

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9106180298      DOC. DATE: 91/06/11      NOTARIZED: NO      DOCKET #  
 FACIL: 50-315 Donald C. Cook Nuclear Power Plant, Unit 1, Indiana & 05000315  
 AUTH. NAME      AUTHOR AFFILIATION  
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 BLIND, A.A.      Indiana Michigan Power Co. (formerly Indiana & Michigan Ele  
 RECIP. NAME      RECIPIENT AFFILIATION

SUBJECT: LER 91-004-00: on 910512, while performing main generator max reactive capability test, RPS (reactor trip sequence) occurred. Caused by undervoltage condition sensed on RCP busses. Defective component replaced. W/910611 ltr.

DISTRIBUTION CODE: IE22T      COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 5  
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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	AEOD/DSP/TPAB	1 1	AEOD/ROAB/DSP	2 2
	NRR/DET/ECMB 9H	1 1	NRR/DET/EMEB 7E	1 1
	NRR/DLPQ/LHFB10	1 1	NRR/DLPQ/LPEB10	1 1
	NRR/DOEA/OEAB	1 1	NRR/DREP/PRPB11	2 2
	NRR/DST/SELB 8D	1 1	NRR/DST/SICB8H3	1 1
	NRR/DST/SBLB8D1	1 1	NRR/DST/SRXB 8E	1 1
	<del>REG FILE</del> 02	1 1	RES/DSIR/EIB	1 1
	RGN3 FILE 01	1 1		
EXTERNAL:	EG&G BRYCE, J.H	3 3	L ST LOBBY WARD	1 1
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June 11, 1991

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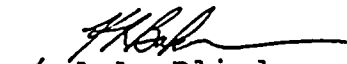
Operating Licenses DPR-58  
Docket No. 50-315

Document Control Manager:

In accordance with the criteria established by  
10 CFR 50.73 entitled Licensee Event Report System,  
the following report is being submitted:

91-004-00

Sincerely,

  
A.A. Blind  
Plant Manager

AAB:sb

Attachment

c: D.H. Williams, Jr.  
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41

## LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) D. C. Cook Nuclear Plant - Unit 1										DOCKET NUMBER (2) 0 5 0 0 0 3 1 5					PAGE (3) 1 OF 4										
TITLE (4) Reactor Protection System Actuation Due to Reactor Coolant Pump Bus Undervoltage Caused by Main Generator Voltage Regulator Failure																									
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	5	1	2	9	1	9	1	0	0	4	0	0	0	6	1	1	9	1	0	5	0	0	0		
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)																							
1		20.402(b)				20.405(c)				<input checked="" type="checkbox"/> 50.73(a)(2)(iv)				73.71(b)											
POWER LEVEL (10)		20.405(a)(1)(i)				50.38(c)(1)				50.73(a)(2)(v)				73.71(c)											
1		20.405(a)(1)(ii)				50.38(c)(2)				50.73(a)(2)(vi)				OTHER (Specify in Abstract below and in Text, NRC Form 366A)											
		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)(vii)(B)															
		20.405(a)(1)(v)				50.73(a)(2)(iii)				50.73(a)(2)(ix)															
LICENSEE CONTACT FOR THIS LER (12)																									
NAME P. F. Carteaux - Safety and Assessment Superintendent										TELEPHONE NUMBER															
										AREA CODE															
										6 1 6		4 6 5 1 - 5 9 0 1 1													
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC															
X	T	L	I	E	C	G	1	0	8	1	0	Y													
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YES (If yes, complete EXPECTED SUBMISSION DATE)												<input checked="" type="checkbox"/> NO													

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

On May 12, 1991 at 0826 hours while performing a main generator "maximum reactive capability" test, a Reactor Protection System actuation (reactor trip sequence) occurred.

The reactor trip was due to an undervoltage condition sensed on the reactor coolant pump (4KV) busses. An investigation concluded that the bus undervoltage condition was due to a decrease in main generator output voltage. This decrease resulted from a transfer from automatic to manual control of the main generator voltage, which was initiated by the malfunction of a protective "exciter field current limiter" device.

The main generator voltage regulation system "exciter field current limiter" panel has been determined to be defective. This component will be replaced. Changes have been made to appropriate operating procedures requiring the matching of manual and automatic main generator voltage regulator setpoints. This will avoid large deviations between setpoints and will enhance electrical distribution system stability during any future transfers of main generator voltage regulation from automatic to manual control.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
D. C. Cook Nuclear Plant - Unit 1	0   5   0   0   0   3   1   5	9   1	—   0   0   4	—   0   0	0   2	OF	0   4

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

Conditions Prior to Occurrence

Unit 1 was in Mode 1 (power operation) at approximately 100 percent of Rated Thermal Power. A "maximum reactive capability" test was in progress.

Description of Event

At 2240 hours on May 11, 1991, performance of procedure \*\*1-OHP SP.070 "Establishing Demonstrated Generator Reactive Limits" commenced. This test procedure calls for the adjustment of main generator (EIIS/TB) reactive loading as far into the underexcited and overexcited regions of the normal operating band as possible while maintaining stator water temperature, main generator reactive loading, main generator output voltage, and main turbine (EIIS/TA-TRB) vibration within specified limits. The underexcited and overexcited conditions are each maintained for a period of approximately six hours. At the beginning and end of each six hour period, main generator related parameters are recorded. During the waiting period with the main generator in the overexcited condition (procedure \*\*1-OHP SP.070, step 6.2.3), main generator voltage control transferred from the automatic voltage regulator (EIIS/TL-EC) to the manual voltage regulator (EIIS/TL-EC). The "Voltage Regulator Failure" annunciator was received, followed by the "Train A Aux Busses Undervoltage" and "Train B Aux Busses Undervoltage" annunciators. At 0826 hours on May 12, 1991, and approximately two seconds after receipt of the above annunciators, the reactor trip on reactor coolant pump (RCP) bus (EIIS/EA-BU) undervoltage actuated. Because the emergency busses (EIIS/EA-BU) were being powered from the RCP busses, they also experienced an undervoltage condition. This resulted in an automatic opening of the bus cross-tie breakers (EIIS/EA-BKR) supplying the emergency busses from the RCP busses. As designed, the AB and CD emergency diesel generators (EIIS/EK) automatically started and supplied power to their respective emergency busses.

When the undervoltage condition on the RCP busses satisfied reactor protection system (EIIS/JE) setpoints and coincidence logic, the reactor trip sequence was initiated, including main turbine trip, automatic starting of the motor-driven (EIIS/BA-P) and turbine-driven (EIIS/BA-P) auxiliary feedwater pumps, opening of the reactor trip breakers (EIIS/JE-BKR), insertion of all control rods (EIIS/AA-ROD) and main feedwater isolation (EIIS/JB). Control room Reactor Operators immediately performed the applicable emergency operating procedures to verify proper response of the automatic protection system, to assess plant conditions, and to implement appropriate recovery actions.

Automatic loading of "blackout loads" onto the re-energized emergency busses was verified by the Operators. Seal injection flow was restored to the reactor coolant pumps (EIIS/AB-P) by manually starting a centrifugal charging pump (EIIS/CB-P), which had been "load shed" from its emergency bus when that bus was de-energized. Pressurizer heaters (EIIS/AB-EHTR) and chemical and volume control system (CVCS) (EIIS/CB) letdown flow were also manually restored. Although reactor coolant pump bus voltage was initially degraded, the busses remained energized, maintaining operation of the reactor coolant pumps, circulating water pumps (EIIS/SG-P), and other major balance-of-plant pumps. The brief de-energization of the emergency busses

LICENSEE EVENT REPORT (LER)  
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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
D. C. Cook Nuclear Plant - Unit 1	0 5 0 0 0 3 1 5	9 1	0 0 4	0 0	0 3	OF 0 4

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resulted in the loss of a number of minor loads which were not automatically restored when the emergency busses were re-energized. These include normal control room lighting (EIIS/FF), steam generator parameter recorders (EIIS/AB-TR), control rod bottom lights (EIIS/AA-ZI), component cooling water temperature indications (EIIS/CC-TI), and alternating current lubricating oil pumps (EIIS/TD-P). The turbine-driven auxiliary feedwater pump was stopped and auxiliary feedwater flow was reduced to stop a minor reactor coolant system (EIIS/AB) cooldown, during which the reactor coolant system average temperature decreased to approximately 534 degrees Fahrenheit. Radiation monitors (EIIS/IL) ERS 1300, ERS 1400, VRS 1500, and SRA 1900 became inoperable when the emergency busses de-energized, due to loss of power supply. The lighting transformer (EIIS/FF-XFMR) was re-energized at 0935, which restored power to normal control room lighting and other minor loads which had lost power at the time of the reactor trip. By 0947 hours, power to all emergency busses from the normal supply (from RCP busses via cross-tie breakers) had been restored. Glycol refrigerant flow to the ice condensers (EIIS/BC), which had been isolated by closure of valves 1-VCR-10 and 1-VCR-20 (EIIS/NH-ISV) at the time of the reactor trip, was restored at 1104 hours.

Cause of the Event

The cause of the reactor trip, as determined from the operation sequence monitor and plant computer printouts, and consistent with the observed sequence of events, was actuation of the reactor protection system (RPS) due to sensed undervoltage on two of the four RCP busses. This RPS function is described in Technical Specifications 2.2.1, Table 2.2-1 item 15 and 3.3.1.1, Table 3.3-1 item 16. The undervoltage condition on the RCP busses was the result of a decrease in main generator output voltage while the RCP busses were being powered by the main generator. The decrease in main generator output voltage resulted from the automatic transfer of main generator voltage control from the automatic voltage regulator to the manual voltage regulator. The specific causes for the generator and distribution system electrical transients which followed the transfer have not been positively identified. The automatic transfer of main generator voltage regulation from automatic to manual control was not appropriate for the existing conditions. A protective device in the main generator exciter circuitry, the "exciter field current limiter panel", initiated the transfer. This device has been determined to be defective. The device may have actuated early due to an erroneous setpoint, or it may have experienced an electronic failure which induced the transfer.

Analysis of the Event

This event is being reported in accordance with 10 CFR 50.73 (a)(2)(iv) as an event that resulted in an unplanned automatic actuation of engineered safety features, including the reactor protection system.

The automatic protective functions associated with the reactor trip sequence were verified to have functioned properly. On de-energization of the emergency 4KV busses, the emergency diesel generators automatically started and powered their associated emergency busses as designed and in accordance



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FACILITY NAME (1)

DOCKET NUMBER (2)

LER NUMBER (6)

PAGE (3)

YEAR SEQUENTIAL REVISION

NUMBER NUMBER NUMBER

D. C. Cook Nuclear Plant - Unit 1

0 5 0 0 0 3 1 5 9 1 - 0 0 4 - 0 0 0 4 OF 0 4

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with applicable accident analyses. Except for a brief period when bus voltage was degraded, offsite power was always available from the normal reserve supply. The emergency busses could, if required, have been loaded to this supply quickly using the guidance in existing emergency operating procedures. In addition to this, offsite power remained available via the Emergency Power (EP) distribution system. The Technical Specification action statements for radiation monitors which became inoperable were met, until monitor operability could be restored. Based on the above, it is concluded that this reactor trip event did not constitute an unreviewed safety question as defined in 10 CFR 50.59(a)(2), nor did it adversely impact the health and safety of the public.

Corrective Action

An investigation resulted in the identification of a failed main generator voltage regulation, "exciter field current limiter panel". This item will be replaced when the required new component has been procured. Pending installation of this replacement component, administrative controls have been placed on the operation of the main generator to ensure that main generator exciter parameters do not approach values at which unit operation may be affected by the failed component. In addition to this, operating procedures have been changed to require periodic verification that manual generator voltage regulator and automatic generator voltage regulator setpoints are closely matched. This should enhance electrical distribution system stability in the event of any future transfer from automatic to manual main generator voltage control.

Failed Components

Plant Designation: Exciter Field Current Limiter Panel  
Manufacturer: General Electric  
Model: 357932 JA115A3  
EIIS Code: TL-EC

Previous Similar Events

LER 50-316/87-007



