

**Omaha Public Power District**

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

October 20, 1992  
LIC-92-263L

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

References: 1. Docket No. 50-285  
2. LER 92-019 Revision 00, from OPPD (W. G. Gates) to NRC  
(Document Control Desk) dated June 30, 1992 (LIC-92-140L)

Gentlemen:

Subject: Licensee Event Report 92-019 Revision 01 for the Fort Calhoun  
Station

Please find attached Licensee Event Report 92-019 Revision 01 dated  
October 20, 1992. This revision provides supplemental information regarding  
the cause of the event and corrective actions. Revisions to the Abstract and  
Text are denoted by vertical lines in the right margin. This report is being  
submitted pursuant to 10 CFR 50.73(a)(2)(i)(A). If you should have any  
questions, please contact me.

Sincerely,

*W. G. Gates*

W. G. Gates  
Division Manager  
Nuclear Operations

WGG/lah

Attachment

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

9210230256 921020  
PDR ADDCK 05000285  
S PDR

*IFDR*  
*11*

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS  
INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD  
COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION  
AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR  
REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, 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)

05000285

PAGE (3)

1 OF 4

TITLE (4)

Control Element Assembly Drop and Plant Shutdown Due to Clutch Coil Failure

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	31	92	92	-- 019 --	01	10	20	92	FACILITY NAME	DOCKET NUMBER
										05000
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)	100	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	
		20.405(a)(1)(iii)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 386A)	
		20.405(a)(1)(iv)		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

William J. Blessie, Shift Technical Advisor

TELEPHONE NUMBER (Include Area Code)

(402) 533-6896

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRRDS
B	AA	DRIV	C490	Y					

## SUPPLEMENTAL REPORT EXPECTED (14)

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

## ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On May 31, 1992, Fort Calhoun Station was in Mode 1 (Power Operation) operating at 100% power with all Control Element Assemblies (CEA's) withdrawn. At 2255, indication was received that CEA 35 had dropped into the reactor core. Control Room Operators verified that the CEA had actually dropped into the core and took action to minimize the mismatch between primary and secondary systems power by reducing turbine loading. Power was then reduced below 70%, and following an unsuccessful attempt to recover the CEA, a Notification of Unusual Event (NOUE) was declared and the plant was shutdown in accordance with Technical Specifications.

The safety significance of this event is minimal since this is an Anticipated Operational Occurrence and because of prompt action taken by the operators to minimize power peaking.

The root cause of this event was the material failure of the clutch coil in Control Element Drive Mechanism (CEDM) 35.

The failed clutch assembly was replaced, an examination of the failed clutch coil assembly was performed and resistance readings were taken on the other CEDM clutch coils. Additional corrective actions will include evaluating potential means of gathering data to trend clutch coil condition.

**LICENSEE EVENT REPORT (LER)**  
**TEXT CONTINUATION**

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (3)			PAGE (5)
Fort Calhoun Station Unit No. 1	05000285	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 4
		92	-- 019 --	01	

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

The Control Element Drive System at Fort Calhoun Station (FCS) provides a means to position the control elements for reactivity control during reactor startup, power operation and reactor shutdown. The control elements act in conjunction with the Reactor Protection System to provide a means for rapid reactor shutdown when limiting conditions are reached.

The Control Element Drive Mechanisms (CEDM's) provide controlled linear motion and prevent bounce-back of the Control Element Assemblies (CEA's). The CEDM's utilize a rack and pinion mechanism to vertically position the CEA's. A drive shaft running parallel to the rack drives the pinion gear through a set of bevel gears. The shaft is driven by an electric motor operating through a reducing gear box and an electromagnetic, anti-reversing clutch. The drive train is equipped with an electromechanical brake to maintain the CEA position. Upon releasing (tripping) the magnetic clutch, the rack with the attached CEA drops into the core due to gravity. The anti-reversing clutch stops any CEA bounce-back.

A CEA drop incident is defined in the FCS Updated Safety Analysis Report (USAR) as the inadvertent release of a CEA causing it to drop into the reactor core. A CEA drop may occur due to an electrical or mechanical failure of the mechanical brake, or interruption of power to or failure of the CEA holding coil (magnetic clutch). The CEA drop event is classified as an Anticipated Operational Occurrence which does not require a Reactor Protection System trip to maintain the Departure from Nucleate Boiling Ratio (DNBR) greater than or equal to 1.18 and peak linear heat rate less than the limiting condition for operation and limiting safety system setting.

On May 31, 1992, FCS was in Mode 1 (Power Operation) operating at 100% power with all CEA's withdrawn. At 2255, indication was received that CEA 35 had dropped into the reactor core. CEA 35 is a dual CEA in Shutdown Group "A". Control Room Operators verified that the CEA had actually dropped into the core, took action to minimize the mismatch between primary and secondary systems power by reducing turbine loading, and entered Abnormal Operating Procedure AOP-02, "CEA and Control System Malfunctions." Technical Specification 2.10.2(4)e was entered which requires power to be reduced to less than or equal to 70% within one hour with a full length CEA misaligned from any other CEA's in its group by 18" or more. A power level of 69.7% was attained at 2354.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (3)			PAGE (4)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort Calhoun Station Unit No. 1	05000285	92	-- 019 --	01	3 OF 4

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

Once power was reduced below 70%, an attempt was made to recover CEA 35 and realign it with the rest of the group, however, the CEA would not move. At 2357, the CEA was declared inoperable and a plant shutdown was commenced in accordance with Technical Specification 2.10.2(4)e(iii) which specifies that the plant be in Hot Shutdown within an additional five hours. A Notification of Unusual Event (NOUE) was declared as a result of initiation of a Technical Specification required shutdown, and a calculation was performed to verify that adequate shutdown margin could be achieved. The states of Nebraska and Iowa were made aware of the NOUE at 0002 on June 1, 1992, and the Senior Resident Inspector was informed at 0007. The NRC was notified at 0019 pursuant to 10 CFR 50.72(a)(1)(i) and 10 CFR 50.72(b)(1)(i)(A).

Hot Shutdown was entered at 0410 and the NOUE was terminated. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(i)(A).

An electrician called to the site to aid in troubleshooting the clutch coil circuitry measured the resistance of the circuit at two ohms. The expected resistance of this circuit is approximately 18 ohms. Additionally, the voltmeter of the power supply which feeds CEA 35 was reading 10 volts low. Maintenance Work Order 922494 was generated to further troubleshoot and repair the circuitry.

Investigation into the incident revealed that the clutch coil for CEA 35 had failed, allowing the CEA to drop into the core. The failed clutch assembly was removed and replaced. CEA 35 was then tested and found to be operable. The clutch power supply voltage and current readings also returned to normal.

The reactor was returned to criticality at 0211 on June 2, 1992. Power was subsequently increased, and Fort Calhoun returned to 100% power operation on June 4, 1992.

The failed clutch assembly was taken out of Containment, decontaminated and disassembled. A resistance reading of the clutch coil was taken and indicated an open circuit existed. The coil outer casing was discolored and appeared to have experienced significant overheating. A noticeable amount of the coil potting material was no longer inside the coil casing. Some of the potting material had spread across the clutch faces, and the electricians who replaced the clutch assembly noted this same material splattered onto the inside of the CEDM.

An examination of the mechanical components of the clutch assembly revealed that the ball bearing directly above the coil turned roughly. The plastic seal face was distorted by heat on the coil side of the bearing. No significant wear or other damage was noted. The failed clutch coil from CEA 35 was shipped to an independent testing laboratory for failure analysis.



**LICENSEE EVENT REPORT (LER)**  
**TEXT CONTINUATION**

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (3)			PAGE (5)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Fort Calhoun Station Unit No. 1	05000285	92	-- 019 --	01	4 OF 4

TEXT (If more space is required, use additional copies of NRC Form 388A) (17)

The safety significance of this event is minimal since this is an Anticipated Operational Occurrence and analyzed in the USAR. Additionally, the prompt action taken by the operators to rectify the power mismatch between the primary and secondary systems and the reduction in power to below 70%, minimized power peaking and peak linear heat rate.

The root cause of this event was the material failure of the clutch coil in CEDM 35. Laboratory analysis of the failed clutch coil concluded that the failure was due to magnet wire shorting, potentially initiated by a manufacturing defect in the insulation (undetected by original testing), and/or an induced overstress (such as a physical shock or a power surge to the coil).

The following corrective actions have been completed:

1. The failed clutch assembly was replaced and the replacement assembly tested and found to be operable.
2. A preliminary examination of the failed clutch assembly was performed as described above.
3. Resistance readings were taken on each CEDM clutch coil during a July 1992 plant shutdown and no discrepancies were noted.
4. The failed clutch coil assembly was shipped to an independent testing laboratory and a detailed examination was performed.

The following corrective actions will be completed:

1. OPPD will evaluate potential means of gathering data to trend clutch coil condition for predictive maintenance. This evaluation will be completed within three months following the 1993 Refueling Outage.
2. Data from monitoring activities will be reviewed, and if necessary, selected CEDM coils replaced prior to the end of the next refueling outage.
3. Based on a recommendation resulting from the detailed examination of the clutch coil, OPPD will verify whether a resistor is installed in series with the CEA 35 clutch coil. If such a resistor is found to be installed, it will be checked for signs of overstress. These actions will be completed by the end of the 1993 Refueling Outage.

It has been approximately 10 years since the last occurrence of a CEA dropping due to a failure of a CEDM clutch coil.