

Omaha Public Power District
1623 Harney Omaha, Nebraska 68102-2247
402/536-4000

March 30, 1990
LIC-90-0253

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

REFERENCE: Docket No. 50-285

Gentlemen:

Subject: Licensee Event Report 90-07 for the Fort Calhoun Station

Please find attached Licensee Event Report 90-07 dated March 30, 1990.
This report is being submitted per requirements of 10 CFR
50.73(a)(2)(ii)(B).

If you should have any questions, please contact me.

Sincerely,

W. G. Gates

W. G. Gates
Division Manager
Nuclear Operations

WGG/tcm

Attachment

c: R. D. Martin, NRC Regional Administrator
A. Bournia, NRC Project Manager
P. H. Harrell, NRC Senior Resident Inspector
INPO Records Center
American Nuclear Insurers

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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

Fort Calhoun Station Unit No. 1

DOCKET NUMBER (2)

0 5 0 0 0 1 2 8 1 5

PAGE (3)

1 OF 05

TITLE (4)

Main Feedwater Piping Outside Design Basis

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES		DOCKET NUMBER(S)
0	2	2	8	9	0	9	0	7	0	0	0
0	2	2	8	9	0	9	0	7	0	0	0

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)									
5		20.402(b)		20.406(e)		50.73(a)(2)(iv)		73.71(b)			
		20.406(a)(1)(i)		50.36(e)(1)		50.73(a)(2)(v)		73.71(e)			
POWER LEVEL (10)	0 1 0 1 0	20.406(a)(1)(ii)		50.36(e)(2)		50.73(a)(2)(vii)		OTHER (Specify in Abstract below and in Text, NRC Form 366A)			
		20.406(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)					
		20.406(a)(1)(iv)	X	50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)					
		20.406(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(ix)					

LICENSEE CONTACT FOR THIS LER (12)

NAME

Bernard Van Sant, Lead Mechanical Engineer

TELEPHONE NUMBER

AREA CODE

4 1 0 1 2 6 1 3 1 6 1 - 1 2 1 4 1 3 1 7

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

SUPPLEMENTAL REPORT EXPECTED (14)

X YES (If yes, complete EXPECTED SUBMISSION DATE)		NO		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
					0	4	2

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

A seismic analysis of the Main Feedwater System piping and supports between the containment wall and the feedwater heaters has shown that several of the supports would be overloaded during a seismic event on the non-safety related portion of the piping (classified as Seismic Class 1). An evaluation was performed to determine what effect overloading these supports would have on the piping system, conservatively assuming a gross failure of the overloaded supports. The analysis showed that system operability would be maintained; however, stresses in the piping would have exceeded the High Energy Line Break (HELB) criteria for postulation of breaks at locations in the pipe previously unanalyzed for HELB. At 1130, on February 28, 1990, the Feedwater piping was determined to be outside the plant design basis. Investigation of the problem revealed that the design deficiency has existed since plant construction.

The corrective actions include modification to the supports on the Feedwater piping, implementation of a Safety Analysis for Operability, and restoration of the system to updated design basis conditions.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

The Fort Calhoun Station Unit 1 Updated Safety Analysis Report (USAR) designates certain piping as Seismic Class 1. The piping so designated must be designed to withstand the effects of a "Design Basis Earthquake" per the criteria established in Appendix F of the USAR. The design basis document for Main Feedwater defines design code for the piping in the Auxiliary Building as United States of America Standard (USAS) B31.7 from the containment penetration to the isolation valve and USAS B31.1 for the remainder of the piping in the Auxiliary and Turbine Buildings. Appendix F Section F.1.3.d.3 of the USAR specifically defines the feedwater piping in the Auxiliary Building upstream of the isolation valves as Seismic Class II and the piping downstream of the isolation valve as Class I. A recent records search performed by OPPD, however, has found licensing correspondence that defines all the feedwater piping in the Auxiliary Building as Seismic Class I.

Appendix "M" of the USAR defines what piping outside of containment is high energy and how it has been analyzed. The Main Feedwater piping is defined as high energy and was analyzed for High Energy Line Break (HELB) considerations.

Omaha Public Power District (OPPD) created a new analysis of the feedwater piping and supports as part of the design basis reconstitution effort and document update for a temporary modification (TM-90-M-019). This analysis was based on the USAR definition of the feedwater piping upstream of the isolation valves as being Seismic Class II. The temporary mod installed a support at the feedwater regulating valve during 1989. The recent re-analysis of the piping and supports for the temporary modification was performed to current standards. The re-analysis revealed loads on several "class II" supports that exceed their design capacity. Follow up work was initiated to demonstrate that the failure of these class II supports would not impact the safety function of the feedwater piping. It was determined that the resultant increase in pipe stress due to the elimination of these supports from the stress analysis created an unanalyzed high energy line break location. A design basis search was also performed at this time, which revealed the licensing correspondence defining all the feedwater piping in the Auxiliary Building as Seismic Class I.

At 11:30 on February 28, 1990, the piping and supports were determined to be outside the plant design basis as specified in the licensing correspondence defining the piping and supports as Seismic Class I. Additionally, the piping and supports were determined to be outside the plant design basis as specified in the USAR Appendix M for high energy line break locations. At this time the plant was in a planned shutdown for a refueling outage and the system was not required for operation. Subsequently a "four hour" report was made to the NRC pursuant to 10CFR 50.72(b)(2)(i).

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

The configuration of the Main Feedwater piping and supports in the Auxiliary Building has not been significantly changed from original construction. Although the original Architect/Engineer (A/E) had seismically analyzed the piping in the Auxiliary Building, it was done using a static analysis method and it is unclear what criteria was used to account for anchor movements and boundary loads from the Turbine Building. The Feedwater and Main Steam piping was reanalyzed by a different contracted engineering firm as part of the HELB work performed for Appendix M of the USAR. It appears that the scope of this work was limited to predicting pipe break locations only and did not include qualification of the supports for the resultant loads. As part of the 79-02 and 79-14 work, the existing isometrics and support drawings were reviewed against as-built conditions. OPPD concluded that there was sufficient agreement between as-built and as-designed to indicate the piping was properly constructed and no reanalysis was required.

The primary cause of this event is attributed to design deficiency: failure of the original A/E to consider loads induced on the piping from the non-seismic portion of the system. Why this was not done cannot be determined due to insufficient documentation of design practices used by the A/E during original construction.

A factor which impeded earlier discovery of this condition is the conflicting information contained in the USAR. Prior to Bulletins 79-02 and 79-14 and up until the determination of this event, the design basis of the USAS B31.1 Feedwater piping and supports was considered to be Seismic Class II and non-safety related. This interpretation was based on Appendix F section F.1.3.d.3 which specifically defines the Feedwater piping in the Auxiliary Building upstream of the isolation valves as Seismic Class II. The Seismic Class II portion of the system had no defined licensing basis.

OPPD contracted an independent consulting firm to determine the impact these overloaded supports could have on the safety related Seismic Class I portion of the Feedwater piping. During this review a concern was raised as to the seismic classification of the B31.1 portion of the Feedwater piping in the Auxiliary Building. Appendix F Section F.2.2.2 of the USAR for Seismic Class I criteria states that B31.1 piping in the Auxiliary Building "received the same attention with regard to selection of hangers and restraints as the B31.7 piping. Seismic stresses were combined with longitudinal stresses due to pressure, weight, and other sustained loads". These statements are conflicting for the Feedwater piping upstream of the isolation valves.

OPPD performed a search of the design basis records and discovered that a "USNRC Safety Evaluation...Regarding the Potential for Flooding, from Postulated Ruptures of Noncategory I (Seismic) Systems" acknowledged the Feedwater piping in the Auxiliary Building as being Seismic Class I. This seismic design requirement for the B31.1 Feedwater piping in the Auxiliary Building made the overloaded supports a reportable condition since they are now outside the Seismic Class I design basis defined in Appendix F of the USAR.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

OPPD requested the independent consulting firm to continue the analysis of the piping to determine the impact of the support failures on the system. The contractor's approach was to perform the piping analysis and review support capacities to determine what supports exceeded operability criteria. These supports were removed from the model and the analysis was rerun. After several iterations it was determined that, although some of the supports still exceeded their design capacity, they would not fail, and the piping would not exceed operability limits. However, at this point the threshold stress for consideration of High Energy Line Break (HELB) criteria was exceeded in a location not previously analyzed in USAR Appendix M, Section M.3.2/Attachment B. Attachment B of Appendix M defines the break locations previously considered in the USAR.

The Feedwater piping is routed out of the Containment Building through the Auxiliary Building and ends in the Turbine Building. The seismic class II piping in the Turbine Building must be seismically analyzed to determine the loads transmitted back to the Seismic Class I piping and supports in the Auxiliary Building. Seismic analysis of the piping in the Turbine Building will require the use of a response spectra for components located in that building. The Fort Calhoun Station USAR does not contain a response spectra for the Turbine Building; however, OPPD has submitted a proposed spectra to the NRC for approval under the Alternate Appendix F submittal. Final resolution of this problem will require NRC acceptance of the Turbine Building spectra.

The following short term corrective actions will be implemented prior to start-up from the 1990 refueling outage:

- (1) Implement a Safety Analysis for Operability (SAO) for the piping and supports. The SAO will establish interim acceptable criteria for plant operation until appropriate long term criteria can be established.
- (2) Modify (under MR-FC-89-45) the piping supports to meet operability requirements defined in the SAO, and eliminate any new break locations.

Long term corrective actions include:

- (1) Approval of the Turbine Building response spectra by NRC. The Turbine Building spectra is not defined in any licensing basis and has been submitted to the NRC as part of the alternate Appendix F criteria.
- (2) Clarification of the USAR concerning the seismic design requirements for the Feedwater piping outside containment.
- (3) Modification of piping supports as required to comply with the design basis updates noted in (1) and (2) above. This is presently scheduled for the 1991 refueling outage.

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During the investigation of this event, a similar condition was determined to exist for Main Steam piping in Room 81 of the Auxiliary Building. This condition was reported to NRC on March 22, 1990 as a followup to the February 28, 1990 notification of the Main Feedwater condition. This LER will be supplemented by April 23, 1990 to incorporate information on the Main Steam piping.

This event is similar to the event reported in LER 90-03 as it describes conditions outside design basis due to design deficiencies by the original A/E. Generic corrective actions noted in that LER will also apply for this event. LER 89-21 also concerned design deficiencies by contracted companies.