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DUKE POWER COMPANY
P.O. BOX 33189
CHARLOTTE, N.C. 28242

HAL B. TUCKER
VICE PRESIDENT
NUCLEAR PRODUCTION

TELEPHONE
(704) 373-4531

July 11, 1986

Dr. J. Nelson Grace, Regional Administrator
U.S. Nuclear Regulatory Commission - Region II
101 Marietta Street NW, Suite 2900
Atlanta, Georgia 30303

Subject: McGuire Nuclear Station, Unit 2
Docket Numbers 50-370
Diesel Generator (D/G) 2A Experienced Failures
Due to a Faulty Relay

Dear Dr. Grace:

In accordance with McGuire Nuclear Station's Technical Specification 4.8.1.1.3, attached is a report concerning Diesel Generator (D/G) 2A experiencing three valid failures due to a faulty relay which occurred at McGuire Unit 2 from May 12 to June 10, 1986.

The event had no impact on the health and safety of the public.

Very truly yours,

Hal B. Tucker/jgm

Hal B. Tucker

JGT/20/jgm

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

Mr. W.T. Orders
NRC Resident Inspector
McGuire Nuclear Station

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

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DUKE POWER COMPANY

McGUIRE NUCLEAR STATION

D/G 2A EXPERIENCED FAILURES DUE TO A FAULTY RELAY

INTRODUCTION:

On May 12, 1986, at 1025, Diesel Generator (D/G) 2A experienced a valid failure due to engine overspeed and was declared inoperable. Subsequently, some loose wiring connections were found and tightened, and both speed switches were calibrated. D/G 2A was declared operable on May 13, 1986, at 0030, following a successful operability run. D/G 2A experienced a second valid failure due to engine overspeed on May 15, 1986, at 0930, and was declared inoperable. The cause of the engine overspeed was investigated and the troubleshooting efforts resulted in fuel rack adjustments and also some unrelated repairs. D/G 2A experienced a valid success when started on May 22, 1986, at 1100, and was declared operable at 1300. On May 31, 1986, D/G 2A experienced a third valid failure due to engine overspeed. During troubleshooting, a faulty overvoltage shutdown relay on D/G 2A was found and replaced. On June 10, at 0126, D/G 2A was started for an operability test and experienced a valid success. On June 10, 1986, at 0510, D/G 2A was declared operable.

Unit 2 was in Mode 6, Refueling, at the time of the first and second D/G 2A valid failures and in Mode 5, Cold Shutdown, at the time of the third D/G 2A valid failure. This event is reportable pursuant to Technical Specification 3.8.1.1.

This event has been attributed to the faulty overvoltage shutdown relay since it caused D/G 2A to experience failures due to engine overspeed. Emergency power was available throughout this event. The health and safety of the public were not affected by this incident.

BACKGROUND:

McGuire Nuclear Station has two independent D/Gs per unit. The D/Gs supply standby AC power to the equipment required to safely shutdown the reactor in the event of a loss of normal power. The D/Gs also supply power to the engineered safeguards equipment as required during a major accident coincident with a loss of normal power (blackout).

Each D/G is equipped with a governor. The governor adjusts energy input to the engine as a function of load to maintain constant speed. Engine speed is monitored by two redundant speed switches which perform certain functions at predetermined speed settings. When the diesel engine overspeeds, the overspeed trip valve opens which drains the lube oil, and lowers the pressure in the sensing line. When pressure in the sensing line drops, redundant pressure switches actuate to pick up relays which give an alarm and deenergize the starting relays, shutting down the engine.

DESCRIPTION OF EVENT:

On May 12, 1986, at 1025, D/G 2A was started (start attempt 354) for an operability test. The D/G tripped due to engine overspeed (valid failure), and was declared inoperable at 1040. At 1534, D/G 2A was started for troubleshooting (start attempt 355) and experienced an invalid test failure due to engine overspeed. At this time, Duke Power personnel discovered some loose wiring connections and one speed switch out of calibration. Subsequently, all loose connections were tightened, and both speed switches were calibrated. Duke Power personnel responsible for these repairs stated that one speed switch being out of calibration should not have caused the engine overspeed trips. At 2200, D/G 2A was started (start attempt 356) and experienced a valid success. D/G 2A was declared operable on May 13, 1986, at 0030. That same day it was also decided that further investigation of the cause of the overspeed trip should be performed. At 1455, D/G 2A was declared inoperable for further troubleshooting. Upon investigation, some additional loose wiring connections were found and burned contacts were discovered on a relay, RVG1 (Cutler Hammer Model D26MRD70A1), that energizes the starting air solenoids. Duke Power determined that the failure of this relay could cause D/G starting air to overspeed the engine. Consequently, the burned contacts were replaced, and all loose connections were tightened. At 1910, D/G 2A was declared operable.

On May 15, 1986, at 0930, D/G 2A was started for an operability test (start attempt 358) and the engine tripped on overspeed (valid failure). D/G 2A was declared inoperable and an investigation was initiated to determine the cause of the overspeed trip. No obvious problems could be found that would have caused the overspeed trips. D/G 2A was started eleven times for troubleshooting and testing without an overspeed trip occurring. From May 15 to May 22, some unrelated repairs were performed and the fuel racks were adjusted. On May 22, 1986, at 1100 D/G 2A was started (start attempt 370) and experienced a valid success. At 1300, D/G 2A was declared operable.

On May 31, 1986, at 1537, D/G 2A was started (start attempt 374) for an operability test. The diesel tripped on overspeed (valid failure) and D/G 2A was declared inoperable. An investigation was then initiated to identify and repair the overspeed trip problems. On June 9, 1986, personnel investigating the problem discovered and replaced a faulty overvoltage shutdown relay, K4 (AMF/Potter & Brumfield model PRD11DYO). On June 10, at 0126, D/G 2A was started (start attempt 405) and experienced a valid success. D/G 2A was declared operable at 0510. D/G 2A has experienced 9 valid successes since the faulty overvoltage shutdown relay was replaced.

CONCLUSION:

The faulty relay, K4, replaced on June 9, is the overvoltage shutdown relay that trips the D/G when manually actuated. This normally closed relay acts as a permissive in series with the relay, K1, that flahses the generator field. The contacts on the overvoltage shutdown relay, K4, were not always making proper contact to allow the field flashing relay, K1, to energize. The net result was that the electric generator would not always load and the engine governor could not compensate fast enough to prevent engine overspeed.

The D/G 2A overspeed trips were erratic in their occurrence. From May 12, 1986, to June 10, 1986, D/G 2A was started a total of 52 times. During this period, 3 valid failures and 1 invalid test failure occurred due to engine overspeed. The remaining starts resulted in 38 invalid tests and 10 valid successes without an overspeed trip.

This incident has been attributed to the faulty overvoltage shutdown relay since it caused D/G 2A to experience failures due to engine overspeed. A review of past reports indicated that there are no previous reportable incidents similar to this one. Therefore, this is considered an isolated event.

A search of Nuclear Plant Reliability Data System (NPRDS) was performed on the AMF/Potter and Brumfield, model PRD11DYO relay. The search revealed that no similar failures had been reported on this model relay.

There were no personnel injuries, radiation overexposures, or release of radioactive materials as a result of this incident.

CORRECTIVE ACTIONS:

Subsequent:

1) All loose connections were tightened, the speed switches were calibrated, some contacts on a relay (RVG1) were replaced, and a faulty overvoltage shutdown relay (K4) was also replaced on D/G 2A.

2) The fuel racks were adjusted.

SAFETY ANALYSIS:

Technical Specification (T.S.) 3.8.1.2 requires that with the unit in Mode 5 or 6, the following AC electrical power sources shall be operable: 1) one circuit between the offsite Transmission Network and the onsite Essential Auxiliary Power System, and 2) one diesel generator. Unit 2 was either in Mode 5 or 6 throughout this incident. During the time that D/G 2A was inoperable D/G 2B was operable.

T.S. 3.8.1.1 requires that when a D/G is inoperable, the remaining D/G be demonstrated operable within 1 hour and at least once per 8 hours thereafter. Since this T.S. is applicable only in Modes 1 through 4, operability runs were not performed on D/G 2B.

If a unit blackout had occurred while D/G 2A was inoperable, D/G 2B would have provided necessary emergency power. Train B of the Residual Heat Removal (ND) system and an emergency boration flow path were operable during the time D/G 2A was inoperable with Unit 2 in Modes 5 and 6.

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