



SVP-16-005

10 CFR 50.73

February 5, 2016

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555

Quad Cities Nuclear Power Station, Units 1 and 2  
Renewed Facility Operating License Nos. DPR-29 and DPR-30  
NRC Docket Nos. 50-254 and 50-265

Subject: Licensee Event Report (LER) 254/2015-010-00, "Loss of Control Room  
Emergency Ventilation System Due to Differential Pressure Switch Failure"

Enclosed is Licensee Event Report (LER) 254/2015-010-00, "Loss of Control Room Emergency  
Ventilation System Due to Differential Pressure Switch Failure," for Quad Cities Nuclear Power  
Station, Unit 1.

This report is submitted in accordance with 10 CFR 50.73 (a)(2)(v)(D) which requires the  
reporting of any event or condition that could have prevented the fulfillment of the safety  
function of structures or systems that are needed to mitigate the consequences of an accident.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this report, please contact Mr. W. J. Beck at (309)  
227-2800.

Respectfully,

  
Scott Darin  
Site Vice President  
Quad Cities Nuclear Power Station

cc: Regional Administrator – NRC Region III  
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station

IE22  
NRR



## LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollections.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

## 1. FACILITY NAME

Quad Cities Nuclear Power Station Unit 1

## 2. DOCKET NUMBER

05000254

## 3. PAGE

1 OF 4

## 4. TITLE

Loss of Control Room Emergency Ventilation System Due to Differential Pressure Switch Failure

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
12	07	2015	2015	010	00	02	05	2016	Quad Cities Nuclear Power Station Unit 2	05000265
									N/A	N/A

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
10. POWER LEVEL  100	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

## 12. LICENSEE CONTACT FOR THIS LER

## LICENSEE CONTACT

Rachel Luebke -- Regulatory Assurance

## TELEPHONE NUMBER

(309) 227-2813

## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	VI	PDS	D295	Y					

## 14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO

## 15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR
N/A	N/A	N/A

## ABSTRACT

On December 7, 2015, at 0825 hours, Operations attempted to start the safety related Control Room Emergency Ventilation (CREV) system train "B" in support of planned maintenance on the non-safety related train "A". The CREV train "B" did not start. Once the CREV train "B" system failed to start, the non-safety related train "A" was restarted. Proper operation of the CREV system and CREV air conditioning (A/C) systems could not be ensured, so both CREV and CREV AC system were declared inoperable. As a result, Technical Specification (TS) 3.7.4, Condition A, and TS 3.7.5, Condition A were entered.

The cause of the CREV train "B" system failure to start was the differential pressure switch, which is installed in a vibration susceptible location on the ductwork. This differential pressure switch makes up the interlock between the CREV train "B" system and the non-safety related Control Room HVAC train "A". The differential pressure switch's normally open contacts had temporarily welded together not allowing the starting signal to be received by the CREV train "B" system.

Corrective actions included replacing the differential pressure switch. A future corrective action will relocate the differential pressure switch off of the ductwork to minimize the vibration effects.

The safety significance of this event was minimal. Given the impact on the CREV system, which is common to both units, this report is submitted (for Units 1 and 2) in accordance with the requirements of 10 CFR 50.73 (a)(2)(v)(D), which requires the reporting of any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

LICENSEE EVENT REPORT  
(LER)

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Quad Cities Nuclear Power Station Unit 1	05000254	YEAR	SEQUENTIAL NUMBER	REV NO.	2 OF 4
		2015	- 010	- 00	

## NARRATIVE

## PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor, 2957 Megawatts Thermal Rated Core Power

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

## EVENT IDENTIFICATION

The Control Room Emergency Ventilation (CREV) system failed to start due to a failed differential pressure switch.

## A. CONDITION PRIOR TO EVENT

Unit: 1 / 2

Event Date: December 7, 2015

Event Time: 0825 hours

Reactor Mode: 1 / 1

Mode Name: Power Operation / Power Operation

Power Level: 100% / 100%

## B. DESCRIPTION OF EVENT

On December 7, 2015, at 0825 hours, Operations attempted to start the safety related Control Room Emergency Ventilation (CREV) [VI] system train "B" in support of planned maintenance on the non-safety related train "A". The CREV train "B" did not start. Once the CREV train "B" system failed to start, the non-safety related train "A" was restarted. Proper operation of the CREV train "B" system and CREV train "B" air conditioning (A/C) system could not be ensured, so both CREV and CREV AC system were declared inoperable. As a result, Technical Specification 3.7.4, Condition A, and Technical Specification 3.7.5, Condition A were entered.

On December 7, 2015, at 1402 hours, ENS #51589 was made to the NRC under 10 CFR 50.72(b)(3)(v)(D) to report this event as an event or condition that could have prevented the fulfillment of the safety function.

Operations restarted the Train "A" Control Room HVAC system and began troubleshooting. Differential Pressure Switch [PDS] 0-5795-50 and Relay [RLY] 0-9400-105-CR5ISO were replaced and sent to Powerlabs for further analysis. On December 8, 2015, at 2201 hours, Operations successfully completed the Post Maintenance Testing on the CREV and CREV AC Systems and exited TS 3.7.4, Condition A and TS 3.7.5 Condition A.

Given the impact on the CREV system, which is common to both Units, this report is submitted (for Units 1 and 2) in accordance with the requirements of 10 CFR 50.73 (a)(2)(v)(D), which requires the reporting of any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

## C. CAUSE OF EVENT

The apparent cause for the CREV train "B" system failure to start was identified as the differential pressure switch, which is installed on a vibration susceptible location of the ductwork [DUCT]. This differential pressure switch makes up the interlock between the CREV train "B" system and the non-safety related Control Room HVAC train "A". The differential pressure switch was susceptible to vibrations and was installed on the air handling unit ductwork. These vibrations caused the differential pressure switch's normally open contacts to temporarily weld together, which did not allow the CREV train "B" system to automatically start or manually start either locally or remotely.

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## NARRATIVE

## D. SAFETY ANALYSIS

System Design

Habitability systems are provided to ensure that control room operators are able to remain in the Main Control Room (MCR) [NA] and operate the plant safely under normal conditions and to maintain the plant in a safe condition under accident conditions. The worst-case design basis accident (DBA) for habitability considerations is postulated as a loss of coolant accident (LOCA) with main steam [SB] isolation valve [ISV] leakage at TS limits.

Per Updated Final Safety Analysis Report (UFSAR) Section 6.4.2, the Control Room HVAC systems are capable of maintaining the control room atmosphere suitable for occupancy throughout the duration of a DBA. The HVAC systems are capable of both automatic and manual transfer from the normal operating mode to the isolation mode. Transfer of the Control Room HVAC systems to the emergency (pressurization) mode of operation is not a fully automatic operation, since some Control Room HVAC system components must be manually started to operate the Control Room HVAC systems in the emergency (pressurization) mode. The manual actions required when placing the Control Room HVAC system into the pressurization mode following an accident include: (1) starting the refrigeration compressor unit; and (2) starting one Air Filtration Unit (AFU) booster fan.

Per UFSAR Section 6.4.2.1, the Control Room Emergency Zone (Control Room Envelope) is defined as the following areas: the main control room, the cable spreading room, the auxiliary electrical equipment room, which surrounds the old computer room; and the Train "B" HVAC equipment room. The Control Room Envelope boundary is the combination of walls, floor, roof, ducting, doors, penetrations and equipment that physically form the Control Room Envelope. The operability of the Control Room Envelope boundary must be maintained to ensure that the in-leakage of unfiltered air into the Control Room Envelope will not exceed the in-leakage assumed in the DBA analysis for the main control room occupants.

UFSAR Section 6.4.2.4 provides that potential adverse interactions between the Control Room Emergency Zone and adjacent zones that may allow the transfer of toxic or radioactive gases into the control room are minimized by maintaining the control room at a slightly positive pressure with respect to adjacent areas during normal conditions.

Safety Impact

The primary purpose of the CREV train "B" system is to provide a protected environment from which occupants can control the unit following an uncontrolled release of radioactivity, hazardous chemicals or smoke. The CREV function was restored when the differential pressure switch was replaced and the CREV system ran when called upon. Since the differential pressure switch had failed and one of its functions is to allow the CREV train "B" system to operate, a safety system functional failure occurred.

Per TS Bases 3.7.4, the CREV train "B" system is considered operable when the train "B" air handling unit is operable along with the AFU and the outside air ventilation intake. Since the train "B" Control Room HVAC system would not start, the system was inoperable and TS 3.7.4 Condition A was entered.

Per TS Bases 3.7.5, the CREV AC system is considered operable when the individual components necessary to maintain the Control Room Emergency Zone temperature are operable. The CREV train "B" air handling unit is necessary to deliver the conditioned air to the Control Room Emergency Zone. Since the train "B" CREV system would not start to all the condition air to be delivered, the CREV AC system was inoperable and TS 3.7.5 Condition A was entered.

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**Risk Insights**

The plant Probabilistic Risk Assessment (PRA) model gives no credit to the Control Room Envelope (CRE) and does not include it in the model; hence, the CREV train "B" Fan failing to operate did not contribute to an increase in risk.

In conclusion, the overall safety significance and impact on risk of this event were minimal.

**E. CORRECTIVE ACTIONS**

**Immediate:**

The differential pressure switch was replaced.

**Follow-up:**

The differential pressure switch will be relocated to a non-vibration susceptible area. The failed switch had been in service for 5 years with no issues prior to the failure.

**F. PREVIOUS OCCURRENCES**

The station events database, LERs, and INPO Consolidated Event System (ICES) were reviewed for similar events at the Quad Cities Nuclear Power Station. This event was attributed to incorrect installation location of the differential pressure switch. Based on the cause of this event and the associated corrective actions, the events listed below, although similar in topic, are not considered significant station experiences that would have directly contributed to preventing this event.

- Station Issue Report (IR) 01067025, "0-9400-105 A-3 Invalid Alarm AFU Post HEPA Filter DP Hi," (05/08/2010) – the local panel for the B Train of Control Room HVAC had tile A-3 lit on panel 0-9400-105 for "AFU Post HEPA Filter DP Hi." The alarm was present when the B Train of Control Room HVAC was not running and differential pressure indication switch DPIS 0-5795-311 was reading 0 inches of water column. The cause of the alarm was a degraded differential pressure indication switch, which was replaced. This previous event, although similar to this LER event was caused by a different failure mode. Both switches were manufactured by the same vendor, but DPIS 0-5795-311 was installed at a location free from excessive vibrations. This is not considered a significant station experience that would have directly contributed to preventing the event of this current LER based on the different failure modes.
- LER 254/2007-003-00, 01/18/08, Safety Function Not Met Due to Control Room Emergency Ventilation System Air Filtration Unit Heater Flow Switch Failure (11/20/07) – Operation's surveillances determined that the CREV Air Filtration Unit (AFU) heaters were not operating as required. Troubleshooting of the AFU heater found that a flow switch had an open contact that was preventing the heater from energizing as required. The previous event was caused by infant mortality of the flow switch, whereas this current LER was caused by improper mounting location of the differential pressure switch.

**G. COMPONENT FAILURE DATA**

Failed Equipment: Control Room HVAC Differential Pressure Switch (DPS 0-5795-50)  
 Component Manufacturer: Dwyer Instrument Inc.  
 Component Model Number: 1910-1  
 Component Part Number: N/A

This event has been reported to ICES as Failure Report No. 320582