UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report No.: 50-395/85-01

Licensee: South Carolina Electric and Gas Company
Columbia, SC 29218

Docket No.: 50-395 License No.: NPF-12

Facility Name: Summer

Inspection Conducted: January 7-11, 1985

Inspector: W. J. Ross 1/29/85
W. J. Ross Date Signed

Approved by: J. J. Blake 1/30/85
J. J. Blake, Section Chief Date Signed
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope: This routine, unannounced inspection involved 38 inspector-hours on site in the areas of plant chemistry and inservice testing of pumps and valves.

Results: No violations or deviations were identified.

REPORT DETAILS

1. Licensee Employees Contacted

*O. S. Bradham, Director, Nuclear Plant Operations
*J. G. Connelly, Deputy Director, Operations and Maintenance
*W. F. Bacon, Associate Manager/Chemistry
R. H. Burch, Chemistry Supervisor
*A. R. Koon, Associate Manager, Regulatory Compliance
*A. J. Cribb, Plant Chemist
L. F. Faltus, Chemistry Supervisor
W. Poston, Maintenance Engineer
*M. D. Quinton, Manager/Maintenance
*B. C. Williams, Supervisor of Operations

NRC Resident Inspector

*C. W. Hehl

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on January 11, 1985, with those persons indicated in paragraph 1 above. The licensee acknowledged the inspection results with no dissenting comments. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspector during this inspection.

Inspector Followup Item 50-395/85-01-01, Revised Secondary Water Chemistry Program (paragraph 5.b).

3. Licensee Action on Previous Enforcement Matters

(Closed) Inspector Followup Item 50-395/83-37-01, "Incorrect References to Procedures and to Deleted Attachments in Chemistry Procedures - 602, 603, 612, and 614". The inspector reviewed revisions to these procedures and verified that the previously observed errors had been corrected.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Plant Water Chemistry (92706)

The inspector reviewed the operational history of the Summer plant since his previous inspection (December 12-16, 1983) and evaluated the degree to which the licensee had protected the primary coolant pressure boundary (i.e., the three steam generators) from degradation. At the time of this inspection, the licensee was trying to return the plant to full power after a brief shutdown to make repairs on the main generator. The plant had returned to

power in December 1984, at the end of a two-month, first-refueling outage and is scheduled to operate nine months in its second fuel cycle.

a. Assessment of Operational Problems Associated with the Secondary Cycle

During 1984 two leaking tubes were found in steam generator 'B' although all three steam generators had been subjected to eddy-current tests during December 1983. The leaks were the results of cracks in the hot-leg side of two Row 1 tubes just below the 'U' bend and appear to have been caused more likely by material failure than by chemical-induced corrosion. The two leaking tubes were plugged. This steam generator was again eddy-current tested during the 1984 refueling outage, and no additional tubes needed to be plugged. Steam generator 'B' was also sludged lanced and visually examined during the refueling outage; however, essentially no solid material was observed or removed. The inspector was informed that all three steam generators will be examined and lanced at the end of the second fuel cycle.

Although there is no evidence of degradation of the steam generator tubes, there was one incident during 1984 that resulted in the transport of several cubic feet of ion exchange resins (from the condensate polishers) to the steam generator. (A similar incident occurred two days after this inspection). These resins undergo thermal decomposition in the steam generator water with the production of sulfate ions and acidic conditions. Consequently, measures must be taken promptly to minimize attack of the inconel-600 steam generator tubes and the initiation of localized corrosion environments in the steam generator.

These two intrusion events led to a re-evaluation by the inspector of the licensee's use of the condensate cleanup system at Summer.

The Final Safety Analysis Report (FSAR) for Summer (Section 10.4.6.2) states that the purpose of the Condensate Polishing System is "to minimize the time for plant startup" by removing solid and soluble impurities from the condensate as part of the phased cleanup of the secondary cycle during startup. Accordingly, the filter/demineralizer system was designed to be bypassed before reactor power exceeds 50% of full power. At higher power levels the quality of water in the steam generators is controlled through blowdown. In order to assure that the polishers are used effectively, the licensee has established limits on six key chemical parameters in the condensate/feedwater (ph, cation conductivity, sodium, suspended solids, oxygen, and hydrazine) that must be met before feedwater is pumped into the steam generators and prior to power escalation above 5%. During 1984, these limits were revised to be consistent with the guidelines recommended by the Steam Generator Owners Group (SGOG) and the Electric Power Research Institute (EPRI) and are more limiting than before (see paragraph 5.b of this report). These limits control the time required to effect cleanup of the condensate/feedwater lines and, subsequently, the extraction steam and drain lines by the condensate polishers. The more stringent limits

also reduce the difficulty of maintaining high quality steam generator water by means of blowdown.

In order to extend the usefulness of the condensate cleanup system and to reduce dependency on the blowdown system to maintain high quality steam generator water during plant operation above 50% power, the licensee installed a "kidney loop" between the hotwell and the condensate polishers during the refueling outage. These new lines and pumps allow water to be cycled between the hotwell and polishers so that a volume of water, equivalent to approximately 30% of the condensate flow at full power, is continually being polished. The inspector considers that, when it becomes operable, this "kidney loop" will increase the capability of the condensate cleanup system to perform two functions other than the one discussed in the FSAR; i.e., maintain a flow of continuously demineralized feedwater during plant operation and provide some degree of protection for the steam generator in case of condenser tube failure while the plant is operating.

Unfortunately, it was during a test of this 'kidney loop', subsequent to this inspection, that a misalignment of valves caused ion-exchange resin to be sucked from the condensate polisner, through the "kidney loop" and into the hotwell.

The inspector also reviewed the licensee's phased approach for cleaning the pipes and drains that provide flow in the high pressure sections of the secondary coolant; i.e., extraction steam lines and the drains from the moisture separator and reheater (MSR). The licensee cycles water from the feedwater heater drains and the MSR drain to the hotwell during the initial phase. By this means the bulk (~80%) of iron oxides removed from the carbon steel pipes of the secondary cycle is transported to the hotwell and is subsequently removed from the condensate by the filter/demineralizers in the condensate cleanup system. When reactor power reaches a level (~40% full power) where the condensate flow must be augmented, the flow of water from the high-pressure feedwater drain tank is valved to the deaerator and then to the suction of the feedwater pump. The licensee does not have the means to monitor the quality of this drain water; however, an administrative hold on power increase is effected until a determination has been made that the quality of the feedwater is not being degraded by the drain water. The licensee is also aware that the drain water is the most probable pathway for copper to be transported from the moisture separators to the steam generator. The moisture separator is the only heat exchanger in the secondary cycle with tubes that are fabricated from a copper alloy.

The inspector observed that during power ascension the licensee encountered difficulty in maintaining the specific level of cation conductivity in the feedwater ($\leq$ 0.2uS/cm) and in the steam generator blowdown (0.8uS/cm). The difficulty was attributed by the licensee, to reduced efficiency of the condensate polishers as the result of ammonia loading and was temporarily resolved by using freshly pre-coated

elements. The inspector considers it likely that the demineralizing capability of the resin elements had been degraded by the deposition of iron oxide on the elements during cleanup of the extraction steam and drain pipes.

Further difficulty with high cation conductivity was encountered after the plant attained full power. Two possible causes of this continuing problem were offered by the licensee: the water in the secondary cycle contained carbonates or was contaminated with light oils that were sprayed on the low-pressure turbine rotor that had been sand blasted and tested for blade and wheel cracks (none were found) during the refueling outage. The effect of either of these contaminants would have been reduced if the "kidney loop" or full-flow polishing had been available.

b. Assessment of the Licensee's Modified Water Chemistry Program

As referenced earlier, the licensee has endorsed the guidelines developed and recommended by SGOG/EPRI and is in the process of revising administrative and chemistry procedures to reflect these guidelines. The inspector reviewed draft Revision 0 of Station Administrative Procedure SAP-401 "Secondary Water Chemistry Program" and discussed, with members of the Chemistry Group and the Operations Department, how the SGOG/EPRI concepts of action level and corrective action responses to abnormal chemistry events are being applied. It was evident to the inspector that the implementation of SGOG/EPRI guidelines was still in a transition stage and not clearly understood and/or approved by the Operations Department. (Training sessions for Operations personnel were initiated during the inspector's visit to define the intent of the guidelines and to clarify the procedures to be taken to implement the guidelines during the transition period and when final procedures are approved.) The inspector will, therefore, defer assessment of the licensee's revised water chemistry program and will designate this action as Inspector Followup Item 85-01-01 "Revised Secondary Water Chemistry Program."

c. Assessment of the licensee's implementation of the Summer water Chemistry Program.

The inspector assessed the manner in which the licensee is implementing the Summer water chemistry program. This assessment was based on discussions with plant, personnel and audits of test results obtained before and after the refueling outage.

The inspector established that during the four-month period preceding the refueling outage, key chemistry parameters in the condensate and feedwater had been maintained within the limits specified in the Summer water chemistry program (Chemistry Procedures CHP-602 and CHP-615) as well as within the more stringent limits recommended by the SGOG/EPRI guidelines. No violations or deviations were identified.

The inspector observed that the Chemistry Group was fulfilling its responsibilities with two shifts on a twelve-hour rotation basis. Good use of the automated analytical and monitoring instruments on the secondary water chemistry sample panel was being made for monitoring the phased startup cleanup activities and for short-term trending of key chemical parameters. However, the inspector noted that some of this instrumentation was inoperable throughout the period of the inspection. A concern over timely maintenance of this instrumentation was discussed with plant management.

During 1984 the licensee has expanded the physical facilities used by the Chemistry Group through the addition of an 'oil laboratory' and a room to be used as office space.

6. Inservice Testing (IST) of Pumps and Valves (92706)

As part of a continuing review and examination of the licensee's program to implement the requirements of Technical Specification 4.0.5 (to test pumps and valves per the requirements of Section XI of the ASME Boiler and Pressure Vessel Code) the inspector reviewed the following procedures and the most recent test data acquired with these procedures:

- STP 105.004, RHR Pump Test (Rev. 7, March 23, 1984)
- STP 105.005, RHR System Valve Operability Test (Rev. 4, August 8, 1983)
- STP 105.006, SI/RHR Monthly Flowpath Verification Test (Rev. 2, March 11, 1983)
- STP 105.007, Accumulator Isolation Valve Verification (Rev. 1, October 1, 1984)
- STP 105.010, RHR/Reactor Coolant System Interlock Test (Rev. 1 Change A, December 5, 1984)
- STP 130.001, Valve Operability Testing, Plant Cooldown to Plant Shutdown (Rev. 4 Change 6, December 5, 1984)
- STP 130.002, Valve Operability Testing, Refueling Shutdown (Rev. 0, May 24, 1982)
- STP 115.008, RHR Valve Leakage Tests

The inspector verified that each Surveillance Test Procedure was attached to a cover sheet that contained pertinent guidance as to scheduling, description of the test, and precautions as well as signatures of personnel authorized to perform the test and review the test results. In addition, information was provided relative to the instruments used to perform the tests.

All test data reviewed were established to be within specified limits, or else correct measures had been taken for retesting the component. The operability of check valves was verified either by comparison of the flow through the valve with a reference flow valve or through disassembly of the valve per a designated Mechanical Maintenance Procedure (MMP) Data sheets from the MMP were included in the Test Data Package and provided information related to any repair that had been performed before the valve was reassembled.

The inspector observed that the reference values for the operability (flow rate) of all high-head injection valves tested per STP 130.002 had been established during the recent refueling outage.

The inspector verified that the most recent tests of all pressure isolation valves established that the leak rate limits of these valves met the limits (1 gpm) prescribed by Technical Specification 4.4.6.2.2, although leakage rates of 0.8 and 0.9 gpm were measured for two valves.

In response to the inspector's concern over the potential for errors in testing caused by the numerous 'pen and ink' changes in STP 130.001, the licensee stated that this procedure is being rewritten as four new procedures, each of which will pertain to a single mode of plant operation. Consequently, the new procedures will be much less extensive than STP 130.001 and easier to use.

During this part of the inspection no violations or deviations were identified.