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U. S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report Nos. 50-272/84-19  
50-311/84-19

Docket Nos. 50-272  
50-311

License Nos. DPR-70  
DPR-75

Licensee: Public Service Electric and Gas Company  
80 Park Plaza  
Newark, New Jersey 07101

Facility Name: Salem Nuclear Generating Station - Units 1 and 2

Inspection At: Hancocks Bridge, New Jersey

Inspection Conducted: May 9, 1984 - June 8, 1984

Inspectors:

James C. Linville  
J. C. Linville, Senior Resident  
Inspector

6/27/84  
date

R. J. Summers  
R. J. Summers, Resident Inspector

6/27/84  
date

Approved By:

L. J. Norrholm  
L. J. Norrholm, Chief, Reactor  
Projects Section No. 2B, Projects  
Branch No. 2, DPRP

6/27/84  
date

Inspection Summary:

Inspections on May 9, 1984 - June 8, 1984 (Combined Report Numbers  
50-272/84-19 and 50-311/84-19)

Areas Inspected: Routine inspections of plant operations including: status of  
previous inspection items, review of periodic and special reports, licensee  
event report review, operational safety verification, surveillance observa-  
tions, maintenance observations, engineered safety feature system walkdown,  
operating events, and Safety Review Group involvement in Post Trip Reviews.

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The inspection involved 162 inspector hours by the resident NRC inspectors.

Results: There were no violations identified in this report. Several concerns were discussed which included the schedule for completing modifications of fire doors (paragraph 2), the failure of Containment Fan Coil Unit 23 motor (paragraph 2), exposure of safety related cable trays to the steam vent from the steam driven auxiliary feedwater pump (paragraph 7), the cause of the degradation of 1C battery (paragraph 7), the failures of the ECCS throttle valves (paragraph 9), operator errors which led to a plant trip and two vital bus blackout signals (paragraph 9), and the timeliness of Safety Review Group involvement in the post trip review process (paragraph 10).

## DETAILS

### 1. Persons Contacted

Within this report period, interviews and discussions were conducted with members of licensee management and staff as necessary to support inspection activity.

### 2. Status of Previous Inspection Items

(Closed) Inspector Followup Item (272/84-08-05) This item involved radiography of the service water check valves for diesel generator cooling to satisfy the requirements of IE Bulletin 83-03. The results showed that two of the Unit 1 valves were not fully closed when flow was shutoff. The licensee initiated work orders and repaired valves 11SW34 and 12SW38.

(Open) Unresolved Item (272/81-29-05) This item involved entry into the Technical Specification 3.7.11 Action Statement for fire door operability for greater than thirty days which necessitated LER 81-106. The LER stated that a supplemental report would be submitted when DCR 1 EC 1333, which was issued to effect modifications to fire doors, was complete. The inspector pointed out that the action statement calls for a schedule for completion of the corrective action. The licensee stated that a schedule for completion of the modifications and termination of the action statement would be submitted in a revised LER by June 30, 1983.

(Closed) Inspector Followup Item (272/82-27-06). The inspector reviewed the corrective actions taken to prevent unplanned radioactive releases due to inadequate torquing of threaded fasteners on the reactor coolant filter. The licensee has re-issued maintenance procedures for the replacement of all filters in the plant. Each procedure specifies the required torque values for the threaded fasteners.

(Closed) Unresolved Item (272/81-01-06). This item pertains to the inoperability of various fire doors throughout the station. This item is closed for administrative purposes. The issue will be tracked under Open Item 272/81-29-05 as discussed above.

(Closed) Violation (272/82-36-03) This violation involved a failure to take and analyze daily grab samples of the plant vent during periods that the Radiation Monitoring System (RMS) plant vent monitors were inoperable as required by the Environmental Technical Specifications. In response to this violation, the licensee established Interpretation Guide-11 for the operators, which states the requirements for plant vent monitoring. In addition, changes have been made to the Control Room Logs for both Unit 1 and Unit 2 to provide the requirement to notify the Chemistry Department to take grab samples when the appropriate RMS channels are inoperable.

(Closed) Inspector Followup Item (272/83-13-03). The inspector reviewed the supplemental report for Unit 1 LER 83-23/01T. The licensee has provided administrative controls, in the Reactor Engineering Manual, that will prevent operations such that Heat Flux Hot Channel Factor limits could be exceeded. In addition to routine surveillance, the measured target value is now administratively controlled by procedure to ensure that the plant is within the Reload Safety Evaluation design tolerance for all operating conditions.

(Closed) Inspector Followup Item (272/84-08-06). This item pertains to the bus bracing modifications of G.E. 4160 Volt Switchgear. The inspector verified that the modification was completed for the 1A 4160 Volt Vital Bus during a bus outage.

(Closed) Unresolved Item (311/84-13-05). On March 30, 1984, the licensee provided clarification for rigging practices in support of modification work to the contractor providing this service. The practice of rigging mechanical equipment to any safety related equipment, such as cable trays and supports for other safety related systems or components, has been prohibited. The Engineering Department will provide direction when rigging questions are raised. The inspector interviewed personnel involved in current modification work to ascertain that this guidance had been implemented and they were aware of the accepted rigging method. In addition, during the review of the DCR work packages for the 11 and 12 Component Cooling Water Heat Exchangers, DCRs 1EC1655 and 1EC1874 respectively, a number of Field Questionnaires pertaining to rigging methods were resolved by the Engineering Department. The inspector had no further questions at this time.

(Open) Inspector Followup Item (272/84-15-01; 311/84-15-04). On June 6, 1984, while heating up Unit 2 for restart following repair of three SJ16 ECCS throttle valves, No. 23 Containment Fan Coil Unit (CFCU) tripped when started in low speed. This was the third time this year that CFCU 23 had exhibited this problem. It appears that the problem may be related to the small stator to rotor gap tolerance of 0.038 inch. The licensee plans to replace CFCU 23 motor with CFCU 14 motor after reversing the end brackets so that the conduit box will be on the proper side for Unit 2. The licensee has retained Franklin Institute to collect vibration data on the motors to evaluate the situation further. The phenomenon has only been observed on Nos. 23 and 15 CFCU within the past few months. If CFCU 14 motor operates properly on CFCU 23 the licensee intends to minimize low speed starts on CFCU 23 by preferentially operating it in high speed normally. This was based on the fact that the failed motor would start satisfactorily in high speed and also in low speed during a coast down from high speed. The inspector will review this matter further during a subsequent inspection.

### 3. Review of Periodic and Special Reports

Upon receipt, the inspectors reviewed periodic and special reports. The review included the following: inclusion of information required by the NRC, test results and/or supporting information consistent with design predictions and performance specifications, planned corrective action for resolution of problems, and reportability and validity of report information. The following periodic reports were reviewed:

- Unit 1 Monthly Operating Report for April 1984
- Unit 2 Monthly Operating Report for April 1984

### 4. Licensee Event Report (LER) Review

The inspectors reviewed LER's to verify that the details of the events were clearly reported. The inspectors determined that reporting requirements had been met, the report was adequate to assess the event, the cause appeared accurate and was supported by details, corrective actions appeared appropriate to correct the cause, the form was complete and generic applicability to other plants was not in question.

#### Unit 2

- \*84-09 Non-Representative Sample of No. 23 Gas Decay Tank Prior to Release of Contents.
- \*84-10 Reactor Trips From 22% and 30% - High-High Level No. 23 Steam Generator.
- \*84-11 No. 23 Steam Generator Feedwater Flow Channels I and II Inoperable.
- \*84-12 Reactor Trip From 5% Due to Steam Flow/Feed Flow Mismatch.

\*Denotes onsite followup

#### Unit 2

- 84-07 This LER, which was reviewed during the previous inspection period, detailed a series of six occasions during which the required movement of four control rods was not documented to fulfill Technical Specification surveillance requirements because of a typographical error when the surveillance procedure was revised. The licensee has corrected the surveillance procedure with an on-the-spot change.



- 84-09 This LER indicated that on two occasions No. 23 Gas Decay Tank was released without taking the samples required by Environmental Technical Specifications because a tag had not been cleared from the air supply valve to the sample isolation valve. It appeared that this was caused by failure to list the tag for the air supply valve as a blocking point on the TRIS tagout record and rather listing it in the special instructions where it was overlooked. Since that time, provisions have been made in the TRIS system to list devices not previously identified in TRIS as blocking points to correct this problem. This problem was not identified by the individuals drawing the samples because they have no indication of valve position and, according to the licensee, apparently sufficient flow can be drawn through the system with all the sample isolation valves closed. The licensee stated that a DWR has been initiated to provide valve position indication at the sample point.
- 84-10 This LER detailed reactor trips due to high-high level in No. 23 Steam Generator on April 23 and 27, 1984 which were caused by feedwater nozzle damage during the April 6, 1984 water hammer event reported in LER 84-11. Inspector review of these events is documented in paragraph 8 of Inspection Report 311/84-15.
- 84-11 This report involved shutdown of the unit on April 28, 1984 due to the failure of No. 23 Steam Generator feedwater flow nozzle caused by the water hammer event of April 6, 1984. Inspector review of this event is documented in paragraph 8 of Inspection Reports 311/84-13 and 15 and in paragraph 11 of Inspection Report 311/84-15. This LER and LER 84-10 indicate that Engineering Evaluation S-2-F300-MEE-021 documents the details of the April 6, 1984 water hammer event. As of June 8, 1984 this report had not yet been issued. Closeout of open item 311/84-13-06 will be based on the review of the engineering evaluation by the inspector.
- 84-12 This LER described a reactor trip on April 24, 1984 due to steam flow-feedwater flow mismatch and low level in No. 21 Steam Generator. Inspector review of this event is documented in paragraph 8 of Inspection Report 311/84-15. It should be further noted, however, that the inspector had noticed during the startup on April 23, 1984 the licensee also had difficulty latching the turbine due to pilot valve difficulties. Further discussion with the shift supervisor at the time indicated that pilot valve sticking had been a historical problem with which the operators frequently had to contend.

## 5. Operational Safety Verification

### a. Control Room Observations

Daily, the inspector(s) verified selected plant parameters and equipment availability to ensure compliance with limiting conditions for operation of the plant Technical Specifications and safe plant operation. Selected lit annunciators were discussed with control room operators to verify that the reasons for them were understood and corrective action, if required, was being taken. The inspector(s) observed shift turnovers biweekly to ensure proper control room and shift manning. The inspector(s) directly observed operations to ensure adherence to approved procedures.

### b. Shift Logs and Operating Records

Selected shift logs and operating records were reviewed to obtain information on plant problems and operations, detect possible conflicts with Technical Specifications or regulatory requirements, determine that records are being maintained and reviewed as required, and assess the effectiveness of the communications provided by the logs.

### c. Plant Tours

During the inspection period, the inspector(s) made observations and conducted tours of the plant. During the plant tours, the inspector(s) conducted a visual inspection of selected piping between containment and the isolation valves for leakage or leakage paths. This included verification that manual valves were shut, capped and locked when required and that motor operated valves were not mechanically blocked. The inspector(s) also checked fire protection, housekeeping/cleanliness, radiation protection, and physical security conditions to ensure compliance with plant procedures and regulatory requirements.

### d. Tagout Verification

The inspector(s) verified that selected safety-related tagging requests were proper by observing the positions of breakers, switches and/or valves.

No violations were observed.

## 6. Surveillance Observations

The inspector(s) observed portions of the surveillance procedures listed below to verify that the test instrumentation was properly calibrated, approved procedures were used, the work was performed by qualified personnel, limiting conditions for operation were met, and the system was correctly restored following the testing:

- 2IC16.2.008, Revision 1, Channel Functional Test, Power Range Channel 2N42 per IO 405125
- 2PD4.2.031, Revision 1, Channel Functional Test, No. 23 Steam Generator Blowdown Process Radiation Monitor 2R19C
- 1IC2.5.031, Sensor Calibration, No. 11 Steam Generator Steam Pressure Protection Channel II Sensor 1PT-515 per IO 400315
- Unit 2 SP(0)4.4.7.2.1, Emergency Core Cooling - ECCS Subsystems, Revision 1

No violations were observed.

#### 7. Maintenance Observations

- a. The inspector(s) observed portions of various safety-related maintenance activities to determine that redundant components were operable, these activities did not violate the limiting conditions for operation, required administrative approvals and tagouts were obtained prior to initiating the work, approved procedures were used or the activity was within the "skills of the trade," appropriate radiological controls were properly implemented, ignition/fire prevention controls were properly implemented, and equipment was properly tested prior to returning it to service.

- b. During this inspection period, the following activities were observed:

- Repairs to air leak on the No. 23 Auxiliary Feedwater Pump turbine start/stop valve, (2MS132) per Work Order (WO) No. 84-05-20-825-9.

While observing this activity, the inspector noted that the licensee had not obtained a complete isolation of the steam supply to the turbine. Steam vented through the steam supply vent valves in the 100 foot elevation, mechanical penetration area of the Unit 2 Auxiliary Building during the activity. This steam is directed onto a safety related cable tray in the area. This arrangement is similar on Unit 1. When this was reported to station management, the vent valves were isolated to prevent possible damage to the cables. In addition, the Operations Department initiated a design change for both units to direct the vent path away from the cable trays. Although this occurrence was on Unit 2, periodic maintenance on both units' turbine driven auxiliary feed pumps has resulted in similar venting operations in the past. The inspector requested that the licensee provide an evaluation of the affects on the cables to determine operability of the equipment associated with the



affected cable tray due to the adverse environmental conditions. This matter is unresolved pending the licensee's evaluation (272/84-19-01, 311/84-19-01).

- Retubing the No. 11 Component Cooling Water System Heat Exchanger (CCWSHX) per WO No. 954571 and DCR No. 1EC1665
- Repairs to the Service Water Pipe for the No. 12 CCWSHX per WO No 954683 and DCR No. 1EC1874

The licensee determined through testing that the Service Water pipe associated with the No. 12 CCWSHX was undergoing corrosive attack. Since the base metal was affected, the licensee elected to replace the pipe with plastic lined, carbon steel pipe. Additional details of this event are documented in NRC Inspection Report 50-272/84-13, paragraph 4.

- Control rod guide tube support pin replacement per WO No. 954690 and DCR No. 1EC1815
- Replacement of the ECCS, high head safety injection throttle valves, 21 and 22SJ16, per WO No. 84-05-30-647-1
- Repairs to the No. 1A Emergency Diesel Generator per WO No. 84-06-05-866-8

Additional details for the above two maintenance activities are in paragraph 9 of this report.

- Repairs to the No. 1B Emergency Diesel Generator per WO No. 9900079-2
- Replacement of the 1C, 125 Volt DC vital battery per WOs 9900063-6 and 84-06-04-839-5 and DCR 1EC1900

During routine maintenance on 1C battery the licensee found several pitted cell posts on 1C battery and many cell posts with exposed copper. The licensee then called in the vendor, C&D, to inspect the 1C battery. C&D found that only 13 of 60 cells were without deficiencies. The deficiencies included 10 cells with copper contamination, 8 cells with sulfated negatives, 17 cells with flaking positive straps and plates, and 35 cells with exposed copper on the cell posts, 5 of which were severely pitted. On the recommendation of the vendor, the licensee replaced the entire 1C battery. The inspector will review the causes of these problems during a subsequent inspection when the information becomes available. (272/84-19-03)

- Replacement of auxiliary feedwater pump room coolers with coolers having AL6X tubes per WO 954525 and DCR 1EC1749.

8. Engineered Safety Feature (ESF) System Walkdown

The inspector(s) verified the operability of the Unit 2 Auxiliary Feedwater System by performing a walkdown of accessible portions of the system to confirm that system lineup procedures match plant drawings and the as-built configuration, to identify equipment conditions that might degrade performance, to determine that instrumentation is calibrated and functioning, and to verify that valves are properly positioned and locked as appropriate.

No violations were observed.

9. Operating Events

A. Unit 1

At 3:54 a.m. on June 2, 1984, the station lost offsite power for about one minute when an operator inadvertently opened the wrong breaker. At the time, Unit 1 was shutdown for refueling with the core completely offloaded. All Unit 1 emergency diesels were tagged out for maintenance which resulted in a total loss of AC power. Unit 2 was in cold shutdown for maintenance on the ECCS high head injection system. Unit 2 Emergency Diesels started and sequenced in the station blackout mode. Since RHR pumps are not loaded in this mode, Unit 2 experienced a loss of shutdown cooling during the event. The licensee reported the event on the ENS telephone. The inspector will review this event further when the LER is submitted.

At 5:15 a.m. on June 5, 1984, with the reactor defueled, Unit 1 lost offsite power due to an undervoltage condition on 2 of 3 vital buses. At the time, 1B vital bus was out of service for maintenance. When the normal infeed breaker to 1A vital bus was opened, no automatic switch to the alternate infeed occurred because the automatic transfer relay was removed. With both the 1A and 1B vital buses deenergized, the blackout relays actuated and automatically started 1A and 1C diesel generators (DG), and tripped open the normal offsite infeed breaker for 1C vital bus. The 1A DG loaded its vital bus, but 1C DG did not because 1C battery is being replaced. Since the only available service water pump was fed from 1C vital bus both operating DGs were without cooling for about 2 hours. Because 1A DG operated with some load on it for about 1 hour, it overheated and actuated the cardox fire protection system. At this point the operators realized that the DGs had no cooling water and tripped them. The licensee partially disassembled 1A DG and replaced all lower bearings on the vendor's recommendation. The inspectors will review this event further when the LER is submitted.

B. Unit 2

At 10:00 a.m. on May 11, 1984, the unit tripped from 100 percent power on steam-flow-feedwater flow mismatch and low water level in No. 22 steam generator. The trip signal was generated by an instrument and control technician who was troubleshooting a problem with a level recorder without having lifted the leads from the control circuit. When he input a high level signal, the feedwater regulating valve closed and actual feedwater flow and level dropped, causing the trip. The cause of the event appears to have been misunderstood communications between the Instrument and Control (I&C) Supervisor, I&C Technical Assistant and I&C Technician involved in this activity, combined with a vague I&C troubleshooting procedure. The inspector will review this event further when the LER is submitted.

At 11:00 a.m. on May 30, 1984, the licensee concluded in a Station Operations Review Committee (SORC) meeting attended by the inspector that the two ECCS subsystems required by Technical Specification 3.5.2 were inoperable based on x-rays of the high head safety injection throttle valves, 21SJ16 and 22SJ16, which showed that the disks had partially backed off the disk nuts. An unusual event was declared and a shutdown of the unit was commenced at 11:06 a.m. These throttle valves, which are one and one-half inch Rockwell globe valves, are set during surveillance testing once per eighteen months to insure that flow from the Boron Injection Tank is properly distributed to each of the four cold legs during a safety injection. The licensee initially discovered this problem on 11SJ16 while x-raying all 12 Unit 1 ECCS throttle valves with the unit in an extended outage for refueling and main generator rewind.

The licensee initiated the radiography of the ECCS throttle valves because of the generic implications of the failure of the similar Rockwell International globe valves in the RTD bypass lines described in paragraph 9 of Inspection Report 50-272/84-04 and LERs 272/84-01 and 311/84-10. The licensee removed and inspected the three throttle valves involved. The lock weld attaching the disk to the disk nut was missing and a portion of the lower disk guide was broken off in the same location relative to the lock weld hole in the disk in each case. Because the disk and disk nut assembly is free to rotate on the stem, opposing torques on the disk and disk nut are required to unthread them. Based on this information, the licensee believes that the disks were partially unthreaded from the disk nuts during opening and closing cycles of the valves when they were used as blocking valves during outages. Since there does not appear to be any way that the disk could be unthreaded from the disk nut while the valve is set in its throttled position, the licensee concluded in a SORC meeting on June 4, 1984, attended by the inspector, that continued operation is safe even if the lock welds are missing from the other undisturbed throttle valves in both plants. To assure that the disks

remain fully threaded to the disk nuts such that the inside of the disks fit snugly to the bottom of the stems separated only by stellite inserts, the licensee took base line radiographs of all twenty four throttle valves and has implemented a program to take additional radiographs for comparison any time the valve positions are disturbed. The inspector will review the minutes of the SORC meetings of May 30, 1984 and June 4, 1984 (311/84-19-02) and the LER on this event when they are issued.

While shutting down on May 30, 1984 because of the inoperable ECCS throttle valves, the unit tripped from about 10 percent power at 3:30 p.m. on high intermediate range flux. Licensee investigation of this event determined that the intermediate range high flux bistable reset point was set overly conservative below the permissive which reinstates the 25 percent intermediate range high flux trip at 10 percent power. Thus, a trip occurred as soon as the permissive was satisfied. The licensee plans to check and adjust the intermediate range currents during the next startup and to caution operators to check to see that the IR high flux trips are reset before reaching the 10 percent permissive. The inspector will review this event further when the LER is issued.

#### 10. Safety Review Group (SRG) Involvement in Post Trip Reviews

During the inspection period, the inspector reviewed the Administrative Directive (AD)-16 Post Trip Review checklists generated in 1984 and the SRG reports on their review of the AD 16 checklists for the first four trips in 1984, which were the only ones available. These reviews contain questions to the Operations Department, in which the AD 16 checklists are generated, Operations Department responses and additional SRG comments to the responses. The inspector noted that while the SRG had provided worthwhile insights, their reports usually took about two months from the time of the trip to be issued. When the inspector discussed the lack of timeliness of the independent review of trips by the SRG with the head of the SRG, he pointed out that SRG members frequently become involved in reviewing the trip before they receive the AD 16 reports and that he is a member of the SORC which has reviewed about half of the ten trips in 1984 prior to unit restart based on a determination by the Operations Manager that the cause of the trip was not clearly understood and corrected. When asked if he had been involved in the SORC reviews of these trips, the head of the SRG said that he didn't think he had because he was unaware of them at the time. He stated that he intended to indicate his interest in being made aware of these meetings with the SORC chairman. The inspector will review the timeliness and SORC involvement of the SRG in the independent post trip review process during a subsequent inspection (272/84-19-02).



11. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations or deviations. The unresolved item identified during this inspection is discussed in paragraph 7.

12. Exit Interview

At periodic intervals during the course of this inspection, meetings were held with senior facility management to discuss inspection scope and findings. On June 8, 1984, the inspectors met with licensee representatives and summarized the scope and findings of the inspection as they are described in this report.