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RLB-92-115

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U. S. Nuclear Regulatory Commission
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Reference: Quad Cities Nuclear Power Station
Docket Number 50-265, DPR-30, Unit Two

Enclosed is Licensee Event Report (LER) 92-010, Revision 01, for Quad Cities Nuclear Power Station.

This report is submitted in accordance with the requirements of the Code of Federal Regulations, Title 10, Part 50.73(a)(2)(iv): The licensee shall report any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS).

Respectfully,

COMMONWEALTH EDISON COMPANY
QUAD CITIES NUCLEAR POWER STATION

R. L. Bax
Station Manager

RLB/TB/plm

Enclosure

cc: J. Schrage
T. Taylor
INPO Records Center
NRC Region III

LICENSEE EVENT REPORT (LER)

Form Rev 2.0

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Title (4)

Reactor Scram Due to Turbine Trip From Moisture Separator High Level Due to a Blocked Drain Line.

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)
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OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)			
4		20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
1 0 0		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
Terry Barber, Regulatory Assurance, Ext. 3103	3 0 9 6 5 4 - 2 2 4 1

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

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS

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)

ABSTRACT:

On October 15, 1990, Quad Cities Unit Two was in the RUN mode at 100 percent of rated core thermal power. At 1210 hours, a reactor scram occurred due to turbine stop valve closure. The turbine stop valve closure was a result of a turbine trip caused by moisture separator high level. All safety feature actuations occurred as designed. Emergency Notification System (ENS) notification was completed at 1530 hours on October 15, 1990, to comply with the requirements of 10CFR50.72(b)(2)(ii).

An investigation revealed the cause of this event was due to a partially blocked drain line on the 2C moisture separator level switch. Because water was not draining properly from the level switch chamber, the level in the chamber increased to the high level setpoint. This resulted in a turbine trip.

The level switches for the moisture separator have been added to a Preventative Maintenance program.

This report is being submitted in accordance with 10CFR50.73(a)(2)(iv).

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2511 MWt rated core thermal power.

EVENT IDENTIFICATION: Reactor Scram Due To Turbine Trip From Moisture Separator High Level Due To A Blocked Drain Line.

A. CONDITIONS PRIOR TO EVENT:

Unit: Two Event Date: October 15, 1990 Event Time: 1210
Reactor Mode: 4 Mode Name: RUN Power Level: 100%

This report was initiated by Deviation Report D-4-2-90-053

RUN Mode (4) - In this position the reactor system pressure is at or above 825 psig, and the reactor protection system is energized, with APRM protection and RBM interlocks in service (excluding the 15% high flux scram).

B. DESCRIPTION OF EVENT:

On October 15, 1990, Quad Cities Unit Two was in the RUN Mode at 100 percent of rated core thermal power. At 1210 hours, the A-3 alarm [ALM], Moisture Separator 2C high level, on the 902-6 panel [PL] annunciated. Approximately 15 seconds later a reactor [RCT] scram [JC] occurred due to turbine [TRB] stop valve (SV) [V] closure. The stop valve closure scram signal comes from any turbine trip [TA] when steam flow is greater than 45 percent of rated flow as measured by turbine first stage pressure. The first hit on the 902-5 panel showed that the trip first hit indicator in the auxiliary electric room [NA] determined that the turbine trip was from moisture separator [SE] high level. The expected reactor water level transient, due to the collapse of voids following the scram, caused reactor vessel level to drop below +8 inches which in turn caused Group II and III Primary Containment Isolations (PCI) [JCI], Reactor Building [NG] Ventilation Isolations [VA], and Standby Gas Treatment (SBGT) [BH] initiation.

Additionally, the Unit Two Diesel Generator (DG) [DG] [EK] autostarted and a Group I PCI was received after the scram. The Group I PCI caused the Main Steam Isolation Valves (MSIV) [SB] to close. Reactor water level was increased and the scram signal was reset. As water level continued to increase a Nuclear Station Operator (NSO) closed the A and B Feedwater [SJ] Regulating Valve (FRV) isolation valves [ISV]. Reactor water level continued to increase; therefore, a different NSO placed the low flow FRV in manual and closed it. Due to the long stroke time of the FRV isolation valves, reactor water level increased to the high level trip setpoint for the reactor feedwater pump (RFP) [P]. At this point, the MSIVs were opened in accordance with QOS 250-1, Pressurizing the Main Steam Lines Following a Group I Primary Containment Isolation, thereby returning reactor pressure control to the Turbine Bypass Valves (BV).

The Shift Engineer (SE) instructed the crew not to initiate a systematic cooldown, but to remain pressurized at 920 psig. The NSO repeated back to the SE that the reactor was to remain pressurized at 920 psig. The NSO began decreasing the pressure regulatory [RG] which was set above reactor pressure for opening the MSIVs in accordance with the procedure. The NSO reduced the pressure regulator setpoint to 920 psig, opening two Bypass Valves. The increased steamflow through the BVs caused reactor water level to decrease rapidly. The RFP was started but the level continued to decrease due to the FRV isolation valves and the low flow FRV being closed. At 1225 hours, a second reactor scram occurred from reactor water low level. No control rod movement occurred since the control rods were already inserted. Reactor water level was restored and maintained around 30 inches.

An Emergency Notification System (ENS) notification of the event was completed at 1530 hours on October 15, 1990, to comply with the requirements of 10CFR50.72(b)(2)(ii).

C. APPARENT CAUSE OF EVENT:

This report is being submitted in accordance with 10CFR50.73(a)(2)(iv), which requires the reporting of any event or condition that results in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS).

The cause of this event was a blocked drain line on the 2C Moisture Separator level switch [LS] [71]. The blockage prevented water from draining out of the level switch chamber thus causing a high level signal and the actuation of the level switch. Testing proved that as the level switch chamber was filled slowly with water the level switch actuated approximately 15 seconds later. This indicated that the water was not draining properly.

The Group I PCI is believed to be a result of vibrations in the main steamline low pressure switches [PS] [63] caused by the steam impact on the stop valves. Although the main steamline low pressure annunciator [ANN] was received following the turbine trip, the pressure indication did not show a pressure drop prior to the MSIV closure. The other Group I isolation signals are main steamline high radiation [IL], main steamline high flow, MSIV room high temperature, and reactor water low-low level. A high radiation signal would have also isolated the offgas system [VL], which did not occur. Chart recorders [FR] showed no increase in steam flow during the event. The MSIV room was entered shortly after the scram and there was no indication of steam. Also, independent temperature switches that alarm on MSIV room high temperature did not alarm. Finally, there were no alarms or indications that reactor water level dropped below the isolation setpoint.

Further investigation led to the discovery of a section of sealtite between the pressure switches and the associated junction box (JBX) that was too rigid. It is believed that the instrument rack [RK] vibration, which occurs during a turbine trip due to close proximity, is transmitted to the pressure switches through the rigid section of sealtite. Subsequent discussions with Dresden Nuclear Power Station revealed that they have not received any spurious Group I isolations since replacing their sealtite.

During the automatic transfer of the auxiliary electrical loads [JX] following the turbine trip, the Unit Two DG autostarted. A review of the sequence of events computer printout and the electrical prints led to the conclusion that the DG started because the normal and reserve feed breakers were both open long enough for the DG Fast Start Relay (FSR) to energize. The normal feed breaker to Bus 24 receives a trip signal from the generator lockout relay when the generator trips. When the normal feed breaker opens, a signal is sent to the reserve feed breaker to close. Thus, the reserve feed breaker will not close until the normal feed breaker is open. The DG Autostart Relay (ASR) receives a signal when both the normal feed breaker and the reservice feed breaker are open concurrently. Therefore, during a short time span, this condition occurs. From review of previous events of this nature, it has been noted that the time span for the DG autostart signal has been increasing (from 70 msec to 90 msec). The time span has increased because the switch on the normal feed breaker that initiates the autostart signal has been closing more rapidly. This is due to the preventative maintenance on the switches. As a result, the auxiliary switches are in a position long enough that allows the ASR to energize and seal in the FSR. Special Test 2-97, Unit Two Diesel Generator Autostart Logic Timing, was performed to measure the time necessary to pickup the ASR and seal in the FSR. The results of the test verified that the time to pickup the ASR is approximately equal to the time both feed breakers were open to Bus 24 during the autotransfer.

Other possible DG autostart signals include an undervoltage condition on Bus 24 or 24-1 and an Emergency Core Cooling System (ECCS) signal. An undervoltage condition on Bus 24 or 24-1 was eliminated because no undervoltage targets or alarms occurred and no load shedding occurred (which is designed to occur on an undervoltage condition). An ECCS signal, -59 inches reactor water level of +2.5 psi drywell pressure, did not occur. An ECCS initiation signal would result in a Core Spray [BM] initiation and would be noted on the alarm typer.

The condenser low vacuum alarm, which was the first hit scram alarm, should not have occurred in this situation. The condenser vacuum was above the switch setpoint at all times. This alarm has occurred randomly in the past when the turbine SVs were tested. Investigation of the Condenser Low Vacuum annunciator input circuitry revealed no obvious cause.

D. SAFETY ANALYSIS OF EVENT:

The safety significance of this event is minimal. All expected ESF actuations occurred as designed to bring the reactor to a safe shutdown condition. The Moisture Separator High Level turbine trip is designed to prevent condensate [SD] from backing up into the moisture separator and possible carrying over into the low pressure turbine sections. The turbine stop valve closure scram occurs when the stop valves are less than 90% full open. This scram is intended to prevent exceeding the minimum critical power ratio (MCPR) safety limit by anticipating the rapid increase in pressure, neutron flux, and heat flux which results from a fast closure of the turbine stop valves. If the turbine stop valve scram had failed, a reactor scram would have occurred from an Average Power Range Monitor (APRM) high neutron flux.

E. CORRECTIVE ACTIONS:

The 2C Moisture Separator level switch chamber was cleaned and the level float checked for free movement. The micro switch and the spring on the switch were replaced. The piping to the level switch was flushed and verified for proper drainage. The level switch chamber was filled with water and checked for proper operation of the high level alarm. The 2A, 2B, and 2D Moisture Separator level switches were flushed out and tested similarly. The level switches will be added to a Preventative Maintenance program for periodic flushing (NTS 265200900530[1]).

Temporary alternations 90-2-133 and 134 were initiated to remove the sealtite (Work Request Q87662) on the 2C and 2D main steamline pressure switches in order to prevent the transmission of vibrations through the sealtite and allow the vibration isolators on the switches to perform as designed. A work request has been initiated to install longer pieces of sealtite so that there will be flexibility between the junction boxes and the pressure switches. The 2A and 2B pressure switches had slack in the sealtite and therefore were left untouched. The instrument rack with the main steamline pressure switches will have instrumentation installed to monitor vibrations during the performance of a turbine test (NTS 2652009005302). In addition, the computer sequence of event monitor will be modified to monitor the Group I PCI initiators (NTS 2652009005303).

As a result of the switches working properly and within the manufacturer's specifications, a modification of the DG autostart logic will be installed to preclude similar starts of the DG (NTS 2652009005304). The normal and reserve feed breakers were inspected cleaned under Work Request #Q71912.

The station currently has a program in place to inspect auxiliary switches in 4kv horizontal switchgear which requires an inspection and cleaning of the switches. The switch is then disconnected so that during operation of the switch it will not cause an undesired actuation of plant equipment. With the switch in the normal (unactuated) position, each contact is tested. The criteria for contacts is less than 1 ohm when closed and greater than 1 megohm when open. The switch is then actuated and the contacts are again tested in this position. This will verify proper contact operation in both the open and closed states. At this point the switch would be replaced upon failure and the new switch tested. A further check is made using a test rig to simulate actual breaker operation. This verifies the linkages that operate the switch are also in proper working order or are adjusted to perform properly. This inspection is adequate to ensure the proper operation of the normal and auxiliary feed breakers.

F. PREVIOUS EVENTS:

A review of Licensee Event Reports (LER) back to 1985 revealed one other scram due to Moisture Separator high level. LER 254/87-005 was written as a result of the Moisture Separator level control valve being out of adjustment resulting in a turbine trip and scram.

G. COMPONENT FAILURE DATA:

The Moisture Separator level switch is manufactured by Magnatrol and the drain line is considered to be a piece part of the switch.