Nuclear

GPU Nuclear Corporation
Post Office Box 480
Route 441 South
Middletown, Pennsylvania 17057-0191
717 944-7621
TELEX 84-2386
Writer's Direct Dial Number:

December 12, 1989
C311-89-2134

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

Dear Sir:

Three Mile Island Nuclear Station Unit I, (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
LER 89-002-00

This letter transmits Licensee Event Report (LER) No. 89-002-00 which deals with the potential for simultaneous failure of both emergency diesel generators due to sludge formation. Public health and safety were not affected.

This LER is being submitted pursuant to 10 CFR 50.73, using the required NRC forms (attached). NRC Form 366 contains an abstract which provides a brief description of the event. For a complete understanding of the event, refer to the text of the report which appears on Form 366A.

Sincerely,

H. D. Hukill
Vice President & Director, TMI-1

HDH/RDW/spb

Attachment

cc: R. Hernan
W. Russell
F. Young

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/88

LICENSEE EVENT REPORT (LER)

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TITLE (4)

POTENTIAL FOR INOPERABILITY OF BOTH EMERGENCY DIESELS DUE TO SLUDGE FORMATION

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 1	1 4	8 9	8 9	0 0 2	0 0	1 2	1 2	8 9		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		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
RUSSELL D. WELLS, TMI-1 LICENSING ENGINEER	AREA CODE 7 1 7 — 9 4 8 - 8 6 9 3

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	
D	E G	D G	F 0 1 0	Y							
D	E G	D R I V	X 9 9 9	Y							

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 fifteen single-space typewritten lines) (16)

At approximately 1230 hours on November 14, 1989, during performance of the Emergency Diesel Generator (EDG) 1B annual inspection, which commenced on November 13, 1989, it was discovered that the radiator fan right angle gear drive bearing lubrication was inadequate due to formation of sludge in the lubrication lines. A similar condition resulted in the upper bearing failure of the EDG 1A radiator fan right angle drive bearing at approximately 0514 hours on November 2, 1989. Although both EDGs were not inoperable at the same time, the potential existed for simultaneous failure of both EDGs. Thus, this event is reportable pursuant to 10 CFR 50.73 (a)(2)(v). EDG 1B was restored to operable status at approximately 0844 hours on November 18, 1989 within the seven (7) day timeclock permitted by Tech. Spec. 3.7.2.c. The root cause of this event is attributed to a combination of overheating of the lubricating oil and inadequate/incomplete procedures for the inspection and maintenance of the EDG lubrication system. Corrective actions planned include revising/issuing procedures for increased maintenance on the EDG lubrication system and further evaluation of the overheating of the lubricating oil.

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

POTENTIAL FOR INOPERABILITY OF BOTH EMERGENCY DIESELS BECOMING INOPERABLE DUE TO SLUDGE FORMATION

I. PLANT OPERATING CONDITIONS BEFORE THE EVENT

TMI-1 was operating at 100% power. The plant was being controlled by the Integrated Control System (JA/-) which was in full automatic control.

II. STATUS OF STRUCTURES, COMPONENTS OR SYSTEMS THAT WERE INOPERABLE AT THE START OF THE EVENT AND THAT CONTRIBUTED TO THE EVENT

No major equipment was inoperable. There was no equipment out of service that contributed to the event.

III. EVENT DESCRIPTION

At approximately 0514 hours on November 2, 1989, Emergency Diesel Generator (EK/DG) 1A was being warmed (test run) in preparation for the "A" train ES testing. Shortly after the engine was started, smoke was observed coming from the radiator housing enclosure. Operators secured the "A" Diesel Generator and the initial investigation revealed an overheated and possibly damaged clutch (EK/CLU) in the radiator fan drive train between the engine main drive shaft and the right angle gear drive (EIC/DRIV) for the radiator fan.

At 0519 hours on November 2, 1989, Emergency Diesel Generator 1A was declared out of service and the seven (7) day timeclock of Tech. Spec. Limiting Condition for Operation (LCO) 3.7.2.c was entered. At 0619 hours, Emergency Diesel Generator 1B was determined to be operable which satisfied the requirement of Tech. Spec. LCO 3.7.2.c that the operable Diesel Generator be tested immediately and daily.

Further investigation of the inoperability of the Emergency Diesel Generator 1A revealed that the clutch overheating was due to a seized bearing at the top of the vertical shaft in the right angle gear drive which prevented the right angle gear drive from turning when the clutch assembly tried to engage as the diesel engine rpm was being increased. There was no damage to the clutch assembly.

Upon disassembly of the right angle gear drive, it was discovered that the upper bearing in the right angle gear drive seized due to lack of lubrication. The right angle gear drive unit is equipped with a forced feed lubrication system (EK/LU) which normally feeds the bearing that was found seized.

III. EVENT DESCRIPTION (CONT'D.)

The forced feed lubrication system was disassembled. A check valve (EK/V) on the suction side of the forced feed lubrication system pump was found clogged with sludge. A large amount of sludge was also found in the oil sump of the right angle gear drive unit.

Following the completion of necessary repairs, Emergency Diesel Generator 1A was restored to operable status at 0618 hours on November 5, 1989. During the period the 1A Diesel Generator was out of service (i.e. November 2 - November 5, 1989), the 1B diesel was determined to be operable on a daily basis pursuant to Tech. Spec. LCO 3.7.2.c.

At approximately 0639 hours on November 13, 1989, Emergency Diesel Generator 1B was removed from service to perform the annual Diesel Generator inspection pursuant to Tech. Spec. Surveillance 4.6.1.c.

At approximately 1230 hours on November 14, 1989, the 1B Diesel Generator radiator fan right angle gear drive and its associated forced feed lubrication system were disassembled. Upon disassembly a large amount of sludge was also found in the oil sump of the right angle gear drive unit. The check valve, suction piping, and strainer (EK/STR) on the suction side of the force feed lubrication system pump were found clogged with sludge. The top bearing (which is lubricated by the forced feed lubrication system) for the vertical shaft in the radiator fan right angle gear drive unit appeared dry due to lack of lubrication.

The observed condition of Diesel Generator 1B was similar to that of the previous observed condition of the 1A Diesel Generator on November 2, 1989 and had the potential to result in the inoperability of both Diesel Generators. Thus, it was determined at 1230 hours on November 14, 1989 that a reportable event existed pursuant to 10 CFR 50.73 (a)(2)(v) due to an "event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident." Additionally, a four (4) hour report pursuant to 10 CFR 50.72 (b)(2)(ii) was made to the NRC via the Emergency Notification System.

The lubricating oil used in the radiator fan right angle gear drive unit is an Exxon product - Spartan Extreme Pressure (EP) 220. The sump of the right angle gear drive is equipped with an oil immersion heater. The EP additive package used in the Exxon Spartan 220 is a sulfur-phosphorus compound. This additive, when exposed to temperatures in excess of 200°F, breaks down forming a sludge in the oil. Initial analyses of the oil collected from the right angle gear drive sump indicate that it had experienced overheating.

III. EVENT DESCRIPTION (CONT'D.)

Additionally, plant procedures only required an annual oil change of the Spartan EP 220, but did not require flushing of the gear drive oil sump, nor inspection and cleaning of the forced feed lubrication system pump suction strainer. Such actions may have prevented the large accumulation of sludge found in the sump.

Thus, the root cause of this event is attributed to a combination of overheating of the lubricating oil and inadequate/incomplete procedures.

Both bearings on the Emergency Diesel Generator 1B radiator fan drive vertical shaft were replaced. The radiator fan right angle gear drive sump, heater element and associated oil circulation piping were cleaned and reused. New Spartan EP 220 oil was added. Emergency Diesel Generator 1B was restored to operable status at 0844 hours on November 18, 1989. During the time period the 1B Diesel Generator was out of service (i.e., November 13 - November 18, 1989), the Emergency Diesel Generator 1A was verified to be operable on a daily basis pursuant to Tech. Spec. LCO 3.7.2.c.

IV. COMPONENT FAILURE DATA

The TMI-1 Emergency Diesel Generators are Fairbanks Morse Model No. 38TD8-1/8 Diesel Generators. Each are powered by a 12-cylinder, 24-piston (over/under configuration), two-cycle, turbo-charged engine. The engine is water cooled via a self-contained radiator system. The radiator and its associated fan unit are located in a separate housing enclosure apart from that of the engine room. The radiator fan is driven via a clutch and a right angle gear drive. The right angle gear drive is a Model No. CH-1000 VBH speed increaser furnished by D.O. James Gear Manufacturing Company.

V. AUTOMATIC OR MANUALLY INITIATED SAFETY SYSTEM RESPONSES

There were no safety system response demands during the occurrence of this event.

VI. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT

During performance of the Emergency Diesel Generator 1B annual inspection, it was discovered that the radiator fan right angle gear drive bearing lubrication was inadequate due to clogged lubrication lines. This same condition led to the upper bearing failure of the Emergency Diesel Generator 1A radiator fan right angle drive bearing on November 2, 1989. Although both Emergency Diesel Generators were not inoperable at the same time, the potential for simultaneous failure did exist. However, no adverse safety consequences resulted because no incident occurred that would have caused an ESAS demand while both Emergency Diesel Generators were potentially in a degraded mode.

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

VII. PREVIOUS EVENTS OF A SIMILAR NATURE

None.

VIII. CORRECTIVE ACTIONS PLANNED

Applicable plant procedures will be revised/issued to provide for increased maintenance on the associated Emergency Diesel Generator lubricating oil components. The sludge buildup occurs over a long period of time and periodic cleaning is expected to resolve operability concerns. The specific cause of the heat degradation is being further evaluated to determine if further corrective actions are necessary.

NOTE: The Energy Industry Identification System (EIIS), System Identification (SI) and Component Function Identification (CFI) Codes are included in parentheses, "(SI/CFI)", where applicable, as required by 10 CFR 50.73 (b)(2)(ii)(F).