

U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-272/94-31
50-311/94-31

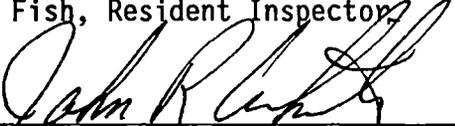
License Nos. DPR-70
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Licensee: Public Service Electric and Gas Company
P.O. Box 236
Hancocks Bridge, New Jersey 08038

Facility: Salem Nuclear Generating Station

Dates: November 6, 1994 - December 17, 1994

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1/17/95
Date

Inspection Summary:

This inspection report documents inspections to assure public health and safety during day and back shift hours of station activities, including: operations, radiological controls, maintenance, surveillances, security, engineering, technical support, safety assessment and quality verification. The Executive Summary delineates the inspection findings and conclusions.

EXECUTIVE SUMMARY

Salem Inspection Reports 50-272/94-31; 50-311/94-31

November 6, 1994 - December 17, 1994

OPERATIONS (Modules 60710, 71707, 93702) Overall, operators continued to insure safe plant operation, despite six unplanned power reductions for Unit 1. Operators made a particularly thorough and accurate report of the effects of the loss of the No. 2 station power transformer on the Salem units. The inspectors noted increased plant staff attention to identifying degraded equipment and insuring notification of the appropriate levels of management. Because of thorough preparation and oversight, plant staff safely and effectively removed a loading guide that was wedged to the bottom of a fuel assembly.

Grass intrusion into the service water system, on December 10, caused a momentary perturbation in the differential pressure across the service water strainers that was ameliorated when the operators started an additional pump. Another grass intrusion on December 11 affected the Salem Unit 1 circulating water system and required operators to effect power reduction. In both cases, operators acted conservatively and aggressively in response to the conditions.

MAINTENANCE and SURVEILLANCE (Modules 61726, 62703) Overall, plant staff continued to maintain the operability of safety related equipment and to verify the operability of equipment required by Technical Specifications.

Lack of timely repair of a safety injection relief valve, the heating steam system, and lack of foresight in increasing Boric Acid Storage Tank (BAST) volume unnecessarily required operators to enter the Technical Specification Limiting Condition of Operation action statement for BAST volume. The inspectors observed effective replacement of the Salem Unit 2 pressurizer power operated relief valve internals. The licensee took prompt and effective corrective action in response to arcing on some 13kV supply cables for the Unit 1 vital buses.

At Unit 1, technicians inadvertently caused a condition that required operators to initiate a shutdown, required by Technical Specifications, by unnecessarily removing test equipment from the 1B safeguards equipment control (SEC) system to troubleshoot the 1A SEC.

The operations organization accommodated a "work-around" situation by deactivating the SEC test circuit in response to spurious alarms in lieu of determining the cause of the condition.

A pressure transient during Unit 2 in-service testing was caused by deficiencies in the containment spray fill and vent procedure. Notwithstanding, the plant operating staff responded appropriately to the pressure transient and effectively controlled and ameliorated the condition.

(EXECUTIVE SUMMARY CONTINUED)

ENGINEERING (Modules 37551, 71707) Inspectors noted significant engineering interaction and effective support of operations and maintenance efforts for several important electrical and mechanical equipment problems. The corporate nuclear engineering organization announced a planned reorganization in an effort to further improve support for station operations.

PLANT SUPPORT (Modules 71707, 71750) Despite heavy demands imposed by the Salem Unit 2 outage, the security department continued to effectively implement the security plan. The Salem radiation protection organization continued to effectively monitor, control, assess, and manage activities involving radiation exposure to workers and the environment.

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DETAILS

1.0 SUMMARY OF OPERATIONS

Unit 1 operated at 100% power with six unplanned power reductions. The power reductions were caused by: repairs to the circulating water trash rake and racks (twice); a loss of one of the offsite power sources (twice); initiation of a forced shutdown due to problems involving surveillance activities for Safeguards Equipment Control equipment; and a grass intrusion event involving the circulating water system.

The inspectors noted that Unit 1 operators responded effectively to the challenges imposed by equipment problems. In each case, the operators safely controlled the plant during the power reduction and subsequent restoration to full power. In addition, the inspectors noted that the operators, in reporting the loss of the No.2 station power transformer to the NRC, supplied an accurate and thorough description of the effects of the transient on the equipment and safety of the plants.

Unit 2 began the period defueled. Operations completed the core reload on December 5. The unit completed the period in Mode 5 (Cold Shutdown).

2.0 OPERATIONS

The inspectors verified that Public Service Electric and Gas (PSE&G) operated the facilities safely and in conformance with regulatory requirements. The inspectors evaluated PSE&G's management control by direct observation of activities, tours of the facilities, interviews and discussions with personnel, independent verification of safety system status and Technical Specification compliance, and review of facility records. The inspectors performed normal and back-shift inspections, including 29 hours of deep back-shift inspections.

2.1 Operator Identification of Degraded Equipment

Improved performance relative to operator identification of degraded equipment or conditions was noted. For example: On November 2, operators filed an incident report, based on review of work requests, relative to recurrent deficient operation of the meteorological tower temperature recorder, noting that the system had failed on nine occasions in 1994. On November 21, 1994, with Unit 1 at 100% power, an alert operator discovered electrical arcing through the heat shrink covering the electrical connector on the end of a 4kV supply cable at the 1A vital bus. The operator immediately and appropriately reported the condition to station management. Section 3.1.3, below, contains details of licensee corrective actions. Based on these and other examples, the inspectors noted increased operator attention to identifying deficient conditions and initiating action to effect resolution.

2.2 Stuck Fuel Assembly Loading Guide

On December 2, a fuel assembly was inadvertently wedged into the fuel assembly loading guide as operators lowered the assembly onto the core plate. To insure safety, the operators moved the assembly and stuck guide to the periphery of the partially loaded core and halted fuel handling activities. The plant staff

prepared a troubleshooting procedure that was effective in safely freeing the stuck guide from the fuel assembly. Subsequently, the licensee determined that the design of the guide permitted potential wedging on to fuel assemblies during core reload activities. Consequently, in consultation with Westinghouse representatives, use of the device was curtailed in favor of an earlier designed tool that was less susceptible to inadvertent wedging onto a fuel assembly.

The inspector reviewed the troubleshooting procedure and observed licensee implementation. The inspector considered the procedure sufficiently detailed to control the removal process. Supervisors conducted thorough pre-job briefs with the control room and the refuel floor crew. Refuel floor staff followed the procedure throughout the troubleshooting evolution. The operators successfully feed the guide from the fuel assembly without incident. The inspector concluded that the safe and effective removal of the stuck guide resulted directly from the thoroughness of licensee preparation and oversight.

2.3 Grass Intrusion Into Service Water and Circulating Water

On December 10, 1994, with Salem Unit 1 at 100% power, control room operators received service water low pressure alarms and service water pump strainer high differential pressure (d/p) alarms. At the time, operators had one service water pump in service on each header. Header pressures dropped from approximately 130 psig to 102 psig. Operators started one additional service water pump before reaching the auto-start set point of 90 psig, and restored header pressure to normal. Operations personnel determined that some grass and mud deposits on the service water traveling screens caused the momentary service water header pressure reduction. The licensee determined that the momentary reduction in did not adversely affect the components cooled by service water.

On December 11, with Salem Unit 1 at 100% power, operators took the No. 13B CW pump out of service to clean the associated water box. During that time, the No. 13A circulating water (CW) pump emergency tripped due to high differential pressure (d/p). The operators initiated power decrease at 5 percent per minute. Subsequently, the 12B CW pump emergency tripped, followed four minutes later by an emergency trip of the No. 12A CW pump. Operators reduced power to 51%, and subsequently restored the Nos. 12A and B circulating water pumps to service. The operators determined that grass had intruded into the circulating water intake structure and affected pump operation.

The inspectors noted that operators took proper action in accordance with abnormal operating procedures S1.OP-AB.LOAD-0001 *Rapid Load Reduction*, and S1.LP-AB.CW-0001, *Circulating Water System Malfunction*.

The inspector noted that, as part of a long term effort to reduce the effects of grass intrusion, the licensee had recently initiated intake structure design changes, including installation of new high capacity trash rakes, two new high d/p screen wash pumps, and new trash racks for the 23 circulator on Unit 2. The licensee is scheduled to replace the remaining screen wash pumps, trash racks, and the traveling screens in subsequent outages.

The resident inspectors also noted that circulating water problems (grass intrusion, inoperable circulating water pumps, and stuck trash rakes) continue to impose challenges to the operators. Although the grass intrusion into the service water intake structure did not significantly affect system operation, the potential effect of grass on the service water system continues as a challenge to normal plant operation.

3.0 MAINTENANCE AND SURVEILLANCE

3.1 MAINTENANCE

The inspectors observed portions of the following safety-related maintenance to determine if the licensee conducted the activities in accordance with approved procedures, Technical Specifications, and appropriate industrial codes and standards.

The inspector observed portions of the following activities:

<u>Unit</u>	<u>Work Order(WO) or Design Change Package (DCP)</u>	<u>Description</u>
Salem 1	WO 940814091	1C diesel generator fuel oil filter piping repair
Salem 1	WO 941113017	Inspect nuclear service water header supply piping
Salem 1	Various	2A Diesel generator maintenance activities
Salem 2	SC.RA-IS.CS-0022	Containment Spray Nozzle Test
Salem 2	S2.OP-ST.RHR-005	In Service Testing Residual Heat Removal Valves and Orifices

The inspectors observed that the plant staff performed the maintenance effectively within the requirements of the station maintenance program.

3.1.1 Safety Injection System Relief Valve Leakage

On October 24, the Engineering Department identified a 0.2 gpm leak from the SI accumulators through the No. 12 safety injection (SI) pump relief valve (12SJ39), to the pressurizer relief tank (PRT). On November 20, 1994, engineers identified a smaller leak (approximately .08 gpm) past the 11SJ39 valve. Operations personnel determined that the leaks did not affect system operability. Notwithstanding, action was initiated to replace 12SJ39 on November 30, since operators had to frequently fill the SI accumulators from the Refueling Water Storage Tank due to the leakage.

The Refueling Water Storage Tank relies on makeup from the Boric Acid Storage Tank. On November 28, the inspector noted that Boric Acid Storage Tank (BAST) combined level (93.5%) approached the minimum allowed (92%) by Technical Specifications (TS). The depletion was due to the need to frequently fill the SI accumulators. The inspector reminded the operators on the proximity to the TS limit. Normally, the operators maintain a comfortable margin to anticipate boric acid additions for power changes.

During the morning, the operators prepared to add boric acid to the BASTs because of the reduced margin to the TS limit. However, the unavailability of heating steam to the auxiliary building limited their ability to make up to the BASTs. Later that afternoon, loss of the No. 2 station power transformer required operators to reduce power by adding boric acid. As a result, the plant entered the TS limiting condition for operation for BAST level. The operators successfully restored BAST levels within the time permitted by the LCO. Subsequently, maintenance personnel replaced the 12SJ39 valve on November 29 during an SI pump outage. Operators observed decreased accumulator leakage as a result.

The inspector noted that poor planning for relief valve and heating steam maintenance, and failure to promptly restore the margin to BAST level, contributed to entry into a TS LCO relative to the decreased BAST levels available for reactivity control.

3.1.2 Power Operated Relief Valve Internals

During the Unit 2 outage, the licensee replaced the internals in both pressurizer power operated relief valves (PORVs). As documented in NRC Inspection Report 50-272 and 311/94-13, PSE&G inadvertently installed internals made of 17-4 PH stainless steel during the 1993 refueling outage. During this outage, the licensee installed new internals consisting of a 316 stainless steel stellite clad plug with a 17-4 PH stainless steel cage. The new internals are identical to those installed on Unit 1 in May 1994. The licensee confirmed that the removed internals consisted of 17-4 PH stainless steel. The inspector observed that the parts did not appear degraded, worn, or defective in any way.

3.1.3 Breakdown of Insulation on 4kV Cables

As discussed in section 2.1, above, on November 21, 1994, an operator observed arcing associated with a 4kV supply cable from the No. 13 station power transformer (SPT), to the Unit 1 vital buses. The arcing (known as "tracking") occurred between the lug nut, where the cable ended at the bus, and the cable grounding strap. The licensee de-energized the cable by removing No. 13 SPT from service and entered the Technical Specification (TS) action statement for loss of one offsite power source to a vital bus. The licensee determined that excessive potting compound material had liquefied and seeped from the conduit above, and provided a current pathway between the cable and ground. Maintenance cleaned the conduit, the connectors, and the ground strap. The cable was re-landed within the time allowed by TS. No similar conditions were found at Unit 2.

The inspector examined the affected bus and cable with the lead electrical system engineer. The inspector also reviewed the completed repair work and independently confirmed that similar conditions for tracking did not exist on the other 4kV supply cables to the Unit 1 and 2 vital buses. The inspector concluded that the licensee took timely and appropriate corrective action.

3.2 Surveillances

The inspectors performed detailed technical procedure reviews, observed surveillances, and reviewed completed surveillance packages. The inspectors verified that plant staff did the surveillance tests in accordance with approved procedures, Technical Specifications, and NRC regulations.

The inspector reviewed the following surveillances:

<u>Unit</u>	<u>Procedure No.</u>	<u>Test</u>
Salem 2	S2.OP-ST.DG-0013	2B Diesel Generator Endurance Run
Salem 2	S2.OP-ST.CS-0010	Containment Spray Testing
Salem 2	S2.OP-ST.RHR-0005	Residual Heat Removal Valves and Orifices

The inspectors observed that plant staff did the surveillances safely and effectively, and that the activities were sufficient to verify operability of the associated systems.

3.2.1 Containment Spray Testing

On November 24, 1994, while performing S2.OP-ST.CS-0010, *In Service Testing Containment Spray Testing*, a portion of the "A" containment spray (CS) header experienced a pressure transient (water hammer) event. The licensee determined that inadequate venting of the CS header caused the pressure transient, in that the flow path used during this test differed from the flow path used during previous tests. Operations management found that the surveillance procedure did not contain guidance for properly filling and venting the containment spray system.

Subsequent system review, by operations and maintenance personnel, found that system damage was limited to a leaking outboard seal on the CS pump, and a body to bonnet leak on a CS header isolation valve. The licensee repaired the pump and valve, and conducted a thorough inspection of the remaining CS piping and components.

The licensee subsequently modified the procedure to properly describe the fill and vent process, and completed the surveillances on both CS headers. In addition, operations management issued an information directive (ID 94-049) to the operators that discussed the water hammer problem and provided guidance on actions to avoid water hammer conditions. The actions included slowly changing the position of valves, and bumping pumps prior to initial pump runs after filling and venting systems.

The inspector observed the surveillances and noted effective communication and active system engineering involvement during the test. The inspector determined that the licensee responded promptly and appropriately to the water hammer condition. The inspectors noted, however, that 10 CFR 50, Appendix B, Criterion V requires that activities affecting quality shall be prescribed by procedures appropriate to the circumstances and the procedures shall insure that important activities have been satisfactorily accomplished. The inspectors concluded that procedure S2.OP-ST.CS-0010 did not include measures to insure that the containment spray system was adequately filled and vented.

While the specifications of 10 CFR 50, Appendix B, Criterion V were not satisfactorily completed in this instance, this violation is not being cited because the criteria specified in 10 CFR 2, Appendix C, Section VII.B (NRC Enforcement Policy-Enforcement Discretion) were satisfied. Specifically, the pressure transient was unintentional, had minor safety significance, caused minor system damage, and was effectively corrected prior to declaring the CS system operable. Further, the licensee determined that this was the only instance of such an event involving containment spray testing. Accordingly, the inspector determined that the licensee's response and corrective measures were prompt and appropriately developed.

3.2.2 Inoperable Safeguard Equipment Cabinets

At 10:58 a.m. on December 9, the licensee declared the No. 1A Safeguards Equipment Control (SEC) system inoperable due to the inability to restore operability to the SEC within the surveillance period permitted by Technical Specifications. The inability to complete the surveillance was related to a problem in the system test circuit. The digital solid state 1A SEC system controls electrical sequencing of equipment onto the 1A vital bus under blackout and accident conditions. The 1B and 1C SECs control sequencing for their respective vital buses.

While troubleshooting the 1A SEC, Instrument and Controls (I & C) technicians inadvertently caused a test fault on the 1B SEC. At 12:58 p.m., operators declared the 1B SEC inoperable, and initiated actions for plant shutdown in accordance with Technical Specification 3.0.3. At 5:00 p.m. plant staff restored both SECs to operable status, the shutdown was terminated, and the plant was restored to normal operation.

The licensee determined that test switches in both equipment cabinets stuck in the depressed position, causing the test circuit faults. Review and investigation efforts revealed that the technicians had unnecessarily removed the test switch panel from the 1B SEC to aid in troubleshooting the 1A SEC, even though a spare test switch panel was available in the I & C shop. While removing the test switch panel from the 1B SEC, the technicians inadvertently caused a test switch associated with a nozzle fan to stick closed. The licensee's investigation also revealed that a stuck closed switch, associated with a containment spray pump, caused the fault with the 1A SEC. The licensee determined that the test switch had been stuck since the surveillance on November 23. The stuck test switch on the 1A SEC was not detected earlier because the operators previously deactivated the automatic test insertion

(ATI) circuit in response to frequent alarms that did not result in an identified fault. The action was taken on the advice of the systems engineering personnel.

Operators previously deactivated at least one other ATI because of "nuisance" alarms. Although not required for operability, the ATIs detect faults affecting operability, such as the stuck containment spray and nozzle fan switches. The licensee restored both stuck switches and verified that no other stuck switches existed by activating all ATIs.

The inspectors concluded that the licensee acted appropriately in response to the stuck switches. The licensee effectively determined the cause of the equipment failures and restored the equipment. The licensee evaluated the stuck switches and correctly determined that the containment spray pump switch, stuck since the previous surveillance, could have affected safety under worst case conditions (i.e., elevated river water temperature). In this instance, the safety significance was low since river water temperature was low, and the condition was promptly ameliorated upon discovery.

The inspectors also determined that the practice of deactivating the ATIs was poor and constituted a "work-around" situation, i.e., a plant condition that was not in accordance with the design, but was accommodated by relying on operator awareness and intervention. Rather than take the necessary steps to identify and correct the cause of the spurious test fault alarms, licensee personnel elected to deactivate the ATIs. Consequently, an indicator of safeguards equipment status was unavailable to the operators.

4.0 ENGINEERING

4.1 Engineering Support of Plant Activities

On November 18, disconnect 4T60 on the 500 kV side of the No. 4 station power transformer (SPT) opened unexpectedly, interrupting one source of offsite power to each of the vital buses for Salem Units 1 and 2. At the time, Unit 1 was operating at 100% power, and Unit 2 was defueled. The Unit 1 vital buses successfully fast transferred. Salem Unit 2 did not have access to the second source of offsite power at the time due to outage activities, and the two available emergency diesel generators (of three installed) started and re-energized their respective vital buses, as designed. The blackout sequencer for Unit 2 secured power to the spent fuel pit pump, as designed. Operators restarted the pump 17 minutes later, with no noted increase in spent fuel pit temperature. Engineering and maintenance staff could not immediately determine the cause for the opening of the disconnect. Plant staff restored power using No. 2 SPT.

On November 28, the Salem units again lost offsite power supplied through No. 2 SPT due to the actuation of a differential protection relay. Both units had a second source of offsite power available. Salem Unit 1 operators reduced power from 100% to 26% in 15 minutes, operated with two circulating water (CW) pumps available for approximately an hour, then re-energized the remaining CW electrical buses and started a third CW pump.

On the same day, the No. 5 substation on the 13kV ring bus lost power causing loss of power to the Technical Support Center (TSC). The TSC diesel generator started, but the TSC supply fan failed to start due to a blown fuse. Details of followup activities for these transients are contained in NRC Inspection report 50-272 & 311/94-33.

During the inspection period, the inspectors noted significant interaction between the engineering support organizations (station and corporate) and the other station organizations. Noteworthy examples of engineering support to plant safety included the diagnoses of the arcing of the 4KV supply cable, the response to the loss of No. 4 SPT, loss of No. 2 SPT, and loss of the No. 5 substation.

On November 30, the corporate nuclear engineering organization announced a reorganization plan, to be accomplished in early 1995. The purpose of the reorganization is to effect improved support of plant operation and maintenance activities by efforts to assure that engineering activities and efforts are prioritized in accordance with the requirements and needs of the nuclear stations.

5.0 PLANT SUPPORT

5.1 Radiological Controls

The inspector periodically verified PSE&G's conformance with the radiological protection program. The inspectors noted that the radiation protection staff monitored, controlled, and managed personnel exposure to be As Low AS Reasonably Achievable (ALARA). Radiation protection management maintained oversight of performance indicators and kept senior station managers advised of status of radiological conditions. Plant radiological conditions were maintained appropriately. Radiation and contamination areas were observed to be posted and controlled. Throughout the outage, radiation protection staff worked effectively with plant operations, engineering, and maintenance personnel to assure that jobs were adequately planned, monitored, and controlled.

5.2 Security

The NRC verified PSE&G's conformance with the security program, including the adequacy of staffing, entry control, alarm stations, and physical boundaries. Inspectors observed good performance by Security Department personnel in their conduct of routine activities. The inspectors observed that security personnel maintained positive control of access to the plant and controlled areas, though challenged by increased numbers of personnel on-site to support outage activities.

6.0 REVIEW OF REPORTS AND OPEN ITEMS

The inspectors reviewed the Salem Monthly Operating Reports for October and November for accuracy and content, and found them acceptable. The inspectors also reviewed the following Licensee Event Reports LERs to verify the

corrective measures as described, and to determine if the licensee responded to the events adequately, met regulatory requirements, license conditions, and commitments:

Salem Unit 1

<u>Number</u>	<u>Event Date</u>	<u>Description</u>
LER 94-012	October 13, 1994	Calorimetric surveillances.
LER 94-015	October 18, 1994	Refueling water storage tank level.
LER 94-017	November 17, 1994	Adequacy of pressurizer over-pressure protection.

Salem Unit 2

LER 94-014	November 18, 1994	Automatic loading of 4kV vital buses.
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The inspector determined that the LERs listed above did not identify any violations beyond those previously identified in NRC Inspection Reports, and considered the LERs closed.

7.0 EXIT INTERVIEWS/MEETINGS

7.1 Resident Exit Meeting

The inspectors met with Mr. J. Summers and other PSE&G personnel periodically and at the end of the inspection report period to summarize the scope and findings of the inspection activities.

Based on NRC Region I review, this report does not contain information subject to 10 CFR 2 restrictions.

7.2 Specialist Entrance and Exit Meetings

<u>Date(s)</u>	<u>Subject</u>	<u>Inspection Report No.</u>	<u>Reporting Inspector</u>
11/7-18/94	Inservice Inspection	50-272 and 311/94-29	Beardslee
11/30-12/9/94	Electrical Distribution	50-272 and 311/94-33	Harrison
12/5-16/94	Engineering Followup	50-272 and 311/94-32	Moy
12/12-16/94	Security	50-272 and 311/94-34	Smith