March 25, 2002

EA-02-042

Mr. Harold W. Keiser
Chief Nuclear Officer and President
PSEG Nuclear LLC - N09
P. O. Box 236
Hancocks Bridge, NJ 08038

SUBJECT: SALEM NUCLEAR GENERATING STATION - NRC INSPECTION REPORT 50-272/01-12, 50-311/01-12

Dear Mr. Keiser:

On February 9, 2002, the NRC completed an inspection of your Salem 1 & 2 reactor facilities. The enclosed report documents the inspection findings which were discussed on February 20, 2002, with Mr. John Carlin 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 personnel. Specifically, this inspection involved six weeks of resident inspection and a region-based inspection of maintenance rule implementation.

Based on the results of this inspection, the inspectors identified three issues of very low safety significance (Green) which were determined to involve violations of NRC requirements. These findings involved the cylinder outlet isolation valve of an emergency diesel generator, the quality of a post-trip review, and records for maintenance activities performed on a charging pump speed increaser and an emergency diesel generator. However, because of their very low safety significance and because they have been entered into your corrective action program, the NRC is treating these issues as non-cited violations, in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny these non-cited violations, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, 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, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Salem facility.

Immediately following the terrorist attacks on the World Trade Center and the Pentagon, the NRC issued an advisory recommending that nuclear power plant licensees go to the highest level of security, and all promptly did so. With continued uncertainty about the possibility of additional terrorist activities, the Nation's nuclear power plants remain at the highest level of security and the NRC continues to monitor the situation. This advisory was followed by additional advisories, and although the specific actions are not releasable to the public, they generally include increased patrols, augmented security forces and capabilities, additional

security posts, heightened coordination with law enforcement and military authorities, and more limited access of personnel and vehicles to the sites. The NRC has conducted various audits of your response to these advisories and your ability to respond to terrorist attacks with the capabilities of the current design basis threat (DBT). On February 25, 2002, the NRC issued an Order to all nuclear power plant licensees, requiring them to take certain additional interim compensatory measures to address the generalized high-level threat environment. With the issuance of the Order, we will evaluate PSEG Nuclear's compliance with these interim requirements.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Glenn W. Meyer, Chief
Projects Branch 3
Division of Reactor Projects

Enclosure: Inspection Report 50-272/01-12, 50-311/01-12
Attachment: Supplemental Information

Docket No. 50-272; 50-311
License No. DPR-70; DPR-75

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos:	50-272, 50-311
License Nos:	DPR-70, DPR-75
Report No:	50-272/01-12, 50-311/01-12
Licensee:	PSEG Nuclear LLC
Facility:	Salem Nuclear Generating Station, Units 1 & 2
Location:	P.O. Box 236 Hancocks Bridge, NJ 08038
Dates:	December 30, 2001 - February 9, 2002
Inspectors:	Raymond K. Lorson, Senior Resident Inspector Fred L. Bower, Resident Inspector Jimi T. Yerokun, Senior Reactor Engineer Marc Ferdas, Reactor Engineer
Approved By:	Glenn W. Meyer, Chief Projects Branch 3 Division of Reactor Projects

Summary of Findings

IR 05000272-01-12, IR 05000311-01-12, on 12/30/01 - 2/9/02, Public Service Electric Gas Nuclear LLC, Salem Units 1 and 2. Maintenance Risk Assessments and Emergent Work Control, Personnel Performance During Non-routine Plant Evolutions, Post-Maintenance Testing.

The inspection was performed by resident inspectors and regional maintenance rule inspection specialists. This inspection identified three green findings which were non-cited violations. The significance of most findings is indicated by their color Green using IMC 0609 "Significance Determination Process" (SDP). Findings for which the SDP does not apply are indicated by "no color" or by the severity level of the applicable violation. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at http://www.nrc.gov/NRR/OVERSIGHT/index.html.

A. Inspector Identified Findings

Cornerstone: Mitigating Systems

- Green: Operating procedures did not provide adequate guidance to operators during their response to a stuck open pressurizer spray valve event that resulted in an automatic reactor trip and safety injection. The instructions which existed regarding the valve, including stopping reactor coolant pumps and isolating control air, conflicted with actions needed to address the event. However, PSEG Nuclear did not identify the procedural deficiencies during the post-trip review of the event as specified by the post-trip review procedure. The failure to identify and evaluate these procedural deficiencies was a non-cited violation.

  This finding was evaluated using the SDP and determined to be of very low risk significance, because the procedural deficiencies did not prevent the operators from controlling plant pressure during the event. (Section 1R14.1)

- Green: PSEG Nuclear failed to promptly identify and correct a condition adverse to quality involving a degraded cylinder isolation valve (petcock) which was not functioning properly during corrective maintenance on the 2C EDG. During a subsequent test of the 2C EDG, flames were observed to be coming out of the cylinder 5R petcock, and the CO_2 automatic fire suppression system actuated before the operators completed the EDG shutdown. The failure to identify and correct the degraded cylinder isolation valve was considered a non-cited violation of 10 CFR 50, Appendix XVI, Corrective Actions.

  The finding was evaluated using the SDP and considered to be of very low risk significance, because the emergency diesel generator unavailability time associated with this event was within the Technical Specification allowed outage time. (Section 1R19)

- Green: PSEG Nuclear maintenance failed to document and maintain records of emergent troubleshooting and maintenance activities on the control circuitry for the 1B EDG. PSEG Nuclear also failed to maintain records of a September 2000 internal inspection of the 12 charging pump speed increaser. These two examples of PSEG Nuclear's failure to maintain complete and adequate inspection and maintenance records were a non-cited violation of Technical Specification (TS) 6.10.1.b and 10 CFR 50, Appendix B, Criterion XVII, Quality Assurance Records.

  The findings were evaluated using the significance determination process (SDP) and considered to be of very low risk significance because the failure to maintain the records did not affect the availability of the mitigating systems. (Section 1R13)

Report Details

SUMMARY OF PLANT STATUS

Unit 1 operated at essentially full power for the duration of the period.

Unit 2 began the period at full power. On December 31, 2001, the unit automatically tripped in response to a failed open pressurizer spray valve (Section R14). The unit was restarted on January 2, 2002, and was returned to full power on January 3, 2002. On January 11 a Technical Specification (TS) required shutdown was initiated when the 2A emergency diesel generator could not be restored to an operable status within the TS allowed outage time following planned maintenance (Section R13). The unit was restarted on January 14, 2002, and was returned to full power on January 16, 2002. On January 24 power was rapidly reduced to 29 percent in response to a main turbine stop valve failing closed. The unit was returned to full power on January 25 following repairs to the main turbine stop valve hydraulic controls. The unit operated at essentially full power for the duration of the period.

1. REACTOR SAFETY

Initiating Events, Mitigating Systems, and Barrier Integrity [Reactor - R]

R04 Equipment Alignment

a. Inspection Scope

On February 1 and 2, 2002, the inspectors performed a walkdown of the 21 chemical and volume control (CVC) charging pump during a 22 CVC pump outage. (The 22 CVC pump had been removed from service due to overheating of the speed increaser. This problem resulted from a failure of the speed increaser lubricating oil pump drive pins (Sections R12 and R13).) The inspectors verified that the 21 CVC pump was protected. The inspectors also observed the 21 CVC pump during operation and reviewed key operating parameters. Additionally, the inspectors reviewed available maintenance records and procedures to evaluate the potential for a similar type of failure to the 11, 12, and/or 21 CVC pump speed increasers.

b. Findings

No findings of significance relative to ensuring reliable operation of the 21 CVC pump were identified. A finding for the failure to maintain a maintenance record for the 12 CVC pump speed increaser is discussed in Section R13.

R05 Fire Protection

a. Inspection Scope

The inspectors toured the following risk-significant plant areas to assess PSEG Nuclear's control of combustible materials and ignition sources, the material condition of fire detection and suppression equipment, and the operational status of fire barriers.

They verified on a sampling basis that fire impairments were documented and that adequate compensatory measures were in place. The following areas were reviewed:

- Unit 2 Safety-Related Relay Room
- 2A and 2B Battery Rooms
- Unit 2 Chiller Room

b. Findings

No findings of significance were identified.

R11 Licensed Operator Requalification

a. Inspection Scope

On February 2, 2002, the inspectors observed licensed operator requalification simulator scenarios to assess operator performance and evaluators' critiques. The scenarios involved abnormal conditions during full power operations, the loss of heat sink and restoration of feed flow, and control room response to a security event. The inspectors observed the operating crew perform the following emergency operating procedures (EOP) and functional recovery procedures (FRP): EOP-TRIP-1, "Reactor Trip or Safety Injection," EOP-Trip-2, "Reactor Trip Response," and EOP-FRHS-1, "Response to Loss of Secondary Heat Sink." Following the simulator exercise, the inspectors reviewed minor issues observed with the scenario evaluators and reviewed the training instructors' critique of the scenario to ensure that these items were included. The inspector observed that the Salem operator training supervisor was present to provide oversight and a PSEG Nuclear security technical analyst was present to support the security event training.

b. Findings

No findings of significance were identified.

R12 Maintenance Rule Implementation

.1 Biennial Inspection

a. Inspection Scope

The inspectors reviewed maintenance rule (MR) documentation to assess: (1) the scoping and classification of structures, systems, and components (SSC) in accordance with 10 CFR 50.65; (2) the appropriateness of performance criteria for SSCs classified as 10 CFR 50.65(a)(2); (3) the goals and corrective actions for SSCs classified as 10 CFR 50.65(a)(1); and, (4) the characterization and corrective actions for failed SSCs. The inspectors reviewed performance-based problems involving in-scope SSCs to assess the effectiveness of the maintenance rule program and reviewed the coding of system failures in the corrective action program to independently assess the adequacy of the MR implementation for the selected risk-significant items. The inspectors also reviewed system health reports and PSEG Nuclear's action plans to improve system

reliability. The inspectors interviewed system performance engineers and maintenance rule personnel.

The inspectors reviewed selected 10 CFR 50.65(a)(1) high risk significant systems to determine if: (1) goals and performance criteria were appropriate; (2) industry operating experience was considered; (3) corrective action plans were in place; and, (4) performance was being effectively monitored. In this area, the inspector reviewed the following systems:

- Service water system
- 4 KV electrical system
- Containment building ventilation system
- Chilled water system

The inspectors reviewed selected 10 CFR 50.65(a)(2) high risk significant systems, to verify that performance was acceptable. In this area, the inspectors reviewed the following systems:

- Residual heat removal system
- Switchgear ventilation system

The inspectors reviewed the periodic evaluation required by 10 CFR50.65 (a)(3) to verify that the SSCs within the scope of the maintenance rule were included in the evaluation and that the balancing of reliability and unavailability was given adequate consideration. The inspector reviewed PSEG Nuclear's latest periodic evaluation, 2001 Periodic Maintenance Effectiveness Assessment Report (Order 80028267), November 11, 1999 through August 8, 2001.

The inspector reviewed selected items in the corrective action program to verify that PSEG Nuclear was identifying issues related to the maintenance rule at an appropriate threshold, entering them in the corrective action program, and prescribing appropriate corrective actions. The notifications and condition reports reviewed are listed in the supplemental information attached to this report.

b. Findings

No findings of significance were identified. (One finding relative to the implementation of 10 CFR50.65 (a)(3) is detailed in Section R12.2.)

.2 22 Charging Pump

a. Inspection Scope

The inspectors reviewed the effectiveness of performance and condition monitoring, and maintenance activities performed to ensure reliable operation of the 22 CVC pump. The pump failed during operation on February 1, 2002, due to overheating of the speed increaser. The speed increaser problem was caused by failure of the coupling drive pins on the attached lubricating oil pump. The inspectors reviewed applicable 22 CVC pump documentation including: in-service test records, lubricating oil and vibration

analysis reports, corrective and preventive maintenance history records, corrective action reports, operating experience, vendor documentation, recent system health reports, and system reliability and unavailability data to determine whether PSEG Nuclear effectively controlled the performance of the 22 CVC pump though the performance of appropriate preventive maintenance.

b. Findings

The inspectors determined that PSEG Nuclear failed to adequately evaluate preventive maintenance (PM) activities for the 22 CVC pump, taking into account industry-wide operating experience, to ensure that the objective of preventing failure of the 22 CVC pump through maintenance was appropriately balanced against the objective of minimizing unavailability due to monitoring or preventive maintenance as required by 10 CFR 50.65 (a)(3). PSEG Nuclear's inadequately justified deferral of established preventive maintenance on the 22 CVC pump speed changer, previously recognized as necessary to prevent its failure and to minimize the unavailability of the pump, resulted in the subsequent failure of the pump. This constituted failure to balance the goal of maximizing reliability through preventive maintenance against the goal of minimizing unavailability due to preventive maintenance and is therefore a violation of 10 CFR 50.65(a)(3). This issue will remain unresolved pending completion of the risk assessment.

The CVC pump speed increaser lubricating oil pump, which is attached to and driven off of the speed increaser, circulates oil to cool and lubricate the speed increaser bearings and gear teeth. The lubricating oil pump is coupled to the speed increaser through two cylindrical pins and coupling holes. The pins and coupling holes are subject to wear during normal operation. Westinghouse issued technical bulletin (NSID-TB-85-19) on September 24, 1985, to document two speed increaser failure events caused by failure of the coupling pins. Bulletin NSID-TB-85-19 recommended that the coupling pins and holes be inspected every refueling outage to identify and correct abnormal wear conditions. PSEG Nuclear developed procedure, SC.MD-PM.CVC-0001(Q), "Centrifugal Charging Pump High Speed Gear Oil Pump Coupling Inspection," to perform this preventive maintenance activity.

The current 22 CVC pump speed increaser had been installed on September 18, 1996. The inspectors reviewed plant maintenance records and determined that the recommended preventive maintenance activity (i.e., SC.MD-PM.CVC-0001(Q)) to inspect and/or repair the lubricating oil pump coupling pins and holes had not been performed between the installation of the 22 CVC speed increaser and its failure in February 2002 (approximately 64 months). In August 2001 component engineering (Order 80032271) approved deferral of the SC.MD-PM.CVC-0001(Q) preventive maintenance activity on the 22 CVC pump from November 2001 to April 2003. The component engineer based this deferral on the apparent good operating condition of the pump. This deferral was inappropriate since degradation of the lubricating oil pump coupling drive pins would not likely affect any of the monitored CVC pump parameters. Additionally, the evaluation did not apparently address the extended period of time since the last performance of SC.MD-PM.CVC-0001(Q), the operating experience recommendation to perform this PM on an approximate eighteen month periodicity, or the site maintenance history involving wear of these pins.

The deferral also assumed that the pump was in a good operating condition but did not apparently consider an August 2001 notification (20083003) that had been generated to document oxidation of the lubricating oil in the 22 CVC pump speed increaser (discussed in NRC Inspection Report 2001-10). In November 2001 Notification 20083003 was updated to indicate that overheating of the lubricating oil was the most likely cause for the oxidation problem and that the oil pump and cooler should be considered as potential contributors to this problem. PSEG Nuclear generated Order 70021007 for the component engineering staff to perform a Level 2 evaluation to determine the cause for the oil oxidation problem.

Engineering reviewed the historical data for the 22 CVC pump bearing temperatures and noted that these temperatures had never exceeded 190°F. Based on this information, engineering personnel improperly concluded that the speed increaser lubricating oil had not oxidized due to an overheating event. This conclusion was incorrect since the CVC speed increaser and pump lubricating oil systems are separate and independent. The speed increaser lubricating oil temperature instruments provide local indication only and are not electronically recorded. Based on the erroneous conclusion discussed above, PSEG Nuclear elected not to perform any additional actions to investigate the performance of the speed increaser lubricating oil system components.

While investigating the 22 CVC pump speed increaser overheating event, PSEG Nuclear determined that the lubricating oil pump coupling drive pins' failure resulted in the overheating and failure of the speed increaser. These drive pins appeared to have been significantly degraded for an extended period of time. The inspectors concluded that the degraded pins could have been identified by a more rigorous investigation into the cause for the oxidized oil condition. PSEG Nuclear initiated Notification 20090923 to document that the initial engineering evaluation for the oxidized oil condition was most likely incorrect and to reinvestigate the cause for the oxidized oil condition during the Significance Level I investigation into the 22 CVC pump speed increaser failure.

In summary, in November 2001 PSEG Nuclear deferred Order 30023804 to perform SC.MD-PM.CVC-0001(Q) on the 22 CVC pump based on the engineering review completed under Order 80032271. Order 30023804 documented that the deferral was necessary since the speed changer inspection activity was intrusive and would be difficult to complete within the TS allotted out of service time. The inspectors determined that the 22 CVC pump failure on February 1, 2002, would likely have been prevented through proper performance of the SC.MD-PM.CVC-0001(Q) procedure in November 2001.

Title 10, Part 50.65 (a)(3) requires that preventive maintenance activities shall be evaluated at least every refueling cycle, and these evaluations shall take into account, where practical, industry-wide operating experience. Adjustments shall be made where necessary to ensure that the objective of preventing failures of components through maintenance is appropriately balanced against the objective of minimizing unavailability of systems, and components due to monitoring or preventive maintenance. Contrary to the above, PSEG Nuclear failed to adequately evaluate preventive maintenance activities and industry-wide operating experience, and did not adequately balance the objective of preventing failures of components through maintenance against the

objective of minimizing unavailability of the 22 CVC pump. Specifically, operating experience documented previous failures of the CVC pump speed increaser due to wear induced failures of the lubricating oil pump drive pins that could be prevented through performance of appropriate preventive maintenance. PSEG Nuclear developed the recommended PM activity but failed to implement the PM within an appropriate time period to prevent failure of the 22 CVC pump. This represented a violation of 10 CFR 50.65 (a)(3).

The failure to adequately balance preventive maintenance and unavailability for the 22 CVC pump though the timely performance of appropriate preventive maintenance was evaluated using the significance determination process (SDP). The finding was determined to have a credible impact on safety, since it resulted in extended operation of the 22 CVC pump with the speed increaser lubricating oil pump drive coupling in a significantly degraded condition that ultimately resulted in failure of the speed increaser. The risk of this event was evaluated by the inspectors and the Region I Senior Reactor Analyst and determined to be dependent on the 22 CVC pump fault exposure time. The risk assessment was not completed prior to the end of the period. Therefore, this finding will remain unresolved pending determination of the 22 CVC pump fault exposure time and completion of the risk assessment **(URI 50-311/01-12-01)**.

R13 Maintenance Risk Assessments and Emergent Work Control

.1 2A, and 1B Emergency Diesel Generators

a. Inspection Scope

The inspectors reviewed emergent maintenance activities associated with the emergency diesel generators (EDGs) listed below. These activities were selected for inspection because additional unavailability time was incurred for the EDGs as PSEG Nuclear performed troubleshooting during these emergent maintenance activities that occurred during the restoration process following planned and scheduled preventive maintenance. The inspectors verified that PSEG Nuclear implemented appropriate actions to manage the risk associated with these outages and to return the EDGs to service.

- 2A EDG: During post-maintenance testing following planned and scheduled maintenance, the 2A EDG output was oscillating unexpectedly. In accordance with SH.OP-AP.ZZ-0101(Q), “Post-Transient Response Requirements,” the Operations Superintendent (OS) initiated a Transient Assessment Response Plan (TARP) Team (Notification 20088423) to resolve the problem. The voltage regulator card in the generator exciter cabinet was replaced following TS required shutdown of Unit 2 and completion of troubleshooting in accordance with SH.MD-AP.ZZ-0002(Q), “Maintenance Department Troubleshooting and Repair” (Order 60020925).

- 1B EDG: During post-maintenance testing following planned and scheduled maintenance, the 1B EDG speed control did not respond as expected. The OS initiated a TARP Team (Notification 20089044) to resolve the problem. PSEG

Nuclear attributed the 1B EDG control problem to an open circuit caused by the improper makeup of an electrical plug located inside the 1B EDG exciter cabinet potential transformer drawer that resulted in an open circuit. The inspectors verified that the troubleshooting, repair and post-maintenance test activities were completed within 61 of the 72 hours allowed by TSs. Order 60025587 was the referenced work document.

b. Findings

The inspectors determined that PSEG Nuclear failed to maintain complete and adequate records of inspections and maintenance performed on the 1B EDG control circuitry in violation of TS 6.10.1.b and 10 CFR 50, Appendix B, Criterion XVII, Quality Assurance Records. This finding was evaluated and determined to be of very low risk significance (Green), because it did not directly affect the operation of a mitigating system. The failure to maintain the required 1B EDG maintenance and inspection records was a non-cited violation.

On January 16, 2002, following planned and scheduled maintenance, the post-maintenance testing of the 1B EDG was terminated when alarms were received in the control room and the EDG did not reach normal speed. PSEG Nuclear personnel initiated a TARP Team, implemented procedure SH.SE-DG.ZZ-0003(Z), "Technical Issues Resolution," and developed an outline for a troubleshooting plan in parallel with maintenance personnel inspecting the 1B EDG control circuitry problem. The troubleshooting plan outline developed by the TARP Team specified instructions for installing temporary instruments in the 1EDG control circuitry, for operating the 1B EDG, and inspecting and recording operating parameters during an unloaded troubleshooting run of the 1B EDG. Maintenance personnel identified and replaced a faulty secondary auxiliary coupling on the primary potential transformer fuse drawer.

Nonetheless, procedure SH.MD-AP.ZZ-0002(Q), "Maintenance Department Troubleshooting and Repair" specifies that a troubleshooting plan be written, reviewed, and approved, and that inspections, evaluations, and replacements performed under the troubleshooting plan be documented within the plan. After the fact the inspectors could not determine whether a separate troubleshooting plan existed but was not retained, or whether a separate troubleshooting never existed. Regardless, there was no record of a troubleshooting plan in accordance with SH.MD-AP.ZZ-0002(Q). All that remained was the TARP's troubleshooting outline.

TS 6.10.1.b requires that records and logs of principal maintenance activities, inspections, repair and replacement of principal items of equipment related to nuclear safety be retained for at least five years. Title 10, Part 50, Appendix B, Criterion XVII, Quality Assurance Records, requires sufficient records be maintained to furnish evidence of activities affecting quality. Inspection and test records shall identify the inspector or data recorder, the type of observation, the results, the acceptability, and the action taken in connection with any deficiencies noted.

Contrary to the above, PSEG Nuclear failed to maintain complete and adequate records of inspection and maintenance activities performed on the 1B EDG control circuitry in violation of TS 6.10.1.b and 10 CFR 50, Appendix B, Criterion XVII, Quality Assurance

Records. This finding is an enforcement item that requires documentation because it has the potential to impact the NRC's ability to perform its regulatory function, in that, quality records required to evaluate and assess safety-related activities were not were not adequately maintained. This finding was considered to be of very low safety significance (Green) since it did not result in any mitigating system problems. This very low risk violation has been entered in the corrective action program (Notification 20091973) and is being treated as a non-cited violation consistent with the NRC's Enforcement Policy **(NCV 50-272 and 50-311/01-12-02)**.

.2 22 Charging Pump

a. Inspection Scope

On February 1, 2002, the operators were required to shutdown the 22 CVC pump when the speed increaser overheated and experienced significant damage The inspectors reviewed the emergent maintenance activities associated with troubleshooting and replacement of the failed 22 CVC speed increaser and reviewed the actions to mitigate the plant risk while the 22 CVC pump was inoperable. Some of the actions taken to manage the plant risk in this condition included: protection of redundant equipment and development of operator guidance for shutting down the plant in the event that the redundant 21 CVC pump failed (the 23 CVC positive displacement pump had been out of service for an extended period of time and was not available to mitigate the risk for this event). The inspectors also reviewed applicable orders and maintenance procedures including:

- Order 60025940, 22 Charging Pump Speed Increaser
- Order 60026024, 23 Reciprocating Charging Pump
- Maintenance Procedure SC.MD-PM.ZZ-0018(Q), AC Motor Cleaning Inspection
- Maintenance Procedure SH.MD-GP.ZZ-0011(Q), Meggering of Rotating Electrical Equipment

Additionally, the inspectors reviewed available maintenance records and procedures to evaluate the potential for a similar type of failure to the 11, 12, and/or 21 CVC pump speed increasers.

b. Findings

The inspectors determined that PSEG Nuclear failed to maintain the records for a September 2000 internal inspection of the 12 CVC pump speed increaser as required by TS 6.10.1.b. This finding was evaluated and determined to be of very low risk significance (Green) since it did not directly affect the operation of a mitigation system. The failure to maintain the required speed increaser inspection record was considered the second example of a non-cited violation.

Maintenance procedure, SC.MD-PM.CVC-0001(Q), "Centrifugal Charging Pump High Speed Gear Oil Pump Coupling Inspection," was developed to periodically inspect the condition of the CVC pump speed increaser attached lubricating oil pump coupling drive pins to ensure reliable operation of the lubricating oil pump. The inspectors reviewed the maintenance history for the 11, 12, and 21 CVC pumps and noted that the 11 CVC pump speed increaser had been recently replaced and also that the 12 and 21 CVC pump speed increasers' lubricating oil pumps had been previously inspected within the vendor recommended periodicity (i.e., 12 CVC pump was inspected in September 2000 under Order 30023802 while the 21 CVC pump was inspected under Order 30023803 in January 2001). The inspectors reviewed the SC.MD-PM.CVC-0001 (Q) inspection data for the 21 CVC pump but were unable to locate this data for the 12 CVC pump. PSEG Nuclear document services and maintenance department personnel conducted a search but were unable to locate the missing record. As a result, the inspectors were not able to review the results from the last 12 CVC pump speed increaser lubricating oil pump coupling and drive pin inspection.

TS 6.10.1.b, requires that records and logs of inspections of nuclear safety equipment be retained for five years. Contrary to the above, PSEG Nuclear was unable to retrieve the record of the 21 CVC pump speed increaser September 2000 inspection. This was considered a non-cited violation of TS 6.10.1.b.

This finding is an enforcement item that required documentation because it had the potential to impact the NRC's ability to perform its regulatory function, in that, quality records required to evaluate and assess safety-related activities were not adequately maintained. The loss of these records could preclude PSEG Nuclear from being able to take appropriate action on safety-related matters; or to properly assess, audit, or otherwise evaluate its safety-related activities. However, this finding is considered to be of very low safety significance (Green) since it did not directly affect the performance of any mitigating system. This very low risk significance violation has been entered into PSEG Nuclear's corrective action program (Notification 20091973) and is being treated as the second example of a records non-cited violation consistent with the NRC's enforcement policy **(NCV 50-272 and 50-311/01-12-02)**.

R14 Personnel Performance During Nonroutine Plant Evolutions

.1 Pressurizer Spray Valve Failure, Reactor Trip and Safety Injection Event

a. Inspection Scope

The inspectors reviewed PSEG Nuclear's response to a December 31, 2001, event involving the failure of the pressurizer spray valve (PS-3) to a full open position. This failure led to an automatic reactor trip and safety injection. The inspectors reviewed plant process data, sequence of events data, EOP and abnormal operating procedures (AOPs), and post-trip and TARP assessment reports and procedures, and interviewed operations and management personnel to evaluate PSEG Nuclear's response to this event.

b. Findings

The inspectors determined that operating procedures did not provide adequate guidance to operators during their response to a stuck open pressurizer spray valve event that resulted in an automatic reactor trip and safety injection. The instructions which existed regarding the valve, including stopping reactor coolant pumps and isolating control air, conflicted with actions needed to address the event. However, PSEG Nuclear did not identify the procedural deficiencies during the post-trip review of the event as specified by the post-trip review procedure. The failure to identify and evaluate these procedural deficiencies was a non-cited violation of the Technical Specification 6.8.1 requirement to establish adequate procedures for recovery from a reactor trip.

The PS3 valve failure occurred due to a broken mechanical feedback linkage that caused the spray valve to fail to the full open position when control air was applied to the valve operator. The operators initially responded to this event per AOP, S2.OP-AB.PZR-0001(Q), "Pressurizer Pressure Malfunction," and attempted to shut the PS3 valve but it would not respond. Shortly thereafter, an automatic reactor trip occurred followed by an automatic safety injection. The operators entered procedure, 2-EOP-TRIP-1, "Reactor Trip or Safety Injection." The operators then secured the 23 reactor coolant pump (RCP) per the AOP guidance for a stuck open PS3 valve. The operators completed the necessary actions in 2-EOP-TRIP-1 and transitioned to 2-EOP-TRIP-3, SI Termination.

During the restoration from the safety injection, operators opened both containment control air isolation valves (21 and 22 CA330) in accordance with 2-EOP-TRIP-3. Opening the CA330 valves caused PS3 to re-open and re-initiated a decreasing pressure transient. The operators subsequently cycled the CA330 valves additional times to control plant pressure and secured the 22 and 21 RCPs to stabilize plant pressure. While the operators were successful at mitigating the plant pressure transient, neither of these actions (i.e., cycling of the CA330 valves nor the securing of the 22 and 21 RCPs) were specified in the AOP and EOPs described above.

The post-trip review was completed and the results were presented to the Station Operations Review Committee (SORC) without identifying that the operators were

required to implement some actions not specified in the AOP and EOPs. This did not meet the post-trip review requirements of procedure SH.OP-AP.ZZ-0101(Q), "Post-Transient Response Requirements."

TS 6.8.1.a requires that procedures be developed and implemented in accordance with Regulatory Guide 1.33, including procedures for recovery from a reactor trip. Operations procedure, SH.OP-AP.ZZ-0101(Q), was developed to provide the necessary actions to recover from a plant trip. This procedure requires that plant trip reviews be conducted to verify that operator performance is consistent with EOPs/AOPs and to identify any necessary procedural changes. Contrary to the above, the post-trip review failed to adequately evaluate equipment actions during the event and identify procedural deficiencies. This is a violation of TS 6.8.1.a.

The failure to perform a proper post-trip review was considered to have a credible impact on safety since it could allow a plant re-start to occur without the appropriate resolution of significant issues. The failure to identify procedural deficiencies that affected the ability to respond to a spray valve failure event was evaluated using the SDP. The issue was determined to be of very low risk (Green), because the finding did not result in the loss of function of any mitigating system and the operators were able to operate mitigating systems to respond to this event. This very low risk significance violation has been entered into PSEG Nuclear's corrective action program (Notifications 20087747 and 20090818) and is being treated as a non-cited violation consistent with the NRC enforcement policy **(NCV 50-311/01-12-03).**

.2 Start-up from Unit 2 Forced Outage

a. Inspection Scope

The inspectors observed selected portions of the reactor start-up planning, preparations and pre-briefing on January 14 following the TS required Unit 2 shutdown and forced outage that began on January 11. The inspectors also observed selected portions of the power escalation in accordance with S1.OP-IO.ZZ-0003(Q), Hot Standby to Minimum Load, on January 15, 2002.

b. Findings

No findings of significance were identified.

R15 Operability Evaluations

a. Inspection Scope

The inspectors reviewed selected condition report operability determinations (CRODs) affecting risk significant mitigating systems to assess: (1) technical adequacy of the evaluations; (2) whether continued system operability was warranted; (3) whether other existing degraded conditions were appropriately addressed with respect to their collective impact on continued safe plant operation; and (4) where compensatory measures were involved, whether the measures were in place, would work as intended,

and were appropriately controlled. Procedure SH.OP-AP.ZZ-0108(Q), Operability Assessment and Equipment Control Program, was used as a reference during the review of the CRODs. When appropriate, selected portions of Station Operations Review Committee meetings that reviewed the CRODs were observed. The following evaluations were reviewed:

- CROD 02-001, 21 Accumulator Isolation Valve SJ54 (Order 70022441)

b. Findings

No findings of significance were identified.

R19 Post Maintenance Testing

a. Inspection Scope

The inspectors observed the performance of post maintenance testing or reviewed documentation for selected risk-significant SSCs to assess whether the SSCs satisfied TSs, Updated Final Safety Analysis Report, and PSEG Nuclear procedural requirements. The inspectors assessed whether the testing appropriately demonstrated that the SSCs were operationally ready and capable of performing their intended safety functions. The following test activities were reviewed:

- Post-maintenance testing and tuning of a replacement voltage regulator card for the 2A EDG in accordance with procedure SC.MD-CM.DG-0012(Q), Diesel Generator Voltage Regulator Adjustment.

- Post-maintenance testing of the 2C EDG on January 24, 2002, that resulted in an automatic actuation of the 2C EDG room CO_2 fire suppression system.

- Post-maintenance testing of the 22 CVC pump on February 2, 2002, following replacement of the speed increaser.

b. Findings

The inspectors determined that PSEG Nuclear failed to promptly identify and correct a condition adverse to quality involving a degraded cylinder isolation valve on the 2C EDG. During a loaded run of the 2C EDG, flames were observed to be coming out of the number 5R cylinder petcock, and the CO_2 automatic fire suppression system actuated before the operators completed the EDG shutdown. This finding was evaluated using the significance determination process and found to be of very low risk significance (Green). This finding was considered a non-cited violation.

While performing a maintenance activity involving the barring and lubricating of the 2C EDG, a technician noted that the cylinder 5R isolation valve (petcock) was difficult to operate. Although this problem was later discussed at the pre-brief for the 2C EDG post-maintenance test run, no actions were implemented to correct the problem. The 2C EDG was subsequently started for the post-maintenance test, and an abnormal noise was noted from cylinder 5R. An unsuccessful attempt was made to shut the

petcock and the EDG was loaded. Subsequently, flames were observed to be coming out of this petcock. Operators began shutting down the 2C EDG, however, the CO_2 automatic fire suppression system actuated before the operators completed the EDG shutdown.

PSEG Nuclear initiated a TARP Team and drafted Notification 20089841 to investigate this event. PSEG Nuclear's initial corrective actions included personnel interviews, replacement of the degraded petcock valve and retesting of the 2C EDG. The inspectors noted a human performance cross-cutting issue, in that, PSEG Nuclear personnel missed three opportunities ((1) when the petcock was difficult to operate during the barring operation; (2) during the pre-brief for the EDG test; and, (3) during the unloaded portion of the test run) to identify and correct the degraded cylinder vent (petcock) valve.

Title 10, Part 50, Appendix B, Criterion XVI, Corrective Action, requires that conditions adverse to quality be promptly identified and corrected. Contrary to the above, PSEG Nuclear failed to promptly identify and correct a degraded 2C EDG cylinder vent valve. This is a violation of 10 CFR 50, Appendix B, Criterion XVI.

This event was considered to have a credible impact on safety since the failure to implement prompt corrective actions for the degraded petcock led to an operating problem that increased the unavailability of the EDG. The finding was evaluated using the SDP process and considered to be of very low risk (Green) since the increase in the 2C EDG unavailability time was short and the repairs were completed within the TS allowed outage time. This very low risk violation has been entered into PSEG Nuclear's corrective action program (Notification 20089888) and is being treated as a non-cited violation consistent with the NRC Enforcement Policy. **(NCV 50-311/01-12-04)**

R22 Surveillance Testing

a. Inspection Scope

The inspectors observed the performance of surveillance test procedures or reviewed test data of selected risk-significant SSCs to assess whether the SSCs satisfied Technical Specifications, Updated Final Safety Analysis Report, and PSEG Nuclear procedure requirements. The inspectors assessed whether the testing appropriately demonstrated that the SSCs were operationally ready and capable of performing their intended safety functions. The following tests were reviewed:

- S2.OP-ST.SJ-0020(Q) Periodic Leakage Test, RCS Pressure Isolation Valves, Mode 4 (3 test records).
- S2.OP-ST.DG-0001(Q) 2A Diesel Generator Surveillance Test (5 test records)
- S1.OP-ST.DG-0002(Q) 1B Diesel Generator Surveillance Test

b. Findings

No findings of significance were identified.

Cornerstone: Emergency Preparedness [EP]

EP6 Drill Evaluation

a. Inspection Scope

The inspectors reviewed selected portions of a training drill conducted on January 10, 2002. The training drill included participants from the States of Delaware and New Jersey. The drill scenario simulated plant damage from a tornado, a reactor coolant system (RCS) leak and a containment breech. The scenario involved the escalation of event classifications up through a General Emergency. The inspectors observed the activities in the Salem control room simulator and at the Emergency Operations Facility (EOF) at the PSEG Nuclear Training Center. The inspectors reviewed several key aspects of the drill, including event classification, notification, facility activation, accountability and emergency response organization staff response to verify that NRC and PSEG Nuclear emergency procedure requirements were met. Additionally, the inspectors reviewed the results of PSEG Nuclear's drill critique report to determine whether drill problems were identified for correction.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES [OA]

OA2 Identification and Resolution of Problems

.1 Pressurizer Spray Valve Failure, Reactor Trip and Safety Injection Event

Section 1R14.1 described a problem identification issue related to PSEG Nuclear's Transient Assessment Response Plan and the Post-Trip Review teams failure to identify and evaluate operators' deviation from established procedures during their response to a stuck open pressurizer spray valve, a safety injection and automatic reactor trip of Unit 2 on December 31, 2001.

.2 2C Emergency Diesel Generator

Section 1R19 described a problem identification and resolution issue related to PSEG Nuclear's failure to correct a condition adverse to quality involving a degraded cylinder isolation valve on the 2C EDG. During a loaded run of the 2C EDG, flames were observed to be coming out of the cylinder 5R petcock. The CO_2 automatic fire suppression system actuated before the operators completed the EDG shutdown.

.3 22 Charging Pump

Section 1R12 described a problem identification and resolution issue related to PSEG Nuclear's failure to properly evaluate a condition adverse to quality involving an oxidized oil condition on the 22 charging system (CVC) pump. PSEG Nuclear initiated

Notification 20090923 to document that the initial engineering evaluation for the oxidized oil condition was most likely incorrect and to reinvestigate the cause for the oxidized oil condition during the Significance Level I investigation into the 22 CVC pump speed increaser failure.

OA3 Event Follow-up

.1 Pressurizer Spray Valve Failure, Reactor Trip and Safety Injection Event

Section 1R14.1 describes the circumstances and actions regarding the pressurizer spray valve failure, automatic reactor trip and safety injection event on December 31, 2001.

OA4 Cross-cutting Issues

.1 2C Emergency Diesel Generator

Section 1R19 describes the circumstances of a loaded run of the 2C EDG where flames were observed coming out of the cylinder 5R petcock and the CO_2 automatic fire suppression system actuated before the operators completed the EDG shutdown. A human performance issue was identified, in that, PSEG Nuclear personnel missed three opportunities ((1) when the petcock was difficult to operate during the barring operation; (2) during the pre-brief for the EDG test; and, (3) during the unload portion of the test run) to identify and correct the degraded cylinder vent (petcock) valve.

OA6 Management Meetings

1. Exit Meeting Summary

On February 20, 2002, the inspectors presented their overall findings to members of PSEG Nuclear management led by Mr. John Carlin of Reliability Engineering. PSEG Nuclear management stated that none of the information reviewed by the inspectors was considered proprietary.

ATTACHMENT
SUPPLEMENTAL INFORMATION

a. Key Points of Contact

D. Boyle, Maintenance Rule Engineer
J. Carlin, Vice-President - Reliability Engineering
M. Conroy, Maintenance Rule Engineer
K. Davison, Salem Operations Manager
D Garchow, Vice-President - Operations
G. Salamon, Licensing Manager
L. Waldinger, Director - Site Operations

b. List of Items Opened, Closed, and Discussed

Opened

50-311/01-12-01	URI	PSEG Nuclear, failed to adequately evaluate preventive maintenance activities and industry-wide operating experience and did not adequately balance the objective of preventing failures of components through maintenance against the objective of minimizing unavailability of the 22 CVC pump as required by 10 CFR 50.65 (a)(3). (Section R12.2)

Opened/Closed

50-272 & 311/01-12-02	NCV	Failure to document and maintain quality records of emergent troubleshooting and maintenance activities on the control circuitry for the 1B EDG and failure to retrieve the quality records of a September 2000 21 CVC pump speed increaser inspection. (Sections R13.1 & R13.2)
50-311/01-12-03	NCV	Failure to follow procedures and perform an adequate post-trip review following the pressurizer spray valve failure, reactor trip and safety injection event. (Section R14.1)
50-311/01-12-04	NCV	Failure to implement prompt corrective actions for a degraded 2C EDG cylinder isolation valve. (Section 1R19)

c. List of Documents Reviewed

In addition to the documents identified in the body of this report, the inspectors reviewed the following documents and records:

Procedures

NC.NA-AP.ZZ-0016(Q) - Rev 5, Monitoring the Effectiveness of maintenance
NC.NA-AP.ZZ-0054(Q), Rev 6, Operating Experience (OE) Program
SH.ER-DG.ZZ.0002(Z), Rev 0, Maintenance Rule (a)(1) Evaluations and Goal Monitoring

Reports

System Health Report, 4KV AC System, Salem Unit 1, 7/1/01 to 10/31/01
System Health Report, 4KV AC System, Salem Unit 2, 7/1/01 to 10/31/01
System Health Report, Containment Building Ventilation, Salem Unit 1, 7/01/01 - 9/30/01
System Health Report, Containment Building Ventilation, Salem Unit 2, 7/01/01 - 9/30/01
System Health Report, Chilled Water, Salem Unit 1, 10/01/01 - 12/31/01
System Health Report, Chilled Water, Salem Unit 2, 4/01/01 - 9/30/01
System Health Report, Control Are Ventilation, Salem Unit 1, 1/01/01 - 6/30/01
System Health Report, Control Are Ventilation, Salem Unit 2, 1/01/01 - 6/30/01
System Health Report, RHR, Salem Unit 1, 7/01/01 - 7/31/01
System Health Report, RHR, Salem Unit 2, 7/01/01 - 7/31/01
System Health Report, Service Water, Salem Unit 1, 4/01/01 - 8/31/01
System Health Report, Service Water, Salem Unit 2, 4/01/01 - 8/31/01

Notifications, Orders and Condition Reports (CR)

Notifications:	20088387	20088453	20088231	20088232	20088386
	20087920	20075453	20075455	20075384	20077196
	20076884	20076881			
Orders:	70022301	70001085	70019771	70018678	70010994
	70017166	70019363	70002253	70020697	70005084
	70005084	80028267	80011114		

CR 980921191

Miscellaneous

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d. List of Acronyms

AOP	Abnormal Operating Procedures
CR	Condition Report
CROD	Condition Report Operability Determination
CVC	Chemical and Volume Control

EDG	Emergency Diesel Generator
EOF	Emergency Operations Facility
EOP	Emergency Operating Procedure
FRP	Functional Recovery Procedure
MR	Maintenance Rule
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
OS	Operations Superintendent
PARS	Publicly Available Records
PM	Preventive Maintenance
PSEG	Public Service Electric Gas
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
SDP	Significance Determination Process
SORC	Station Operations Review Committee
SSC	Structures, Systems and Components
TARP	Transient Assessment Response Plan
TS	Technical Specification
URI	Unresolved Item