Omaha Public Power District
P.O. Box 399 Hwy. 75 - North of Ft. Calhoun Fort Calhoun, NE 68023-0399
402/636-2000

August 3, 1992
LIC-92-255L

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 92-022 for the Fort Calhoun Station

Please find attached Licensee Event Report 92-022 dated August 3, 1992. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(ii)(B). If you should have any questions, please contact me.

Sincerely,

W. G. Gates
Division Manager
Nuclear Operations

WGG/lah

Attachment

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

45.5129

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 4

TITLE (4)
Inadequately Sized Heater Drain Pump Cables

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 7	0 2	9 2	9 2	— 0 2 2	— 0 0	0 8	0 3	9 2		0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 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
	AREA CODE
Daniel J. Rosloniec, Shift Technical Advisor	4 0 2 5 3 3 - 6 8 9 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 reconstitution of the Electrical System Design Basis, it was discovered that the cables supplying 4160 volt power to three Heater Drain Pump motors were inadequately sized. Engineering analysis determined that a bolted three-phase fault could produce a cable outer jacket temperature of 798 degrees F. This would exceed the specified jacket ignition temperature for the cable of 700 degrees F, potentially causing the Heater Drain Pump cables in both safe shutdown switchgear rooms to exceed their cable ignition temperature. This was determined to be outside the safe shutdown design basis of Fort Calhoun Station.

The safety significance of this incident is considered minimal. The Anaconda cable used for the Heater Drain Pump 4160 volt feeds meets IEEE 383-1974. Insulation/jacket combustion is not self-sustaining when the energy source is removed and the associated breaker will clear a fault in 7/60ths of a second. Combustion, if any, would therefore be expected to be short lived.

The root cause of this condition has been determined to be the inadequate cable sizing which was part of the original plant design.

A fire watch has been established for appropriate areas until the undersized Heater Drain Pump cable are upgraded to proper specifications.

The Fort Calhoun Station (FCS) Feedwater System includes three Heater Drain Pumps (FW-5A, FW-5B and FW-5C) which are used to return condensed extraction steam from the Turbine back to the Feedwater System. The steam passes through heaters to preheat the feedwater before the feedwater enters the Steam Generators.

Pump FW-5A is powered from non-safety related 4160 volt Bus 1A1 which has its switchgear located in the same fire area (Fire Area 36A) as safety related 4160 volt Bus 1A3. Pump FW-5B is powered from non-safety related 4160 volt Bus 1A2 and Pump FW-5C is powered from safety related 4160 volt Bus 1A4. The buses for FW-5B and FW-5C are located in the same fire area (Fire Area 36B).

During reconstitution of the Electrical System Design Basis, it was discovered that the cables supplying 4160 volt power to the three Heater Drain Pump motors were inadequately sized. Engineering Analysis EA-FC-90-055 determined that a bolted three-phase fault on the motor terminals for Heater Drain Pumps FW-5A, FW-5B, or FW-5C could result in conductor temperatures well in excess of the acceptance criteria of 250 degrees C specified for no cable insulation damage. Cable jacket temperature rise was further evaluated in Engineering Analysis EA-FC-92-026, which found that such a fault could produce a cable outer jacket temperature of 798 degrees F (426 degrees C). This would exceed the specified jacket ignition temperature for the cable of 700 degrees F.

10 CFR 50 Appendix R Section III G addresses requirements for fire protection of safe shutdown capability. This section indicates, in part, that fire protection features shall be capable of limiting fire damage so that one train of systems necessary to achieve and maintain hot shutdown conditions is free of fire damage. Appendix R Section III G also indicates that if cables or equipment, including associated non-safety circuits, are located within the same fire area, specified separation criteria must be satisfied. The potential for jacket ignition of faulted Heater Drain Pump cables requires that they be considered associated circuits by common enclosure with equipment in the safe shutdown switchgear areas to which they are routed. (Properly sized Heater Drain Pump cable would not be required to be considered an associated circuit.) Classification of these cables as associated circuits requires application of 10 CFR 50 Appendix R Section III G separation criteria along the entire length of the cables. The Heater Drain Pump cables do not meet these criteria in Fire Area 32 (Room 19) and Fire Area 46 (the Turbine Building). Cables for all three pumps are routed through both of these areas.

A scenario has been postulated in which a fire in either Fire Area 32 or 46, in the vicinity of the heater drain pump cables, could cause bolted three-phase faults in the 4160 volt power circuits for FW-5A and either, or both FW-5B and FW-5C. The faults could result in the cable jackets exceeding ignition temperature from the faulted point to the switchgear stress cone connection. As the FW-5A cable extends into safety related Fire Area 36A and the FW-5B and FW-5C cables extend into safety related Fire Area 36B, the scenario results in heater drain pump cable ignition temperature being exceeded in both switchgear areas. Appendix R Section III G requires that the plant be designed to preclude potential ignition sources from one fire safe shutdown train.

The potential for heater drain pump cable in both safe shutdown switchgear rooms to exceed its cable ignition temperature was determined to be outside the safe shutdown design basis of the Fort Calhoun Station. This determination was made on July 2, 1992 at 1145 with the plant in Mode 1 (Power Operation) at 100% power.

The NRC was notified of this condition pursuant to 10 CFR 50.72(b)(1)(ii)(B) on July 2, 1992 at 1220. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(ii)(B).

Although this condition was found to be outside the FCS design basis, it was not found to be safety significant. The Anaconda Cable used for the Heater Drain Pump 4160 volt feeds meets IEEE 383-1974. Insulation/jacket combustion is not self sustaining when the energy source is removed. The pump breakers will clear the fault in 7 cycles (7/60ths of a second) at which time the energy source is removed. Combustion, if any, would therefore be expected to be short lived. The possibility of a catastrophic switchgear fire is judged to be extremely remote.

An analysis was prepared to assess the high conductor temperatures that would be associated with the postulated Heater Drain Pump cable faults. The results of this analysis indicate that a fault on the FW-5A cable could result in the loss of Auxiliary Feedwater Pump FW-6, a safe shutdown pump. (A portion of the cable powering Heater Drain Pump FW-5A is in the same cable tray as the power cables for the safety related electric Auxiliary Feedwater Pump FW-6.) A fault on the FW-5C cable could result in the loss of Raw Water Pump AC-10B, a safe shutdown pump. (A portion of the cable powering Heater Drain Pump FW-5C is contained in the same cable tray as power cable for safety related Raw Water Pump AC-10B.) A fault on the FW-5B cable would not result in the loss of a safe shutdown pump. Both FW-6 and AC-10B have redundant pumps, so safe shutdown capability would not be lost.

No other Appendix R fault current/cable sizing problems have been identified.

The root cause of this condition has been determined to be the inadequate cable sizing which was part of the original plant design. A contributing cause was the assumption made in OPPD's Appendix R compliance review that the original plant design was correct and power cable reanalysis was not required.

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

The following corrective actions have been or will be completed:

1. Safety Analysis for Operability (SAO) 92-01 has been put into effect until properly sized cables are installed. This SAO requires an hourly fire watch patrol in Fire Areas 32 and 46 if specified fire detection is operable, and a continuous fire watch if fire detection is inoperable.

2. Engineering Change Notice 92-311 has been issued to upgrade the power cables for the Heater Drain Pumps to the proper specifications. This work will be completed by October 1, 1992.

3. Electrical System Design Basis Reconstitution fault current calculations will be reviewed by February 28, 1993 to ensure that the calculations support the Appendix R design basis.

LERs 89-014 and 89-015 discuss previous design basis issues relating to compliance with 10 CFR 50 Appendix R. These LERs did not relate to cable sizing issues.