UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
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NAPERVILLE, IL 60563-2657

July 24, 2025

EAF-RIII-2025-0074

Marri Marchionda-Palmer
Chief Operating Officer
Constellation Energy Generation, LLC
Quad Cities Nuclear Power Station,
Units 1 and 2
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION – SIGNIFICANCE DETERMINATION OF FINDINGS DOCUMENTED IN NRC INSPECTION REPORT NO. 05000254/2024403 – REPORT 05000254/2025090

Dear Marri Marchionda-Palmer:

On April 16, 2025, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Quad Cities Nuclear Power Station. The purpose of the inspection was to review the circumstances surrounding a Unit 1 reactor pressure vessel (RPV) drain down event that occurred on March 28, 2023, during a refueling outage. The NRC's Office of Investigations (OI) also conducted investigations regarding the circumstances of that event. The investigations were completed on September 11, 2024, and September 18, 2024, and substantiated willful behaviors.

The results of the inspection were documented in "NRC Inspection Report 05000254/2024403 and Investigation Reports 3-2023-013 and 3-2023-015," dated May 6, 2025 (ADAMS Accession No. ML25114A211). Based on the results of this inspection and the investigations, six apparent violations (AVs) of NRC requirements were identified and considered for escalated enforcement action in accordance with the NRC Enforcement Policy.

Violations involving willfulness or impacting the NRC's regulatory process are not adequately characterized by the Significance Determination Process (SDP). The SDP evaluates the safety significance of the underlying degraded conditions or events, not the severity of willful actions or behaviors that impede regulatory oversight. For this reason, such violations are referred to as traditional enforcement violations and are processed in accordance with the NRC's Enforcement Policy. Traditional enforcement violations may have underlying findings that are assessed for significance using the SDP.

The NRC provided you with the option of either: (1) attending a Predecisional Enforcement Conference; or (2) requesting an alternative dispute resolution (ADR) mediation session with the NRC. You requested ADR and a mediation session was held on June 17-18, 2025. At the

session, you agreed that a Confirmatory Order would be issued in a settlement of the AVs to avoid further action by the NRC. In light of the corrective actions, you have already taken and agreed to take by specified future dates, as described in the Confirmatory Order (ADAMS Accession No. ML25175A334) the NRC is satisfied that its concerns will be addressed. These AVs and associated findings are closed.

This letter documents the NRC's significance determinations for the three findings associated with the AVs. All three findings were determined to be of very low safety significance (Green).

Whereas traditional enforcement addressed the willful actions and impacts on regulatory process of these AVs, the SDP evaluated the safety significance of the underlying degraded conditions and drain down event. The NRC determined the safety significance of these findings using the SDP, as summarized below:

- For the finding associated with AV 05000254/2024403-04, "Willful failure by a licensed reactor operator (RO) to implement procedure resulting in RPV drain down," the inspectors evaluated the finding using IMC 0609, Appendix G, "Shutdown Operations Significance Determination Process," because it affected the Initiating Events cornerstone and pertained to operations, an event, or a degraded condition while the plant was shut down.

  The inspectors performed a Phase 1 analysis using IMC 0609, Appendix G, Attachment 1, "Shutdown Operations Significance Determination Process Phase 1 Initial Screening and Characterization of Findings." The inspectors determined that the inventory control safety function, control rod drive system, and loss of inventory (LOI) initiating event scenarios were affected by the finding, so the inspectors evaluated the finding using Exhibit 2, "Initiating Events Screening Questions."

  The inspectors used data from the plant computer and determined that the maximum drain rate occurred between the time operators entered the scram signal and began manipulating the low flow feedwater regulating valve (LFFRV) to restore level, which occurred 1.4 minutes later. During this time, the level decreased 3.1 inches, which resulted in an estimated maximum drain rate of 2.2 inches per minute. Using this estimated maximum drain rate, the inspectors estimated the time to reach the shutdown cooling isolation setpoint was 80.3 minutes (1.3 hours). The inspectors determined that a Phase 2 analysis was needed because the finding resulted in an LOI event such that the shutdown cooling isolation low level setpoint would be reached in 24 hours or less if the leakage were undetected or unmitigated. The inspectors transitioned the evaluation to a senior reactor analyst for further review.

  A senior reactor analyst performed a Phase 2 analysis using IMC 0609, Appendix G, Attachment 3, "Phase 2 Significance Determination Process Template for BWR During Shutdown." The senior reactor analyst determined that (1) the finding was a precursor finding because it caused an LOI event and (2) the finding occurred in plant operating state (POS) 2 and the early time window because the reactor was in Mode 5, the reactor vessel head was on but detensioned, the reactor vessel was vented, and the finding occurred prior to the plant entering POS 3.

The senior reactor analyst assigned an IEL value of 3 based on the following considerations.

1. The estimated time to shutdown cooling isolation (i.e., loss of residual heat removal) with no operator action was 80.3 minutes.
2. The reactor coolant system level indication was a reasonable reflection of reactor coolant system level based on discussions with operations personnel.
3. The drain path could be readily identified within half the time to shutdown cooling isolation because operators were maintaining level and quickly identified and isolated the drain path.
4. The drain path would not automatically isolate if the RPV decreased to 6.6 inches and shutdown cooling isolated; however, operators could isolate the drain path by resetting the scram signal. If the drain path was not isolated, the continued LOI would not prevent operators from resetting the Group 2 isolation and restarting residual heat removal. Therefore, a drain path could be isolated by at least one functional valve such that a train of residual heat removal could be restarted.

The senior reactor analyst estimated the risk significance of specified core damage sequences using Worksheet 2, “SDP for a BWR Plant – Loss of Inventory Control in POS 2 (Head Off or RCS Vented),” and determined that the dominant sequence involved the failure to isolate the drain path, success of automatic injection, and failure of long-term cooling, with a risk significance value of 7, and that each of the remaining core damage sequences had a risk significance value of 10 or higher.

The senior reactor analyst determined the risk significance of the finding using Table 7, “Counting Rule Worksheet.” Because there was one sequence with a risk significance value of 7 and each of the remaining sequences had a risk significance value of 10 or higher, the senior reactor analyst determined that the finding was of very low safety significance (Green).

The senior reactor analyst reviewed the dominant sequence to determine its impact on large early release frequency. The senior reactor analyst determined that the sequence would not result in early core damage, and therefore not result in a large early release, because the success of automatic injection would provide a large quantity of water to cover the core and restore water level for a sustained period. The senior reactor analyst determined that the core damage sequences which could result in early core damage, and therefore could result in a large early release, had a sufficiently low risk significance from Worksheet 2 that the finding was of very low safety significance (Green) for large early release frequency.

- For the finding associated with AV 05000254/2024403-05, “Willful failure to survey and decontaminate personnel sprayed with reactor coolant,” the inspectors assessed the significance of the finding using IMC 0609, Appendix C, “Occupational Radiation Safety SDP.” This finding screened as very low safety significance (Green) without a detailed risk assessment.
- For the finding associated with AV 05000254/2024403-06, “Failure to administer fitness for duty and fatigue testing following event,” the inspectors assessed the significance of the finding using IMC 0609, Appendix E, Part I, “Baseline Security SDP for Power Reactors.”

This finding screened as very low safety significance (Green) without a detailed risk assessment.

In light of the corrective actions specified in the Confirmatory Order related to "NRC Inspection Report 05000254/2024403 and Investigation Reports 3-2023-013 and 3-2023-015," the cross-cutting aspects of these findings will not be considered during the end-of-cycle reviews.

In accordance with Title 10 of the *Code of Federal Regulations* (CFR) 2.390 of the NRC's "Rules of Practice," a copy of this letter, along with its enclosures, will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC website at http://www.nrc.gov/reading-rm/adams.html.

Sincerely,

Signed by Feliz-Adorno, Nestor
on 07/24/25

Néstor J. Féliz Adorno, Chief
Engineering and Reactor Projects Branch
Division of Operating Reactor Safety

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Letter to Marri Marchionda-Palmer from Néstor J. Féliz Adorno dated July 24, 2025.

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