NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

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)
10 CFR 50.49 Testing of Conax Electrical Penetrations

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 6	2 2	8 4	8 4	— 0 0 9	—	0 0	0 7	2 3	8 4	N	0 5 0 0 0
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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)	20.405(a)	50.73(a)(2)(iv)	73.71(b)		
POWER LEVEL (10) 0 0 0	20.405(a)(1)(i)	50.36(c)(1)	X 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
James J. Fisicaro, Supervisor - Nuclear Industry & Regulatory Affairs	AREA CODE 4 0 2 — 5 3 6 - 4 5 0 5

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
B	E D	P E N	C 5 1 5		B	E F	P E N	C 5 1 5	
B	E E	P E N	C 5 1 5						

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)

The Omaha Public Power District has been conducting sequential environmental qualification testing of the electrical penetration assemblies in order to fulfill the requirements of 10 CFR 50.49. The District was notified by the test laboratory that during the LOCA/MSLB profile testing, the penetration assemblies had failed. The LOCA/MSLB testing sequentially follows the irradiation testing. The LOCA/MSLB testing includes stress parameters of steam, pressure, and chemical spray. Inspection of penetration assemblies revealed that during the LOCA/MSLB test the Teflon insulation on the lead wires had become brittle and had cracked.

It has been concluded that this failure would only occur after accumulation of a high radiation dose in conjunction with the pressure/steam environment. These conditions make failure at the onset of the accident extremely unlikely.

Thus far, the District has modified selected penetration assemblies to preclude this sort of failure. Those penetrations which would not complete their accident function prior to onset of the high radiation dose associated with a Large Break LOCA, those penetrations which perform a LBLOCA-mitigating function, or those required for post-accident monitoring or long term core cooling have been modified to alleviate the concern. The remaining penetrations will be qualified by November, 1985, pending concurrence of the NRC in establishing a new extension date.

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

The Omaha Public Power District in a letter to ONRR dated July 3, 1984, requested an extension of the 10 CFR 50.49 deadline until November 30, 1985. Additionally, this letter provided justification for continued operation until full qualification could be achieved.

The Fort Calhoun Station containment electrical penetration system provides a dual function of passing electric power into containment and instrument signals out of containment via insulated conductors, and at the same time sealing the conductors to provide containment integrity (refer to USAR Section 5.9.3 for a description of the penetrations). This function is accomplished by the use of subassemblies which are inserted in a penetration canister. Each subassembly is made up of a stainless steel tube (sheath) through which a lead wire, or wires (depending on the type) are run and sealed at both ends. The penetration system subassembly types are multiconductor low voltage (600 V), single conductor low voltage, medium voltage (4160V), coaxial, triaxial, and thermocouple lead wires. The subassemblies under discussion are the multiconductor low voltage (120V and 480V single and three phase power, A.C. control, D.C. control, and instrumentation) and/or thermocouple configurations. These particular multiconductor penetrations use FEP teflon as the lead wire insulation, and TFE teflon as the seal material in the subassembly.

Because the DOR Guidelines for electrical equipment qualification require the sequential testing of equipment containing materials which are susceptible to radiation damage, the District is conducting an environmental qualification test of the low voltage multiconductor penetration subassembly. The sequential test procedure uses IEEE 317-1976 and IEEE 323-1974 as a guide. Plant specific parameters are used to envelope the sequentially applied environmental stress parameters (aging, short circuit and short time overload, seismic, radiation, MSLB/LOCA, and short circuit).

The District was notified by the test laboratory that after irradiation was performed and during the initial MSLB/LOCA profile test (steam, pressure, chemical spray) an insulation breakdown had occurred. After an inspection by the District and after an evaluation of the information resulting from that inspection, it was determined that the teflon lead wire insulation had become brittle and cracked. It is the District's judgement, based on test evidence, that the penetrations failed to perform their electrical function. The failure appears to be an interaction of the steam/spray environment and the radiation weakened lead wire insulation. The penetration had in fact passed functional tests following radiation exposure, using the outboard (auxiliary building side) seal as the pressure boundary. It is the District's conclusion that damage to the lead wire insulation occurs only after accumulation of a high radiation dose and a pressure/steam environment. It is also the District's judgement that this environment is present only during LBLOCA in which fuel damage occurs releasing fission products. It should be noted that even in the case of a LBLOCA, all equipment is expected to complete its immediate accident function (e.g., reactor trip, safeguards initiation, etc.).

The District is taking a two phase approach to achieve qualification. Phase I, as discussed in the following paragraphs, modifies selected electrical penetrations needed to accomplish long term core cooling or accomplish post-accident monitoring after a Large Break LOCA (LBLOCA). Additionally, administrative control will be

established for dealing with the assemblies not required after a LBLOCA. Phase II will address and resolve the Electrical Equipment Qualification-related circuits not modified in Phase I by the requested extension date of November 30, 1985.

Phase I

The District has upgraded all subassemblies associated with equipment which must be energized to accomplish long term core cooling or accomplish post-accident monitoring. The balance of equipment which is Electrical Equipment Qualification (EEQ) related either does not accomplish a mitigation function in a LBLOCA (e.g., the Auxiliary Feedwater System), completes its function before failure (e.g., reactor trip) or can be dealt with administratively. The modifications to the subassemblies are designed to ensure electrical integrity and in doing so also ensure containment integrity. The modifications used a combination of qualified heat shrink tubing to sleeve the lead wires and qualified room temperature vulcanizing (RTV) silicone rubber to seal the heat shrink covered lead wire interface at the subassembly seal by sealing the area between the heat shrink and the stainless steel sheath. Both materials were designed for the purpose which the modifications require. The Raychem heat shrink tubing is qualified for a LOCA in Wyle Laboratories report number 58442-1, including electrical properties. The Dow Corning RTV is qualified by a combination of testing and District analysis. The RTV seals and provides additional electrical insulation at the interface as discussed in Dow Corning Bulletin 61-016a. The RTV has been checked to insure bonding on the Raychem heat shrink tubing and stainless steel subassembly sheath. The teflon has been completely surrounded by the RTV or Raychem. The District has also shortened the teflon insulated lead wires.

Administrative controls have been established to provide direction to operating personnel in the event it becomes necessary to assure proper positioning of pilot-solenoid air-operated valves following a LBLOCA. An analysis of the failure mechanism indicates the possibility for three instances where this administrative control would be required. The first possibility is that of shorting the solenoid lead wire with the position indication lead wire, causing the valve to change position. Secondly, shorting may cause the loss of position indication. Thirdly, shorting may cause the operator to receive misleading indication (e.g., the valve is indicated to be both open and closed at the same time). The administrative controls are procedural in nature and direct the operator to fail the instrument air supply to containment in the event undesired valve repositioning occurs, or misleading information is indicated. This allows the operator to achieve the desired valve position, regardless of indication.

Phase II

The District will complete the environmental qualification of the remaining penetration assemblies by the requested extension date of November 30, 1985.

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

July 23, 1984
LIC-84-236

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Reference: Docket No. 50-285

Gentlemen:

Licensee Event Report for
the Fort Calhoun Station

Please find attached Licensee Event Report 84-009 dated July 23, 1984. This report is being submitted per requirements of 10 CFR 50.73.

Sincerely,

R. L. Andrews

R. L. Andrews
Division Manager
Nuclear Production

RLA/DJM:jmm

Attachment

cc: Mr. Richard P. Denise, Director
Division of Resident, Reactor Project
& Engineering Programs
U. S. Nuclear Regulatory Commission
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611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

INPO Records Center
Mr. E. G. Tourigny, Project Manager

SARC Chairman
PRC Chairman
Mr. L. A. Yandell, Senior Resident
Inspector
Fort Calhoun File (2)

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