NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Quad-Cities Nuclear Power Station, Unit 2	0 5 0 0 0 2 6 5	1 OF 0 5

TITLE (4)

Loss of Auxiliary Power to Unit in Refueling and Unit 1 Reactor Scram

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 7	8 5	8 5	0 1 1	0 0	0 6	0 3	8 5	Quad-Cities Unit 1	0 5 0 0 0 2 5 4
										0 5 0 0 0

OPERATING MODE (9)	1
POWER LEVEL (10)	0

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

	20.402(b)		20.405(c)	X	50.73(a)(2)(iv)
	20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)
	20.405(a)(1)(ii)		50.36(c)(2)	X	50.73(a)(2)(vii)
	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)

	73.71(b)
	73.71(c)
	OTHER (Specify in Abstract below and in Text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
Brian R. Strub (ext. 186)	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	
A				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 May 7, 1985, Unit 1 was in the RUN mode at approximately 90 percent of rated core thermal power. Unit 2 was in COLD SHUTDOWN. At 1517 hours, contractor personnel working on roof repairs were attempting to connect a power cord for a drill to an AC outlet located near the ground below. While lowering the cord from the roof, a sudden 'A' phase to ground fault occurred. This fault opened oil circuit breakers (OCB) 8-9 and 9-10, which caused a loss of normal auxiliary power to Unit 2. Diesel Generator 1/2 auto-started and closed-in to Bus 23-1 on a Bus 23-1 undervoltage signal. Unit 2 remained stable.

The electrical transient in the 345 KV switchyard caused a transient on the Unit 1 electrical system. The transient caused a loss of 'A' Reactor Protection System Bus and a lock-up of a Feedwater Regulating Valve. The locked-up Feedwater Regulating Valve resulted in a high Reactor water level condition which resulted in a Turbine trip, and Reactor scram. This occurred six minutes after the electrical transient, at 1523 hours. Subsequently, a normal scram recovery was performed and all electrical systems were returned to normal. All systems and equipment functioned as designed.

IE22
1/1

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Event Description

On May 7, 1985, Unit 1 was in the RUN mode at approximately 90 percent of rated core thermal power. Unit 2 was in COLD SHUTDOWN for its End of Cycle 7 Refueling and Maintenance Outage. At 1517 hours, contractor personnel, working on roof repairs, were attempting to connect a power cord for a drill to an AC outlet located near the ground below in the vicinity of Unit 2 Reserve Auxiliary Transformer (T-22). In the process of lowering the cord from the roof, a sudden 'A' phase to ground fault occurred, apparently from the cord getting too close to T-22 'A' 345 KV phase line. Two contractor personnel received burn injuries. They were given first aid treatment by Radiation Chemistry Technician personnel, and transported by ambulances to Franciscan Hospital, Rock Island, Illinois. No personnel were contaminated. Both injured contractors are recovering and there will be no disabling injuries.

At the instant of the fault, Transformer T-22 tripped when oil circuit breakers (OCB) 8-9 and 9-10 (FK) opened due to 'A' phase undervoltage. This caused a loss of normal auxiliary power to Unit 2. Diesel Generator 1/2 auto-started due to an undervoltage signal on Bus 23-1 and closed-in to that Bus. There was no immediate safety concern over the status of Unit 2 since the unit was shutdown for refueling and the Reactor water level was elevated in preparation for Reactor vessel head installation. The unit remained stable.

At the time of the loss of T-22, several events took place on Unit 1:

A. Loss of the 'A' Reactor Protection System (RPS) Bus.

B. Momentary voltage degradation of the Instrument Bus.

C. One-half of the Group II and III Primary Containment Isolation Valves went closed.

D. Steam Jet Air Ejector (SJAE) Suction Valve closure.

E. Feedwater Regulating Valve, HO 1-642B, lock-up.

F. Diversion of the Unit 1 Feedwater Heater Drains to the main Condenser.

The diversion of the Feedwater Heater Drains to the main Condenser, thereby not cascading from heater to heater, resulted in a slow decrease of Feedwater temperature. This caused a slow reactivity addition. Station procedures direct the Nuclear Station Operators to drop 20 percent speed on

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Event Description (continued)

the Recirculation Pumps and then to begin inserting control rods in sequence. This power reduction, with a locked-up regulating valve, resulted in a high Reactor water level condition. The main Turbine trip at +48 inches and the resulting Reactor scram from Turbine Stop Valve closure occurred at 1523 hours. After the scram, a normal scram recovery was initiated.

A Generating Station Emergency Plan (GSEP) Unusual Event was declared at 1540 hours due to Emergency Action Level (EAL) #10, loss of all off-site power to a unit. Appropriate NRC Emergency Notification System (ENS) phone notifications were made for both the Unit 1 scram and the Unit 2 loss of power.

At approximately 1600 hours, after Unit 1 was stabilized, it was decided to energize Bus 24-1 on Unit 2 utilizing the Bus 14-1 to Bus 24-1 crosstie breakers. Bus 29 was subsequently energized, as were the RPS buses. The GSEP Unusual Event was terminated at 1700 hours.

Cause

These events occurred from a transient that took place in the 345 KV switchyard. A fault occurred on the high voltage side of the Unit 2 Reserve Auxiliary Transformer. This fault was a high voltage transmission system fault. The fault was of five cycle (0.083 sec) duration and was at ground potential for the five cycles. The oscillograph recordings were analyzed by System Operational Analysis Department (SOAD). These recordings showed 'A' phase to be at zero volts for five cycles, while 'B' and 'C' phase voltages dropped by 10 percent from normal voltage for five cycles. The duration was the result of equipment response time to isolate the fault. The fault was detected by two independent sets of 345 KV protective relays. Both sets of relays operated and initiated the proper breaker trips. All protective devices functioned correctly and cleared the fault within design limits.

The electric grid has been analyzed for the simultaneous loss of both nuclear units at Quad-Cities Station. The analysis involved a 3 phase fault and loss of both units. The electric grid can withstand such a situation. An event of this type is documented in RO 50-265/77-37/03L.

The depressed voltages on the 345 KV system during the fault resulted in abnormal voltages in both Unit 1 electrical divisions. One electrical division is supplied by the Unit 1 main Generator via the Unit Auxiliary Transformer and the other division is supplied by off-site power via the

Cause (continued)

Reserve Auxiliary Transformer. To determine the extent to which the 345 KV fault affected the auxiliary power system, System Planning conducted a computer study. The results of the study show that the phase voltage on the auxiliary power system were as follows:

Division Supplied By Reserve Auxiliary Transformer	Division Supplied By Unit Auxiliary Transformer
4 KV System	
Vab - 2400 V	Vab - 2670 V
Vac - 2400 V	Vac - 2670 V
Vbc - 4400 V	Vbc - 4290 V
480 Volt System	
Vab - 132 V	Vab - 218 V
Vac - 455 V	Vac - 455 V
Vbc - 455 V	Vbc - 455 V

The most significant difference between the voltages in the two divisions occurred on the A to B voltage on the 480 Volt systems. The A to B voltage on the 480 Volt buses powered from the Reserve Auxiliary Transformer dropped to 132 Volts (27 percent of normal) as compared to 218 Volts (45 percent of normal) on the buses powered from the Unit Auxiliary Transformer. The depressed voltage of 132 Volts for five cycles caused the contactor feeding the 1-A RPS Motor Generator (MG) Set drive motor to drop out. The control circuit for the 480 Volt drive motor of the RPS MG Set does not allow an automatic restart of the motor. When the contactor dropped out, tripping the MG Set, the flywheel had no effect on the resulting MG Set operation. The flywheel would be effective for transients when the MG Set drive motor does not trip. The abnormal voltages did not affect the operation of equipment on the 4 KV System. The loss of voltage and the degraded voltage protective circuits designed for the Class 1E, 4160 Volt buses require two seconds or more to operate. They should not operate for transient voltage dips.

Cause (continued)

SJAE suction valve closure is a normal consequence on the loss of 'A' RPS Bus, as is the closure of one-half of the Group II and III Primary Containment Isolation Valves. The momentary voltage degradation on the Instrument Bus caused the Feedwater Heater Level Control Valves to trip. The air operated, normal drain valves, on the Feedwater Heaters, close automatically upon sensing Feedwater Heater high water level by the operation of normally energized electrical solenoid valves. These solenoid valves are installed in each Level Control Valve's control air line and are electrically energized from the Instrument Bus. A momentary voltage degradation of the Unit 1 Instrument Bus caused these solenoid valves to close. After these valves close, they can only be reset manually at the local rack. The heater drains were, therefore, diverted to the Feedwater Heater emergency dump valves that drain directly to the main Condenser.

The Feedwater Regulating Valve lock-up was a result of the tripping of the hydraulic pump for the valve operator. This pump tripped because its contactor dropped out in a similar fashion as the RPS MG Set drive motor contactor.

Corrective Action

Transformer 22 was examined and damaged insulators were found on the 'A' phase lines feeding the transformer. The insulators were replaced and the transformer was returned to service at 0645 hours on May 8, 1985. All systems and equipment functioned as designed and no changes are necessary. However, the Station is considering a modification which may prevent losing the feed to the RPS MG Set drive motor for similar faults on the 345 KV system. The modification involves a time delay relay which allows the flywheel to be more effective in performing its intended function.

In November, 1977, a fault in the 345 KV switchyard involving Transformer 82, resulted in the loss of both units. This event is documented in RO 50-265/77-37/03L.

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NJK-85-151

May 30, 1985

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
Docket Number 50-265, DPR-30, Unit Two

Enclosed please find Licensee Event Report (LER) 85-11, Revision 00, for Quad-Cities Nuclear Power Station.

This report is submitted to you in accordance with the requirements of the Code of Federal Regulations, Title 10, Part 50.73(a)(2)(iv) and 50.73(a)(2)(vii), which requires the reporting of any event that resulted in an automatic actuation of any Engineered Safety Feature, and the reporting of an event where a single cause resulted in at least one independent train or channel to become inoperable in multiple systems.

Respectfully,

COMMONWEALTH EDISON COMPANY
QUAD-CITIES NUCLEAR POWER STATION

N. J. Kalivianakis
Station Manager

NJK:BRS/bb

Enclosure

cc B. Rybak
A. Madison
INPO Records Center
NRC Region III

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