



PECO NUCLEAR

A Unit of PECO Energy

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10CFR50.73

January 25, 2000
Docket No. 50-353
License No. NPF-85

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

SUBJECT: Licensee Event Report
Limerick Generating Station (LGS) - Unit 2

This LER concerns the failure of the B main transformer surge arrester which caused a generator lockout/turbine trip and subsequent reactor scram.

Reference:	Docket No. 50-353
Report Number:	2-99-006
Revision Number:	00
Event Date:	December 31, 1999
Report Date:	January 25, 2000
Facility:	Limerick Generating Station P.O. Box 2300, Sanatoga, PA. 19464-2300

This LER is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv).

Very truly yours,

lwh

cc: H. J. Miller, Administrator Region I, USNRC
A. L. Burritt, USNRC Senior Resident Inspector, LGS

IB22

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION (6-1998)	APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001 Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the 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. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)	

FACILITY NAME (1) Limerick Generating Station, Unit 2	DOCKET NUMBER (2) 05000353	PAGE (3) 1 OF 3
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TITLE (4)
Generator Lockout and SCRAM due to Failure of B Phase Main Transformer Surge Arrester

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
12	31	1999	1999	-- 006	-- 00	01	25	2000	FACILITY NAME	DOCKET NUMBER
										05000
										05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)								
POWER LEVEL (10)	100	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)			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 K. P. Bersticker, Manager - Experience Assessment	TELEPHONE NUMBER (Include Area Code) (610) 718-3400
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	EA	LAR	O030	N					
X	EA	CB	A576	N					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR
<input checked="" type="checkbox"/> YES	(If yes, complete EXPECTED SUBMISSION DATE).			<input type="checkbox"/> NO		02	29	2000

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

On December 31,1999 at 01:11 hours Unit 2 reactor scrambled from 100% power on a main generator lockout/turbine trip when the generator protective relays detected a B-phase to ground fault. The fault was initiated when the 500kV surge arrester located next to the B-phase generator main step-up transformer failed. The fault was isolated from the system through the automatic operation of the 235 and 335 circuit breaker. Following the scram, it was discovered that one of the two external grading capacitors located on the B-phase pole of the 355 circuit breaker had also failed. No emergency core cooling systems(ECCS) were actuated. The cause of the failure of the surge arrester and capacitor are still under investigation. The surge arresters on all three(3) phases were replaced. The unit was returned to service on January 2, 2000.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Limerick Generating Station Unit 2	05000				2 OF
	-353	1999	006	00	3

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

Background

At the time of the event Unit 2 was in Operational Condition (OPCON) 1 (Power Operation) at 100% power. Load dispatchers were removing the 500 KV capacitor bank from service, when the substation 355 circuit breaker external B phase capacitor failed. No other major evolutions were underway and no structures, systems or components were out of service which contributed to the event.

Event Description

On December 31, 1999 at 01:11 hours Unit 2 reactor scrambled from 100% power on a main generator lockout/turbine trip(EIIS:TB) which was caused by a phase to ground fault on the B main transformer 500 kV (EIIS:EA) surge arrester. At the time of the event the substation 355 circuit breaker was being opened to remove the 3-1 capacitor bank. A failed grading capacitor on the 355 circuit breaker resulted in a voltage spike that went back to the surge arrester on the B-phase transformer and caused it to fail. The surge arrester should have been able to absorb the energy of the voltage spike. The main transformer ground fault relay system (EIIS:EL) functioned normally to trip the unit. The reactor was stabilized and no emergency core cooling actuations occurred.

An unusual event was declared on 12/31/99 at 02:55 hours based on a report by plant personnel of an unanticipated explosion within protected area boundary resulting in visible damage to permanent structure or equipment and was terminated at 04:00 hours.

A 4 hour notification was made to NRC for RPS/ESF actuations [10CFR50.72(b)(2)(ii)] on 12/31/99 at 03:10 hours.

This event was determined to be reportable under the requirements of 10CFR50.73(a)(2)(iv).

Unit 2 was returned to service on January 2, 2000.

Cause of the Event

The cause of the event was the failure of the 355 circuit breaker grading capacitor and the external main transformer B-phase surge arrester. The 355 circuit breaker B-phase capacitor and the surge arrester failure modes are unknown at this time but are currently being investigated. It is anticipated that results will be available by 2/29/00. The 355 circuit breaker operations will not occur until the root cause has been fully evaluated.

Consequences of the Event

The actual consequences of the event were minimal. The main transformer protective relay actuations, the main turbine trip and the RPS actuations all occurred per design and all control rods fully inserted. No release of radioactive material occurred and no ECCS actuations occurred as a result of this event.

The inservice Drywell Chiller(EIIS:KM) tripped resulting in increased drywell temperature and pressure. The Drywell Chiller (2A) was started and drywell cooling was maximized. The cause of the trip of the inservice Drywell Chiller was due to the cooling water isolation valve closing on undervoltage (voltage transient to the control logic). This then produced a low flow signal at the switch which tripped the chiller.

The Reactor Building Enclosure HVAC system(EIIS:VA) tripped which was apparently caused by an undervoltage trip as a result of losing the B phase. The Turbine Building Enclosure HVAC system (EIIS:VK) also tripped which was apparently caused by a undervoltage trip due to the voltage transient. Both HVAC systems were later restarted.

The Reactor Core Isolation Cooling(RCIC)(EIIS:BM) initiation light came on but the system did not start. The signal was of a millisecond duration and allowed only the logic for the white light to energize. The results of the review indicate instrument line ringing was sufficient to account for the light to come on. Due to the high frequency of the level ringing the indicated swings in level are not actual level but the results of a pressure wave initiated upon turbine trip and stop valve closure. As a result, the duration that the transmitter actually

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
	05000	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF
Limerick Generating Station Unit 2	-353	1999	006	00	3

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

exceeds the trip unit setpoint is a few milliseconds but does not actuate RCIC nor does it prevent actuation. The potential consequences of the event were also minimal since the plant is designed for a Generator Load rejection.

Corrective Action Completed

On December 31, 1999 Maintenance performed Dissolved Gas Analysis(DGA) testing of the transformer oil on all three phases of the main transformer. The purpose of this test was to determine if there had been any internal arcing or overheating in the transformers. Test results indicated that there was no internal arcing or overheating.

The surge arresters on all three phases of the main transformer were replaced and were Doble tested as satisfactory.

The 3-1 capacitor bank has been blocked out until repairs are made and is not required for normal operation.

The unit was returned to service on January 2, 2000.

Corrective Action Planned

An investigation is currently underway which includes a series of tests and failure analyses on the surge arresters/breaker(grading capacitor) to determine any further action. The preventative maintenance program on the 500 kV breakers and surge arrester will be examined.

During the upcoming outage on Unit 1 the surge arresters on the main transformer will be replaced with the MOV type arrester.

Previous Similar Occurrences

There has been a previous similar occurrence (LER-95-002) of an offsite transformer surge arrester problem which affected both units.

Failure Data

Surge Arrester

Manufacturer-Ohio Brass

Model-MPR-240 silicon carbide/gapped

Circuit Breaker(Grading Capacitor)

Manufacturer-ABB

Model-Live-Tank ELF-SP7-2