

PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION
P. O. BOX A
SANATOGA, PENNSYLVANIA 19864

(215) 327-1200 EXT. 2000

November 16, 1990
Docket Nos. 50-352
50-353
License Nos. NPF-39
NPF-85

M. J. McCORMICK, JR., P.E.
PLANT MANAGER
LIMERICK GENERATING STATION

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

SUBJECT: Licensee Event Report
Limerick Generating Station - Units 1 and 2

This LER reports a condition prohibited by Technical Specifications (TS) as a result of the Emergency Diesel Generators (EDGs) being inoperable and the associated TS actions not being performed within the required time period. Various Unit 1 and Unit 2 EDGs were inoperable due to the EDGs being aligned to inadequately tested redundant rectifier banks.

Reference: Docket Nos. 50-352
50-353
Report Number: 1-90-023
Revision Number: 00
Event Date: October 15, 1990
Report Date: November 16, 1990
Facility: Limerick Generating Station
P.O. Box A, Sanatoga, PA 19464

This LER is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(i)(B). This report is submitted 2 days late to permit time to further analyze the safety significance of this condition, including the testing of another EDG. This was discussed with Ms. M. G. Evans of the NRC Region I on November 16, 1990. We regret any inconvenience this may have caused.

Very truly yours,

JKP:cah

cc: T. T. Martin, Administrator, Region I, USNRC
T. J. Kenny, USNRC Senior Resident Inspector, LGS

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LICENSEE EVENT REPORT (LER)

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TITLE (4) The Emergency Diesel Generators were inoperable on various occasions due to their redundant rectifier banks not being tested.

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 NAMES		DOCKET NUMBER(S)		
1	0	1 5	9	0	0	0	2	3	0	0	1	LGS, Unit 2	0 5 0 0 0 3 5 3
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OPERATING MODE (9) 5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more of the following) (11)									
POWER LEVEL (10) 0 0 0	<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.73(e)(2)(iv)	<input type="checkbox"/> 73.71(b)						
	<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.38(b)(1)	<input type="checkbox"/> 50.73(e)(2)(v)	<input type="checkbox"/> 73.71(c)						
	<input type="checkbox"/> 20.405(a)(1)(iii)	<input type="checkbox"/> 50.38(c)(2)	<input type="checkbox"/> 50.73(e)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)						
	<input type="checkbox"/> 20.405(a)(1)(iv)	<input checked="" type="checkbox"/> 50.73(e)(2)(i)	<input type="checkbox"/> 50.73(e)(2)(viii)(A)							
	<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 50.73(e)(2)(ii)	<input type="checkbox"/> 50.73(e)(2)(viii)(B)							
	<input type="checkbox"/> 20.405(a)(1)(vi)	<input type="checkbox"/> 50.73(e)(2)(iii)	<input type="checkbox"/> 50.73(e)(2)(ix)							

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Gil J. Madsen, Regulatory Engineer, Limerick Generating Station	2 1 5 3 2 7 - 1 2 0 0

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE):	<input checked="" type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

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

On 10/15/90, during an investigation of a D13 Emergency Diesel Generator (EDG) failure, a condition prohibited by Technical Specifications (TS) was identified. The EDGs for Unit 1 and Unit 2 were inoperable on various occasions between March 1989 and October 1990, due to inadequate surveillance testing of the redundant rectifier banks installed in the voltage regulation circuit in the EDG System. This condition was discovered during a recently identified failure mode for the EDGs with redundant rectifier banks as reported in Special Report 1-90-019. During portions of 1989, the rectifier banks for the Unit 1 and Unit 2 EDGs were alternately switched between the primary rectifier bank and the redundant bank at the beginning of the performance of the monthly operability EDG tests. As a result of this practice, only one set of rectifier banks had been tested during both of the monthly operability tests and the Loss of Offsite Power (LOOP) test, while the redundant bank had only been tested in the monthly operability test. The operability of the Unit 1 and Unit 2 EDGs was verified with only one of the two available rectifier banks in service during LOOP testing. This condition is in violation of TS since the EDGs were not declared inoperable while aligned to the inadequately tested rectifier banks and the required TS actions were not taken. On 8/2/89, the specific steps for switching the rectifier banks were administratively removed from the monthly operability procedures. On 10/17/90, the untested rectifier banks were removed from service.

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Unit Conditions Prior to the Event:

Unit 1 operating condition was 5 (Refueling) at 0% power level.

Unit 2 operating condition was 1 (Power Operation) at 100% power level.

Both of the units have operated at various operating modes and power levels since March of 1989 when redundant rectifier banks on the Emergency Diesel Generators were utilized but were not properly tested for operability during Loss of Offsite Power (LOOP) testing.

There were no structures, systems or components out of service which contributed to this event.

Description of the Event:

On October 15, 1990, during an investigation of the D13 Emergency Diesel Generator (EDG) (EIIS:DG) test failure, a condition prohibited by Technical Specifications (TS) was identified. All of the EDGs for Unit 1 and Unit 2 were inoperable on various occasions due to inadequate surveillance testing of the redundant rectifier (EIIS:RECT) banks for the voltage regulation (EIIS:RG) circuit in the EDG System under simulated Loss of Offsite Power (LOOP) conditions.

Limerick Generating Station (LGS) utilizes Fairbanks-Morse EDGs with a primary and redundant rectifier bank in the generator voltage regulator circuit for each EDG. On September 15, 1990, the Unit 1 D13 EDG was tested for its monthly operability test and was subsequently being prepared for its Division 3 AC Safeguard Bus test. The frequency of this surveillance test (ST) procedure is once per refueling cycle and includes a dead bus start of the EDG simulating a LOOP start and loading of the EDG under LOOP conditions. While the ST procedure was being performed, a Division 3 AC Safeguard Bus overvoltage condition occurred during energization of the bus from the D13 EDG on the simulated loss of offsite power. The overvoltage condition was caused by a rectifier bank failure. The resultant EDG test failure was reported in LGS Special Report 1-90-019. A subsequent analysis was concluded that the EDG loads would be adversely affected during continued operation with the overvoltage condition. During the root cause investigation of the overvoltage condition, a failure mode of the rectifier bank was discovered which can only be identified during dead bus starts, and not during the normal monthly operability STs.

Between the time period of March 16, 1989 and August 2, 1989, the rectifier banks for each of the four Unit 1 EDGs were alternately switched between the primary rectifier bank and the redundant bank at the beginning of the performance of the monthly operability EDG tests. Similarly, the rectifier banks for each of the four Unit 2 EDGs were alternately switched between primary and redundant rectifier banks during the start up phase of Unit between July 1989 and August 1989. At the time, switching of the recti

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banks during monthly EDG operability testing was considered to be a good practice since testing of the redundant equipment would increase the reliability of the EDG subcomponents. As a result of this practice, one set of rectifier banks had been tested during the performance of both the monthly operability ST procedures and during the refueling outage LOOP testing, while the redundant rectifier bank had only been tested during the monthly operability ST procedure. The switching of the rectifier banks resulted in conditions where the EDGs and the redundant rectifier banks were being lined up for service without being properly tested under LOOP conditions. Therefore, the operability of the EDG system was not fully verified.

The practice of switching rectifier banks during monthly EDG operability tests was discontinued in August 1989 since a problem was identified with a rectifier bank transfer switch. The switching of the rectifier banks was stopped to avoid excessive wear of the transfer switches. It had not been realized at this time that we had been aligning inadequately tested rectifier banks to the EDG system for operation. On August 2, 1989, the specific steps for switching the rectifier banks were administratively removed from the monthly ST procedure.

Following identification of the rectifier bank failure, based on a review of the limited available station records (i.e., previously performed monthly ST procedures), plant personnel administratively controlled the rectifier bank switches for the other Unit 1 and Unit 2 EDGs on October 1, 1990. The switch positions selected were these that lined up rectifier banks that had been previously tested during the performance of both the LOOP and monthly operability STs procedures. We recognized that the performance of only the monthly operability ST procedure was not sufficient to demonstrate operability of the EDG system with it lined up to the redundant rectifier bank. Later, on October 15, 1990, during review of Special Report 1-90-019, we recognized that each EDG should have been declared inoperable whenever the EDG voltage regulation circuit was not aligned to the LOOP tested rectifier bank, and that the condition was reportable as a condition prohibited by TS since the required TS Action was not taken within the specified time period. A full verification of the rectifier bank switch positions was then performed by October 17, 1990 based upon review of the permanent records contained offsite (i.e., LOOP ST procedures). Following review of the previously performed LOOP ST procedures, all eight of the EDGs were then properly aligned to an adequately tested rectifier bank. It was at this time we identified that the D12 and D14 EDGs for Unit 1, and the D21 and D23 EDGs for Unit 2 had been aligned to an inadequately tested rectifier bank since August 1989. All of the inadequately tested rectifier banks were then removed from service to prevent alignment for use in the EDG voltage regulation circuits.

During certain times between March 1989 and October 1990, the inadequate testing of the redundant rectifier banks resulted in conditions in which the EDGs for Unit 1 and Unit 2 were not in compliance with the TS Surveillance Requirements (SR) for dead bus load conditions, SR 4.8.1.1.2 and 6. The EDGs were not declared inoperable in accordance with TS when aligned to the inadequately tested rectifier banks and the required TS actions were not taken within the

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specified period of time. This resulted in conditions prohibited by TS, and this report is being submitted in accordance with the requirements of 10CFR50.73(a)(2)(1)(B).

Analysis of the Event:

There were no adverse consequences and no release of radioactive material as a result of this event.

A LOOP transient did not occur and the EDGs were not required to perform their intended safety function during the time period that the EDGs were lined up to redundant rectifier banks that were inadequately tested and in service. Therefore, the past alignments of the inadequately tested rectifier banks did not adversely impact plant operations.

For Unit 1, the D12 and D14 EDGs were LOOP tested in October 1990 and on November 15, 1990 respectively with the previously inadequately tested rectifier banks in service. The test verified that the rectifier banks were fully functional and had not experienced a similar failure as D13. Therefore, the D12 and D14 EDGs would have functioned properly when aligned to the inadequately tested rectifier bank in the event a LOOP had occurred. For Unit 2, the D22 and D24 EDGs were aligned to the adequately tested rectifier bank since August 1989, when Unit 2 received its full power operating license and therefore, these EDGs would have functioned properly if a LOOP transient had occurred.

A data search on the Nuclear Plant Reliability Data System (NPRDS) was performed to determine if this particular type of failure of the rectifier banks had occurred previously at another plant. No other similar failures were identified. This is the first known failure of this type and the likelihood of multiple, simultaneous failures of the rectifier banks due to the identified failure mode is considered extremely remote and not credible. In addition, licensed operators receive requalification training to review and perform operator responses to the loss of offsite power with a simultaneous loss of the EDGs. This training provides practice on immediate operator actions to minimize the unavailability of safety systems in the plant.

Analysis has shown that the plant can be safely shutdown with 2 EDGs following a LOOP, therefore, the operators could have successfully placed the plant in a safe shut down condition in the event of a LOOP transient.

Cause of the Event:

The cause of this event is inadequate testing of the redundant rectifier banks for the EDGs due to an inadequate procedure. During the performance of the monthly operability, we had concluded that we were adequately testing the rectifier bank that was being utilized for both the monthly operability ST test and the LOOP test. Therefore, we concluded at the time that we were adequately establishing the operability of the EDG system with it lined up to the particular rectifier bank that was being used.

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When the rectifier bank failure mode was identified during the LOOP testing of the D13 EDG, we recognized at this time that the monthly operability ST procedure was not sufficient to verify the operability of the EDG system with it lined up to the rectifier banks under LOOP conditions.

Corrective Actions:

On October 17, 1990, all of the inadequately tested rectifier banks were removed from service to prevent alignment for use in the EDG voltage regulation circuits. The procedural step which included the switching of rectifier banks, that had been routinely performed prior to August 1989, was administratively removed from the appropriate monthly EDG operability ST procedures on August 2, 1989. To assure operability of the EDGs, only the rectifier banks that have been previously tested during LOOP testing will be utilized.

All of the other redundant equipment in the EDG system has been verified to be adequately tested to demonstrate operability of the equipment.

The inadequately tested rectifier banks on the D11 EDG for Unit 1 and the four Unit 2 EDGs will be tested during the next scheduled performance of the LOOP ST for each EDG.

The root cause of the rectifier bank failure is currently being investigated. The results of this investigation will be provided in a supplement to the Special Report 1-90-019.

Previous Similar Occurrences:

None

Tracking Codes: D02 - Inadequate procedure - did not cover situation