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Clinton Power Station
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ILLINOIS POWER

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L45-92(01-20)-LP
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January 20, 1992
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. 91-008-00

Dear Sir:

Please find enclosed Licensee Event Report No. 91-008-00: Failure of the Reactor Recirculation Flow Control Valve Position Feedback Loop and Leaking Hydraulic Valves Resulted in Entrance into Restricted Operating Region and Manual SCRAM. This report is being submitted in accordance with the requirements of 10CFR50.73.

Sincerely yours,

F. A. Spangenberg, III
Manager, Licensing and Safety

KWD/alh

Enclosure

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

IE22
1/1

NRC FORM 366 (6-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

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-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.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
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TITLE (4)
Failure Of The Reactor Recirculation Flow Control Valve Position Feedback Loop And Leaking Hydraulic Valves Resulted In Entrance Into Restricted Operating Region 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 NAMES	DOCKET NUMBER(S)
1 2	2 2	9 1	9 1	— 0 0 8	— 0 0	0 1	2 0	9 1	None	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 6 3	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 (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)(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
S. E. Rasor, Director - Plant Maintenance, Extension 3204	AREA CODE 2 1 7 9 3 5 - 8 8 8 1

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	
X	A D	H C U	G 2 5 0	Y							
X	A D	Z T	S 0 5 2	N							

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)

On December 22, 1991, with the plant in POWER OPERATION, a manual SCRAM was initiated due to operation in the restricted zone of the thermal power versus core flow map of Technical Specification 3.4.1.3. While the control room operators conducted a scheduled power reduction, the "B" Reactor Recirculation (RR) flow control valve (FCV) started to operate erratically. Control room operators, attempting to stop the erratic operation, hydraulically locked out the "B" RR FCV. The "B" RR FCV continued to operate erratically and then suddenly closed enough to cause core flow to drop into the restricted zone. The control room operator immediately initiated a reactor SCRAM in accordance with plant procedure 3005.01, "Unit Power Changes". No reactor power oscillations were observed. The causes of this event are attributed to the failure of the "B" RR FCV position feedback loop and to internal leakage of the hydraulic valves on the hydraulic power unit. Corrective actions for this event include replacing the RR FCV position and velocity transducers, replacing the leaking hydraulic valves, examining and testing the feedback sensor and associated lead, and determining if any long-term corrective actions are appropriate.

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

DESCRIPTION OF EVENT

On December 22, 1991, at 0035 hours, with the plant at 96 percent reactor power in Mode 1 (POWER OPERATION), control room operators commenced reducing power to conduct weekly surveillances and to perform work on the moisture separator reheater (MSR) low load valves.

At 0340 hours, while control room operators continued to decrease reactor power from 73 percent to 70 percent, the "B" Reactor Recirculation (RR) [AD] loop flow dropped from 24 million pounds mass per hour (M lbm/hr) to 9 M lbm/hr. Control room operators also observed the following indications:

* The RR control system servo error for the "B" RR loop oscillated between +/-5 milliamperes.

* Indicated valve position for the "B" RR loop flow control valve (FCV) [FCV] oscillated between 24 percent and 29 percent open and momentarily stopped at 27 percent open.

* Reactor power dropped to 61 percent.

* The "B" RR motor [MO] load dropped to 3.0 megawatts (MW) while the "A" RR motor load indicated 3.8 MW.

* Indicated jet pump [P] flow for the "B" RR loop was less than the "A" RR loop.

The control room operators entered Technical Specification 3.4.1.3, Action A, due to RR loop flow mismatch of greater than ten percent. This action statement requires the RR loop flows to be restored within the specified limit within two hours. Operations personnel intended to exit the action statement by entering single RR loop operation.

At 0401 hours, with no operator action, the indicated position for the "B" RR flow control valve increased from 28 percent to 29 percent open and total core flow increased from 38.8 M lbm/hr to 40.2 M lbm/hr. The control room operator hydraulically locked out the "B" RR flow control valve due to the increase in total core flow. Hydraulically locking out the "B" RR flow control valve should have prevented any further valve movement, but at 0402 hours, the total core flow decreased to 37.8 M lbm/hr without any operator action. Since 37.8 M lbm/hr is in the restricted zone of the thermal power versus core flow map of Technical Specification 3.4.1.3, the control room operator immediately initiated a reactor SCRAM in accordance with plant procedure 3005.01, "Unit Power Changes", by placing the reactor mode switch [HS] into SHUTDOWN. No reactor power oscillations were observed during operation in the Restricted Zone.

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

Subsequent to the event, investigation of the "B" RR electronic and hydraulic control system showed that:

- The "B" RR flow control valve stroked full open and full closed without binding or sticking.

- The main control room position indication for the "B" RR flow control valve indicated 25 percent to 75 percent open when the flow control valve actually traversed from the full closed to full open position.

- The "B" RR flow control valve drifted closed when "Motion Inhibit" was selected by the control room operator. The flow control valve drifting occurred only when the flow control valve was being controlled by hydraulic subloop number one (1B1) of the hydraulic power unit [HCU]. The "B" RR flow control valve did not drift when it was controlled by hydraulic subloop number two (1B2).

- Resistance checks performed on the "B" RR flow control valve position transducer (LVDT) [ZT] from the main control room were substantially higher than the resistance values obtained from the "A" RR flow control valve LVDT.

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 such that their inoperable condition contributed to this event.

CAUSE OF THE EVENT

The cause of the event is attributed to the failure of the "B" RR flow control valve position feedback loop and to the internal leakage of the hydraulic valves [V] on the hydraulic power unit.

The "B" RR flow control valve's erratic operation was due to the failure of the valve position feedback loop The flow control valve position feedback loop failure resulted from high resistance, but the cause of the high resistance has not yet been determined. Illinois Power (IP) is continuing the investigation into the cause of the high resistance. This investigation is expected to be complete by June 1, 1992. IP will submit a supplemental report following completion of the investigation if the investigation results significantly change the information provided in this report.

In response to the erratic operation of the "B" RR flow control valve, the control room operator hydraulically locked out the flow control valve; however, due to leaking hydraulic valves on the hydraulic power unit, the flow control valve continued to operate erratically and then suddenly closed, resulting in operation in the restricted zone. Once the restricted zone was entered, the control room operator initiated a manual SCRAM in accordance with station procedure CPS 3005.01.

CORRECTIVE ACTION

The velocity transducers (LVT) [ST] and the position transducer (LVDT) on the "B" RR flow control valve have been replaced and calibrated under Maintenance Work Request (MWR) MWR D28388. Additionally, as a preventive measure, the LVT and LVDT have been replaced and calibrated on the "A" RR flow control valve under MWR D26846. Additionally, the "B" LVDT lead and connector from the sensor to the first termination point have been replaced under MWR D28388.

The "B" RR hydraulic power unit subloop 1B1 has been repaired to eliminate the flow control valve drifting problem, and subloop 1B2 was checked to ensure that it did not cause the flow control valve to drift. This was completed under MWR D31389.

The following corrective actions are being taken to determine, if possible, the cause of the high resistance in the feedback electronics (position sensor and associated lead) and to generically minimize the chance of recurrence.

The Nuclear Station Engineering Department (NSED) will examine and test the LVDT, the LVT, and the signal cable removed from the "B" RR flow control valve. NSED will complete this action by May 1, 1992.

NSED will evaluate the results of the examination and testing of the LVDT, LVT, and signal cable to determine, if possible, the cause of the high resistance in the feedback loop. This evaluation will be completed by June 1, 1992.

NSED will perform a review of the feedback electronics and the hydraulics for the RR flow control valves to determine what long-term corrective actions may be appropriate. This review will be completed by December 31, 1992.

ANALYSIS OF EVENT

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

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

Assessment of the safety consequences and implications of this event indicates that this event was not nuclear safety significant. A recirculation flow control failure with increasing or decreasing flow has been analyzed in Chapter 15 of the Updated Safety Analysis Report (USAR).

ADDITIONAL INFORMATION

IER 87-036-00 discusses the "A" RR flow control valve ramping open due to a loose velocity transducer.

The LVDT is model number HCA manufactured by Schaevitz Engineering.

The hydraulic power unit is model number T77017-110 manufactured by Greer Hydraulics Inc.

For further information regarding this event, contact S. E. Rasor, Director-Plant Maintenance at 217-935-8881, extension 3204.