



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION I  
2100 RENAISSANCE BLVD., SUITE 100  
KING OF PRUSSIA, PA 19406-2713

February 13, 2017

Mr. Peter P. Sena, III  
President and Chief Nuclear Officer  
PSEG Nuclear LLC - N09  
P.O. Box 236  
Hancocks Bridge, NJ 08038

**SUBJECT: HOPE CREEK GENERATING STATION UNIT 1 – INTEGRATED INSPECTION  
REPORT 05000354/2016004**

Dear Mr. Sena:

On December 31, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Hope Creek Generating Station (HCGS). The enclosed report documents the inspection results, which were discussed on January 12, 2017, with Mr. Eric Carr, Site Vice President of HCGS, and other members of your staff.

NRC inspectors examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

NRC inspectors documented two findings of very low safety significance (Green) in this report. Two of these findings involved violations of NRC requirements. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest the violations or significance of these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement; and the NRC Resident Inspector at HCGS. In addition, if you disagree with the cross-cutting aspect assigned to any finding, or a finding not associated with a regulatory requirement 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 I, and the NRC Resident Inspector at HCGS.

P. Sena

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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 the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

*/RA/*

Fred L. Bower, III, Chief  
Reactor Projects Branch 3  
Division of Reactor Projects

Docket No. 50-354  
License No. NPF-57

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Inspection Report 05000354/2016004  
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**U.S. NUCLEAR REGULATORY COMMISSION**

REGION I

Docket No. 50-354

License No. NPF-57

Report No. 05000354/2016004

Licensee: PSEG Nuclear LLC (PSEG)

Facility: Hope Creek Generating Station (HCGS)

Location: P.O. Box 236  
Hancocks Bridge, NJ 08038

Dates: October 1, 2016 through December 31, 2016

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S. Haney, Resident Inspector  
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Approved By: Fred L. Bower, III, Chief  
Reactor Projects Branch 3  
Division of Reactor Projects

Enclosure

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## SUMMARY

Inspection Report (IR) 05000354/2016004; 10/01/2016 – 12/31/2016; Hope Creek Generating Station (HCGS); Maintenance Risk Assessments and Emergent Work Control, Follow-Up of Events and Notices of Enforcement Discretion.

This report covered a three-month period of inspection by resident inspectors and announced inspections performed by regional inspectors. The inspectors identified two self-revealing findings of very low safety significance (Green), both of which were non-cited violations (NCVs). The significance of most findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process (SDP)," dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within Cross-Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated November 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

### Cornerstone: Initiating Events

- Green. A self-revealing very low safety significance (Green), non-cited violation of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.65(a)(4) was identified for inadequately assessing and managing risks associated with maintenance activities to prevent plant transients that upset plant stability. Specifically, because PSEG did not identify a conflict with the reactor water cleanup (RWCU) pump trip logic prior to conducting a planned breaker swap, the 'A' RWCU pump tripped while it was credited to as a defense-in-depth system for decay heat removal (DHR). PSEG assigned a corrective action to perform a work group evaluation and address lessons learned from this event.

The issue was more than minor because it was associated with the Equipment Performance (availability) attribute of the Initiating Event cornerstones and adversely affected its objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown. Additionally, this issue was similar to IMC 0612, Appendix E, examples 7.e and 7.f, in that the resulting increased risk put the plant into a higher risk category. In this case, the plant risk would have been reclassified from Yellow to Orange when RWCU pump was unavailable during residual heat removal (RHR) shutdown cooling outage window. The inspectors evaluated the finding using IMC 0609, Appendix G, "Shutdown Operations Significance Determination Process," Attachment 1, Exhibit 1, "Initiating Event Screening Questions." The inspectors determined the finding was Green because no quantitative phase 2 analysis was required, and RWCU system was not identified as a major system on Table G1 for Decay Heat Removal safety function. This finding had a cross-cutting aspect in the area of Human Performance, Work Management, because PSEG did not identify and appropriately manage risk associated with the breaker swap activity. Specifically, PSEG's work order to swap the breaker was not planned or scheduled during a RWCU system outage window where the plant shutdown safety risk would have been properly managed (H.5). (Section 1R13)

## Cornerstone: Mitigating Systems

- Green. A self-revealing Green non-cited violation (NCV) of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix B, Criterion III, “Design Control,” and Technical Specification (TS) 3.0.4 was identified for PSEG not effectively implementing the design change package (DCP) process. Specifically, PSEG inadequately implemented their configuration change control procedure, CC-AA-103, and a design change package (DCP 80108179) for rerouting a ‘B’ channel instrument line (LT-N085B) by not fully restoring the system upon completion of the DCP on November 3, 2016. As a consequence, multiple main control room (MCR) indicators became inoperable without PSEG identifying the problem until operators transitioned the reactor plant to startup, Operational Condition (OPCON) 2 or Mode 2, on November 9, 2016. This constituted a violation of TS 3.0.4 because PSEG transitioned to OPCON 2 while multiple limiting conditions for operability (LCO) were not met. PSEG’s corrective actions included securing the reactor startup, conducting system troubleshooting/restoration prior to recommencing the reactor startup, completing an apparent cause evaluation of the issue and an extent of condition on all DCPs completed during the refueling outage, and revising their preventive maintenance procedures to ensure that the instrument racks are properly backfilled on a frequent reoccurring basis and following any instrument rack maintenance.

The issue was more than minor because it was associated with the human performance attribute of the mitigating systems cornerstone and adversely affected its objective to ensure the availability and reliability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage), in that, multiple ‘B’ channel reactor water level instruments that fed the RPS logic were inoperable. Additionally, the finding was similar to IMC 0612, Appendix E, example 3.g, which describes an operator not following a procedure and making a mode change without all the required equipment operable. The IMC 0609, Appendix G, “Shutdown Operations Significance Determination Process (SDP),” Section 4.1 – Scope, states that “if the plant is shut down and the entry conditions for Residual Heat Removal/Decay Heat Removal (RHR/DHR) and RHR/DHR cooling have not been met then Appendix G does not apply.” Because of this, the finding was evaluated using IMC 0609, Appendix A, “The Significance Determination Process (SDP) for Findings At-Power.” Per Exhibit 2, “Mitigating Systems Screening Questions,” the finding was determined to be of very low safety significance (Green) because although the finding represented a deficiency affecting the qualification of a mitigating system and caused multiple ‘B’ channel instruments to be inoperable, it did not represent a loss of system and/or function, or an actual loss of function for greater than its TS allowed outage time. This finding had a cross-cutting aspect in the area of Human Performance, Work Management, in that PSEG did not implement a process of planning, controlling, and executing work activities such that nuclear safety was the overriding priority. Specifically, PSEG did not ensure restoration activities for the completed DCP ensured the affected instrumentation was returned to an operable status. [H.5] (Section 4OA3)

## REPORT DETAILS

### Summary of Plant Status

The Hope Creek Generating Station (HCGS) began the inspection period at 100 percent rated thermal power (RTP). On October 13, 2016, operators reduced power to approximately 95 percent RTP to remove the '4C' feedwater heater from service. Operators returned the unit to full power on the same day. The unit was manually scrammed on October 14, 2016, from 20 percent RTP to start HCGS's planned 20th refueling outage (H1R20). On November 9, 2016, the reactor mode switch was placed in start-up, criticality was reached on November 10, 2016, and the unit was synchronized to the grid on November 11, 2016. The unit was returned to 100 percent RTP on November 20, 2016. The unit remained at or near full RTP for the remainder of the inspection period.

### 1. REACTOR SAFETY

#### Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

##### 1R01 Adverse Weather Protection (71111.01 – 1 sample)

###### Readiness for Seasonal Extreme Weather Conditions

###### a. Inspection Scope

The inspectors reviewed PSEG's readiness for the onset of seasonal cold temperatures experienced the week of December 5, 2016. The review focused on the auxiliary boiler feed pump building ventilation system and the emergency diesel generators (EDGs). The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), TSs, control room logs, and the corrective action program (CAP) to determine what temperatures or other seasonal weather could challenge these systems, and to ensure PSEG personnel had adequately prepared for these challenges. The inspectors reviewed station procedures, including PSEG's seasonal weather preparation procedure and applicable operating procedures. The inspectors performed walkdowns of the selected systems to ensure station personnel identified issues that could challenge the operability of the systems during cold weather conditions. Documents reviewed for each section of this inspection report are listed in the Attachment.

###### b. Findings

No findings were identified.

##### 1R04 Equipment Alignment

###### Partial System Walkdown (71111.04Q – 3 samples)

###### a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- The EDG fuel oil storage tank (FOST) system while troubleshooting high particulates found in the 'H' EDG FOST on October 2



- 'B' RHR system in shutdown cooling line-up while performing 'A' RHR system fill and vent on October 25
- 'B' reactor protection system (RPS) instrument rack level indication while performing system troubleshooting on November 10

The inspectors selected these systems based on their risk-significance relative to the reactor safety cornerstones at the time they were inspected. The inspectors reviewed applicable operating procedures, system diagrams, the UFSAR, TSs, work orders, notifications (NOTF), and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have impacted the system's performance of its intended safety functions. The inspectors also performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and were operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. The inspectors also reviewed whether PSEG staff had properly identified equipment issues and entered them into the CAP for resolution with the appropriate significance characterization.

b. Findings

No findings were identified.

1R05 Fire Protection

.1 Resident Inspector Quarterly Walkdowns (71111.05Q – 4 samples)

a. Inspection Scope

The inspectors conducted tours of the areas listed below to assess the material condition and operational status of fire protection features. The inspectors verified that PSEG controlled combustible materials and ignition sources in accordance with administrative procedures. The inspectors verified that fire protection and suppression equipment was available for use as specified in the area pre-fire plan, and passive fire barriers were maintained in good material condition. The inspectors also verified that station personnel implemented compensatory measures for out of service, degraded, or inoperable fire protection equipment, as applicable, in accordance with procedures.

- FRH-II-511, Room 5108, EDG FOST area during the week of October 1
- FRH-II-413, Room 4111, HPCI pump and turbine room during the week of November 2
- FRH-II-351, Room 3576, remote shutdown panel room during the week of December 12
- FRH-II-552, Room 5510, control room during the week of December 12

b. Findings

No findings were identified.

.2 Fire Protection – Drill Observation (71111.05A – 1 sample)

a. Inspection Scope

The inspectors observed a fire brigade drill scenario conducted on December 14, 2016, that involved a simulated fire in the HCGS's technical support center (TSC) electrical room. The inspectors evaluated the readiness of the plant fire brigade to fight fires. The inspectors verified that PSEG personnel identified deficiencies, openly discussed them in a self-critical manner at the post-drill debrief, and took appropriate corrective actions as required. The inspectors evaluated specific attributes as follows:

- Proper wearing of turnout gear and self-contained breathing apparatus
- Proper use and layout of fire hoses
- Employment of appropriate fire-fighting techniques
- Sufficient fire-fighting equipment brought to the scene
- Effectiveness of command and control
- Search for victims and propagation of the fire into other plant areas
- Smoke removal operations
- Utilization of pre-planned strategies
- Adherence to the pre-planned drill scenario
- Drill objectives met

The inspectors also evaluated the fire brigade's actions to determine whether these actions were in accordance with PSEG's fire-fighting strategies.

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06 – 1 sample)

Internal Flooding Review

a. Inspection Scope

The inspectors reviewed the UFSAR, the site flooding analysis, and plant procedures to identify internal flooding susceptibilities for the site. The inspectors review focused on the 'A' RHR pump and heat exchanger room. They verified the adequacy of equipment seals located below the flood line, floor and water penetration seals, watertight door seals, common drain lines and sumps, sump pumps, level alarms, control circuits, and temporary or removable flood barriers. They assessed the adequacy of operator actions that PSEG had identified as necessary to cope with flooding in this area, and also reviewed the CAP to determine if PSEG was identifying and correcting problems associated with both flood mitigation features and site procedures for responding to flooding.

b. Findings

No findings were identified.

1R07 Heat Sink Performance (711111.07A – 2 samples)a. Inspection Scope

The inspectors reviewed the 'A' RHR heat exchanger and the 'A1' and 'A2' safety auxiliaries cooling system (SACS) heat exchangers to determine their readiness and availability to perform their safety functions. The inspectors reviewed the design basis for the component and verified PSEG's commitments to NRC Generic Letter 89-13, "Service Water System Requirements Affecting Safety-Related Equipment." The inspectors observed actual performance tests for the heat exchangers and reviewed the results of previous inspections on the heat exchangers. The inspectors discussed the results of the most recent inspection with engineering staff and reviewed pictures of the as-found and as-left conditions. The inspectors verified that PSEG initiated appropriate corrective actions for identified deficiencies. The inspectors also verified that the number of tubes plugged within the heat exchanger did not exceed the maximum amount allowed.

b. Findings

No findings were identified.

1R08 In-Service Inspection (711111.08P – 1 sample)a. Inspection Scope

From October 10 through 21, 2016, the inspectors conducted an inspection and review of in-service inspection program activities in order to assess the effectiveness of PSEG's program for monitoring degradation of the reactor coolant system (RCS) boundary, risk-significant piping and components, and containment systems during the HCGS's refueling outage (H1R20). The sample selection was based on the inspection procedure objectives, and risk priority of those pressure retaining components in systems where degradation would result in a significant increase in risk.

Non-destructive Examination (NDE) and Welding Activities (Section 02.01)

The inspectors observed and/or reviewed the following NDE activities and completed data records:

- Manual phased array ultrasonic testing, volumetric inspection record, American Society of Mechanical Engineers (ASME) Class 1, Reactor Vessel Core Shroud.
- Manual phased array ultrasonic examination of four reactor vessel nozzles involving dissimilar metal welds. (N1A, N2G, N2H, N5A)
- Reviewed the ultrasonic measurement of the reactor vessel drain piping wall thickness. The inspectors reviewed the calculation of the remaining wall thickness of the drain piping.
- Radiographic testing, volumetric inspection records, ASME Class 2, new welds for the replacement of a section of reactor water cleanup system piping. This work was completed in accordance with the PSEG Repair/Replacement program work order

60104838. The inspector also reviewed the post maintenance pressure test completed after the piping replacement.

For each evaluation, the inspectors verified NDE activities were performed in accordance with the 2001 Edition, 2003 Addenda, of the ASME Boiler and Pressure Vessel Code requirements. The inspectors also verified the NDE activities met the requirements contained in ASME Section XI, Mandatory Appendix VIII, Article VIII-2000 and the examination personnel were qualified in accordance with ASME Section XI, Mandatory Appendix VII. The inspectors verified that indications and defects, if present, were dispositioned in accordance with the ASME Code.

The inspectors performed a record review of the Containment General Visual Examination implemented in conformance with the 2001 Edition, 2003 Addenda of Article IWE of Section XI. The inspectors ensured that difficult to access areas or areas made visible by maintenance activities, were included within the scope of the visual examination. Additionally, the inspectors verified the basis for declaring some containment areas as inaccessible for visual examination by comparing the basis against previous containment visual examination records. The inspectors also performed a walk down of the accessible areas of containment to independently assess the condition of the moisture barrier and containment liner.

#### Re-examination of an Indication Previously Accepted for Service After Analysis

There was no sample available for review during this inspection that involved an examination with recordable indications that had been accepted for continued service following the previous HCGS refueling outage (H1R19).

#### Identification and Resolution of Problems (IMC 02.05)

The inspectors reviewed a sample of condition reports which identified NDE indications, deficiencies and other nonconforming conditions since the previous refueling outage. The inspectors verified that nonconforming conditions were properly identified, characterized, evaluated, corrective actions identified and dispositioned, and appropriately entered into the corrective action program.

#### b. Findings

No findings were identified.

#### 1R11 Licensed Operator Regualification Program (71111.11Q – 2 samples)

#### .1 Quarterly Review of Licensed Operator Regualification Testing and Training

#### a. Inspection Scope

The inspectors observed licensed operator simulator training on December 20, 2016, which included a fire, spurious equipment actuations, a security event, loss of coolant accident and primary containment failure. The inspectors evaluated operator performance during the simulated event and verified completion of risk significant operator actions, including the use of abnormal and emergency operating procedures. The inspectors assessed the clarity and effectiveness of communications, implementation of actions in response to alarms and degrading plant conditions, and the

oversight and direction provided by the control room supervisor. The inspectors verified the accuracy and timeliness of the emergency classification made by the shift manager and the TS action statements entered by the shift technical advisor. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

.2 Quarterly Review of Licensed Operator Performance in the Main Control Room

a. Inspection Scope

The inspectors observed and reviewed unit shutdown activities from October 14 through October 16, 2016, and unit startup activities from November 7 through November 9, 2016. The inspectors observed infrequently performed test or evolution briefings, pre-shift briefings, and reactivity control briefings to verify that the briefings met the criteria specified in PSEG's Operations Section Expectations Handbook and PSEG Administrative Procedure OP-AA-329, "Conduct of Infrequently Performed Tests and Evolutions," Revision 1. Additionally, the inspectors observed test performance to verify that procedure use, crew communications, and coordination of activities between work groups similarly met established expectations and standards.

b. Findings

No findings were identified.

.3 Biennial Review of Licensed Operator Requalification (71111.11B – 1 sample)

a. Inspection Scope

The following inspection activities were performed using NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," Revision 10, and Inspection Procedure Attachment 71111.11, "Licensed Operator Requalification Program."

Examination Results

On December 29, 2016, the results of the annual operating tests were reviewed in-office to determine if pass/fail rates were consistent with the guidance of NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," Revision 10, and IMC 0609, Appendix I, "Operator Requalification Human Performance Significance Determination Process (SDP)." The review verified that the failure rate (individual or crew) did not exceed 20 percent.

- The overall individual operator failure rate was 13.04 percent.
- The overall crew failure rate was 12.5 percent.

### Written Examination Quality

The inspectors reviewed a sample of biennial written examinations administered during the 2016 examination cycle for qualitative and quantitative attributes as specified in Appendix B of Attachment 71111.11B, "Licensed Operator Requalification."

### Operating Test Quality

The inspectors reviewed the operating tests (scenarios and Job Performance Measures (JPMs)) associated with the on-site examination week. The exam materials were reviewed for qualitative and quantitative attributes as specified in Appendix C of 71111.11B, "Licensed Operator Requalification Program."

### Licensee Administration of Operating Tests

The dynamic simulator exams and JPMs administered during the week of September 26, 2016, were observed. These observations included facility evaluations of crew and individual operator performance during the dynamic simulator exams and individual performance of JPMs.

### Examination Security

The inspectors assessed the facility staff's handling of exam material. The inspectors also checked JPMs, scenarios, and written examinations for excessive overlap of test items from week to week.

### Conformance with Operator License Conditions

License reactivation and license proficiency records were reviewed to ensure that Title 10 of the *Code of Federal Regulations* (10 CFR) 55.53 license conditions and applicable program requirements were met. The inspectors also reviewed a sample of records for requalification training attendance, and a sample of medical examinations for compliance with license conditions and NRC regulations.

### Simulator Performance

Simulator performance and fidelity was reviewed for conformance to the reference plant control room. A sample of simulator deficiency reports was also reviewed to ensure facility staff addressed identified modeling problems. Simulator test documentation was also reviewed.

### Problem Identification and Resolution

A review was conducted of recent operating history documentation found in IRs, PSEG's CAP, and the most recent NRC plant issues matrix. The inspectors also reviewed specific events from PSEG's corrective action program which indicated possible training deficiencies, to verify that they had been appropriately addressed. The NRC resident inspectors were also consulted for insights regarding licensed operators' performance.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12Q – 1 sample)

a. Inspection Scope

The inspectors reviewed the samples listed below to assess the effectiveness of maintenance activities on structure, system, and component (SSC) performance and reliability. The inspectors reviewed system health reports, CAP documents, maintenance work orders, and maintenance rule basis documents to ensure that PSEG was identifying and properly evaluating performance problems within the scope of the maintenance rule. For each sample selected, the inspectors verified that the SSC was properly scoped into the maintenance rule in accordance with 10 CFR 50.65 and verified that the (a)(2) performance criteria established by PSEG staff was reasonable. As applicable, for SSCs classified as (a)(1), the inspectors assessed the adequacy of goals and corrective actions to return these SSCs to (a)(2). Additionally, the inspectors ensured that PSEG staff was identifying and addressing common cause failures that occurred within and across maintenance rule system boundaries.

- Review of the 'C' 4.16 kilovolt vital bus potential transformer failure on August 2

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 3 samples)

a. Inspection Scope

The inspectors reviewed station evaluation and management of plant risk for the maintenance and emergent work activities listed below to verify that PSEG performed the appropriate risk assessments prior to removing equipment for work. The inspectors selected these activities based on potential risk significance relative to the reactor safety cornerstones. As applicable for each activity, the inspectors verified that PSEG personnel performed risk assessments as required by 10 CFR 50.65(a)(4) and that the assessments were accurate and complete. When PSEG performed emergent work, the inspectors verified that operations personnel promptly assessed and managed plant risk. The inspectors reviewed the scope of maintenance work and discussed the results of the assessment with the station's probabilistic risk analyst to verify plant conditions were consistent with the risk assessment. The inspectors also reviewed the TS requirements and inspected portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met.

- Protected equipment and risk assessment for breaker maintenance performed during a planned yellow risk condition in the refueling outage on November 1
- Protected equipment and risk assessment for the emergent 'B' channel RPS instrument rack reference line backfill performed on November 10
- Protected equipment and risk assessment for modification acceptance testing on the hardened torus vent design change on November 13

b. Findings

Introduction. A self-revealing very low safety significance (Green), non-cited violation of 10 CFR 50.65(a)(4) was identified for inadequately assessing and managing risks associated with maintenance activities to prevent plant transients that upset plant stability. Specifically, because PSEG did not identify a conflict with the reactor water cleanup (RWCU) pump trip logic prior to conducting a planned breaker swap, the 'A' RWCU pump tripped while it was credited to as a defense-in-depth system for decay heat removal (DHR).

Description. On November 1, 2016, HCGS's Operations and Electrical Maintenance departments were performing a 6-year preventive maintenance (PM) to swap out the feeder breaker 52-49022 to MCC 10B491. At 5:02 a.m., when operators opened the feeder breaker, the running 'A' RWCU pump tripped. Immediately, the control room crew confirmed that the RWCU pump trip was due to the opening of the feeder breaker, which de-energized the downstream 10Y407 120V alternating current (AC) distribution panel that feeds the 10C613 RWCU instrumentation panel. After completing the breaker PM at 5:40 a.m., the 'A' RWCU pump was placed in service and the breaker was closed to energize the MCC to restore power to the 10Y407 distribution panel.

During this event, HCGS was in Operation Condition 5 (Refueling) and the RHR shutdown cooling was secured to support outage work activities. Two Fuel Pool Cooling and Cleanup (FPCC) pumps and natural circulation were providing DHR. Additionally, the 'A' RWCU pump was in service and credited as a defense-in-depth DHR system for shutdown safety considerations. The control room had identified these systems as protected equipment per procedure OP-AA-108-116, Protected Equipment Program.

PSEG completed a prompt investigation for the 'A' RWCU pump trip on November 8, 2016. PSEG's prompt investigation determined that the RWCU system was not protected and hardened as required by the "Hardening Plan for DHR" in accordance with procedure OU-HC-105. The DHR hardening plan would have included a review of system trips from RPS, electrical protection, and trips from containment isolations, and determination if those trips should be bypassed, made inert, or removed. For this event, PSEG found that breaker 52-49022 was not recognized as a component that needed to be protected to keep RWCU in service. Also, the system was not hardened so that the RWCU pump trip logic, associated with loss of power to RWCU instrumentation panel, was defeated.

The inspectors reviewed HCGS's RF20 Shutdown Safety Management Plan (SDSMP) and noted that the SDSMP evaluated the shutdown risk color to be Yellow for the planned RHR shutdown cooling outage. The SDSMP stated that during RHR outage window, both FPCC systems and RWCU would be available for DHR. Further, the SDSMP stated that planned entry into the RHR outage with RWCU unavailable for DHR was not permitted since shutdown risk would increase to Orange. PSEG performed the breaker swap activity without realizing the potential shutdown risk increase posed by the activity. For 38 minutes following the 'A' RWCU pump trip, PSEG did not recognize and account for the change in shutdown risk by providing additional compensatory measures during the RHR outage with the 'A' RWCU pump de-energized. PSEG entered this issue in their CAP as NOTFs 20747082 and 20747599. PSEG's prompt investigation identified that the plant shutdown risk increased to Orange during this 38 minute period. PSEG assigned a corrective action to perform a work group evaluation and address



lessons learned from this event. The inspectors reviewed the prompt investigation report and considered the planned corrective actions adequate.

Analysis. PSEG's inadequate assessment and management of the increased risk due to the loss of power to the 'A' RWCU pump was a performance deficiency. The issue was more than minor because it was associated with the Equipment Performance (availability) attribute of the Initiating Event cornerstones and adversely affected its objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown. Additionally, this issue was similar to IMC 0612, Appendix E, more than minor examples 7.e and 7.f, in that the resulting increased risk put the plant into a higher risk category. Specifically, consistent with the SDSMP, plant risk increased from Yellow to Orange while 'A' RWCU pump was unavailable during the RHR shutdown cooling outage when it was credited as a defense-in-depth DHR system. The inspectors evaluated the finding using IMC 0609, Appendix G, "Shutdown Operations Significance Determination Process," Attachment 1, Exhibit 1, "Initiating Event Screening Questions." The inspectors determined the finding was Green because no quantitative phase 2 analysis was required, and RWCU system was not identified as a major system on Table G1 for the DHR safety function.

This finding had a cross-cutting aspect in the area of Human Performance, Work Management, because PSEG did not identify and appropriately manage risk associated with the breaker swap activity. Specifically, PSEG's work order to swap the breaker was not more appropriately planned or scheduled during a RWCU system outage window where the plant shutdown safety risk would have been properly managed (H.5).

Enforcement. Title 10 CFR 50.65(a) (4) requires, in part, that before performing maintenance activities, the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities. Contrary to this, from 5:02 a.m. to 5:40 a.m. on November 1, 2016, PSEG did not adequately assess and manage the increase in shutdown safety risk that resulted when the 'A' RWCU pump tripped and became unavailable when it was credited as a defense-in-depth DHR system during a planned RHR shutdown cooling outage window. Specifically, shutdown risk increased from Yellow to Orange when the 'A' pump tripped because the RWCU system was not adequately protected and hardened as required by the "Hardening Plan for DHR." Because this violation was determined to be of very low safety significance, and these issues have been entered into the licensee's CAP as NOTFs 20747082 and 20747599, this violation is being treated as an NCV consistent with Section 2.3.2 of the NRC Enforcement Policy (**NCV 05000354/2016004-01, "Trip of Protected RWCU Pump during Maintenance Activity"**).

#### 1R15 Operability Determinations and Functionality Assessments (71111.15 – 4 samples)

##### a. Inspection Scope

The inspectors reviewed operability determinations for the following degraded or non-conforming conditions based on the risk significance of the associated components and systems:

- Review of startup level control valve packing leakage the week of October 1
- Review of the potential failure of MasterPact breakers to close the week of October 5

- Review of the main control room chiller SACS pressure control valve positioner degraded condition the week of October 15
- Review of the EDG lockout relay surveillance testing requirements the week of November 1

The inspectors evaluated the technical adequacy of the operability determinations to assess whether TS operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the TSs and UFSAR to PSEG's evaluations to determine whether the components or systems were operable. The inspectors confirmed, where appropriate, compliance with bounding limitations associated with the evaluations. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled by PSEG.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 1 sample)

Permanent Modifications

a. Inspection Scope

The inspectors reviewed the commercial grade item dedication evaluation listed below to determine whether the evaluation affected the safety functions of systems that are important to safety. The inspectors verified that the design bases, licensing bases, and performance capability of the affected systems would not be degraded when the commercial grade item used on safety-related systems. In addition, the inspectors reviewed qualification documents, including "burn-in" test results of diode.

- Commercial Grade Item Dedication Evaluation for the EDG speed switch Zener Diode modification

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 4 samples)

a. Inspection Scope

The inspectors reviewed the post-maintenance tests for the maintenance activities listed below to verify that procedures and test activities adequately tested the safety functions that may have been affected by the maintenance activity, that the acceptance criteria in the procedure were consistent with the information in the applicable licensing basis and/or design basis documents, and that the test results were properly reviewed and accepted and problems were appropriately documented. The inspectors also walked down the affected job site, observed the pre-job brief and post-job critique where possible, confirmed work site cleanliness was maintained, and witnessed the test or

reviewed test data to verify quality control hold point were performed and checked, and that results adequately demonstrated restoration of the affected safety functions.

- 'B' turbine auxiliaries cooling system loop inboard supply isolation valve repair and testing during the week of October 1 (Order 60131499)
- Standby liquid control (SLC) flow test abort due to pump trip and SLC valve continuity during the week of November 1 (Order 50177094)
- Main turbine stop valve #4 position switch repair and testing during the week of November 3 (Order 60131546)
- 'B' channel RPS instrument rack reference line backfill and testing during the week of November 10 (Order 60132499)

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20 – 1 sample)

a. Inspection Scope

The inspectors reviewed the station's work schedule and outage risk plan for the Unit 1 maintenance and refueling outage (H1R20), conducted October 13 through November 11, 2016. The inspectors reviewed PSEGs development and implementation of outage plans and schedules to verify that risk, industry experience, previous site-specific problems, and defense-in-depth were considered. During the outage, the inspectors observed portions of the shutdown and cooldown processes and monitored controls associated with the following outage activities:

- Configuration management, including maintenance of defense-in-depth, commensurate with the outage plan for the key safety functions and compliance with the applicable TS's when taking equipment out of service
- Implementation of clearance activities and confirmation that tags were properly hung and that equipment was appropriately configured to safely support the associated work or testing
- Installation and configuration of reactor coolant pressure, level, and temperature instruments to provide accurate indication and instrument error accounting
- Status and configuration of electrical systems and switchyard activities to ensure that TSs were met
- Monitoring of decay heat removal operations
- Impact of outage work on the ability of the operators to operate the spent fuel pool cooling system
- Reactor water inventory controls, including flow paths, configurations, alternative means for inventory additions, and controls to prevent inventory loss
- Activities that could affect reactivity
- Maintenance of secondary containment as required by TSs
- Refueling activities, including fuel handling and fuel receipt inspections
- Fatigue management

- Tracking of startup prerequisites, walkdown of the drywell (primary containment) to verify that debris had not been left which could block the emergency core cooling system suction strainers, and startup and ascension to full power operation
- Identification and resolution of problems related to refueling outage activities

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 6 samples)

a. Inspection Scope

The inspectors observed performance of surveillance tests and/or reviewed test data of selected risk-significant structures, systems, and components to assess whether test results satisfied TSs, the UFSAR, and PSEG procedure requirements. The inspectors verified that test acceptance criteria were clear, tests demonstrated operational readiness and were consistent with design documentation, test instrumentation had current calibrations and the range and accuracy for the application, tests were performed as written, and applicable test prerequisites were satisfied. Upon test completion, the inspectors considered whether the test results supported that equipment was capable of performing the required safety functions. The inspectors reviewed the following surveillance tests:

- 'C' EDG monthly surveillance test on October 3
- HPCI exhaust check valve containment isolation valve water leak rate testing on October 15 (CIV)
- Penetration P1C main steam isolation valve local leak rate testing on October 19 (CIV)
- Core spray relief valve 1BEPSV-F012A failure on October 25
- In-service system leakage test of the reactor coolant pressure boundary on November 3 (RCS)
- HPCI low pressure and high pressure time response in-service testing on November 11 (IST)

b. Findings

No findings were identified.

**Cornerstone: Emergency Preparedness**

1EP4 Emergency Action Level and Emergency Plan Changes (IP 71114.04 – 1 Sample)

a. Inspection Scope

PSEG implemented various changes to the HCGS's Emergency Action Levels (EALs), Emergency Plan, and Implementing Procedures. PSEG had determined that, in accordance with 10 CFR 50.54(q)(3), any change made to the EALs, Emergency Plan, and its lower-tier implementing procedures, had not resulted in any reduction in

effectiveness of the Plan, and that the revised Plan continued to meet the standards in 50.47(b) and the requirements of 10 CFR Part 50, Appendix E.

The inspectors performed an in-office review of all EAL and Emergency Plan changes submitted by PSEG as required by 10 CFR 50.54(q)(5), including the changes to lower-tier emergency plan implementing procedures, to evaluate for any potential reductions in effectiveness of the Emergency Plan. This review by the inspectors was not documented in an NRC Safety Evaluation Report and does not constitute formal NRC approval of the changes. Therefore, these changes remain subject to future NRC inspection in their entirety. The requirements in 10 CFR 50.54(q) were used as reference criteria.

b. Findings

No findings were identified.

1EP6 Drill Evaluation (71114.06 – 1 sample)

Emergency Preparedness Training Observations

a. Inspection Scope

The inspectors observed a simulator training evolutions for licensed operators on December 13, 2016, which required emergency plan implementation by an operations crew. The inspectors observed event classification activities performed by the crew. The inspectors also attended the post-evolution critique for the scenario. The focus of the inspectors' activities was to note any weaknesses and deficiencies in the crew's performance and ensure that PSEG evaluators noted the same issues and entered them into the CAP.

b. Findings

No findings were identified.

**2. RADIATION SAFETY**

**Cornerstones: Occupational and Public Radiation Safety**

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01 - 7 samples)

a. Inspection Scope

The inspectors reviewed PSEG's performance in assessing and controlling radiological hazards in the workplace. The inspectors used the requirements contained in 10 CFR Part 20, TSs, applicable Regulatory Guides, and the procedures required by TSs as criteria for determining compliance.

### Inspection Planning

The inspectors reviewed the performance indicators (PIs) for the occupational exposure cornerstone, radiation protection program audits, and reports of operational occurrences in occupational radiation safety since the last inspection.

### Radiological Hazard Assessment (1 sample)

The inspectors conducted independent radiation measurements during walkdowns of the facility and reviewed the radiological survey program, air sampling and analysis, continuous air monitor use, recent plant radiation surveys for radiological work activities, and any changes to plant operations since the last inspection to verify survey adequacy of any new radiological hazards for onsite workers or members of the public.

### Instructions to Workers (1 sample)

The inspectors reviewed high radiation area (HRA) work permit controls and use, observed containers of radioactive materials and assessed whether the containers were labeled and controlled in accordance with requirements.

The inspectors reviewed several occurrences where a worker's electronic personal dosimeter alarmed. The inspectors reviewed PSEG's evaluation of the incidents, documentation in the CAP, and whether compensatory dose evaluations were conducted when appropriate. The inspectors verified follow-up investigations of actual radiological conditions for unexpected radiological hazards were performed.

### Contamination and Radioactive Material Control (1 sample)

The inspectors observed the monitoring of potentially contaminated material leaving the radiological controlled area and inspected the methods and radiation monitoring instrumentation used for control, survey, and release of that material. The inspectors selected several sealed sources from inventory records and assessed whether the sources were accounted for and were tested for loose surface contamination. The inspectors evaluated whether any recent transactions involving nationally tracked sources were reported in accordance with requirements.

### Radiological Hazards Control and Work Coverage (1 sample)

The inspectors evaluated in-plant radiological conditions and performed independent radiation measurements during facility walkdowns and observation of radiological work activities. The inspectors assessed whether posted surveys; radiation work permits; worker radiological briefings and radiation protection (RP) job coverage; the use of continuous air monitoring, air sampling and engineering controls; and dosimetry monitoring were consistent with the present conditions. The inspectors examined the control of highly activated or contaminated materials stored within the spent fuel pools and the posting and physical controls for selected HRAs, locked high radiation areas (LHRAs) and very high radiation areas (VHRAs) to verify conformance with the occupational PI.

Risk-Significant HRA and VHRA Controls (1 sample)

The inspectors reviewed the procedures and controls for HRAs, VHRAs, and radiological transient areas in the plant.

Radiation Worker Performance and Radiation Protection Technician Proficiency (1 sample)

The inspectors evaluated radiation worker performance with respect to RP work requirements. The inspectors evaluated RP technicians in performance of radiation surveys and in providing radiological job coverage.

Problem Identification and Resolution (1 sample)

The inspectors evaluated whether problems associated with radiation monitoring and exposure control (including operating experience) were identified at an appropriate threshold and properly addressed in the CAP.

b. Findings

No findings were identified.

2RS3 In-Plant Airborne Radioactivity Control and Mitigation (71124.03 – 2 samples)a. Inspection Scope

The inspectors reviewed the control of in-plant airborne radioactivity and the use of respiratory protection devices in these areas. The inspectors used the requirements in 10 CFR Part 20, RG 8.15, RG 8.25, NUREG/CR-0041, TS, and procedures required by TS as criteria for determining compliance.

Inspection Planning

The inspectors reviewed the UFSAR to identify ventilation and radiation monitoring systems associated with airborne radioactivity. The inspectors also reviewed respiratory protection program procedures and current PIs for unintended internal exposure incidents.

Engineering Controls (1 sample)

The inspectors reviewed operability and use of both permanent and temporary ventilation systems, and the adequacy of airborne radioactivity radiation monitoring in the plant based on location, sensitivity, and alarm set-points.

Use of Respiratory Protection Devices (1 sample)

The inspectors reviewed the adequacy of PSEG's use of respiratory protection devices in the plant to include applicable as low as is reasonably achievable evaluations, respiratory protection device certification, respiratory equipment storage, air quality testing records, and individual qualification records.

b. Findings

No findings were identified.

**4. OTHER ACTIVITIES**

4OA1 Performance Indicator Verification (71151 – 2 samples)

.1 Safety System Functional Failures

a. Inspection Scope

The inspectors sampled PSEG's submittals for the Safety System Functional Failures PI for HCGS for the period of January 1, 2016, through September 30, 2016. To determine the accuracy of the PI data reported during those periods, inspectors used definitions and guidance contained in Nuclear Energy Institute (NEI) Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7, and NUREG-1022, "Event Reporting Guidelines 10 CFR 50.72 and 10 CFR 50.73." The inspectors reviewed PSEG's operator narrative logs, operability assessments, maintenance rule records, maintenance work orders, condition reports, event reports and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152 – 2 samples)

.1 Routine Review of Problem Identification and Resolution Activities

a. Inspection Scope

As required by Inspection Procedure 71152, "Problem Identification and Resolution," the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify PSEG entered issues into their CAP at an appropriate threshold, gave adequate attention to timely corrective actions, and identified and addressed adverse trends. In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into their CAP and periodically attended condition report screening meetings. The inspectors also confirmed, on a sampling basis, that, as applicable, for identified defects and non-conformances, PSEG performed an evaluation in accordance with 10 CFR Part 21.

b. Findings

No findings were identified.



## .2 Semi-Annual Trend Review

### a. Inspection Scope

The inspectors performed a semi-annual review of site issues to identify trends that might indicate the existence of more significant safety concerns. As part of this review, the inspectors included repetitive or closely-related issues documented by PSEG in trend reports, site PIs, major equipment problem lists, system health reports, maintenance rule assessments, and maintenance or CAP backlogs. The inspectors also reviewed PSEG's CAP database for the first and second quarters of 2016 to assess notifications written in various subject areas (equipment problems, human performance issues, etc.), as well as individual issues identified during the NRC's daily condition report review (Section 4OA2.1). The inspectors reviewed the PSEG quarterly trend report for the first quarter of 2016, conducted under LS-AA-125, to verify that PSEG personnel were appropriately evaluating and trending adverse conditions in accordance with applicable procedures.

### b. Findings and Observations

No findings were identified.

For historical perspective and trending, the inspectors requested the number CAP evaluations performed for HCGS per year since 2013.

HCGS's CAP Evaluations				
	2013	2014	2015	2016
RCEs	7	0	2	1
ACEs	76	41	34	27
CCEs	18	15	14	4
WGEs	191	121	149	74
Totals:	292	177	199	106

The inspectors noted that of the CAP evaluation numbers provided above, the number of CCEs performed for HCGS and common site organizational issues dropped from 14 in 2015 to 4 in 2016. PSEG generated NOTF 20752032 on December 20, 2016, to document the inspector's concern about potential adverse trends not being identified and evaluated at an appropriate level by PSEG. However, the inspectors did not identify any performance deficiencies.

During a recent PSEG briefing to the inspectors summarizing CAP program changes in September 2016, PSEG stated that CAP changes were going to put more emphasis on identifying trends and performing collective evaluations. The inspectors questioned PSEG whether CAP program data supported this.

The inspectors reviewed PSEG's Problem Identification and Resolution (PIR) Functional Area Self-Assessment (FASA 80117891) completed on October 14, 2016, and observed that:

- PSEG's FASA determined that a station strength existed in management's ability to identify cognitive trends in the CAP. Specifically, seven cognitive adverse trend issues were identified and entered into the CAP for resolution between February 2015 and August 2016, a period of 18 months.

The inspectors noted that PSEG's FASA did not go into detail about why this was evaluated as a station strength. The inspectors requested a list of the identified trends, reviewed them, and noted that the PSEG identified trends included qualification standards, security equipment, overdue CAP items, plant page system, work hour standards, and non-plant HVAC systems. The inspectors observed that none of the identified trends were related to safety-related or important to safety equipment.

PSEG noted that a concern of the FASA team was "*that these initiatives* [reducing the cumulative impact from the CAP] *would result in a non-conservative reduction in the application of the CAP.*" When comparing to two 18-month time periods (February 2013 to August 2014 and February 2015 to August 2016), the FASA team observed a reduction in completed evaluations: RCEs went from 5 to 2, ACEs from 90 to 42, CCEs from 22 to 15, and WGEs from 242 to 189. PSEG attributed the decline in evaluations performed to an improved power history in the more recent period to the prior period. The inspectors reviewed the power history graphs that were referenced in the PIR FASA and determined that although multiple plant trips occurred in the first time period versus only one plant trip in the second time period, just as many station significant events occurred over the time periods. However, the inspectors did note that PSEG management has recognized the station's adverse human performance (HuP) trend since 2013 and a more recent increase in the number of HuP events since July 2016.

The inspectors also noted that the scope of the FASA was limited in that it only reviewed 2 RCEs (both from 2015) and 8 ACEs (6 from 2015; 2 from 2016) as part of this FASA. The inspectors questioned whether this provided a representative sample to make determinations about the health of the station's CAP. On January 12, 2017, PSEG entered the above inspector observations into the CAP in NOTF 20753422.

The inspectors evaluated all of the issues above in accordance with the guidance in IMC 0612, Appendix B, "Issue Screening," and Appendix E, "Examples of Minor Issues," and determined the issues of concern were of minor significance because the inspectors did not identify any conditions adverse to quality that were not appropriately corrected or scheduled for correction in a reasonable period of time as a result of the failure to implement the NOTF screening process appropriately. Consequently, the issues were not subject to enforcement action in accordance with the NRC's enforcement policy.

### .3 Annual Sample: Review of a Potential Adverse Trend Associated with Procurement Engineering Issues

#### a. Inspection Scope

The inspectors reviewed PSEG's identification, evaluation, and corrective actions associated with recent issues with procurement engineering issues affecting safety-related components. Specifically, since September 2014, HCGS has experienced issues related to the assigned shelf-life or purchase classification (PC) of safety-related components or components that are important to safety. These issues have routinely called into question the operability of the affected systems and caused PSEG to perform numerous operability evaluations (OPEVALs), technical reviews, and causal determinations at both sites.

The inspectors assessed PSEG's problem identification threshold, technical and cause analyses, operating experience (OE) and trend reviews, vendor oversight, and the prioritization and timeliness of corrective actions to evaluate whether PSEG was appropriately identifying, characterizing, and correcting problems associated with these issues and whether the planned and/or completed corrective actions were appropriate. The inspectors compared the actions taken in accordance with the requirements of PSEG's procurement and maintenance procedures, PSEG's CAP, 10 CFR Part 50, Appendix B, HCGS's TSs, and the Maintenance Rule. In addition, the inspectors performed several walk downs of areas where components affected by PSEG's procurement engineering issues are installed to independently assess the material condition, operating environment, and configuration control.

b. Findings and Observations

No findings were identified.

The inspectors noted that in December 2013, HCGS experienced a trip of the running 'A' MCR chiller caused by a failed pressure control valve (PCV) positioner due to age. A design control finding (NCV 05000354/2014003-05) was documented for not effectively implementing a design change that should have reclassified the positioner from PC4 (nonsafety-related) to PC1 (safety-related), and for not appropriately tracking the shelf-life of the positioner. After another MCR chiller positioner failure in May 2016, the inspectors issued a corrective action non-cited violation (NCV 05000354/2016003-04) because PSEG did not ensure that the correct shelf-life had been assigned to the positioner (14 vice 32 years). The inspectors also documented that contrary to PSEG's In-Storage Shelf-Life Program procedure, SM-AA-300-1005, SM-AA-102-1001, Warehouse Operations, and SM-AA-300-1001-F1, Form 1, for Material Master (MM) Classification Determination Checklist, the practice in the procurement engineering warehouse for the receipt process was to assign the receipt date as the manufacturing date, and in this case, the shelf-life of the positioners was already expired upon receipt from a third party supplier and went unrecognized.

On October 27, 2016, PSEG completed an evaluation and extent of condition (EOC) of the above issues (WGE 70189201) which validated the fact that PSEG was not appropriately following their procedures for both the shelf-life program and the warehouse operations receipt process. PSEG's EOC confirmed that approximately 510 parts in the warehouse inventory with an engineering assigned shelf-life were potentially affected and required a follow-up evaluation to validate each part's current remaining shelf-life. This follow-up evaluation is currently in-progress and is scheduled to be completed by PSEG by March 2017. The inspectors noted that of the 510 parts identified in PSEG's EOC: 260 were PC1, 110 were PC2 (commercial grade item), 24 were PC3 (augmented quality item), and 116 were PC4. They noted that 15 of the 260 PC1 items were purchased or procured as 'New Old Stock' just like the failed MCR chiller PCV positioners.

Using the information gathered during the review of the above issues, and a review of associated CAP documents related to procurement engineering, the inspectors compiled a summary of notable CAP issues (below) related to PC or shelf-life of safety-related components.

Summary of PSEG Procurement Engineering Issues Since September 2014				
Date	Site	Issue	Evaluation(s)	Cause(s)
9/19/14	SAL	PC4 vs PC3 material installed in CO <sub>2</sub> system	WGE 70169414	Lack of knowledge in planning work <b>[Individual Behavior - HuP Error]</b>
10/31/14	HC	PC4 vs PC1 screws for MCC terminals	RCE 70160636 OPEVAL 70189700	Non-conforming TE 80110958-0040 <b>[Not Following Procedure]</b>
12/19/14	SAL/HC	Adverse Trend in Parts Issues	CCE 70172477	EFFR (8/25/16) found CAs ineffective <b>[No cause determined]</b>
4/14/15	HC	PC4 O-rings procured for SR system	WGE 70175866	PC1 to PC4 in '07; no justification <b>[Not Following Procedure]</b>
4/23/15	HC	RF19 issues with issuing expired EQ parts	NOTF 20686716	No evaluation - Process breakdown. <b>[Not Following Procedure]</b>
2/1/16	HC	EDG relay's shelf-life calculation	WGE 70184094	Error in calculation of shelf-life <b>[Individual Behavior - HuP Error]</b>
3/1/16	SAL/HC	NSR lubricants used in SR equipment	ACE 70184822 TE 70184719;4400	Inadequate change management in '06 <b>[Not Following Procedure]</b>
4/18/16	SAL/HC	Further evaluation of parts issues; follow-up to CCE 70172477 (above)	ACE 70185463	No functional testing and poor inspection practices for quality assurance <b>[Inadequate Procedure]</b>
8/18/16	HC	PC4 O-rings installed in EQ SR transmitters	WGE 70188713	<b>[Not Following Procedure]</b>
8/26/16	SAL	PC4 O-rings used in EQ SR SOVs	OPEVAL 70188852 ACE 70188852	Incorrect classification 20 years ago <b>[Inadequate Procedure]</b>
8/29/16	HC	PC3 refrigerant used in SR chillers	NOTF 20739264 ACIT 70108218	Non-conforming TE 70189070 <b>[Inadequate Procedure]</b>
9/16/16	HC	Valve positioner expired shelf-life EOC due 3/15/17 for 510 similar items	WGE 70189201 OPEVAL 70189201	Did not follow receiving process <b>[Not Following Procedure]</b>
9/16/16	SAL	EOC from HC NOTFs concerning positioners	TE 70189427 IEE 80118586	Did not follow receiving process <b>[Not Following Procedure]</b>
9/20/16	SAL/HC	Shelf-life of digital system components	NOTF 20742519 ACIT 70189491	ACIT found no industry guidance. <b>[Inadequate Procedure]</b>
9/20/16	SAL/HC	PC4 material used for fire application	WGE 70189404	Attention to detail by procurement <b>[Individual Behavior - HuP Error]</b>
9/29/16	HC	PC4 vs PC1 Room Flood Alarm switches	OPEVAL 70189543	<b>[Not Following Procedure]</b>

The inspectors determined that all of the items listed above involved HuP errors with procedure use and adherence or procedure quality. The inspectors reviewed PSEG's CAP to see if this potential adverse trend had been identified. The inspectors noted that on September 30, 2016, PSEG documented an identified cognitive trend associated with two recent issues involving expired shelf-life components (NOTFs 20742431 [positioner], 20744223 [durometer], and 20744724 [capacitors]). These NOTFs were all assigned to the in-progress WGE 70189201. No other adverse trends in procurement engineering had been entered into the CAP.

The inspectors reviewed PSEG procedure, LS-AA-125-1002, Common Cause Evaluation (CCE) Manual, Section 1.2.3 which states that CCE initiators include CAP reviews and cognitive trends identified by MRC and Station Ownership Committee (SOC). Section 4.2 also states that the primary objective of a CCE is to identify and eliminate the most prevalent performance gap or cause of a continuing problem. Based on this, the inspectors questioned PSEG on December 14, 2016, as to why no CCE had been performed for the potential adverse trend. On December 15, 2016, PSEG initiated NOTF 20751705 for the inspector identified procurement engineering adverse trend.

40A3 Follow-Up of Events and Notices of Enforcement Discretion (71153 – 4 samples)Plant Eventsa. Inspection Scope

For the plant events listed below, the inspectors reviewed and/or observed plant parameters, reviewed personnel performance, and evaluated performance of mitigating systems. The inspectors communicated the plant events to appropriate regional personnel, and compared the event details with criteria contained in IMC 0309, “Reactive Inspection Decision Basis for Reactors,” for consideration of potential reactive inspection activities. As applicable, the inspectors verified that PSEG made appropriate emergency classification assessments and properly reported the event in accordance with 10 CFR 50.72 and 50.73. The inspectors reviewed PSEGs follow-up actions related to the events to assure that PSEG implemented appropriate corrective actions commensurate with their safety significance.

- ‘A’ EDG failure to load during surveillance testing on August 25
- An unexpected reactor scram signal received during the reactor pressure vessel hydrostatic test while also performing excess flow check valve testing on November 5 (EN#54327)
- The ‘B’ RPS channel instrument rack found to be not backfilled while transitioning the reactor to startup (operational condition 2 or Mode 2) on November 9
- Implementation and potential compliance issues associated with the hardened torus vent modification acceptance testing performed on November 13

b. Findings‘B’ Instrument Rack Found to be Not Backfilled (Event Date – 11/09/16)

Introduction. A Green self-revealing NCV of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” and TS 3.0.4 was identified for PSEG not effectively implementing the DCP process. Specifically, PSEG inadequately implemented their configuration change control procedure, CC-AA-103, and a design change package (DCP 80108179) for rerouting a ‘B’ channel instrument line (LT-N085B) by not fully restoring the system upon completion of the DCP on November 3, 2016. As a consequence, multiple MCR indicators became inoperable without PSEG identifying the problem until operators transitioned the reactor plant to startup, OPCON 2 or Mode 2, on November 9, 2016. This constituted a violation of TS 3.0.4 because PSEG transitioned to OPCON 2 while multiple LCOs were not met.

Description. On November 9, 2016, at 0317, after completing work activities for HCGS’s 20<sup>th</sup> refueling outage, PSEG transitioned the reactor to Mode 2 by placing the reactor mode switch to startup. Just after transitioning to Mode 2, the MCR operators commenced lowering reactor water level (RWL) to a startup level band between 30 and 39 inches. While lowering level, operators noted several ‘B’ channel instrument level indicators not tracking RWL correctly as compared to the other channels’ level indicators. The unexpected indications were noted on the following ‘B’ channel RWL instruments: 1) reactor protection system trip (LT-N080B); 2) post-accident monitoring system (LT-3683B); and, 3) narrow range (PDT-N004B). Operators secured lowering

RWL and investigated the erroneous indications, which required declaring the associated instruments inoperable.

PSEG's investigation and troubleshooting of the issue revealed that these 'B' channel instruments all shared a common reference leg, and that it had not been backfilled and properly restored following a modification that rerouted one of the other 'B' channel level instrument lines on November 3, 2016. PSEG restored the 'B' channel instruments by properly backfilling and venting the common reference leg, and verified all the 'B' channel instruments were operating correctly prior to recommencing the reactor startup. PSEG also submitted licensee event report (LER) 2016-006-00 on January 9, 2017, per 50.73(a)(2)(i)(B), for an operation or condition that was prohibited by TSs, specifically TS 3.0.4 which does not allow making a mode change when applicable LCOs are not met.

The inspectors reviewed PSEG's causal evaluation, troubleshooting, system restoration efforts, and the work orders associated with DCP 80108179. The inspectors found that the design change implemented on November 3, 2016, was the result of a NRC inspector questioning the operability of 'B' channel instrument tubing that ran through the reactor building truck bay in 2006. Inspectors questioned this because, under certain accident conditions with the reactor building truck bay door open and a potential tubing rupture, it could become an un-monitored release risk, as it is physically located outside of the reactor building ventilation system boundary. PSEG evaluated the location of instrument line and validated the line travelled through the reactor building truck bay and that it communicated with the reactor coolant pressure boundary, going from Jet Pump No. 5 to the 'B' channel reactor pressure vessel fuel zone level instrument (B21-N085B). PSEG determined that the instrument line needed to be rerouted around the truck bay in order to align with the analysis of a potential instrument line break documented in HCGS's UFSAR Section 15.6.2. PSEG initiated compensatory actions to enter a 4 hour TS any time the reactor building truck bay door was opened until the instrument line was rerouted.

PSEG's causal evaluation (ACE 70190770) determined that on November 3, 2016, the work order operation (30284462-0020) to perform a backfill of the 'B' instrument rack after the DCP 80108179 (implemented by WO 60125710), was inappropriately confirmed as not needed or required. PSEG also found that the DCP to re-route the LT-N085B reference leg tubing was planned and reviewed in 2014, but not by the Instrumentation and Controls maintenance group. This DCP required draining the common reference leg for instruments associated with the 'B' instrument rack and did not have a specific activity to perform a fill and vent as per HC.IC-GP.ZZ-0114. In addition to the above, PSEG found that the original refueling outage work included a PM activity (PM 30284462) to fill and vent the 'B' channel instrument rack (10-C-027) as a contingency work activity if work was performed on that rack, but that the activity was not appropriately tied to the DCP work, and was closed as unnecessary on October 31, 2016, prior to the DCP being completed.

PSEG procedure CC-AA-103, Configuration Change Control for Physical Plant Changes, Revision 16, Section 4.7, Configuration Change Installation, and Attachment C, Work Planning Instructions, requires the appropriate level of review and proper system restoration. CC-AA-103-1001, Implementation of Configuration Changes, Section 4.4.4, Change Packages with Multiple Operability Decisions (CC-AA-103, Steps 4.11.4) states, in part, each Configuration Change Package (CCP) shall be an

individually implementable entity, with a clearly defined scope that, when implemented, will permit restoration of operability. Based on this, the inspectors determined PSEG inadequately accomplished the use of their configuration change control procedure, CC-AA-103, and a design change package (DCP 80108179) for rerouting a 'B' channel instrument line (LT-N085B) by not fully restoring the system upon completion of the DCP on November 3, 2016. PSEG's corrective actions included securing the reactor startup, conducting system troubleshooting/restoration prior to recommencing the reactor startup, performing an extent of condition on all DCPs completed during the refueling outage, and revising their preventive maintenance procedures to ensure that the instrument racks are properly backfilled on a frequent reoccurring basis and following any instrument rack maintenance.

Analysis. PSEG not effectively implementing the DCP process for DCP 80108179 was a performance deficiency that was reasonably within their ability to foresee and correct and which should have been prevented. This issue was evaluated in accordance with IMC 0612, Appendix B, and determined to be more than minor since it was associated with the human performance attribute of the mitigating systems cornerstone and adversely affected its objective to ensure the availability and reliability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage), in that, multiple 'B' channel reactor water level instruments that fed the RPS logic were inoperable. Additionally, the finding was similar to IMC 0612, Appendix E, example 3.g, which describes an operator not following a procedure and making a mode change without all the required equipment operable. IMC 0609, Appendix G, "Shutdown Operations Significance Determination Process (SDP)," Section 4.1 – Scope, states that "if the plant is shut down and the entry conditions for Residual Heat Removal/Decay Heat Removal (RHR/DHR) and RHR/DHR cooling have not been met then Appendix G does not apply." Because of this, the finding was evaluated using IMC 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." Per Exhibit 2, "Mitigating Systems Screening Questions," the finding was determined to be of very low safety significance (Green) because although the finding represented a deficiency affecting the qualification of a mitigating system and caused multiple 'B' channel instruments to be inoperable, it did not represent a loss of system and/or function, or an actual loss of function for greater than its TS allowed outage time.

The inspectors determined this finding has a cross-cutting aspect in the area of Human Performance, Work Management, in that PSEG did not implement a process of planning, controlling, and executing work activities such that nuclear safety was the overriding priority. Specifically, PSEG did not ensure restoration activities for the completed DCP ensured the affected instrumentation was returned to an operable status. [H.5]

Enforcement. Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," states, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis for systems and components shall be correctly translated into procedures and instructions. It goes on to state, in part, that measures shall be established for the identification and control of design interfaces and for coordination among participating organizations. PSEG procedure CC-AA-103, Configuration Change Control for Physical Plant Changes, Revision 16, Section 4.7, Configuration Change Installation, and Attachment C, Work Planning Instructions, requires the appropriate level of review and proper system restoration. DCP 80108179

for rerouting a 'B' channel instrument line (LT-N085B) was completed utilizing this procedure. HCGS TS 3.0.4 prohibits entry into an OPCON when an LCO is not met.

Contrary to the above, between November 3 and 9, 2016, PSEG did not effectively implement the DCP process for DCP 80108179. Specifically, PSEG inadequately accomplished procedure CC-AA-103 and DCP 80108179 for rerouting a 'B' channel instrument line (LT-N085B) by not fully restoring the system upon completion of the DCP on November 3, 2016. Consequently, multiple control room indicators became inoperable without PSEG identifying the instrumentations' inoperability until operators transitioned the reactor plant to startup, OPCON 2, on November 9, 2016. Thus, PSEG violated TS 3.0.4 when they transitioned the HCGS reactor to OPCON 2 while multiple LCOs were not met. PSEG's immediate corrective actions included entering the issue into their CAP (NOTF 20748450), securing the reactor startup, conducting system troubleshooting and restoration prior to recommencing the reactor startup, and performing an extent of condition on all DCPs completed during the refueling outage. Because this finding was of very low safety significance (Green) and entered into PSEG's CAP as NOTF 20748450, this finding is being treated as an NCV consistent with Section 2.3.2.a of the NRC Enforcement Policy. **(NCV 05000354/2016004-02, Inadequate Implementation of a Design Change Causes Multiple 'B' Channel Instruments to be Inoperable)**

#### 4OA5 Other Activities

##### Institute of Nuclear Power Operations Report Review

###### a. Inspection Scope

The inspectors reviewed the final report for the Institute of Nuclear Power Operations (INPO) plant assessment of HCGS conducted in May 2016. The inspectors evaluated this report to ensure that NRC perspectives of PSEG performance were consistent with any issues identified during the assessment. The inspectors also reviewed this report to determine whether INPO identified any significant safety issues that required further NRC follow-up.

###### b. Findings

No findings were identified.

#### 4OA6 Meetings, Including Exit

On January 12, 2017, the inspectors presented the inspection results to Mr. Eric Carr, HCGS Site Vice President, and other members of the HCGS staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report. PSEG management acknowledged and did not dispute the findings.

### **ATTACHMENT: SUPPLEMENTARY INFORMATION**



**SUPPLEMENTARY INFORMATION****KEY POINTS OF CONTACT**Licensee Personnel

E. Carr, Site Vice President  
 E. Casuli, Plant Manager  
 D. Burgin, Emergency Preparedness Manager  
 A. Bush, Hope Creek, Section XI Program Manager  
 S. Forbes, Maintenance Supervisor  
 E. Giles, Salem Section XI Program Manager  
 A. Hak, System Engineer  
 D. Mora, NDE Supervisor, Salem and Hope Creek  
 T. MacEwen, Principal Nuclear Engineer - Regulatory Affairs  
 M. Marandola, Nuclear Engineer  
 A. Ochoa, Senior Compliance Engineer  
 T. Oliveri, Salem and Hope Creek NDE Services Manager  
 R. Ronan, Radiation Protection Technical Analyst  
 J. Rothermel, EQ Engineer  
 R. Smith, System Engineer  
 K. Timko, Associate Engineer, Radiation Protection  
 H. Trimble, Manager, Radiation Protection

**LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED**Open and Closed

05000354/2016004-01	NCV	Trip of Protected RWCU Pump during Maintenance Activity (Section 1R13)
05000354/2016004-02	NCV	Inadequate Implementation of a Design Change Causes Multiple 'B' Channel Instruments to be Inoperable (Section 4OA3)

**LIST OF DOCUMENTS REVIEWED**

\* Indicates NRC-identified

**Section 1R01: Adverse Weather Protection**Procedures

HC.IC-GP.BB-0003 Nuclear Boiler-Nondivisional Channel L-11683/B21-N027  
 RX Cavity Flood Up Level/RX Shutdown Range Level Setup, Revision 22  
 HC.OP-GP.ZZ-0003, Station Preparations for Winter Conditions, Revision 30

Maintenance Orders/Work Orders

30279722      30292898

**Section 1R04: Equipment Alignment**

Procedures

HC.IC-GP.BB-0003 Nuclear Boiler-Nondivisional Channel L-11683/B21-N027  
 RX Cavity Flood Up Level/RX Shutdown Range Level Setup, Revision 22  
 HC.IC-GP.ZZ-0006, Venting and Backfilling Instrumentation, Revision 7  
 HC.OP-GP.ZZ-0114, Transmitter Isolation/Restoration Sensitive Rack Instrumentation  
 Instrument Rack 10C-027 – RPV Channel B, Revision 17  
 HC.OP-DL.ZZ-0026, Surveillance Log, Revision 154  
 HC.OP-ST.SH-0001, Accident Monitoring Instrumentation Channel Check - Monthly,  
 Revision 35  
 HC.OP-IS.BC-0105, Residual Heat Removal System Valves – Cold shutdown, Inservice  
 Test, Revision 33  
 HC.OP-SO.BC-0001, Residual Heat Removal System Operation, Revision 53

Notifications

20742018      20746896      20748450

Maintenance Orders/Work Orders

30284462      50172825      60125710      70190510      80108179      80115571

Other Documents

Hope Creek Operations Narrative Logs dated October 25, 2016

**Section 1R05: Fire Protection**

Procedures

FRH-II-351, Service & Radwaste Area Elevation, Revision 6  
 FRH-II-362, TSC Electrical, Mechanical, HVAC Equipment Rooms and Vent Stack Enclosure  
 Elevations, Revision 6  
 FRH-II-552, Control Room & Electrical Access Area, Revision 7  
 FRH-II-511, Diesel Fuel Oil Storage Tanks Area, Revision 6  
 FRH-II-413, HPCI Pump and Turbine Room, Revision 3

Notifications

20742454      20751742      20751752      20751753

Other Documents

Fire Drill Scenario 54205605, dated December 14, 2016

**Section 1R06: Flood Protection Measures**

Procedures

HC.OP-IS.BC-0105, Residual Heat Removal System Valves – Cold shutdown, Inservice  
 Test, Revision 33  
 HC.OP-SO.BC-0001, Residual Heat Removal System Operation, Revision 53

Notifications

20746896

Maintenance Orders/Work Orders

70190510      80115571

Other Documents

Hope Creek Operations Narrative Logs dated October 25, 2016

**Section 1R07: Heat Sink Performance**

Procedures

HC.OP-ST.BC-0009, Residual Heat Removal System RHR Heat Exchanger Flow Measurement – 18 Month, Revision 16

Notifications

20684303 20745211

Maintenance Orders/Work Orders

50175528

Calculations

BC-0056, RHR Hydraulic Analysis, Revision 5

**Section 1R08: In-Service Inspection**

Procedures and Evaluation Results:

AREVA Inc. Nondestructive Examination Procedure, Automated Phased Array Ultrasonic Examination of Core Shroud Assembly Welds, 54-ISI-884-000 (2-18-20160)

Areva NP Inc. Nondestructive Examination Procedure Phased Array Ultrasonic Examination of Core Shroud Assembly Welds

Hope Creek, Vendor Information Form 431231: Flaw Evaluation form for recirculation Nozzle N2G, N2H DM Welds, Structural Integrity Associates (10/26/2016)

Hope Creek, Vendor Information Form 431231; Flaw Evaluation form for recirculation nozzle N2G, N2H DM Welds Structural Integrity Associates, (4/27/09)

BWRVIP-76, Revision 1-ABWR Vessel and Internals Project; BWR Core Shroud Inspection and Flaw Evaluation, EPRI Technical Report, April 2015

PDI-UT-10, Generic Procedure for the Ultrasonic Examination of Dissimilar Metal Welds, Revision F

Procedure OU-AA-335-018; Attachment 4 ASME IWE (Class MC) Containment Visual Examination Record, 6/23/2015, Revision 7

MSIP PERFORMANCE AND VERIFICATION RECORD, PSEG Hope Creek RPV1-N2GSE, 12" Recirculation Nozzle, 2/13/99

MSIP PERFORMANCE AND VERIFICATION RECORD, PSEG Hope Creek RPV1-N2GSE, 12"

MSIP PERFORMANCE AND VERIFICATION RECORD, PSEG Hope Creek RPV1-N2HSE, 12" Recirculation Nozzle, 2/13/99

Structural Integrity Associates, Calculation Package File No. 1600360.301, Project Name 1600360 HCGS Core Shroud H4 Flaw Evaluation, 11/7/2016

Notifications

20744755 20747062

NDE Summary Reports:

Automated Ultrasonic Phased Array Examination Summary Sheet, PSEG, Hope Creek, Unit 1, Outage RFO-20, Summary No: 100635 (31 Pages), 10/23/2013: Weld: RPV1-NIASE

Automated Ultrasonic Phased Array Examination Summary Sheet, PSEG, Hope Creek, Unit 1, Outage RFO-20, Summary No: 100675 (20 Pages), 10/26/2016: Weld: RPV1-N2GSE

Automated Ultrasonic Phased Array Examination Summary Sheet, PSEG, Hope Creek,  
Summary No: 100680, Report Number VEN-16-018, Weld ID: RPV1-N2HSE, Class 1  
(23 Pages) 10/22/2016

Automated Ultrasonic Phased Array Examination Summary Sheet, PSEG, Hope Creek,  
Summary No: 100745, HCRFO20, RPV Core Spray Inlet at 120 DEG, Component ID:  
RPV1-N5ASE; (30 Pages) 10/28/2016

Hope Creek Summary Number: 106565, Report No. UT-RF-46 (12 Pages) N2J Nozzle area  
Pipe to safe end (RFO-20)

System Pressure Test Data Sheet (CODE) Post Maintenance Pressure Test VT-2 Visual  
NDE Summary Reports

Summary No.100080, HCRFO-20, Vertical Longitudinal Weld Seam at 330 Degrees;  
RPV1-W14-3 (11/3/2016)

Mistras Certification of Inspection, Radiography, WO#60104838, Reactor Water Clean-up  
Elbow, Weld Record 77007, 10/11/2016

### **Section 1R11: Licensed Operator Requalification Program**

#### Other Documents

SG-760, Loss of 1BD483 Inverter/Dual Recirc Seal Failure/Station Blackout/SAG, dated  
November 23, 2016

#### Procedures

TQ-AA-106 Licensed Operator Requal Training Program, Revision 31

TQ-AA-0304 Licensed Operator Requal Training Exam Development Job Aid, Revision 17

TQ-AA-201 Exam Security and Administration Revision 25

#### JPMs

305H-JPM.ZZ03E, 305H-JPM.SF004, 305H-JPM.ED002, 305H-JPM.AC007,  
305H-JPM.ZZ032, 305H-JPM.SB015, 305H-JPM.GK002, 305H-JPM.BF007,  
305H-JPM.BF-001, 305H-JPM.BD006, 305H-JPM.AB001

#### Simulator Scenarios

ESG-076, ESG-020, ESG-080, ESG-068

#### Biennial Written Exams

2016 Biennial #2 and 2016 Biennial #6

#### Simulator-Related Test Documents

TQ-AA-106-0308, Simulator Scenario Based Testing and Documentation, Revision 1

#### Simulator Testing

ESG-076

ESG-080

ESG-068

Transient Test-C, Closure of All MSIV's

Transient Test-F, Main Turbine Trip W/NO RX Trip

Transient Test-I, Max Unisolable Main Steam Break

Normal Evolutions, Unit Synchronization to Rated Power

Condition Reports

CR-2015-00354  
 CR-2015-02135  
 CR-2016-03846  
 CR-2016-04905

**Section 1R12: Maintenance Effectiveness**Procedures

ER-HC-310-1009, Hope Creek Generation Station Maintenance Rule Scoping, Revision 12  
 HC.MD-ST.PB-0011, 10A403 Class 1E 4.16 kV 18 Month Vital Bus Loss of Voltage Instrument  
 Channel Calibration and Functional Test, Revision 15  
 HC.OP-AB.ZZ-0135, Station Blackout/Loss of Offsite Power/Diesel Generator Malfunction,  
 Revision 42  
 HC.OP-ST.KJ-0001, Emergency Diesel Generator Operability Test – Monthly, Revision 78  
 MA-AA-716-004, Conduct of Troubleshooting, Revision 14

Notifications

20687215	20724437	20734685	20738180	20738181	20738182
20739031	20739056	20739059	20739136	20751700*	20752280*

Drawings

E-0006-1, Sheet 1, Single Line Meter & Relay Diagram 4.16 kV Class 1E Power System,  
 Revision 12  
 E-0008-1, Sheet 1, Single Line Meter & Relay Diagram Diesel Generator, Revision 4  
 E-0048-1, Sheet 1, Schematic Meter & Relay Diagram Diesel Generator, Revision 10  
 E-3081-0, Sheet 1, Diesel Generator Control, Revision 7

Maintenance Orders/Work Orders

30178273	50174288	50187699	60130770	70188723	70189068
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Other Documents

70189068-0010, Work Group Evaluation, 'A' EDG unable to raise load during IST  
 70189068-0070, MSPI Failure Determination for 'A' Emergency Diesel Generator  
 HC-MSPI-001, MSPI Basis Document, Revision 7

**Section 1R13: Maintenance Risk Assessments and Emergent Work Control**Procedures

CC-AA-107, Configuration Change Acceptance Testing Criteria  
 LS-AA-120, Issue Identification and Screening Process, Revision 14  
 HC.OP-IS.GS-0101, Containment Atmosphere Control System Valves – Inservice Test,  
 Revision 50  
 HC.OP-LR.GS-0001, Containment Isolation Valve Type C Leak Rate Test, CIVS 1GSHV-5050B  
 AND 1GSHV-5052B Penetration P22: 'B' Hydrogen Recombiner Inlet, Revision 3  
 OP-HC-108-115-1001, Operability Assessment and Equipment Control Program, Revision 33  
 HC.IC-GP.BB-0003, Nuclear Boiler – Nondivisional Channel L-11683/B21-N027, RX Cavity  
 Flood Up Level/RX Shutdown Range Level Setup, Revision 22  
 HC.OP-GP.ZZ-0114, Transmitter Isolation/Restoration Sensitive Rack Instrumentation  
 Instrument Rack 10C-027 – RPV Channel B, Revision 17  
 HC.OP-DL.ZZ-0026, Surveillance Log, Revision 154

HC.OP-ST.SH-0001, Accident Monitoring Instrumentation Channel Check - Monthly, Revision 35  
 WC-AA-105, Work Activity Risk Management, Page 1 of 51, Level 3 – Information Use, Revision 6  
 OU-AA-101-1006, Outage Management Risk and Impact Assessment, Page 1 of 28, Level 3 – Information Use, Revision 3  
 HC.IC-GP.ZZ-0006, Venting and Backfilling Instrumentation, Revision 7  
 HC.IC-GP.ZZ-0114, Transmitter Isolation/Restoration Sensitive Rack Instrumentation Instrument Rack 10C-027 – RPV Channel B, Revision 17  
 OU-AA-101-1006, Outage Management Risk and Impact Assessment, Revision 3  
 WC-AA-105, Work Activity Risk Management, Revision 5  
 OU-AA-101, Refuel Outage Management, Revision 24  
 OU-AA-103, Shutdown Safety Management Program, Revision 23  
 OU-HC-105, Shutdown Safety Management Program – Hope Creek Annex, Revision 7

#### Notifications

20747082	20747599	20747947	20748038	20748051	20748096
20748450	20748450	20748459	20748530		

#### Drawings

M-42-1, Sheet 1, Nuclear Boiler Vessel Instrumentation, Revision 38  
 M-42-1, Sheet 2, Nuclear Boiler Vessel Instrumentation, Revision 21  
 E-6252-0, Electrical Schematic Diagram Reactor Water Clean-up Recirculation Pumps, Revision 2  
 E-0025-1, Single Line Meter & Relay Diagram 480 Volt Unit Substations 10B250, 10B260, 10B490, Revision 25

#### Maintenance Orders/Work Orders

30200096	30284462	50172825	50175707	60125710	60128255
60132499	80108179	80113492	80113941	80115583	80118623

#### Other Documents

Protected Equipment Log, dated November 10, 2016  
 WC-AA-105-F1, Risk Activity Evaluation Worksheet, 20748450 – Backfill of ‘B’ Transmitter Rack 10-C-027, dated November 9, 2016  
 WC-AA-105-F3, Risk Management Plan for 20748450 – Backfill of ‘B’ Transmitter Rack 10-C-027, dated November 9, 2016  
 Prompt Investigation 20747082, Trip of the A RWCU Pump  
 RF20 Shutdown Safety Management Plan P1.23a, approved on 10/14/16  
 NEI 13-02, Industry Guidance for Compliance with Order EA-13-109, BWR Mark I & II Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions, November 2013

**Section 1R15: Operability Determinations and Functionality Assessments**Procedures

HC.MD-FT.KJ-0003, 18 Month Functional Testing of Emergency Diesel Generator Relays, Revision 2  
 HC.OP-ST.KJ-0003, Emergency Diesel Generator 1CG400 Operability Test – Monthly, Revision 76  
 HC.OP-AB.ZZ-0135, Station Blackout/Loss of Offsite Power/Diesel Generator Malfunction, Revision 42  
 OP-AA-106-101-1006, Operational and Technical Decision Making Process, Page 1 of 20 Level 3 – Information Use, Revision 8  
 OP-HC-108-106-1001, Equipment Operational Control, Revision 4  
 OP-HC-108-115-1001, Operability Assessment and Equipment Control Program, Revision 33

Notifications

20632584	20640696	20661029	20711720	20735957	20736874
20742431	20742480	20742823	20743294	20743585	20743834
20743845	20743886	20744709	20744757		

Drawings

E-0011-1, Sheet 1, Single Line Meter & Relay Diag. 250V DC System, Revision 20  
 E-0467-0, Sheet 1, Reactor Bldg. Supply FRVs, Revision 6  
 E-0467-0, Sheet 2, Reactor Bldg. Supply FRVs, Revision 12  
 E-0486-0, Sheet 1, Electrical Schematic Diagram Diesel Generator Rm Recirc System Fans, Revision 14

Maintenance Orders/Work Orders

30250796	30272360	30281648	60116329	70163760	70182552
70188920	70189201	70189542	70189741		

Other Documents

VTD 430606, Sheet 1, Internal Wiring Diagram for SDC AC Masterpact NW LGSB2, Revision 4  
 Operability Evaluation 16-016, Revision 0  
 70188920-0010, Maintenance Rule Functional Failure Cause Determination  
 Technical Specification 3.8.3.1, Onsite Power Distribution System  
 UFSAR 6.8, Filtration Recirculation and Ventilation System, Revision 20  
 UFSAR 7.4, Systems Required for Safe Shutdown, Revision 20  
 Technical Bulletin TB-12-0007, Masterpact Breakers Fail to Close, dated September 2016, Revision 3

**Section 1R18: Plant Modifications**Procedures

SM-AA-300, Procurement Engineering Support Activities, Revision 7  
 CC-AA-320-1002, Dynamic (Seismic) Qualification for Alternate Replacement Items and Commercial Grade Dedication Items, Revision 2

Notifications

20736860	20738444
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Maintenance Orders/Work Orders

60130589
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Other Documents

Dedication Plan No. 16-3301, MM 1113342 – Zener Diode, Revision 0  
 70188603-0050, Equipment Apparent Cause Evaluation – Repeat Failures of ‘C’ EDG Speed Switch  
 Publication No. 1N5333B/D, 1N53 Series 5 Watt Surmetic 40 Zener Voltage Regulators, Revision 15

**Section 1R19: Post-Maintenance Testing**Procedures

HC.OP-SO.EG-0001, Safety and Turbine Auxiliaries Cooling Water System Operation, Revision 55  
 HC.IC-GP.BB-0003, Nuclear Boiler – Nondivisional, Channel L-11683/B21-N027, RX Cavity Flood Up Level/RX Shutdown Range Level Setup, Revision 22  
 HC.IC-GP.ZZ-0006, Venting and Backfilling Instrumentation, Revision 7  
 HC.OP-DL.ZZ-0026, Surveillance Log, Revision 154  
 HC.OP-GP.ZZ-0114, Transmitter Isolation/Restoration Sensitive Rack Instrumentation Instrument Rack 10C-027 – RPV Channel B, Revision 17  
 HC.OP-ST.SH-0001, Accident Monitoring Instrumentation Channel Check – Monthly, Revision 35  
 HC.OP-ST.AC-0002, Turbine Valve Testing – Quarterly, Revision 50  
 HC.OP-FT.AC-0005, Turbine Overspeed Protection System Operability Test – Quarterly, Revision 13

Notifications

20729848	20742337	20742431	20742480	20742813	20744116
20747327	20748450				

Maintenance Orders/Work Orders

30284462	50172825	50177094	60125710	60131546	60131546
70183238	70189201	70189545	70190099	80108179	

Completed Tests, Inspections, and Surveillances

HC.OP-ST.BH-0002(Q), SLC Flow Test - 18 Months, Revision 29

**Section 1R20: Refueling and Other Outage Activities**Procedures

HC.OP-ST.KJ-0005, Integrated Emergency Diesel Generator 1AG400 Test – 18 Months, Revision 43  
 ER-HC-380-1005, Hope Creek Specific Appendix J Program Information, Revision 2  
 HC.OP-GP.ZZ-0002, Primary Containment Closeout, Revision 17  
 HC.OP-IO.ZZ-0003, Startup from Cold Shutdown to Rated Power, Revision 109  
 HC.OP-IO.ZZ-0004, Shutdown from Rated Power to Cold Shutdown, Revision 102  
 HC.OP-IS.ZZ-0001, Inservice System Leakage Test of the Reactor Coolant Pressure Boundary, Revision 45  
 HC.OP-ST.KJ-0007, Integrated Emergency Diesel Generator 1CG400 Test - 18 Months, Revision 47



Notifications

20552369	20654839	20672049	20683619	20684205	20710937
20722388	20741164	20742727	20743128	20743458	20743459
20743579	20744060	20744147	20745314	20745406	20745416
20745456	20745468	20745471	20745473	20745664	20745702
20745702	20745771	20745785	20745874	20745959	20746795
20746857	20746865	20747082	20747160	20747227	20747285
20747293	20747296	20747327	20747426	20747508	20747926

Maintenance Orders/Work Orders

30204912	30264481	30280722	30283646	30284699	30285664
30285782	50176129	60116064	60121916	60124249	60128119
60128619	60131628	60131628	60131668	60131712	60131830
60132106	70176824	70189240	70189240	70189662	70190161
70190219	70190361	80118888			

Other Documents

Troubleshooting Plan 16-185

AB-0067, MSIV Leakage Rate Conversion for Testing – EPU, Revision 1

HC-16-207, 50.59 Screening, 80118771, Revise Technical Specification Bases 3/4.6.1.2

50175140, Containment Leak Rate Test Data Sheet, Penetration P1C, completed on 10/20/16

50161887 and 50161888, Containment Leak Rate Test Data Sheet, Penetration P1C, completed on 4/15/15

50149279 and 50149280, Containment Leak Rate Test Data Sheet, Penetration P1C, completed on 10/17/13

**Section 1R22: Surveillance Testing**Procedures

ER-HC-380-1005, Hope Creek Specific Appendix J Program Information, Revision 2

ER-AA-380-1003, 10 CFR 50 Appendix J Running Summary – Data Entry, Revision 3

OP-HC-108-110-1001, Containment Leak Rate Test Data Sheet, Revision 8

ER-HC-380, Primary Containment Leakrate Testing Program, Revision 9

HC.MD-GP.ZZ-0237, General Instructions for Disassembly, Inspection and Reassembly of Anchor Darling Testable Check Valves, Revision 5

WC-AA-111, Predefine Process, Revision 8

HC.MD-FT.KJ-0003, 18 Month Functional Testing of Emergency Diesel Generator Relays, Revision 2

HC.OP-LR.AB-0003, Containment Isolation Valve Type C Leak Rate Test CIVs 1ABHV-F022C and 1ABHV-F028C Penetration P1C: 'C' Main Steam Line, Revision 7

HC.OP-ST.KJ-0003, Emergency Diesel Generator 1CG400 Operability Test – Monthly, Revision 76

HC.OP-LR.FD-0003, Containment Isolation Valve Water Leak Rate Test CIVS 1FDHV-F071 and 1FDV-004 Penetration P201: HPCI Turbine Exhaust, Revision 4

HC.OP-ST.BJ-0002, HPCI System Functional Test (Low Pressure) - 18 Months and HPCI System Response Time Test (High Pressure) – Revision 41

HC.OP-IS.BJ-0001, HPCI Main and Booster Pump Set - 0P204 AND 0P217 – Inservice Test, Revision 65

HC.OP-LR.AB-0001, Containment Isolation Valve Type C Leak Rate Test CIVS 1ABHV-F022A and 1ABHV-F028A Penetration P1A: 'A' Main Steam Line, Revision 7

HC.OP-IS.ZZ-0001, Inservice System Leakage Test of the Reactor Coolant Pressure Boundary, Revision 45

Notifications

20451913	20484065	20484577	20556246	20560222	20571228
20613859	20632746	20685599	20685806	20686558	20689406
20743220	20743294	20743886	20744399	20745655	20745823
20746737	20746865	20747426	20748464	20749222	20751478

Drawings

PP301Q-0305, Sheet 1, Swing Check Valve, Revision 8  
 PP301Q-0305, Sheet 2, Swing Check Valve, Revision 8  
 M-56-1, Sheet 1, HPCI Pump Turbine, Revision 34  
 M-55-1, Sheet 1, High Pressure Coolant Injection, Revision 40  
 M-41-1, Sheet 1, Nuclear Boiler, Revision 40

Maintenance Orders/Work Orders

30158457	30179629	30228069	30250796	30272360	30281241
30281648	30284699	50084697	50136566	50136930	50161887
50161888	50175140	50175708	60075850	60130794	70056232
70056741	70076614	70115834	70138010	70138010	70139003
70142153	70142153	70156159	70176744	70188934	70189240
70189240	70189542	70190160	70190161	80118771	80118888

Other Documents

Calc AB-0067, MSIV Leakage Rate Conversion for Testing – EPU, Revision 1  
 Maintenance Plan HC754005  
 Maintenance Plan 49862

Completed Tests, Inspections, and Surveillances

NWS Certificate of Conformance N60912-00-0002 (PO 4500941188), 10/27/2016

**Section 1EP4: Emergency Action Level and Emergency Plan Changes**Procedures

EP-AA-121-1003, Equipment Important to Emergency Response – Work Prioritization, Revision 3  
 NC.EP-EP.ZZ-0404(Q), Protective Action Recommendations (PARS) Upgrades, Revision 7  
 NC.EP-EP.ZZ-0309(Q), Dose Assessment (MIDAS) Instructions, Revision 14  
 HC.EP-EP.ZZ-0204(Q), Emergency Response Backup Callout, Revision 9

**Section 1EP6: Drill Evaluation**Other Documents

SG-760, Loss of 1BD483 Inverter/Dual Recirc Seal Failure/Station Blackout/SAG, dated November 23, 2016

**Section 2RS1: Access Control to Radiologically Significant Areas**

Procedures

RP-AA-376, Radiological Postings, Labeling, and Markings, Revision 8  
 RP-AA-401-1001, Special Instructions for Highly Radioactive Incore Components, Revision 0  
 RP-AA-401-1002, Instructions for Establishing Electronic Alarming Dosimeter Set-Points,  
 Revision 3  
 RP-AA-460, Controls for High and Very High Radiation Areas, Revision 17  
 RP-AA-463, High Radiation Area Key Controls, Revision 4  
 RP-AA-503, Unconditional Release Survey Method, Revision 8  
 RP-AA-4000, Personnel Conduct in Radiologically Controlled Areas, Revision 4

Notifications

20713490      20719296      20723965      20732181      20741567      20742015

Maintenance Orders/Work Orders

60130086      70184981      70186416      70187457      70189255      70189479

Air Samples

69933            69934            70157            70158            70192            70309  
 70312            70374

Other Documents

Technical Support Document No. 14-028, Hope Creek Generating Station Neutron  
 Characterization Study, March 18, 2014, Revision 00

**Section 2RS3: In-plant Airborne Radioactivity Control and Mitigation**

Procedures

RP-AA-301, Radiological Air Sampling Program, Revision 7  
 RP-AA-504, Routine Operation of the Radiation Protection Gross Counting Facility, Revision 5

**Section 4OA1: Performance Indicator Verification**

Procedures

LS-AA-2080, Monthly Data Elements for NRC Safety System Functional Failures, Revision 5

**Section 4OA2: Problem Identification and Resolution**

Procedures

CC-AA-11, Nonconforming Materials, Parts, or Components, Revision 5  
 ER-AA-1001, Component Classification, Revision 4  
 ER-AA-310-1004, Maintenance Rule – Performance Monitoring, Revision 14  
 ER-AA-310-1005, Maintenance Rule – Dispositioning Between (a)(1) AND (a)(2),  
 Revision 10  
 LS-AA-125, Corrective Action Program, Revision 22  
 LS-AA-125-1004, Effectiveness Review Manual, Revision 6  
 LS-AA-125-1002, Common Cause Evaluation Manual, Revision 9  
 OP-AA-108-115, Operability Determinations & Functionality Assessments, Revision 4  
 SM-AA-300, Procurement Engineering Support Activities, Revision 7  
 SM-AA-300-1005, PSEG Nuclear LLC In-Storage Shelf Life Program, Revision 5  
 SM-AA-404-1001, Preparation of Purchase Order Packages For Record Retention, Revision 2  
 SM-AA-410, Control of Purchased Material, Equipment and Services, Revision 8

Notifications

20319954	20388640	20699262	20699267	20751474*	20751705*
20532636	20552805	20727417	20727690	20741967	20741970
20742431	20742777	20744724	20745616	20745723	20745724
20749469	20750396				

Maintenance Orders/Work Orders

60099504	60102285	70057419	70162284	70172477	70185463
70186423	70186738	70187096	70188603	70189201	70189427
70190742	80118586				

Other Documents

Purchase Order 4500797640, MM 1027466, (4) Pneumatic Positioners, dated March 21, 2014  
Salem Unit 1 and 2, Management Alignment and Ownership Meeting, OPEVAL Tracking, dated  
November 15, 2016

**Section 40A3: Follow-up of Events and Notices of Enforcement Discretion**Procedures

OP-HC-108-115-1001, Operability Assessment and Equipment Control Program, Revision 33  
HU-AA-104-101, Procedure Use and Adherence, Revision 6  
LS-AA-120, Issue Identification and Screening Process, Revision 14  
HC.OP-GP.ZZ-0114, Transmitter Isolation/Restoration Sensitive Rack Instrumentation  
Instrument Rack 10C-027 – RPV Channel B, Revision 17  
HC.IC-GP.ZZ-0114  
CC-AA-107, Configuration Change Acceptance Testing Criteria  
HC.OP-IS.GS-0101, Containment Atmosphere control System Valves – Inservice Test,  
Revision 50  
HC.OP-DL.ZZ-0026, Surveillance Log, Revision 154  
HC.IC-GP.ZZ-0006, Venting and Backfilling Instrumentation, Revision 7  
HC.IC-FT.ZZ-0006, Excess Flow Check Valves, Revision 34  
HC.IC-GP.BB-0003, Nuclear Boiler – Nondivisional Channel L-11683/B21-N027,  
RX Cavity Flood Up Level/RX Shutdown Range Level Setup, Revision 22  
HC.OP-AB.RPV-0003, Recirculation System/Power Oscillations, Revision 30  
HC.OP-ST.SH-0001, Accident Monitoring Instrumentation Channel Check – Monthly,  
Revision 35  
HC.OP-IS.ZZ-0001, Inservice system Leakage Test of the Reactor Coolant Pressure Boundary,  
Revision 45  
HC.OP-LR.GS-0001, Containment Isolation Valve Type C Leak Rate Test, CIVS 1GSHV-5050B  
and 1GSHV-5052B, Penetration P22: 'B' Hydrogen Recombiner Inlet, Revision 3

Notifications

20746413	20747935	20747947	20747948	20748038	20748051
20748096	20748450	20748459	20748530		

Maintenance Orders/Work Orders

30284462	50172825	50175707	60125710	60128255	80108179
80113492	80113941	80115583	80118623		

Other Documents

NEI 13-02, Industry Guidance for Compliance with Order EA-13-109, BWR Mark I & II Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions, November 2013

Hope Creek Operations Narrative Logs dated November 3 – 6, 2016

EN#52347

**LIST OF ACRONYMS**

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ACE	apparent cause evaluation
ADAMS	Agencywide Documents Access and Management System
ASME	American Society of Mechanical Engineers
CAP	corrective action program
CCE	common cause evaluation
CCP	configuration change package
CFR	Code of Federal Regulations
CIV	containment isolation valve
DCP	design change package
DHR	decay heat removal
EAL	Emergency Action Level
EDG	emergency diesel generator
EOC	extent of condition
FASA	functional area self-assessment
FOST	fuel oil storage tank
FPCC	fuel pool cooling and cleanup
HCGS	Hope Creek Generating Station
HPCI	high pressure coolant injection
HRA	high radiation area
HuP	human performance
HVAC	heating, ventilation and air conditioning
IMC	inspection manual chapter
INPO	institute of nuclear power operations
IR	inspection report
ISI	In-service Inspection
IST	inservice test
JPM	job performance measures
kV	kilovolt
LCO	limiting conditions for operability
LER	licensee event report
LHRA	locked high radiation areas
MCC	motor control center
MCR	main control room
MM	material master
MR	maintenance rule
NCV	non-cited violation
NDE	Non-Destructive Examination
NEI	Nuclear Energy Institute
NOTF	notification(s)
NRC	Nuclear Regulatory Commission
OE	operating experience
OPCON	operational condition

OPEVAL	operability evaluation
PC	purchase classification
PCV	pressure control valve
PI	performance indicator(s)
PIR	problem identification and resolution
PM	preventive maintenance
PSEG	Public Service Enterprise Group Nuclear LLC
RCE	root cause analysis
RCS	reactor coolant system
RHR	residual heat removal
RPS	reactor protection system
RTP	rated thermal power
RWCU	reactor water cleanup
RWL	reactor water level
SACS	secondary auxiliary cooling system
SDP	significance determination process
SDSMP	shutdown safety management plan
SLC	standby liquid control
SOC	Station Ownership Committee
SSC	structure, system, and component
SW	service water
TS	technical specification(s)
TSC	technical support center
UFSAR	Updated Final Safety Analysis Report
WGE	work group evaluation
WO	work order
VHRA	very high radiation area