



AP&L

Arkansas Power & Light Company
Arkansas Nuclear One
Route 3, Box 137 G
Russellville, AR 72801
Tel 501 964 3100

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U.S. Nuclear Regulatory Commission
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SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Licensee Event Report No. 50-313/89-040-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(iv), attached is the subject report concerning two Emergency Diesel Generator actuations which occurred due to loss of power to a 480 volt Engineered Safeguards bus caused by personnel error.

Very truly yours,

E. C. Ewing
General Manager,
Technical Support
and Assessment
ECE/RHS/sgw
attachment

cc: Regional Administrator
 Region IV
 U. S. Nuclear Regulatory Commission
 611 Ryan Plaza Drive, Suite 1000
 Arlington, TX 76011

INPO Records Center
1500 Circle 75 Parkway
Atlanta, GA 30339-3064

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PDR ADOCK 05000313
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(9-83)U.S. Nuclear Regulatory Commission
Approved OMB No. 3150-0104
Expires: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	Arkansas Nuclear One, Unit One	DOCKET NUMBER (2)	PAGE (3)
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105000 31310F04

TITLE (4) Two Emergency Diesel Generator Actuations Due to Loss of Power to a 480V Engineered Safeguards Bus
Caused By Personnel Error

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)		
Month	Day	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names	Docket Number(s)		
1	2	05	8	9	8	9	--	0	4	0	--
OPERATING MODE (9) N (Check one or more of the following) (11)											
POWER		20.402(b)		20.405(c)		X	50.73(a)(2)(iv)		73.71(b)		
LEVEL		20.405(a)(1)(1)		50.36(c)(1)			50.73(a)(2)(v)		73.71(c)		
(10) 101010		20.405(a)(1)(11)		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)(1)			50.73(a)(2)(viii)(A)				
		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)				
		20.405(a)(1)(v)		50.73(a)(2)(iii)							

LICENSEE CONTACT FOR THIS LER (12)

Name	Telephone Number
Larry A. Taylor, Nuclear Safety and Licensing Specialist	Area
	Code
	5101964-13100

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

Cause	System	Component	Manufacturer	Reportable	Cause	System	Component	Manufacturer	Reportable

SUPPLEMENT REPORT EXPECTED (14)

EXPECTED SUBMISSION DATE (15)	Month	Day	Year
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Yes (If yes, complete Expected Submission Date) No

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

On December 5, 1989 at 0645 and December 6, 1989 at 2205, while the plant was shutdown in a maintenance outage, automatic actuations of an Emergency Diesel Generator (EDG) occurred as a result of loss of power to a 480 volt (v) Engineered Safeguards (ES) bus. Prior to both events, the B5 and B6 480v ES busses were crossconnected to facilitate maintenance activities. The December 5 event occurred as a result of a personnel error which occurred while operators were attempting to "splitout" the B5 and B6 busses and return the ES power distribution system lineup to normal. The error resulted in a loss of power to bus B6 which caused the offsite feeder breaker for 4.16 kilovolt bus A4 to open and initiated a start of the 'B' EDG which tied on to the A4 bus. The December 6 event was also the result of a personnel error which caused a loss of power to 480v ES bus B5. This condition caused the offsite feeder breaker for A3 to trip and the 'A' EDG to start. The momentary loss of power to A3 caused the operating Decay Heat Removal (DHR) pump to trip. DHR flow was lost for approximately 9 minutes and resulted in a Reactor Coolant System temperature increase of 17 degrees. Management briefings were conducted for the operating crews prior to restart from the outage covering the lessons learned from these events. On-shift guidance with respect to management expectations regarding watchstanding professionalism and formality and attention to detail is also being provided.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)
		Sequential	Revision
		Year	Number
Arkansas Nuclear One, Unit One	0 5 0 0 0 3 1 3 8 9 -- 0 4 0 -- 0 0 0 2 0 F 0 4		

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

A. Plant Status

At the time of these events, Arkansas Nuclear One, Unit 1 (ANO-1) was in the cold shutdown condition. Midcycle outage 1M89 was in progress.

B. Event Description

On December 5, 1989 at approximately 0645 hours, while licensed plant operators were in the process of restoring the Engineered Safeguards (ES) electrical distribution system lineup to normal, a momentary loss of power to 4160V ES bus A4 and 480V ES bus B6 occurred. The 'B' Emergency Diesel Generator (EDG) automatically started and reenergized bus A4.

The electrical distribution lineup prior to this event was as follows (see Figure 1): 4.16KV switchgear A3 was being powered from switchgear A1 (supplied by offsite power) and 4.16KV switchgear A4 was being supplied by A2. 480V ES bus B5 was being supplied by A3 via circuit breakers A-301 and B-512. 480V ES bus B6 was crossconnected to B5 through circuit breakers B-513 and B-613. The feeder breakers from A4 to B6 (A-401, B-612) were open. The 'A' EDG was being run for surveillance testing and was tied to A3 and operating in parallel with the offsite power system. Decay Heat Removal [DHR] pump P-34A was in service.

Three operators were involved in the bus transfer. It should be noted at this time that the normal feeder breakers to B5 and B6 (B-512, B-612) and the B5/B6 crosstie breakers (B-513, B-613) are each electrically interlocked to trip when the other three are closed. The sequence of events leading up to the diesel start was as follows:

- Operator #1 closed the 4.16KV feeder breaker from A4 to B6 (A-401).
- Operator #2 held the handswitch for B-512 in the close position to prevent it from tripping due to the interlock discussed above.
- Operator #1 held the handswitches for B-513 and B-613 in the close position to prevent the inadvertent loss of power to B6.
- Operator #3 closed the 480V feeder breaker from A-4 to B-6 (B-612) and held the switch in the close position.
- Operator #1 then released the handswitches for B-513 and B-613.

When the switch for B-613 was released, breaker B-613 tripped, the 'B' EDG started automatically, the A2 to A4 feeder breaker (A-409) tripped, as designed, and the EDG tied to A4. At this time, the operators observed that the feeder breaker from A4 to B6 (A-401) was open with the handswitch in the normal after close position, indicating that the breaker had tripped. This resulted in completely deenergizing the B6 bus and initiating the EDG start due to an undervoltage condition on B6. Since the operators did not know why A-401 had tripped, they reestablished power to B6 from B5 by reclosing breaker B-613 and opening B-612. At 0700, the A2 supply to A4 was restored and the 'B' EDG was secured. At 0745, the electrical distribution lineup was returned to a normal alignment (B5 and B6 split).

A second inadvertent loss of power to a 480V ES bus and subsequent EDG start occurred on December 6, 1989 at approximately 2205.

The electrical distribution lineup prior to this event was as follows. 480V ES busses B5 and B6 were crossconnected through their respective crosstie breakers (B-513, B-613). B6 was being powered from 4.16KV bus A4 through feeder breakers A-401 and B-612. The A3 to B5 feeder breakers (A-301 and B-512) were open, racked down and tagged out to allow inspection of 4.16KV/480V transformer X5. DHR pump P-34A was in service.

After completion of the transformer inspection, a plant auxiliary operator was instructed to go to the A3 switchgear room and remove the hold cards from breaker A-301 and B-512 and rack in the breakers in preparation for closing the breakers. After racking in the breakers, the operator was in the process of charging the springs for breaker B-512 when it inadvertently closed and immediately reopened. At this time the B6 crosstie breaker (B-613) opened, since it is interlocked with B-512, B-513 and B-612.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		Sequential	Revision	Year	
Arkansas Nuclear One, Unit One	10151001031138	89--	014	0--01	00030F004

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to open when the other three are closed. The tripping of breaker B-613 caused a loss of power to bus B5 which initiated an autostart of the 'A' EDG due to undervoltage on B5. The A1 to A3 feeder breaker tripped, as designed, and the EDG output breaker closed, reenergizing bus A3. The momentary loss of power to 4.16KV bus A-3 caused the breaker for DHR pump P-34A to trip, resulting in a loss of DHR flow. The operators immediately reenergized bus B5 from A3 by closing breakers A-301 and B-512. At approximately 2210, bus A3 was paralleled to A1 and the EDG was secured. At 2214, DHR pump P-34A was restarted and DHR flow was reestablished. DHR cooling flow had been interrupted for approximately 9 minutes. During this time Reactor Coolant System (RCS) [AB] temperature increased from 103 degrees to 120 degrees.

C. Safety Significance

The EDGs response to the loss of power to the ES bus during both events was as designed. All interlocks and breakers functioned as required. During the first event, the operating DHR pump (P-34A) was being powered from A3 and the momentary loss of power to A4 did not cause a loss of DHR flow. However, during the second event, DHR flow was lost for approximately nine minutes, resulting in an increase in RCS temperature of approximately seventeen degrees. Although the DHR pump was available for restart immediately after tripping, decay heat loads were such that it was not necessary to restart the pump until the electrical distribution lineup was normalized. Considering that DHR cooling was reestablished expeditiously and that the EDGs responded properly during these events, their safety significance is considered minimal.

D. Root Cause

In an effort to determine the causes of the two events discussed in this report, an evaluation of the design of the 480V ES bus tie and feeder breakers was conducted. This evaluation verified that there were no design deficiencies which could have caused or contributed to the events. Additionally, functional testing of the involved breakers was performed which verified that all the breakers operated as designed.

The exact cause of why breaker A-401 was either open or tripped during the first event or why breaker B-512 inadvertently closed during the second event could not be determined. However, since the breaker design was verified to be correct and the breakers were proven to be operable, the most likely cause of these events is considered to be personnel error during the bus transfer evolutions.

E. Basis for Reportability

These events are reportable in accordance with 10CFR50.73(a)(2)(iv), as automatic actuations of an Engineered Safety Feature.

F. Corrective Actions

A senior management evaluation of these events determined that increased emphasis needed to be placed on watchstanding professionalism and formality. Management briefings were conducted for operating crews prior to restart from outage 1M89 covering the results of this evaluation.

Additionally, senior management and supervisory personnel are providing on-shift guidance to shift personnel. This guidance includes management expectations regarding watchstanding professionalism and formality, attention to detail, procedure compliance and safety.

A review of operating procedures will be conducted to evaluate the need to require sign-off steps when crossconnecting or restoring ES electrical busses to normal configuration while shutdown, and to determine if additional procedural enhancements are necessary. This review is expected to be completed by March 31, 1990.

During the next Refuel Cycle, training will be provided on 480V breaker operations and on B5 - B6 breaker interlocks. This training is expected to be completed by March 31, 1990.

G. Additional Information

There have been no previous EDG actuations caused by personnel error reported.

Energy Industry Identification System (EIIS) codes are indicated in the text as [XX].

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)
Arkansas Nuclear One, Unit One		Sequential Revision	
	Year Number	Number	
[0] [1] [5] [0] [0] [0] [3] [1] [3] [8] [9] -- [0] [4] [0] -- [1] [0] [0] [4] [0] [4]			

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

FIGURE 1

SIMPLIFIED SCHEMATIC OF ES ELECTRICAL DISTRIBUTION SYSTEM

