U. S. NUCLEAR REGULATORY COMMISSION
REGION I

DOCKET NOS: 50-272
50-311

REPORT NOS: 50-272/94-03
50-311/94-03

LICENSEE: Public Service Electric and Gas Company (PSE&G)
P.O. Box 236
Hancocks Bridge, New Jersey 08038

FACILITY: Salem Nuclear Generating Station

DATES: January 31 to February 4, 1994

INSPECTOR: James S. Stewart 3-4-94
James S. Stewart, Operations Engineer Date
PWR Section, Operations Branch
Division of Reactor Safety

APPROVED BY: Glenn W. Meyer 3-4-94
Glenn W. Meyer, Chief Date
PWR Section, Operations Branch
Division of Reactor Safety

Areas Inspected: Announced inspection of plant operations in accordance with inspection procedure 2515/71715. The inspection focused on direct observation of control room activities, but included plant general inspections, review of records, and interviews with personnel.

Inspection Results: See Executive Summary

EXECUTIVE SUMMARY

Salem Inspection Reports 50-272/94-03 and 50-311/94-03
January 28 to February 4, 1994

OPERATIONS (Inspection Procedure 71715)

The inspector observed the conduct of operations during power changes at both units and found the operational activities to be effective. Numerous equipment problems hampered operations at both units preventing power escalation at Unit 1 and requiring power reductions at Unit 2. Operators conducted the power changes and combatted plant problems in an effective manner that was in accordance with procedures and in compliance with applicable regulations. Operators exhibited a high level of professionalism.

During turbine testing on Unit 1, a reactor plant certified, quality assurance engineer was observed performing a control room observation. Quality assurance observation and review of nonroutine control room activities was considered a strength.

ENGINEERING

Numerous and repetitive equipment problems were evident throughout the inspection, thus implicating the quality of engineering work. Main condenser circulating water heat exchangers repeatedly clogged, requiring power reductions on both units. A simultaneous failure of the two operating station air compressors caused a temporary loss of all control air for both units. Additionally, repetitive malfunctions of the Unit 1 individual rod position indication system and main turbine steam control system occurred. There were also repetitive malfunctions affecting the Unit 2 service water system, station control air system, and steam generator feed pump control systems. No single root cause for the numerous equipment problems was identified.

During plant walkdowns, the inspector reviewed air powered control equipment on both units and verified that air-solenoid valves were being operated within the appropriate design specifications.

MAINTENANCE/SURVEILLANCE

The equipment problems discussed above were recurrent. The inspector found evidence that rework was necessary during equipment testing and operation. However, no root cause for the numerous equipment problems was identified.

The numerous equipment surveillance activities that were observed were suitably and efficiently conducted. Surveillance procedures were organized in a standard, well written format. Operators used and complied with applicable procedures during the conduct of testing. When equipment deficiencies were identified during testing, appropriate corrective actions were taken, including trouble record documentation, entry into technical specifications, and notification of appropriate personnel.

DETAILS

1.0 INSPECTION OBJECTIVES

An announced inspection of plant operations at Salem Units 1 and 2 was conducted from January 28 to February 4, 1994. The scope of the inspection included direct observations of control room and plant activities during regular, backshift, and weekend periods. The objectives included an evaluation of control room and plant performance through extended, direct observation and assessment of policies and programs being used by the facility.

2.0 SUMMARY OF OPERATIONS

2.1 Summary of Reactor Power Operations

For Unit 1, the inspection started one day following a reactor trip from approximately 20 percent power, due to low, low steam generator level. The transient occurred during transfer from manual to automatic mode of steam generator level control and was due to a malfunction of the steam generator level control system. During the inspection, Unit 1 recovered from the trip and achieved approximately 30 percent power, then reduced power to less than 5 percent because of clogged main turbine condenser circulating water heat exchangers (circulators).

For Unit 2 the inspection began with the unit at full power. During the inspection, power was reduced to 90 percent due to clogged main condenser circulators, further reduced to 50 percent to correct instability of the steam generator feed pump control circuitry, then increased to full power, and again reduced to less than 5 percent due to clogged main condenser circulators.

2.2 Operations Activities

Operators were observed being attentive to plant parameters and conditions, using the appropriate procedures, employing effective communication, and documenting activities in accordance with technical specification and Salem policy requirements. Administrative policies effectively ensured that plant activities were conducted with proper control room oversight and operators were observed maintaining a proper control room environment. Operator activities were conducted with a high level of professionalism.

During the numerous power changes that occurred on both units, reactor coolant temperatures and neutron flux were controlled within the respective control bands and no axial flux deviation penalties were accumulated. Logkeeping accurately reflected reactor and equipment status. A reactor plant certified, quality assurance engineer was observed monitoring control room testing of the main turbine. Quality assurance observation and review of nonroutine control room activities was considered a strength.

On both units, chronic equipment problems challenged the operators and hampered recovery of the units to normal full power operation. The operators responded promptly and

effectively to these challenges. Following the Unit 1 trip due to steam generator low, low level, numerous troubleshooting and testing evolutions on the feedwater regulating valves were required. Additionally, the individual rod position indication (IRPI) experienced excessive drift on a number of occasions. While largely attributed to changes in reactor temperature, the IRPI drift involved in one instance, circuitry malfunction. In each case, as IRPI problems were detected by the operators, appropriate technical specification action statements were entered, trouble reports and notifications were made, and the equipment was quickly repaired using proper work control. During one repair of the 2C IRPI, technical specification action statement 3.0.3 was entered when a component, which disabled the entire channel of IRPI, was replaced. Documentation and reporting of the entry into the action statement was appropriate and in compliance with station requirements.

During Unit 1 control room observations, timely and effective operator action prevented a possible trip of both Salem units. The event started with a concurrent trip of the number 2 and number 3 station air compressors. The number 1 station air compressor had been out of service for modification. The operators appropriately monitored control air header pressure and took actions specified by procedure, S1.OP-AB.CA-0001, "Loss of Control Air." A trip of both units was prevented due to rapid operator response that included temporary lineup and use of three diesel air compressors.

Unit 2 operations were also hampered by chronic equipment malfunctions. At the beginning of the inspection, power was reduced to 90 percent of full power in response to a high differential temperature on a main condenser circulator. The condition was the result of clogging due to grasses and ice in the plant intake. Power was further reduced to 50 percent to correct instabilities in the steam generator feed pump control circuitry. Throughout the inspection, repetitive malfunctions of the service water system were encountered. The number 25 service water pump had undergone a motor replacement and on restoration, a low pump differential pressure was encountered, followed by high vibration, followed by unsteady pump amperage and bearing thermocouple temperatures. Simultaneously, the number 23 service water pump was out of service due to a broken motor pin for the travelling screen. The 22 service water pump also had a broken travelling screen pin that was repaired, followed by a clogged filter problem that required the pump be secured. The 26 service water pump had a failed auto-start circuit and had only recently recovered from a broken travelling screen pin that occurred when frozen intake caused a jam of the screen. Throughout the service water transients and repairs, operators properly entered technical specification action statements and followed station policy on maintaining proper redundancy and control of service water availability.

A main transformer fire alarm was received during 50 percent power operation when a low deluge pressure condition was actuated by a small fire deluge system leak. Operators properly and promptly responded to the condition by monitoring the main transformer and alerting the fire response team.

At the completion of the inspection, a Salem significant events response team (SERT) had been assembled to perform an event assessment and root cause determination. The team was being led by a former plant manager and included adequate and appropriate staffing for full event review.

During walkdowns of accessible portions of both units, the inspector observed the material condition and housekeeping of the plant to be excellent. Additionally, job performance measures training was observed being conducted on the Unit 2 remote shutdown equipment. The training included walkdown and simulation of plant control outside the control room and was being performed using appropriate procedures and training staff oversight.

2.3 Maintenance/Surveillance

Numerous surveillance activities were observed and were suitably and efficiently conducted. Surveillance procedures were organized in a standard, well written format. Operators used and complied with applicable procedures during the conduct of testing. When equipment deficiencies were identified during testing, appropriate corrective actions were taken including trouble record documentation, entry into technical specifications, and notification of appropriate personnel.

The repetitive equipment problems discussed above were considered a weakness in plant engineering and maintenance. Subsequent to the air compressor excursion, chronic malfunction and repeated trips of both the number 2 and 3 air compressors occurred. These trips occurred as engineering and maintenance personnel performed troubleshooting and repair of the compressors. Additional balance-of-plant equipment malfunctions disrupted recovery of Unit 1 to power operation. The 12-MS-28, main turbine bypass steam control valve, failed to properly shut during a turbine trip test. During the 12-MS-28 retest, the 13-MS-28 and 14-MS-28, main turbine bypass steam control valves would not open due to faulty solenoids. And during the main turbine alignment to power operation, the main generator output breaker could not be shut due to a malfunction of the synchronizing control unit.

Unit 2 also experienced and coordinated the recovery from the loss of control air event. During troubleshooting, numerous and repeated malfunctions and trips of the number 2 air compressor were encountered.

Finally, during recovery of the 21 steam generator feed pump, repetitive problems with the feed pump reheat steam trip valve (21-RS-15) were encountered. Testing of the valve was repeated a number of times with repeated failure of the solenoid control unit. The valve was finally repaired and the feed pump returned to service.

2.2 Plant Engineering Activities

As discussed above, the repetitive equipment problems on both units were considered a weakness in plant engineering and maintenance.

During plant walkdowns, the inspector reviewed air powered control equipment on both units and verified that air-solenoid valves were being operated within the appropriate design specifications. Specifically, solenoid valves were verified not to have the overpressure conditions described in NUREG-1275, Volume 6. The applications reviewed included emergency diesel generator service water and starting air, boric acid blender flow control, safety injection flow and discharge, and spent resin storage level control systems. In all cases, the air provided was within the design specifications for the solenoid and flow control valve applications.

Salem engineering Technical Memorandum, STD 94-20, was reviewed and determined to be adequate and appropriate. The memorandum reviewed a January 5, 1994, operations entry into technical specification 3.0.3, on Salem Unit 2. The technical specification entry had been made to allow maintenance personnel to adjust components in the Dixon rod control cabinet, which provides control room console indication of individual rod position. The engineering memorandum recommended to the operations department that technical specification entry into 3.0.3 was not necessary because redundant safety plant display system and P250 plant computer indication of individual rod position was available and unaffected by the maintenance. The memorandum was reviewed by the operations management and placed in the plant night orders book so that the interpretation could be used by operators in future maintenance activities on the Dixon control system.

3.0 EXIT MEETING

An exit meeting was held with representatives of the Salem plants on February 4, 1994. The attendants acknowledged the inspector findings and conclusions. A listing of persons contacted during the inspection as well as exit meeting attendees is provided below:

Public Service Gas and Electric, Salem 1 and 2

C. Vondra	Plant Manager
*L. Catalfumo	Operations Manager
*M. Morroni	Maintenance Manager
*P. O'Donnell	Operations Engineer
P. Ott	Operations Engineer
*S. Skabicki	Quality Assurance
*J. Wiedeman	Technical Engineer
*E. Villar	Licensing Engineer
K. Mai	Reactor Engineer

* Denotes those attending the February 4, 1994, exit meeting.