Constellation

SVP-25-042 10 CFR 50.73

July 18, 2025

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

Quad Cities Nuclear Power Station, Unit 1
Renewed Facility Operating License No. DPR-29
NRC Docket No. 50-254

Subject: Licensee Event Report 254/2025-005-00 "Scram Due to 125 VDC Voltage Fluctuations from Battery Cell Failure"

Enclosed is Licensee Event Report 254/2025-005-00 "Scram Due to 125 VDC Voltage Fluctuations from Battery Cell Failure".

This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A) for an event that resulted in automatic actuation of the reactor protection system including a reactor scram, containment isolation signals affecting more than one system, and emergency diesel generator initiation. This is also being submitted under 10 CFR 50.73(a)(2)(i)(B) for an operation or condition which was prohibited by the plant's Technical Specifications.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this report, please contact Conner Bealer at 779-231-6207.

Respectfully,

Erik Frederickson for Doug Hild

Doug Hild
Site Vice President
Quad Cities Nuclear Power Station

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

NRC FORM 366 (04-02-2024) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 04/30/2027

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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/)

1. Facility Name		2. Docket Number	3. Page
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4. Title

Scram Due to 125 VDC Voltage Fluctuations from Battery Cell Failure

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved		
Month	Day	Year	Year	Sequential Number	Revision No.	Month	Day	Year	Facility Name		Docket Number
05	19	2025	2025	- 005 -	00	07	18	2025	Quad Cities Nuclear Power Station, Unit 2	☒ 050	00265
									Facility Name: N/A	☐ 052	Docket Number: N/A

9. Operating Mode	10. Power Level
1	100%

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

10 CFR Part 20	☐ 20.2203(a)(2)(vi)	**10 CFR Part 50**	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)	☐ 73.1200(a)
☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)	☐ 73.1200(b)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)	☐ 73.1200(c)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.36(c)(2)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)	☐ 73.1200(d)
☐ 20.2203(a)(2)(i)	**10 CFR Part 21**	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(A)	**10 CFR Part 73**	☐ 73.1200(e)
☐ 20.2203(a)(2)(ii)	☐ 21.2(c)	☐ 50.69(g)	☐ 50.73(a)(2)(v)(B)	☐ 73.77(a)(1)	☐ 73.1200(f)
☐ 20.2203(a)(2)(iii)		☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(2)(i)	☐ 73.1200(g)
☐ 20.2203(a)(2)(iv)		☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(ii)	☐ 73.1200(h)
☐ 20.2203(a)(2)(v)		☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)		

☐ **OTHER** (Specify here, in abstract, or NRC 366A).

12. Licensee Contact for this LER

Licensee Contact	Phone Number (Include area code)
Richard Swart – Regulatory Assurance	309-227-2810

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

Cause	System	Component	Manufacturer	Reportable to IRIS		Cause	System	Component	Manufacturer	Reportable to IRIS
B	EJ	BTRY	G-185	Y		n/a				

14. Supplemental Report Expected		15. Expected Submission Date	Month	Day	Year
☒ No	☐ Yes (If yes, complete 15. Expected Submission Date)				

16. Abstract (Limit to 1326 spaces, i.e., approximately 13 single-spaced typewritten lines)

On 5/19/2025 at 10:44, Operations removed the 125 VDC Battery Charger #2A from the 125 VDC Battery #2 as part of a charger swap evolution. Battery voltage fluctuations on battery #2 and supported control power buses on both Unit 1 and Unit 2 caused various equipment transients. On Unit 1, two reactor feedwater pumps (RFP) tripped, resulting in an automatic Unit 1 scram on low reactor vessel water level. On Unit 2, one RFP tripped, and one reactor recirculation adjustable speed drive ran back, resulting in a power decrease on Unit 2, followed by stable Unit 2 operation. Delays in subsequent control power recovery, and loss of past operability, surpassed Technical Specification (TS) required action completion times for both units.

The cause of the 125 battery #2 voltage fluctuation was broken positive terminal posts on battery cell number 21. The entire 58 cell battery was replaced.

This report is being submitted per 10 CFR 50.73(a)(2)(iv)(A) for an event that resulted in automatic actuation of the reactor protection system including a reactor scram, containment isolation signals affecting more than one system, and emergency diesel generator initiation. This is also being submitted under 10 CFR 50.73(a)(2)(i)(B) for an operation or condition which was prohibited by the plant's TS.

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PLANT AND SYSTEM IDENTIFICATION

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

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

EVENT IDENTIFICATION

Scram due to 125 VDC Voltage Fluctuations from Battery Cell Failure

A. CONDITION PRIOR TO EVENT

Unit: 1	Event Date: May 19, 2025	Event Time: 1045 hours CST
Reactor Mode: 1	Mode Name: Power Operation	Power Level: 100%
Unit: 2	Event Date: May 19, 2025	Event Time: 1045 hours CST
Reactor Mode: 1	Mode Name: Power Operation	Power Level: 100%

No systems, structures, or components that were inoperable at the start of the event contributed to the event.

B. DESCRIPTION OF EVENT

On 5/19/25 at 10:44, both Quad Cities Unit 1 and Unit 2 were operating at 100% power. Planned maintenance activities included a 125 VDC Battery Charger [BYC] swap.

125 VDC Safety Related battery system [EJ] configuration at Quad Cities includes a 125 VDC battery [BTRY] on each unit. The Unit 2 battery that is the subject of this report is designated as 125 VDC Battery #2 (battery #2). Each unit's battery provides control power to its own Essential Service System (ESS) [J] Division I buses [BU], and to the opposite unit's ESS Division II buses. Battery #2 therefore provides control power for the ESS Division I buses on Unit 2, and the ESS Division II buses on Unit 1. Due to this configuration, a single battery impacts control power on both units.

Operations removed the 125 VDC Battery Charger #2A from battery #2 as part of a charger swap evolution at 10:44:18. Subsequent battery voltage fluctuations on battery #2 caused voltage fluctuations on control power for Unit 1 ESS Division II buses and Unit 2 ESS Division I buses.

On Unit 1, two reactor feedwater pumps (RFP) [SK] tripped, which resulted in an automatic Unit 1 scram on low reactor vessel water level at 10:45:10. The third RFP failed to trip automatically on high reactor water level during post-scram recovery and was successfully tripped by opening a feed breaker. ESS Bus 14-1 tripped due to low voltage when Bus 14 experienced control power fluctuations and could not auto transfer

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following the scram and main generator [TB] trip and resulting voltage decrease. The bus 14-1 trip resulted in an automatic start of the Unit 1 Emergency Diesel Generator (EDG) [DG] to recover the bus. Unit 1 also experienced expected primary containment isolations on Reactor Water Clean Up [CE], Drywell Containment Atmospheric Monitoring system [IK], and the Reactor Building Ventilation system [VA]. Unit 1 experienced closure of the outboard Main Steam Isolation Valves (MSIV) [SB] due to loss of related divisional power sources, resulting in isolation from the main condenser. During recovery, Reactor Core Isolation Cooling (RCIC) [BN] system was manually initiated for coolant injection, and following flow indication instability in automatic mode, RCIC was controlled manually. A RFP was recovered for continued coolant addition. Reactor pressure was controlled utilizing manual control of Automatic Depressurization System (ADS) [SB] valves, one valve at a time, on an intermittent basis.

On Unit 2, one RFP tripped, and one Reactor Recirculation [AD] Adjustable Speed Drive ran back, resulting in a power decrease on Unit 2, followed by stable Unit 2 operation at 80% power.

The 125 VDC Battery Charger #2A was recovered at time 10:46:36 to re-establish stable control power to ESS buses, but this was after the various equipment transients on both units.

Unit 1 entered Mode 4 (i.e., cold shutdown) on 5/19/25 at 23:54. Unit 2 was returned to full power operation on 5/21/25 at 05:06.

This report is being submitted per 10 CFR 50.73(a)(2)(iv)(A) for an event that resulted in automatic actuation of the reactor protection system including a reactor scram, containment isolation signals affecting more than one system, and EDG initiation, as discussed above.

The failure of a Unit 1 RFP to trip was caused by inadequate breaker auxiliary power contact closure for control power specific to the breaker [BRK] when it was installed during the previous refuel outage. Therefore, there was a failure to meet Limiting Condition for Operation (LCO) 3.3.2.2, "Feedwater System and Main Turbine High Water Level Trip Instrumentation," and this condition existed for approximately 46 days, which exceeds the TS 3.3.2.2 Completion Times.

The failure of battery #2 to provide stable voltage was the result of a failure of positive terminal posts on cell number 21. Cell 21 was first noted to have an anomalous condition on 4/9/25, which is conservatively considered the initial time of inoperability. Therefore, there was a failure to meet LCO 3.8.4, “DC Sources – Operating,” and this condition existed for approximately 937 hours. Completion times for Actions D.1, D.2, and F.1 were not met.

In support of equipment reliability for Appendix R fires, the 125 VDC control systems include an Automatic Transfer Switch (ATS) [ASU] to swap Emergency Core Cooling System (ECCS) bus control power on a loss

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of normal safety related power to non-safety related 125 VDC power from alternate sources on site. Due to the ESS bus voltage fluctuations, the ATS for Alternate 125VDC Feed to Switchgear 14-1 Cubicle 9 for Bus 14-1 transferred to non-safety related power, and the ATS for Alternate 125 VDC Feed to Switchgear 23-1 Cubicle 9 for Bus 23-1 also transferred to non-safety related power. These do not automatically transfer back to safety related power. Therefore, the supported equipment on Buses 14-1 and 23-1 was considered functional but inoperable with respect to TS.

The Bus 14-1 ATS was discovered on 5/20/25 to have transferred to non-safety related power. It was reset to safety related power on 5/20/25 at 17:34 hours for a total of 36.9 hours on alternate power, impacting the following three TS requirements:

First for Unit 1, TS 3.8.1, "AC Sources-Operating," Condition B (i.e., one required DG inoperable) was applicable for the Unit 1 EDG being inoperable to Bus 14-1. However, the Completion Times for Required Actions B.1, B.2, B.3.1, B.3.2, and F.1 were not met.

Second for Unit 1, the applicability of TS 3.5.1, "ECCS-Operating," Condition B (i.e., one LPCI subsystem or one Core Spray subsystem inoperable) was not recognized. However, the 7 day Completion Time for Required Action B.1 was not challenged.

Third for Unit 1, TS 3.5.1, Condition K (i.e., two or more low pressure ECCS injection systems inoperable for reasons other than Condition C or E) was applicable due to B Core Spray and B loop RHR [BO] being inoperable. However, the Completion Time for Required Action K.1 was not met.

The Bus 23-1 ATS was discovered on 5/21/25 to have transferred to non-safety related power. It was reset to safety related power on 5/21/25 at 18:32 hours for a total of 55.9 hours on alternate power, impacting the following four TS requirements:

First for Unit 2, TS 3.8.1, Condition B (i.e., one required DG inoperable) was applicable for the Unit 0 EDG being inoperable to Bus 23-1. However, the Completion Times for Required Actions B.1, B.2, B.3.1, B.3.2, and F.1 were not met.

Second for Unit 2, the applicability of TS 3.5.1, Condition B (i.e., one LPCI subsystem or one Core Spray subsystem inoperable) was not recognized. However, the 7 day Completion Time was not challenged.

Third for Unit 2, TS 3.5.1, Condition K (i.e., two or more low pressure ECCS injection systems inoperable for reasons other than Condition C or E) was applicable due to A Core Spray and A Loop RHR being inoperable. However, the Completion Time for Required Action K.1 was not met.

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Fourth for Unit 2, TS 3.0, Limiting Condition for Operation (LCO) Applicability, LCO 3.0.3., is for situations where an LCO is not met and the associated Actions are not met, was also not recognized for entry. The action to be in Mode 3 within 13 hours, was not met.

This report is also being submitted under 10 CFR 50.73(a)(2)(i)(B) for operations or conditions which were prohibited by the plant's TS, as detailed above.

Event Notification System report 57718 was submitted on 05/19/2025 at 1409 and was updated on 5/20/25 at 1200.

C. CAUSE OF EVENT

The cause of the self-revealing event was broken positive terminal posts on cell 21 of battery #2 caused by intergranular stress corrosion cracking as determined by preliminary laboratory failure analysis. This impacted voltage produced by the overall battery. Momentary drops and variations in voltage caused various instruments or control relays to drop out, leading to related equipment transients.

The cause of the failure of a feedwater pump to trip was inadequate procedure instructions for post maintenance testing on the feed breaker.

D. SAFETY ANALYSIS

System Design

The DC electrical power systems provide the AC emergency power system with control power. They also provide both motive and control power to selected safety related equipment. Also, these DC subsystems provide DC electrical power to inverters, which in turn power the AC essential service buses. The DC electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure.

The Division 1 and 2 125 VDC electrical power sources provide control power to selected safety related equipment as well as circuit breaker control power for 4160 V, 480 V, control relays and annunciators. Each unit includes a 125 VDC source consisting of a 125 VDC battery and two 125 VDC full capacity chargers (normal and spare). Each 125 VDC unit source (125 VDC battery and associated chargers) supplies power to the associated unit Division 1 125 VDC electrical power distribution subsystem and the opposite unit Division 2 125 VDC electrical power distribution subsystem. The Division 1 and 2 125 VDC electrical power distribution subsystems provide power to redundant loads, therefore both unit 125 VDC sources are needed to support the operation of both units. These sources are referred to as the Division 1 and 2 125 VDC electrical power sources since they supply the associated units Division 1 and 2 125 VDC electrical power distribution subsystems, respectively.

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During normal operation, the DC loads are powered from the battery chargers with the batteries floating on the system. In case of loss of normal power to the battery charger, the DC loads are automatically powered from the associated battery.

Safety Impact

There were no safety consequences as a result of this event. There was no radiation release associated with this event. Operations took immediate actions upon discovery of the condition, and entered proper abnormal and emergency operating procedures to stabilize both units. The event was within the analysis of the UFSAR Chapter 15. Opposite division ESS control voltage was not impacted, maintaining availability of ECCS functions.

This event is not considered a safety system functional failure per NEI 99-02.

E. CORRECTIVE ACTIONS

Immediate:

1. Battery #2 was fully replaced with 58 new cells.
2. RFP breaker contacts were adjusted to restore proper control power.
3. ATS switches were reset to safety related power sources.

Follow-up:

1. Failure analysis by the manufacturer will be performed to determine a more precise cause for the battery post failure.
2. Procedures for breaker testing will be corrected.

F. PREVIOUS OCCURENCES

The station events database, LERs and IRIS were reviewed for similar events at Quad Cities Nuclear Power Station for the three previous years. No previous events were identified.

G. COMPONENT FAILURE DATA

Failed Equipment: Battery Cell
Component Manufacturer: GNB Batteries G-185
Component Model Number: NCN-21
Component Part Number: none

This event has been reported to IRIS.