



**Commonwealth Edison**

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RLB-93-057

March 30, 1993

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) 93-003, Revision 0, for Quad Cities Nuclear Power Station.

This report is submitted as a voluntary report only.

Respectfully,

COMMONWEALTH EDISON COMPANY  
QUAD CITIES NUCLEAR POWER STATION

*RLB*

R. L. Bax  
Station Manager

RLB/TB/plm

Enclosure

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

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## LICENSEE EVENT REPORT (LER)

Form Rev 2.0

Facility Name (1) Quad Cities Unit One										Docket Number (2) 0   5   0   0   0   2   5   4				Page (3) 1   of   0   4					
Title (4) Postulated Loss Of LPCI Swing Bus Due To An Original Design Weakness																			
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   3	0   5	9   3	9   3	0   0   3	0   0	0   3	3   1	9   3	Quad Cities Unit Two				0   5   0   0   0   2   6   5						
OPERATING MODE (9) 4				THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)															
POWER LEVEL (10) 1   0   0				20.402(b)				20.405(c)				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)				<input checked="" type="checkbox"/> 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 Randy Charneski, Tech Staff Engineer, Ext. 2175										TELEPHONE NUMBER AREA CODE 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)							
Yes (If yes, complete EXPECTED SUBMISSION DATE)												<input checked="" type="checkbox"/> NO							
ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)																			

ABSTRACT

On March 5, 1993, Quad Cities Station determined there exists a potential design deficiency concerning the LPCI Swing Bus during degraded voltage conditions. Specifically, the potential exists that during a LOCA condition concurrent with degraded voltage that there are single component failures that could result in the failure of the LPCI Swing Bus and the associated 4 KV Safety Bus to transfer to their respective alternate supplies, resulting in sustained degraded voltage. Sustained degraded voltage on the LPCI Swing Bus and associated 4 KV Safety Bus could lead to the failure of both LPCI and the Division II Core Spray Sub systems resulting in an Emergency Core Cooling response that is more limiting than the current licensing basis.

Based on the review of this issue Quad Cities Station has concluded that this event is not within the current licensing basis and due to the extremely low probability of occurrence and availability of core cooling systems, is of minimal safety significance. Therefore, this event was deemed not reportable. However, because of the nature of this issue, Quad Cities has elected to provide this voluntary report.

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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

PLANT AND SYSTEM IDENTIFICATION:

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

EVENT IDENTIFICATION: Postulated loss of LPCI Swing Bus due to an original design weakness.

A. CONDITIONS PRIOR TO EVENT:

Unit: One	Event Date: March 5, 1993	Event Time: N/A
Reactor Mode: 4	Mode Name: RUN	Power Level: 100%

This report was initiated by Deviation Report D-4-1-93-027.

RUN (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 March 5, 1993, Unit 1 and Unit 2 were in the RUN mode at 100% rated core thermal power when it was determined that during a Loss of Coolant Accident, concurrent with a degraded voltage condition, that a single breaker failure, [the main feed breaker to the 4 KV Safety Bus] could render the Low Pressure Coolant Injection (LPCI) System 480 volt Swing Bus Motor Control Center (MCC) 18/19-5 (28/29-5) and the Division II Core Spray Subsystems incapable of performing their intended functions. Failure of both LPCI and Division II Core Spray Systems results in an Emergency Core Cooling response that is more limiting than the current licensing basis.

Under the current licensing basis, the LPCI Swing Bus is designed to operate as described below. The event assumes a LOCA concurrent with a Loss of Offsite Power (LOOP) on Unit 1. At the LPCI Swing Bus (MCC 18/19-5), the normal feed contactor (Device 1951) drops out (opens) on a loss of power. However, this does not yet cause a transfer of the Swing Bus due to the presence of a time-delay-on-drop-out relay (TDOD). The undervoltage relays (IAV 698B relays), sensing a loss of voltage time out and trip the Bus 14-1 feed breaker (1410). Bus 14-1 feed breaker (1427) is interlocked (slaved) with breaker (1410); therefore, it trips and initiates an autostart signal to the Unit 1 Diesel Generator (which has already received an autostart signal from the LOCA signal). The output breaker of the Unit 1 Diesel Generator (1429) will close when the Bus 14-1 feed breaker (1410) is open and the Unit 1 diesel generator is producing adequate voltage at rated frequency. Closing the Unit 1 Diesel generator output breaker will restore voltage to 480V Bus 19, picking up (closing) the contactor (1951) and preventing a transfer. If the Unit 1 Diesel Generator fails to start or one of the breakers fails to operate, the time delay relay associated with the contactor (1951) will initiate a transfer after a period of 20 seconds. This affords the Unit 1 Diesel Generator an opportunity to restore the normal feed to the Swing Bus.

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The above scenario can now be reconsidered with the initiating event; a LOCA with degraded voltage rather than a LOOP. The Unit 1 Diesel Generator would start (from the LOCA signal) and the output breaker 1429 would close after the second level undervoltage relay times out; identical to the actions initiated by the undervoltage relay as discussed above. However, a single failure in the second level undervoltage circuit would fail to trip the normal feed breaker (1410) preventing the Unit 1 Diesel Generator output breaker from closing. Thus, the Diesel Generator could not close in, and would continue to run unloaded. The offsite source of power, still in a "degraded" voltage condition, would not assure adequate voltage to re-align the LPCI injection valves. However, if the voltage level remained above the "drop out" voltage of the contactor (1951) the Swing Bus transfer mechanism would not execute its transfer sequence. Note that the "power monitoring" scheme installed for detecting problems with the diesel generator voltage regulator under modification M4-1(2)89-165 would detect the degraded condition, but would take no action as the trip logic requires that the Unit 1 Diesel Generator output breaker (1429) be closed for a transfer to occur.

Further analysis of this event has shown that other single failure modes can be postulated that will result in the same outcome. Since the degraded voltage relay logic is two out of two, failure of either relay will also prevent the isolation of the Safety Bus. Failure of 125 volt DC at the Safety Bus, since the degraded voltage relays are energize to actuate, will also prevent the isolation of the Safety Bus. Finally, failure of the HFA relay, which actuates upon degraded voltage and provides the trip signal to the Safety Bus main feed breaker, will also prevent the Safety Bus from isolating.

C. APPARENT CAUSE OF EVENT:

The root cause of this event is considered a design weakness. The postulated sequence of events that could cause this problem are beyond the current licensing basis and were not considered when the existing degraded voltage protection logic was installed.

D. SAFETY ANALYSIS OF EVENT:

The sequence of events postulated is considered to be an extremely low probability and outside the current licensing basis. First, a LOCA must occur that is sufficiently large to exceed the capacity of HPCI and Auto Depressurization System (ADS)/Core Spray Systems. Concurrently, a degraded voltage condition must occur. Finally, a failure must occur that prevents the isolation of the Safety Bus.

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Additionally, a previous evaluation was performed by Nuclear Fuel Services, developed as a historical safety assessment of the degraded voltage setpoint issue at Dresden identified during the Dresden Electrical Distribution Safety Functional Inspection (EDSFI). This report evaluates the condition where only one Core Spray pump is available as a result of degraded voltage and concludes that utilizing generic realistic LOCA analysis, that sufficient systems are available to assure that Peak Clad Temperatures following the large break LOCA are maintained less than 2200 degrees F. This evaluation is also applicable to Quad Cities Station.

Therefore, based on this information Quad Cities Station has determined this event to be of minimal safety significance.

E. CORRECTIVE ACTIONS:

On March 5, 1993, Interim Procedure #70 was implemented. This procedure provides guidance to Operations on how to respond to this event if it were to occur.

Several different approaches to resolve this design weakness are being evaluated. An Engineering study on this issue is expected to be complete by 06/01/93. Engineering recommendations will be evaluated relative to the increase in plant safety and implemented if appropriate (NTS# 2542009302701).

F. PREVIOUS EVENTS:

This concern has not been identified previously at Quad Cities. However, a similar event concerning degraded voltage and the LPCI Swing Bus Transfer was previously addressed under modification M04-1(2)-89-165. This modification provided voltage and frequency protection at the LCPI Swing Bus to detect a failure of the diesel generator voltage regulator. As described previously, this protection is only available when the diesel generator output breaker is closed.

G. COMPONENT FAILURE DATA:

As this event did not involve actual component failure, this section is not applicable.