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

May 14, 2013

Mr. Thomas P. Joyce
President and Chief Nuclear Officer
PSEG Nuclear LLC
P. O. Box 236
Hancocks Bridge, NJ 08038

SUBJECT: HOPE CREEK GENERATING STATION - NRC TRIENNIAL FIRE PROTECTION INSPECTION REPORT 05000354/2013008

Dear Mr. Joyce:

On April 5, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed a triennial fire protection inspection at Hope Creek Generating Station. The enclosed inspection report documents the inspection results, which were discussed on April 5, 2013, with Mr. Eric Carr, Hope Creek Generating Station Plant Manager, and other members of your staff.

The inspection 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 station personnel. The inspectors also reviewed mitigation strategies for addressing large fires and explosions.

Based on the results of this inspection, one finding of very low safety significance (Green) was identified. This finding was also determined to be a violation of NRC requirements. However, because of its very low safety significance, and because it was entered into your corrective action program, the NRC is treating this finding as a non-cited violation (NCV) consistent with Section 2.3.2 of the NRC Enforcement Policy. If you contest any NCV in this report, you should provide a written 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 D.C. 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement; and the NRC Senior Resident Inspector at Hope Creek Generating Station. In addition, if you disagree with the cross-cutting aspect assigned to any finding 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 Regional Administrator, Region I, and the Resident Inspector at Hope Creek Generating Station.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records System (PARS) component of the NRC's document system, Agencywide Documents Access and Management System (ADAMS).

ADAMS is accessible from the NRC Web Site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

**/RA/**

John F. Rogge, Chief
Engineering Branch 3
Division of Reactor Safety

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

Enclosure:
Inspection Report 05000354/2013008
w/Attachment: Supplemental Information

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Sincerely,

**/RA/**

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REGION I

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|---|---|
| Docket Nos.: | 50-354 |
| License Nos.: | NPF-57 |
| Report Nos.: | 05000354/2013008 |
| Licensee: | PSEG Nuclear, LLC (PSEG) |
| Facility: | Hope Creek Generating Station |
| Location: | P.O. Box 236<br>Hancocks Bridge, NJ 08038 |
| Dates: | March 18, 2013 through April 5, 2013 |
| Inspectors: | K. Young, Senior Reactor Inspector (Team Leader), Division of Reactor Safety (DRS)<br>W. Cook, Senior Reactor Analyst, DRS<br>R. Fuhrmeister, Senior Reactor Inspector, DRS<br>J. Lilliendahl, Reactor Inspector, DRS<br>J. Patel, Reactor Inspector, DRS<br>B. Scrabeck, Project Engineer, Division of Reactor Projects (DRP) (Observer) |
| Approved by: | John F. Rogge, Chief<br>Engineering Branch 3<br>Division of Reactor Safety |

SUMMARY OF FINDINGS

IR 05000354/2013008; 03/18/2013 - 04/5/2013; PSEG Nuclear, LLC (PSEG); Hope Creek Generating Station; Triennial Fire Protection Baseline Inspection.

This report covered a 2 week on-site triennial fire protection team inspection by specialist inspectors. One finding of very low significance was identified. The finding was determined to be a non-cited violation. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, “Significance Determination Process.” Cross-cutting aspects associated with findings are determined using IMC 0310, "Components Within The Cross-Cutting Areas." Findings for which the significance determination process (SDP) does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, “Reactor Oversight Process,” Revision 4, dated December 2006.

**Cornerstone: Mitigating Systems**

- Green. The team identified a Green, Non-Cited Violation (NCV) of License Condition 2.C(7) of the Hope Creek operating license, in that the procedures for shutting down the plant in response to a fire in the cable spreading room, control equipment room, or control room were not adequate. Specifically, the alternative (remote) post-fire safe shutdown procedures were not adequate 1) to prevent overfilling of the reactor vessel following a spurious, fire-induced start of High Pressure Coolant Injection (HPCI) or 2) to ensure that cooling water is provided to the Emergency Diesel Generators (EDG) prior to overheating. Corrective actions included initiating revisions to the safe shutdown procedures and entering this issue into the corrective action program (CAP) as notifications 20600413 and 20601659.

  The finding was more than minor because it affected the procedure quality attribute associated with the mitigating systems cornerstone as related to the objective of ensuring the reliability and availability of mitigating systems under postulated fire safe shutdown conditions. The finding screened as very low safety significance (Green) based upon IMC 0609, Appendix F, “Fire Protection Significance Determination Process,” Attachment 1, “Fire Protection SDP Phase 1 Worksheet,” because the procedural inadequacies would not have prevented the ability of the operators to safely shutdown the plant in a fire event. The team determined that operators had adequate operator training, there was operable detection/suppression systems in the fire areas of concern, there was no/limited ignition sources in the fire areas of concern, there was adequate administrative controls of transient combustibles and ignition sources, and the control room was continually manned. The inspectors determined that the finding has a cross-cutting aspect in the area of Human Performance, Resources, because PSEG did not provide complete and accurate procedures. Specifically the safe shutdown procedures were not adequate to prevent overfilling the reactor vessel or overheating the EDGs [H.2(c)] (Section 1R05.05).

**Other Findings**

None

# REPORT DETAILS

## Background

This report presents the results of a triennial fire protection inspection conducted in accordance with the U.S. Nuclear Regulatory Commission (NRC) Inspection Procedure (IP) 71111.05T, "Fire Protection (Triennial)." The objective of the inspection was to assess whether PSEG Nuclear, LLC has implemented an adequate fire protection program (FPP) and that post-fire safe shutdown capabilities have been established and are being properly maintained at the Hope Creek Generating Station facility. The following fire areas (FA) and/or fire zones (FZ) were selected for detailed review based on risk insights from the Hope Creek Generating Station Individual Plant Examination (IPE)/Individual Plant Examination of External Events (IPEEE).

- FA AB2, Electrical Access Area, Division II (Rooms 5401/3425)
- FA CD16, Cable Spreading Room (Room 5202)
- FA CD30, "C" Diesel Generator & HVAC Rooms (Rooms 5306/5210)
- FA CD61, Upper Control Equipment Room (Rooms 5605/5631)

Inspection of these areas/zones fulfills the inspection procedure requirement to inspect a minimum of three samples.

The inspection team evaluated the licensee's fire protection program against applicable requirements which included plant Technical Specifications, Operating License Condition 2.C.(7), NRC Safety Evaluations, Title 10 of the *Code of Federal Regulations* (10 CFR) 50.48, 10 CFR Part 50, Appendix R and Branch Technical Position (BTP) Chemical Engineering Branch (CMEB) 9.5-1. The team also reviewed related documents that included the Updated Final Safety Analysis Report (UFSAR), Section 9.5.1, the FPP and Appendix 9A, Appendix R comparison. These sections include the fire hazards analysis (FHA) and the post-fire safe shutdown analysis.

The team also evaluated four licensee mitigating strategies for addressing large fires and explosions as required by Operating License Condition 2.C.(16) and 10 CFR 50.54 (hh)(2). Inspection of these strategies fulfills the inspection procedure requirement to inspect a minimum of one sample.

Specific documents reviewed by the team are listed in the attachment to this report.

## 1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R05 Fire Protection (IP 71111.05T)

.01 Protection of Safe Shutdown Capabilities

a. Inspection Scope

The team reviewed the FHA, safe shutdown analyses, and supporting drawings and documentation to verify that post-fire safe shutdown capabilities were properly protected. The team ensured that applicable separation requirements of BTP CMEB 9.5-1, Section III.G of 10 CFR Part 50, Appendix R, and the licensee's design and licensing bases were maintained for the credited safe shutdown equipment and their supporting power, control, and instrumentation cables. This review included an assessment of the adequacy of the selected systems for reactivity control, reactor coolant makeup, reactor heat removal, process monitoring, and associated support system functions.

b. Findings

No findings were identified.

.02 Passive Fire Protection

a. Inspection Scope

The team walked down accessible portions of the selected fire areas to evaluate whether the material conditions of the fire area boundaries were adequate for the fire hazards in the area. The team compared the fire area boundaries, including walls, ceilings, floors, fire doors, fire dampers, and penetration seals to design and licensing basis requirements, industry standards, and the Hope Creek Generating Station FPP, as approved by the NRC, to identify any potential degradation or non-conformances.

The team reviewed selected engineering evaluations, installation and repair work orders, and qualification records for a sample of penetration seals to determine whether the fill material was properly installed and whether the as-left configuration satisfied design requirements for the intended fire rating.

The team also reviewed recent inspection and functional test records for fire dampers, and the inspection records for penetration seals and fire barriers, to verify whether the inspection and testing was adequately conducted, the acceptance criteria were met, and any potential performance degradation was identified. In addition, the team reviewed recent test results for the carbon dioxide ($CO_2$) and fire damper functionality tests for the areas protected to verify the testing was adequately conducted, the acceptance criteria were met, and any performance degradation was identified.

b. Findings

No findings were identified.

.03 Active Fire Protection

a. Inspection Scope

The team evaluated manual and automatic fire suppression and detection systems in the selected fire areas to determine whether they were installed, tested, maintained, and operated in accordance with NRC requirements, National Fire Protection Association (NFPA) codes of record, and the Hope Creek Generating Station FPP, as approved by the NRC. The team also assessed whether the suppression systems capabilities were adequate to control and/or extinguish fires associated with the hazards in the selected areas.

The team reviewed the as-built capability of the fire water supply system to verify the design and licensing basis and NFPA code of record requirements were satisfied, and to assess whether those capabilities were adequate for the hazards involved. The team reviewed the fire water system hydraulic analyses to assess the adequacy of a single fire water pump to supply the largest single hydraulic load on the fire water system plus concurrent fire hose usage. The team evaluated the fire pump performance tests to assess the adequacy of the test acceptance criteria for pump minimum discharge pressure at the required flow rate, to verify the criteria was adequate to ensure that the design basis and hydraulic analysis requirements were satisfied. The team also evaluated the underground fire loop flow tests to verify the tests adequately demonstrated that the flow distribution circuits were able to meet design basis requirements. In addition, the team reviewed recent pump and loop flow test results to verify the testing was adequately conducted, the acceptance criteria were met, and any potential performance degradation was identified.

The team reviewed initial discharge testing, design specifications, vendor requirements, modifications and engineering evaluations, and routine functional testing for the $CO_2$ suppression systems for the areas protected. The team walked down accessible portions of the $CO_2$ system, including storage tanks and supply systems, to independently assess the material condition, operational lineup, and availability of the system. The team also reviewed and walked down the associated fire fighting strategies and $CO_2$ system operating procedures.

The team walked down accessible portions of the detection and water suppression systems in the selected areas and major portions of the fire water supply system, including motor and diesel driven fire pumps, interviewed system and program engineers, and reviewed selected corrective action program (CAP) documents (notifications) to independently assess the material condition of the systems and components. In addition, the team reviewed recent test results for the fire detection and suppression systems for the selected fire areas to verify the testing was adequately conducted, the acceptance criteria were met, and any performance degradation was identified.

The team assessed the fire brigade capabilities by reviewing training, qualification, and drill critique records. The team also reviewed Hope Creek Generating Station's fire fighting strategies (i.e. pre-fire plans) and smoke removal plans for the selected fire areas to determine if appropriate information was provided to fire brigade members and plant operators to identify safe shutdown equipment and instrumentation, and to facilitate suppression of a fire that could impact post-fire safe shutdown capability. The team independently inspected the fire brigade equipment, including personnel protective gear (e.g. turnout gear) and smoke removal equipment, to determine operational readiness for fire fighting. In addition, the team reviewed Hope Creek Generating Station's fire brigade equipment inventory and inspection procedure and recent inspection and inventory results to verify adequate equipment was available, and any potential material deficiencies were identified.

b. Findings

No findings were identified.

.04 Protection from Damage from Fire Suppression Activities

a. Inspection Scope

The team walked down the selected fire areas and adjacent areas, and reviewed selected documents to determine whether redundant safe shutdown trains could be potentially damaged from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems. During the walkdowns, the team evaluated the adequacy and condition of floor drains, equipment elevations, and spray protection. Specifically, to determine whether a potential existed to damage redundant safe shutdown trains, the team evaluated whether:

- A fire in one of the selected fire areas would not release smoke, heat, or hot gases that could cause unintended activation of suppression systems in adjacent fire areas which could potentially damage all redundant safe shutdown trains; or

- A fire suppression system rupture, inadvertent actuation, or actuation due to a fire, in one of the selected fire areas, could not directly damage all redundant trains (e.g. sprinkler caused flooding of other than the locally affected train); and

- Adequate drainage was provided in areas protected by water suppression systems.

b. Findings

No findings were identified.

.05 Post-Fire Safe Shutdown Capability – Normal and Alternative

a. Inspection Scope

The team reviewed the safe shutdown analysis, operating procedures, piping and instrumentation drawings (P&ID), electrical drawings, the UFSAR, and other supporting documents for the selected fire areas to verify that the licensee had properly identified the systems and components necessary to achieve and maintain post-fire safe shutdown conditions.

The team assessed the adequacy of the selected systems and components for reactivity control, reactor coolant makeup, reactor heat removal, process monitoring, and support system functions. This review included verification that alternative post-fire safe shutdown could be performed both with and without the availability of offsite power. Plant walkdowns were also performed to verify that the plant configuration was consistent with that described in the safe shutdown and fire hazards analyses. The team verified that the systems and components credited for use during shutdown would remain free from fire damage.

The team verified that the training program for licensed and non-licensed operators included alternative shutdown capability. The team also verified that personnel required for safe shutdown using the normal or alternative shutdown systems and procedures are trained and available onsite at all times, exclusive of those assigned as fire brigade members.

The team reviewed the adequacy of procedures utilized for post-fire safe shutdown and performed an independent walk through of procedure steps to ensure the implementation and human factors adequacy of the procedures. The team also verified that the operators could be reasonably expected to perform specific actions within the time required to maintain plant parameters within specified limits.

Specific procedures reviewed for normal and alternative post-fire shutdown included the following:

- HC.OP-IO.ZZ-0008(Q), Shutdown from Outside Control Room, Rev. 32;
- HC.OP-AB.HVAC-0002(Q), Control Room Environment, Rev. 8; and
- HC.OP-AB.ZZ-0135(Q), Station Blackout/Loss of Offsite Power/Diesel Generator Malfunction, Rev. 38.

The team reviewed manual actions to ensure that they had been properly reviewed and approved and that the actions could be implemented in accordance with plant procedures in the time necessary to support the safe shutdown method for each fire area. The team also reviewed the periodic testing of the alternative shutdown transfer capability and instrumentation and control functions to ensure the tests are adequate to ensure the functionality of the alternative shutdown capability.

b. Findings

Introduction: The team identified a finding of very low safety significance (Green) involving a violation of License Condition 2.C(7) of the Hope Creek Generating Station operating license, in that the procedures for shutting down the plant in response to a fire in the cable spreading room, control equipment room, or control room were not adequate. Specifically, the alternative (remote) post-fire safe shutdown procedures were not adequate 1) to prevent overfilling of the reactor vessel following a spurious, fire-induced start of HPCI or 2) to ensure that cooling water is provided to the emergency diesel generators (EDG) prior to overheating.

Description: Hope Creek Generating Stations's thermal hydraulic analysis for the potential failure of the high level HPCI trip, BJ-0024, analyzed a scenario for a fire in the cable spreading room, control equipment room, or control room where a fire causes a spurious start of the high pressure coolant injection (HPCI) that also bypasses the HPCI level 8 automatic trip. The analysis determined that for the worst case conditions, HPCI must be secured within 7.9 minutes to prevent a reactor vessel overfill event. If not secured promptly, HPCI would overfill the reactor vessel and water would enter the main steam lines which would adversely impact the Reactor Core Isolation Cooling (RCIC) turbine driven pump. The analysis showed that if RCIC is not operating and if HPCI is secured within 10 minutes, then there is adequate time for the RCIC steam line to drain prior to being required for inventory control.

During the inspection, the team noted that procedure HC.OP-AB.HVAC-0002(Q), Control Room Environment Abnormal Operating Procedure, was revised. The previous version of procedure HC.OP-AB.HVAC-0002(Q) instructed the operators to open one breaker which would promptly shutdown HPCI. To provide for a more controlled shutdown of HPCI, PSEG revised procedure HC.OP-AB.HVAC-0002(Q) to contact Instrumentation and Control (I&C) personnel to connect an Emergency Core Cooling System (ECCS) logic test device to a panel in the control equipment room to force a shutdown signal to HPCI without de-energizing the HPCI auxiliary lube oil pump.

The team determined, depending on availability of I&C personnel, that securing HPCI could be significantly delayed beyond the 10 minutes assumed in the analysis. Although the analysis assumed that RCIC would not be running during the postulated reactor vessel overfill, the team determined that during some control room evacuation scenarios, reactor level may drop low enough to automatically start RCIC. Also, the I&C actions are performed in one of the fire areas where the fire could occur that would require the personnel to enter the fire area prior to extinguishing the fire. Finally, the ECCS logic tester is considered a tool, and tools (for repairs) are not permitted for actions required for hot shutdown.

PSEG reviewed the issue and agreed that the procedure change was not appropriate. PSEG generated a notification (20600413) and revised the procedure to open the HPCI breaker without the I&C actions.

During the inspection, the team also noted that the procedural guidance was inadequate for promptly providing cooling water to the EDGs. For a fire which requires the

evacuation of the control room, transfer switches are used to prevent spurious starting of cooling water pumps for the protected 'B' EDG. These transfer switches also prevent the normal automatic starting of cooling water pumps, so the pumps must be started manually. Although the other three EDGs do not have transfer switches, their automatic starting circuits are not protected from fire damage in the cable spreading room and lower control equipment room, so cooling water pump automatic starting cannot be assumed.

The team reviewed procedure HC.OP-IO.ZZ-0008(Q), Shutdown from Outside Control Room, and noted that the procedure directs concurrent implementation of procedure HC.OP-AB.ZZ-0135(Q), Station Blackout – Loss of Offsite Power – Diesel Generator Malfunction. The team noted that procedure HC.OP-AB.ZZ-0135(Q) directed the local starting of EDGs, but did not direct the local starting of cooling water pumps until much later in the procedure. Prior to starting cooling water pumps, procedure HC.OP-AB.ZZ-0135(Q) directed the operators to perform actions such as performing the loss of ventilation procedure. HC.OP-IO.ZZ-0008(Q) provided steps for starting cooling water, but those steps were also not prioritized correctly. Prior to starting cooling water pumps, procedure HC.OP-IO.ZZ-0008(Q) directed the operators to perform actions such as locally closing a motor operated valve in the reactor building. The team determined that the procedures did not provide reasonable assurance that cooling water would be started prior to the EDG overheating.

PSEG reviewed the issue and determined that damage to the EDGs would likely occur in 2 to 20 minutes without cooling water. PSEG agreed that the procedure should be revised to clearly start cooling water promptly once an EDG has been started. PSEG documented this issue in notification 20601659 and ensured that operators were aware to promptly start EDG cooling in the event of a fire causing evacuation of the control room.

Analysis: The team determined that PSEG's failure to provide adequate procedural guidance for post-fire safe shutdown was a performance deficiency that was reasonably within PSEG's ability to foresee and prevent. The finding was more than minor because it affected the procedure quality attribute associated with the mitigating systems cornerstone as related to the objective of ensuring the reliability and availability of the RCIC system and EDGs under postulated fire safe shutdown conditions.

The team assessed this finding in accordance with NRC Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," Appendix F, "Fire Protection Significance Determination Process." Using Appendix F, Attachment 1, "Fire Protection SDP Phase 1 Worksheet," the team assigned a low degradation rating to this performance deficiency because the identified procedural inadequacies would not have prevented the ability of operators to safely shutdown the plant in a fire event. The team determined that adequate post-fire safe shutdown training for operators was in place, there was no or limited ignition sources in place for the fire areas of concern, there was operable detection and suppression systems in place for the fire areas of concern, there was adequate administrative controls for transient combustibles and ignition sources in place, and the control room was continually manned. Therefore, based on these aspects of the Hope Creek Generating Station fire protection program, the team

determined the finding is of very low safety significance (Green). A Region I Senior Reactor Analyst coordinated with the site PRA staff and conducted confirmatory detailed risk analyses confirming the very low safety significance of this procedural adequacy issue.

The inspectors determined that the finding has a cross-cutting aspect in the area of Human Performance, Resources, because PSEG did not provide complete and accurate procedures. Specifically the post-fire safe shutdown procedures were not adequate to prevent overfilling the reactor vessel or overheating the EDGs. ([H.2(c)] per IMC 0310)

Enforcement: License Condition 2.C(7) for Hope Creek Generating Station states in part that, "PSEG Nuclear LLC shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report." Appendix 9A of the UFSAR states that "Procedures are in effect to implement this [alternate shutdown] capability." Contrary to the above, until April 5, 2013, PSEG's procedures for remote shutdown were not adequate 1) to prevent overfilling of the reactor vessel following a spurious, fire-induced start of HPCI or 2) to ensure that cooling water is provided to the EDGs prior to overheating. Because the finding was of very low safety significance and has been entered into Hope Creek Generating Station's CAP (Notifications 20600413 and 20601659), this violation is being treated as a non-cited violation (NCV), consistent with Section 2.3.2 of the NRC Enforcement Policy. **NCV 05000354/2013008-01, Inadequate Post-Fire Safe Shutdown Procedures.**

.06 Circuit Analysis

a. Inspection Scope

The team verified that the licensee performed a post-fire safe shutdown analysis for the selected fire areas and the analysis appropriately identified the structures, systems, and components important to achieving and maintaining safe shutdown. Additionally, the team verified that the licensee's analysis ensured that necessary electrical circuits were properly protected and that circuits that could adversely impact safe shutdown due to hot shorts or shorts to ground were identified, evaluated, and dispositioned to ensure spurious actuations would not prevent safe shutdown.

The team's review considered fire and cable attributes, cable routing, potential undesirable consequences and common power supply/bus concerns. Specific items included the credibility of the fire threat, cable insulation attributes, cable failure modes, and actuations resulting in flow diversion or loss of coolant events.

The team also reviewed cable raceway drawings and/or cable routing databases for a sample of components required for post-fire safe shutdown to verify that cables were routed as described in the safe-shutdown analysis. The team also reviewed equipment important to safe shutdown, but not part of the success path, to verify that the licensee had taken appropriate actions in accordance with the design and licensing basis and NRC Regulatory Guide 1.189, Revision 2.

Cable failure modes were reviewed for the following components:

- BC-BP202, RHR Pump B Motor;
- BC-HV-F015A, Shutdown Cooling Return Valve;
- FD-FV-4880, HPCI Turbine Stop Valve;
- LR-7854, Remote Shutdown Panel RPV Level;
- PE-52-40207, 'B' EDG In-feed Breaker;
- PR-7853D, Remote Shutdown Panel RPV Pressure; and
- SN-PSV-F013B, Safety Relief ADS Valve.

The team reviewed a sample of circuit breaker coordination studies to ensure equipment needed to conduct post-fire safe shutdown activities would not be impacted due to a lack of coordination that could result in a common power supply or common bus concern.

The team verified that the transfer of control from the control room to the alternative shutdown location(s) would not be affected by fire-induced circuit faults (e.g. by the provision of separate fuses and power supplies for alternative shutdown control circuits).

b. Findings

No findings were identified.

.07 Communications

a. Inspection Scope

The team reviewed safe shutdown procedures, the safe shutdown analysis, and associated documents to verify an adequate method of communications would be available to plant operators following a fire. During this review the team considered the effects of ambient noise levels, clarity of reception, reliability, and coverage patterns. The team also inspected the designated emergency storage lockers to verify the availability of portable radios for the fire brigade and for plant operators. The team also verified that communications equipment such as repeaters and transmitters would not be affected by a fire.

b. Findings

No findings were identified.

.08 Emergency Lighting

a. Inspection Scope

The team observed the placement and coverage area of eight-hour emergency lights throughout the selected fire areas to evaluate their adequacy for illuminating access and egress pathways and any equipment requiring local operation or instrumentation monitoring for post-fire safe shutdown. The team also verified that the battery power supplies were rated for at least an eight-hour capacity. Preventive maintenance

procedures, the vendor manual, completed surveillance tests, and battery replacement practices were also reviewed to verify that the emergency lighting was being maintained consistent with the manufacturer's recommendations and in a manner that would ensure reliable operation.

b. Findings

No findings were identified.

.09 Cold Shutdown Repairs

a. Inspection Scope

The team reviewed the licensee's safe shutdown analysis and determined that there are no repairs necessary to accomplish cold shutdown following a fire.

See section 4OA2.01, Corrective Actions for Fire Protection Program, of this report for more information regarding potential cold shutdown repairs.

b. Findings

No findings were identified.

.10 Compensatory Measures

a. Inspection Scope

The team verified compensatory measures were in place for out-of-service, degraded, or inoperable fire protection and post-fire safe shutdown equipment, systems, or features (e.g., detection and suppression systems and equipment, passive fire barriers, pumps, valves, or electrical devices providing safe shutdown functions or capabilities). The team evaluated whether the short term compensatory measures adequately compensated for the degraded function or feature until appropriate corrective action could be taken and that the licensee was effective in returning the equipment to service in a reasonable period of time.

b. Findings

No findings were identified.

.11 Fire Protection Program Changes

a. Inspection Scope

The team reviewed recent changes to the approved fire protection program to verify that the changes did not constitute an adverse effect on the ability to safely shutdown.

b. Findings

No findings were identified.

.12 Control of Transient Combustibles and Ignition Sources

a. Inspection Scope

The team reviewed the licensee's procedures and programs for the control of ignition sources and transient combustibles to assess their effectiveness in preventing fires and in controlling combustible loading within limits established in the FHA. A sample of hot work and transient combustible control permits were also reviewed. The team performed plant walkdowns to verify that transient combustibles and ignition sources were being implemented in accordance with the administrative controls.

b. Findings

No findings were identified.

.13 Large Fires and Explosions Mitigation Strategies

a. Inspection Scope

The team conducted a review of selected mitigation strategies intended to maintain or restore core cooling, containment integrity, and spent fuel pool cooling capabilities under the circumstances associated with the loss of large areas of the plant due to explosions and/or fires. The team assessed whether PSEG Nuclear, LLC continued to meet the requirements of Operating License Condition 2.C.(16) and 10 CFR 50.54(hh)(2). The team reviewed the following mitigation strategies:

- HC.OP-AM.TSC-0014, RCIC Operation with Complete Loss of AC and DC Power, Rev. 8;
- HC.OP-AM.TSC-0020, Spent Fuel Pool-External Makeup, Rev. 4;
- HC.OP-AM.TSC-0023, Alternate Containment Flooding via Fire Water, Rev. 5; and
- HC.OP-AM.TSC-0024, Remote Operation of SRVs with RPV Injection, Rev. 7.

The team's review included: a detailed assessment of the procedural guidance; a walkdown of the strategy with trained operators to assess the feasibility of the strategy and operator familiarity; maintenance and surveillance testing of all designated strategy equipment; and an inventory check of strategy equipment to ensure the appropriateness of equipment storage and availability. The team also evaluated the adequacy of corrective actions associated with issues identified during previous inspections in this area.

b. Findings

No findings were identified.

## 4. OTHER ACTIVITIES [OA]

4OA2 Identification and Resolution of Problems (IP 71152)

.01 Corrective Actions for Fire Protection Deficiencies

a. Inspection Scope

The team verified that the licensee was identifying fire protection and post-fire safe shutdown issues at an appropriate threshold and entering them into the CAP. The team also reviewed a sample of selected issues to verify that the licensee had taken or planned appropriate corrective actions.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

Exit Meeting Summary

The team presented their preliminary inspection results to Mr. Eric Carr, Hope Creek Generating Station Plant Manager, and other members of the site staff at an exit meeting on April 5, 2013. No proprietary information was included in this inspection report.

Attachment: Supplemental Information

## SUPPLEMENTAL INFORMATION

## KEY POINTS OF CONTACT

Licensee Personnel
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P. Bonnett, HCGS Compliance Engineer
D. Boyle, HCGS Operations Support Manager
B. Burgio, HCGS Programs Risk Manager
J. Carlin, Fire Protection Superintendent
R. Chan, Manager, NOS
V. Chandra, HCGS Mechanical Design Engineer
M. Cocking, HCGS Fire Protection Supervisor
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P. Finch, Safe Shutdown Engineer, Contractor
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W. Kopchick, Director, Operations
C. Lukacsy, Senior Reactor Operator
E. Maguire, PSEG Licensing Engineer
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D. Rambo, HCGS Design Engineering Technical Clerk
M. Reeser, Fire Protection Engineer
S. Savar, Appendix R Engineer, Contractor
S. Simpson, Manager, Regulatory Assurance
D. Shumaker, Corporate Fire Protection Program Engineer
M. Smith, Manager, Electrical
A. Tramontana, Manager, Programs Engineering

NRC Personnel
J. Rogge, Chief, Engineering Branch 3, Division of Reactor Safety
G. Dentel, Chief, Branch 3, Division of Reactor Projects
W. Cook, Senior Reactor Analyst, Division of Reactor Safety
F. Bower, Senior Resident Inspector, Hope Creek Generating Station
S. Ibarrola, Resident Inspector, Hope Creek Generating Station

State of New Jersey
J. Humphreys, Department of Environmental Protection, Bureau of Nuclear Engineering

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened
NONE

Opened and Closed

| | | |
|---|---|---|
| 05000345/2013008-01 | NCV | Inadequate Post-Fire Safe Shutdown Procedures (Section 1R05.05) |

Closed
NONE

Discussed
NONE

## LIST OF DOCUMENTS REVIEWED

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HCGS UFSAR, Appendix 9A, Appendix R Comparison, Rev. 18
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VTD 51-9126574-000, HCGS Safe Shutdown Analysis Report, Rev. 0
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70105173, Evaluation of NRC Information Notice 2009-29
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NC.FP-PM.ZZ-0001(Z), Ambulance and Medical Inventory Inspection, Rev. 4
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SH.OP-AM.TSC-0002, Remote Response Center (RRC) Operations, Rev. 2
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HC.OP-AM.TSC-0019, Alternate Fuel Pool Make Up, Rev. 8

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A-0541-0, Separation Criteria, Aux. Building-Control/Diesel EL. 54'-0", Rev. 6
A-0542-0, Separation Criteria, Aux. Building-Control/Diesel EL. 77'-0", Rev. 9
A-0543-0, Separation Criteria, Aux. Building-Control/Diesel EL. 102'-0", Rev. 14
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E-4085-1, Sht. 1, Cable Block Diagram Class 1E 4.16 KV STA.PWR.SYS SWGR Diesel Generator CKT. BRKR (1)52-40207, Rev. 4
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E-6603-0, Sht. 3, Remote Shutdown Panel (RSP) (10C399) Transfer Switch Power Dist., Rev. 2
E-6603-0, Sht. 4, Remote Shutdown Panel (RSP) (10C399) Transfer Switch Power Dist., Rev. 0
E-6603-0, Sht. 5, Remote Shutdown Panel (RSP) (10C399) Transfer Switch Power Dist., Rev. 1
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E-6604-0, Sht. A, Electrical Schematic Diag. Remote Shutdown Pnl. 10C399 Index Sh., Rev. 25
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E-8014-0, Sht. 13, Connection Diagram Bailey Interface, Rev. 0
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J-0399-0, Sht. 4, Remote Shutdown Panel 10C399 MIMIC Section, Rev. 11
J-0399-0, Sht. 13, Remote Shutdown Panel - 10C399 Left Section, Rev. 4
J-0399-0, Sht. 14, Remote Shutdown Panel 10C399 Right Section, Rev. 2
J-0399-0, Sht. 15, Remote Shutdown Panel 10C399 List of Devices, Rev. 10
J-0399-0, Sht. 16, Remote Shutdown Panel 10C399 List of Devices, Rev. 6
J-4042-0, Sht. 2, Nuclear Boiler Vessel Level, Rev. 8
J-4042-0, Sht. 5, Nuclear Boiler Vessel Level, Rev. 5
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M-5104, BTP CMEB 9.5-1 Fire Barriers Floor Plan at Level 4 Elevation 120'-0" & 132'-0", Rev. 7
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M-5111, BTP CMEB 9.5-1 Fire Barriers, Fire Water Pump House Floor Plan, Rev. 2
M-5112, Fire Area Boundaries EL. 54'-0", Rev. 2
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M-5115, Fire Area Boundaries EL. 120'-0" & 132'-0", Rev. 2
M-5116, Fire Area Boundaries EL. 137'-0"/145'-0"/146'-0"/150'-0", Rev. 5
M-5117, Fire Area Boundaries EL. 153'0" & 162'-0", Rev. 2
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M-22-0, Sht. 3, Fire Protection – Fire Water Reactor and Auxiliary Buildings, Rev. 36
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M-22-0, Sht. 5, Fire Protection Carbon Dioxide Systems, Rev. 22
M-22-0, Sht. 6, Fire Protection Fire Water & Foam System Details, Rev. 23
M-22-0, Sht. 7, Fire Protection Fire Water System Details, Rev. 24
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52998468 conducted 3/12/12
53001719 conducted 3/21/12
53016083 conducted 4/3/12
53036612 conducted 4/30/12
53059278 conducted 5/17/12

53059880 conducted 5/23/12
53059869 conducted 5/30/12
53066714 conducted 6/5/12
53059853 conducted 6/11/12
53079546 conducted 8/1/12
53096662 conducted 8/23/12
53098189 conducted 8/27/22
53120719 conducted 10/9/12
53185863 conducted 11/19/12
53186495 conducted 11/20/12
53187475 conducted 11/26/12
53188934 conducted 12/1/12
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| HC-13053 | HC-13054 | HC-13055 | HC-13056 | HC-13057 | HC-13058 |
| HC-13059 | HC-13060 | HC-13061 | HC-13062 | HC-13063 | HC-13064 |

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HTC-13-CD84-001
HTC-13-RB2-004
HTC-13-RB2-003
HTC-13-RB2-002

Corrective Action Program Documents (Notifications and Orders)

| | | | | | |
|---|---|---|---|---|---|
| 20441217 | 20461361 | 20525967 | 20532089 | 20538847 | 20541961 |
| 20543427 | 20543643 | 20543463 | 20545311 | 20549544 | 20550055 |
| 20550462 | 20553920 | 20554612 | 20558287 | 20558947 | 20560205 |
| 20569621 | 20569738 | 20569376 | 20572408 | 20574325 | 20594162 |
| 20594228 | 20574929 | 20574972 | 20574979 | 20575266 | 20575639 |
| 20575782 | 20576394 | 20583011 | 20586633 | 20589437 | 20589971 |
| 20592545 | 20593392 | 20595748* | 20576105 | 20596110 | 20596317 |

| | | | | | |
|---|---|---|---|---|---|
| 20596339 | 20596927 | 20597108 | 20597380 | 20505145 | 20506357 |
| 20506211 | 20543689 | 20595748 | 20596317 | 20596927 | 20597810* |
| 20597812 | 20597907* | 20597915* | 20598006* | 20598058* | 20598141* |
| 20598143* | 20598149* | 20599510* | 20599586 | 20599590* | 20599775* |
| 20599900* | 20599903* | 20599972* | 20600055* | 20600210* | 20600211* |
| 20600217* | 20600222* | 20600413* | 20600447 | 20600627 | 20600681 |
| 20600764 | 20600929 | 20600948* | 20601199* | 20601352* | 20601365* |
| 20601421* | 20601659* | 60105902 | 70086733 | 70109918 | 70150858 |

* NRC identified during this inspection.

Radio Coverage Maps
Hope Creek, EL. 54', Operations UHF Radio Coverage
Hope Creek, EL. 77' and 87', Operations UHF Radio Coverage
Hope Creek, EL. 102', Operations UHF Radio Coverage
Hope Creek, EL. 120' and 132', Operations UHF Radio Coverage
Hope Creek, EL. 137' and 146', Operations UHF Radio Coverage
Hope Creek, EL. 153' and 162', Operations UHF Radio Coverage
Hope Creek, EL. 171', 178', and 201', Operations UHF Radio Coverage

Specifications
10855-E-071, Technical Specification for Electro-Sound Powered System for HCGS, Rev. 2

Work Orders
30199524

Industry Standards
NEI 00-01, Guidance for Post-Fire Safe Shutdown Circuit Analysis, Rev. 2

Miscellaneous Documents
EIR 51-9126574-000, Hope Creek Generating Station Safe Shutdown Analysis Report, Rev. 0
Fire Impairment Tracking Report, 3/19/13
HCGS Fire Protection Impairment Log, 3/19/13
LR-N13-0031, PSEG Nuclear LLC's Overall Integrated Plan for the Hope Creek Generating Station in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated February 27, 2013

## LIST OF ACRONYMS

| | |
|---|---|
| AC | Alternating Current |
| ADAMS | Agencywide Documents Access and Management System |
| ADS | Automatic Depressurization System |
| BTP | Branch Technical Position |
| CAP | Corrective Action Program |
| CFR | Code of Federal Regulations |
| CMEB | Chemical Engineering Branch |
| $CO_2$ | Carbon Dioxide |
| DC | Direct Current |
| DRP | Division of Reactor Projects |
| DRS | Division of Reactor Safety |
| ECCS | Emergency Core Cooling System |
| ECR | Engineering Change Request |
| EDG | Emergency Diesel Generator |
| Elev. | Elevation |
| FA | Fire Area |
| FHA | Fire Hazards Analysis |
| FPP | Fire Protection Program |
| FSSD | Post-Fire Safe Shutdown |
| FZ | Fire Zone |
| GL | Generic Letter |
| HCGS | Hope Creek Generating Station |
| HPCI | High Pressure Coolant Injection |
| HVAC | Heating, Ventilation, & Air Conditioning |
| I&C | Instrumentation and Control |
| IN | [NRC] Information Notice |
| IMC | [NRC] Inspection Manual Chapter |
| IP | [NRC] Inspection Procedure |
| IPE | Individual Plant Examination |
| IPEEE | Individual Plant Examination of External Events |
| IR | [NRC] Inspection Report |
| kV | kilovolt |
| MSIV | Main Steam Isolation Valve |
| NCV | Non-Cited Violation |
| NEI | Nuclear Energy Institute |
| NFPA | National Fire Protection Association |
| NRC | Nuclear Regulatory Commission |
| NRR | [NRC] Nuclear Reactor Regulation |
| PARS | Publicly Available Records System |
| P&ID | Piping and Instrumentation Drawing |
| PSEG | PSEG Nuclear, LLC |
| RCIC | Reactor Core Isolation Cooling |
| RG | [NRC] Regulatory Guide |
| RHR | Residual Heat Removal |
| RPV | Reactor Pressure Vessel |
| SDP | [NRC] Significance Determination Process |

| | |
|---|---|
| SE | [NRC] Safety Evaluation |
| SER | [NRC] Safety Evaluation Report |
| SRV | Safety Relief Valve |
| TSC | Technical Support Center |
| UFSAR | Updated Final Safety Analysis Report |