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

May 6, 1992

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

Sir:

Licensee Event Report #92-005-00, Docket #050-373 is being submitted to your office in accordance with 10CFR50.73(a)(2)(v).

G. J. Diederich
Station Manager
LaSalle County Station

GJD/MT/mkl

Enclosure

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

IE22

LICENSEE EVENT REPORT (LER)

Form Rev 2.0

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

Title (4)

Reactor Core Isolation Cooling Overspeed Trip Due To Governor Valve Sticking Open

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
	2	9 2	---	0 1 0 5	---	0 0	0 5	0 6	9 2		0 5 0 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)

OPERATING MODE (9)	1	___ 20.402(b)	___ 20.405(c)	___ 50.73(a)(2)(iv)	___ 73.71(b)		
POWER LEVEL (10)	0 0	___ 20.405(a)(1)(i)	___ 50.36(c)(1)	X 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
Michael Tennyson, Technical Staff Engineer, Extension 241	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	B N	V	D 2 4 3	Y					
X	B N	V	L 2 4 3	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 April 6, 1992, at 1032 hours, while Unit 1 was in Operational Condition 1 (Run), at 100% power, the Reactor Core Isolation Cooling (RCIC) [BN] Turbine tripped on mechanical overspeed. This event occurred while the operating department was performing the quarterly surveillance that demonstrates the cold quick start capability of the RCIC System. This LaSalle Special Procedure is LLP-92-032, "Reactor Core Isolation Cooling System Cold Quick Start in Conditions 1, 2, and 3 with 1E51-F019 Out Of Service Closed."

The cause for the mechanical overspeed during the surveillance, was failure of the Governor Valve to close during the start of the system. It was concluded that binding between the valve stem and the carbon ring packing assembly caused the governor valve failure to close.

At the time of this incident the High Pressure Core Spray (HPCS, HP) [BG] System, and the other Emergency Core Cooling Systems (ECCS) were fully operable. The RCIC System was declared inoperable and work requests were written to investigate and repair the problem.

This event is reported to the Nuclear Regulatory Commission as a Licensee Event Report in accordance with 10CFR50.73(a)(2)(v) due to the RCIC System being declared inoperable (loss of a safety system function).

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): 1 Event Date: 04/06/92 Event Time: 1033 Hours

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

B. DESCRIPTION OF EVENT

On April 6, 1992, at 1033 hours, while Unit 1 was in Operational Condition 1 (Run), at 100% power, the Reactor Core Isolation Cooling (RCIC) [BN] Turbine tripped on mechanical overspeed. The Turbine trip occurred while the operating department was performing the quarterly surveillance that demonstrates the cold quick start capability of the RCIC system. This LaSalle Special Procedure LLP-92-032, is "Reactor Core Isolation Cooling System Cold Quick Start in Conditions 1, 2, and 3 With 1E51-F019 Out Of Service Closed."

Upon opening of the RCIC Steam Supply Stop Valve 1E51-F045 and the Full Flow Test Return Stop Valve 1E51-F059, the RCIC Turbine went from zero rpm to 5650 rpm which resulted in the Mechanical Overspeed Trip System actuation and a RCIC turbine trip as designed. The mechanical overspeed trip assembly actuates at 125% of rated speed (5625 plus or minus 50 rpm).

During the test, the Unit High Speed Data Acquisition System Recorder (Startrec) was used to monitor the RCIC Pump discharge pressure, pump suction pressure, pump flow rate, turbine speed, ramp generator signal converter, steam demand signal, and the opening of the Steam Supply Valve 1E15-F045.

The Startrec Recorder showed that there was no movement from the Governor Valve.

After the overspeed trip, the RCIC System was immediately declared inoperable. An entry was made in the Degraded Equipment Log (DEL 65-91-1-49), and work requests L14938 and L14983 were initiated to repair the problem.

Woodward Governor Company, Technicon Enterprise (Consulting Firm), and Dresser Rand, formerly Terry Turbine were called in for assistance in determining the exact cause of the problem.

This event is reported to the Nuclear Regulatory Commission as a Licensee Event Report in accordance with 10CFR50.73(a)(2)(v) due to RCIC being declared inoperable (loss of a safety system function).

C. APPARENT CAUSE OF EVENT

The cause for the mechanical overspeed during the surveillance, was the failure of the Governor Valve to close during the start of the system. In an attempt to determine the root cause of the problem, a working group was given the task of identifying all probable causes for the overspeed trips. The team members included Mechanical and Instrument Maintenance, Dresser Rand, Woodward Governor, Onsite Engineering, Operations Department, Maintenance Staff, and Technicon Enterprise.

First an assessment of the maintenance history for both units was performed. The Unit 2 history indicated one problem with a faulty overspeed trip mechanism that was replaced in August 1989 and a problem with oil contamination that was addressed during the last Unit 2 refuel outage. There were no experiences on Unit 2 that resulted in a overspeed trip event during cold quick start testing.

Overspeed trip events had previously occurred on Unit 1 in June 1990, July 1991, and October 1991. The cause of the first overspeed trip was due to oil contamination. The overspeed trip in July resulted from a frozen governor valve. The overspeed trip in October 1991 was traced to binding between the governor valve stem and carbon packing which prevented axial movement of the valve stem.

The previous oil contamination events resulted in corrective actions which included replacement of the actuator and servo on a five year frequency. The actuators are also inspected and cleaned at every refuel outage. The Hydraulic Actuator and Remote Servo for the Unit 1 Governor Valve were replaced in July of 1991 and have been working properly since installation. In addition, an oil sample was taken and sent to the Systems Material Department for analysis to verify no contamination.

A review of the Startrec trace indicated that proper electrical actuation signals were provided to the governor control system, however the governor valve failed to respond and remained in the full open position. In order to cover all possible areas which could cause a problem with the governor control system, complete checks of all electrical control components were performed. The check of electrical control verified proper continuity at all connections to the governor control system.

The remote servo full open stroke on Unit 1 was measured and compared to Unit 2. The measurements were the same indicating that both governors were at their full open position. This also indicated that the governor valve did not move during the cold quick start on April 6, 1992. Upon removal of the pin that connects the servo to the governor valve linkage, the remote servo stem was found in its proper position and not cocked with respect to the servo body. The concern that the servo may be bound within the cylinder and unable to be retracted to move the governor valve was eliminated.

The governor valve linkage was disassembled in a controlled sequence to determine if and where binding could be occurring. The disassembly started with the removal of the pin between the remote servo and the linkage, and continued in a stepwise fashion to the governor valve bonnet. After each step of the linkage removal, the valve stem was checked and found to remain bound in the axial direction. This indicated that governor valve linkage was not the cause of the problem.

C. APPARENT CAUSE OF EVENT (CONTINUED)

The governor valve bonnet was stripped of all the operating linkages allowing the valve stem to be rotated, however axial movement was not possible. The bonnet was removed and taken to the decontamination area where it was confirmed that the valve plug was in its fully withdrawn position and the valve stem protruding from the bonnet was not bent. The valve plug was disconnected from the stem and removal of the valve plug from the bonnet was quite easy. This demonstrated that the valve plug was not causing or contributing to the binding.

The inner snap ring to the carbon ring packing assembly was removed, and the stem/carbon ring assembly was pushed out of the valve bonnet. The first 15 carbon rings moved out with the stem since they were bonded together. Three of the carbon rings broke, but the other twelve remained bonded to the stem. This confirms that binding between the valve stem outside diameter and the carbon ring inside diameter was the cause of the RCIC turbine overspeed trip on April 6, 1992.

The valve stem was heavily corroded and pitted in the areas outside the carbon ring stack. Again it appears that the carbon rings were swollen beyond the clearance allowed between the outside diameter of the stem and inside diameter of the carbon rings. The condition of the stem surface and the amount of rust noted was much more severe than was reported during the overspeed trip in October, 1991.

During the disassembly of the governor valve in October 1991, the valve was found to contain a significant quantity of water. This water was evident when the valve plug and stem assembly was freed from the bonnet using a rubber mallet. As the plug was removed it was estimated that about a cup of water was found trapped between the valve plug labyrinth seal depressions and the bonnet sleeve. It was suspected that this trapped water created a vacuum lock which could have contributed to the binding of the governor valve. This concern was eliminated after the stem binding was discovered. This concern was further discounted after the valve plug was easily removed from the bonnet sleeve following the April 6, 1992 overspeed.

Following the discovery of water accumulating in the governor valve bonnet area during the October 1991 overspeed event, the governor valve gland leakoff line, which had been routed to the Barometric Condenser in an inverted U, was rerouted to slope downward in an effort to prevent water accumulation.

Though the exact reason for the accumulation of water in the Governor Valve is not presently known, the following scenarios are suspect and investigation is continuing.

* Steam leakage through the steam admission valve when the plant is running and the RCIC system is in standby. Steam leaking by the valve seat would condense and could collect in the governor valve.

* Blowback to the governor valve from the turbine casing could take place after steam flow is secured to the turbine and the governor valve cools faster than the turbine. The potential for this effect was observed at the end of operational tests conducted on April 10. The barometric condenser was shut off soon after the steam flow was secured, and a steam leak through the turbine shaft seals indicated that steam was still inside the turbine and possibly the steam pipeline downstream of the steam admission valve.

* Ineffective performance of the barometric condenser and barometric condenser vacuum pump would fail to remove the steam and moisture from the governor valve, and could result in water formation and deposits observed.

D. SAFETY ANALYSIS OF EVENT

The Mechanical Overspeed Assembly trips the RCIC Turbine at 125 percent of the rated speed, 5625 plus or minus 50 rpm. Actuation of the trip assembly requires a reset of the RCIC Turbine locally at the turbine.

During the performance of the surveillance, the RCIC system mechanical overspeed trip occurred at 5650 rpm, actuating as designed.

At the time of this incident the High Pressure Core Spray System, and the other Emergency Core Cooling Systems were fully operable. The RCIC System was immediately declared inoperable. There were no adverse consequences to this event.

E. CORRECTIVE ACTIONS

The RCIC System was declared inoperable on April 6, 1992 at 1033 hours. Work Requests # L14938 and L14983 were written to investigate and repair the problem. A working group was established to determine what happened, how it could be solved, and what steps need to be taken in order to prevent recurrence.

A Dresser Rand Company Representative (formerly Terry Turbine), Woodward Governor Company Representative, Mechanical and Instrument Maintenance, Operations, OnSite Engineering, Technical Staff, and Technicon Enterprise were all called on for assistance.

The electrical controls to the hydraulic actuator from the control box and ramp generator were inspected. The voltage signals sent to the actuator were consistent and correct. The oil lines to the actuator were verified for proper routing and an oil sample was obtained and sent out for analysis.

The governor valve linkage was disassembled from the remote servo, and the servo was inspected for binding. The linkage was then dismantled in a sequential manner and inspected for any binding. The linkage and the remote servo were determined to operate satisfactorily.

The governor valve bonnet was disconnected and taken to the decontamination shop. The stem and carbon rings were frozen together. The frozen assembly was sent to Argonne Labs for analysis.

The governor valve bonnet was reassembled with a new set of carbon rings and a new valve stem. The bonnet, the linkage and remote servo was re-connected and the system was tested.

E. CORRECTIVE ACTIONS (CONTINUED)

The RCIC System was started per LaSalle Special Procedure, LLP-92-72, "Controlled Start of Reactor Core Isolation Cooling System in the CST Test Mode with 1E51-F019 Out Of Service Closed." After proper operation of the Governor Valve was verified, the system was shutdown and restarted to test the oil pressure and vacuum pump.

The actuator was fitted with a pressure gauge, to determine if the oil pressure from the actuator was sufficient to move the servo. The maximum force was established at forty foot-pounds, equivalent to approximately 350-375 psig. The oil pressure during the start of the system was at 350 psig.

A compound pressure/vacuum gauge was connected to the governor valve leakoff line to the barometric condenser to confirm there was a suction from the line at the governor while the system was running. The line was pulling the moisture and steam from the governor leakoff line at 12-15 inches of mercury vacuum. At the end of the system run, it was observed that steam from the turbine and pipeline downstream of the steam admission valve was blowing out the shaft seals. Since this steam that remained in the turbine and steam piping was one of the suspected causes of the water accumulation in the governor valve, the barometric condenser vacuum pump will be run continuously for one hour after the system is shutdown. Associated procedures are being revised to reflect this requirement.

LaSalle Special Procedure, LLP-92-032, was performed to test the quick response capability of the system. The procedure was performed successfully.

LaSalle Special Procedure, LLP-92-115, "Freedom of Movement Test on Reactor Core Isolation Cooling System Governor Valve," will be performed weekly on both units until it has been determined that the water accumulation problem is resolved.

The Steam Supply Admission Valve will be checked for any sign of leakage while the system is in standby. The leakoff lines to the RCIC Trip and Throttle Valve will also be inspected to determine if they are clogged. The station will also be investigating the possibility of changing the material type of the valve stem.

The corrective actions and all continuing investigations will be tracked by Action Item Record 373-180-92-02401.

LaSalle Special Procedure, LLP-92-032, was performed satisfactorily on April 10, 1992. The test was repeated satisfactorily twenty-four hours later and the RCIC System was declared operable on April 11, 1992.

F. PREVIOUS EVENTS

LER Number	Title
373/84-054-02	Reactor Core Isolation Cooling Inoperable And Steam Line Isolation
373/90-007-00	Reactor Core Isolation Cooling Trip On Mechanical Overspeed Due To Contaminated Oil

F. PREVIOUS EVENTS (CONTINUED)

LER Number	Title
373/91-012-00	Reactor Core Isolation Cooling Trip On Mechanical Overspeed Due To Governor Valve Sticking Open
373/91-017-00	Reactor Core Isolation Cooling Trip On Mechanical Overspeed Due To Governor Valve Sticking Open

G. COMPONENT FAILURE DATA

Manufacturer	Nomenclature	Model Number	MFG Part Number
Dresser Rand	Carbon Spacers	N/A	54843
Dresser Rand	Valve Stem	N/A	90124B