UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
2056 WESTINGS AVENUE, SUITE 400
NAPERVILLE, IL 60563-2657

June 12, 2025

David Rhoades
Senior Vice President
Constellation Energy Generation, LLC
President and Chief Nuclear Officer (CNO)
Constellation Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BYRON STATION, UNIT 2 – POST-APPROVAL LICENSE RENEWAL PHASE 1 INSPECTION REPORT 05000455/2025011

Dear David Rhoades:

On May 8, 2025, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Byron Station, Unit 2 and discussed the results of this inspection with Harris Welt and other members of your staff. The results of this inspection are documented in the enclosed report.

One finding of very low safety significance (Green) is documented in this report. This finding involved a violation of NRC requirements. We are treating this violation as a Non-Cited Violation (NCV) consistent with Section 2.3.2 of the Enforcement Policy.

If you contest the violation or the significance or severity of the violation documented in this inspection report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region III; the Director, Office of Enforcement; and the NRC Resident Inspector at Byron Station, Unit 2.

If you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region III; and the NRC Resident Inspector at Byron Station, Unit 2.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at http://www.nrc.gov/reading-rm/adams.html and at the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

Signed by Feliz-Adorno, Nestor
on 06/12/25

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

Docket No. 05000455
License No. NPF–66

Enclosure:
As stated

cc w/ encl: Distribution via LISTSERV®

Letter to David Rhoades from Néstor Féliz Adorno dated June 12, 2025.

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U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Numbers:	05000455
License Numbers:	NPF-66
Report Numbers:	05000455/2025011
Enterprise Identifier:	I-2025-011-0020
Licensee:	Constellation Energy Generation, LLC
Facility:	Byron Station, Unit 2
Location:	Byron, IL
Inspection Dates:	April 14, 2025, to May 08, 2025
Inspectors:	M. Domke, Senior Reactor Inspector
Approved By:	Néstor J Féliz Adorno, Chief Engineering and Reactor Projects Branch Division of Operating Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting a Post-Approval License Renewal Phase 1 Inspection at Byron Station, Unit 2, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to https://www.nrc.gov/reactors/operating/oversight.html for more information.

List of Findings and Violations

Failure to Perform One-Time Inspections			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000454/2025011-01 Open/Closed	[H.1] - Resources	71003
The inspectors identified a Green finding with an associated Non-Cited Violation (NCV) of the Byron Station Unit 1 Operating License Condition 2.C.(23)(b)1. Specifically, the licensee failed to perform one-time inspections (OTIs) for chemical volume control, residual heat removal, and spent fuel system heat exchangers prior to the period of extended operation (PEO), to ensure that reduction in heat transfer and fouling did not cause a loss of intended function during the PEO as described in the Updated Final Safety Analysis Report (UFSAR) Supplement.			

Additional Tracking Items

None.

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

OTHER ACTIVITIES – TEMPORARY INSTRUCTIONS, INFREQUENT AND ABNORMAL

71003 - Post-Approval Site Inspection for License Renewal

Post-Approval Site Inspection for License Renewal (1 Sample)

(1) Inspectors conducted a Phase 1 Post-Approval License Renewal Inspection for Byron Unit 2 during refueling outage B2R25. The following aging management programs were evaluated by the team:

- One-Time Inspection XI.M32
- Aboveground Metallic Tanks XI.M29
- Flow Accelerated Corrosion XI.M17
- Overhead Heavy and Light Load Handling XI.M23
- Structures Monitoring XI.S6

INSPECTION RESULTS

Failure to Perform One-Time Inspections			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000454/2025011-01 Open/Closed	[H.1] - Resources	71003
The inspectors identified a Green finding with an associated Non-Cited Violation (NCV) of the Byron Station Unit 1 Operating License Condition 2.C.(23)(b)1. Specifically, the licensee failed to perform one-time inspections (OTIs) for chemical volume control, residual heat removal, and spent fuel system heat exchangers prior to the period of extended operation (PEO), to ensure that reduction in heat transfer and fouling did not cause a loss of intended function during the PEO as described in the Updated Final Safety Analysis Report (UFSAR) Supplement.			
Description: Appendix F of the UFSAR (a.k.a., the License Renewal UFSAR Supplement), Section A.2.1.20, "OTI" Aging Management Program (AMP), and Commitment 20 from UFSAR Appendix F, Section A.5.0, Table A.5-1, "License Renewal Commitment List," stated "The OTI AMP is a new condition monitoring program that will be used to verify the system-wide effectiveness of the Water Chemistry (A.2.1.2) program, Fuel Oil Chemistry (A.2.1.18) program, and Lubricating Oil Analysis (A.2.1.26) program which are designed			

to prevent or minimize age-related degradation so that there will not be a loss of intended function during the PEO." Section A.2.1.20 further states that program elements include, in part, "determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined."

The licensee established ER-AA-700-301, "License Renewal One-Time Inspection Program," Revision 2, as the implementing procedure for the OTI AMP. Step 4.4.2 stated "To inspect for the reduction of heat transfer due to fouling, visual examinations in accordance with Table 1 or Table 2, as appropriate, should be performed." Table 1, applicable to the "First License Renewal," identified "Visual (VT-3 or equivalent)" as the examination technique.

However, during a review of Work Order (WO) 01848043-01 on April 15, 2025, inspectors noted that the required visual examination to verify the absence of heat transfer degradation in the Byron Unit 1 seal water heat exchanger was not performed. Unit 1 had already entered the PEO. Handwritten WO notes stated "heat exchangers were not disassembled for this exam." Instead, the WO documented that "an analysis was performed using trending data to show there is no reduction in heat transfer." The work task description specifically required a visual examination using a qualified VT-3 method from ASME Code or an equivalent.

The term "VT-3 or equivalent" was taken directly from NRC guidance in the Generic Aging Lessons Learned (GALL) Report, NUREG 1801, Revision 2. According to the ASME Code, a VT-3 examination determines the general mechanical and structural condition of components and supports by verifying parameters such as clearances, settings, and physical displacements and by detecting discontinuities and imperfections such as corrosion, wear, erosion, loose or missing parts, debris, and loss of integrity at bolted or welded connections.

Interviews with licensee personnel revealed they believed that an engineering analysis showing no evidence of tube fouling could serve as an equivalent to a VT-3 visual inspection. According to the WO 01848043-01 analysis "trends comprised of historic data will be used to show that there is no evidence of fouling or other degradation mechanisms that could lead to a reduction of heat transfer." It further stated, "This will be done by validating current data trends match the output values from 20+ years ago for 1CV04AA/B Letdown Heat Exchangers." The licensee completed this heat exchanger analysis on April 25, 2024, which was 5 days prior to the PEO.

An earlier Action Request (AR) 04550565, initiated during outage planning on January 26, 2023, indicated that the licensee "… identified One-Time Inspections (OTI) for license renewal and for the seal water heat exchanger and the 1A RH (Residual Heat) pump seal cooler could be substituted with heat exchanger efficiency/performance calculations." This AR also stated that "Programs [Engineering group] will need to ensure License Renewal gets updated with plan for utilizing efficiency calculations instead of performing OTI's." However, inspector interviews with personnel from the License Renewal and Engineering groups revealed that no commitment changes were processed related to WO 01848043 or AR 04550565. Instead, personnel from both groups signed off on the WO 01848043 analysis as acceptable, even though the committed actions were not changed. This approach was inconsistent with procedure ER-AA-700, "License Renewal Implementation Program," Revision 10, which assigned responsibility to specific roles, including the Aging Management Coordinator (Section 3.11), AMP Owners (Section 3.13), and AMP Owner Supervisors/Managers (Section 3.18), "to confirm the completion of all LR commitments."

In response to inspector questions, the licensee discovered two additional instances in Unit 1 where engineering analyses were used instead of the required visual examinations without a commitment change: WO 01850349 (1FC01A spent fuel heat exchanger) and WO01849427 (1RH01PA residual heat pump seal cooler).

Additionally, the inspectors inquired about whether a commitment change should have been pursued given the hardships outlined by the associated analyses and action requests. For example, WO 01848043 analysis indicated various chemical volume control heat exchangers "have never been disassembled due to the risk of disassembly/reassembly, the high levels of dose, and the potential for introducing foreign material to the system."

Licensee procedure ER-AA-700-1004, "License Renewal Requirements Management," Revision 1, provided guidance for defining the closure of license renewal requirements and described the process for changing or deleting those requirements and their associated implementing activities. Furthermore, UFSAR Appendix F, Section A.5.0, stated: "Because these commitments are contained within the UFSAR, any potential changes to these commitments require evaluation in accordance with 10 CFR 50.59 as defined per the Exelon commitment management process." Also, License Condition 2.C.(23)(a) stated, in part, the licensee may make changes to the programs and activities applicable to Byron Unit 1 described in this Supplement provided the licensee evaluates such changes pursuant to the criteria set forth in 10 CFR 50.59 and otherwise complies with the requirements in that section. Despite this, interviews with AMP owners, managers, and coordinators revealed a lack of awareness of the established commitment change process and a limited understanding of the regulatory definition and implications of license renewal commitments, including the requirement to evaluate proposed changes in accordance with 10 CFR 50.59. Particularly, none of the individuals interviewed who were involved in the decision to substitute the committed action with an analysis demonstrated an understanding of the 10 CFR 50.59 process or its applicability to license renewal commitments, and all acknowledged they had not received training in the 50.59 process.

Although this inspection was scoped for Unit 2, the licensee implements its License Renewal Programs mostly at the site level rather than by individual unit. As a result, while inspecting Unit 2 program implementation, the team encountered an issue in Unit 1. Because the programs are integrated across both units, this Unit 1 issue is documented in this Unit 2 inspection report.

Corrective Actions: The license created a corrective action to generate three work orders to disassemble and/or inspect the heat exchangers using WOs 01850349, 01849427, and 01848043 as templates. Another corrective action has the AMP owner advise work planners the scope and inspection methodology of the remaining affected heat exchangers.

Corrective Action References: AR04550565, AR04858763, AR04863225

Performance Assessment:

Performance Deficiency: The failure to implement the OTI AMP prior to the PEO was contrary to Byron Station Unit 1's Renewed Facility Operating License No. NPF-37 License Condition 2.C.(23)(b) and was a performance deficiency.

Screening: The inspectors determined the performance deficiency was more-than-minor because if left uncorrected, it would have the potential to lead to a more significant safety concern. Specifically, the licensee's failure to implement OTIs to ensure tube fouling had not

occurred within chemical volume control, residual heat, and spent fuel system heat exchangers would allow potential degradation of license renewal scoped components to go unnoticed which does not assure the components will remain functional throughout the PEO.

Significance: The inspectors assessed the significance of the finding using IMC 0609 Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." Inspectors answered "no" to screening questions of the Mitigating Systems Exhibit 2. Specifically, the inspectors determined that this finding is of very low safety significance (Green) because the inspectors did not find any example of degraded conditions associated with this performance deficiency.

Cross-Cutting Aspect: H.1 - Resources: Leaders ensure that personnel, equipment, procedures, and other resources are available and adequate to support nuclear safety. Specifically, licensee leadership did not assign roles and responsibilities outlined in applicable procedures, resulting in staff substituting required visual inspections with engineering analyses without formally changing the associated license renewal commitments. Personnel lacked knowledge of the regulatory implications and procedural requirements for license renewal commitments and the process and NRC requirements for changing them, reflecting inadequate training and oversight. In addition, limited resources supporting license renewal activities contributed to the licensee incorrectly substituting a required visual inspection with an evaluation five days before the PEO, despite UFSAR Supplement Section A.2.1.20 specifying that OTIs were to be performed within the 10-year period prior to the PEO.

Enforcement:

Violation: License Condition 2.C.(23)(b) of Byron Station Unit 1 Renewed Facility Operating License No. NPF-37 stated, in part, that the License Renewal UFSAR Supplement "describes certain programs to be implemented and activities to be completed prior to the PEO." Unit 1 entered the PEO on April 30, 2024.

Appendix F of the UFSAR (a.k.a., the License Renewal UFSAR Supplement), Section A.2.1.20, "OTI" AMP, and Commitment 20 from UFSAR Appendix F, Section A.5.0, Table A.5-1, "License Renewal Commitment List," described the OTI Program as a condition monitoring program intended to verify the effectiveness of other AMPs that prevent or minimize age-related degradation, ensuring intended functions are maintained during the PEO. Section A.2.1.20 further stated that the elements of the program include, in part, "determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined."

The licensee established ER-AA-700-301, "License Renewal One-Time Inspection Program," Revision 2, as the implementing procedure for the OTI program. Step 4.4.2 stated: "[t]o inspect for the reduction of heat transfer due to fouling, visual examinations in accordance with Table 1 or Table 2, as appropriate, should be performed." Table 1 was applicable for "First License Renewal" and identified "Visual (VT-3 or equivalent)" as the examination technique.

Contrary to the above, the licensee failed to implement the OTI AMP, a program described in the License Renewal UFSAR Supplement, prior to the PEO on April 30, 2024. Specifically, the licensee did not visually examine the chemical volume control, residual heat removal, and spent fuel system heat exchangers (1CV04AA, 1RH02AA, and 1FC01A, respectively). While licensee procedure ER-AA-700-301 identified visual examinations, specifically

"Visual (VT-3 or equivalent)," as the examination technique, the licensee relied instead on an analysis of historical heat transfer data.

Enforcement Action: This violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2 of the Enforcement Policy.

Observation: License Renewal Implementation Issues	71003

Procedure ER-AA-700, "License Renewal Implementation Program," Revision 10, defined the responsibilities for oversight, support, and performance of license renewal implementation activities through the completion of the PEO. Section 1 of the procedure stated its purpose was, in part, to ensure license renewal requirements are implemented in accordance with 10 CFR 54 and to ensure the intended functions of aging systems, structures, and components (SSCs) are maintained consistently with the Current Licensing Basis (CLB). Section 3 assigned specific roles such as the PEO Readiness Lead, Designated Site Engineering Manager, and License Renewal Project Site Lead, which were intended to ensure ownership, coordination, and continuity of license renewal implementation activities.

During interviews, the inspectors learned that these roles were not staffed, and, in some cases, they had never been staffed since license renewal implementation began. Instead, some functions were distributed across existing personnel without formally assigning the roles or ensuring the full scope of responsibilities described in ER-AA-700 were fulfilled. For example, inspectors noted that personnel from NDE Services were performing only ASME Code-related VT-1 and VT-3 visual examinations, rather than conducting all license renewal VT-1 and VT-3 inspections as described in the procedure. Additionally, for non-ASME Code components, visually uncertified engineers were assigned to perform VT-1 and VT-3 inspections using a site-defined "visual equivalency" process, rather than the certified methods outlined in the procedure.

ER-AA-700 also assigned broader responsibilities to the unstaffed roles, including maintaining a Pre-PEO workbook/database, auditing license renewal documentation, implementing a change management plan to transition from project-based to site-based ownership, and developing a Communications and Orientation Plan. The absence of these formally assigned roles raised concerns about the licensee's ability to coordinate and maintain effective programmatic control of license renewal implementation.

This inspection is the third license renewal inspection at this site in the past 3 years. NRC identified NCVs during each inspection, including: a 2023 failure to perform 17 required selective leaching inspections (ML23108A332); a 2024 failure to implement the external surfaces monitoring program for piping insulation (ML24220A258); and the current 2025 NCV related to failure to perform required OTIs for Unit 1 heat exchangers. In addition to these NCVs, inspectors identified minor violations and observations involving implementation issues of license renewal commitments. Collectively, issues were identified in 16 percent of the commitments sampled during these inspections, highlighting the need for stronger licensee oversight, coordination, and accountability to ensure that SSCs within the scope of license renewal continue to meet their intended functions throughout the PEO.

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

- On May 8, 2025, the inspectors presented the Post-Approval License Renewal Phase 1 Inspection results to Harris Welt and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71003	Corrective Action Documents	04801709	LR -CST Liquid Penetrant Indication	09/14/2024
		04802681	Degraded Sealant Found at the Base of the U1 CST (1CD01T)	09/18/2024
		04848584	Resolution of LR Bolting Integrity Program Issues	03/25/2025
		04857340	B2R25 FAC Component 2FW081 Low Wall Thickness	04/15/2025
		04860831	Documentation of OTI Exam Results on 2FW015A	04/27/2025
	Corrective Action Documents Resulting from Inspection	AR04858763	NRC ID: LR-OTI Sample Group 3 Methodology Questioned by NRC	04/20/2025
		AR04863225	NRC ID: Byron License Renewal Program not IAW ER-AA-700	05/05/2025
	Drawings	1SWRF-1-ISI	Inspection Identification Drawing for Inservice Inspection for Seal Water Heat Exchanger and Miscellaneous Filters	A
		LR-BYR-M-138 sheet 4	License Renewal Boundary Drawing Diagram of Chemical and Volume Control and Boron Thermal Regeneration Unit 2	0
		LR-BYR-M-64 Sheet 4A	License Renewal Boundary Drawing Diagram of Chemical and Volume Control and Boron Thermal Regeneration Unit 1	0
	Engineering Changes	642506	B1R26 1CD01T CST Evaluation of Structural Integrity due to Reduced Bottom Plate Thickness	0010
	Engineering Evaluations	2-BY-2FW081	Engineering Evaluation of UT Inspected Component	10/16/2023
		WJE No. 2019.1842.0	Byron Generating Station Unit 2 Tendon Tunnel Concrete Investigation	05/14/2020
	NDE Reports	2025-MT-011	Magnetic Particle Examination	04/14/2025
		2025-UT-003	Ultrasonic Bolting Calibration and Data Sheet	04/14/2025
		2025-UT-004	Ultrasonic Bolting Calibration and Data Sheet	04/14/2025
		B2R24-FAC-027	Flow Accelerated Corrosion Examination	10/15/2023
	Procedures	BB-PBD-AMP-XI.M32	One-Time Inspection Program Basis Document	2
		BVP 700-301	Byron One-Time Requirements and Guidelines	2
		ER-AA-700	License Renewal Implementation Program	10
		ER-AA-700-1001	License Renewal Project Turnover and Station Preparations for PEO Entry	6
		ER-AA-700-1004	License Renewal Requirements Management	1

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
		ER-AA-700-401	Selective Leaching Aging Management	2
		LS-AA-110	Commitment Management	15
	Work Orders	01839285	LR-OTI Main Condensate and Feedwater System	09/18/2024
		01839351	LR-OTI Condensate and Feedwater System	04/25/2025
		01848043	LR-OTI Chemical and Volume Control System	04/30/2024
		01849427	LR-OTI Residual Heat Removal System	04/30/2024
		01850349	LR-OTI Spent Fuel Cooling System	04/05/2024
		01876873	LR Periodic Inspection of CST Tank (1CD01T) Tank Bottom	09/23/2024