

LICENSEE EVENT REPORT (LER)

FACILITY NAME Zion Nuclear Power Station Unit 1												DOCKET NUMBER 0 5 0 0 0 2 9 5 1				PAGE 1 OF 0 4				
TITLE System Auxiliary Transformer Trip Caused By Spurious Operation of the Sudden Pressure Relay with Minimal Impact to the Plant																				
EVENT DATE			LER NUMBER				REPORT DATE			OTHER FACILITIES INVOLVED										
MONTH	DAY	YEAR	YEAR	SEQ.	REV.	MONTH	DAY	YEAR	FACILITY NAMES ZION UNIT 2				DOCKET NUMBER(S) 0 5 0 0 0 3 0 4							
0	3	1	1	9	7	9	7	-	0	0	7	-	0	0	0	4	1	0	9	7
OPERATING MODE 5			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (CHECK ONE OR MORE OF THE FOLLOWING)																	
POWER LEVEL 0 0 0			20.402(b)				20.405(e)				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 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)				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																				
NAME N. M. Brennan, Regulatory Assurance Ext. 2380												TELEPHONE NUMBER 8 4 7 7 4 6 - 2 0 8 4								
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT																				
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS											
A	E A	6 3	G 0 8 0	N																
SUPPLEMENTAL REPORT EXPECTED										EXPECTED SUBMISSION DATE		MONTH	DAY	YEAR						
<input type="checkbox"/> YES. (If yes, complete EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO																				

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

At 1554 on March 11, 1997, during rounds, an operator opened the local System Auxiliary Transformer (SAT) panel. While leaning against the open panel to tap the oil temperature gauge mounted above the panel, he heard a click. The SAT deluge activated to spray water on the SAT, the SAT tripped, and Unit 1 experienced an undervoltage condition on the safeguard buses. The loads on the safeguard buses were stripped, the Emergency Diesel Generators (EDG) started, and essential loads were sequenced onto the safeguard buses. This event is reportable per 10CFR 50.73(a)(2)(iv). The sudden pressure lockout relay and associated auxiliary relay were found tripped which indicated the SAT sudden pressure relay (SPR) circuitry had energized. Testing confirmed that the SAT had not experienced a sudden pressure event and the sudden pressure circuit was operating properly. Operator error was ruled out. The EDG safe shutdown timer was found not to have fully reset automatically and was reset manually. The safety significance of these events were minimal as safety related equipment actuated as designed and the timer reset failure does not affect EDG operation.

The cause of the SAT trip could not be conclusively determined. The most probable cause is spurious operation of the SAT SPR. Spurious operation of SPRs has been experienced both within ComEd and the utility industry. Corrective actions taken: 1) the SAT was tested for damage, and none was found. 2) the SPR was replaced with a newer, more reliable model and tested satisfactorily after installation. 3) the faulty sudden pressure relay was sent to a lab for analysis. 4) the Unit 2 SAT SPRs will be replaced. 5) Operator actions near electrical panels were addressed, and 6) repairs to the safe shutdown timer are scheduled.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE	
ZION NUCLEAR POWER STATION		YEAR	SEQ.	REV.		
	0 5 0 0 0 2 9 5	9 7 -	0 0 7 -	0 0	0 2	OF 0 4

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

A. PLANT CONDITIONS PRIOR TO EVENT

Unit 1 MODE 5 - Maintenance Outage Rx Power 0% RCS [AB]Temp./Pressure Ambient/Atmos
 Unit 2 MODE 5 - Refueling Rx Power 0% RCS [AB]Temp./Pressure Ambient/Atmos

B. DESCRIPTION OF EVENT

At 1554 on March 11, 1997 an equipment operator was making his rounds. The operator opened the local SAT panel door to observe the status of various equipment in the panel. In addition the operator leaned against the open panel in an attempt to tap the oil temperature gauge mounted above the panel. As he tapped or was about to tap the gauge (operator doesn't remember), he heard a click and the SAT deluge activated, water sprayed on the transformer, and the SAT tripped. The Unit 1 safeguard buses experienced an undervoltage condition, the emergency diesel started, and the blackout timers sequenced the essential Unit 1 essential blackout equipment onto their respective buses. After the SAT was secured, a walkthrough of the operator's actions was performed. It was observed that the sudden pressure lockout relay (86) and associated auxiliary relay (63FPX) were tripped. A review of drawing 22E-1-4814B indicated that the SAT sudden pressure relay circuitry had energized.

Based on this observation it was assumed the SAT had experienced a sudden pressure event. Transformer oil samples were taken, but the analysis did not show an indication of an internal problem in the SAT which would have resulted in a pressure spike. Operational Analysis Department performed various electrical tests on the SAT and found no indication of damage to the transformer.

At Zion, the SAT sudden pressure circuit contains a fault pressure relay (63FP), an auxiliary relay (63FPX), and a lockout relay (86). Both the 63FPX and the 86 relays are located in a control panel mounted on the north side of the SAT. Both relays have indicator flags which will indicate when they are tripped. The 63FP relay is mounted about 4 feet off the ground on the transformer tank and approximately 8 feet from the control panel. This equipment is not safety related and is installed to minimize damage to the SAT in the event of sudden pressure increase resulting from an internal fault. The relay will not actuate by gradual pressure variations due to transformer temperature changes, by normal pump surges, vibrations or mechanical shock. The 63FP relay consists of a sealed housing divided into upper and lower chambers. The upper chamber contains a piston, a cylinder block, and a self resetting snap-action switch. The lower chamber contains the spring reinforced bellows which is filled with a special silicone oil with definite physical properties. The upper chamber contains a volume of reserve oil. The piston contains an equalizing hole to allow for slow pressure changes due to temperature changes and pump starts. The snap-action switch is a single-pole double throw switch with normally open (NO) and normally closed (NC) contacts.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE	
ZION NUCLEAR POWER STATION		YEAR	SEQ.	REV.		
	0 5 0 0 0 2 9 5	9 7	- 0 0 7	- 0 0	0 3	OF 0 4

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

B. DESCRIPTION OF EVENT (Continued)

The NC contact of the 63FP relay is wired across the coil of the 63FPX relay to suppress misoperation due to a voltage surge in the control or relay wiring. A review of the circuit showed a DC ground will not cause enough current flow in the 63FPX circuit to cause the relay to operate. Station logs indicated there was not a DC ground prior to this event. The NO contact of the 63FP relay is wired in series with the 63FPX coil. When the 63FP relay operates, the NC 63FP contact opens and the NO contact closes to energize the 63FPX relay. The 63FPX relay then operates the 86 relay which trips the SAT, actuates the transformer deluge, and gives an alarm in the control room.

The sudden pressure circuit was tested and the circuit was found to be operating properly. The circuit was reset, the panel with the 63FPX and 86 relays was vigorously shaken, and the temperature gauge was tapped to duplicate an operator action which could have caused this event. Because these actions did not result in actuation of these relays, operator action and inadvertent operation of the 63FPX were eliminated as the causes of the event.

The SPk was replaced with a newer, more reliable model, and the circuit tested satisfactorily. The SAT was returned to service on March 14, 1997 at 0735. The Main and Unit Auxiliary Transformer SPRs are a different type and supplied by a different manufacturer.

As a result of the SAT trip the Unit 1, Division 17-2 Safe Shutdown Timer was activated. A subsequent walkdown of this timer revealed it did not fully reset automatically. This problem did not impede the operation of the safety related equipment associated with the SAT trip. The problem may have caused non-sequential loading of the Emergency Diesel Generator in a subsequent event. This malfunction has been addressed in a previous evaluation and corrective actions are in place.

C. CAUSE OF EVENT

The cause of the event could not be conclusively determined.

The most probable cause is a spurious operation of the SAT sudden pressure relay. This conclusion is based on the elimination of other possible causes and reports of spurious operation of these relays in the past.

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FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE	
ZION NUCLEAR POWER STATION		YEAR	SEQ.	REV.		
	0 5 0 0 0 2 9 5	9 7	-	0 0 7	-	0 0
						0 4 OF 0 4

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D. SAFETY ANALYSIS

This event is reportable pursuant to 10CFR50.73(a)(2)(iv), which states that the licensees shall report: "...any event or condition that results in manual or automatic actuation of any Engineered Safety System (ESF)." The event of the Unit 1 System Auxiliary Transformer (SAT) #142 tripping off in Mode 5 produced a Loss of Offsite power to Unit 1. The SAT trip caused an undervoltage condition on Unit 1 which stripped the safeguard buses, started the Emergency Diesels, and caused the blackout timers to sequence the essential blackout equipment onto their respective buses. The safety significance of the event was minimal since all three Unit 1 diesels started and sequenced on blackout loads. The reserve feed from Unit 2 SAT #242 and the respective switchgear were available to supply power to Unit 1 safeguard buses if needed. The failure of the safe shutdown timer to reset automatically did not impede the operation of safety related equipment associated with the SAT trip.

E. CORRECTIVE ACTIONS

1. The SAT was tested for damage and none was found.
2. The sudden pressure relay was replaced with a new more reliable model which is less prone to spurious operation. The circuit tested satisfactorily after installation.
3. The existing sudden pressure relay was sent to a lab for analysis to determine the cause of the failure.
4. The Unit 2 SAT sudden pressure relays will be replaced prior to going to mode 4.
5. As an additional management action, the Unit 1 Operations Manager issued a memo regarding work practice improvements which has been discussed at all shift briefs. The memo addressed operator conduct when working in or around electrical panels and stopping the practice of tapping on gauges.
6. The Division 17-2 Safe Shutdown timer automatic reset function will be repaired.

F. PREVIOUS EVENTS SEARCH AND ANALYSIS

Similar events have been reported involving the inadvertent operation of sudden pressure relays both within ComEd and in the industry. This information is based on discussions with transformer experts (associated with the transformer manufacturers and the relay manufacturer) and Electric Power Research Institute (EPRI). However, the failed relays were not documented or analyzed to determine the cause of the inadvertent operation.

G. COMPONENT FAILURE DATA

General Electric Type J Fault Pressure Relay