Omaha Public Power District
444 South 16th Street Mall
Omaha, Nebraska 68102-2247
402/636-2000

May 18, 1992
LIC-92-135L

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 92-016 for the Fort Calhoun Station

Please find attached Licensee Event Report 92-016 dated May 18, 1992. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(ii). If you should have any questions, please contact me.

Sincerely,

W. G. Gates
Division Manager
Nuclear Operations

WGG/dle

Attachment

c: R. D. Martin, NRC Regional Administrator, Region IV
D. L. Wigginton, NRC Senior Project Manager
S. D. Bloom, NRC Project Engineer
R. P. Mullikin, NRC Senior Resident Inspector
INPO Records Center

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45-5124

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NRC FORM 366 (6-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 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.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Fort Calhoun Station Unit No. 1	0 5 0 0 0 2 8 5	1 OF 0 3

TITLE (4)
Insufficient Containment Spray Pump Net Positive Suction Head

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)
									N	0 5 0 0 0
0 4	1 7	9 2	9 2	— 0 1 6	— 0 0	0 5	1 8	9 2		0 5 0 0 0

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	X 50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Scott A. Lindquist, Shift Technical Advisor	AREA CODE 4 0 2 5 3 3 - 6 8 2 9

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)

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

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

During Omaha Public Power District's Design Basis Reconstitution of the containment spray (CS) system, it was discovered that an as-built hydraulic analysis of the CS system was not available. As part of the resolution of this Design Basis Document open item, a hydraulic analysis of the CS system was performed. The analysis revealed that the CS pumps would not have adequate suction head during the recirculation phase of operation per the requirements of AEC Safety Guide 1 (Regulatory Guide 1.1). This condition is outside the Fort Calhoun Station design basis, thus, a four-hour report was made to the NRC pursuant to 10 CFR 50.72(b)(2)(i) on April 17, 1992. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(ii).

The containment pressure analysis that reflects as-built containment design and the emergency core cooling system detailed system model show that actual NPSH for the CS pumps will significantly exceed required NPSH due to the presence of subcooling in the containment sump water. Therefore, the safety significance of this event is minimal.

The root cause of this event is attributed to analytical deficiencies of the original CS system design by the plant Architect/Engineer.

Corrective actions include the preparation of Safety Analysis for Operability (SAO) 92-02, a revision to USAR Section 6.2.1, and required review of this LER and its associated Root Cause Analysis by the Design Engineers - Mechanical.

The function of the containment spray (CS) system is to limit the containment structure pressure rise thereby reducing the leakage of airborne radioactivity from the containment by providing a means for cooling the containment atmosphere after the occurrence of a loss-of-coolant accident (LOCA).

Pressure reduction is accomplished by spraying cool borated water into the containment atmosphere. Heat removal is accomplished by recirculating and cooling the water through the shutdown cooling heat exchangers. The CS system is independent of the containment air recirculation and cooling system.

The CS system consists of the Safety Injection and Refueling Water Tank (SIRWT), three containment spray pumps, two heat exchangers (shutdown cooling heat exchangers) and all necessary piping, valves, instruments and accessories. The CS pumps discharge the borated water through the two heat exchangers, during recirculation, to a dual set of spray headers and spray nozzles in the containment. These spray headers are supported from the containment roof and the spray nozzles are arranged in the headers to give essentially complete spray coverage of the containment horizontal cross sectional area. One pump meets the capacity requirements in the event of a Design Basis Accident.

Initially, the pumps take suction from the SIRWT. Upon reaching low tank level, the recirculation actuation signal (RAS) is initiated, automatically transferring the pump suction to the containment recirculation line inlet. The recirculated effluent is cooled by component cooling water in the shutdown cooling heat exchangers prior to discharge into the containment atmosphere. During the recirculation phase, a portion of the cooled effluent from the shutdown heat exchangers may be directed to the high-pressure safety injection pumps.

During the Omaha Public Power District (OPPD) Design Basis Reconstitution of the CS system, it was discovered that an as-built hydraulic analysis of the CS pumps was not available. Thus, as part of the resolution of this Design Basis Document open item, a hydraulic analysis of the CS system was performed. This analysis shows that the CS pumps will provide significantly greater flow to containment than originally analyzed. While this is conservative for the containment pressure analysis, it is non-conservative for the CS pump suction head. As pump flow increases, the required net positive suction head (NPSH) also increases. The original design of the pumps calculated the NPSH requirements at 1700/2000 gpm (Pre-RAS/Post-RAS) per pump. The current analysis shows that approximately 3000 gpm (Post-RAS) per pump will be delivered in the event of a single failure.

Containment spray pump flow concerns were previously raised and reported to the NRC in December, 1990 in LER 90-025, Revision 1, due to high motor horsepower requirements. A modification was initiated to reduce flow to an acceptable level (approximately 3000 gpm) by closing one of the spray headers if two of the three CS pumps failed to start. This reduced the horsepower requirements to an acceptable level. At that time, an analysis (OPPD Calculation FC05508) was performed, which indicated that the NPSH available to the pumps was adequate. This analysis credited the subcooling of the spray water in the sump. The subcooling was based on data from the containment pressure analysis, which calculates containment peak pressures and peak temperatures.

While this method of calculating NPSH is realistic and valid, the design requirements of the Updated Safety Analysis Report (USAR) Section 6.2.1 reference AEC Safety Guide 1 (Regulatory Guide 1.1) and this Safety Guide does not allow the use of actual sump temperature in calculating NPSH. The AEC Safety Guide conservatively requires that the sump water be assumed to be at boiling temperature for the associated containment pressure, thus only elevation head between sump level and pump inlet can be credited in NPSH calculations.

The NPSH calculation that was performed for this design basis issue has been performed in accordance with AEC Safety Guide 1, which requires that no credit be taken for containment pressure effects in the analysis and consequently shows inadequate NPSH. The calculated NPSH differs from the required NPSH by approximately four feet. This condition was determined to be outside the Fort Calhoun Station design basis. Therefore, on April 17, 1992, a four-hour report was made to the NRC pursuant to the requirements of 10 CFR 50.72(b)(2)(i). This report is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(ii).

The containment pressure analysis that reflects as-built containment design and emergency core cooling system detailed system model show that actual NPSH for the CS pumps will significantly exceed required NPSH due to the presence of subcooling in the containment sump water. Therefore, the safety significance of this event is minimal. Documentation of the acceptability of the current configuration is contained in Safety Analysis for Operability (SAO) No. 92-02, which was approved by the Plant Review Committee on April 25, 1992.

The root cause of this event is attributed to analytical deficiencies of the original Containment Spray system design by the plant Architect/Engineer. A contributing cause of this event is the lack of awareness of the USAR section 6.2.1 method for calculating recirculation phase CS pump available NPSH by the preparer and reviewer of Calculation FC05508 in 1990. This is considered to be a contributing cause because it resulted in a missed opportunity to discover this condition at an earlier time.

The following corrective actions will be taken:

1) The Design Engineers - Mechanical will review this Licensee Event Report and its associated Root Cause Analysis to emphasize the importance of confirming USAR assumptions when performing calculations. This will be completed by June 4, 1992.

2) An analysis is being completed and the affected USAR Section 6.2.1 will be revised to credit liquid subcooling in the recirculation phase available NPSH calculation. This will be completed by August 15, 1992.

There have been no previous events involving the lack of CS net positive suction head.