



PECO NUCLEAR

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T.S. 6.9.2

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

SUBJECT: Limerick Generating Station, Unit 2
Special Report for a Valid Emergency
Diesel Generator Test Failure

REFERENCE: Technical Specifications Sections 4.8.1.1.3 and
6.9.2

This Special Report is submitted pursuant to the requirements of Technical Specifications (TS) Section 6.9.2 as required by TS Surveillance Requirement 4.8.1.1.3. TS Surveillance Requirement 4.8.1.1.3 requires reporting of all diesel generator failures, valid or non-valid, within 30 days. The report is required to include the information recommended in Regulatory Position C.3.b of Regulatory Guide (RG) 1.108, "Periodic Testing of Diesel Generator Units as Onsite Electric Power Systems at Nuclear Power Plants," Revision 1, August 1977.

On January 1, 1997, Unit 2 was operating at 87.3% power in end of cycle coastdown approaching a refueling outage scheduled to commence on January 31, 1997. The D21 Emergency Diesel Generator (EDG) was being run for its monthly surveillance test (ST) in accordance with ST-6-092-311-2, "Diesel Generator Slow Start Operability Test Run." All other Unit 2 EDGs were operable. The D21 EDG was successfully started in the test mode from the Main Control Room (MCR). In accordance with the ST procedure, the Equipment Operator (EO) stationed in the D21 EDG room increased the mechanical governor speed setting to its high speed stop. The EO expected that the engine speed would remain at the rated value and be controlled by the electronic governor. However, engine speed increased to a value corresponding to the mechanical governor high speed stop. This indicated that the electronic governor was potentially malfunctioning. Upon observing this condition the EO notified the MCR. Using the manual speed

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control handswitch, MCR Operations personnel successfully lowered speed to the desired value, thereby indicating that the electronic governor appeared to be functioning (i.e., remote control was functional). The D21 EDG was observed for approximately 10 minutes and continued to run unloaded satisfactorily. The ST procedure was aborted and the D21 EDG was manually shutdown for investigation.

Inspection of the D21 EDG Woodward electronic governor (EGA) wiring connections identified a loose wire. Specifically, a 'banana' test jack had been installed in conjunction with the wire lug and the terminal screw was making minimal thread engagement. Woodward governor terminal blocks characteristically have small, short terminal screws. Station personnel also noted that several terminals on the EGA and the motor operated potentiometer (MOP) have two wires landed under one terminal screw. This would be similar to having one wire and a banana jack under one terminal screw. With these conditions, a maximum of two threads are engaged. Typically the first thread can not be credited since the screw end is tapered to facilitate installation. This leaves only one thread of effective engagement.

The banana jacks were removed from all terminals on the EGA, and all wires on the terminal block were tightened. The D21 EDG was successfully tested in accordance with procedure ST-6-092-314-2 and returned to an operable status.

The D21 EDG had been last satisfactorily tested on November 27, 1996. A review of maintenance records did not reveal any activities that were performed since that time that would have affected the EGA wiring. Therefore, station personnel concluded that this condition occurred on January 1, 1997, and was the result of normal vibration and wear, and may have been abetted by the presence of the banana jack. A contributing factor is the location of the subject terminal block. The terminal block is located on the bottom of the EGA box and is difficult to access because of its proximity to a panel wire trough.

A review of operating experience determined that a similar condition occurred on January 2, 1993, on the D21 EDG when a loose wire on the EGA caused the EDG output to be erratic. Another similar condition occurred on February 24, 1996, when a loose wire on the D21 EDG MOP caused the engine load to drift to maximum. No other events were found on any other Unit 1 or Unit 2 EDG that were caused by loose wires on the EGA. The review also found that several EDG failures were attributed to loose electrical components, including wires, relays and fuses. In response to these prior events, the procedure for EDG 18-month maintenance inspection was revised to require a check for tightness of these components. This procedure was last performed on the D21 EDG in May 1996.

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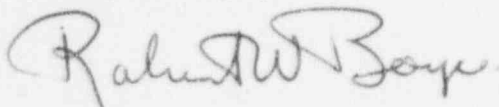
Corrective actions implemented or planned as a result of this latest event are as follows:

1. All other Unit 2 EDGs were tested within 24 hours per the Technical Specifications action requirements to verify proper operation, and all EDGs operated satisfactorily. All Unit 1 EDGs were tested in accordance with the monthly ST procedure schedule and no abnormalities were observed.
2. Maintenance work orders were initiated to inspect the terminal connections on the EGAs and MOPs of all eight Unit 1 and Unit 2 EDGs prior to the next scheduled ST procedure run. This is in addition to the tightness checks performed during the EDG 18-month maintenance inspection.
3. An evaluation of industry experience was performed and there were no similar findings reported. Further investigation of this event with consideration for the two previous events is in progress, and long term corrective actions will be developed as necessary. The use of longer terminal screws, as well as other alternatives, will be evaluated.
4. Other plant systems which utilize Woodward governors will be evaluated for similar conditions.
5. A supplement to this special report will be issued if significant findings are identified from the investigation stated above.

This event was reviewed using the guidance of RG 1.108, Revision 1, August 1977, Section C.2.e(5) with respect to EDG failures. The intermittent electrical contact caused by the loose wire resulted in the failure of the EGA. Had the D21 EDG been called upon to start in response to a Loss of Coolant Accident signal it is likely that the D21 EDG would have immediately tripped on overspeed. The mechanical governor alone probably would not have limited the speed overshoot on the fast start to a value below the overspeed trip setpoint. Therefore, this is considered a valid test and a valid failure. Since the D21 EDG valid failure is the first failure in the last 20 valid demands, the ST procedure monthly frequency is not required to be changed in accordance with TS Section 4.8.1.1.2.a.

If you have any questions, please do not hesitate to contact Mr. James L. Kantner at (610) 718-3400.

Very truly yours,



DMS/JBM

cc: T. T. Martin, Administrator Region I, USNRC
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