CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9708220277 DOC.DATE: 97/08/18 NOTARIZED: NO DOCKET #
FACIL:50-250 Turkey Point Plant, Unit 3, Florida Power and Light C 05000250
AUTH.NAME AUTHOR AFFILIATION
MIHALAKEA,S. Florida Power & Light Co.
HOVEY,R.J. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 97-006-00:on 970722,manual reactor trip occurred due to failed rod control power supplies.Replaced twelve power supplies in rod control logic & power cabinets.W/970808 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 6
TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	PD2-3 PD	1	1	CROTEAU,R	1	1
INTERNAL:	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/DET/EIB	1	1
	RGN2 FILE 01	1	1			
EXTERNAL:	L ST LOBBY WARD	1	1	LITCO BRYCE,J H	1	1
	NOAC POORE,W.	1	1	NOAC QUEENER,DS	1	1
	NRC PDR	1	1	NUDOCS FULL TXT	1	1

NOTE TO ALL "RIDS" RECIPIENTS:
PLEASE HELP US TO REDUCE WASTE. TO HAVE YOUR NAME OR ORGANIZATION REMOVED FROM DISTRIBUTION LISTS OR REDUCE THE NUMBER OF COPIES RECEIVED BY YOU OR YOUR ORGANIZATION, CONTACT THE DOCUMENT CONTROL DESK (DCD) ON EXTENSION 415-2083

FULL TEXT CONVERSION REQUIRED
TOTAL NUMBER OF COPIES REQUIRED: LTTR 24 ENCL 24

FPL

AUG 18 1997

L-97-201
10 CFR 50.73

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

Re: Turkey Point Unit 3
Docket No. 50-250
Reportable Event: 97-006
Date of Event: July 22, 1997
Manual Reactor Trip due to Failed Rod Control Power Supplies

The attached Licensee Event Report is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Very truly yours,

R. J. Hovey
Vice President
Turkey Point Plant

SM

Attachment

cc: Regional Administrator, USNRC Region II
Senior Resident Inspector, USNRC, Turkey Point Plant

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
TURKEY POINT UNIT 3	05000250	1 OF 5

TITLE (4) MANUAL REACTOR TRIP DUE TO FAILED ROD CONTROL POWER SUPPLIES

EVENT DATE (5)			LER NUMBER(6)			RPT DATE (7)			OTHER FACILITIES INV. (8)	
MON	DAY	YR	YR	SEQ #	R#	MON	DAY	YR	FACILITY NAMES	DOCKET # (S)
7	22	97	97	06	00	8	18	97	TURKEY POINT UNIT 4	05000251

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

10 CFR 50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER (12)

S. MIHALAKEA, LICENSING ENGINEER	Telephone Number (305) 246-6454

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	NPRDS?	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	NPRDS?
B	AA	RJX	L045	N					N

SUPPLEMENTAL REPORT EXPECTED (14) NO ☒ YES ☐ (If yes, complete EXPECTED SUBMISSION DATE)	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

ABSTRACT (16)

On July 22, 1997, Florida Power & Light's (FPL) Turkey Point Unit 3 was operating in Mode 1 at 100% power. At 12:42:51 hours, 12 control rods dropped into the core and the Reactor Control Operator (RCO) manually tripped the reactor at 12:42:57 hours.

The 12 control rods dropped in the core due to a failure of the redundant pair of +24 Vdc rod control power supplies, PS1 and PS2, located in the 1AC power cabinet.

Following the reactor trip, all safety related equipment functioned properly with one exception. The Train 1 Auxiliary Feedwater (AFW) flow control valve to Steam Generator (SG) "C", FCV-3-2818, would not fully close due to failure of its corresponding controller, HIC-3-1458A. The RCOs took manual action to isolate Train 1 AFW to the "C" SG.

A post trip review established that the response of pertinent plant parameters was as expected.

A total of 12 power supplies were replaced in the rod control logic and power cabinets. The remaining Unit 4 power supplies manufactured by the same vendor will be replaced during the next refueling outage.

I. DESCRIPTION OF THE EVENT

On July 22, 1997, FPL's Turkey Point Unit 3 was operating in Mode 1 at 100% power. The NIS Rod Drop alarm came in at 12:42:51 hours. The RCOs noticed several rod bottom lights lit and system alarms flashing on the reactor annunciator panel "B". These rods were later identified to be the Group 1 Control Banks A and C, and Shutdown Bank A, powered by the 1AC power cabinet.

The board RCO and the shift supervisor noticed that there were more than 2 rods dropped in the core and concurred to manually trip the reactor. The RCO promptly tripped the reactor, 6 seconds after the Rod Drop alarm. The remaining rods inserted as expected when the reactor trip breakers opened.

Following the reactor trip, all safety related equipment functioned properly with the following exception:

The Train 1 AFW flow control valve to SG "C", FCV-3-2818, would not fully close due to failure of its corresponding controller, HIC-3-1458A. The Operators took manual action to isolate Train 1 AFW to the "C" SG.

The NRCOC was notified at 13:21 on July 22, 1997 in accordance with 10 CFR 50.72 (b)(2)(ii). This event is being reported in accordance with 10 CFR 50.73 (a)(2)(iv).

II. CAUSE OF THE EVENT

The immediate cause of the reactor trip was the manual action taken to trip the reactor following multiple rods falling into the core.

The underlying cause of the trip was loss of both + 24 Vdc power supplies to the 1AC rod control power cabinet [AA: RJX], resulting in the drop of all 12 rods whose control rod drive mechanisms are powered by the 1AC power cabinet.

The Rod Control System power cabinets contain redundant 24 Vdc power supplies that provide voltage to control cards which regulate the current to the gripper and lift coils of the rod drive mechanisms. In each power cabinet, power supplies PS1 and PS2, each +24 Vdc, are auctioneered to provide reliable +24 Vdc to the power cabinet controls. Additionally, power supplies PS3 and PS4 are auctioneered to provide -24 Vdc to the power cabinet controls. The Rod Drive Motor Generator (MG) set provides the main source of 120 volts AC control power for the

four power cabinets. Auxiliary 120 volts AC actual power comes from the Motor Control Center (MCC) 3B non vital bus. Power supplies PS1 and PS3 are fed from the (MG) set output and PS2 and PS4 are fed from the MCC 3B non vital bus.

Instrumentation and Control (I&C) Maintenance personnel performed an investigation to determine the root cause of the power supply failure. Both power supplies PS1 and PS2 output voltages were found to be 0.8 volts DC in the failed condition. Upon removal of the overvoltage protection device, the PS1 output was 37 volts and PS2 output was 40 volts (instead of the nominal +24 volts), indicating that both power supplies failed, producing a high voltage.

A component failure investigation was performed on each power supply circuit. I&C Maintenance found that the second stage of the circuit's error amplifier failed, causing a high output voltage condition which activated the overvoltage protection, consequently shorting the output of the power supply. Based on the results of the investigation, FPL has concluded that the error amplifier circuit failure in each power supply is the direct cause of both power supplies failing.

The failed power supplies were determined to be at least 16 years old. Power supply lifespan specifications are not provided by the manufacturer.

The system is designed such that upon failure of one power supply, the remaining fully redundant power supply will carry the required cabinet loading. The automatic response for the loss of any one of the four power supplies in a power cabinet is a Rod Control System Non-Urgent Failure annunciator in the control room, and a failure identification lamp on the cabinet so that the operator can tell which cabinet has the failure. A likely scenario is that the failure of the first power supply did not result in a Non-Urgent Failure alarm. Westinghouse personnel agree that one of the power supplies could fail in an undetected mode (above the low voltage alarm setpoint) allowing the second power supply to carry the load. The failure of the second power supply would then transfer the load to the first failed power supply resulting in a total loss of +24 Vdc without a Non-Urgent Failure alarm.

FPL addressed the undetected power supply failure problem in the past by conducting a load test of each individual power supply on a refueling basis. This activity is accomplished by I&C Maintenance procedure 0-PMI-028.5, "Rod Control System Preventive Maintenance." This procedure includes steps for calibrating the power supply and ensuring that the redundant power supply assumes the circuit load upon

failure of the first.

FPL has had in the past, failures of PS3 and PS4 (-24 Vdc power supplies), which are a different model power supply than PS1 and PS2 built by the same manufacturer. These failures were reported in LERs 251/94-004, and 250/95-004. An abnormally high rate of failure of the PS1 and PS2 (+24 Vdc power supplies) had not been seen in the past. The remaining Unit 3 original vendor power supplies in the power and logic cabinets were replaced as a result of this event. The remaining Unit 4 original vendor power supplies are scheduled to be replaced during the next refueling outage.

III. ANALYSIS OF THE EVENT

Multiple dropped rod events are expected to result in an automatic reactor trip due to low primary system pressure. However, a manual reactor trip was promptly performed in response to the indications of multiple dropped rods. Plant procedures provide operator guidance in responding to the transient conditions, and assure that the plant is stabilized in a safe condition.

The loss of redundant power supplies in the rod control system power cabinets was not originally considered by Westinghouse in the rod control system failure analysis and therefore was not specifically evaluated. At a later time, according to Nuclear Safety Advisory Letter, NSAL-96-002, dated April 10, 1996, Westinghouse determined that the loss of one or multiple power cabinets results in a symmetrical rod drop pattern which is bounded by the analysis performed for the design basis Rod Drop event. The Rod Drop design basis event for Turkey Point is based on the worst credible asymmetric dropped rod configurations in the core intended to maximize the peaking factors and potential for cladding damage. The failure of the 1AC power cabinet event, involved the drop of 12 symmetric rods from different rod banks with no reestablishment of the core nuclear power, and therefore it can be concluded that the design basis analysis in the Final Safety Analysis Report was not exceeded.

Following the reactor trip, all safety related systems functioned properly with the following exception:

The Operators manually isolated Train 1 AFW to "C" SG due to failure of FCV-3-2818 to fully close. The valve failed to fully close due to failure of the corresponding controller, HIC-3-1458A. The controller, HIC-3-1458A, was replaced. The system tested satisfactorily.

IV. CORRECTIVE ACTIONS

1. A total of 12 power supplies were replaced in the Unit 3 rod control power and logic cabinets.

2. Unit 4 power supplies will be replaced during the next Unit 4 refueling outage.

3. An evaluation will be performed to address the potential for age related issues concerning the rod control system.

4. A cause determination will be performed for the failure of HIC-3-1458A.

V. ADDITIONAL INFORMATION

Similar events: LER 251/94-004 reported a Unit 4 reactor trip due to failed Rod Control power supplies PS3 and PS4 in the 1AC power cabinet. Furthermore, LER 250/95-004 reported a Unit 3 reactor trip due to failed Rod Control power supplies PS3 and PS4 in the 2AC power cabinet.

The failed power supplies are Lambda model LM-E24. The replacement power supplies are Abbott Model M300/25-AEX-ER for the power cabinets, and Abott Models M300s/16.5-AEX-ER, LV16.5AEX1.1-1-2 for the logic cabinets.

EIIS Codes are shown in the format [EIIS SYSTEM: IEEE component function identifier, second component identifier (if appropriate)].