



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
2100 RENAISSANCE BOULEVARD, SUITE 100
KING OF PRUSSIA, PENNSYLVANIA 19406-2713

May 4, 2021

Mr. Eric Carr
President & Chief Nuclear Officer
PSEG Nuclear, LLC
PO Box 236
Hancock's Bridge, NJ 08038

SUBJECT: HOPE CREEK NUCLEAR GENERATING STATION – INTEGRATED
INSPECTION REPORT 05000354/2021001

Dear Mr. Carr:

On March 31, 2021, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Hope Creek Nuclear Generating Station. On April 14, 2021, the NRC inspectors discussed the results of this inspection with Mr. Steve Poorman, Plant Manager 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,

X /RA/

Signed by: Brice A. Bickett
Brice A. Bickett, Chief
Reactor Projects Branch 3
Division of Operating Reactor Safety

Docket No. 05000354
License No. NPF-57

Enclosure:
As stated

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

Docket Number: 05000354

License Number: NPF-57

Report Number: 05000354/2021001

Enterprise Identifier: I-2021-001-0051

Licensee: PSEG Nuclear, LLC

Facility: Hope Creek Nuclear Generating Station

Location: Hancock's Bridge, NJ 08038

Inspection Dates: January 01, 2021 to March 31, 2021

Inspectors: J. Patel, Senior Resident Inspector
D. Beacon, Resident Inspector
P. Finney, Senior Project Engineer
L. Grimes, Project Engineer

Approved By: Brice A. Bickett, Chief
Reactor Project Branch 3
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 Hope Creek Nuclear Generating Station, 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

The Hope Creek Generating Station (Hope Creek) began the inspection period at approximately 100 percent rated thermal power (RTP). On January 1, Hope Creek commenced a planned load reduction to approximately 80 percent RTP to perform control rod pattern exchange. Power was restored to 100 percent RTP on January 2. Hope Creek performed planned power reductions to approximately 90 to 95 percent RTP, to remove selected portions of feedwater heating from service to support cycle extension methods in accordance with the operating license, on January 8, January 14, January 26, and February 1, and returned to full power on the same or subsequent day following each load reduction. On February 8, Hope Creek began an end-of-cycle coastdown period. On February 24, the operators preemptively reduced power to 85 percent RTP to support repair work in the switchyard, and returned to 92 percent RTP, limited by end-of-cycle coastdown, on the following day. Hope Creek remained in an end-of-cycle coastdown period until the end 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 plant status activities described in IMC 2515, Appendix D, "Plant Status," and conducted routine reviews using IP 71152, "Problem Identification and Resolution." 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.

Starting on March 20, 2020, in response to the National Emergency declared by the President of the United States on the public health risks of the coronavirus (COVID-19), resident and regional inspectors were directed to begin telework and to remotely access licensee information using available technology. During this time the resident inspectors performed periodic site visits each week, increasing the amount of time on site as local COVID-19 conditions permitted. As part of their onsite activities, resident inspectors conducted plant status activities as described in IMC 2515, Appendix D; observed risk significant activities; and completed on site portions of IPs. In addition, resident and regional baseline inspections were evaluated to determine if all or portion of the objectives and requirements stated in the IP could be performed remotely. If the inspections could be performed remotely, they were conducted per the applicable IP. In some cases, portions of an IP were completed remotely and on site. The inspections documented below met the objectives and requirements for completion of the IP.

REACTOR SAFETY

71111.01 - Adverse Weather Protection

Impending Severe Weather Sample (IP Section 03.02) (1 Sample)

- (1) The inspectors evaluated readiness for impending adverse weather conditions for the onset of extreme weather between January 31 and February 2

71111.04 - Equipment Alignment

Partial Walkdown Sample (IP Section 03.01) (3 Samples)

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

- (1) 'C' emergency diesel generator on January 12
- (2) 'B' emergency diesel generator on January 19
- (3) Reactor core isolation cooling system on February 23

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) Class 1E switchgear rooms on January 7
- (2) 'B' and 'D' core spray rooms on January 21
- (3) Filtration Recirculation Vent system room and electrical access area on March 15
- (4) HVAC equipment, inverter, and battery rooms on March 22
- (5) Motor control center area, safeguard instrument rooms, and reactor auxiliary cooling system pumps and heat exchanger area on March 22

71111.06 - Flood Protection Measures

Inspection Activities - Internal Flooding (IP Section 03.01) (1 Sample)

The inspectors evaluated internal flooding mitigation protections in the:

- (1) Core spray, residual heat removal, and reactor core isolation cooling rooms on February 23

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) Licensed operator performance in the main control room during quarterly turbine valve testing on March 5

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

- (1) The inspectors observed and evaluated a crew of licensed operators in the plant's simulator during a licensed operator requalification training on January 26

71111.12 - Maintenance Effectiveness

Maintenance Effectiveness (IP Section 03.01) (1 Sample)

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

- (1) Plant leak detection system on March 23

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) Planned inoperability of reactor core isolation cooling system during maintenance on January 20
- (2) Planned inoperability 'A' emergency diesel generator during the impending weather conditions between January 31 and February 2
- (3) Planned inoperability of 'B' emergency diesel generator and 10A402 4kV bus for the large load reject test following governor replacement on February 19
- (4) Emergent work to address 500 kV line (5037) 'C' phase coupling capacitor voltage transformer oil leak on February 24 through February 25
- (5) Emergent work to address a trip of 'A' reactor feed pump on March 12

71111.15 - Operability Determinations and Functionality Assessments

Operability Determination or Functionality Assessment (IP Section 03.01) (5 Samples)

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

- (1) 'A' residual heat removal following ultrasonic testing results below nominal wall thickness on the minimum flow recirculation line on January 25
- (2) 'A' and 'B' control room chillers following compressor lube oil makeup and removal on February 2
- (3) High pressure coolant injection system oil supply pressure low indication on March 10
- (4) Reactor core isolation cooling system operability after barometric condenser condensate pump arcing during the test on March 17
- (5) 'D' emergency diesel generator lube oil high moisture content on March 18

71111.19 - Post-Maintenance Testing

Post-Maintenance Test Sample (IP Section 03.01) (5 Samples)

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

- (1) Reactor core isolation cooling system following installation of signal isolators to allow mapping and monitoring of ramp generator signal converter and electric governor-magnetic signals to control room integrated display system on January 20
- (2) 'A' emergency diesel generator following 24-month preventive maintenance on February 8
- (3) 'B' emergency diesel generator following planned maintenance and governor replacement on February 19
- (4) 'A' control area chiller following planned maintenance on March 4
- (5) 'A' reactor feed pump governor control relay failure on March 12

71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance tests:

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

- (1) HC.MD-ST.PB-0003, class 1E 4.16 kV feeder degraded voltage monthly instrumentation channel functional test on January 11
- (2) HC.OP-IS.BJ-0001, high pressure coolant injection main and booster pump in-service test on March 10

Inservice Testing (IP Section 03.01) (1 Sample)

- (1) HC.OP-IS.BD-0001, reactor core isolation cooling pump in-service test on February 23

OTHER ACTIVITIES – BASELINE

71151 - Performance Indicator Verification

The inspectors verified licensee performance indicators submittals listed below:

IE01: Unplanned Scrams per 7000 Critical Hours Sample (IP Section 03.01)

- (1) January 1, 2020 through December 31, 2020

IE03: Unplanned Power Changes per 7000 Critical Hours Sample (IP Section 03.02) (1 Sample)

- (1) January 1, 2020 through December 31, 2020

IE04: Unplanned Scrams with Complications (USwC) Sample (IP Section 03.03) (1 Sample)

- (1) January 1, 2020 through December 31, 2020

71152 - Problem Identification and Resolution

Annual Follow-up of Selected Issues (IP Section 02.03) (2 Samples)

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

- (1) Review of events and corrective actions involving Baily Solid State Logic Modules (SSLMs) failures.
- (2) Review of notifications and corrective actions (20865437, 20864303, 20864280, 20841123, 20853137, and 20856884) associated with safety-related 10A402 bus degraded voltage relay failures.

INSPECTION RESULTS

Observation: Events involving Bailey SSLMs	71152
<p>Inspectors reviewed events involving Bailey Solid State Logic Modules (SSLMs). Specifically:</p> <ul style="list-style-type: none">• In August 2019, the cooling tower bypass valve (CTBV) opened unexpectedly despite no automatic feature to do so. This caused circulating water supply temperature and consequently condenser backpressure to rise and operators manual tripped the plant in response.• In November 2020, a 4 KV breaker trip resulted in loss of a turbine area motor control cabinet (MCC), a reactor water cleanup isolation, chiller trip, and reactor protection system half-scam. <p>In both cases, Bailey SSLMs were a potential or proven cause of the event. Given the relative impacts of the issues in concert with Hope Creek's license condition requiring a Bailey SSLM reliability program, inspectors reviewed corrective action program (CAP) products associated with the two events as well as PSEG processes and procedures related to implementation of its monitoring program. The inspectors noted the following PSEG performance observations as it related to IP 71152 performance attributes.</p> <p>Regarding the August 2019 CTBV event, the inspectors observed that:</p> <ul style="list-style-type: none">• The apparent cause evaluation (ACE) did not define the extent of the condition or explore the potential for the condition to exist with other plant equipment per LS-AA-125-1001, "Cause Analysis," Revision 19, Steps 4.2 and 4.13.3, and PIA-035, "Cause Analysis Manual," Revision 3, Attachment 1. Additionally, while the original notification (NOTF) and ACE characterized the issue as a condition adverse to regulatory compliance, PSEG's SSLM post-mortem failure analysis NOTF and subsequent extent of condition were dispositioned outside of the CAP and not clearly linked to the ACE as a Corrective Action or Action Item in accordance with LS-AA-125, "Corrective Action Program," Steps 4.4.1, 4.4.8, and 4.4.9.• The ACE causal technique used was a Failure Mode and Effects Analysis (FMEA) but the inspectors noted the FMEA could not be located during the inspection review. While PSEG's CAP guidance does not specifically require retention of the causal technique, LS-AA-125-1001, Step 4.13.2, directs staff to "ensure logic used to arrive at the report conclusions are clear with adequate details for a technically competent	

individual to reach the same conclusions." Additionally, procedure HC.IC-AP.ZZ-0017, "Bailed Module Reliability Program," Revision 0, requires failure documentation on both a worksheet and failure detail sheet with originals retained with the work order and copies provided to the System Engineer. Neither of these forms nor the completed corrective work order could be located. The inspectors noted that without clear documentation of the implemented causal technique(s), an independent review could be challenging to affirm the same conclusions reached by the station.

- Organizational learnings regarding the cause of failure, field-programmable logic array (FPLA) fuse growth, did not appear to be formally fed back to Hope Creek staff or communicated to Salem to review applicability or learnings as suggested by LS-AA-125, Step 4.4.9.3, and LS-AA-125-1001, Step 4.2.7.

Regarding the 4 KV breaker trip and loss of the turbine area MCC event, the inspectors observed that:

- While a formal cause evaluation has not yet been completed, PSEG completed a prompt investigation that recommended an extent of condition be completed following cause determination. LS-AA-125-1001, Step 4.2.2, and PIA-035 direct staff to "begin the EOCo analysis as soon as practical after the condition is understood." PIA-005, "ACE Template," Revision 7, defines the extent of condition purpose "is to identify any immediate vulnerability." The inspectors noted the event occurred in June 2020 but a cause evaluation that would procedurally drive an extent of condition review is not expected until May 2021, thereby challenging the site to an extended potential vulnerability window.

PSEG captured these observations in notification 20872232, 20872233, 20874480, and 20874822. These observations, where contrary to PSEG's requirements or standards in CAP implementation, were determined to be minor performance deficiencies in accordance with the NRC IMC 0612 and were not subject to enforcement action in accordance with the NRC's Enforcement Policy.

Observation: Missed opportunities associated with the degraded voltage relay failures	71152
<p>The inspectors reviewed PSEG's corrective actions associated with the safety-related 10A402 bus degraded voltage relay failures. The inspectors reviewed four undervoltage relays that either failed surveillance testing or bench testing since November 2019. For each occurrence, the inspectors reviewed PSEG's CAP to verify that the licensee was appropriately identifying, evaluating, and correcting the conditions adverse to quality. The inspectors reviewed to verify that the licensee took appropriate corrective actions and performed the extent of conditions as it applies to other relays in the loss of voltage protection scheme. The inspectors also reviewed failure analysis to determine the adequacy of preventive maintenance strategy.</p> <p>The inspectors identified the following missed opportunities as they related to this review:</p> <ul style="list-style-type: none"> • For the November 2020 relay failures, PSEG did not perform an extent of condition review once the results from the failure analysis were obtained and PSEG determined relay failures were attributed to a specific batch. Specifically, PSEG did not conduct a review to identify other potentially faulty relays installed in the plant associated with the suspected bad batch. 	

- For the November 2019 relay failure, PSEG did not perform a failure analysis due to the relay approaching the end of service life. The inspectors identified the relay was not approaching the end of service life, and the failure mode should have been understood to determine the adequacy of the preventive maintenance strategy.

The inspectors evaluated these issues in accordance with the IMC 0612, Appendix B, "Issue Screening," and Appendix E, "Examples of Minor Issues," and determined the issues did not constitute performance deficiencies or were of minor significance. As a result, these issues were not subject to enforcement action in accordance with the NRC's enforcement policy. PSEG entered these observations into their CAP as notifications 20872766, 20872767, and 20874361.

EXIT MEETINGS AND DEBRIEFS

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

- On April 14, 2021, the inspectors presented the integrated inspection results to Mr. Steve Poorman, Plant Manager and other members of the licensee staff.

THIRD PARTY REVIEWS

Inspectors reviewed Institute on Nuclear Power Operations report that was issued during the inspection period on March 1.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71152	Corrective Action Documents Resulting from Inspection	20872232* 20872233* 20873118*		