NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

# LICENSEE EVENT REPORT (LER)

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
|---|---|---|
| McGuire Nuclear Station, Unit 1 | 0 5 0 0 0 3 6 9 | 1 OF 0 6 |

TITLE (4) Unit 1 Entered Tech Spec 3.0.3 When Two Vital Battery Chargers Were Deenergized When Diesel Generator 2A Failed To Start on Blackout Test - Relay Malfunction

| 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) |
| 0 6 | 0 1 | 8 8 | 8 8 | — 0 1 0 | — 0 0 | 0 7 | 0 1 | 8 8 | Unit 2 | 0 5 0 0 0 3 7 0 |
| | | | | | | | | | | 0 5 0 0 0 |

| OPERATING MODE (9) | 1 | 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) | 50.72(a)(2)(iv) | 73.71(b) | | |
| | | 20.405(a)(1)(i) | 50.36(c)(1) | 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) | X 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 |
|---|---|
| | AREA CODE |
| Steven E. LeRoy, Licensing | 7 0 4 3 7 3 - 6 2 1 3 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 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | N/A | N/A | C 7 7 0 | Y | | | | | | | |
| | | | | | | | | | | | |

| SUPPLEMENTAL REPORT EXPECTED (14) | | EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
|---|---|---|---|---|---|
| YES (If yes, complete EXPECTED SUBMISSION DATE) | XX NO | | | | |


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

On 06/01/88 at 0320, Diesel Generator (D/G) 2A did not start as required when normal power was purposefully failed to Train 2A during an Engineered Safety Features (ESF) Blackout (B/O) test. Unit 1 then entered the Action Statement of Technical Specification (TS) 3.0.3 because the emergency power supply to the shared Vital Battery Chargers EVCA and EVCC was from D/G 2A (an alignment required by the ESF Train 2A B/O test), and the two chargers deenergized when D/G 2A failed to start. Operations (OPS) restored normal power to Train 2A and restarted EVCA and EVCC Chargers by 0344 on June 1. Operations then logged Unit 1 out of TS 3.0.3. During the subsequent investigation, OPS and Instrumentation and Electrical (IAE) discovered that an intermittent malfunction in a set of contacts in the D/G 2A Start Timing Relay caused the failure of D/G 2A. IAE replaced the relay by approximately 1850 on 06/01/88. This event is assigned a Cause of Other because the equipment malfunction of contacts 4 and 4A on relay 2TRC caused the failure of D/G 2A. IAE will investigate failure mode of the contacts on 2TRC and inspect the other three D/G's relays.


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

INTRODUCTION:

On June 1, 1988 at 0320, Diesel Generator (D/G) [EIIS:DG] 2A did not start as required when normal power was purposefully failed to Train 2A during an Engineered Safety Features (ESF) [EIIS:JE] Blackout test. Unit 1 then entered the Action Statement of Technical Specification (TS) 3.0.3 because the emergency power supply to the shared Vital Battery Chargers [EIIS:BYC] EVCA and EVCC was form D/A 2A (an alignment required by the ESF Train 2A Blackout test procedure), and the two chargers deenergized when D/G 2A failed to start.

Operations restored normal power to Train 2A and restarted EVCA and EVCC Chargers by 0344 on June 1. Operations then logged Unit 1 out of TS 3.0.3. During the subsequent investigation, Operations and Instrumentation and Electrical (IAE) discovered that an intermittent malfunction in a set of contacts [EIIS:CNTR] in the D/G 2A Start Timing Relay [EIIS:RLY] caused the failure of D/G 2A to start during the ESF Train 2A Blackout test. IAE replaced the relay by approximantely 1850 on June 1, 1988.

Unit 1 was in Mode 1, Power Operation, at 100% power, and Unit 2 was in Mode 5, Cold Shutdown, at the time of this event.

This event is assigned a Cause of Other, because the equipment malfunction of contacts 4 and 4A on relay 2TRC caused the failure of D/G 2A to start as designed during the EFS Train 2A Blackout test.

EVALUATION:

Background

The 125 volt direct current (VDC) Vital Instrumentation and Control Power system is a shared system which provides power to all class 1E 125 VDC loads that are essential to reactor control and instrumentation. The system consists of four normally independent channels of power, each consisting of a 125 VDC bus, a 125 VDC battery, and a full capacity charger. The four batteries and associated chargers are EVCA, EVCB, EVCC, and EVCD. The associated buses are EVDA, EVDB, EVDC, and EVDD, respectively. 2.0) The battery charger on each channel is independent and supplies power for both normal bus operation and battery float charging. A standby charger (EVCS) is provided to replace an inoperable charger during testing or maintenance.

TS 3/4.8.2 requires that the four direct current channels be operable and energized in Modes 1, 2 (Startup), 3 (Hot Standby), and 4 (Hot Shutdown). With one 125 VDC battery and/or its normal and standby chargers inoperable or not energized, the TS requires that the associated bus must be energized from an operable battery bank within 2 hours to allow continued operation for up to 72 hours. With more than one battery and/or normal and standby charger inoperable, the Action Statement of TS 3.0.3 applies. (TS 3.0.3 applies when a Limiting Condition for Operation or an Action Statement for another TS cannot be met.) It requires that within 1 hour action shall be initiated to place the unit in a mode in which the specification does not apply by accomplishing a unit shutdown within the following 6 hours, and Mode 5 within the subsequent 24 hours.

The normal power supply for EVCA Charger is bus 1ETA through incoming feeder 1EMXA, and the emergency power supply is from D/G 1A. The alternate power supply for EVCA Charger is from bus 2ETA through alternate incoming feeder 2EMXA,and the emergency power supply for this alignment is from D/G 2A. The normal power supply for EVCC Charger is from bus 2ETA through incoming feeder 2EMXA, and the emergency power supply is from D/G 2A. The ESF Actuation Periodic Test procedure, PT/2/A/4200/09A, is performed in Mode 5 or Mode 6 (Refueling) during each refueling outage to test the ability of the D/Gs to start and load as designed in response to a manually initiated Blackout or Safety Injection [EIIS:BQ] signal. The Train 2A Blackout test portion requires EVCA Charger power to be aligned from its alternate feeder 2EMXA and EVCC Charger power to be aligned from its normal feeder 2EMXA to test the worst case alignment of Vital Battery Charger power in the event of a Train 2A Blackout.

On a Blackout signal, the D/G Load Sequencing system is designed to start the D/G and then sequentially add loads to avoid momentarily overloading the D/G. To start D/G 2A, the sequencer provides a maintained contact closure on a two out of three undervoltage signal to energize and seal in automatic start relays DASR and DASR1. If several prerequisite conditions are met when the DASR contacts close, four starting relays energize through normally closed contacts 2TRC 4 and 4A. After a 20 second time delay, contacts 2TRC 4 and 4A open and the four starting relays deenergize if another contact has not closed to indicate that 50% of D/G engine speed has been attained.

Description of Event

On June 1, 1988, at 0319:49, Operations (OPS) deenergized bus 2ETA to initiate the ESF Train 2A Blackout test. Although the D/G Load Sequencer then actuated as expected, D/G 2A failed to start on an undervoltage signal as designed. Because of the required test alignment, EVCA and EVCC Chargers deenergized when bus 2ETA was deenergized for the test and D/G 2A failed to start to provide emergency power. OPS entered Unit 1 into the Action Statement of TS 3.0.3 at 0320 because EVCA and EVCC Chargers were inoperable.

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

OPS deenergized the D/G 2A Control Power to prevent a D/G 2A start from occurring while they attempted to restore normal power to the two chargers. OPS reenergized bus 2ETA at 0330 by depressing the Normal Supply Breaker pushbutton on the Control Board. OPS then attempted to start both chargers by closing the appropriate contacts in the Control Room, but neither charger would start. OPS investigated and discovered that the Motor Control Center breaker for EVCA Charger had tripped, and the Charger AC Input Breaker for EVCC Charger had tripped. After resetting the two breakers, OPS successfully started EVCA Charger at approximately 0335, but EVCC Charger would not start because the Charger AC Input Breaker tripped again. After several other unsuccessful attempts to start EVCC Charger, OPS was able to start it at 0344, and then logged Unit 1 out of the Action Statement of TS 3.0.3. D/G 2A Control Power was then restored.

IAE and OPS were called in to investigate the D/G 2A start circuitry to determine why D/G 2A failed to start on a Blackout signal. OPS also attempted to start D/G 2A manually from the Control Room and discovered that it would not start in this mode either. This narrowed down the cause of the malfunction since only a few contacts are common to the emergency start and manual start circuits. IAE and OPS began a series of test runs at approximately 1300 to attempt to isolate the cause of the failure. (Sliding links were opened to prevent D/G 2A from actually starting during the testing.) The first six simulated undervoltage signals initiated the appropriate start sequence in the D/G 2A start circuitry which IAE was monitoring with voltmeters. On the seventh simulated undervoltage signal, IAE obtained a reading of 18 volts across a part of the D/G 2A start circuit where no voltage reading should have been evident, indicating some unexplained resistance across contacts 4 and 4A of relay 2TRC. This indicated that contacts 4 and 4A on relay 2TRC were not remaining completely closed for the designed 20 second time delay to energize the four starting relays and initiate a D/G 2A start. IAE discovered upon examination of contacts 4 and 4A that this set of contacts was pitted and blackened. IAE replaced relay 2TRC by approximately 1850.

Conclusion

This event has been assigned a Cause of Other because of the equipment malfunction in the D/G 2A start circuit. IAE and OPS discovered during troubleshooting that an intermittent failure of contacts 4 and 4A in D/G 2A Start Timing Relay 2TRC to stay completely closed for the designed 20 second time delay prevented D/G 2A from starting on the Train 2A Blackout signal.

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

IAE could not determine exactly why contacts 4 and 4A of relay 2TRC failed. The pitting and blackening of the contacts may have been either the cause or the result of the failure of the contacts to stay closed. One theory is that dust on the contacts could have caused the initial failure. IAE will perform further testing on the relay to attempt to determine the failure mode of contacts 4 and 4A. Relay 2TRC is a Cutler Hammer relay, model number D26MRD7CA1, equipped with a model number D87XEL30 time delay. According to a manufacturer's representative, these type relays are listed as suitable for 500,000 operations, but are actually tested to 25 million operations. Relay 2TRC and the corresponding relays have presumably operated much less than 500,000 times.

IAE has recently set up a yearly preventive maintenance inspection and cleaning of the D/G Control Panels according to procedure IP/0/A/3190/01, Preventive Maintenance and Cleaning. The D/G 2A Control Panel, which contains relay 2TRC, was inspected April 26, 1988. Contacts 4 And 4A would not have been specifically inspected because they are located inside relay 2TRC.

Operations has frequently encountered problems with various Vital Battery Charger breakers tripping while attempting to restore power to them. Licensee Event Report (LER) 369/88-04 documents a similar problem with the charger breakers, but the planned corrective action for IAE to further investigate this problem, specifically with EVCB Charger, has not yet been completed.

A review of LERs for McGuire revealed no entries into TS 3.0.3 due to equipment malfunctions similar to the failure of contacts 4 and 4A of relay 2TRC; therefore, this event is not considered to be recurring.

This event is reportable to the Nuclear Plant Reliability Data System (NPRDS). According to the search of the NPRDS, three relay or contact failures have previously caused D/G problems at McGuire. Failures of relays or contacts have also caused failures of D/Gs to start or D/G trips at other plants.

CORRECTIVE ACTIONS:

Immediate: OPS restored power to the EVCA and EVCC Vital Battery Chargers and exited TS 3.0.3 by 0344 on June 1, 1988.

Subsequent: IAE replaced relay 2TRC by 1850 on June 1, 1988.

Planned:

1) IAE will perform further investigation to try to determine the failure mode of contacts 4 and 4A of relay 2TRC.

2) A revision to this LER will be submitted if the IAE investigation into the contact failure reveals a failure mode.

3) IAE will inspect contacts 4 and 4A of the 2TRC relays on the other three D/Gs.

4) IAE will investigate problems with Vital Battery Charger breakers tripping when chargers are reenergized.

SAFETY ANALYSIS:

Unit 1 was in TS 3.0.3 for approximately 24 minutes on June 1, 1988 because EVCA and EVCC Chargers were deenergized. Normal power was restored well within the one hour allotted in the TS 3.0.3 Action Statement. EVCA and EVCC Batteries were operable during this time period to provide power for the EVDA and EVDC buses. The minimum duty cycle required for the batteries is one hour according to the McGuire Final Safety Analysis Report (FSAR); however, each battery actually can carry its normal load and that of another battery for three hours. Also, EVCB and EVCD Chargers were fully operable during this time period with normal power from Train 1B and Train 2B, respectively.

Unit 2 was in Mode 5 during the initiation of the ESF Train 2A Blackout test. Only one D/G and one offsite power source is required by TSs to be available during Mode 5, and D/G 2B and one offsite power source were operable when D/G 2A failed to start. It should be noted that D/G 2A started on an undervoltage signal in several starts just prior to the failure to start at 0320. Also, an undervoltage signal to D/G 2A caused the expected responses in the D/G 2A start circuit in nine of ten tests subsequent to the failure.

No personnel injuries, radiation overexposures, or releases of radioactive material occurred as a result of this event.

This event is considered to be of no significance with respect to the health and safety of the public.

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July 1, 1988

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

Subject: McGuire Nuclear Station, Units 1 and 2
Docket No. 50-369, -370
Licensee Event Report 369/88-10

Gentlemen:

Pursuant to 10CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 369/88-10 concerning Unit 1 entering Tech Spec 3.0.3 when two Vital Battery Chargers were deenergized when Diesel Generator 2A failed to start during a Unit 2 Blackout test. This report is being submitted in accordance with 10CFR 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,

Hal B. Tucker

Hal B. Tucker

SEL/291/bhp

Attachment

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