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RLB-92-003

January 6, 1992

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Reference: Quad Cities Nuclear Power Station
Docket Number 50-254, DPR-29, Unit One

Enclosed is Licensee Event Report (LER) 91-025, Revision 00, 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.

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

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STMGR 248

LICENSEE EVENT REPORT (LER)

Form Rev 2.0

Facility Name (1)	Docket Number (2)	Page (3)
Quad Cities Unit One	0 5 0 0 0 2 5 4	1 of 0 6

Title (4)

Reactor Scram Due to Turbine Trip from Reactor Water High Level Due to 1A Feed Reg Vlv Failing full 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
1 2	1 1	9 1	9 1	0 2 5	0 0	0 1	0 6	9 2		0 5 0 0 0

OPERATING MODE (9): 4

POWER LEVEL: 0 7 8

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

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
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
R. Dvorak, Technical Staff, Ext. 2177	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	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
X	J B	L C Y	C 6 3 5	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)

ABSTRACT:

On December 11, 1991, Quad Cities Unit One was in the RUN mode at 78 percent of rated core thermal power. At 0425 hours, a reactor scram occurred due to turbine stop valve closure as a result of a high reactor water level turbine trip. The high reactor water level was caused by a feedwater regulating valve failing full open. All safety feature actuations occurred as designed. Emergency Notification System (ENS) notification was completed at 0632 hours on December 11, 1991, to comply with the requirements of 10CFR50.72(b)(2)(ii).

An investigation revealed the cause of the event to be due to misalignment of the 1A Feedwater Regulating Valve causing the valve to bind. The manual operator assembly broke in an attempt to close the valve manually which allowed the valve to open fully due to spring force. The failed open feedwater regulating valve caused the high reactor water level and subsequent turbine trip.

PLANT AND SYSTEM IDENTIFICATION:

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

EVENT IDENTIFICATION: Reactor Scram due to turbine trip from reactor water high level due to 1A feed reg vlv failing full open.

A. CONDITIONS PRIOR TO EVENT:

Unit: One Event Date: December 11, 1991 Event Time: 0425
Reactor Mode: 4 Mode Name: RUN Power Level: 78%

This report was initiated by Deviation Report D-4-1-91-149.

RUN Mode (4) - Run - 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 December 11, 1991, Unit One was in the RUN mode at 78 percent of rated core thermal power. At 0050 hours, the Unit One (U1) Nuclear Station Operator (NSO) attempted to close the 1-642A air-operated Feedwater Regulating Valve (FWRV)[FCV]. The U1 NSO was unable to close the valve further than 34 percent open. The NSO dispatched an Equipment Attendant (EA) to the Feedwater Regulating Station [JB] to investigate. A Shift Foreman (SF) and Mechanical Maintenance Foreman were also sent to assist the EA.

At the Feedwater Regulating Station the valve was observed to open but would not close beyond 34 percent. The Shift Engineer (SE) then decided that the valve should be closed manually in an attempt to diagnose the nature of the binding at 34 percent. From previous experience, it was known that the valve did not bind once isolated. Since the unit was at reduced load, the Shift Engineer decided to stroke the valve on line. Due to other activities, the manual stroking was planned for 0400 hours.

At 0400 hours, the U1 NSO, U1 EA, both SF, and some trainees gathered in the Control Room for a pre-job briefing on the performance of QOP 600-6, PLACING THE "A" FEEDWATER REGULATOR INTO "LOCAL" MANUAL OPERATION FOR UNIT ONE. After the briefing, the U1 EA, both SF, and two trainees proceeded to the valve with QOP 600-6 in hand intending to manually close the valve.

Communications were established between the Control Room and the Feedwater Regulating Station and the procedure was started. In accordance with QOP 600-6, the manual handwheel of the "A" FWRV was turned clockwise until resistance was felt. The air supply to the valve positioner was then closed. The SE arrived in the Control Room at this time. A small level transient occurred with reactor [RCT] water level rising to the high level alarm [LA] setpoint of +36 inches. In response to the alarm, the U1 NSO instructed the EA to close the "A" FWRV manually. The U1 NSO then began closing the motor operated isolation valve [ISV] MO-1-3206A. When reactor water level returned to +30 inches, the U1 NSO placed the control switch for MO-1-3206A in the pull-to-stop position. During this time, the U1 EA was attempting to manually close the "A" FWRV noting alternating positions of tightness in no particular pattern. The U1 NSO then observed rising reactor water level. The personnel at the Feedwater Regulating Station reported that the manual operator [B4] had broken and that the valve was opening from spring force. The Shift Control Room Engineer observed and verified the 1A FWRV position indication increasing towards full open. The SE directed the U1 NSO to close the MO-1-3206A isolation valve and give a small increase to the reactor recirculation (RR) [AD] pump controllers to increase power. The RR pump controller increase was assumed by the U2 NSO who had been relieved by the control room extra NSO and had not yet assumed control of Unit 2. Reactor water level continued to increase until the +48 inches Reactor Feed Pump/Main Turbine [SJ] [TA] trip setpoint was reached. The SE was not able to give direction to manually scram the reactor due to the rate at which level was rising. The reactor scrammed on turbine stop valve [TRB] [V] closure due to a turbine trip at greator than 40 percent power. The expected reactor water level transient, due to the collapse of voids following the scram and the tripping of the reactor feed pumps, caused reactor vessel level to drop below +8 inches. This 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.

In addition, a spurious Group I PCI was received. This caused the Main Steam Isolation Valves (MSIV) [ISV] to close which caused reactor pressure to increase. Also, the Unit One diesel generator [DG] Auto-start alarm [ALM] was received but the diesel did not start nor was it required to start in this scenario. The Center Desk NSO obtained procedure QCOP 250-1, PRESSURIZING THE MAIN STEAM LINES, and subsequently reopened the MSIVs. Reactor level was observed to be decreasing, and the SE directed that a Reactor Feed Pump be started. The U1 NSO started the 1A RFP and level was brought back up and controlled by the low flow FWRV, AO-1-643, at approximately 25 inches.

The Unit was stabilized by 0500 hours using the turbine bypass valves to control reactor pressure and the low flow FWRV and Reactor Water Cleanup system reject to control reactor level. The SE then notified the On-Call Station Duty Officer and was instructed not to initiate a systematic cooldown but to remain pressurized until further directed.

An Emergency Notification System (ENS) notification of the event was completed at 0632 hours on December 11, 1991, to comply with the requirements of 10CFR50.72(b)(2)(ii).

There were no other systems or components inoperable at the beginning of this event which could have contributed to this event.

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 apparent cause of this event was misalignment of the 1A FWRV between the stem and operator causing binding. This lead to manual operation and subsequent failure to the full open position when the manual operator assembly fractured.

Contributing to the stem binding was the packing gland follower at the end of travel indicating end of useful packing life (packing bottomed out). As the handwheel was turned during manual operation of the valve, the subsequent reaction force to the bound stem opposed the manual operator assembly causing a fracture of its housing. The housing fracture allowed the valve to fail open due to spring force.

The spurious Group I PCI is believed to be caused by main steam line pressure wave propagation reinforcing instrument line resonance to yield accentuated pressure fluctuations at the location of the main steam line low pressure switch [63]. The Group I signal was received after the MSIVs began closing. The main steam line low pressure annunciator was not received until after MSIV closure. The other Group I isolation signals are main steam line high radiation [IL], main steam line high flow, MSIV room high temperature, and reactor water low-low level. There were no alarms or indications received to indicate any of these conditions occurred.

The diesel generator autostart annunciator is believed to be caused by Bus 14-1 sensing an undervoltage and a subsequent relay [27] race in the diesel generator autostart circuitry. This annunciator has been observed in previous scram events and a recorder [ER] was installed to monitor the bus transfer. Unfortunately, the recorder had a triggering problem and was unable to provide any results.

D. SAFETY ANALYSIS OF EVENT:

The safety significance of this event is minimal. All expected ESF actuations occurred as desired to bring the reactor to a safe shutdown condition. The reactor vessel high level turbine trip is designed to prevent moisture carryover into the main turbine.

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 1A FWRV was disassembled and repaired under Nuclear Work Request Q93104. The operator diaphragms, lower diaphragm plate, yoke, packing gland, and manual operator assembly were all replaced. The valve and operator were properly aligned, and the valve was stroked to ensure smooth travel with no binding. The 2A FWRV was also inspected for signs of degradation of the manual operator assembly but none were found. However, manual valve manipulations of the air operated FWRVS have been suspended until the Tech Staff System Engineer can interface with the valve manufacturer to resolve any possible generic problems with the valve and operation (NTS #254 200 91 14901).

A special test is being prepared to measure the pressure at the main steam line pressure switches during a turbine trip to address the spurious Group I PCI signal. Further corrective actions will be based upon the results of this test. This test was previously scheduled from a prior event for the Unit Two refuel outage Q2R11. Additionally, the computer sequence of event recorder will be modified to monitor the Group I PCI initiators (NTS #265 200 90 05303).

The reactor for the Bus 14-1 auto transfer has been modified to trigger on the proper signal and remains installed under Special Test I-163. Further corrective actions will be based on the results of the next event recorder indications (NTS #254 200 91 14902).

F. PREVIOUS EVENTS:

A search of the Nuclear Plant Reliability Data System (NPRDS) identified 4 instances in which Quad Cities had problems with the air-operated feedwater regulating valves (1A and 2A). None of these previous failures resulted in the manual valve operator assembly fracturing and allowing the valve to fail open. Two of the four previous events were problems associated with valve binding. A nationwide search found no problems directly associated with operator failure due to stem binding.

There were no OPEX reports found that specifically identified Feedwater Regulating Valve manual operator assembly failure of valve/operator misalignment.

G. COMPONENT FAILURE DATA:

Description: Air-operated Feedwater Regulating Valve.
Manufacturer: Copes-Vulcan.
Model Number: D-100-160 Actuator
Manual Operator Assembly part # 37933.