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SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Licensee Event Report 50-313/93-002-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(iv), enclosed is the subject report concerning the automatic start of an Emergency Diesel Generator.

Very truly yours,

James J. Fisicaro

James J. Fisicaro
Director, Licensing

JJF/TFS/mmg
Enclosure
cc: Regional Administrator
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NRC Form 366
(6-89)

U.S. Nuclear Regulatory Commission
Approved OMB No. 3150-0104
Expires: 4/30/92

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Arkansas Nuclear One, Unit One	0 5 0 0 0 3 1 3	1 OF 0 5

TITLE (4) Circuit Breaker Malfunction Due To Procedural Deficiency Results In ESF Bus Being De-energized and Emergency Diesel Generator Automatic Start

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 5 0 0 0
0 3	0 9	9 3	9 3	-- 0 0 2	-- 0 0	0 4	0 2	9 3		0 5 0 0 0

OPERATING MODE (9)	N	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)	X 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
	__	20.405(a)(1)(iii)	__	50.73(a)(2)(i)	__ 50.73(a)(2)(viii)(A)	Abstract below and
	__	20.405(a)(1)(iv)	__	50.73(a)(2)(ii)	__ 50.73(a)(2)(viii)(B)	in Text, NRC Form
	__	20.405(a)(1)(v)	__	50.73(a)(2)(iii)	__ 50.73(a)(2)(x)	366A)

LICENSEE CONTACT FOR THIS LER (12)

Name	Telephone Number (Area Code)
Thomas F. Scott, Nuclear Safety and Licensing Specialist	5 0 1 9 6 4 - 5 0 0 0

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	

SUPPLEMENT 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)

On March 9, 1993, at 1548 hours, ANO-1 was operating at 100 percent power when green train 4160 volt Engineered Safeguards (ES) and non-ES buses and the 480 volt ES load center were de-energized. During a transfer of power sources from an off-site supplied Startup Transformer to the Unit Auxiliary Transformer, the circuit breaker from the Startup Transformer did not automatically open when the circuit breaker to the Unit Auxiliary Transformer was closed. This resulted in high circulating currents due to transformer voltage differences that caused both breakers to open. An Emergency Diesel Generator started and supplied ES loads. Non-ES loads were re-powered from the Startup Transformer. The unit was run back to 63 percent power due to a condensate pump being de-energized and decreasing main condenser vacuum. Return to a normal electrical line-up occurred at 1940 hours. The circuit breaker to the Unit Auxiliary Transformer had not been completely racked up. Excessive auxiliary relay contact clearances resulted in failure to provide a signal that the breaker had closed. The root cause has been attributed to a procedural deficiency in that precautions concerning breaker racking-up evolution were inadequate. Corrective actions include procedure revisions and personnel training.

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

A. Plant Status

At the time this event occurred, Arkansas Nuclear One Unit 1 (ANO-1) was operating at 100 percent power.

B. Event Description

On March 9, 1993, at approximately 1548 hours, an Emergency Diesel Generator (EDG) [EK] automatically started and supplied power to an Engineered Safeguards (ES) 4160 volt bus [EB] and a 480 volt load center that had been de-energized.

Part of the normal plant startup process involves transfer of electrical power supply from an off-site supplied Startup Transformer to the Unit Auxiliary Transformer (UAT) that receives its power from the main generator. On March 8, 1993, the unit was at approximately 40 percent power when this transfer was attempted for the green electrical train. It was unsuccessful because the 4160 volt circuit breaker to the UAT (A-212) did not remain closed. Troubleshooting efforts led to replacement of control power fuses in the A-212 breaker logic. A second attempt to close the breaker was also unsuccessful. The breaker was then racked down and tested using the test stand. All test results were satisfactory. No cause for the failure to remain closed was identified. Following an evaluation by Operations, Maintenance, and Engineering personnel, a decision was made to attempt closing A-212 a third time. A detailed pre-evolution briefing was conducted to identify contingency actions if power were lost to affected buses. Breaker A-212 was successfully closed. The handswitch was held in the "To Close" position until positive confirmation of breaker closure was obtained both locally and remotely. After approximately 15 seconds, the A-212 handswitch was slowly returned to the "Normal After Close" positions. Circuit breaker A-213, which supplies power to the green buses from Startup One Transformer, did not open automatically as designed. Both A-212 and A-213 remained closed for 15 to 30 seconds. A voltage difference between the two transformers caused circulating currents which resulted in actuation of a time delay overcurrent relay on A-212. This actuated a bus lockout that opened both A-212 and A-213 to de-energize green train 4160 volt ES bus A4, 480 volt load center B6, and 4160 volt non-ES bus A2. As designed, #2 EDG automatically started and supplied power to green train ES loads. A plant runback was initiated due to one condensate [SD] pump being de-energized and a reduction in main condenser [SG] vacuum caused by a de-energized circulating water [KE] pump. The non-ES 4160 volt bus A2 was powered from the Startup Transformer via breaker A-213 at 1550 hours. The plant was stabilized at approximately 63 percent power at 1600 hours. At 1931, bus A2 was transferred to the Unit Auxiliary Transformer. Circuit breaker A-213 automatically opened during that transfer. ES loads were transferred to the Unit Auxiliary Transformer at 1940 hours. Power escalation started at 2110 hours and 100 percent power level was achieved at 0415 hours on March 10, 1993.

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

Technical Specification 3.7.1.B Limiting Condition For Operation (LCO) states "All 4160 V switchgear, 480 V load centers and 480 V motor control centers in both of the ESAS distribution systems are operable and are being powered from either one of the two startup transformers or the unit auxiliary transformer". If this LCO cannot be met, which it was not with A4 and B6 supplied by #2 EDG, entry into action requirement 3.7.2.A is directed. The action requirement specifies that a hot shutdown shall be initiated within twelve hours. Since power sources were considered operable, Operations personnel did not identify that the plant was in this action requirement until prompted approximately two hours after the initiating event. The total time the unit was actually in the action requirement was 3 hours and 52 minutes.

C. Root Cause

Troubleshooting was performed on the A-212 breaker and its Control Room handswitch following the failure of A-213 to open automatically. The A-213 trip circuit needs 3 distinct contacts to operate for energizing its trip coil.

1. Control switch for breaker A-212 in "Normal-after Close".

2. Sync-switch for A-212 in the "On" position.

3. A-212 breaker closed as indicated by an "a" contact in the A-212 stationary auxiliary switch assembly.

The above three conditions must be met simultaneously before A-213 will trip. Electrical Relay and Operations personnel verified the contacts for the control switch and sync-switch were making up. Various speeds of handswitch manipulation were used by Operations with each test showing expected results (contacts did make up). The "a" contact in the stationary auxiliary switch assembly could not be checked because the A-212 breaker must be closed for the switch assembly to be "made up". By eliminating the first 2 possible problems, it is most likely that the A-212 breaker auxiliary contact switch assembly was not fully made up, resulting in the A-213 opening circuitry not achieving continuity. Supporting this assumption, when the A-212 breaker was initially racked up prior to the event, the closing springs did not immediately charge after the breaker was in the "racked-up" position. The springs did charge after the elevator motor clutch handle was engaged again and allowed to "spring" back to the disengaged position. This problem of failure to achieve immediate spring charging had been previously identified on a 4160V breaker, with the corrective action adding a "Note" to the Operations electrical procedures detailing the need to allow the elevator clutch handle to "spring back" to the disengaged position once the elevator motor had stopped. When the A-212 breaker was attempted to be racked down after the bus lockout event, it was discovered that the breaker elevator motor fuses were blown. The fuses likely were blown during the previous "rack up" event of A-212 prior to the bus lockout, lending credence to the probability of the A-212 breaker not being firmly racked up. It

should be noted that as little as 1/8 inch gap between the plunger mechanism attached to the breaker and the stationary auxiliary switch assembly (where the "a" contact in question is located) is enough to prohibit proper contact operation. The breaker not being fully racked up was not apparent to personnel involved since the elevator motor had stopped traveling as if interlocked off by the "up" limit switch, as it normally is. The elevator motor fuses being blown was most likely a result of the method by which the racking-up was conducted. Procedures direct that the breaker be raised "carefully" and that the individual conducting the evolution "observe that the shutter slides open and breaker studs are centered with respect to opening in stationary disconnect devices". To ensure compliance with these requirements, the operator stopped the elevator motor travel at two different times to visually verify shutters opening and centered alignment of the auxiliary switch block. Starting the elevator travel and subsequent restart of lifting the breaker led to a high current through the elevator motor circuitry, eventually leading to fuse interruption protection. The breaker appeared to be adequately racked up when the charging spring motor energized to charge the springs. Therefore, the root cause is attributed to a procedural deficiency in that precautions concerning 4160 volt circuit breaker racking-up evolutions were not sufficiently detailed.

After the plant was stabilized following the runback, Operations personnel determined that there were two operable sources of offsite power and that all ES switchgear, load centers and motor control centers were operable. They did not recognize a need to refer to Technical Specifications to determine if the plant conditions placed them in an action requirement. Failure to identify that the plant was in the action requirement is attributed to cognitive human error.

D. Corrective Actions

After replacing the elevator motor fuses, the A-212 breaker was racked down and inspected for any signs of electrical or mechanical damage. No problems were found. Following troubleshooting of the A-212 control room hand switch, the breaker was racked up without any unusual indications.

The Operations Manager issued a Night Order emphasizing the importance of referring to Technical Specifications any time there is a possibility of applicability.

A search of the Condition Reporting and Job Order systems was conducted to determine similarities with previous breaker failure events. No similar occurrences were found.

The procedure used for racking up 4160 volt circuit breakers will be revised to provide actions and/or precautions to minimize the potential for similar future occurrences. Following the procedure revision, training for Operations personnel will be conducted on proper methods of racking up circuit breakers. Training will be completed by June 1, 1993.

A procedure revision has been made to add a caution alerting Operations personnel that potential high current conditions can exist during bus transfer evolutions and to add a requirement to trip a transformer supply breaker if it fails to open automatically.

The Operations Manager will review this event with the Operations staff during requalification training. Failure to recognize entry into the Technical Specification action requirement will be emphasized. This training will be completed by June 1, 1993.

Because of a potential contribution to causing elevator motor fuses to have blown, the A-212 elevator mechanism will be lubricated and alignment inspected during the next outage of sufficient duration. This is anticipated to be completed during the refueling outage which is scheduled to begin in September 1993.

The applicability of this event to Unit 2 is being evaluated and appropriate actions will be issued prior to April 6, 1993.

E. Safety Significance

Red train electrical buses remained energized throughout the event. Both sources of off-site power remained operable. The green train ES buses were without power only for approximately 11 seconds. The EDG started and provided power for ES loads as designed. The power reduction that occurred due to a condensate pump being de-energized and a reduction in main condenser vacuum had no significant impact on plant safety. This event is judged to have little actual safety significance.

F. Basis for Reportability

The automatic starting of the Emergency Diesel Generator constituted an actuation of an Engineered Safety Feature reportable pursuant to 10CFR50.73(a)(2)(iv).

This event was reported in accordance with 10CFR50.72(b)(2)(ii) at 1712 hours on March 9, 1993.

G. Additional Information

There have been no similar events reported as Licensee Event Reports by ANO.

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

Circuit breaker A-212 is a General Electric (G080) model type AM-4.16-350-2H.