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DUKE POWER

December 8, 1989

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

Subject: McGuire Nuclear Station Unit 2 Docket No. 50-370 Licensee Event Report 370/89-12

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 370/89-12 concerning a missed Diesel Generator 2B surveillance. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(i)(B). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Imy 2 ME Comel

T.L. McConnell

DVE/ADJ/cbl

Attachment

xc: Mr. S.D. Ebneter Administrator, Region II U.S. Nuclear Regulatory Commission 101 Marietta St., NW, Suite 2900 Atlanta, GA 30323

> INPO Records Center Suite 1500 1100 Circle 75 Parkway Atlanta, GA 30339

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Mr. Darl Hood U.S. Nuclear Regulatory Commission Office of Nuclear Reactor Regulation Washington, D.C. 20555

Mr. P.K. Van Doorn NRC Resident Inspector McGuire Nuclear Station

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ACILITY NAME (1)		• d = = = = = = =							DOCKET NUMBER	(2)	PAGE 13
ncGuire Nucle	ar Sta	tion, Uni	t 2						0 15 10 10	1013171	1 OF 111
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ABSTRACT (Limit to 1400 a On July 2 perform a maintenan for a suc Invalid T Productio Quality A reclassif switch to occurred 29, 1989 (TSs) req days to e	6, 198 heat ce on cessfu est, R n Engi ssuran ied as be ou becaus at 152 uire t	9, Diesel soak and the D/G. 1 start. un for Tr neer ques ice (QA) p a Valid t of cali e of two 2, anothe hat the s	Genera bearing The st Operat coublesh stioned berson o Failure bration blown f er Valid surveill llowing	tor ( def] art t ions ootin the s n a s . Su . Or uses Fail ance two V	(D/G) lectic time ( (OPS) hg. ( start surve: ubseque h July on the lure of test: Valid	2B was on read was gro ) person class illance uent in y 27, he vol occurre ing fro Failu	s sta dings eater onnel ember ifica e of nvest 1989, tage ed on equen	rted for which w than th classif 8, 1989 tion whi the D/G igations at 0237 regulato D/G 2B. cy be in	a fourte as requir e 11.0 se ied the s , an OPS le workin Logbooks. had foun , a Valid r for D/G Technic creased f	en hour r ed becaus conds all tart as a Nuclear g with a The sta d a speed Failure 2B. On al Specif rom every	August

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U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104 EXPIRES 8/31/00

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)
		YEAR SEQUENTIAL REVISION	
McGuire Nuclear Station, Unit 2	0 15 10 10 10 13 1 7	0 8 9 - 0 1 2 - 0 0	0 2 0 1 1 1

EVALUATION:

Background

Each unit at McGuire Nuclear Station has two independent D/Gs [EIIS:DG]. As part of the Essential Power System [EIIS:EB], they provide standby AC power to the equipment required to safely shutdown the Reactors [EIIS:RCT] in the event of a major accident and to maintain the facility in the shutdown or refueling condition for extended periods of time. The D/Gs are required in a Blackout (loss of normal power) condition as well as a Blackout and Loss of Coolant Accident conditions.

TS 3.8.1.2 requires the following A.C. electrical power sources to be operable in Mode 5 (Cold Shutdown), and Mode 6 (Refueling):

- A. One circuit between the offsite transmission network and the Onsite Essential Auxiliary Power System, and
- B. One D/G. Either D/G is capable of meeting this requirement.

TS 4.8.1.1.2, in part, requires the D/G to start and accelerate to at least 488 RPM in less than or equal to 11 seconds. The voltage and frequency shall be at least 4160 volts and 57 HZ within 11 seconds after the start signal. This TS also requires that each D/G be demonstrated operable once per 31 days if the number of failures in the last 20 valid tests is one or none. If two or more valid failures have occurred in the last 20 valid tests, the surveillance frequency is increased to once per 7 days.

CMP 2-6, Diesel Generator Logbook, describes the method used to log all D/G start attempts and classify them as "Valid Success", "Valid Failure", "Invalid Test", or "Invalid Test Failure". Page 10 of 11 shows the D/G Start Classification Guide.

Description of Event

On July 9, 1989, at 1535, D/G 2B was started, loaded, and run for approximately 30 minutes to deplete the Day Tank of fuel oil prior to maintenance. The D/G was then declared inoperable at 1600 when OPS personnel tagged the D/G out for maintenance. Unit 2 was in Mode 5, and entered Mode 6, on July 10 at 1750.

From July 10 through July 19, maintenance was performed on D/G 2B. This maintenance included rotating the upper and lower cam bearings, replacing nine cam bearing halves, and replacing two connecting rod bearings. Unit 2 entered No Mode (Core Unloaded) on July 19 at 1729.

On July 25 at 0353, D/G 2B was started for post maintenance testing and run at no load condition for approximately 5 minutes. The time to reach 4160 volts was 11.956 seconds. This slow start was expected because of the extensive maintenance on the D/G. During this run, maintenance personnel discovered and subsequently repaired a fuel oil leak. Maintenance personnel also checked the bearings that had maintenance performed on them, and took temperature readings following each D/G start during the post maintenance break in runs.

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)	
		YEAR SEQUENTIAL REVISION NUMBER NUMBER		
McGuire Nuclear Station, Unit 2	0 15 10 10 0 3 7 0	0 8 9 0 1 2 - 0 0	0 13 OF 1 11	

The following table lists post maintenance starts performed on July 25 and recorded in the D/G 2B logbook.

Start Number	Run Time	Seconds To 4160V
706	15 min. No Load	10.314
707	30 min. No Load	10.39
708	30 min. at 400 KW	10.45
	30 min. at 1000 KW	
709	1 hour at 2000 KW	10.83
710	30 min. at 2000 KW	10.87
	2 hours at 3000 KW	
711	2 hours at 3600 KW	10.11

Each of the above starts was classified as an Invalid Test, Run for Troubleshooting by OPS personnel.

On July 26 at 0249, D/G 2B was started for a 14 hour run to thoroughly heat the D/G and allow maintenance personnel to take deflection readings. This was start number 712 in the D/G logbook. The time to 4160 volts was 11.07 seconds. The start was classified as an Invalid Test, Run for Troubleshooting. OPS work request 136725 was issued to correct the cause of the slow start. Instrument and Electrical personnel (IAE) recalibrated the speed switches [EIIS:SIS] for the D/G and found them slightly out of calibration.

On July 27 at 0237, D/G 2B was started for procedure PT/2/A/4350/36B, D/G 2B 24 Hour Run. At 2024, OPS personnel manually tripped the D/G because of loss of voltage control from the Control Room and from the local panel. This was start number 713 and was classified by OPS personnel as a Valid Failure. Subsequent investigations by IAE personnel revealed two blown fuses [EIIS:FU] in the voltage regulator circuitry. The fuses were replaced and the D/G was tested to ensure the problem was corrected. The testing included procedure PT/2/A/4350/19B, D/G 2B Governor and Voltage Regulator Benchmark Test.

Procedure PT/2/A/4350/02B, D/G 2B Operability Test was successfully performed by OPS personnel on July 30, at 2228. The work requests were signed complete and D/G 2B was declared operable at 1050 on July 31.

Unit 2 entered Mode 6 from No Mode on July 31 at 1255 by commencing fuel load operations. D/G 2A was declared inoperable and red tagged for maintenance on July 31 at 1605.

Unit 2 entered Mode 5 at 0628 on August 18. D/G 2A was restored to operable status at 1745 on August 24.

On August 24 at 2030, D/G 2B was again declared inoperable for battery [EIIS:BI] replacement. The operability procedure was run on August 29 at 1102 and the D/G was declared operable at 1400 hours.

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APPROVED DMB ND. 3150-0104 EXPIRES: 8/31/88

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)	
		YEAR SEQUENTIAL REVISION NUMBER NUMBER		
McGuire Nuclear Station, Unit 2	0 5 0 0 0 3 7 0	8 9 - 0 1 2 - 0 0	0 4 0 1 1 1	

At 1522 on August 29, OPS personnel started D/G 2B for a one hour run as required by the Engineered Safeguards Feature (ESF) test. The time to reach 4160 volts was 11.024 seconds as recorded in the D/G Logbook for start number 730. The start was classified as a valid failure. OPS personnel decided to continue on with the ESF test and formulate a plan for correcting the slow start time. The D/G was declared inoperable at 1655 on August 29. This ESF test was completed satisfactorily.

Upon completion of the ESF test, personnel from Mechanical Maintenance, IAE, and OPS conferred to formulate a plan for determining the cause, and correcting the problem of the slow starts on D/G 2B. During the course of this investigation, IAE personnel found the speed sensor had been damaged. The speed sensor was replaced and documented on OPS work request 139534. The speed sensor is manufactured by Airpax Corporation, model number 085-101-0005. The D/G was subsequently retested and declared operable at 2300 on August 31.

Start number 730 for the ESF test was, at that time, the second Valid Failure within the last twenty valid starts (reference TS Table 4.8-1, page 11 of 11 of this LER). This TS requires the surveillance testing of this D/G to be increased from once per 31 days to once per 7 days. OPS personnel began testing D/G 2B according to this requirement.

In October, QA personnel were conducting QA surveillance 89-46 of the D/G Logbook. During the course of this surveillance, an OPS Nuclear Production Engineer reclassified start numbers 710 and 711 from Invalid Test, Run for Troubleshooting, to Valid Success. The starting times and load requirements had been met for a Valid Success.

On November 8 at 1100, following a review of past D/G starts, the OPS Engineer and an OPS Manager reclassified start number 712 as a Valid Failure. This was a conservative determination based on the time to reach 4160 volts of 11.07 seconds. OPS personnel stated they felt the speed sensor was the probable cause of the slow starts but the exact cause of the damage to the speed sensor or when it occurred could not be determined.

With start number 712 reclassified as a Valid Failure, the increased surveillance should have been started when the fuse failure occurred on July 27, start number 713. The operability test was run on July 30 at 2228, and again on August 29 at 1102. Under the seven day surveillance requirement, the operability test should have been performed on August 6; therefore, D/G 2B was technically inoperable from August 6 at 2228, until August 29 at 1102. D/G 2A was inoperable for maintenance on the D/G from July 31 at 1605, until August 24 at 1745. During part of this time, Busline 2B was removed from service and declared inoperable at 1130 on August 3. This Busline was restored to service and declared operable at 0759 on August 19.

## Conclusion

This event is assigned a cause of Management Deficiency because of Inadequate Directives. OMP 2-6 does not provide guidance on when post maintenance testing ends and valid challenges to the D/G begins. OMP 2-6 is written to comply with TS

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EXPIRES: 8/31/06

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		YEAR SEQUENTIAL REVISION NUMBER NUMBER		
McGuire Nuclear Station, Unit 2	0 5 0 0 0 3 7 0	8 9 - 0 1 2 - 0 0	015 01 11	

and with NRC Regulatory Guide 1.108, Periodic Testing of D/G Units Used As Onsite Power Systems. Regulatory Guide 1.108 addresses testing of D/G units during plant preoperational test and periodic testing of D/G units during normal plant operation.

On July 26, OPS personnel believed they had correctly classified start number 712 on D/G 2B as an Invalid Test, Run for Troubleshooting, following extensive maintenance. The classification was based on the guidance in OMP 2-6. During a subsequent surveillance of the D/G Logbook, OPS personnel conservatively decided to reclassify the start as a Valid Failure. This decision was made because the time to reach 4160 volts was 11.07 seconds which is greater than the 11.0 seconds allowed by TS. The surveillance of the D/G Logbook was being performed by McGuire Quality Assurance personnel in conjunction with OPS personnel. The reclassification came after extensive discussions over what constituted post maintenance testing as opposed to valid challenges to the D/G. The decision was made to conservatively classify the start as a Valid Failure.

TS 4.8.1.1.2, Table 4.8.1, lists the frequency of testing for a D/G based on the number of Valid Failures. By reclassifying the start performed on July 26 as a Valid Failure, the surveillance frequency for D/G 2B should have been increased to once per 7 days when the fuses failed in the Voltage Regulator circuit on July 27. The surveillance was performed on July 30 at 2228, and again on August 29 at 1102. D/G 2B was technically inoperable from August 6 at 2228, until August 29 at 1102. In addition, D/G 2A was inoperable from July 31 at 1605 until August 24 at 1745. Neither D/G was technically operable between August 6, 1989 at 2228, and August 24, 1989 at 1745, although D/G 2B would have started and assumed the required loads if needed as shown by the operability test performed on August 29, 1989.

Station personnel involved in the evaluation of this event believe the indicated slow times to reach 4160 volts following the maintenance on D/G 2B were a result of the damaged speed sensor discovered on August 31, 1989. A trend of the time to reach 4160 volts indicates the speed sensor was damaged during or immediately following the maintenance on D/G 2B. The exact cause of the damage to the speed sensor and the time it occurred could not be determined.

A review of the McGuire Licensee Event Reports for the previous twelve months revealed no other events involving missed TS surveillances on the D/Gs because of Inadequate Directives. Eight events did involve missed TS surveillances, therefore, missed surveillances is recurring.

A review of Special Reports for the previous twelve months shows the failure of the speed sensor to be a Recurring Problem. As documented in Special Report 2-M89-0227, this is the fifth speed sensor known to be damaged from apparent contact with the camshaft gear. Maintenance procedures have been changed to remove the speed sensors before removing or replacing the cam shaft bearing shells. This is documented in PT/0/A/4350/21, D/G Periodic Maintenance, change number 13.

The missed surveillance on D/G 2B is not NPRDS reportable. The failure of the speed sensor is NPRDS reportable.

LICENSEE EVI	ENT REPORT	(LER) TEXT	CONTINUATION
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U.S NUCLEAR REGULATORY COMMISSION APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/08

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McGuire Nuclear Station, Unit 2	0 15 10 10 10 31 7	0 8 9 - 0 1 2 - 0 0	016 OF 111	

There were no personnel injuries, radiation overexposures, or uncontrolled releases of radioactive material as a result of this event.

CORRECTIVE ACTIONS:

Immediate: None

Subsequent:

- 1) The damaged speed sensor was replaced.
- PT/0/A/4350/21, D/G Periodic Maintenance was changed to remove the speed sensor before removing or replacing cam shaft bearing shells.
- IAE personnel changed procedure IP/0/A/3250/16A, D/G Speed Switch Calibration, to increase the gap between the camshaft gear and the speed sensor.

Planned:

- Maintenance personnel will conduct a test at the next available D/G outage to determine how the speed sensor is being damaged by the camshaft gear. Measurements will be taken to determine if the camshaft gear has sufficient movement to make contact with the speed sensor.
- Operations personnel will revise Operations Management Procedure 2-6, Diesel Generator Logbook, to provide better guidance on classifying D/G starts. This will include post maintenance testing.
- IAE personnel will reset the gap between the speed sensor and the camshaft gear on all McGuire D/Gs.

## SAFETY ANALYSIS:

During the time that Busline 2B and D/G 2A were out of service for maintenance, and D/G 2B was technically inoperable, the TS requirement to have one D/G operable during Modes 5 and 6 was not met. Offsite power was available for the entire time through Busline 2A. If this offsite power supply had been lost, D/G 2B was capable of starting and assuming the required loads as documented by the operability surveillance test performed on August 29, 1989. The damaged speed sensor may have indicated a slow start time but the D/G would still function to supply emergency power. Also, an additional source of power was available from Unit 1 by way of a crosstie between the 4160 volt distribution centers. This source could have been manually aligned to Unit 2 by the OPS personnel. This source is described in the Final Safety Analysis Report, Section 8.2.1.4.1., Offsite Power System Operational Description.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION	EXT CONTINUATION	TEXT	(LER)	REPORT	EVENT	LICENSEE	
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U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB ND. 3150-0104 EXPIRES: 8/31/88

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McGuire Nuclear Station, Unit 2	0 15 10 0 0 31 70	8 9 - 0 1 2 - 0 0	0 17 OF 1 11	

In Modes 1, 2, 3, and 4, TS 3.8.1.1 requires both D/Gs and both offsite power sources to be operable. Major maintenance is not performed during these modes of operation; therefore, the problem of post maintenance testing would not have occurred. Major maintenance would require the unit to be in Modes 5 or 6.

The health and safety of the public were not affected by this incident.

RC Form 366A

A86 Port 386A	LICI	ENSEE EVENT REPOR	T (LER) TEXT	CONTINU	ATION	1	APPROVED O EXPIRES 8/31	ME ND. 3150-0104
ACILITY NAME (1)			DOCKET NUMBER (2	1	T		6)	PAGE (3)
					YEAR	NUMBER	NUMBER	
McGuire	Nuclear	Station, Unit 2	0 15 10 10 10	13170	8 9.	- 01112	-010	0 18 01 11
EXT (If more space is require	id, use additional N	RC Form 3064 's/ (17)						
SEQUENC	E OF EVEN	<u>TS</u>						
Date	Time	Event						
7/6/89		Unit 2 entered	i Mode 5.					
7/9/89	1535	D/G 2B started	i to deplete	the day	tank	level.		
7/10/89	1750	Unit 2 entered	Mode 6.					
7/10/89 7/19/89	thru	Extensive main	ntenance was	perform	ed on l	D/G 2B.		
7/19/89	1729	Unit 2 core re	eached No Mo	de, core	unload	ded.		
7/25/89	0853	D/G 2B began s min. at no los	start no. 70 ad condition	5 for po	st main	ntenance	testing	- Run 5
	1352	D/G 2B began s	start no. 70	6 - 15 m	in. at	no load		
	1448	D/G 2B began s	start no. 70	7 - 30 m	in. at	no load	•	
	1559	D/G 2B began s	start no. 70	8 - 30 m - 30 m	in. at in. at	400 KW 1000 KW		
	1745	D/G 2B began s	start no. 70	9 - 1 hr	. at 20	000 KW.		
	1930	D/G 2B began s	start no. 71	0 - 30 m - 2 hr	in. at s. at 3	2000 KW 3000 KW.		
	2323	D/G 2B began s	tart no. 71	1 - 2 hr	s. at i	3600 KW.		
7/26/89	0249	D/G 2B began s 11.07 sec.	tart no. 71	2 - 14 h	rs. at	3000 KW	. Start	time
	~0800	W.R. 136725 wa	is issued to	correct	cause	of slow	start.	
	~2000	IAE recalibrat	ed speed sw	itches.				
7/27/89	0237	D/G 2B began s	tart no. 71	3 for 24	hour i	run.		
	~2015	D/G 2B experie	enced voltag	e contro	l fail	ure.		
	2024	D/G 2B was mar	ually tripp	ed.				
7/28/89		IAE discovered circuit.	and replace	ed blown	fuse :	in volta	ge regul	ator

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OME ND. 3150-0104 EXPIRES: 8/31/00

FACILITY NAME (1)			DOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)
				YEAR SEQUENTIAL REVISION	
McGuire	Nuclear	Station, Unit 2	0 15 10 10 10 1 31 71	0 8 9 - 0 1 1 2 - 0 1 0	010 05 1 1
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7/29/89	1336	D/G 2B began	start no. 718 for 2	4 hour run.	
7/30/89	2228	D/G 2B began	start no. 725 for o	operability test.	
7/31/89	1050	D/G 2B was de	clared operable.		
	1255	Unit 2 entere	d Mode 6 - fuel loa	d commenced.	
	1605	D/G 2A was de	clared inoperable a	nd tagged for maintenand	ce.
8/3/89	1130	Busline 2B wa	s tagged and declar	e inoperable for mainter	nance.
8/18/89	0628	Unit 2 entered	d Mode 5.		
8/19/89	0759	Busline 2B was	s restored to opera	ble.	
8/24/89	1745	D/G 2A was rea	stored to operable.		
	2030	D/G 2B was de replacement.	clared inoperable a	nd tagged for D/G batter	ry
8/29/89	1102	D/G 2B began s	start no 729 for op	erability test.	
	1400	D/G 2B was dee	clared operable.		
	1522	D/G 2B began s sec.	start no. 730 for E	SF test. Time to 4160V	11.024
	1655	D/G 2B was dec	clared inoperable.		
	~2300	ESF test was o	completed satisfact	orily	
8/30/89		Mechanical Mai starts of D/G	intenance, IAE, and 2B.	OPS personnel met on sl	.ow
8/31/89		D/G 2B Speed s	sensor was discover	ed damaged and replaced.	
	2300	D/G 2B was dec	clared operable.		

NAC Form 3664



LICENSEE EVENT REPORT (LER) TEXT CONTINUATION			SION	
FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) PAGE (3)	PAGE (3)	
		VEAR SEQUENTIAL REVISION		
McGuire Nuclear Station, Unit 2	0 15 10 10 10 13 17 1	0 8 1 9 - 0 1 1 2 - 0 0 1 1 1 0 1	11	
DIE	SEL GENERATOR TEST SCHEDU	ULE		
NUMBER OF FAILURES IN LAST 20 VALID TESTS*	NUMBER OF FAILURES IN LAST 100 VALID	TEST FREQUENCY		
DIE NUMBER OF FAILURES IN LAST 20 VALID TESTS* < 1	NUMBER OF FAILURES IN LAST 100 VALID TESTS*	TEST FREQUENCY Once per 31 days		

\*Criteria for determining number of failures and number of valid tests shall be in accordance with Regulatory Position C.2.e of Regulatory Guide 1.108, but determined on a per diesel generator basis.

For the purposes of determining the required test frequency, the previous test failure count may be reduced to zero if a complete diesel overhaul to like-new conditions is completed, provided that the overhaul including appropriate post-maintenance operation and testing, is specifically approved by the manufacturer and if acceptable reliability has been demonstrated. The reliability criterion shall be the successful completion of 14 consecutive tests in a single series. Ten of these tests shall be in accordance with the routine surveillance requirements of Specifications 4.8.1.1.2.a.4 and 4.8.1.1.2.a.5; the remaining four tests in accordance with the 184-day requirements specified in the footnote to Specification 4.8.1.1.2.a.4 and Specification 4.8.1.1.2.a.5. If this criterion is not satisfied during the first series of tests, any alternate criterion to be used to transvalue the failure count to zero requires NRC approval.

\*\*The associated test frequency shall be maintained until seven consecutive failure free demands have been performed and the number of failures in the last 20 valid demands has been reduced to one.