



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION I
2100 RENAISSANCE BOULEVARD, SUITE 100
KING OF PRUSSIA, PENNSYLVANIA 19406-2713

May 4, 2022

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

SUBJECT: LIMERICK GENERATING STATION, UNITS 1 AND 2 – INTEGRATED
INSPECTION REPORT 05000352/2022001 AND 05000353/2022001

Dear Mr. Rhoades:

On March 31, 2022, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Limerick Generating Station, Units 1 and 2. On April 29, 2022, the NRC inspectors discussed the results of this inspection with Mr. Frank Sturniolo, Site Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

No findings or violations of more than minor significance were identified during this inspection.

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,

Jonathan E. Greives, Chief
Projects Branch 4
Division of Operating Reactor Safety

Docket Nos. 05000352 and 05000353
License Nos. NPF-39 and NPF-85

Enclosure:
As stated

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SUBJECT: LIMERICK GENERATING STATION, UNITS 1 AND 2 – INTEGRATED
 INSPECTION REPORT 05000352/2022001 AND 05000353/2022001 DATED
 MAY 4, 2022

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**U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report**

Docket Numbers: 05000352 and 05000353

License Numbers: NPF-39 and NPF-85

Report Numbers: 05000352/2022001 and 05000353/2022001

Enterprise Identifier: I-2022-001-0048

Licensee: Constellation Energy Generation, LLC

Facility: Limerick Generating Station, Units 1 and 2

Location: Sanatoga, PA 19464

Inspection Dates: January 1, 2022 to March 31, 2022

Inspectors: A. Ziedonis, Senior Resident Inspector
L. Grimes, Resident Inspector
E. Garcia, Reactor Engineer
M. Henrion, Health Physicist

Approved By: Jonathan E. Greives, Chief
Projects Branch 4
Division of Operating Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting an integrated inspection at Limerick Generating Station, Units 1 and 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

No findings or violations of more than minor significance were identified.

Additional Tracking Items

None.

PLANT STATUS

Unit 1 operated at or near rated thermal power for the entire inspection period.

Unit 2 began the inspection period at rated thermal power. On January 9, 2022, the unit was down-powered to approximately 70 percent thermal power to perform corrective maintenance on electrical connections associated with the 'B' condensate pump motor. The unit was returned to full power on January 10, 2022. On March 2, 2022, the unit was shutdown for a maintenance outage to replace the 'G' safety relief valve (SRV) after station personnel identified a leak internal to the valve. The unit was returned to full power on March 8, 2022, and remained at or near rated thermal power for the remainder of the inspection period.

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 performed activities described in IMC 2515, Appendix D, "Plant Status," conducted routine reviews using IP 71152, "Problem Identification and Resolution," observed risk significant activities, and completed on-site portions of IPs. 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.

REACTOR SAFETY

71111.04 - Equipment Alignment

Partial Walkdown Sample (IP Section 03.01) (4 Samples)

The inspectors evaluated system configurations during partial walkdowns of the following systems/trains:

- (1) Unit 2 condensate and feedwater system following removal of the 'B' condensate pump from service on January 9, 2022
- (2) Unit 2 reactor core isolation cooling (RCIC) system on January 24, 2022
- (3) Unit 1 turbine valve alignment following control valve #4 oscillations and subsequent manual closure on February 22, 2022
- (4) Unit 2 primary containment instrument gas system automatic re-alignment following compressor trouble alarm on March 9, 2022

71111.05 - Fire Protection

Fire Area Walkdown and Inspection Sample (IP Section 03.01) (5 Samples)

The inspectors evaluated the implementation of the fire protection program by conducting a walkdown and performing a review to verify program compliance, equipment functionality, material condition, and operational readiness of the following fire areas:

- (1) Unit 2 fire area 56, Unit 2 RCIC pump room on January 21, 2022
- (2) Unit 1 fire area 41, Unit 1 reactor enclosure cooling water heat exchanger area on February 3, 2022
- (3) Unit 1 fire area 44, Unit 1 safeguard system access area on February 3, 2022
- (4) Unit 1 fire area 47, Unit 1 standby liquid control and general equipment areas on February 8, 2022
- (5) Unit 1 fire area 33, Unit 1 RCIC pump room on March 17, 2022

71111.06 - Flood Protection Measures

Inspection Activities - Internal Flooding (IP Section 03.01) (2 Samples)

The inspectors evaluated internal flooding mitigation protections in the:

- (1) Unit common safety-related electrical cable manhole 106-east on February 2, 2022
- (2) Unit 1 reactor building safeguards system access area on February 3, 2022

71111.11Q - Licensed Operator Regualification Program and Licensed Operator Performance

Licensed Operator Performance in the Actual Plant/Main Control Room (IP Section 03.01) (1 Sample)

- (1) The inspectors observed and evaluated licensed operator performance in the control room during a Unit 1 planned power reduction for 6B feedwater heater (FWH) removal on January 25, 2022; 5A FWH removal on February 9, 2022; 5B/C FWH removal on February 15, 2022; and Unit 2 reactor shutdown on March 2, 2022

Licensed Operator Regualification Training/Examinations (IP Section 03.02) (1 Sample)

- (1) The inspectors observed and evaluated licensed operator annual requalification exam scenarios in the simulator on February 7, 2022

71111.12 - Maintenance Effectiveness

Maintenance Effectiveness (IP Section 03.01) (3 Samples)

The inspectors evaluated the effectiveness of maintenance to ensure the following structures, systems, and components remain capable of performing their intended function:

- (1) Unit 1 RCIC turbine trip and throttle valve overspeed trip latch mechanism maintenance effectiveness on January 20, 2022
- (2) Unit 1 turbine control valve number four maintenance effectiveness with test box installed during repairs on February 22 and 23, 2022
- (3) Unit 2 SRV solenoid installation and resultant primary containment instrument gas trouble alarm on March 7, 8, 11 and 14, 2022

71111.13 - Maintenance Risk Assessments and Emergent Work Control

Risk Assessment and Management Sample (IP Section 03.01) (5 Samples)

The inspectors evaluated the accuracy and completeness of risk assessments for the following planned and emergent work activities to ensure configuration changes and appropriate work controls were addressed:

- (1) Unit 2 operation with 'B' condensate pump motor power cable current transformer bolted connection thermal hot spot on January 6 and 7, 2022
- (2) Unit 2 emergent work in response to RCIC overspeed trip latch identified with low engagement on January 21, 2022
- (3) Unit 1 emergent work associated with high pressure coolant injection (HPCI) pump discharge breaker troubleshooting on January 26, 2022
- (4) Unit 1 emergent work associated with high pressure coolant injection pump discharge breaker troubleshooting on January 26, 2022
- (5) Unit 2 emergent work and elevated risk associated with the unplanned unavailability of RCIC on February 17 and 18, 2022

71111.15 - Operability Determinations and Functionality Assessments

Operability Determination or Functionality Assessment (IP Section 03.01) (6 Samples)

The inspectors evaluated the licensee's justifications and actions associated with the following operability determinations and functionality assessments:

- (1) Unit 1 HPCI system with the pump discharge valve motor breaker opened on January 14, 2021
- (2) Unit 2 RCIC system following identification of the overspeed trip latch identified with non-preferred engagement on January 18 and 19, 2021
- (3) Unit 2 hardened containment vent system with the battery removed from service on February 4, 2022
- (4) Unit common control rod neutron absorption capability in response to industry operating experience documented in IR 4430157 on February 14, 2022
- (5) Unit 1 scram discharge volume 'D' channel level transmitter following degraded calibration test results on February 24, 2022
- (6) Unit 2 'G' SRV with elevated tailpipe temperature and non-functional pilot temperature indication during the week of February 28, 2022

71111.18 - Plant Modifications

Temporary Modifications and/or Permanent Modifications (IP Section 03.01 and/or 03.02) (1 Sample)

The inspectors evaluated the following temporary or permanent modifications:

- (1) Unit common 'D' emergency service water pump shim installation and vertical lift adjustment on February 22, 2022

71111.19 - Post-Maintenance Testing

Post-Maintenance Test Sample (IP Section 03.01) (6 Samples)

The inspectors evaluated the following post-maintenance testing activities to verify system operability and/or functionality:

- (1) Unit 2 HPCI pump flow testing following planned maintenance on January 11, 2022
- (2) Unit 2 RCIC turbine trip and throttle valve stroke following trip latch corrective maintenance on January 24, 2022
- (3) Unit 1 HPCI pump discharge valve stroke following electrical breaker auxiliary relay replacement on February 1 and 3, 2022
- (4) Unit 2 RCIC vacuum breaker motor operated valve following hand switch replacement on February 18, 2022
- (5) Unit common 'D' emergency service water pump following installation of shaft coupling shims on February 25, 2022
- (6) Unit 2 'G' SRV pilot state thermocouple following replacement on March 4, 2022

71111.20 - Refueling and Other Outage Activities

Refueling/Other Outage Sample (IP Section 03.01) (1 Sample)

- (1) The inspectors evaluated maintenance outage activities on Unit 2 (2M56) to replace the 'G' SRV following indications of leakage from March 2 through March 5, 2022

71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance testing activities to verify system operability and/or functionality:

Surveillance Tests (other) (IP Section 03.01) (2 Samples)

- (1) ST-6-092-314-1, Unit 1 D14 emergency diesel generator slow start monthly (instrumented) run on January 24, 2022
- (2) ST-1-107-851-2, Unit 2 core average scram insertion time evaluation on March 4, 2022

Inservice Testing (IP Section 03.01) (1 Sample)

- (1) ST-6-049-231-2, Unit 2 RCIC pump comprehensive test on February 28, 2022

FLEX Testing (IP Section 03.02) (1 Sample)

- (1) 'C' FLEX diesel generator functional test on February 28, 2022

71114.06 - Drill Evaluation

Drill/Training Evolution Observation (IP Section 03.02) (1 Sample)

The inspectors evaluated:

- (1) A licensed operator training evolution in the simulator on January 10, 2022

RADIATION SAFETY

71124.08 - Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation

Radioactive Material Storage (IP Section 03.01) (3 Samples)

The inspectors evaluated the licensee's performance in controlling, labeling, and securing the following radioactive materials:

- (1) Dry Active Waste shipping container in radioactive waste outdoor annex
- (2) Used laundry shipping container in radioactive waste outdoor annex
- (3) Metal trash storage container in radioactive waste outdoor annex

Radioactive Waste System Walkdown (IP Section 03.02) (3 Samples)

The inspectors walked down the following accessible portions of the solid radioactive waste systems and evaluated system configuration and functionality:

- (1) Common Condensate Phase Separator Tank Room 128 on elevation 162'
- (2) Common Waste Sludge Pump Room 124 on elevation 162'
- (3) Common Equipment Drain Filter Holding Pump Room 238 on elevation 191'

Waste Characterization and Classification (IP Section 03.03) (2 Samples)

The inspectors evaluated the following characterization and classification of radioactive waste:

- (1) 10 CFR Part 61 Report for 2020 Reactor Water Cleanup Container 20DR3006
- (2) 10 CFR Part 61 2022 Report for Limerick Generating Station

Shipping Records (IP Section 03.05) (4 Samples)

The inspectors evaluated the following non-excepted radioactive material shipments through a record review:

- (1) Radioactive Waste Shipment Number MW-21-027, Class A, UN 3321, Radioactive Material 7, Low Specific Activity (LSA-II)
- (2) Radioactive waste shipment number MW-21-032, Class B, UN 2916, Radioactive Material 7, Type B
- (3) Radioactive waste shipment number MW-21-034, Class A, UN 3321, Radioactive Material 7, Low Specific Activity (LSA-II)

- (4) Radioactive waste shipment number MW-21-043, Class A, UN 3321, Radioactive Material 7, Low Specific Activity (LSA-II)

OTHER ACTIVITIES – BASELINE

71151 - Performance Indicator Verification

The inspectors verified licensee performance indicators submittals listed below:

IE03: Unplanned Power Changes per 7000 Critical Hours Sample (IP Section 02.02) (2 Samples)

- (1) Unit 1 for the period of January 1, 2021 through December 31, 2021
- (2) Unit 2 for the period of January 1, 2021 through December 31, 2021

MS07: High Pressure Injection Systems (IP Section 02.06) (2 Samples)

- (1) Unit 1 for the period of January 1, 2021 through December 31, 2021
- (2) Unit 2 for the period of January 1, 2021 through December 31, 2021

MS08: Heat Removal Systems (IP Section 02.07) (2 Samples)

- (1) Unit 1 for the period of January 1, 2021 through December 31, 2021
- (2) Unit 2 for the period of January 1, 2021 through December 31, 2021

71152A - Annual Follow-up Problem Identification and Resolution

Annual Follow-up of Selected Issues (Section 03.03) (1 Sample)

The inspectors reviewed the licensee's implementation of its corrective action program related to the following issues:

- (1) Fuel defects that were identified in two fuel assemblies that were off-loaded following Unit 1 cycle 18 operation (spring 2018 through spring 2020). Specifically, one defect was attributed to foreign material damage, and the second defect was attributed to pellet clad interaction on high resident time fuel. The scope of the inspector's review was focused on identification, evaluation, corrective action, and use of operating experience associated with the pellet clad interaction defect on the high resident time fuel assembly. The inspectors reviewed information listed in the documents reviewed section, reviewed various industry operating experience documents, and interviewed reactor engineering staff, to gain a thorough understanding of Constellation's performance as it related to this issue.

INSPECTION RESULTS

No findings were identified.

EXIT MEETINGS AND DEBRIEFS

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

- On March 11, 2022, the inspectors presented the 71124.08 Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation inspection results to Mr. Frank Sturniolo, Site Vice President, and other members of the licensee staff.
- On April 29, 2022, the inspectors presented the integrated inspection results to Mr. Frank Sturniolo, Site Vice President, and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71111.04	Corrective Action Documents	4482719	Instrument gas compressor low pressure alarm during start-up	03/05/2022
71111.12	Corrective Action Documents	4479540	U1 reactor pressure spike	02/21/2022
		4479917	Aggregate U1 CV-4 servo oscillations during EOC operations	02/22/2022
71111.13	Corrective Action Documents	4470069	2B-P102 has elevated motor lead temperature	01/05/2022
		4470782	2B condensate pump motor CT unable to be tested	01/09/2022
		4470880	4.0 critique - U2 load drop for 2B condensate pump repair	01/10/2022
		4471134	Incorrect CT lugs identified on the 2B condensate motor	01/11/2022
		4471604	EMD 4.0 critique of 2B condensate motor lug repair	01/13/2022
		4477995	EOC inspection of 1A-P501-DR CT lead/lugs	02/14/2022
		4477996	EOC inspection of 1B-P502-DR CT lead/lugs	02/14/2022
	Miscellaneous	EPRI Report 1007460	Terry Turbine Maintenance Guide, RCIC Application (Replaces TR-105874 and TR-016909-R1)	November 2002
	Procedures	M-050-005	RCIC Turbine Trip Throttle Valve Overhaul HV-50-112/212	Revision 3
		M-050-007	RCIC Turbine Minor Inspection	Revision 4
		M-050-008	RCIC Turbine Major Inspection	Revision 0
		RT-6-049-331-1	RCIC Overspeed Trip Test	Revision 9
		ST-6-049-231-2	RCIC Pump Comprehensive Test	Revision 17
	71111.15	Corrective Action Documents	4386300	Underprediction in control blade depletion from Tip adder
4402523			ATI 4386300-12 past due	02/15/2021
4404958			SC 20-06 rev 1 GE-H B-10 depletion for non-hafnium CRs	02/26/2021
4424979			Limerick U1 cycle 19 MSBWP (SC 20-06)	05/21/2021
4430157			SC 20-06: LIM1C19 blades exceed segment limit with Tip adder	06/18/2021
44656177			Trend IR: recommends for U2 HCVS batteries	12/09/2021
4472586			Tagout revision for U2 RCIC trip hook / latch engagement	01/22/2022
4474396			EOC inspection - U1 RCIC trip latch mechanism	01/28/2022
4475525			U1 RCIC trip lever 4.0 critique for mechanical maintenance	02/02/2022
4478843			DRE and corporate actions for MA-AA-721-1001, revision 3	02/17/2022
4478948			LAS and corporate actions for MA-AA-721-1001, revision 3	02/17/2022
4481385			PMC: 2G MSRVS tailpipe temperature trend	02/28/2022

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Corrective Action Documents Resulting from Inspection	4472545	NRC ID - U2 RCIC trip reset latch issue	01/18/2022
		4472586	PCR for RCIC turbine trip latch level inspection	01/18/2022
		4478226	U2 HCVS battery will exceed 90 days OOS	02/15/2022
71111.20	Corrective Action Documents	4483201	Lessons learned: 2G SRV solenoid replacement improvements	03/06/2022
71152A	Corrective Action Documents	4202624	Unit 1 weekly offgas sample has increased parameter values	12/12/2018
		4202624-12	Equipment Corrective Action Program Evaluation: Limerick Unit 1 Fuel Cladding Defect Identified by Chemistry Offgas Sampling	Updated 02/22/2021
	Procedures	NF-AB-440-1001	Fuel Conditioning for 3D Monicore Plants	Revision 9
		NF-LG-721-1005	Reactor Maneuvering Shutdown Instruction Preparation Guideline	Revision 6