Commonwealth Edison
LaSalle County Nuclear Station
2601 N. 21st Road
Marseilles, Illinois 61341
Telephone 815/357-6761

September 21, 1994

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

Licensee Event Report #94-006-00, Docket #050-374 is being submitted to your office in accordance with 10CFR50.73(a)(2)(iv).

for D. J. Ray
Station Manager
LaSalle County Station

DJR/SK/lja

Enclosure

cc: NRC Region III Administrator
NRC Senior Resident Inspector
INPO - Records Center
IDNS Resident Inspector
IDNS Senior Reactor Analyst
Nuclear Licensing Administrator

IE22 1/1

LICENSEE EVENT REPORT (LER)

Form Rev 3.0

Facility Name (1)	Docket Number (2)	
LaSalle County Station Unit 2	0 5 0 0 0 3 7 4	1 of 0 4

Title (4)

Reactor Scram Due to Spurious Opening of Main Turbine Bypass Valves

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 8	2 5	9 4	9 4	---	0 0 6	---	0 0	0 9	2 1	9 4		

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)											
POWER LEVEL (10)	1 0 0		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)				
			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
	AREA CODE
Steve Kleinhardt, System Engineer, Extension 2245	8 1 5 3 5 7 - 6 7 6 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	T G			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 August 25, 1994, Unit 2 was in Operating Condition 1 (Run) operating at approximately 1118 MWe. At approximately 0328 hours, the Main Turbine Control Valves (CV) began to drift closed. In response to this closure, the Main Turbine Bypass Valves (BPV) began to open sequentially to control Reactor pressure. Approximately 13 seconds after the CV's began to close the BPV's closed, which resulted in an increase in Reactor pressure. The increasing pressure collapsed voids in the core which increased moderation and in turn caused power to increase. When Reactor pressure reached approximately 1023 psig, a Reactor Scram occurred due to reaching the Average Power Range Monitor (APRM) Hi Flux Scram setpoint.

The apparent cause of the CV and BPV movement was due to high frequency noise on three of the cards in the Electro-Hydraulic Control circuitry. An additional contributing cause was nine cards were found not fully seated in their connectors.

This event is being reported to the Nuclear Regulatory Commission as a Licensee Event Report in accordance with 10CFR50.73(a)(2)(iv) due to an actuation of an Engineered Safety Feature (ESF) and unplanned automatic Reactor Protection System (RPS) reactor Scram.

PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor

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

A. CONDITION PRIOR TO EVENT

Unit(s): 2 Event Date: 8/25/94 Event Time: 0328 Hours

Reactor Mode(s): 1 Modes(s) Name: Run Power Level(s): 100%

B. DESCRIPTION OF EVENT

On August 24, 1994, Unit 2 was operating at approximately 1118 MWe. At 2301 hours, the number one Main Turbine Bypass Valve (BPV) spuriously opened approximately 75% for about 2.4 seconds, and then reclosed. Minor oscillations were observed, on their respective recorders, in Control Valve (CV) position, Reactor Pressure, and Generator output. An Operator was dispatched to the Auxiliary Equipment Room where it was observed that the temperature and all other indications in the vicinity of the Electro-Hydraulic Control (EHC) [TG] Cabinet were normal. It is known that the electronic components in the EHC Cabinet are sensitive to radio transmissions which may originate in the vicinity of the cabinet. Security was contacted and they confirmed that no radio transmissions had occurred in the vicinity of the EHC Cabinet during this event. At 2342 hours the number one Main Turbine BPV spuriously opened again, this time for approximately 0.7 seconds. The Instrument Maintenance Supervisor was present at the EHC Cabinet, where he saw no abnormal indications although he heard the BPV position indication and alarm relays changing state. No troubleshooting adjustments or connections were being made by the Instrument Maintenance Department (IMD) at the time of this event.

On August 25, 1994, Unit 2 was operating at approximately 1118 MWe. The following is based on a review of the Hathaway alarm sequences of events recorder (AN)[IQ] printout and Startrec (high speed data recorder) traces of this event. At approximately 0328 hours, the Main Turbine Control Valves (CV) began to drift closed, due to a decreasing CV demand signal. In response to this closure, the BPV's began to open in order to control Reactor pressure, as evidenced by an increasing BPV demand signal. Over a period of about 11.5 seconds, the CV's closed from approximately 59% open to approximately 37% open. This caused an increase in Reactor pressure from 1007 psig to 1017 psig, resulting in the sequential opening of all five BPV's. Approximately 1.5 seconds later, the CV and BPV demand signals simultaneously returned to normal which resulted in the CV's starting to reopen and the simultaneous closing of all five BPV's. With all five BPV's closing faster than the CV's could reopen to the position required for the current turbine load and turbine throttle

B. DESCRIPTION OF EVENT (Continued)

steam pressure, reactor pressure began to increase. The increasing pressure collapsed voids in the core which increased moderation and in turn caused reactor power to increase. Approximately 0.7 seconds after the demand signal for the CV's and BPV's returned to normal, with reactor pressure at approximately 1023 psig, a Reactor Scram occurred due to reactor neutron flux reaching the Average Power Range Monitor (APRM) Fixed Hi Neutron Flux Scram setpoint.

C. APPARENT CAUSE OF EVENT

Extensive troubleshooting of the EHC System was performed in an attempt to pinpoint the cause of the CV closure. The turbine was aligned to simulate speed and pressure control while off-line, which allowed for the manipulation of CV and BPV positions in response to pressure and speed signal simulations. This testing allowed for the monitoring of various system parameters for non-linear circuit operation while simulating changes in load set and steam pressure. After several test iterations, where various EHC circuit cards were pulled, high frequency noise and nonlinear operation were observed in the system and were isolated to two circuit cards. A speed error change observed during load set and steam pressure changes was isolated to the primary pressure amplifier circuit. Oscillations were also observed in the #1 CV servo current, which was isolated to the valve's Servo-Amplifier-Demodulator-Indicator card. Replacement of the following cards in the EHC circuitry eliminated the noise and the current oscillations:

1) #1 CV Servo-Amplifier-Demodulator-Indicator (SADI)
2) Primary Pressure Amplifier
3) IC Operational Amplifier (component in the Primary Pressure Amplifier)

During the course of troubleshooting, the following circuit boards were found not fully seated in their connectors.

1) Primary Speed Amplifier
2) Primary Acceleration Amplifier
3) Primary Low Value Gate
4) Secondary Speed Amplifier
5) Secondary Acceleration Amplifier
6) Secondary Low Value Gate
7) Load Limit
8) Pressure Load Gate
9) Voltage Comparator for the Secondary Pressure Amplifier

If the unit was running with all of these cards loose, it is possible that the CV closures (decreased demand) were a result of spurious discontinuity in the load or speed circuits.

D. SAFETY ANALYSIS OF EVENT

The safety significance of this event was minimal. Previous analyses have obtained a delta critical power ratio (CPR) reduction during pressurization events, without a recirculation pump trip, terminated by APRM flux SCRAM. The bounding analyzed event was a slow closure of 1 Turbine Control Valve (TCV), and the fast closure of the remaining 3 TCVs. Any reduction in the pressurization rate or magnitude is conservative to this analysis. In this event, the pressurization was caused by the fast closure of the bypass valves. This rate and magnitude are similar to the fast closure of one TCV, and is bounded by the above analysis. A comparison of the event's pressure signal to the analysis confirms this assumption. Conservatively applying the bounding case's delta CPR to the CPR prior to the SCRAM, the minimum critical power ratio (MCPR) safety limit was never challenged.

E. CORRECTIVE ACTIONS

The three cards mentioned above were replaced with new cards which eliminated the high frequency noise and the CV #1 oscillations. In addition, all of the cards in the EHC cabinets were verified to be properly seated in their connectors. A temporary recorder was installed to monitor several test points which are not monitored by the Startrec system.

All cards in the U-1 EHC cabinet will be verified to be properly seated in their connectors. This activity will be performed at a time when the Main Turbine is not on line and the EHC System is not controlling reactor pressure to reduce the risk of inducing a transient.

F. PREVIOUS EVENTS

LER Number	Title
374/91-012	Unit 2 Reactor Scram due to Turbine Valve Closure