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AUTH.NAME AUTHOR AFFILIATION
HURCHALLA,J.A. Florida Power & Light Co.
SAGER,D.A. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 94-007-00:on 941026,automatic reactor trip on loss of electrical load due to flashover on 240 kV switchyard potential transformer.Unit stabilized in mode 3 & transformer replaced.W/941123 ltr.

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Florida Power & Light Company, P.O. Box 128, Fort Pierce, FL 34954-0128

November 23, 1994

L-94-298
10 CFR 50.73

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

Re: St. Lucie Unit 1
Docket No. 50-335
Reportable Event: 94-007
Date of Event: October 26, 1994
Automatic Reactor Trip on Loss of Electrical Load due to Flashover on 240 KV Switchyard Potential Transformer

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,

D. A. Sager
Vice President
St. Lucie Plant

DAS/msd

Attachment

cc: Stewart D. Ebneter, Regional Administrator, USNRC Region II
Senior Resident Inspector, USNRC, St. Lucie Plant

290039

IE22
1/1

NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), 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)
St. Lucie Unit 1	05000335	1 OF 5

TITLE (4) Automatic Reactor Trip on Loss of Electrical Load due to Flashover on 240 KV Switchyard Potential Transformer

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
10	26	94	94	007	0	11	23	94	N/A	
									FACILITY NAME N/A	DOCKET NUMBER

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

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

	20.402(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
	20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)
	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 (12)

NAME	TELEPHONE NUMBER (Include Area Code)
James A. Hurchalla, Shift Technical Advisor	(407) 465-3550

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
B	FK	XPT	G080	NO						

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 15 single-spaced typewritten lines) (16)

On October 26, 1994, Unit 1 was in mode 1 and operating at 100% steady state power. At 1426 utility personnel observed a flash in the area of the 240 KV switchyard near the Unit 1 synchronizing potential transformer. At this time Unit 1 experienced an automatic reactor trip on Loss of Electrical Load predicated by Main Generator differential current condition. Standard post trip actions were performed, the normal Reactor Trip Recovery procedure was implemented and all safety functions were satisfactory. Subsequently a fire was reported at 1445 in the 240 KV switchyard at the affected synchronizing potential transformer outside the protected area. The fire was controlled and allowed to extinguish itself.

The root cause of the failed potential transformer is attributed to an external fault to the transformer across its insulator. This fault was most likely induced by marginal component design insulation level and contributed to by salt contamination of the insulator.

Corrective actions were: 1) Operations stabilized the unit in mode 3. 2) The affected potential transformer has been replaced. 3) Contamination preventive coatings are scheduled for both units synchronizing potential transformers 4) The unit 1 Main Transformers and Isophase bus have been tested. 5) The Main Generator was visually inspected with satisfactory results.

DESCRIPTION OF THE EVENT

On 26 October, 1994, Unit 1 was at 100% power steady state operations. At 1426, utility personnel observed an arc on the Unit 1 synchronizing potential transformer (EIIS:FK) located on the "A" phase 240 KV line from the Unit 1 Main Transformers (EIIS:EL) at switchyard bay 1. Unit 1 experienced an automatic reactor trip from the Reactor Protection System (EIIS:JC) on "Loss of Electrical Load" due to a Main Generator (EIIS:TB) lockout. Utility licensed operators conducted Emergency Operating Procedure (EOP)-1, "Standard Post Trip Actions" and diagnosed an uncomplicated reactor trip. Implementation of EOP-2, "Reactor Trip Recovery" confirmed an uncomplicated reactor trip and the plant was stabilized in Mode 3, Hot Standby.

At the time of the event Unit 2 experienced spurious annunciator activity which immediately reset. In addition several radiation monitors spiked causing Shield Building Ventilation Fans HVE 6A & 6B (EIIS:VC) to start. No other significant actuations or abnormalities were observed.

At 1445 a fire was reported outside the site protected area in the 240 KV switchyard. The synchronizing potential transformer for the "A" phase of the Unit 1 Main Transformer 240 KV line to the Switchyard 240 KV busses had faulted and was leaking oil which subsequently ignited. Upon investigation by the Nuclear Watch Engineer, it was determined that the fire was isolated to the potential transformer and its support column. At 1545 utility on-site fire fighting personnel were requested to respond as a precautionary measure. However, it was determined that since the fire was controlled with minimal potential to affect other switchyard components that it was best to let the oil burn off and not risk personnel or switchyard components by extinguishing it. At 1555, off-site fire fighters were called to assist in providing observation so that on-site fire personnel would not need to be stationed at the switchyard until the oil had burned out. At 2355 utility switchyard personnel notified the control room that the fire at the potential transformer was completely extinguished.

CAUSE OF THE EVENT

The root cause of this event has been determined to be an external fault across the porcelain insulator of the synchronizing potential transformer (PT) which resulted in a flashover of the insulator. Examination by the FPL Power Delivery test laboratory indicates the flashover resulted from a combination of marginal basic insulation level of the potential transformer contributed to by salt contamination of the insulator.

The St. Lucie electrical distribution system utilizes one synchronizing potential transformer for each unit located on the "A" phase 240 KV tie line from the main transformers in the switchyard. They are used to synchronize the main generator to the offsite distribution system during unit startup. IEEE design standards for the original installation allowed two basic insulation levels (BIL), 900 KV and 1050 KV. The failed potential transformer was installed during original construction per vendor recommendation as a 900 KV BIL model. This was not considered to present a problem during past switchyard operability reviews since an FPL transmission database dating from 1982 had revealed no in-service failure of this model potential transformer in applications in the FPL distribution system. Due to past industry events a cleaning and coating program was initiated for insulated switchyard protective components. Though the potential transformers are routinely cleaned, they have not received the protective coating. The potential transformers are being added to the switchyard maintenance coating program.

Contrary to earlier reports from utility personnel the analysis does not support lightning as a likely contributor. FPL laboratory modeling for this event concludes that a low intensity lightning strike could potentially have initiated this event but was not required for this fault to occur. A normal voltage level coupled with the marginal insulation level and salt contamination was analyzed to be sufficient to initiate the fault. An internal fault to the transformer has been ruled out based on the examination. It is unlikely that the fault propagated from a path other than the synchronizing PT interface since utility power delivery personnel found no evidence of damage to other equipment in the switchyard.

ANALYSIS OF EVENT:

This event is reportable under the requirements of 10CFR50.73.a.2.iv as "any event that resulted in manual or automatic actuation of any Engineered Safety Feature.

Examination of the Generator Continuous Monitoring System data indicated that the Main Generator protective circuitry functioned as designed and that the onsite electrical distribution parameters were maintained within electrical and mechanical limits with respect to the fault on the "A" phase of the Unit 1 240 KV electrical distribution. Offsite electrical power was not interrupted to either unit during this event. An inspection of the Unit 1 electrical generation system was performed in conjunction with that of the switchyard. The results of the electrical distribution inspection and testing revealed the only degraded or failed component resulting from this transient was the Unit 1 synchronizing potential transformer.

The potential transformer fault caused a differential current condition on the "A" phase of 240 KV from the Unit 1 Main Transformer resulting in a Main Generator Lockout as designed. The lockout generated a turbine trip causing an automatic reactor trip from the Reactor Protection System on "Main Turbine Generator Loss of Load". The function of this reactor trip is described in the St. Lucie design basis as an equipment protective trip which is not required for reactor safety. This event is bounded by section 15.2.7 of the St. Lucie Unit 1 Final Updated Safety Analysis Report (FUSAR) "Loss of External Electrical Load". The actual plant response was more conservative for several reasons.

1) The Reactor Protection System actuated on "Loss of Load" versus "High Pressurizer Pressure" thereby minimizing the Reactor Coolant System (EIIS:AB) temperature and pressure transient.
2) The Steam Bypass Control System (EIIS:JI) did not initially "quick-open" as expected but did automatically "modulate" to restore the Reactor Coolant System to no load values.
3) Auxiliary Feedwater (EIIS:BA) to the Steam Generators was not required as the 1A Main Feedwater Pump (EIIS:SJ) supplied adequate feedwater to both steam generators during the post trip recovery actions.
4) Both Unit 1 Startup Transformers (EIIS:EA) were unaffected during this event and continued to provide offsite electrical power after the trip.

Therefore, the health and safety of the public were not affected by this event.

CORRECTIVE ACTIONS:

1) Operations personnel stabilized the plant in Mode 3, Hot Standby.

2) Utility Power Delivery personnel replaced the failed Unit 1 "A" phase synchronizing potential transformer with a new 900 KV BIL rated model of increased strike distance for enhanced insulating capability.

3) Utility Power Delivery department will coat the Unit 1 synchronizing potential transformer prior to placing the unit on-line.

CORRECTIVE ACTIONS (cont.)

4) The new Unit 1 synchronizing potential transformer will be replaced by Power Delivery department during the next refueling outage. This replacement is currently being manufactured and is similar to one recently installed on Unit 2 which has a 1050 KV basic insulation level.

5) The utility Power Delivery department has inspected Unit 1 switchyard components and found no degraded components other than the failed potential transformer.

6) The utility Power Delivery department has scheduled periodic application of silicone coatings of both unit synchronizing potential transformers.

7) The utility Power Delivery department has performed tests of 1A and 1B Main Transformers and the Isophase buss with satisfactory results.

8) An internal visual inspection has been performed of the Main Generator by utility Electrical Maintenance and the Generator Original Equipment Manufacturer with satisfactory results.

9) The utility Electrical Maintenance department has cleaned and adjusted the undervoltage coil on the Steam Bypass Control System which was responsible for the failed "quick-open" signal.

ADDITIONAL INFORMATION

Failed Component Identification:

"A" phase 240 KV synchronizing potential transformer
Manufacturer: General Electric
Type: EW-900
Catalogue/Serial No.: K549000
Rating: 1200/2000 to 120V

Previous Similar Events:

LER 335-94-005 describes an event which caused an automatic reactor trip due to a fault on the Unit 1 site electrical distribution system.