



March 30, 2018

10 CFR 50.73

SVP-18-021

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 254/2018-001-000 "Secondary Containment Differential Pressure Momentarily Lost Due to Fuel Pool Radiation Monitor Spike"

Enclosed is Licensee Event Report (LER) 254/2018-001-00, "Secondary Containment Differential Pressure Momentarily Lost Due to Fuel Pool Radiation Monitor Spike," for Quad Cities Nuclear Power Station, Unit 1 and 2.

This report is submitted in accordance with 10 CFR 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.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this report, please contact Mark Humphrey at (309) 227-2800.

Respectfully,

A handwritten signature in black ink, appearing to read "K. Ohr", written over a horizontal line.

Kenneth S. Ohr
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 Infocollect.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NE0B-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 5

4. Title

Secondary Containment Differential Pressure Momentarily Lost Due to Fuel Pool Radiation Monitor Spike

5. Event Date

Month

Day

Year

01

31

2018

6. LER Number

Year

Sequential
Number

Rev No.

2018

001

- 00

7. Report Date

Month

Day

Year

03

30

2018

8. Other Facilities Involved

Facility Name

Quad Cities Nuclear Power Station Unit 2

Docket Number

05000265

Facility Name

N/A

Docket Number

N/A

9. Operating Mode

1

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

☐ 20.2201(b)☐ 20.2203(a)(3)(i)☐ 50.73(a)(2)(ii)(A)☐ 50.73(a)(2)(viii)(A)☐ 20.2201(d)☐ 20.2203(a)(3)(ii)☐ 50.73(a)(2)(ii)(B)☐ 50.73(a)(2)(viii)(B)☐ 20.2203(a)(1)☐ 20.2203(a)(4)☐ 50.73(a)(2)(iii)☐ 50.73(a)(2)(ix)(A)☐ 20.2203(a)(2)(i)☐ 50.36(c)(1)(i)(A)☐ 50.73(a)(2)(iv)(A)☐ 50.73(a)(2)(x)

10. Power Level

☐ 20.2203(a)(2)(ii)☐ 50.36(c)(1)(ii)(A)☐ 50.73(a)(2)(v)(A)☐ 73.71(a)(4)

100

☐ 20.2203(a)(2)(iii)☐ 50.36(c)(2)☐ 50.73(a)(2)(v)(B)☐ 73.71(a)(5)☐ 20.2203(a)(2)(iv)☐ 50.46(a)(3)(ii)☒ 50.73(a)(2)(v)(C)☐ 73.77(a)(1)☐ 20.2203(a)(2)(v)☐ 50.73(a)(2)(i)(A)☐ 50.73(a)(2)(v)(D)☐ 73.77(a)(2)(ii)☐ 20.2203(a)(2)(vi)☐ 50.73(a)(2)(i)(B)☐ 50.73(a)(2)(vii)☐ 73.77(a)(2)(iii)☐ 20.2203(a)(2)(vii)☐ 50.73(a)(2)(i)(C)☐ Other (Specify in Abstract below or in NRC Form 366A)

12. Licensee Contact for this LER

Licensee Contact

Rachel Luebke – Regulatory Assurance

Telephone Number (Include Area
Code) (309) 227-2813

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to ICES	Cause	System	Component	Manufacturer	Reportable to ICES
B	IL	DET	G080	Y					

14. Supplemental Report Expected

☐ Yes (If yes, complete 15. Expected Submission Date) ☒ No

15. Expected Submission Date

Month

Day

Year

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On January 31, 2018, at 1310 hours, a Fuel Pool Channel B High Radiation alarm occurred. The 2B fuel pool radiation monitor spiked high at 200 mRem/hr, trended downward, and returned to its previous steady-state value of 10 mRem/hr. The high spike caused the Unit 1 and Unit 2 Reactor Building (RB) ventilation and Control Room (CR) ventilation to isolate as designed and the Standby Gas Treatment System (SBGTS) train to start.

The Unit 1 and Unit 2 RB ventilation system isolation caused the secondary containment differential pressure to be momentarily lost (pressure went positive), and secondary containment was declared inoperable. Since both Units 1 and 2 share a common RB, the loss of differential pressure for approximately one (1) minute impacted both Unit 1 and Unit 2 secondary containments.

The cause of the secondary containment loss of differential pressure event was due to a failed fuel pool radiation monitor sensor / converter that caused the RB ventilation system to isolate. The specific sensor / converter failure mode is under investigation.

Corrective actions included replacing the failed radiation monitor sensor / converter, and sending the failed sensor / converter for failure analysis.

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 10 CFR 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**

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Quad Cities Nuclear Station Unit 1	05000254	2018	- 001	- 00

NARRATIVE**PLANT AND SYSTEM IDENTIFICATION**

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

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

EVENT IDENTIFICATION

Fuel pool radiation monitor spiked high which resulted in Unit 1 and Unit 2 Reactor Building Ventilation System Isolation, which caused secondary containment differential pressure to be momentarily lost.

A. CONDITION PRIOR TO EVENT

Unit: 1 Event Date: January 31, 2018
Reactor Mode: 1 Mode Name: Power Operation

Event Time: 1310 hours
Power Level: 100%

B. DESCRIPTION OF EVENT

On January 31, 2018, at 1310 hours, a Fuel Pool [DA] Channel B High Radiation alarm [RA] occurred. The 2B fuel pool radiation monitor [MON] had spiked high at 200 mRem/hr and then trended downward and returned to its previous steady-state value of 10 mRem/hr. The high spike caused the Unit 1 and Unit 2 Reactor Building (RB) ventilation [VA] and Control Room (CR) ventilation [VI] to isolate as designed. The Standby Gas Treatment System (SBGTS) [BH] also started as designed due to the radiation monitor spike. There were no maintenance or operation conditions ongoing at the time that could have caused the radiation monitor spike.

Isolation of the Unit 1 and Unit 2 RB ventilation system caused the secondary containment [NG] differential pressure to be momentarily lost (pressure went positive). Secondary containment was then declared inoperable and Technical Specification (TS) 3.6.4.1, Condition A was entered for the short positive pressure duration. RB negative differential pressure was reestablished at greater than 0.1 inches vacuum water gauge approximately 1 minute later and TS 3.6.4.1, Condition A was exited. RB to atmosphere momentarily transitioning to a positive differential pressure is an expected occurrence until the secondary containment isolation valves close within 60 seconds. The required negative differential pressure (0.10 inches water vacuum and greater) will be restored typically within 2-3 minutes once the secondary containment isolation valves are fully closed and SBGTS is fully running.

Since Units 1 and 2 share a common RB [NG], the loss of RB differential pressure impacted both secondary containments.

On January 31, 2018, at 1719 hours, ENS #53189 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.

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NARRATIVE**C. CAUSE OF EVENT**

The cause of the 2B fuel pool radiation monitor spike was a detector failure. The most likely potential causes of a detector failure are due to a manufacturing defect resulting in loss of quench gas in the Geiger-Mueller tube or a defective Geiger-Mueller tube. The failed detector was sent to Exelon PowerLabs for failure analysis. The specific failure mode of the detector has not been determined.

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 SBGTS is designed to maintain the RB (RB is common to both Units 1 and 2) at a negative pressure and to filter the exhaust of radioactive matter from RB spaces to the environment (by particulate filtration and halogen adsorption) in the unlikely event of a DBA, including the Loss of Coolant Accident (LOCA) and the refueling accident. It is also instrumental in maintaining the integrity of secondary containment during a primary to secondary containment instrument line break. Two parallel trains are provided, each of which is capable of producing greater than 0.25 inches water negative pressure required in the RB while processing 4000 cubic ft /min of exhaust air.

Safety Impact

When the fuel pool radiation monitor spiked high due to an invalid actuation, the Unit 1 and Unit 2 RB ventilation system isolated which caused the differential pressure of the shared secondary containment to be momentarily lost.

TS 3.6.4.1, Action A.1, requires restoration of secondary containment to operable status within four hours. This 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 when secondary containment is inoperable is minimal.

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NARRATIVE

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 pressure increased to positive for approximately one (1) minute, 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 to be met. Secondary containment would have been able to perform its safety function. Therefore, the dose consequence from postulated releases from the reactor building during this short duration would be bounded by the existing design basis LOCA dose analysis. The safety significance of this event was minimal.

An engineering analysis 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 safety system functional failures.

Risk Insights

The plant Probabilistic Risk Assessment (PRA) model gives no credit to Reactor Building (Secondary Containment) effectiveness for mitigating fission product releases to the environment and does not include it in the model, hence the as-found conditions did not contribute to an increase in risk. In addition, the physical integrity of the secondary containment structure was never compromised and the primary containment function was never lost.

Although a secondary containment loss of function (loss of differential pressure) occurred momentarily when the invalid fuel pool radiation monitor spike caused the Unit 1 and Unit 2 RB ventilation system to isolate, there was no DBA condition in progress, and secondary containment function was restored within one (1) minute when operation of the SBGTS restored the required differential pressure to the RB (secondary containment).

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

E. CORRECTIVE ACTIONS**Immediate:**

1. An initial investigation was conducted. Troubleshooting determined the detector had failed.
2. Replaced the failed 2B fuel pool radiation monitor detector (sensor/converter) with a new detector to restore function.

Follow-up:

1. The failed detector was sent to Exelon PowerLabs for failure analysis.
2. Additional actions will be determined pending the results of failure analysis.

F. PREVIOUS OCCURRENCES

The station events database, LERs, and INPO Consolidated Event System ICES (EPIX) were reviewed for similar events at Quad Cities Nuclear Power Station. This event was a momentary loss of secondary containment differential pressure resulting from an invalid Unit 1 and Unit RB ventilation system isolation due to a fuel pool radiation monitor failure. Based on the conditions of this event, causes, and associated corrective actions, two

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NARRATIVE

events described below are specifically applicable given that a sensor/converter failure caused a spurious signal and in one case resulted in a loss of secondary containment differential pressure.

- Station Issue Report (IR) 1690135, Received Unexpected U2 Fuel Pool Channel B Hi Rad Alarm (08/07/14) – Due to detector failure/Geiger-Mueller (G-M) tube failure. All automatic equipment actuations responded as expected and the Reactor Building differential pressure was maintained during the event. The G-M tube failure was due to loss of quench gas. The loss of quench gas is considered a manufacturing defect.
- LERs - A review of LERs at Quad Cities Nuclear Power Station over the past 10 years identified LER 2014-001-00 (03/04/2014) as a similar event. Due to a sensor / converter (detector) Geiger-Mueller (GM) tube manufacturing defect, the GM tube was double pulsing, causing an increase in sensor/converter output with a resulting isolation of reactor building ventilation and secondary containment differential pressure increase.

G. COMPONENT FAILURE DATA

Failed Equipment: Radiation Monitor
Component Manufacturer: General Electric
Component Model Number: 194X927G016
Component Part Number: 194X927G016 (Range 1 to 10⁶ mR/hr)

This event has been reported to ICES.