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

September 25, 1992

Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, D.C. 20555

Dear Sir:

Licensee Event Report #92-012-00, Docket #050-374 is being submitted to your office in accordance with 10CFR50.73(a)(2)(iv).

W.R. Hinds for

G. J. Diederich
Station Manager
LaSalle County Station

GJD/JCK/mkl

Enclosure

xc: Nuclear Licensing Administrator
NRC Resident Inspector
NRC Region III Administrator
INPO - Records Center
IDNS Resident Inspector

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LICENSEE EVENT REPORT (LER)

Form Rev 2.0

Facility Name (1)	Docket Number (2)	Page (3)
LaSalle County Station Unit 2	0 5 0 0 0 3 7 4	1 of 0 8

Title (4)

Reactor Scram Due To A Main Turbine Trip Caused By A Thrust Bearing Wear Detector Signal

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 0 0 0	
0 8	2 7	9 2	9 2	0 1 2	0 0	0 9	2 5	9 2		0 5 0 0 0	

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)					
1	___ 20.402(b)	___ 20.405(c)	X 50.73(a)(2)(iv)	___ 73.71(b)		
POWER LEVEL (10) 0 8 0	___ 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		
	___ 20.405(a)(1)(iii)	___ 50.73(a)(2)(i)	___ 50.73(a)(2)(viii)(A)	in Abstract		
	___ 20.405(a)(1)(iv)	___ 50.73(a)(2)(ii)	___ 50.73(a)(2)(viii)(B)	below and in		
	___ 20.405(a)(1)(v)	___ 50.73(a)(2)(iii)	___ 50.73(a)(2)(x)	Text)		

LICENSEE CONTACT FOR THIS LER (12)

Name	TELEPHONE NUMBER
	AREA CODE
John C. Klika, Asst. Tech Staff Supervisor, Extension 2533	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 A	D E T	G 0 8 4	Y					

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 27, 1992 at 0305 hours, Unit 2 experienced a Reactor Scram as a result of a Main Turbine trip which was caused by a Thrust Bearing Wear Detector signal. All rods successfully inserted as a result of the Automatic Scram signal.

During the scram response, both Turbine Driven Reactor Feed Pumps failed to trip from either remote manual operation, High Reactor Level 8 automatic trip, or local mechanical trip operation. As a result of this failure, the Reactor Water level increased to a level requiring the Main Steam Isolation Valves (MSIV) to be closed.

The MSIV closure resulted in the Safety Relief Valves (SRV) being used to control reactor pressure. During operation of two SRVs (A&B), remote position indication failed to show that the valves closed when demanded.

Also during the event, the Reactor Core Isolation Cooling (RCIC) System auto started due to a Level 2 initiation signal which resulted from a pressure spike sensed at the instrument racks containing the level transmitters for the RCIC initiation signal.

When reactor level was brought under control, a MSIV (Group I) Isolation High Steam Flow signal was received when a Main Steam Line was being unisolated. This occurred when the MSIV was opened with approximately 760 psi differential pressure across the valve.

Root cause investigations were performed to determine the reason for all the above noted failures. This is reportable pursuant to 10CFR50.73(a)(2)(iv) due to an automatic 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: 8/27/92 Event Time: 0305 Hours

Reactor Mode(s): 1 Mode(s) Name: Run Power Level(s): 80%

B. DESCRIPTION OF EVENT

Reactor Power was being reduced from 1100 Mwe to 850 Mwe at 120 Mwe/hour using Reactor Recirculation (RR)[AD], Flow Control. At the time of the scram, actual flow control manipulations were briefly suspended to allow for xenon burnout.

On August 27, 1992 at 0305 hours, Unit 2 experienced a Reactor Scram as a result of a Main Turbine Stop Valve (TSV) (TG) [TA] closure trip. The Turbine Trip was caused by a Thrust Bearing Wear Detector Turbine Trip signal to the Electro-Hydraulic Control (EHC, EH) [TG] System. As a result of the automatic scram signal, all control rods inserted to their full in position.

During the first seconds of the event, the Reactor Core Isolation Cooling (RCIC, RI) [BN] System auto started due to a spurious (FW) [SJ] Level 2 (-50 inches) initiation signal.

During the scram response, in an attempt to control reactor water level, the Motor Driven Reactor Feed Pump (MDRFP) (FW) [SJ] was successfully started in preparation for tripping of the Turbine Driven Reactor Feed Pumps (TDRFPs). When attempting to shutdown the TDRFPs, all methods of initially tripping them failed including remote manual trip operation, High Reactor Level 8 automatic trip, or local mechanical trip operation.

As a result of this failure, the Reactor Water level increased above the Level 8 High Level setpoint (+55.5 in) resulting in a trip of the MDRFP and the RCIC System. The Outboard Main Steam (MS) [SB] Isolation Valves (MSIVs) were manually closed at 0308 hours when the +73 inch reactor level administrative limit was reached. This limit is provided to prevent flooding the steam lines outboard of the MSIV's (bottom of the Main Steam lines is at +108 inches). The level transient resulted in a maximum level of +130 inches.

The closure of the MSIVs resulted in TDRFP shutdown and also caused a loss of the Main Condenser as a heat sink.

The loss of the Main Condenser as a heat sink required use of the Safety Relief Valves (SRV) for manual control of reactor pressure. During operation of 'A' and 'S' SRVs, remote position indication failed to show that the valves fully closed when demanded. Subsequent review showed that earlier in the event 'U' SRV had automatically cycled on reactor pressure as designed with final position indicated as full closed. No "SRV Full Open" Alarm was seen by the operators during any SRV operations. Additional review of SRV tailpipe temperatures showed that the SRVs had, in fact, closed.

B. DESCRIPTION OF EVENT CONTINUED

After reactor water level was returned to the normal operating range and brought under control, an attempt was made to reestablish the Main Condenser as a heat sink. All the inboard MSIV's were closed and all outboard MSIVs were opened. Pressure was being equalized across the Inboard MSIVs. When the "A" Inboard MSIV was opened, a MSIV (Group I) isolation High Steam flow signal was received resulting in closure of all five open MSIVs.

Attempts to use the RCIC System to help control reactor pressure were made and the turbine tripped on high exhaust pressure on the first two start attempts. The system was successfully started on the next attempt and operated normally to control pressure.

The failure of the thrust bearing wear detector signal and the failure of the TDRFPs to trip were the principle concerns of this event. Other indication concerns were identified during the investigation and are listed below.

1. 2E51-F066 RCIC Testable Check Valve Position Indication showed the valve to not be full closed (RCIC Running Alarm).
2. Scram Annunciator "First Out" Indication did not function.
3. High Drywell Temperature Alarm.

On 8/27/92, Confirmatory Action Letter (CAL) RIII-92-011 was issued, and an Augmented Inspection Team (AIT) was formed by the NRC to investigate this event. Further information is available in the AIT report (Inspection Report 374/92020), the CAL response, and the startup onsite review (OSR-92-33).

C. APPARENT CAUSE OF EVENT

The cause of the Turbine Thrust Bearing Wear/Failure Signal was determined to be due to a shift in the setpoint for the Thrust Bearing Wear Detector. This shift was caused by a failure of the manufacturer to build the assembly unit per design.

Following extensive investigations into the TDRFP trip failure, the root cause was determined to be suspended particulate in the Turbine Oil System which accumulated on the spool interfaces creating flow blockages thereby preventing proper operation of the trip system. In addition, the disk dump valve spool on 2A TDRFP was found to have a runout (bent shaft) of 5 mils and the 2B TDRFP Trip Solenoid Pilot Valve had a runout of 4 mils, both of which are above the 1 mil specification. The spool on the 2B TDRFP also had a minor interference problem with the trip assembly.

The spurious "Reactor Level 2 Low" Signal was due to a pressure oscillation/ringing which resulted from the closure of the Turbine Stop Valves. The individual spikes lasted approximately 80 milliseconds and decayed to nearly a zero amplitude in approximately 3-4 seconds. This phenomenon was previously documented as a result of the March 1, 1992 scram on Unit 1 in LER 92-003-00. The duration of the spikes have not been sufficient nor have they been in phase such that all isolation or actuation instrumentation are able to sense the trip signals simultaneously. For this reason there is a randomness in the actuation of the various protective signals.

C. APPARENT CAUSE OF EVENT CONTINUED

The Group I High Steam Flow Signal was received when the MSIV was opened with approximately 760 psi differential pressure across the valve. This was due to the operator reading the wrong indicator, which resulted in him thinking that the differential pressure was within the 200 psi differential pressure administrative limit for opening the MSIVs.

Failure of the SRV Position Indication on 'A' and 'B' SRVs was due to failure of the Linear Variable Differential Transformer (LVDTs) to return to their "null" position. This was determined to be the result of accumulations of fretting induced corrosion between the actuating pin and the guide bushings. Also, within a second of the scram, the 'U' SRV automatically opened for about 11 seconds but the "SRV Fully Open" annunciator did not function. This was determined to be due to a ' annunciator logic card connector.

The Scram Annunciator "First Out" Indication failure was due to burned out light bulbs in the applicable annunciator window. This was due to lack of surveillance of these bulbs.

The High Drywell Temperature Alarm Annunciation was a valid alarm based on the actual signals which were received by the instrument. One of the sensors was located in the vicinity of the Control Rod Drive System Header which contained hot process fluid as a result of the scram. This heat load caused the local temperature to rise about 18 degrees which was enough to cause the 135 degree setpoint to be exceeded.

The RCIC trips on High Exhaust Pressure were caused by the passage of water, which had accumulated in the steam line, through the turbine, and into the exhaust header. The water flashed to steam creating a momentary high pressure condition. In both cases the RCIC Steam Line Drain Valves operated properly but there was insufficient time to drain all the water from the steam lines before RCIC was attempted to be used for Reactor pressure control.

Following the initial shutdown of the RCIC System, the RCIC Testable Check Valve 2E51-F0C6 failed to indicate full closed and this was due to the check valve position cam hanging up on the valve packing and insufficient system backflow. This caused the "RCIC Running" Alarm to remain in the alarm condition. In all other cases, the RCIC System functioned as designed in response to operator demands.

D. SAFETY ANALYSIS OF EVENT

A complete shutdown of the reactor was successful as a result of the automatic scram signal. Reactor Pressure Vessel (RPV) level never was below the 0 inch level (more than 13 feet above the top of active fuel).

The effect of the TDRFP trip failure was minimized by closure of the MSIVs which resulted in a shutdown of the feed pumps. The lack of SRV Position indication made the ability to verify primary coolant boundary integrity more difficult. The fact that reactor pressure stopped decreasing and tailpipe temperatures decreased to normal values following the attempts to close the SRVs provided sufficient information to assure that the valves were closed.

D. SAFETY ANALYSIS OF EVENT CONTINUED

Based on the results of the investigations, it was determined that the 2E51-F066 Check Valve did not close during the shutdown of the RCIC System as indicated by Control Room Valve Position Indication. When the RCIC System was shutdown, the 2E51-F065 valve closed eliminating the system backflow through the piping and equalizing the pressure across the 2E51-F066 valve. Without the system backflow, the 2E51-F066 valve remained partially open after the RCIC injections. The additional force required to assist the valve closed was very minimal based on manual closure tests performed on August 29 and 30, 1992. If backflow conditions existed, the valve would have closed performing the valve's design function.

With the exception of the above mentioned failures, all safety systems performed their intended protective functions as required.

E. CORRECTIVE ACTIONS

THE THRUST BEARING WEAR DETECTOR FAILURE

Following the turbine trip, trends in bearing temperatures were reviewed to determine if there was any other indication of thrust bearing problems. A slight increase (approximately 2-3 degrees) in thrust bearing metal temperatures was noted but was consistent with oil supply temperature affects of power reduction.

The Thrust Bearing Assembly was disassembled to check as found dimensions to determine if there was any shift in the bearing parts. These investigations revealed no signs of wear on the thrust bearing that would have lead to or required a turbine trip.

A series of local and remote Wear Detector operations and turbine rotor thrust checks were performed. These tests identified that the span between Turbine End and Generator End trip points had changed from the previously recorded span of 110 mils (-40 to +70) to 84 mils (-80 to +4). This shift in the span, and not thrust bearing failure, is believed to be the actual cause of the trip. This test also showed that the Wear Detector was able to consistently follow Thrust Collar position accurately. In addition, the wear detector mechanical integrity of the bushing drive between the detector motor clutch and the bushing coupling was checked to identify any problems with the wear detector.

Findings from the wear detector inspection included:

1. Slight clutch face contact irregularities,
2. Inadequate clutch spring compressive torque settings,
3. A ball bearing (lower bearing) that felt a little rough, and
4. Loose set screw for the lower coupling half attachment to the bushing stem which caused a change in the calibration of the setpoint for the trip.

The clutch faces were dressed up, the clutch spring was retorqued, the lower bearing was exchanged (new bearing not available) with the upper bearing, the bushing drive coupling and stem were drilled to accommodate a roll pin, and the set screw was re-applied and firmly tightened.

E. CORRECTIVE ACTIONS CONTINUED

TDRFP TRIP FAILURE

Following unit shutdown both TDRFPs were taken out of service and an action plan was developed to determine the root cause of the failures. This plan included a complete check of the trip system consisting of:

1. Voltage checks at the trip solenoid (SV-12),
2. Resistance check of the trip solenoid,
3. Compare results to vendor requirements,
4. Manual trip and reset of the turbines from the front standard while measuring Trip Dump Valve shaft travel,
5. Trip and reset turbine from Control Room while measuring SV-12 shaft travel, and
6. Logic test of the Reactor Level 8 Trip.

Because the 2A TDRFP was still in its original tripped condition, a complete visual inspection of the tripping mechanism was conducted to identify oil contamination, scoring of pistons and cylinders, burrs, or other mechanical damage.

Following these inspections, the results were reviewed by Technical Staff, Engineering, and General Electric Turbine Engineers to determine further corrective actions. As a result of this review the following was done:

a. The control system, including the Trip Dump Valve and related Trip Assembly Servos, was oil flushed,

b. Runout checks were made on the hydraulic dump valve and remote trip actuating pistons resulting in the replacement of the 2A TDRFP Trip Dump Valve and the 2B TDRFP Trip Solenoid Pilot Valve. In addition, an O-ring was found in the guide hole for the trip dump valve of 2A TDRFP and was removed, and

c. The K7A and K7C relays in the Reactor Level 8 Trip circuit were replaced and the circuit was retested satisfactory.

REACTOR LEVEL 2 LOW SIGNAL

The actual cause of the ringing experienced by the level instrumentation is a natural phenomena which has been seen at LaSalle in the last three scrams due to turbine trips. The effect of this ringing has been reviewed and installation of a modification which would affectively provide a time delay of the signal is being reviewed. Action Item Record (AIR) 374-180-92-06701 will track completion of this review.

GROUP I HIGH STEAM FLOW ISOLATION

The root cause of the isolation signal was the use of the wrong pressure indications in determining the differential pressure across the MSIVs. As a result of the high flow condition, the steam lines were "walked down" to identify any potential integrity problems, none were found. In order to ascertain any potential internal problems with the MSIV's, Local Leak Rate Tests, Actuator Leak Tests, and Valve Timing Tests were performed with satisfactory results. In addition, the Training Department is highlighting this event in subsequent training activities to empnasis the affects of opening MSIVs with excessive differential pressure and to assure that operators use the proper indications in determining the differential pressure. Actions related to this issue are discussed in more detail in HPES Report 92-014.

E. CORRECTIVE ACTIONS CONTINUED

SRV POSITION INDICATION

Calibrations in accordance with LaSalle Instrument Procedure, LIP-NB-613, "Unit 2 SRV LVDT Refuel Calibration," were performed on the 'A' and 'B' SRV LVDTs. Results of this surveillance indicated that the "as found" null positions were out of tolerance. In addition, it was determined that the Signal Conditioner/Logic Card received the position signals but failed to process the "SRV Full Open" Alarm. The logic card was replaced and was tested satisfactory.

Both 'A' and 'B' SRV LVDTs were visually inspected with no conclusions being made. Further inspections consisted of obtaining detailed voltage and fit measurements which showed that the LVDTs were stuck in the intermediate position. Additional investigation determined that the LVDTs were not bent but there was evidence of corrosion or fretting corrosion between the stainless steel actuating pin and the brass guide bushings. Analysis by Station Material Analysis Department (SMAD) showed that the corrosion was fretting induced.

As a result of these findings, three additional LVDTs were removed and inspected, with one exhibiting the same type of problem. Due to this additional problem, all SRV LVDTs were removed, inspected, and refurbished in accordance with vendor and engineering recommendations. No further problems were identified.

Based on these findings, the LVDTs for A, B, and all 7 Automatic Depressurization System (ADS) [SB] SRV's were replaced with new LVDTs with the remaining LVDTs being refurbished and reinstalled.

Periodic disassembly inspections and replacement of the LVDTs is being evaluated. This will be documented in AIR 374-121-92-011018.

Because the SRVs experienced passage of water, the vendor (Crosby) was consulted about the possible affects of passing high pressure water. Results of that consultation indicate that there are no concerns about the operability of the valves.

FIRST OUT INDICATION

The burnt out light bulbs in the Annunciator "First Out" Indication was due to inadequate testing of the first out circuitry. An Electrical Maintenance Department procedure had been developed for testing this circuitry but had been overlooked as a result of a failure to enter the surveillance into the General Surveillance (GSRV) Program. This surveillance was performed shortly following the event and determined that the light bulbs were burnt out. The bulbs were replaced and tested satisfactory. A similar test was performed on Unit 1. In addition the following actions were initiated:

a. The GSRV was updated to include the surveillance item, and

b. All departments will review the GSRV items against department surveillances to assure that all necessary surveillances are included in the GSRV Program. AIR 374-180-92-06702 will track completion of this review.

E. CORRECTIVE ACTIONS CONTINUED

HIGH DRYWELL TEMPERATURE

The area temperature sensor in the vicinity of the Control Rod Drive (CRD) Lines has been temporarily shielded per a Temporary System Change (TSC 2-958-92) to minimize the affect of the hot CRD Lines on Drywell Temperature Indication during a scram. Also, the Safety Parameter Display System (SPDS) algorithm for the interpretation of the inputs is being revised to discount any indication which is not within a set range of other indications. AIR 374-180-92-06703 will track this revision.

RCIC EXCESS FLOW CHECK VALVE INDICATION

Following the event, the 2E51-F066, RCIC Inboard Testable Check valve, was visually inspected to compare it's as found condition to that of the 2E51-F065, RCIC Outboard Testable Check valve. The Micro Switch Lever Arm for the closed limit was not in contact with the closed limit cam while the lever arm for the open limit was in contact with the open limit cam. This would result in the Open indication in the Control Room.

The valve was disassembled to address potential frictional forces which might have prevented valve closure, indicator hinge pin packing or other internal component degradation. Upon inspection, the indicator hinge pin bearing support surface showed signs of scoring between the bearing surface and the stuffing box bushing confirming the presence of additional friction forces preventing valve closure. Mechanical Maintenance repaired the indicator hinge pin bearing surface and repacked the stuffing box. Valve operation was verified through the work request test.

The original concern causing the RCIC Valve to remain open due to opposing frictional forces had been resolved allowing the valve to close on it's own accord from approximately 60 - 0% open.

F. PREVIOUS EVENTS

LER Number	Title
373/82-077/03L-0	RCIC Testable Check Valve Indication Failure
374/87-014-00	High Thrust Bearing Wear Scram/Foreign Material In Wear Detector

G. COMPONENT FAILURE DATA

Manufacturer	Nomenclature	Model Number	MFG Part Number
Crosby/Trans-Tec	Linear Voltage Differential Transformer	0304-001	
General Electric	Thrust Brg Wear Detector		
Anchor Darling	Testable Check Valve		
General Electric	TDRFP Trip System		
Hathaway	Annunciator Logic Card		8367901

SHEET 7

EVENT SUMMARY AND CAUSE CODES

DVR Number
QL-2-[illegible]-[illegible]

- [ ] Lost generation
- [ ] Cost > $25,000
- [ ] Hazard or Spill
- [ ] Personnel injury
- [ ] Component type
- [ ] Reactor trip
- [X] ESF actuation
- [X] NRC reportable
- [ ] LER
- [ ] PSE
- [ ] Failure mode
- [ ] NRC violation, level___
- [ ] GSEP event, class_____
- [ ] Tech Spec LCO
- [ ] Potential or future loss
- [ ] SALP functional area__

Department

X	P	M			M	6			M	M			
X	P	M			M	3			M	M			
X	I	E			M	5			I	M			

Licensed? L or blank — Level — Department — Type — Detail code

A	L	W			O	P			I	1			
A	L	W			O	P			I	3			
A													

Type — Detail Code — Department

B	D	1							Sudden Pressure Change Phenomena				
B	D	15							Instrument Location				
B													

Type — Detail code

C													

Type of deficiency — Detail code — Procedure type

D													
D													
D													

Type — Detail code — Department

E													
E													
E													

SHEET 7

EVENT SUMMARY AND CAUSE CODES

DVR Number
01-__-__-___

- [ ] Lost generation
- [ ] Cost > $25,000
- [ ] Hazard or Spill
- [ ] Personnel injury

- [ ] Reactor trip
- [ ] ESF actuation
- [ ] NRC reportable
- [ ] LER
- [ ] PSE

- [ ] NRC violation, level___
- [ ] GSEP event, class_____
- [ ] Tech Spec LCO
- [ ] Potential or future loss
- SALP functional area__

Component type | Failure mode | Department

X	C	M	M	9	E M M M
X	S	B			
X					

Licensed? L or blank | Level | Department | Type | Detail code

A								
A								
A								

Type | Detail Code | Department

B	D	1	5	D&B Power offtakes & Check Valves in spurs
B				
B				

Type | Detail code

C		

Type of deficiency | Detail code | Procedure type

D			
D			
D			

Type | Detail code | Department

E			
E			
E			