee's response was found not to be complete and a Request for Additional Information (RAI) was issued by the NRC, dated April 2, 1982 (Ref. 4). The licensee provided a supplemental response in a letter dated May 27, 1982 (Ref. 5).

This report provides a technical evaluation of the information provided in the licensee's responses to the Generic Letter, and includes a recommendation regarding the need for additional analysis and/or upgrading modification of this plant's AFW system.

## 2. EVALUATION

Information provided in licensee's responses included:

- o Specificaion of the overall seismic capability of the AFW system.
- o Identification of AFW system components that are currently non-seismically qualified for SSE.
- o Description of the AFW system boundary.
- o Status of compliance with seismic related NRC Bulletins and Information Notices.
- o Additionally, identifcaion of areas of modification/upgrade and proposed areas and schedules for modification/upgrade after the next refueling outage.
- o Additionally, description of methodologies and acceptance criteria for seismic design of the AFW system, which is determined to be seismically qualified to the SSE level by the licensee.

We have reviewed the licensee's responses, and a point-by-point evaluation of licensee's responses against Generic Letter's requirements is provided below.

### (1) Seismic Capability of AFW System

Except for those items identified in the following, the AFW system has been designed, constructed and maintained to withstand an SSE utilizing methods and acceptance criteria consistent with that applicable to other safety-related systems in the plant. Presently, those items identified by the licnese as not being fully seismically qualified are evaluated below:

- o Pumps/Motors - None
- o Piping - None
- o Valves/Actuators - None
- o Power Supplies -None
- o Water Source(s) - None
- o Initiation/Control Systems - The licensee stated that some components of initiation/control systems are currently non-seismically qualified

and they will be upgraded after the next refueling outage. Because the licensee did not discuss their specific seismic capacity, we judge that the current seismic capacity of the initiation/control systems is less than OBE; but will be at the SSE level when the licensee's proposed upgrade is completed.

- o Structures - None

Based on our evaluation described above, those areas of the AFW system judged not to possess an SSE seismic capability are identified below.

- |                                     |       |
|-------------------------------------|-------|
| o <u>Pumps/Motors</u>               | None  |
| o <u>Piping</u>                     | None  |
| o <u>Valves/Actuators</u>           | None  |
| o <u>Power Supplies</u>             | None  |
| o <u>Water Sources(s)</u>           | None  |
| o <u>Initiation/Control Systems</u> | None* |
| o <u>Structures</u>                 | None  |

\*Note: Currently not fully qualified, but are being upgraded.

Based on the above evaluation, we conclude that the AFW system will possess an SSE level of seismic capability upon completion of the AFW upgrade project.

Because the primary water source and supply path is seismically qualified, switchover to a secondary water source is not involved. Additionally, information regarding the seismic capability of any alternate decay heat removal system is not required because the AFW system will have an SSE level of seismic capability.

Regarding the AFW system boundary, the licensee considered only those portions of piping up to and including a single valve, which is normally closed or capable of remote closure. Therefore, the AFW system boundary does not fully conform to the definition specified in the Generic Letter 81-14. Since the licensee's response did not include any discussion on this deviation, we feel that it needs to be evaluated further by the NRC.

The licensee stated that the AFW system was included within the scope of the seismic related NRC Bulletins 79-02, 79-04, 79-07, 79-14, 80-11, and IE Information Notice 80-21.

(2) Walk-Down of Non-Seismically Qualified Portion of AFW System

A walk-down of the non-seismically qualified portion of the initiation/control systems is required. The licensee's responses did not report any walk-down results but indicated that they are continuing their investigation into the issues of seismic qualification by performing walk-downs, documentation reviews, and analyses as appropriate.

(3) Additional Information

The licensee's responses provided a description of the methodologies, loading combinations and acceptance criteria that were used in the design of the seismically qualified portions of the AFW system.

### 3. CONCLUSIONS

The information contained in licensee's responses to GL 81-14 is complete. The licensee did not report any results for a walk-down of the non-seismically qualified areas of the AFW system. However, the licensee indicated that they are continuing the investigation into seismic qualification by performing walk-downs as well as other means. It is also noted that the licensee's AFW system boundary does not fully conform to the definition specified in Generic Letter 81-14.

Based on the submitted information, we conclude that the AFW system at Arkansas Nuclear One, Unit 1, with exception of the boundary question, presently provides a reasonable assurance to perform the safety-related function following the occurrence of an SSE. We recommend that no further action be initiated regarding modification and/or upgrading of the AFW system of this plant under NRC Multiplant Action C-14.

Dated: July 26, 1984

The following NRC staff contributed to this Safety Evaluation:  
Raj Anand



REFERENCES

1. D. G. Eisenhut, U. S. Nuclear Regulatory Commission, memorandum to H. R. Denton, "Multiplant Action Plan C-14; Seismic Qualification of Auxiliary Feedwater System," February 20, 1981.
2. U. S. Nuclear Regulator Commission, Generic Letter No. 81-14 to all operating pressurized water reactor licensees, "Seismic Qualification of Auxiliary Feedwater System," February 10, 1981.
3. D. C. Trimble, Arkansas Power and Light Company, letter to D. G. Eisenhut of U. S. Nuclear Regulatory Commission, August 7, 1981.
4. J. F. Stolz, USNRC, letter to Arkansas Power and Light Company, "Request for Additional Information on Seismic Qualification of the Auxiliary Feedwater System, Arkansas Nuclear One, Unit 1," April 2, 1982.
5. J. R. Marshall, Arkansas Power and Light Company, letter to J. F. Stolz of USNRC, May 27, 1982.