



Illinois Power Company
Clinton Power Station
P.O. Box 678
Clinton, IL 61727
Tel 217 935-5623
Fax 217 935-4632

John G. Cook
Vice President

U-602457
L45-95(06 - 13)LP
2C.220
JGC-245-95
June 13, 1995
10CFR50.73

Docket No. 50-461

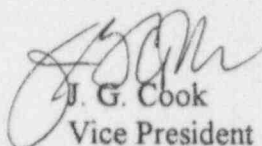
Document Control Desk
Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Clinton Power Station - Unit 1
Licensee Event Report No. 95-005-00

Dear Sir:

Enclosed is Licensee Event Report No. 95-005-00: Fault in Reactor Recirculation Control Circuitry Causes Pumps to Trip from Fast to Slow, Operation in the Restricted Zone and Manual SCRAM. This report is being submitted in accordance with the requirements of 10CFR50.73.

Sincerely yours,



J. G. Cook
Vice President

MRS/csm

Enclosure

cc: NRC Clinton Licensing Project Manager
NRC Resident Office, V-690
Regional Administrator, Region III, USNRC
Illinois Department of Nuclear Safety
INPO Records Center

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LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS
INFORMATION COLLECTION REQUEST: 50.0 HRS.
FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE
INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBS
7714), U.S. NUCLEAR REGULATORY COMMISSION,
WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK
REDUCTION PROJECT (3150-0104), OFFICE OF
MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

Clinton Power Station

DOCKET NUMBER (2)

05000461

PAGE (3)

1 OF 4

TITLE (4) Fault in Reactor Recirculation Control Circuitry Causes Pumps to Trip from Fast to Slow, Operation in the
Restricted Zone and Manual SCRAM

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 NAME	DOCKET NUMBER
05	15	95	95	005	00	06	13	95	None	None
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)		100	20.402(b)		20.405(c)		X		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
			20.405(a)(1)(iii)		50.73(a)(2)(i)				50.73(a)(2)(viii)(A)	(Specify in Abstract below and in Text, NRC Form 366A)
			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)	

NAME

Bill Sanders, Plant Engineer

LICENSEE CONTACT FOR THIS LER (12)

TELEPHONE NUMBER (Include Area Code)

(217) 935-8881, Extension 4071

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS
B	AD	BU	F180	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

YES

(If yes, complete EXPECTED SUBMISSION DATE).

X

NO

EXPECTED
SUBMISSION
DATE (15)

MONTH

DAY

YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On May 15, 1995, the plant was in POWER OPERATION at about 100% reactor power. Operators were adjusting reactor core flow using the "B" reactor recirculation flow control valve when the hydraulic power unit locked up, which hydraulically locks the flow control valve, and both reactor recirculation pumps tripped from fast to slow speed. The reduction in core flow caused the plant to enter the restricted zone of the thermal power versus core flow operating map. Plant procedures required the operators to initiate a manual SCRAM when the restricted zone was entered. The cause of the hydraulic power unit locking up and the pump trip from fast to slow speed was a fault in one of the reactor recirculation control panel +/- 15 volt Direct Current (DC) field bus bars. This fault created a false indication of low differential temperature between the steam dome and reactor recirculation pump suction which causes the pumps to trip from fast to slow speed following a time delay. The fault was due to a protrusion or "spur" on the +/- 15 volt DC bus bar. The "spur" was created during the manufacturing process and propagated through the insulating paper from the -15 volt DC portion of the field bus and shorted with the +15 volt DC portion of the bus bar. The nest assembly, which contained the faulty field bus bar, was replaced with a spare nest assembly.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Clinton Power Station	05000461	95	005	00	2 OF 4

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

DESCRIPTION OF EVENT

On May 15, 1995, at about 1636 hours, the plant was in Mode 1 (POWER OPERATION) and at about one hundred percent reactor [RCT] power. Operators began adjusting reactor power using the "B" reactor recirculation system [AD] flow control valve [FCV] when the hydraulic power unit locked up which hydraulically locks the flow control valve. The "B" reactor recirculation system flow control valve was locked in its last position. About 16 seconds after the flow control valve hydraulic power unit locked up, both reactor recirculation pumps [P] tripped from fast to slow speed causing a significant reduction in reactor core flow.

At about 1637 hours the reactor operator recognized that the reduction in reactor core flow had caused the reactor to operate in the restricted zone of the thermal power versus core flow operating map. The reactor operator immediately initiated a manual SCRAM by placing the reactor mode switch [HS] in the shutdown position as required by CPS No. 4008.01, "Loss of Reactor Coolant Flow." As reactor water level decreased to the low reactor water level (Level 3) trip setpoint, containment isolation valves in Groups 2 (Residual Heat Removal [BO] to upper containment pools), 3 (Residual Heat Removal shutdown cooling), and 20 (miscellaneous) automatically closed or were already closed as designed. When Reactor water level began increasing the operators manually tripped the "A" turbine [TRB] driven reactor feedwater (TDRFP) [SJ] pump. Reactor water level reached the low level (Level 4) alarm [ALM] trip setpoint causing the "A" reactor recirculation flow control valve to automatically runback due to the tripped "A" TDRFP. The "B" reactor recirculation flow control valve did not respond because the hydraulic power unit was locked up. Reactor water level recovered reaching the high water level (Level 8) trip setpoint which automatically tripped the "B" turbine driven reactor feedwater pump and the main turbine. The turbine bypass valves [V] opened to control reactor pressure.

At about 1641 hours the reactor SCRAM signal was reset. At about 1644 hours the operators started the motor [MO] driven reactor feedwater pump to control reactor water level. The plant was stabilized in Mode 3 (Hot Shutdown). Condition Report 1-95-05-040 was initiated to investigate this event.

Following the event, troubleshooting by Control and Instrumentation technicians and Nuclear Station Engineering personnel determined that the lock up of the reactor recirculation flow control valve hydraulic power unit and the trip of the reactor recirculation pumps from fast to slow speed was caused by a fault on one of the +/- 15 volt Direct Current (DC) field power bus bars for the reactor recirculation control system. The lock up of the hydraulic power unit occurred immediately at the time of the fault. The fault also created a false indication of low differential temperature between the steam dome and the reactor recirculation pump suction. This signal caused the reactor recirculation pumps cavitation interlock to trip the pumps from fast to slow speed following a 15 second time delay.

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

No other automatic or manually initiated safety system responses were necessary to place the plant in a safe and stable condition. No other equipment or components were inoperable at the start of this event to the extent that their inoperable condition contributed to this event.

CAUSE OF THE EVENT

The cause of this event is attributed to a fault in the +/- 15 volt DC field bus bar in the control cabinet nest assembly which contains the circuit cards for the "B" portion control circuitry of the reactor recirculation system. The field bus bar is made of two copper plated bars stacked on top of one another with a piece of insulating paper between the bars to electrically isolate them. The bus bars are then roll pressed together with an outer layer of varnish and paper insulation. During plant operation one copper bar is energized to +15 volts DC, the other is energized to -15 volts DC. The fault was apparently caused by a protrusion or "spur" on the inside face of the -15 volt DC portion of the field bus bar that propagated through the insulating paper and eventually shorted against the +15 volt DC portion of the field bus bar. The "spur" originated during the manufacturing process. During the fifth refueling outage, which was completed on April 29, 1995, several circuit cards were removed from the nest assembly where the bus bar fault occurred. The removal of the cards may have caused the "spur" to protrude through the insulating paper to the point where sufficient current was being drawn creating an area of localized heating on the bar. The additional heat caused further expansion and the protrusion from the -15 volt DC portion eventually contacted the +15 volt DC portion of the field bus bar causing the fault.

CORRECTIVE ACTION

The nest assembly which contained the +/- 15 volt DC field bus bar, was replaced with a spare nest assembly which included a field bus bar in accordance with Maintenance Work Request D61201.

ANALYSIS OF THE EVENT

This event is reportable under the provisions of 10CFR50.73(a)(2)(iv) due to a manual actuation of the Reactor Protection System.

Assessment of the safety consequences of and implications of this event indicated that this event was not nuclear safety significant. This event was analyzed and found to be consistent with the analyses of Decrease in Reactor Coolant Flow Rate transients found in Chapter 15 of the Updated Safety Analysis Report. This event was found to be within the design basis of the plant. The capability of the plant to perform its intended safety functions and achieve and maintain a safe shutdown was not affected by this event.

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ADDITIONAL INFORMATION

The failed bus bar was part number N0310YP of a nest assembly model # 2ANU-D Style A manufactured by The Foxboro Company.

Clinton Power Station has not reported other manual SCRAMs having similar causes.

For further information regarding this event, contact W. N. Sanders, Plant Engineer, at (217) 935-8881, extension 4071.