CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9605310228 DOC.DATE: 96/05/28 NOTARIZED: NO DOCKET #
FACIL:50-400 Shearon Harris Nuclear Power Plant, Unit 1, Carolina 05000400
AUTH.NAME AUTHOR AFFILIATION
CHAPLIN,S. Carolina Power & Light Co.
DONAHUE,J.W. Carolina Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 96-008-00:on 960425,turbine/trip reactor trip occurred due to main generator lockout.Caused by failure of output breaker disconnect.Failed A phase disconnect switch on Breaker 52-7 replaced.W/960528 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 7
TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:Application for permit renewal filed. 05000400

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	PD2-1 PD	1	1	LE,N	1	1
INTERNAL:	ACRS	1	1	AEOD/SPD/RAB	2	2
	AEOD/SPD/RRAB	1	1	FILE CENTER	1	1
	NRR/DE/ECGB	1	1	NRR/DE/EELB	1	1
	NRR/DE/EMEB	1	1	NRR/DRCH/HHFB	1	1
	NRR/DRCH/HICB	1	1	NRR/DRCH/HOLB	1	1
	NRR/DRCH/HQMB	1	1	NRR/DRPM/PECB	1	1
	NRR/DSSA/SPLB	1	1	NRR/DSSA/SRXB	1	1
	RES/DSIR/EIB	1	1	RGN2 FILE 01	1	1
EXTERNAL:	L ST LOBBY WARD	1	1	LITCO BRYCE,J.H	2	2
	NOAC MURPHY,G.A	1	1	NOAC POORE,W.	1	1
	NRC PDR	1	1	NUDOCS FULL TXT	1	1

NOTE TO ALL "RIDS" RECIPIENTS:
PLEASE HELP US TO REDUCE WASTE! CONTACT THE DOCUMENT CONTROL DESK, ROOM OWFN 5D-5(EXT. 415-2083) TO ELIMINATE YOUR NAME FROM DISTRIBUTION LISTS FOR DOCUMENTS YOU DON'T NEED!

FULL TEXT CONVERSION REQUIRED
TOTAL NUMBER OF COPIES REQUIRED: LTTR 26 ENCL 26

CATEGORY 1 DOCUMENT

A04

CP&L

Carolina Power & Light Company
Harris Nuclear Plant
PO Box 165
New Hill NC 27562

MAY 28 1996

U.S. Nuclear Regulatory Commission
ATTN: NRC Document Control Desk
Washington, DC 20555

Serial: HNP-96-090
10CFR50.73

SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1
DOCKET NO. 50-400
LICENSE NO. NPF-63
LICENSEE EVENT REPORT 96-008-00

Gentlemen:

In accordance with Title 10 to the Code of Federal Regulations, the enclosed Licensee Event Report is submitted. This report relates to the reactor trip due to failure of an output breaker disconnect.

Sincerely,

J. W. Donahue
General Manager
Harris Plant

SDC

Enclosure

c: Mr. J. B. Brady (NRC - HNP)
Mr. S. D. Ebneter (NRC - RII)
Mr. N. B. Le (NRC - PM/NRR)

IE22

NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), 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.

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Harris Nuclear Plant - Unit 1	50-400	1 OF 6

TITLE (4)

Reactor Trip due to Failure of an output breaker disconnect device.

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 NAME	DOCKET NUMBER
04	25	96	96	-- 008 --	00	05	28	96		05000
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	1
POWER LEVEL (10)	100%

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

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)	X	50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Steven Chaplin, Senior Engineer - Licensing/Regulatory Programs	(919) 362-2113

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
E	EL	Disc	M230	Y						
X	KE	RLY	W120	Y						

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X	YES (If yes, complete EXPECTED SUBMISSION DATE).	NO		8	15	96

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

On April 25, 1996 at approximately 2107 with the unit operating in Mode 1 at 100% power, a turbine trip/reactor trip occurred due to a main generator lockout. The generator lockout was caused by the failure of a manual disconnect for one of two unit output breakers. At the time of the failure, the full generator output was being routed through the breaker whose disconnect failed. It is believed that a false under-voltage signal occured during the fast transfer of feed to the 1E bus (B train bus) to the Startup Auxiliary Transformer. The under-voltage signal resulted in the loss of power to several electrical busses. Secondary system equipment was secured due to the loss of Normal Service Water. The "A" Emergency Service Water pump started and supplied its header. The "B" bus under-voltage signal caused the Loss of Offsite Power sequencer program to start. Appropriate "B" train safety equipment started as required. The "A" train successfully completed a fast transfer to the Startup Auxiliary Transformer. However, the "A" Emergency Diesel Generator was found to be in the "Operational" mode but the "Maintenance" mode status lights were on, indicating a circuitry problem. Isolation signals were received for the Containment and Control Room Isolation Systems due to radiation monitor power loss. At approximately 2152, it was noted that the Charging/Safety Injection Pump suction had transferred from the Volume Control Tank (VCT) to the Refueling Water Storage Tank. The swapover occurred due to the loss of electrical power to the boric acid flow transmitter. Operators stabilized the unit in Mode 3. The disconnect failure was preliminarily attributed to inadequate maintenance. The investigation is continuing. The "A" and "B" phase disconnects for the affected breaker were replaced and the other switchyard disconnect switches were inspected for proper seating. After returning the unit to service, thermography monitoring of the unit output breaker disconnects showed elevated temperatures. The unit was taken offline and the disconnect contacts on the generator bus sides of the unit output breakers were refurbished. The unit returned to service and subsequent thermography readings indicated expected operating temperatures for the disconnects.

EVENT DESCRIPTION:

There are two 100% capacity unit output breakers, designated 52-7 and 52-9, which connect the main generator to the main switchyard south and north 230 KV buses, respectively. The breakers have manual disconnects on both the generator and 230 KV bus sides. Each disconnect has three poles designated A phase, B phase and C phase. On April 25, 1996, at approximately 2045, Breaker 52-9 was taken out of service for maintenance, resulting in the full generator output being routed through Breaker 52-7. At approximately 2107 on April 25, 1996, with the unit operating in Mode 1 at 100% power, the A phase disconnect pole on the generator side of unit output Breaker 52-7 failed [EIIS Code:EL-DISC]. This failure resulted in a short to ground which caused a generator lockout, a turbine trip and a reactor trip.

The resulting electrical perturbation caused several busses to lose power which caused the B Normal Service Water Pump to trip. (NSW, EIIS Code: KG-P). Operating personnel secured the running secondary plant equipment, including both main feedwater pumps, and broke condenser vacuum. Operators stabilized the unit in Mode 3.

Five Engineered Safety Features Actuation System (ESFAS) signals were generated during the event: the reactor trip, the start of the B Emergency Diesel generator (EDG), the start of the AFW pumps on low low steam generator level, the containment ventilation isolation signal and the control room isolation signal.

The following describes specific equipment performance noted following the unit trip:

- An electrical perturbation initiated a load shed on non-safety AC bus 1E resulting in a loss of power to busses 1E-1, 1E-2, 1E-3, half of the General Services bus (bus 1-4A, Section 2), and the B safety bus. The most likely cause for the loss of the 6.9 KV non-safety bus 1E is a momentary contact closure of an under-voltage sensing relay during the fast transfer from the Unit Auxiliary Transformer to the Start up Auxiliary Transformer. The momentary contact closure provided a false under-voltage signal. The momentary contact closure appears to have been induced by physical agitation of the relay during operation of two 6.9 KV breakers during the fast transfer. Since an actual under-voltage condition did not exist, the Under-voltage Lockout Relay 86UV/E electrically reset (EIIS Code: EA-RLY27). Investigation and confirmatory testing of this scenario is still in progress.

- The loss of power to B safety bus deenergized several radiation monitors causing actuations, including both a Containment Ventilation and Control Room Isolation Signals.

- The Digital Rod Position Indicator system lost power due to deenergization of the bus 1E-2. Power to this system was restored at approximately 2209 and full insertion of the control rods was verified.

- As described above, the electrical perturbation isolated the feed for the B safety bus and automatically started the B EDG (EIIS Code: EK-DG). Appropriate B train safety equipment started as required via the emergency sequencer.

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Harris Nuclear Plant - Unit 1	50-400	96	-- 008	-- 00	3 OF 6

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

- The standby A NSW pump did not start automatically when the B NSW pump tripped. The failure of the A NSW to start appears to be the result of the short time period the under-voltage signal was present. The under-voltage signal is estimated to have been present for approximately 50 milliseconds, i.e., a duration equivalent to the reset time of the Under-voltage Lockout Relay 86UV/E. The automatic start circuitry for the A NSW pump has two relays in series, each with a pick-up time of approximately 50 milliseconds. Therefore, the under-voltage signal duration would have had to been present for at least 100 milliseconds to automatically start the A NSW pump.

- The A EDG did not receive an emergency start signal during the event due to the successful transfer to the Start up Auxiliary Transformer. However, the operability of the A EDG was initially questioned due to conflicting status indications and was reported as such in the 4-Hour NRC Event Notification pursuant to 10 CFR 50.72(b)(2). Soon after the unit trip, an operator observed that the "Maintenance" mode status lights were illuminated for the A EDG even though the "Operational" mode was selected. Control room indications showed that the A EDG had received a stop signal. A possible cause of the conflicting status light display was a trip of the 86DG lockout relay (EIIS Code: EK-RLY86) from a transient or induced voltage in the control circuitry of the Generator Control Panel. If an emergency start signal had been present during or after the transient, the 86DG lockout relay would have reset and the A EDG would have started. Additional testing of the 86DG lockout relay in the A EDG control circuitry is planned in an attempt to duplicate the 86DG lockout relay trip.

- While the operators were stabilizing the unit after the reactor trip and taking actions associated with the loss of the AC busses, full AFW flow to the steam generators resulted in Reactor Coolant System (RCS) temperature decreasing below the normal no-load temperature of 557 degrees F to approximately 537 degrees F. The RCS cooldown caused a decrease in the pressurizer level and a resulting increase in charging flow. The RCS letdown isolated at 17% pressurizer level. Automatic level control of the Volume Control Tank (VCT) did not function due to loss of power from bus 1E-2 to the boric acid flow transmitter. At approximately 2113, the VCT level decreased to 5% and the Charging/Safety Injection Pumps suction automatically transferred to the Refueling Water Storage Tank (RWST) as designed. The Reactor Operator did not detect the VCT low level alarm, nor the fact that the suction of the charging pumps automatically switched to the RWST, until a RWST Low Level Alarm was received at approximately 2152. (The lowest recorded RWST level was 94% which is greater than the Technical Specification required minimum of 92%). The AFW flow was reduced when directed by procedure, and the RCS temperature returned to its normal value of 557 degrees F at approximately 2131.

- At approximately 2245 hours, operators manually started the A NSW pump. The discharge valve did not open and the valve opening timer did not trip the pump. Operators manually tripped the pump from the 6.9 KV breaker. Subsequent investigation concluded that Control Relay CR1/2189 (EIIS Code: KE-RLY) in the pump's discharge valve circuitry did not pick up and latch-in. This control relay failure caused both the failure of the valve to open and the failure of the pump to trip. The mechanical latch on the control relay was adjusted and the pump was subsequently started successfully.

- At approximately 2255, operators manually started the B NSW pump. Indications in the Main Control Room showed the pump started and tripped approximately 30 seconds later. Subsequent investigations have not determined the cause of the failure. On subsequent attempts the pump started and the discharge valve opened as designed. It is suspected that the cause of the pump trip was an intermittent problem associated with Control Relay CR4/2190 (EIIS Code:KE-RLY) that did not recur during the trouble shooting. Control Relay CR4/2190 was subsequently replaced on May 23, 1996.

- During evaluation of Emergency Response Facility Information System (ERFIS) data from the reactor trip, it appeared that the pressurizer pressure master controller did not energize the backup heaters at the proper set point, and automatic energization of the B group of backup heaters was not blocked by the B sequencer operation. These items are still under investigation.

CAUSE:

The failure of the A phase disconnect for unit output Breaker 52-7 was due to a high resistance connection resulting from the A phase switch jaw and blade contacts not being fully closed (blade not rotated into the horizontal position). The reason for the switch not being fully closed is attributed to a misalignment in the mechanical linkage of the closing mechanism. High contact resistance, identified using thermography, was also noted on other breaker disconnects which did not fail. These conditions are preliminarily attributed to inadequate preventive maintenance. Investigation is continuing.

SAFETY SIGNIFICANCE:

There were no significant safety consequences as a result of this event. The reactor tripped and the control rods fully inserted. The event challenged the automatic swapover of the unit auxiliaries to the Startup Auxiliary Transformer and initiated an under-voltage startup of the B EDG. Safety systems responded as required to ensure unit safety and operators stabilized the unit in Mode 3.

This event is being reported per 10 CFR 50.73(a)(2)(iv).

PREVIOUS SIMILAR EVENTS:

There have been no reactor trips caused by a switchyard breaker disconnect.

CORRECTIVE ACTIONS COMPLETED:

The following actions were performed prior to returning the unit to service on April 28, 1996:

1. The failed A phase disconnect switch on Breaker 52-7 was replaced. Pitted contacts on the B phase blade and jaw were also replaced. The switch was adjusted and proper operation was verified.

2. The bus side disconnect switches on Breakers 52-7 and 52-9 were visually inspected with no problems identified. The unit side disconnect switch on the Breaker 52-9 was visually inspected and proper operation verified.

3. Transmission Department personnel provided initial training to some unit operations personnel on recognizing correct disconnect alignment.

4. The mechanical latch on the A NSW Pump discharge valve Control Relay CR1/2189 was adjusted.

5. Control Relay CR4/2190 for the B NSW Pump was replaced.

6. An assessment of control room operations staff performance was conducted. The review identified several areas where operator performance can be improved, including proactive control of key unit parameters such as AFW flow and recognition of some off-normal conditions.

7. The remainder of the disconnects in the switchyard were inspected to verify that blade contacts were properly seated. No other abnormally positioned disconnects were identified.

   Following restart of the unit, the temperature of disconnect switches on Breakers 52-7 and 52-9 remained high as determined using infrared thermography . On May 3, 1996, the unit was removed from service and the disconnect contacts on the both the generator and bus sides of Breakers 52-7 and 52-9 were replaced. Contact resistance measurements verified successful repair of the breaker disconnect switches. After unit restart, thermography monitoring indicated expected operating temperatures.

CORRECTIVE ACTIONS PLANNED:

1. Complete investigation of the pressurizer pressure control by June 25, 1996.

2. Investigation and confirmatory testing of the under-voltage relay momentary contact closure and associated false under-voltage signal will be completed by July 1, 1996.

3. Additional testing in an effort to duplicate the 86DG lockout relay trip in the A EDG control circuitry is planned. This testing will be completed by July 1, 1996.

4. The Superintendents-Shift Operations will brief appropriate operations personnel on the assessment of control room operation staff performance. This briefing will be completed by July 1, 1996.

5. The preventive maintenance requirements for switchyard maintenance and operator inspections will be revised by September 30, 1996, which is prior to the next refueling outage currently scheduled to commence in March 1997.

6. Training will be provided to the operators regarding proper operation of the breaker disconnects. This training will be completed by October 7, 1996.

7. Licensed operators will be briefed on the importance of throttling Auxiliary Feedwater flow in a more timely manner to maintain the RCS temperature closer to the normal operating bounds and thereby minimizing cooldown. These briefings will be completed by October 7, 1996.

8. This event will be covered in operator training to emphasize that several indicators, such as annunciators and VCT level, could have aided the operators in recognizing the realignment of the Charging/Safety Injection Pump suction. This training will be completed by October 7, 1996.

9. The plant system engineer will become more intrusive in coordinating switchyard activities including predictive and preventive maintenance. Switchyard maintenance has traditionally been scheduled and performed by Transmissions Department personnel. The scope of switchyard work during refueling outages will be established and integrated into the outage schedule by December 22, 1996.

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Harris Nuclear Plant - Unit 1	50-400	96	-- 008 --	00	6 OF 6

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

10. Mechanisms for identifying correct alignment of disconnect switches will be investigated. If identified, a suitable mechanism will be installed during Refueling Outage No. 7 currently scheduled to commence in March 1997.

EIIS CODES:

Main Generator Output Breaker Disconnect: EL-DISC

Normal Service Water Pump: KG-P

6.8 KV Bus Under-voltage Lockout Relay: EA-RLY27

Emergency Diesel Generator: EK-DG

Normal Service Water Pump Valve Control Relay: KE-RLY