Commonwealth Edison
Dresden Nuclear Power Station
R.R. #1
Morris, Illinois 60450
Telephone 815/942-2920

August 29, 1991

EDE LTR #91-535

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

Licensee Event Report #91-021-0, Docket #050237 is being submitted as required by Technical Specification Table 3.2.2, NUREG 1022 and 10 CFR 50.73(a)(2)(v)(D).

E. D. Eenigenburg
Station Manager
Dresden Nuclear Power Station

EDE/ade

Enclosure

cc: A. Bert Davis, Regional Administrator, Region III
File/NRC
File/Numerical

(ZDVR/294)



IE22
1/1

LICENSEE EVENT REPORT (LER)

Form Rev 2.0

| Facility Name (1) | Docket Number (2) | Page (3) |
|---|---|---|
| Dresden Nuclear Power Station, Unit 2 | 0 5 0 0 0 2 3 7 | 1 of 0 4 |

Title (4) Improper Setpoint of Second Level Undervoltage Relays Due to Management Deficiency

| 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 7 | 3 1 | 9 1 | 9 1 | — | 0 2 1 | 0 0 | 0 8 | 2 2 | 9 1 | Dresden Unit 3 | 0 5 0 0 0 2 4 9 |

| OPERATING MODE (9) | N | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11) | | | |
|---|---|---|---|---|---|
| POWER LEVEL (10) | 0 9 9 | ___ 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) |
| | | ___ 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 AREA CODE |
|---|---|
| Steve Lawson, Technical Staff Safety System Group Leader Ext. 2785 | 8 1 5 9 4 2 - 2 9 2 0 |

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

| CAUSE | SYSTEM | COMPONENT | MANUFAC-TURER | REPORTABLE TO NPRDS | CAUSE | SYSTEM | COMPONENT | MANUFAC-TURER | REPORTABLE TO NPRDS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |

| SUPPLEMENTAL REPORT EXPECTED (14) | Expected Submission Date (15) | Month | Day | Year |
|---|---|---|---|---|
| X Yes (If yes, complete EXPECTED SUBMISSION DATE) ___ NO | | 0 3 | 3 1 | 9 1 |

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

On July 31, 1991 at 1530 hours with Unit 2 at 99% and Unit 3 at 59% rated core thermal power during Electrical Distribution System Functional Inspection (EDSFI), an NRC inspection team questioned whether the setting of the 4KV emergency bus Second Level Undervoltage relays (set at 3708 volts) would provide adequate protection to Class 1E equipment. An engineering review was performed for Dresden Unit 2 Division II utilizing the Unit 2 Emergency Diesel Generator Cooling Water Pump (DGCWP) as the most limiting safety component. To start and operate the DGCWP, 85 and 90% of the 460 volt motor nameplate voltage must be available at the motor terminals respectively. Due to the greater voltage drops associated with the starting currents the calculated voltage at the 4kV safety bus will be greater for the starting case. Based upon these required motor terminal voltages the preliminary calculated voltage required at the 4kV safety bus (Bus 24-1) must be greater than 3960 volts to start and 3850 volts to run the Unit 2 DGCWP. Prompt investigation and review resulted in implementation of compensatory measures, performance of an operability determination, and a 10CFR50.72 4 hour notification.

Although the preliminary calculations were performed for Unit 2 Division II Safety Buses, the compensatory actions were conservatively applied to both Unit 2 and Unit 3 safety divisions. Engineering will continue to refine their calculations as more data is received and will also evaluate long term corrective actions for all Safety Buses with respect to the degraded voltage protective relaying system. Safety significance was mitigated by a history review of grid voltage conditions which indicates that the probability of low grid voltage conditions which render the ECCS systems inoperable, occurring coincident with an accident condition is extremely low.

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2527 MWt rated core thermal power

Nuclear Tracking System (NTS) tracking code numbers are identified in the text as (XXX-XXX-XX-XXXXX)

EVENT IDENTIFICATION:

Improper Setpoint of Second Level Undervoltage Relays Due to Management Deficiency

A. CONDITIONS PRIOR TO EVENT:

Unit(s): 2/3 Event Date: July 31, 1991 Event Time: 1530 Hours

Reactor Mode: N Mode Name(s): Run/Run Power Level(s): 99%/59%

Reactor Coolant System (RCS) Pressure: 999/1005 psig

B. DESCRIPTION OF EVENT:

On July 31, 1991 at 1530 hours with Unit 2 at 99% and Unit 3 at 59% core thermal power during a Dresden Station Electrical Distribution System [EB] Functional Inspection (EDSFI), the Nuclear Regulatory Commission (NRC) inspection team performed a review of a preliminary Electrical Load Management System (ELMS) calculation of the auxiliary power system. This preliminary calculation showed that 480 V-ac Motor Control Centers (MCC) [ED] exhibited low voltage conditions. Based on these results, the NRC requested Commonwealth Edison Company (CECo) to verify that the existing degraded voltage relay setpoint (3708 volts on the 4 KV safety bus [EB]) was sufficient to start and operate all safety related (Class 1E) equipment.

CECo performed a preliminary calculation of auxiliary power system voltage for Dresden Unit 2 Division II utilizing the Unit 2 Emergency Diesel Generator [LB] Cooling Water Pump (DGCWP) as the most limiting Class 1E load. The DGCWP was selected since it was the largest electrical load on the lowest voltage MCC. The preliminary calculations determined that the minimum 4 KV-ac safety bus voltage to assure starting and running the DGCWP is 3960 and 3850 volts respectively. Based on these results, compensatory measures were developed to ensure the availability of the DGCWP. These compensatory measures were discussed with Nuclear Reactor Regulation (NRR) and NRC Region III personnel on July 31, 1991, and promptly incorporated into Dresden Operating Order 20-91, Operator Compensatory Actions associated with a degraded voltage on Buses 23-1 (33-1), 24-1 (34-1).

C. APPARENT CAUSE OF EVENT:

This report is submitted in accordance with 10CFR50.73(a)(2)(v)(D) which requires the reporting of any event or condition that could have prevented the fulfillment of the safety function of systems that are needed to mitigate the consequences of an accident. The apparent cause of the event is attributed to inadequate design control due to management deficiency. Based on a review of the modification that installed the second level undervoltage relays, the following management deficiencies were identified which resulted in inadequate undervoltage relaying configuration control:

1. The setpoint calculation was not performed to an approved Quality Assurance (QA) program.

2. The setpoint calculation was not documented in accordance with 10CFR50 Appendix B.

The setpoint calculation methodology was determined to be inadequate due to the following factors:

1. Increased motor currents due to lower motor voltage were not accounted for.

2. Transformer voltage drops were not accurately modeled.

3. The loading assumptions were non-conservative.

4. The limiting case load selected was not bounding.

D. SAFETY ANALYSIS OF EVENT:

Based on a review of Dresden switchyard voltages for the previous four years, the frequency of degraded grid voltage (134 kV and 347 kV) which results in 4 kV safety bus voltages <3850 volts (LOCA + BOP load case) was determined to be approximately 1% and 2.5% for Units 2 and 3 respectively. At these switchyard voltages, in the unlikely event that a LOCA occurred with offsite power available combined with BOP loads the expected 4 kV safety bus voltage will be approximately 3850 volts. Therefore, the safety significance of the LOCA concurrent with degraded grid voltage is mitigated by the current analysis that supports that all Emergency Core Cooling Systems can perform their intended function at a safety bus voltage of 3850 volts or greater. However, the DGCWP operability cannot be assured for 4 kV safety bus voltages < 3960 volts.

Compensatory measures to ensure DGCWP operability in this scenario were discussed on a conference call with CECo, NRR, the NRC EDSFI team and Region III. It was determined that these measures would be put in place immediately and further testing and evaluations would be performed expeditiously by CECo. Currently compensatory measures are in place at levels which assure safety related equipment will start and run. If equipment does not start, direction is given to the Operators to separate from offsite power and allow Class 1E power supplies to provide adequate voltage and power.

E. CORRECTIVE ACTIONS:

As immediate corrective actions, Operations personnel were informed through Daily Orders and given guidance to take action at 4000 V, 3900 V, and 3850 V levels. Training was provided to the Operating crews prior to assuming their shift. An Operating order was written on August 1, 1991 detailing the actions to be taken as above.

The relays were installed and the settings were established for Unit 2 and Unit 3 in 1982 and 1983 respectively. As a result of an internal Quality Assurance Audit in 1985, a Stop Work Order had been placed on in-house engineering activities for design document preparation on December 3, 1985. This required all safety related design documents be prepared by architect-engineers with 10CFR50 App. B Quality Assurance programs approved by CECo Nuclear Quality Programs. This Stop Work Order was clarified on September 5, 1986 to include calculations for setting or sizing of safety related protective relays, trip devices, thermal overloads, fuses and any other protective device calculation performed by either CECo System Planning Department or Station Electrical Engineering Department. The Stop Work Order was removed on November 19, 1986 on the condition that appropriate procedures be developed, independently reviewed and approved prior to in-house design document preparation. This requirement was included in Station Nuclear Engineering Department Procedure Q.51.

Detailed procedures for design document preparation and control have since been implemented. Of interest to the setting of the degraded voltage protection relay are:

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|---|---|
| ENC-QE-51 | Design Document Preparation |
| ENC-QE-51.D | Controlled Analysis by Nuclear Engineering Department |
| ENC-QE-59 | Nuclear Engineering Department Responsibilities for Auxiliary Power Settings |
| QE-59 Exhibit O | Undervoltage and Overvoltage Relay Section and Settings |

It is further believed that the technical inadequacies of the degraded voltage relay setpoint calculation are an isolated incident as the device is unique, having not previously been utilized on the CECo System. It is further unique as the relays on the 4KV system would typically be controlled by the System Planning Department; however, as this relay protects only station equipment, and does not have any function which would impact the transmission system, the setpoint design activity was assigned to the Station Electrical Engineering Department. Station Electrical setting calculations were otherwise limited to low voltage breaker trip settings. The setpoints of the degraded voltage relays are currently being reviewed by Engineering for all CECo nuclear Units in accordance with IE Notice 91-29 (237-200-91-12801).

Further corrective actions are to complete additional auxiliary power system calculations for Unit 2 Division II by September 30, 1991, Unit 2 Division I by November 30, 1991 and Unit 3 Division I and II by January 31, 1992 (237-200-91-12802). A supplemental report will be issed to provide updated information concerning this topic (237-200-91-12803).

F. PREVIOUS OCCURENCES:

No previous errors involving this calculation have been indentified.

G. COMPONENT FAILURE DATA:

There were no component failures during this event: therefore, this section is not applicable.