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

November 25, 1992

CWS LTR #92-695

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

Licensee Event Report 92-37, Docket 050237 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10 CFR 50.73(a)(2)(ii)(B).

L. J. Gerner for

Charles W. Schroeder
Station Manager
Dresden Nuclear Power Station

CWS/

Enclosure

cc: A. Bert Davis, Regional Administrator, Region III
NRC Resident Inspector's Office
File/NRC
File/Numerical

300163

(ZDVR/790)

IE24

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 5

Title (4) Unit Emergency Bus Undervoltage Relay Susceptible to Setpoint Drift Due to Design 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)
1 0	2 7	9 2	9 2	0 3 7	0 0	1 1	2 5	9 2	Dresden Unit 3	0 5 0 0 0 2 4 9

OPERATING MODE (9)	N
POWER LEVEL (10)	0 9 6

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)

___	20.402(b)	___	20.405(c)	___	50.73(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
___	20.405(a)(1)(iii)	___	50.73(a)(2)(i)	___	50.73(a)(2)(viii)(A)		in Abstract
___	20.405(a)(1)(iv)	X	50.73(a)(2)(ii)	___	50.73(a)(2)(viii)(B)		below and in
___	20.405(a)(1)(v)	___	50.73(a)(2)(iii)	___	50.73(a)(2)(x)		Text)

LICENSEE CONTACT FOR THIS LER (12)

Name	TELEPHONE NUMBER
	AREA CODE
Emory Johnson, Technical Staff System Engineer Ext. 2603	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	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
B	E B	2 7 #	B 4 5 5	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

		Expected Submission Date (15)	Month	Day	Year
___ Yes (If yes, complete EXPECTED SUBMISSION DATE)	___ X NO				

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

After reviewing a 10CFR Part 21 notification on ABB Type 27N Relays, Dresden Station was informed by Corporate Engineering that the Units 2 and 3 4160 Volt Emergency Bus second level undervoltage relays were susceptible to setpoint drift and loss of time delay function due to elevated radiation dose during a postulated Loss of Coolant Accident (LOCA) and significant fuel failure. This setpoint drift could lead to a failure of the LPCI and Core Spray pumps to restart. During a LOCA event, potential loss of the time delay function may lead to an unnecessary transfer of power to the unit Emergency Diesel Generators during Emergency Core Cooling System (ECCS) pump motor starts. As a compensatory measure, the 2B and 3A Core Spray subsystem pumps were taken out of service and both units placed in a 7-day limiting condition for operation (LCO). These systems are the source of elevated dose rates associated with the relays during the postulated accident. The relays were temporarily altered by removing the components susceptible to setpoint drift. The LCOs were then terminated. This is the first reported instance concerning setpoint drift for this device based on radiation dose effects. Previous events concerning second level degraded voltage relays were reported as LERs 91-21/050237 and 92-04/050249.

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:

Unit Emergency Bus Undervoltage Relays Susceptible to Setpoint Drift Due to Design Deficiency

A. CONDITIONS PRIOR TO EVENT:

Unit(s): 2(3) Event Date: October 27, 1992 Event Time: 1940 Hours

Reactor Mode(s): N(N) Mode Name(s): Run(Run) Power Level(s): 96%(91%)

Reactor Coolant System (RCS) Pressure(s): 1009(1003) psig

B. DESCRIPTION OF EVENT:

At 1940 hours on October 27, 1992, with Unit 2 and Unit 3 in run at 96% and 91% of rated core thermal power, respectively, after reviewing a 10CFR Part 21 notification on ABB Type 27N Relays Dresden Station was informed by the Nuclear Engineering Department (NED) that the Unit 2 and Unit 3 Emergency Bus Second Level Undervoltage Relays [EB] were susceptible to setpoint drift. The drift would occur as a result of the elevated radiation dose that certain internal components to the relays would receive during a postulated Loss of Coolant Accident (LOCA) with significant fuel failure. The specific components affected provide input signal filtering and time delay functions. It is postulated that the dose would be incurred as a result of the radiation field emanating from the Core Spray 2(3)-1404-12 inch injection lines. This setpoint drift may cause the 4160 Volt Emergency Buses 23-1(33-1) and 24(34-1) to unnecessarily transfer to the Emergency Diesel Generators [EK]. The setpoint drift could also lead to failure of the Low Pressure Cooling Injection (LPCI) [BO] and Core Spray [BM] pumps to restart, due to a loss of the ability of the relay to reset following the LOCA event.

As a compensatory measure, Core Spray pumps 2B and 3A were taken out of service and each unit placed in a 7-day limiting condition for operation (LCO) as of 1950 hours. These subsystems were identified as the source of the elevated dose rates associated with the relays during the postulated accident. The relays were temporarily altered to prevent drift and loss of time delay by removing the components susceptible to radiation dose. The time delay function was maintained with the system logic by incorporating the time delay into an Agastat relay which receives its trip signal directly from the second level undervoltage relays. Upon completion of the temporary alterations, the Core Spray subsystems were returned to service. The LCO for Unit 3 was terminated at 2213 hours on October 31, 1992. The LCO for Unit 2 was terminated at 1400 hours on November 1, 1992.

C. APPARENT CAUSE OF EVENT:

This report is being submitted in accordance with 10 CFR50.73(a)(2)(ii)(B) because the plant was in a condition that was outside its design basis.

In an Asea Brown Boveri (ABB) 10CFR Part 21 letter to the NRC dated September 11, 1992, ABB reported that independent testing of the 27N undervoltage relays revealed that the relay time delay and harmonic filter features failed at radiation levels below those for which it had been previously qualified. The failure resulted in the time delay reducing to zero and the relay setpoint drifting high. This failure affects eight relays at Dresden Units 2 and 3 used for second level undervoltage relays on 4160 Volt Buses 23-1, 24-1, 33-1, and 34-1. The potential loss of the time delay feature could cause the transfer of power for these buses to the unit Emergency Diesel Generator inappropriately, since it would not allow for the reduction of motor inrush current. The potential drifting of the relay setpoint in the high direction could similarly cause the transfer of power for the Emergency Buses to the Unit Emergency Diesel Generators, and prevent the restarting of the low pressure Emergency Core Cooling System (ECCS) pumps, if the setpoint increases above the nominal voltage supplied by the Emergency Diesel Generators by not allowing the relays to reset.

D. SAFETY ANALYSIS OF EVENT:

Time Delay Function:

The time delay function is to preclude a motor starting transient inducing a false trip. The Technical Specification margin of safety implicit in Table 3.2.2 for this time delay is the difference between the slowest possible motor starting time (and therefore the longest period of voltage dip) and the minimum time delay of the degraded voltage function (7 seconds less 20%, or 5.6 seconds). This is to assure that a motor starting transient will not result in an unnecessary transfer of auxiliary power to the Emergency Diesel Generator.

Harmonic Filter Function:

Harmonic filter function is a factory option. The relay senses peak voltage of the input signal. The relay accuracy for pure sine waves (no distortion from signals at frequencies other than 60 Hz) is better without the harmonic filter installed. However, if the input waveform contains harmonic distortion, the apparent bus voltage as sensed by the relay could be higher than the actual voltage present at the load terminals.

The System Operational Analysis Department (SOAD) has measured the actual distortion present at the output of the bus potential transformer and evaluated the effect on the relay. The difference between two values in total harmonic content is insignificant in comparison to the other setting tolerances.

This condition does not affect the original LOCA analysis since this condition would not have prevented any ECCS systems from initiating upon reception of a LOCA signal.

D. SAFETY ANALYSIS OF EVENT (Continued):

However, during the course of the recovery (time that the LPCI pumps and Core Spray pumps are required to operate and maintain core cooling) the possibility exists that the setpoint could drift such that the emergency buses would transfer to the unit Emergency Diesel Generators, and the LPCI and Core Spray pumps would be prevented from restarting. The failure potentially affects both divisions of LPCI and Core Spray during a LOCA. However, the probability of relay failure is mitigated by three factors:

1. The time the relays were installed. The present relays were installed after 10/22/91 for both units.

2. The mild radiation field to which the relays have been since being installed.

3. The low probability of an event that results in significant fuel failure.

The dose level seen by these relays under normal operation is less than 1E4 Rad Total Dose for 40 years. This equates to less than 2.5E2 Rad/year, which would allow for nine years operation before the relays would reach the most sensitive radiation dose level discovered in the previously discussed test.

Additionally, since the second level undervoltage relays do not affect the operation of the remaining 4160 Volt Buses, these buses are expected to be available. Consequently, although LPCI and Core Spray may become unavailable, systems such as Condensate [SD], Feedwater [SJ], and Service Water [KG] would be capable of providing core cooling by flooding the containment in accordance with Dresden Emergency Operating Procedures

E. CORRECTIVE ACTIONS:

Immediate corrective action taken was to remove Core Spray pumps 2B and 3A from service, and each unit was placed in a 7-day limiting condition for operation.

A 72-hour Temporary Waiver of Compliance was requested from the NRC and granted in order to perform temporary alterations to address the issue. The waiver was relative to the action statement that requires an immediate and orderly shutdown to commence upon a total loss of function to Degraded Voltage protective features (Technical Specification Section 3.2.B, Table 3.2.2, Note 1). The waiver allowed for the immediate shutdown requirement to be waived for up to a maximum period of one hour per bus and not to exceed two occurrences per bus for the duration of the waiver period. To install the temporary alterations, the trip functions were required to be bypassed. The waiver period began at 1200 hours on October 30, 1992, and continued through 1200 hours on November 3, 1992. For each bus, the actual duration of the LCO entered that was governed by the waiver was less than 30 minutes. The final LCO related to the bus work was terminated at 1213 hours on November 1, 1992.

Under Work Requests 13623, 13624, 13625, and 13626, temporary alterations were performed to remove the harmonic filter and time delay function from the relay. The time delay function was then transferred to an Agastat relay within the system logic. All temporary alterations were installed before 1400 hours on November 1, 1992.

Corrective actions will be completed to permanently resolve the concern. These actions will be completed on Unit 2 by refuel outage D2R14, and on Unit 3 by refuel outage D3R13 (237-180-92-33901).

F. PREVIOUS OCCURENCES:

LER/Docket Numbers	Title
91-021/050237	Improper Setpoint of Second Level Undervoltage Relays Due to Management Deficiency

During an Electrical Distribution System Functional Inspection (EDSFI), the NRC inspection team questioned whether the setting of the Second Level Undervoltage relays would provide adequate protection to Class 1E equipment. An Engineering review was performed. The review resulted in implementation of compensatory measures.

92-004/050249	Improper Setpoint of Second Level Undervoltage Relays Due to Management Deficiency

With Unit 3 shutdown, NED notified Dresden Station that Unit 3 4160 Volt Buses 33-1 and 34-1 calculated critical voltages, after plant modifications, would be 3832 Volts and 3792 Volts, respectively. Based on these calculations and the fact that modifications had to be performed to achieve these voltages, Unit 3 had been in an unanalyzed condition. Corrective actions were to design and install necessary modifications prior to any mode change on either unit.

G. COMPONENT FAILURE DATA:

Manufacturer	Nomenclature	Model Number	Mfg. Part Number
Asea Brown Boveri	Undervoltage Relay	ITE-27N	411T4375-L-HF-DP

An industry-wide NPRDS data base search revealed no failures for ITE-27N type relay device due to setpoint drift.