



**Commonwealth Edison**

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

November 9, 1989

EDE LTR #89-851

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

Attached please find Licensee Event Report #89-027-0, which was prepared in accordance with NUREG 1022. The event described in this report is a postulated loss of Low Pressure Coolant Injection (LPCI) motor control centers resulting from a unique and extremely remote Diesel Generator (DG) voltage regulator failure during a design basis Loss of Coolant Accident (LOCA), concurrent with a Loss of Offsite Power, due to an original construction design deficiency. This concern was originally identified at the Northern States Power Monticello facility. Review of this event with the Corporate Nuclear Licensing staff resulted in it being classified as a voluntary LER due to its generic applicability.

*L. E. Gerner for*

E. D. Eenigenburg  
Station Manager  
Dresden Nuclear Power Station

EDE/jmt

Enclosure

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

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LICENSEE EVENT REPORT (LER)

Form Rev 2.0

Facility Name (1) Dresden Nuclear Power Station, Unit 2 Docket Number (2) 0 15 10 10 10 12 13 17 Page (3) 1 of 0 4

Title (4) Postulated LPCI Swing Bus Loss Resulting From Diesel Generator Voltage Regulator Failure 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	12	8	9	0	2	7	0	1	10	9	8	9	N/A	0	15	10	10	10	12	14	19

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(a)(1)(i)	20.405(a)(1)(ii)	20.405(a)(1)(iii)	20.405(a)(1)(iv)	20.405(a)(1)(v)	20.405(c)	50.36(c)(1)	50.36(c)(2)	50.73(a)(2)(i)	50.73(a)(2)(ii)	50.73(a)(2)(iii)	50.73(a)(2)(iv)	50.73(a)(2)(v)	50.73(a)(2)(vii)	50.73(a)(2)(viii)(A)	50.73(a)(2)(viii)(B)	50.73(a)(2)(x)	73.71(b)	73.71(c)	<input checked="" type="checkbox"/> Other (Specify in Abstract below and in Text) Voluntary

LICENSEE CONTACT FOR THIS LER (12)  
 Name: Joseph Welch, Technical Staff System Engineer  
 Telephone Number: 8 1 5 9 4 2 1 -2 9 2 10  
 Ext. 2666

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)  
 Yes (If yes, complete EXPECTED SUBMISSION DATE) |  NO  
 Expected Submission Date (15) 0 5 10 11 9 10

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

On October 12, 1989 with Unit 2 and Unit 3 in the run mode near full rated core thermal power, it was determined that a postulated failure of the Diesel Generator (DG) voltage regulators during a design basis Loss of Coolant Accident (LOCA), concurrent with a Loss of Offsite Power (LOOP), could render Low Pressure Coolant Injection (LPCI) System Motor Control Centers (MCCs) 29-7/28-7 (Unit 2) or 39-7/38-7 (Unit 3) incapable of performing their intended function. It is postulated that during the LOCA/LOOP, an output voltage regulator failure occurs following the start and initial loading of the Unit DG. The postulated regulator failure is such that the voltage is maintained below that required to carry the LPCI MCC loads, but greater than the voltage required to initiate the automatic low voltage MCC transfer logic. This then results in the loss of the LPCI subsystem and the Division II Core Spray system. The root cause of this event has been attributed to an original construction design deficiency. The safety significance of this postulated failure is minimal because this sequence of events is unique and extremely remote. Corrective action included development of an Operator response procedure, Operator training, and initiation of design reviews. This concern had not been previously identified at the Dresden facility. This event is being reported as a voluntary LER due to its generic applicability.

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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

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:

Postulated LPCI [B0] Swing Bus Loss Resulting From Diesel Generator [EK] Voltage Regulator Failure Due to Design Deficiency

A. CONDITIONS PRIOR TO EVENT:

Unit(s): 2 (3)	Event Date: October 12, 1989	Event Time: 1400 hours
Reactor Mode(s): N (N)	Mode Name(S): Run (Run)	Power Level(s): 99.6% (99%)
Reactor Coolant System (RCS) Pressure: 1003 (1010) psig		

B. DESCRIPTION OF EVENT:

On October 22, 1989 with Unit 2 and Unit 3 both at or above 99% rated core thermal power, a review and analysis of Institute of Nuclear Power Operations (INPO) Operating Experience report OE 3573 was completed concerning discovery of a design deficiency at the Monticello Nuclear Power Station. It was determined that a postulated single failure of the Diesel Generator (DG) [EK] voltage regulators during a design basis Loss of Coolant Accident (LOCA), concurrent with a Loss of Off-Site Power (LOOP), could render Low Pressure Coolant Injection (LPCI) system 480 V swing bus Motor Control Centers (MCCs) [ED] 29-7/28-7 (Unit 2) or 39-7/38-7 (Unit 3) incapable of performing their intended function. The LPCI motor operated injection valves, as well as other LPCI and Recirculation System [AD] motor operated valves that change position during a LPCI automatic initiation, are powered from MCC 29-7/28-7 (MCC 39-7/38-7). MCC 29-7/28-7 (39-7/38-7) is designed to transfer from DG-backed 480 V bus 29 (Unit 3, bus 39) as a primary power source to DG-backed 480 V bus 28 (Unit 3, bus 38) as a secondary power source. The transfer of these MCCs is designed to occur automatically approximately 15 seconds after sensing low voltage on Bus 29(39).

It is postulated that during the design basis LOCA event, concurrent with a LOOP, a DG output voltage regulator failure occurs following the successful start and initial loading of the Unit DG. The regulator failure is such that the voltage is maintained below the voltage required to carry the MCC 29-7/28-7 (39-7/38-7) loads (approximately 80%), but greater than the voltage required to initiate the automatic MCC 29-7/28-7 (39-7/38-7) low voltage transfer logic (approximately 70% for Unit 3 and 50% for Unit 2). Nominal, degraded, and automatic transfer voltages for the affected MCCs are listed below.

Nominal Voltage	480 V ( 100%)
Degraded Voltage	384 V ( 80%)
Automatic Transfer Voltage	
Unit 2 (MCC 29-7/28-7)	240 V ( 50%)
Unit 3 (MCC 39-7/38-7)	336 V ( 70%)

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TEXT Energy Industry Identification System (EIIS) codes are identified in-the text as [XX]

This is postulated to result in loss of the LPCI subsystem. Additionally, it is postulated that the degraded MCC 29-7/28-7 (39-7/38-7) voltage causes degraded voltage on the associated DG-backed 4 KV bus 24-1 (34-1) feeding the MCCs. This is postulated to result in loss of the Division II Core Spray system. Consequently, only the Division I Core Spray system would be available to provide low pressure Emergency Core Cooling System (ECCS) injection.

As immediate corrective action, a memo was written and issued to licensed shift Operations personnel describing this problem. Subsequently, on October 13, 1989, Dresden General Abnormal Procedure (DGA-5), Degraded Voltage on MCC 29-7/28-7 (39-7/38-7) Due to a Failure of the Unit 2(3) Diesel Generator Voltage Regulator During a LOCA/LOOP Event, was written and approved to inform and instruct the Operators in appropriate steps to mitigate this scenario. Also, training was provided on DGA-5 for Operations personnel.

Subsequently, two additional concerns were raised about degraded voltage conditions that could affect the MCC 29-7/28-7 (39-7/38-7) bus equipment operability. They are overvoltage and underfrequency of bus voltage. A revision to the procedure was written and approved on October 17, 1989 to incorporate and mitigate the consequences of these additional concerns.

No equipment was declared inoperable nor was there any actual component failure during this event.

C. APPARENT CAUSE OF EVENT:

Review of this event concluded that this issue did not meet the reporting requirements of 10CFR 50.73(a)(2)(ii) or 10CFR 50.72(b)(1)(ii) because it did not result in an unanalyzed condition that significantly compromised plant safety, due to the unique and extremely remote nature of this postulated scenario. Additionally, this type of failure mechanism was not included in the original design basis. However, it was determined that it should be reported as a voluntary LER due to its generic applicability. A courtesy NRC Emergency Notification System call was completed at 1504 hours on October 12, 1989. The root cause of this event has been attributed to an original construction design deficiency.

D. SAFETY ANALYSIS OF EVENT:

The sequence of events postulated is unique and extremely remote. First, a design basis LOCA must occur; second, a LOOP must occur; and third, the DG output must degrade to a point where equipment function is affected, but the voltage must remain above the trip point for the LPCI MCC 29-7/28-7 (39-7/38-7) automatic transfer circuit. To be of concern, this degradation must occur after the DG is powering the emergency bus. The degradation must also occur before the LPCI injection valve has opened. This time window is less than 40 seconds for the bounding case. The probability of these events occurring individually over the life of the plant is low, and the probability of them occurring simultaneously, within the short time window necessary for DG degradation to be of concern, is conservatively judged to be extremely low (upper bound of 1.2 E-8/year to 3 E-8/year).

Surveillances are performed in accordance with Technical Specification 4.9.D.1 to assure DG operability. Surveillance on the DG auto start and load, including the LPCI MCC 29-7/28-7 (39-7/38-7) transfer, are performed each refueling outage in accordance with Technical Specification 4.9.D.4.

The DGs are also monitored continuously during operation. Significant degradation in the DG output voltage or frequency during accident conditions would result in a control room alarm to alert the Operator. In addition, bus undervoltage (approximately 70%) is alarmed separately in the control room.

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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]		8   9	-	0   2   7	-	0   0	

DGA-5 has been written and implemented to provide the Operators with symptoms by which to recognize the failure of LPCI MCCs 29-7/28-7 (39-7/38-7) to transfer when required. Immediate and subsequent Operator actions to diagnose the condition and effect a transfer from the degraded power source are provided in these procedures.

E. CORRECTIVE ACTIONS:

The immediate corrective action was to issue a memo to licensed shift Operations personnel describing this concern. Subsequently, procedure DGA-5, Degraded Voltage on MCC 29-7/28-7 (39-7/38-7) Due to a Failure of the Unit 2(3) Diesel Generator Voltage Regulator During a LOCA/LOOP Event, was written, approved, and then revised to inform and instruct the Operators in the appropriate steps to mitigate this postulated event (237-200-89-15401).

In addition, an engineering study is being performed concerning a modification to correct this design deficiency. Two of the possibilities include additional protective relays or powering the involved MCCs via an Uninterruptible Power Supply (UPS). These design proposals are currently under review, and an installation schedule is being developed. A supplement to this report will be provided to document the approved modification design and installation schedules (237-200-89-15402).

F. PREVIOUS EVENTS:

This issue developed from an INPO Operating Experience notification concerning a similar concern at the Northern States Power Monticello facility. This concern had not been previously identified at the Dresden site.

G. COMPONENT FAILURE DATA:

As this event did not involve actual component failure, this Section is not applicable.