



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

Report No.: 50-355/92-16

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

Docket No.: 50-395

License No.: NPF-12

Facility Name: V. C. Summer Nuclear Station

Inspection Conducted: July 11 through August 14, 1992

Inspectors: FOR R. W. Wright 8/31/92  
R. C. Haag, Senior Resident Inspector Date Signed

FOR R. W. Wright 8/31/92  
L. A. Keller, Resident Inspector Date Signed

Approved by: [Signature] 8/31/92  
Floyd S. Cantrell, Chief Date Signed  
Reactor Projects Section 1B  
Division of Reactor Projects

SUMMARY

Scope:

This routine inspection was conducted by the resident inspectors onsite in the areas of monthly surveillance observations, monthly maintenance observations, operational safety verification, verification of plant records, and action on previous inspection findings. Selected tours were conducted on backshift or weekends. These tours were conducted on five occasions.

Results:

A non-cited violation was identified.

A non-cited violation involved a failure to follow procedure during a battery charger service test (paragraph 3). A concern was identified for the apparent susceptibility of the Main Control Board (MCB) annunciators to fail due to electrical transients (paragraph 5.d). Data from recent testing of the "B" train Reactor Building Cooling Units (RBCU's) indicated that the heat transfer coefficient for these coolers is below the acceptance criteria. The licensee believes that this data is unreliable, and that the RBCU's will perform their design basis function. This item is identified as an inspector followup item pending further inspector review (paragraph 5.e.). The inspection required by TI 2E15/115, Verification of Plant Record was completed. No problems were identified during this review which included a comparison of operator logs against security access records (paragraph 6).

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- F. Bacon, Associate Manager, Chemistry
- W. Baehr, Manager, Chemistry and Health Physics
- K. Beale, Supervisor, Emergency Services
- \*C. Bowman, Manager, Maintenance Services
- M. Browne, Manager, Design Engineering
- \*B. Christiansen, Manager, Technical Services
- \*H. Donnelly, Senior Engineer, Nuclear Licensing
- \*M. Fowlkes, Manager, Nuclear Licensing
- S. Furstenber, Associate Manager, Operations
- G. Hall, Associate Manager, Health Physics
- W. Higgins, Supervisor, Regulatory Compliance
- \*S. Hunt, Acting General Manager, Nuclear Safety
- \*A. Koon, Nuclear Operations Project Coordinator
- \*K. Nettles, General Manager, Station Support
- H. O'Quinn, Manager, Nuclear Protection Services
- \*C. Osier, Acting Manager, Systems and Performance Engineering
- M. Quinton, General Manager, Engineering Services
- \*J. Skolds, Vice President, Nuclear Operations
- \*G. Taylor, General Manager, Nuclear Plant Operations
- \*R. White, Nuclear Coordinator, South Carolina Public Service Authority
- \*B. Williams, Manager, Operations

Other licensee employees contacted included engineers, technicians, operators, mechanics, security force members, and office personnel.

\*Attended exit interview

Acronyms and initialisms used throughout this report are listed in the last paragraph.

### 2. Plant Status

The plant operated at or near 100 percent power throughout the inspection period.

Other inspections or meeting:

- On July 15, 1992, the licensee conducted their annual emergency drill. A regional evaluation team observed the drill.
- During the week of July 13, 1992, a regional inspection in the area of radiological effluent monitoring was performed.

### 3. Monthly Surveillance Observation (61726)

The inspectors observed surveillance activities of safety related systems and components listed below to ascertain that these activities were conducted in accordance with license requirements. The inspectors verified that required administrative approvals were obtained prior to initiating the test, testing was accomplished by qualified personnel in accordance with an approved test procedure, test instrumentation was calibrated, and limiting conditions for operation were met. Upon completion of the test, the inspectors verified that test results conformed with technical specifications and procedure requirements, any deficiencies identified during the testing were properly reviewed and resolved, and the systems were properly returned to service. Specifically, the inspectors witnessed/reviewed portions of the following test activities:

- Emergency Diesel Generator "B" Operability Test (STP 125.002). On July 13, 1992, during a TS operability run, the "B" EDG tripped from full load. The local annunciator panel indicated that the engine tripped on high crankcase pressure. Subsequent troubleshooting included:
  - I&C personnel checked the operation of the crankcase vacuum switch
  - EDG lube oil analysis
  - Analysis of parameters recorded during the run
  - Visual inspection inside crankcase and camshaft areas
  - Discussions with vendor representatives
  - A run of the crankcase exhaust blower to verify proper operation

Everything that was checked appeared normal and no definitive cause of the trip could be determined. The crankcase exhaust blower suction valve was adjusted to provide increased vacuum, but the "as-found" valve position was sufficient. The "B" EDG was subsequently retested satisfactorily. The licensee concluded that this trip was the result of spurious operation of a trip (high crankcase pressure) that is bypassed in the emergency operating mode. The licensee classified this trip as an invalid failure and reported the event to the NRC in a Special Report in accordance with TS 4.8.1.1.3.

- Battery Charger Service Test (STP 501.005). The inspector observed portions of the swing battery charger (XBC 1A-1B) service test conducted on July 27, 1992. The inspector noted that step 7.4 directed the closing of DC output breaker, CB2 and AC input breaker, CB1. The CB1 and CB2 designations were not included on the permanent plant labels but were written in pencil next to the labels. The electricians performing the test indicated they would have the labeling changed to include the CB1/CB2 designations.

The inspector noted that the electricians, in preparation for performing the current limit threshold test (step 7.4), utilized a

separate procedure for setting up and operating the "Propel" load bank (EMP 115.025). Procedure EMP 115.025 was listed in the reference section of the STP, but there was no specific guidance as when to enter into the EMP, or what steps are to be performed. After setting up the load bank, using EMP 115.025, the electricians attempted to perform the current limit test in the STP, but were unable to achieve any load on the load bank. It was later determined that step 7.2.3 of EMP 115.025 had been inadvertently omitted. This step required installation of jumpers from the load stabs to the voltage sensor terminals on the load bank. The load bank cannot perform its function without these jumpers installed. The omission of step 7.2.3 of EMP 115.025 was identified as a non-cited violation, NCV-395/92-16-01, Failure To Follow Procedure During Battery Charger Service Test. This NRC identified violation was not cited because the criteria specified in Section VII.B. of the NRC Enforcement Policy was satisfied. Specifically this action was taken due to the lack of safety significance for the violation and the positive actions the licensee undertook to prevent recurrence. Corrective actions included counselling the individual who inadvertently omitted the procedural step, lessons-learned briefings for all electricians and a procedural upgrade for STP 501.005.

- ATWS Mitigation System Actuation Circuitry (AMSAC) Operational Test (ICP 345.040). Inspector noted strict procedural adherence by the technicians performing the test, and management oversight for this activity.
- Quarterly in-service testing of motor driven emergency feedwater pump "B" (STP 220.001A). All data from this test indicated acceptable pump performance.
- Functional test of the control circuit for the service water to emergency feedwater cross connect valves (STP 503.003).
- Operational test of the intermediate building smoke detectors and associated control panel XPN-100 (STP 128.302). Each detector was functionally tested with smoke to verify the detector sensed the condition and the corresponding deluge valve received an open signal.

A non-cited violation was identified involving the failure to follow procedural instructions while performing a battery charger service test. Corrective action taken in response to an invalid EDG failure appeared to be appropriate. All other tests observed demonstrated acceptable results.

#### 4. Monthly Maintenance Observation (62703)

Station maintenance activities for the safety-related systems and components listed below were observed to ascertain that they were

conducted in accordance with approved procedures, regulatory guides, and industry codes or standards and in conformance with TS.

The following items were considered during this review: that limiting conditions for operation were met while components or systems were removed from service, approvals were obtained prior to initiating the work, activities were accomplished using approved procedures and were inspected as applicable, functional testing and/or calibrations were performed prior to returning components or systems to service, activities were accomplished by qualified personnel, parts and materials used were properly certified, and radiological and fire prevention controls were implemented. Work requests were reviewed to determine the status of outstanding jobs and to ensure that priority was assigned to safety-related equipment maintenance that may affect system performance. The following maintenance activities were observed:

- Troubleshooting of SW booster pump discharge check valve XCV3135A-SW (MWR 9200071). The licensee suspected that this check valve was not completely seating. The inspector observed the troubleshooting activities on the check valve. The valve appeared to be functioning properly and the only corrective actions taken were to add hydraulic fluid and tighten fittings on the dashpot assembly. The subsequent post maintenance test on the valve (STP 123.003A) was satisfactory.
- Investigation of lack of Main Control Board (MCB) annunciation for "B" EDG fuel oil day tank low level (MWR 9203950). During the performance of the diesel generator support systems pump and valve test (STP 225.001), the operators noted that when they pumped down the fuel oil day tank the local alarm at the diesel control panel came in at 318 gallons, but the MCB annunciator did not come in. The technicians replaced the associated contact follower card in the diesel control panel. The inspector observed the retest and noted that the MCB annunciator functioned properly.
- Inspection of electrical termination integrity of control room evacuation panel (CREP), XPN7200B (PMTS P0158607). Inspector noted that cleanliness and material condition were adequate.
- Investigation and repair of emergency feedwater check valve XVC1009B (MWR 92K3115, NCN 4518). The design of this check valve utilizes a spring to assist valve closure and a remote actuation feature to allow air pressure to offset the spring force. During a test, the required torque to open the valve with air pressure applied exceeded the maximum value. This condition was corrected by lubricating and exercising the valve. Since no credit is taken for valve operation with air assistance, this condition did not affect valve operability. While reviewing this activity, the inspector noted a lack of general understanding by some of the operators on the air and spring assist functions of the valve. Also, the Design Basis Document (DBD) contained some confusing wording on the operation of XVC1009 series valves. The inspector discussed with licensee management the need for additional clarification on XVC1009

operation during operation training and improvements that can be made to the DBD.

- Investigation and repair of SW booster pump discharge valve XVB3106B (MWR 9203832). While stroke testing the valve from the closed position, per STP 123.0037, the breaker thermal overload tripped with the valve in mid-position. The thermal overload also tripped while closing the valve. After several attempts of resetting the overloads and trying to stroke the valve, satisfactory operation was obtained. The inspector noted this test failure while reviewing operations' logs and subsequently reviewed the maintenance work records. An MWR was written to investigate the problem, however, there was not an NCN written for this test failure. This appeared to be in contrast with SAP 1141, Nonconformance Control Program, which states that a test failure resulting from a hardware defect is a nonconformance.

While working the MWR, the electrician could not find any obvious problems with the valve operation. The thermal overload was tested and verified to be the correct size, the motor's impedance and balance was verified and valve's operating current load/ampereage was within acceptable limits. The only discussion or mention in the MWR cause of the test failure was included in an engineer's comment that the valve may have been binding. Yet the inspector noted that no actions were taken to inspect the Limitorque actuator or the valve internals for signs of binding or other possible problems. The effort to determine the cause of the test failure appeared to be weak. The inspector considered the failure to initiate an NCN for test failure as a major contributing factor for the weak root cause determination. The inspector was informed that this problem was classified as a test deficiency per SAP 133, Control of Station Surveillance Test Activities; however, it was not apparent that this classification aided in determining the cause of the failure. The licensee informed the inspector that they would review the scope of work and evaluations that were completed for this activity.

The efforts to determine the cause of a motor operator valve failure during testing appeared to be weak. All other maintenance activities observed were completed using the required procedures and equipment and achieved the desired results.

## 5. Operational Safety Verification (71707)

### a. Plant Tour and Observations

The inspectors conducted daily inspections in the following areas: control room staffing, access, and operator behavior; operator adherence to approved procedures, TS, and limiting conditions for operations; and review of control room operator logs, operating orders, plant deviation reports, tagout logs, and tags on components to verify compliance with approved procedures.

The inspectors conducted weekly inspections for the operability verification of selected ESF systems by valve alignment, breaker positions, condition of equipment or component(s), and operability of instrumentation and support items essential to system actuation or performance.

Plant tours included observation of general plant/equipment conditions, fire protection and preventative measures, control of activities in progress, radiation protection controls, physical security controls, plant housekeeping conditions/cleanliness, and missile hazards. Reactor coolant system leak rates were reviewed to ensure that detected or suspected leakage from the system was recorded, investigated, and evaluated; and that appropriate actions were taken if required. Selected tours were conducted on backshifts or weekends.

Previously, the inspector had discussed with licensee management the lack of cooling ventilation flow for the EFW turbine driven pump room. This room is provided with ventilation flow by the EFW pump room cooler units, however the fans for these air handling units receive an automatic start signal only when the motor driven EFW pumps are operating. In previous evaluations the licensee had determined that the high temperatures in the EFW turbine driven pump room were not a concern to the equipment environmental qualifications. The inspector questioned the high room temperature as a habitability concern for personnel taking log readings, while performing tests and during the initial operator actions for emergency procedures. Recently, the licensee added steps in a special instruction for dealing with hot weather conditions to manually start one of the two EFW pump room air handling unit fans.

b. Emergency Diesel Generator Reliability Review

The Station Blackout (SBO) Rule requires that nuclear power plants be able to withstand an SBO for a "specified duration" which is based, in part, on the reliability of the EDGs. The unavailability of the EDGs due to testing and maintenance is directly related to the resolution of the SBO issue. In a memorandum, dated June 19, 1992, NRR requested that the regional staff obtain the out-of-service time for EDGs due to planned maintenance or unplanned corrective maintenance during power operations and shutdown periods over the past two years. Correspondingly, the inspectors requested that the licensee complete an EDG outage summary chart for the "A" and "B" EDGs during the June 1990 to May 1992 time period. Based on the licensee supplied out-of-service data, the unavailability time for each EDG was 3.5 percent with no overlapping outage time. This data was sent to the regional office for consolidation and transfer to NRR.

c. Thermo-Lag 330 Fire Barrier Material

On June 24, 1992, the NRC issued Bulletin 92-01, "Failure of Thermo-Lag 330 Fire Barrier System to Maintain Cabling in Wide Cable Trays and Small Conduits Free From Fire Damage". The bulletin required licensees to 1) identify the areas which have Thermo-Lag 330 fire barrier material installed, 2) determine the areas which use this material for protecting small diameter conduit or wide trays (greater than 14 inches) that provide safe shutdown capability, and 3) take appropriate measures consistent with these fire barriers being inoperable. In response to this bulletin, the licensee issued NCN 4498 which identified areas where Thermo-Lag was installed in the plant and instituted compensatory actions (one hour roving fire watch) for four of these areas. The inspector verified that the one area that was excluded from compensatory actions did not meet the criteria specified in the bulletin, and also reviewed security records to verify that fire watch personnel had entered the four areas on an hourly basis.

d. Partial loss of MCB annunciators

On July 22, 1992, approximately 20 percent of the MCB annunciators were disabled due to an electrical surge associated with a lightning strike. Appropriate compensatory actions were initiated until the annunciators were restored later that same day. The electrical surge originated from an oil sump level switch (ILS06363) which is located outside plant buildings. The electrical surge destroyed a diode on a "multiple input" card located in annunciator logic (Beta) cabinet XPN-6092. This failed diode resulted in the complete failure of cabinet XPN-6092. This cabinet feeds approximately 20 percent of the MCB annunciators. In reviewing this event, the inspector noted that outside field inputs into the Beta cabinets do not have surge protection and that of the six Beta cabinets, five have at least one outside field input which could be susceptible to lightning strikes. The inspector inquired if the licensee was going to research the ramifications of losing the assessment capability associated with the loss of each individual Beta cabinet that is susceptible to lightning surges. The licensee indicated they would look into this issue and determine if surge protection is warranted for field inputs to the Beta cabinet that are susceptible to lightning strikes. This item is identified as IFI 395/92-16-02, Adequacy of MCB Annunciator Electrical Surge Protection.

e. Reactor building Cooling Unit Heat Transfer Coefficients

In response to Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment", the licensee committed to perform preventative maintenance on the RBCU heat exchangers in lieu of testing and trending heat transfer coefficients. Additionally, the licensee committed to establish



an effective testing program to verify the heat transfer capability of various other heat exchangers. The procedure developed to evaluate the heat transfer capability of Service Water (SW) cooled heat exchangers, ES-560.211, has been utilized on the "B" train RBCU's in an effort to determine if this testing method is preferable to periodic inspections. The testing conducted on the RBCU's involved measuring various parameters (i.e. SW inlet and outlet temperature, RB pressure, temperature and humidity, etc.) and inputting these parameter values into a computer program which calculates a fouling factor for the heat exchanger. The computer program then utilizes this fouling factor to determine the heat transfer coefficient that would exist under accident conditions.

The minimum heat transfer coefficient required under accident conditions for the RBCU's is 48.29. The inspector noted that the last three of the four tests conducted on RBCU cooler 2B indicated that the accident heat transfer coefficient was below the acceptance criteria, and 4 of the 4 tests conducted on cooler 1B also indicated unacceptable heat transfer coefficients. The licensee felt that this test data was unreliable due to measurement uncertainties and the large distribution of the test data. The inspector noted that changes in input data, which were within the measurement uncertainties for the instruments used for data collection, could result in satisfactory test results. Based on this, and the fact that SW flows and differential pressure across the heat exchangers are consistent with values measured following tube cleaning conducted in 1988, the inspector felt that there was not an immediate operability concern. The licensee has scheduled RBCU inspections for the upcoming outage. The inspectors will observe the condition of these heat exchangers during these inspections. This item is identified as IFI 395/92-16-03, Adequacy of RBCU Heat Transfer Capability.

6. Verification of Plant Records (Temporary Instruction 2515/115)

On April 23, 1992, the NRC staff issued Information Notice (IN) 92-30, Falsification of Plant Records, to alert licensees to the NRC's concern that plant mechanics, technicians and operators may have falsified plant logs at several nuclear power plants. Specifically, the IN discussed events where both licensed and non-licensed operators falsified their inspection round logs, including some which involved violation of technical specifications. Also, an event was discussed where I&C technicians failed to properly follow a surveillance procedure and subsequently created data that was entered on the calibration data sheet.

To allow licensees sufficient time to implement their own review program in this area, the TI inspection effort did not begin before June 30, 1992. As part of the licensee's response, the IN was placed into the required reading for all plant personnel who could be required to take log readings or record plant data. For these same individuals

the issue of falsification of records and the responsibilities associated with record taking was discussed during staff meetings. The licensee's assessment of the IN concluded that the current amount of operator logs are not excessive and that management has been sensitive to personnel demands associated with operator logs. The licensee did not perform a self-monitoring program to compare operator logs versus room entry security records. When questioned by the inspector on why this type of comparison was not performed, the licensee stated that previous reviews of plant problems had included comparisons of logs and security records and no falsification problems were identified. However, the inspector noted that these comparisons were only completed for a few isolated events and the comparison times were relatively short.

To complete the inspection required by the TI, the inspector requested copies of various operator logs and a security record printout for room entries corresponding to the logs. These records were for nine rooms/areas, each requiring separate entries, and fifteen separate days which covered a five month time period (March 8 through July 25, 1992). With both day and evening logs being reviewed, the total number of individual entries was 270. For all the logs associated with an individual room/area, the inspector verified that a security access record existed for that particular entry and the log signoff times matched the access times. One exception involved an operator under instruction who made a room entry and verified the actual log parameters, while the operator providing the instructions completed the log signoff. The licensee informed the inspector that this example complied with SAP 200, "Conduct of Operations", for a qualified individual to review the trainee's log keeping. However, the licensee's expectation is for both the qualified operator and the trainee to complete the log signoff. The need to meet these expectations for operator logs and trainees was discussed with operation personnel.

While reviewing the "Thermo-Lag" fire barrier material issue, the inspectors reviewed the security access records for the areas which required a hourly fire watch patrol. This review verified that room/area entries were made for the documented roving fire watch patrols.

Based on review of the licensee's actions associated with IN 92-30 and the inspectors successful verification of required room entries against security access records, the inspection requirements of TI 2515/115 are completed and the TI is closed.

7. Action on Previous Inspection Findings (92701, 92702)

(Closed) Unresolved Item 395/92-13-01, Failure to take required technical specification explosive gas sample. A personnel error and the failure to update a procedure used to track TS action items (GTP 702), resulted in missed grab sample. The importance of complying with TS related to sampling was emphasized to Operations and Chemistry

personnel during shift meetings. GTP 702 was compared to other TS amendments. No significant errors were found as a result of this review. Additionally, the procedure for TS changes (NL-116) was enhanced to ensure all documents affected by a TS amendment would be identified and any necessary revisions made in a timely manner.

(Closed) Inspector Followup Item 395/90-27-01, Discrepancies between actual stroke times and remote indication stroke times for air operated valves (AOVs). Previously, the licensee had discovered large differences between actual stroke time and STP stroke time (based on main control board indications) for several AOVs in the chill water system. For all the AOVs under the IST program the licensee identified those AOVs with a maximum allowed stroke time, i.e., TS or FSAR required time, and compared the maximum stroke times with previous STP stroke times. For those AOVs without a large margin between the required and measured times, the licensee either inspected the AOV or reviewed the controls for setting the valve limit switches. No additional problems were identified. Also, licensee plans to improve remote position indication (RPI) verifications that are performed each cycle such that limit switch actuations are actually verified at the open and closed positions.

#### 8. Exit Interview (30703)

The inspection scope and findings were summarized on August 14, 1992, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed the inspection findings.

Dissenting comments concerning the apparent violation for inadequate procedural controls for the EDG floor painting activity were received from the licensee. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during the inspection.

| <u>Item Number</u> | <u>Description and Reference</u>   |
|--------------------|--|
| 395/92-16-01       | NCV - Failure to follow procedure during battery charger service test (paragraph 3). |
| 395/92-16-02       | IFI - Adequacy of MCB annunciator electrical surge protection (paragraph 5.d).       |
| 395/92-16-03       | IFI - Adequacy of RBCU heat transfer capability (paragraph 5.e).                     |

#### 9. Acronyms and Initialisms

|       |  |
|-------|--|
| AC    | Alternating Current                        |
| AMSAC | ATWS Mitigation System Actuation Circuitry |
| AOV   | Air Operated Valve                         |
| ATWS  | Anticipated Transient Without Scram        |

|      |                                   |
|------|-----------------------------------|
| CMP  | Civil Maintenance Procedure       |
| CREP | Control Room Evacuation Panel     |
| DBD  | Design Basis Document             |
| DC   | Direct Current                    |
| EDG  | Emergency Diesel Generator        |
| EFW  | Emergency Feedwater               |
| EMP  | Electrical Maintenance Procedure  |
| ESF  | Engineered Safety Feature         |
| FSAR | Final Safety Analysis Report      |
| GTP  | General Test Procedure            |
| I&C  | Instrumentation and Control       |
| ICP  | Instrumentation Control Procedure |
| IFI  | Inspector Followup Item           |
| IN   | Information Notice                |
| IST  | Inservice Test                    |
| LER  | Licensee Event Reports            |
| MCB  | Main Control Board                |
| MWR  | Maintenance Work Request          |
| NCN  | Nonconformance Notice             |
| NCV  | Non-Cited Violation               |
| NRC  | Nuclear Regulatory Commission     |
| NR   | Nuclear Reactor Regulation        |
| ONO  | Off-Normal Occurrence             |
| PMTS | Preventive Maintenance Task Sheet |
| QA   | Quality Assurance                 |
| QC   | Quality Control                   |
| RBCU | Reactor Building Cooling Unit     |
| RCS  | Reactor Coolant System            |
| RPI  | Remote Position Indication        |
| RWP  | Radiation Work Permits            |
| SAP  | Station Administrative Procedure  |
| SBO  | Station Blackout                  |
| SPR  | Special Reports                   |
| STP  | Surveillance Test Procedures      |
| SW   | Service Water                     |
| TI   | Temporary Instruction             |
| TS   | Technical Specifications          |