



SVP-17-028

10 CFR 50.73

May 1, 2017

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) 254/2016-002-01, "Secondary Containment Differential Pressure Momentarily Lost Due to Air Line Failure (RWCU pump Rm)"

Reference: Letter from Scott Darin (Exelon Generation Company, LLC) to U.S. NRC Document Control Desk, "Licensee Event Report (LER) 254/2016-002-00," dated March 14, 2016

Enclosed is Licensee Event Report (LER) 254/2016-002-01, "Secondary Containment Differential Pressure Momentarily Lost Due to Air Line Failure (RWCU pump Rm)," 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,

A handwritten signature in black ink that reads "Scott Darin".

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



**LICENSEE EVENT REPORT (LER)**

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

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 Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOF-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.

<b>1. FACILITY NAME</b> Quad Cities Nuclear Power Station Unit 1	<b>2. DOCKET NUMBER</b> 05000254	<b>3. PAGE</b> 1 OF 5
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**4. TITLE**  
Secondary Containment Differential Pressure Momentarily Lost Due to Air Line Failure (RWCU Pump Rm)

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
01	15	2016	2016	- 002	- 01	05	01	2017	Quad Cities	05000265
									FACILITY NAME	DOCKET NUMBER
										05000

**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)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)

  

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)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<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)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A

**12. LICENSEE CONTACT FOR THIS LER**

LICENSEE CONTACT Rachel Luebbe – Regulatory Assurance	TELEPHONE NUMBER (Include Area Code) (309)-227-2813
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**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	VA	PSX	N/A	Y					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	<b>15. EXPECTED SUBMISSION DATE</b>		
	MONTH	DAY	YEAR
	N/A	N/A	N/A

**ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On January 15, 2016, at 20:38 hours, The Main Control Room received alarms indicating a low differential pressure in the reactor building. The alarms occurred during an entry to the Unit 2 Reactor Water Cleanup (RWCU) pump room. A negative reactor building pressure was restored within two minutes (approximately 20:40 hours) without operator action. Since both Units 1 and 2 share a common reactor building (RB), the loss of differential pressure impacted both Units 1 and 2 secondary containments.

The cause was a sheared air line inside the Unit 1 RB ventilation exhaust plenum which depressurized the air header supplying operating air to all three Unit 1 RB exhaust fan isolation dampers and causing the dampers to fail open, including the one on the standby fan.

Corrective actions included replacing the sheared air line, and the addition of a preventive maintenance task for replacement of equivalent air lines on all RB supply and exhaust fan dampers. The safety significance of this event was minimal. Given the impact on the secondary containment, this report is submitted (for Units 1 and 2) in accordance with the requirements of 10CFR 50.73(a)(2)(v)(C), 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 control the release of radioactive material.



**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Quad Cities Nuclear Power Station Unit 1	05000254	2016	- 002	- 01

**NARRATIVE**

**PLANT AND SYSTEM IDENTIFICATION**

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

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

**EVENT IDENTIFICATION**

Momentary Loss of Secondary Containment Differential Pressure due to a manufacturing defect in the tubing fitting of an air line in the Unit 1 Reactor Building Exhaust fan plenum.

**A. CONDITION PRIOR TO EVENT**

Unit: 1 / 2	Event Date: January 15, 2016	Event Time: 20:38 hours
Reactor Mode: 1 / 1	Mode Name: Power Operation / Power Operation	Power Level: 100% / 100%

**B. DESCRIPTION OF EVENT**

On January 15, 2016, at 20:38 hours, unexpected Main Control Room Reactor Building (RB) Low differential pressure (DP) alarms were received due to loss of negative DP in the RB. At approximately the same time, Operations had entered the Unit 2 RWCU Pump room.

Reactor building DP was observed rising to 0 inches water column (WC) and peaked at +0.2 inch WC. Technical Specification (TS) 3.6.4.1 Condition A, and QGA 300, Secondary Containment Control were entered for both Units Secondary Containment being inoperable. With no operator action, a negative reactor building DP was restored at approximately 20:40 hours. TS 3.6.4.1 Condition A and QGA 300 were exited at 20:42 hours.

On January 16, 2016, at 01:42 hours, ENS #51659 was made to the NRC under 10 CFR 50.72 (b)(3)(v)(C), to report this event as an event or condition that could have prevented the fulfillment of a safety function of structures or systems that are needed to control the release of radioactive material.

An investigation of this event was performed which determined that a sheared air line to the 1C RB exhaust fan isolation damper depressurized a common air header to all three Unit 1 RB exhaust fan isolation dampers, causing them to fail open. This air line was internal to the exhaust ductwork, therefore it could not be identified through normal Operator rounds. With a normal fan lineup of two supply and two exhaust fans operating per unit, the isolation damper for the standby Unit 1 exhaust fan remained open. This created a recirculation path which was compensated by the RB DP control dampers throttling nearly full open. This significantly degraded the margin available for the system to respond to changes in building DP. When an entry was made into the Unit 2 RWCU Pump room, the area DP control system responded as expected by throttling closed all area DP control dampers which decreased total building exhaust flow. With reduced margin available in the building DP control, this caused a positive pressure condition in the RB.



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**C. CAUSE OF EVENT**

The cause was a sheared air line inside the Unit 1 RB ventilation exhaust plenum which depressurized the air header supplying operating air to all three Unit 1 RB exhaust fan isolation dampers, causing the dampers to fail open, including the one on the standby fan.

The cause of the sheared air line was a manufacturing defect in the non-safety tube fitting that was not detected during installation. Over the course of 44 years, the defect propagated into a crack in the threads of the fitting and eventually failed. The failed component is original plant equipment and therefore this is considered a historical cause.

The building and area DP control systems are not interconnected, but can have substantial effects on each other. Specifically, when a RWCU area room is opened, the sensed area pressure increases. This causes the area DP control system to reposition the area DP control dampers in the closed direction in an attempt to restore area DP. This reduces building exhaust flow, which will cause building pressure to increase and the DP control dampers to further open to restore building DP.

**D. SAFETY ANALYSIS**

**System Design**

The function of the secondary containment is to contain, dilute, and hold up fission products that may leak from primary containment following a Design Basis Accident (DBA). In conjunction with operation of the Standby Gas Treatment System (SBGTS) and closure of certain valves [V] whose lines penetrate the secondary containment, the secondary containment is designed to reduce the activity level of the fission products prior to release to the environment, and to isolate and contain fission products that are released during certain operations that take place inside primary containment, when primary containment is not required to be operable, or that take place outside primary containment.

Updated Final Safety Analysis Report (UFSAR) Section 6.2.3.1 provides that the safety objective of the secondary containment system, in conjunction with other engineered safeguards and nuclear safety systems, is to limit the release of radioactive materials so that offsite doses resulting from a postulated DBA will remain below 10 CFR 100 guideline values.

The RB Ventilation is designed to maintain the RB (RB is common to both Units 1 and 2) at a negative pressure during normal operation.

**Safety Impact**

Since both Units 1 and 2 share a common RB (secondary containment), the momentary loss of secondary containment differential pressure effects both units.

TS 3.6.4.1, Condition A, requires restoration of secondary containment to operable status within four hours. This four hour completion time provides a period of time to correct the problem that is commensurate with the importance of maintaining secondary containment during Modes 1, 2, and 3, since the probability of an accident occurring during this short period where secondary containment is inoperable is minimal.

The primary purpose of the secondary containment is to minimize the ground level release of airborne radioactive materials and to provide a controlled, elevated release of the building atmosphere under accident conditions. An engineering analysis was performed to demonstrate that during the time that secondary containment differential



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pressure increased to positive for approximately two (2) minutes, there would be a negligible effect on the resulting dose calculations. Secondary containment would have sufficiently contained radioactive materials during a LOCA such that all current dose limits would remain met. Secondary containment would have been able to perform its safety function. Therefore, the dose consequence from postulated releases from the RB during this short duration would be bounded by the existing design basis LOCA analysis. The safety significance of this event was minimal.

The engineering analysis that was performed demonstrated this event did not constitute a Safety System Functional Failure (SSFF). (Reference NEI 99-02, Revision 7, Regulatory Assessment Performance Indicator Guideline, Section 2.2, Mitigating Systems Cornerstone, Safety System Functional Failures, Clarifying Notes, Engineering analyses.) As such, this event will not be reported in the NRC Performance Indicator (PI) for SSFF since an engineering analysis was performed which determined that the system was capable of performing its safety function during this event when the secondary containment differential pressure increased to positive for approximately two (2) minutes.

**Risk Insights**

The plant Probabilistic Risk Assessment (PRA) model gives no credit to secondary containment or RB Ventilation and does not include it in the model, hence the as-found conditions did not contribute to an increase in PRA risk. In addition, overall RB negative DP was restored in approximately one (1) minute, so the physical integrity of the secondary containment structure was never compromised and the primary containment function was never lost.

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

**E. CORRECTIVE ACTIONS**

Immediate:

1. The sheared air line was replaced and a full system post maintenance test (PMT) was performed to verify that the RB DP would be maintained in all Unit 1 exhaust fan lineups when entries are made into the Unit 2 RWCU HX room.

Follow-up:

1. Establish additional trending for RB ventilation DP control dampers to identify potential decreases in system margin.
2. Implement a preventive maintenance task to periodically replace the air line which failed on all other Unit 1 and 2 RB ventilation exhaust fan dampers.

**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 a manufacturing defect in the tubing fitting of an air line during original plant construction. Based on the nature of this failure, the events listed below, although similar in topic, are not considered significant station experience that would have directly contributed to preventing this event.

- Station Issue Report (IR) 1412296: Low RB to Atmosphere DP Condition During Fan Starts, September 13, 2012 – Numerous issues were identified in 2012 with maintaining RB DP during fan starts and entries to RWCU rooms. The apparent cause that was identified during this troubleshooting was exhaust fan isolation dampers and area DP control dampers not operating properly due to numerous small air leaks. The air leaks were



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caused by aged rubber gaskets and manufacturing defect like the current event. System DP control improved significantly following these repairs.

- LER 254/2014-001-00, 5/5/14, Secondary Containment Differential Pressure Momentarily Lost Due to Fuel Pool Monitor Radiation Monitor Spike (3/4/14) – A Fuel Pool Channel 1B High Radiation spiked high causing the Unit 1 and Unit 2 RB Ventilation and Control Room Ventilation to isolate as designed. The SBGTS was already in operation for a scheduled surveillance. The previous event caused a momentary positive differential pressure until the RB Ventilation isolation dampers closed within 60 seconds and draw down the building within a two to three (2-3) minute period. This event was caused while operating the RB Ventilation system and caused by a sheared air line on the exhaust fan isolation damper system.
- LER 254/2016-001-01, 1/12/16, Secondary Containment Differential Pressure Momentarily Lost Due to Air Line Failure (RWCU Hx Rm) (1/12/16) – This LER has the same cause and corrective actions as the current event. This event and the current event occurred three (3) days apart. Troubleshooting was still in progress from the 1/12/16 event when the current 1/15/16 event occurred. Ongoing troubleshooting activities had not yet identified and corrected the deficient condition before the second event occurred.

**G. COMPONENT FAILURE DATA**

Failed Equipment: Male threaded brass pipe fitting  
 Component Manufacturer: Unknown  
 Component Model Number: N/A  
 Component Part Number: N/A

This event has not been reported individually to ICES, but was included in Failure report No. 321068 .