

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Dresden Nuclear Power Station, Unit 2 DOCKET NUMBER (2) 0 5 0 0 0 2 3 1 7 1 OF 0 5

TITLE (4) Unit 2 and 2/3 Diesel Generators (D/G) Inoperable Due to Damaged Power Cable of the 2/3 D/G Cooling Water Pump and Subsequent Failure of Unit 2 D/G Turbocharger While Testing

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	2	85	85	044	01	04	01	87	Dresden Unit 3	0 5 0 0 0 2 4 1 9	
									N/A	0 5 0 0 0	

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 50.73 (Check one or more of the following) (11)

OPERATING MODE (9) N	20.402(b)	20.405(a)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 11010	20.405(a)(1)(i)	50.73(a)(1)	50.73(a)(2)(iv)	73.71(a)
	20.405(a)(1)(ii)	50.73(a)(2)	50.73(a)(2)(iv)	OTHER (Specify in Abstract below and in Text, NRC Form 355A)
	20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(iv)(A)	
	20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(iv)(B)	
	20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(iv)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Ronald Jackson Technical Staff Engineer (X-549)	AREA CODE 815 9421-2920

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
X	E K	E N G	E 1 4 7	Y					
X	E K	C B L	C 6 8 3	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) NO

EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR

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

On 12/13/85 at approximately 0330 hours with Unit 2 operating at 100% power and Unit 3 in shutdown condition, the power cable to the 2/3 diesel generator (D/G) Cooling Water Pump was discovered damaged during normal operating routines. The 2/3 D/G was declared inoperable and an operability test was performed at 0428 hours on the Unit 2 D/G. While taking the Unit 2 D/G off-line, the Equipment Operator heard unusual noises at the turbo-charger. A second surveillance test was performed and after 8 minutes into the test, the noises recurred and the Unit 2 D/G tripped. Since the 2 and 2/3 D/G's were both inoperable, at approximately 0610 hours an Unusual Event was declared and a Unit 2 shutdown was initiated.

The power cable failure was caused by station personnel using the cable conduit as a support when climbing a permanent ladder installed near the cable. After repair of the power cable, the station declared the 2/3 D/G operable and terminated the Unit 2 shutdown and the Unusual Event at approximately 1400 hours on 12/13/85. Investigation into the Unit 2 D/G trip revealed that damaged turbocharger bearings caused the diesel to fail. A failure analysis indicated that the bearings failed due to lack of lubrication. Since there was no evidence of failure found during the station's inspection of the turbocharger and main lube oil auxiliary equipment, the cause of inadequate lubrication to the turbocharger bearings cannot be determined.

The safety significance of this event was minimal since the normal auxiliary power to both units was operable during the entire event, the Unit 2/3 4KV cross-tie between Buses 24-1 and 34-1 was available and the number of hours Unit 2 was without both D/G's was small, thus minimizing the probability of an accident. The last similar occurrence was reported under Licensee Event Report 77-051 on Docket #050237.

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

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2527 Mwt rated core thermal power. Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

EVENT IDENTIFICATION:

Unit 2 and 2/3 Diesel Generators (D/G) Inoperable Due to Damaged Power Cable of the 2/3 D/G Cooling Water Pump and Subsequent Failure of Unit 2 D/G Turbocharger While Testing.

A. CONDITIONS PRIOR TO EVENT:

Event Date: December 13, 1985 Event Time: 0330 hours

Unit 2 - Reactor Mode: N - Run; Reactor Pressure: 1000 psig;
Reactor Temperature: 540°F; Power Level: 100%

Unit 3 - Reactor Mode: N - Refuel; Reactor Pressure/Temp: 0; Power Level: 0%

B. DESCRIPTION OF EVENT:

On 12/13/85 at approximately 0330 hours, with Unit 2 operating at 100% power and Unit 3 in shutdown condition with all fuel removed from the vessel, the power cable to the 2/3 D/G Cooling Water Pump [LB] was discovered damaged during normal operating routines. Consequently, the 2/3 D/G [EK] was declared inoperable at 0330 hours. Investigation into the power cable failure was initiated, and Dresden Operating Surveillance (DOS) 6600-1, Diesel Generator Surveillance Tests, was performed on the Unit 2 D/G for assurance of operability as required by Technical Specification Section 3.9.B. Unit 3 D/G Operability Test was not required by Technical Specification Section 3.9.D because Unit 3 was in cold shutdown, no work was being performed that could drain the vessel, and secondary containment was not required, or a core or containment cooling system was not required. While performing the surveillance test on the Unit 2 D/G, the Equipment Operator heard surging noises at the D/G turbocharger as the diesel was being taken off-line. At approximately the same time the noises occurred, the Control Room Operator observed a sudden 50 kilowatt (kw) load decrease that gradually returned to its original position. The Shift Engineer and Station Control Room Engineer were notified of the unusual sounds and meter indication discovered during the surveillance. After discussing the event, it was decided to repeat the surveillance test to determine if an actual problem existed on the Unit 2 D/G.

At 0559 hours, full load of 2500 kw was applied to the D/G and after approximately 8 minutes into the surveillance test, the surging noises recurred and the generator load decreased twice by 500 kw before dropping to 0 kw. In addition, it was observed that the D/G output breaker had tripped open. The D/G trouble alarm and low water pressure alarm had illuminated on the 902-8 Control Room panel and the local D/G control panel, respectively. Since the 2 and 2/3 D/G's were both inoperable at approximately 0610 hours, an Unusual Event was declared and a Unit 2 shutdown was initiated as required by Technical Specification Section 3.0.A.

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C. CAUSE OF EVENT:

Investigation results of the power cable failure on the 2/3 D/G Cooling Water Pump revealed that one of the three conductors was partially burned and its insulation was partially worn. The area of the cable that was found damaged is normally enclosed in a metal connector that links the cable to the Cooling Water Pump motor. It is believed that station personnel used the cable conduit as a support when climbing a permanent ladder installed near the cable, thus creating a rubbing action between the cable and the metal connector. This rubbing eventually caused the conductor's insulation to wear, which resulted in the conductor burning upon contacting the grounded metal connector.

The initial indication of the Unit 2 D/G turbocharger failure was a reduction in the diesel engine speed, which decreased the shaft driven Cooling Water Pump speed, thus producing a low cooling water pressure that resulted in a trip of the D/G. Evidence of the engine speed reduction was observed by the sudden load change that occurred during the surveillance test. Station Maintenance personnel removed the turbocharger from the diesel engine and discovered that the main shaft was bent and found pieces of the turbocharger, Electro-Motive Model #8377586, bearings in the diesel engine oil pan. Maintenance personnel then inspected the turbocharger related components of the lube oil system, which consist of the turbocharger oil filter, the turbocharger output check valve, the soak back oil pump and filter, and the turbocharger oil filter pressure gauge. All of the components inspected were found to be operable.

To further investigate the cause of the turbocharger failure, a review was conducted of all the Unit 2 D/G operability surveillances (DOS 6600-1) for the year 1985. As a result of this review, it was found that the turbocharger lube oil pressure was greater than the main lube oil system pressure for approximately 5 months prior to the event. Normally the main lube oil system pressure is greater than the turbocharger oil pressure. It was believed that the oil pressures were abnormal due to an internal failure of the turbocharger thus causing a back pressure to develop at the turbocharger oil pressure gauge.

Further analysis of the turbocharger components were conducted by the manufacturer, Electro-Motive Division (EMD) of General Motors, to determine the cause of the turbocharger bearing failure. After the turbocharger was disassembled and inspected by EMD technical personnel, a failure analysis report was issued on April 25, 1986 which concluded that the turbocharger bearings failed due to a lack of lubrication. This failure mode was identified by smeared, scored and overheated planet, thrust, compressor journal and turbine journal bearings. Since EMD's failure analysis report indicated a lack of lubrication as the failure mode and not an internal turbocharger failure, the station decided to conduct further inspection on the Unit 2 D/G lube oil system.

Lube oil is supplied to the turbocharger after passing through the turbocharger oil filter, turbocharger oil filter supply and return manifold and oil passages in the idler gear stubshaft assembly. On January 29, 1987 the turbocharger filter lube oil manifold and the stubshaft assembly were both inspected for

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possible blockage but no debris was found. A second inspection was performed on March 6, 1987 to determine if lube oil was actually being supplied to the turbocharger bearings. This inspection involved removing a rear oil pan handhole cover on the diesel engine and inspecting underneath the gear train for return oil draining from the turbocharger. Upon inspection, it was found that lube oil was returning from the turbocharger. Since no evidence of lack of lubrication to the turbocharger bearings could be found during any of these inspections nor during inspection of the turbocharger and main lube oil auxiliary equipment, the cause of inadequate lubrication to the turbocharger bearings cannot be determined.

D. SAFETY SIGNIFICANCE OF EVENT:

After successful completion of the surveillance tests on the 2/3 D/G and its Cooling Water Pump, the station declared the 2/3 D/G operable and terminated the Unusual Event (approximately 1400 hours) and Unit 2 shutdown.

The safety significance of this event was minimal since the normal auxiliary power was supplied continuously to both units, the Unit 2/Unit 3 4KV cross-tie between Buses 24-1 and 34-1 [EA] was available, and the number of hours Unit 2 was without both D/G's was small, thus minimizing the probability of an accident.

E. CORRECTIVE ACTIONS:

Repairs were made on the damaged power cable and surveillance tests were performed successfully on the 2/3 D/G and its Cooling Water Pump. As a corrective measure in preventing future occurrences of this type, the station plans to replace the flexible cable conduit with rigid conduit and install an additional brace for more support. This work was added to an existing modification (12-2/3-84-62) and has been completed.

With reference to the D/G repairs, station Maintenance personnel replaced the damaged turbocharger and for preventive maintenance measures replaced the soakback oil pump and filter. To prevent future occurrences of turbocharger failures due to lack of lubrication, the Technical Staff has began trending the main lube oil and turbocharger lube oil pressures, along with other diesel engine parameters, for all three emergency D/G's to detect any abnormalities. The other D/G parameters being trended are: Lube oil temperature, fuel oil pressure, cooling water inlet and outlet temperatures, cooling water inlet and outlet pressures, air intake box pressure, and cylinder head temperatures.

F. PREVIOUS OCCURRENCES:

A previous occurrence of a D/G turbocharger failure was recorded by Licensee Event Report #77-051, Docket #050237. On October 30, 1977 during an operability surveillance test of the Unit 2/3 emergency D/G, the diesel tripped on low water pressure as it was being unloaded. The diesel engine tripped due to a failure of the turbocharger clutch and shaft bearing. After failure analysis was conducted on the turbocharger by the manufacturer, Electro-Motive Division of General Motors, it was indicated that the turbocharger failed because of prolonged diesel operation at low loads. A failure of this type would not recur since Dresden no longer operates its emergency diesel generators at low loads.

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G. COMPONENT FAILURE DATA:

<u>Manufacturer</u>	<u>Nomenclature</u>	<u>Model Number</u>
Electro Motive Division/ General Motors	Turbocharger	8377586
Chempump Division/Crane Co.	Power Cable	N/A



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April 1, 1987

EDE LTR #87-213

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

Licensee Event Report #85-44-01, Docket #050237 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10 CFR 50.73 (a)(2)(i). Failure analysis and further testing of the Unit 2 Emergency Diesel Generator Turbocharger has been performed since the original Licensee Event Report was issued. The results of the analysis and testing have been included in this supplemental report.

E.D. Eenigenburg

E.D. Eenigenburg
Station Manager
Dresden Nuclear Power Station

EDE/kjl

Enclosure

cc: A. Bert Davis, Acting Regional Administrator, Region III
File/NRC
File/Numerical

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