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)
Catawba Nuclear Station, Unit 1	0 5 0 0 0 4 1 3	1 OF 0 5

TITLE (4) Diesel Generator Auto Start Adn Subsequent Failure Of An Emergency Load Group To Energize Due to Equipment Malfunctions

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR
1 1	1 7	8 7	8 7	0 4 2	0 0	1 2	1 7	8 7

OTHER FACILITIES INVOLVED (8)	
FACILITY NAMES	DOCKET NUMBER(S)
N/A	0 5 0 0 0
	0 5 0 0 0

OPERATING MODE (9)	5
POWER LEVEL (10)	0 1 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

	20.402(b)		20.405(c)	X	50.73(a)(2)(iv)
	20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)
	20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)
	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)

	73.71(b)
	73.71(c)
X	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
	50.72(b)(2)(ii)

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER AREA CODE
Julio G. Torre, Associate Engineer - Licensing	7 0 4 3 7 3 - 1 8 0 2 9

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	
O	E K	T M R	C 7 1 0	See Below							
O	E A	R L Y	W 1 2 0	N							

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)

On November 17, 1987, Duke Power personnel were testing a 50F cooling fan control relay in 6.9KV Breaker LTD-5 when the breaker tripped and locked out at 1102 hours due to an out of adjustment wiper that shorts two terminals in the relay being strained due to the testing. The malfunctioning relay caused a phase to phase current invalance and activated a ground fault relay which tripped 1TD-5. As a result power to 4.16 KV Essential Bus 1ETB was lost and caused a Diesel Generator 1B auto start. Essential 600V Load Centers 1ELVB and 1ELXD did not energize as required because an 8.5 second undervoltage timer had drifted to 9.7 seconds at a previous time. Therefore since the 1 second load shed trip signal which follows the timing out of the 8.5 seconds test timer was still available on the incoming breakers of Load Group 1 when the D/G sequencer tried to close following the expiration of its 10 second timer (which runs simultaneously to the 8.5 second undervoltage timer) 1ELXB and 1ELXD failed to energize. The operator at the controls manually energized 1ELXB and 1ELXD approximately 20 minutes after initiation of the event. The wiper on the 50F relay was readjusted and satisfactorily tested. Appropriate Duke Power personnel have been trained to disable ground fault relays prior to testing phase relays. The defective timer was replaced following the event. The 6.9 KV phase relay is not tested at power. Therefore, testing activities could not have initiated this event during power operation. The faulty 8.5 second undervoltage timer was replaced and NPRDS reportability of this application is being evaluated. Offsite power was available for the duration of the event. The health and safety of the public were unaffected by this incident.

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

BACKGROUND:

The 6.9KV Normal Auxiliary Power System (EIIS:EA) (EPB) associated with Unit 1 consists of four independent 6.9KV switchgear (EIIS:SWGR) assemblies, 1TA, 1TB, 1TC, and 1TD. Each incoming 6.9KV breaker (EIIS:BRK) is rated for 2500 amperes continuous current. However, the breakers can carry up to 3000 amperes when forced cooled by fans located in the incoming breaker compartments.

Each 6.9KV switchgear normally receives power from the four half size auxiliary transformers (EIIS:XFMR) on each Unit (1T1A, 1T2A, 1T1B, 1T2B). The bus tie breaker in the switchgear is normally open so that each end of the 6.9KV switchgear is fed from a separate source.

Under normal conditions, one of the low voltage windings on each half-size auxiliary transformers feeds approximately one-half the 6.9KV switchgear assembly. However, each transformer is sized to carry the loads of one entire switchgear in the event that one of the normal sources is out of service.

Each incoming breaker is provided with lockout relays (EIIS:RLY) designed to operate when any one of the following associated relays operates: 1) time delay overcurrent relay 51; 2) time delay around overcurrent relay 51G; 3) breaker time failure time delay relay 62RS; and 4) feeder breaker auxiliary timer relays 62BA and 62BB. Operation of either one of the lockout relays will also trip and lockout the tie breaker. The lockout relays must be manually reset before the breakers can be reclosed.

Breaker 1TD-5 is the incoming breaker to power 1/2 of the 1TD 6.9KV switchgear. The 1TD switchgear is separated into two halves powered by 1TD-5 and 1TD-9 and is connected by a normally open tie breaker.

In the event one halve trips, the tie breaker energizes to provide power to the isolated halve.

The Diesel Sequencing System (EQR) is normally maintained in standby condition on the 4.16KV Essential Switchgear and can be actuated by either a Loss of Coolant Accident (LOCA) signal from the Solid State Protection System (EIIS:JC) (SSPS) or a 2 out of 3 phase under voltage signal sensed on the 4.16KV Essential Busses 1ETA and 1ETB.

When the sequencer is activated by a two-out-of-three 3-phase undervoltage condition on the 4.16KV Essential Bus, the Diesel Generator (EIIS:DG) (D/G) is immediately stated. An undervoltage test timer (EIIS:TMR) provides for an 8.5 second testing period to verify whether the undervoltage condition is the result of a sustained loss of voltage or of a short term voltage dip. If the voltage parameters have returned to normal at the end of the test period the sequencer returns to its stand-by condition. If the loss of voltage is sustained, the 4.16KV incoming breaker is tripped at 8.5 seconds, the 4.16KV Essential and Blackout Busses are load shed and the D/G breaker closes when the D/G reaches 95% rated speed and the busses have beer load shed for one second (the trip signal during load shed is maintained for 1 second and then removed to allow the

breakers to close). A 10 second timer (which is started at the same time that the 8.5 second test timer) ensures that the D/G has reached 95% rated speed and that appropriate busses are load shed for 1 second before load sequencing is initiated. At the expiration of the 10 second timer, the D/G Load Sequencer is enabled and blackout required loads are automatically placed in service in a predetermined logical sequence.

On the essential 600V load center level, all load center incoming breakers are also load shed and reclosed by the sequencer at the correct point in the loading sequence.

Blackout System 600V load centers individual load breakers are load shed during loss of system voltage and later reclosed during loading sequence.

DESCRIPTION OF INCIDENT:

On November 17, 1987, with the Unit 1 in Mode 5, Cold Shutdown, Duke Power Transmission Department personnel were testing a Westinghouse 50F cooling fan (EIIS:FAN) control relay in 6.9 KV Breaker 1TD-5 on the 1TD Switchgear when the breaker tripped and locked out at 1102:30 hours. Because of the 1TD-5 breaker lockout, the tie breaker between the two halves of 1TD did not close to provide power to the isolated halve. Thus, the trip of 1TD-5 resulted in an immediate loss of power to 4.16KV Essential Bus 1ETB which subsequently caused the bus to isolate and D/G 1B to automatically start and the 8.5 second undervoltage test timer and the 10 second timer to start (due to the ETB low voltage condition). At this point blackout logic was initiated and diesel restart was enabled.

During the subsequent investigation of the event, Duke Power Personnel determined that the 8.5 second timer had drifted to approximately 9.7 seconds previously to the start of the incident. At the expiration of the 10 second timer, the D/G Load Sequencer was enabled to pick up the appropriate vital loads. Blackout logic was initiated at this point. Therefore, since the load shed trip signal which follows the timing out of the 8.5 seconds test timer was still available on incoming breakers of Load Group 1 when the D/G Load Sequencer tried to close following the expiration of the 10 second timer, Essential 600V Load centers 1ELXB and 1ELXD did not energize as required.

Subsequently, the 1 second trip load shed signal was completed as expected and the trip signal of 1ELXB and 1ELXD cleared at 1102:41 hours. Upon recognizing that 1ELXB and 1ELXD had failed to energize, the operator at the controls (OATC) entered AP/1/A/5500/07, Loss of Normal Power (Case I) procedure, and at 1107 hours reset the sequencer and restored power to 1ELXB and 1ELXD.

Duke Power Transmission Department personnel immediately readjusted the wiper on the States Block switch assembly in the faulty 50F type SC relay. Normal power to plant equipment was restored at approximately 1120 hours. 6.9KV Breaker 1TD-5 was manually closed by Duke Power Operations personnel at 1156 hours.

CONCLUSION:

This event has been attributed to a malfunction of the States Block Switch assembly (Westinghouse Type MT5, Model 210B) in the 50F fan control relay of Breaker 1TD-5. Duke Power personnel determined that when the relay was tested on November 17, 1987, the shorting contacts between terminals 8 and 9 of the States Block Switch assembly were opening intermittently as the test block was inserted into the switch assembly. This condition resulted in a phase to phase current invalance, and it activated the breaker's ground fault relay which tripped the breaker. Duke Power personnel investigating the cause of the trip of 1TD-5 discovered that the wiper States Block switch assembly of the 50F SC relay was out of adjustment and did not cause enough tension on the contacts to maintain them closed due to the strain produced by the insertion of the test block. The wiper was readjusted and tested prior t restoring normal power to affected plant equipment at approximately 1120 hours and closing breaker 1TD-5 at approximately 1156 hours.

During this event, Essential 600V Load Centers 1ELXB and 1ELXD did not energize as required when Load Group 1 energized. Duke Power personnel determined that the drift in the undervoltage test timer from its 8.5 second setting to approximately 9.7 seconds prevented 1ELXB and 1ELXD from energizing. Due to the drift to 9.7 seconds a load shed trip signal was available at the incoming breakers to 1ELXB and 1ELXD when the signal to close them actuated. This configuration prevented the breakers from closing as required. The timer was recalibrated on November 17, 1987 after the event. Subsequently, a decision was made to replace the undervoltage timer relay in order to ensure reliability since the cause of its drifting was not apparent. This relay had been last checked on October 23, 1987 and was found to be in a satisfactory condition.

This test timer relay is a Cutler-Hammer Model D87XEL30. A search of NPRDS revealed no reported failures for this timer relay model. Reportability of this application to NPRDS is being evaluated by Duke Power personnel.

There has been one previous similar occurrence involving a D/G auto start due to an equipment malfunction (see LER 413/85-27). This previous event was attributed to a design deficiency and corrective actions taken as a result could not have prevented this incident. However, due to similarities between both incidents, this is considered to be a recurring event.

CORRECTIVE ACTION:

SUBSEQUENT

(1) The Operator At The Controls (OATC) entered AP/1/A/5500/07, Loss of Normal Power (Case I) procedure.

(2) Transmission Department Personnel repaired the faulty switch in the 50F type SC relay.

(3) Work Request 5969 PRF was issued and completed to calibrate the

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undervoltage timer.

(4) Work Request 8632 IAE was issued and completed to replace the undervoltage timer.

(5) The Transmission Department has instructed all appropriate technicians to disable ground fault relays prior to testing phase relays.

PLANNED

Duke Power Design Engineering/Electrical personnel will evaluate the feasibility of adding logic to prevent the D/G load sequencer from energizing Load Group 1 prior to the load shed of essential busses.

SAFETY ANALYSIS:

At the time of this incident, Unit 1 was in Mode 5, Cold Shutdown, and D/G 1A was inoperable. Following initiation of the blackout condition on 1ETB switchgear, D/G 1B autostarted and 1ETB load shed following time-out of the 1ETB under voltage test timer. Following the time-out of the 10 second timer, ensuring D/G 1B had reached 95% rated speed, Load Group 1 energized with the exception of 1ELXB and 1ELXD. All other required load groups energized as expected.

Due to the nature of the loads, the failure of 1ELXB and 1ELXD to energize did not adversely affect unit operation while in Mode 5. Additionally, such failure would have not affected Unit operation at any power level with available offsite power.

Abnormal Procedure AP/1/A/5500/07, Loss of On Site Power, Case I, was entered when it was recognized that all essential loads had not properly actuated. Power was restored to 1ELXB and 1ELXD in approximately 20 minutes from the start of the event. Off Site power was available to both Units 1 and 2 for the duration of this event.

The Transmission Department does not test this 6.9KV phase relay at power. Therefore, testing activities could not have initiated this event during power operation.

This event is reportable pursuant to 10 CFR 50.52 Section (b)(2)(ii) and 10 CFR 50.73 Section (A)(2)(iv).

The health and safety of the public were unaffected by this incident.

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VICE PRESIDENT
NUCLEAR PRODUCTION

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December 17, 1987

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

Subject: Catawba Nuclear Station, Unit 1
Docket No. 50-413
LER 413/87-42

Gentlemen:

Pursuant to 10 CFR 50.73 Section (a) (1) and (d), attached is Licensee Event Report 413/87-42 concerning a Diesel Generator Auto Start and subsequent failure of an emergency load group to energize due to equipment malfunctions. This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Hal B. Tucker

JGT/1140/sbn

Attachment

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