

**Licensee Event Report  
Reviewer Assignment Form**

Revised 12/01/94

LER # 2651809500400

Date: November 17, 1995

Subject: Condenser Vacuum Scram Switches found out of Technical Specification

Limits due to apparent Setpoint Drift.

Signatures of reviewers indicating review and approval of item:

Systems Eng. Supv:

D. M. B. for DC 11-17-95  
Date

Mark L. Bridge for NRC 11-21-95  
Date

Operating Eng.:

Alex L. Misch 11/21/95  
Date

/  
Date

/  
Date

/  
Date

/  
Date

/  
Date

Approved:

[Signature] 11/27/95  
Station Manager/PORC Chairman Date



## System Engineering Department Memorandum

Date: November 27, 1995

To: L. W. Pearce  
Station Manager

From: James Dinh  
System Engineer

Approver: Dave Craddick  
SED Supervisor

Subject: Supplement Report to LER 2-95-004

Re: LER 2-95-004

Upon completion of the Quarterly Low Condenser Vacuum SCRAM Calibration and Functional Test on Unit Two on 7/26/95, all four switches 2-503-A/B/C/D setpoints were found to be out of Technical Specifications (TS) limits. These switches have been undergoing an investigation to determine the root cause(s) behind the switch testing failures. This report is the result of the investigation.

### ROOT CAUSE:

A high temperature and humidity test was performed on two of the replaced switches and two new switches of similar model to simulate the switch's normal operating condition. The switches were also tested for setpoint cycling effect. These four switches had a calibration test performed on a regular frequency during the duration of the test. Based on the results of the investigation, it was determined that high temperature and humidity did affect the switch's performance. All four switch setpoints drifted either conservatively high or low and out of the switch allowable tolerance limits. Cycling of the switches only temporarily decreased the amount of setpoint drift.

In addition, a trending of the Unit Two condenser vacuum switches setpoint over a four month interval from 7/28/95 to the current date was performed. The switches were placed in an accelerated calibration frequency of weekly for the first month and monthly for the remaining three months. The results indicated that the switches setpoint did drift on a regular basis but the amount of drift was within the new Administrative Limit on 19 out of 20 readings. The one time a switch setpoint drifted out of the new Administrative Limit, the setpoint was still within the TS Limit. To match Quad Cities Station to the industry instrument calibration standard and practice, the new Administrative Limit was recently developed to accurately monitor the switches for performance problems and to eliminate any false alarm due to calibration random error.

#### **CORRECTIVE ACTIONS:**

QCIS 500-1, Quarterly Low Condenser Vacuum SCRAM Calibration and Functional Test, was revised to incorporate the new Administrative Limit. Also, the calibration of the U-2 condenser low vacuum SCRAM switches will remain in a monthly accelerated frequency to prevent the switches from exceeding their TS limit until these switches are replaced.

U-1 condenser low vacuum SCRAM switches did not indicate any negative trending. However, since these switches are the same model as the U-2 switches and therefore have a potential for setpoint drifts, the calibration of the U-1 switches will also be accelerated to a monthly frequency until these switches are replaced.

Engineering Request ER9501735 was submitted to replace these switches with more reliable model (NTS #2651809500405). The switch replacement will be scheduled for Q1R14, and Q2R14, respectively. The expected completion date is May 1997.

Commonwealth Edison Company  
Quad Cities Generating Station  
22710 206th Avenue North  
Cordova, IL 61242-9740  
Tel 309-654-2241



LWP-95-079

August 25, 1995

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

Reference: Quad Cities Nuclear Power Station  
Docket Number 50-265, DPR-30, Unit Two

Enclosed is Licensee Event Report (LER) 95-004, 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)(v)(A). The licensee shall report any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems than are needed to shutdown the reactor and maintain it in a safe shutdown condition.

The following commitments are being made in this letter:

The Unit 2 Low Condenser Vacuum Scram switches will continue to be calibrated on an increased frequency. Based on the results of the calibration surveillances, further corrective actions will be determined. This will be completed by November 1, 1995.

A copy of Quad Cities Station calibration procedure will be sent to the switch manufacturer for review. This will be completed by September 1, 1995.

Two of the replaced switches were sent to Material Engineering Group (MEG) for failure analysis. MEG is testing the switches for temperature, humidity, and cycling effects associated with the setpoint drift. Corrective actions based on this analysis will be identified by November 1, 1995.

The results of the follow-up corrective actions will be reported in a supplementary report. This will be completed by November 30, 1995.

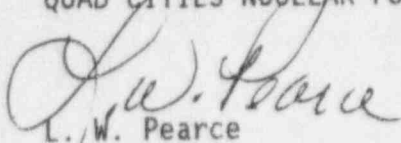
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LWP-95-079  
August 25, 1995  
Page 2

If there are any questions or comments concerning this letter, please refer them to Nick Chrissotimos, Regulatory Assurance Administrator at 309-654-2241. ext. 3100.

Respectfully,

COMMONWEALTH EDISON COMPANY  
QUAD CITIES NUCLEAR POWER STATION

  
L.W. Pearce  
Station Manager

LWP/NC/plm  
Enclosure

cc: J. Schrage  
C. Miller  
INPO Records Center  
NRC Region III

## LICENSEE EVENT REPORT (LER)

Form Rev. 2.0

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

Title (4)

Condenser Vacuum Scram Switches Found Out Of Technical Specification Limits Due To Apparent Setpoint Drift.

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	7	2	6	9	5	9	5	--	0	0	4	--	0	0	0	8	2	5	9	5	0	5	0	0	0		

OPERATING MODE (9)		1		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)									
POWER LEVEL (10)		0		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)			
				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)										TELEPHONE NUMBER									
NAME										AREA CODE									
Nick Chrissotimos, Regulatory Assurance, Ext. 3100										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									

SUPPLEMENTAL REPORT EXPECTED (14)						Expected Submission Date (15)		Month	Day	Year
X YES (If yes, complete EXPECTED SUBMISSION DATE)						NO		1	1	3   0   9   5

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

## ABSTRACT

On July 26, 1995, at 1500 hours, Unit Two was in the Shutdown mode. During a quarterly calibration and functional test per QCIS 500-1, "Quarterly Low Condenser Vacuum [SH] Scram Calibration and Functional Test", all four (4) low condenser vacuum scram switches [PS] 2-503-A/B/C/D setpoints were found to be out of their Technical Specifications (TS) limit of 21" Hg. (decreasing). A Problem Identification Form (PIF) was written and the switches were calibrated to within the allowable tolerance. The safety consequences of this event are minimal. The unit was in the Shutdown mode and per TS, the operation of the low condenser vacuum scram switches is not required. The switches were replaced with like-for-like switches on July 27, 1995. The new switches were placed in an accelerated weekly calibration frequency for the first month and monthly for the next five months. Any further corrective actions will be determined based on the results of the accelerated calibration and also on the results of the failure analysis of the old, replaced switches.



LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

Form Rev. 2.0

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)						PAGE (3)		
		Year		Sequential Number		Revision Number				
Quad Cities Unit Two	0   5   0   0   0   2   6   5	9   5	-	0   0   4	-	0   0		2   OF   0   5		

TEXT Energy Industry Identification System (EIS) 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: Condenser Vacuum Scram Switches found out of Technical Specification Limits due to apparent Setpoint Drift.

A. CONDITIONS PRIOR TO EVENT:

Unit: Two                      Event Date: July 26, 1995                      Event Time: 1500  
Reactor Mode: 1              Mode Name: Shutdown                      Power Level: 0

This report was initiated by Licensee Event Report LER265\95\004.

SHUTDOWN (1) - In this position, a reactor scram is initiated, power to the control rod drives is removed, and the reactor protection trip systems have been deenergized for 10 seconds prior to permissive for manual reset.

B. EVENT DESCRIPTION

On July 26, 1995, at 1500 hours, Unit Two was in the Shutdown mode. During a quarterly calibration and functional test per QCIS 500-1, "Quarterly Low Condenser Vacuum Scram Calibration and Functional Test", all four (4) low condenser vacuum scram switches 2-503-A/B/C/D setpoints were found to be out of their TS limit of 21" Hg. (decreasing). The "As Found" setpoints of the four vacuum switches ranged from 20.55" Hg. to 20.90" Hg. (decreasing). A PIF was written and the switches were calibrated to within the tolerance. It was determined to replace these switches with like-for-like switches on July 27, 1995. There were no Engineered Safety Feature (ESF) actuations resulting from this event.

The reactor is protected from the effects of a complete loss of vacuum in the turbine-generator condenser by closing the turbine stop valves and the turbine bypass valves. The scram on condenser low vacuum is designed to reduce the severity by anticipating the transient and scrambling the reactor at a slightly higher vacuum than the setpoints that close the turbine stop valves and bypass valves.

C. APPARENT CAUSE OF EVENT

This Licensee Event Report (LER) is being submitted due to the requirements of 10CFR50.73(a)(2)(v)(A).

The apparent cause of this event was setpoint drift which caused all four switches to be out of TS setpoint limits. This type of switch has been known to have setpoint drift. There were 18 occurrences at Quad Cities in the last five (5) years in which a condenser low vacuum switch setpoint was out of the allowable tolerance. None of these occurrences resulted in a TS limit violation due to a built-in margin of safety between the instrument setpoint and the TS setpoint.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

Form Rev. 2.0

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Quad Cities Unit Two	0   5   0   0   0   2   6   5	Year	Sequential Number	Revision Number	
		9   5	-   0   0   4	-   0   0	3   OF   0   5

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

The root cause of the setpoint drift is still being investigated. Two of the four replaced switches were sent to Material Engineering Group (MEG) for failure analysis. The two remaining switches are being investigated on-site by System Engineering and Instrument Maintenance Department. Also, Barksdale application Engineering was requested to assist with the root cause analysis. The results of the investigation will be reported in a supplementary report expected to be issued by November 30, 1995.

One possible cause considered was improper calibration methodology. The calibration procedure was reviewed. The calibration of the vacuum switches was overviewed by Engineering and Quality Control Department. No deficiencies in the procedure or the calibration performance were found.

Another possible cause considered was condenser vacuum sensing line slope problem found in August 1995. The sensing line slope problem was corrected. Due to the calibration performance method of the low condenser vacuum switches, it was determined that the sensing line slope is irrelevant to the switch setpoint drift problem.

Another possible cause considered was human error on the part of the Instrument Maintenance (IM) technician who performed the calibration on these switches in April 1995 during the initial installation. The calibration performed in April 1995 was witnessed by a Quality Control inspector and the switch setpoints were found to be within their tolerance. Also, the same technician reperformed the calibration check of these switches on July 27, 1995, as part of the accelerated calibration frequency program. The switch setpoints were again checked on July 28, 1995, by a different IM technician, and found to be within their tolerance. Based on this analysis, it was determined that there was no human error associated with this event.

The last possible cause considered was that this batch of switches was defective. These four switches were procured in February 1995 and installed in April 1995 during a unit shutdown. This was the first and only time these switches have been calibrated since installation. MEG is investigating this issue and the results will be reported in a supplementary report.

#### D. SAFETY ANALYSIS OF EVENT

The safety consequences of this event are minimal. The unit was in the Shutdown mode and per TS, the operation of the low condenser vacuum scram switches is not required nor had been required since their installation in April 1995. The automatic scram initiation from these switches is bypassed when the reactor mode switch is not in Run.

Had the reactor been in the RUN mode and a low condenser vacuum event occurred, the reactor would have scrammed at 20.6" Hg. from low condenser vacuum scram switches 2-503C and 2-503D. The scram would have occurred prior to the automatic closure of the



## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

Form Rev. 2.0

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)				PAGE (3)			
		Year		Sequential Number		Revision Number			
Quad Cities Unit Two	0   5   0   0   0   2   6   5	9   5	-	0   0   4	-	0   0	4	OF	0   5

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

main turbine stop valves and the main turbine bypass valves which would actuate at 20.4" Hg. and 7.5" Hg., respectively. This was based on the last calibration surveillance of the main turbine stop valves and the main turbine bypass valves vacuum switches performed in March 1995. Had the main turbine stop valve switch setpoints also drifted in the conservative direction, the turbine stop valves would close prior to the scram initiation from the low condenser vacuum scram switches.

The condenser low vacuum scram is a backup to the turbine stop valve closure scram and causes a scram before the turbine stop valves close on condenser low vacuum, thus reducing the transient on the reactor. However, the turbine stop valve closure scram function alone is adequate to prevent the cladding safety limit from being exceeded in the event of a turbine trip transient with bypass valve closure.

#### E. CORRECTIVE ACTIONS

##### Corrective Actions Completed:

The immediate corrective action was to recalibrate the pressure switches to their allowable setpoint tolerance by performance of procedure QCIS 500-1, "Quarterly Low Condenser Vacuum Scram Calibration and Functional Test". On July 27, 1995, it was decided to replace all four switches and their setpoints were changed to a higher value for added margin of safety. The replaced switches were quarantined for further investigation.

Two switches were set up in the Instrument Maintenance Department (IMD) shop for on-site failure analysis performed by System Engineering and IMD. Two calibration tests, each with three setpoint calibration readings, were performed. There was no evidence of setpoint drift found. All the readings were within the instrument tolerance. The switches were internally inspected. No evidence of physical damage or loose components were found.

##### Corrective Actions to Be Completed:

The switches were placed in an accelerated calibration frequency. For the next six (6) months, the calibration frequency was accelerated to weekly for the first month and to monthly for the remaining five (5) months. Based on the results of the calibration surveillances, further corrective actions will be determined. This will be completed by November 1, 1995. To date, three weekly calibrations have been performed on the new switches with the switches setpoints changed to a higher value for added margin of safety. The switches continue to be calibrated per the accelerated frequency. (INSTRUMENT MAINTENANCE; NTS#2651809500401)

The manufacturer's assistance was requested to determine the root cause(s) of the switches' failure. A copy of the calibration procedure will be sent to the manufacturer for review. This will be completed by September 1, 1995. (SYSTEM ENGINEERING; NTS#2651809500402)

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

Form Rev. 2.0

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)	
		Year		Sequential Number	Revision Number	
Quad Cities Unit Two	0   5   0   0   0   2   6   5	9   5	-	0   0   4	-	0   0   5   OF   0   5

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

Two of the replaced switches were sent to MEG for failure analysis. MEG is testing the switches for temperature, humidity, and cycling effects associated with the setpoint drift. A 10CFR part 21 notification may be warranted based on the failure analysis. The manufacture has suggested that the root cause of the setpoint drifts might be due to differential temperature effects and/or lack of switches' setpoint cycling prior to installation. These potential root causes are being investigated by MEG. Corrective actions based on this analysis will be identified by November 1, 1995. (SYSTEM ENGINEERING; NTS#2651809500403)

The results of the follow-up corrective actions will be reported in a supplementary report expected to be issued by November 30, 1995.  
(SYSTEM ENGINEERING; NTS32651809500404)

#### F. PREVIOUS EVENTS

A Nuclear Plant Reliability Data System (NPRDS) search has been conducted for the last ten years for events involving these low condenser vacuum scram switches which resulted in TS Limit violation. There were 17 occurrences in which a Barksdale Condenser Low Vacuum Switch was found to be out of TS limit due to setpoint drift. Among these, 10 out of 17 setpoint drift occurrences were caused by changes in the ambient temperature. The root cause(s) of the rest of the setpoint drift occurrences were undetermined.

#### G. COMPONENT FAILURE DATA

Equipment Piece Number 2-503A/B/C/D  
 Manufacturer Barksdale  
 Model Number D1T-H18SS  
 Description Vacuum Pressure Switches