



UNITED STATES
 NUCLEAR REGULATORY COMMISSION
 REGION II
 101 MARIETTA STREET, N.W., SUITE 2900
 ATLANTA, GEORGIA 30323-0199

Report No.: 50-395/95-20

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

Docket No.: 50-395

License No.: NPF-12

Facility Name: Virgil C. Summer Nuclear Station

Inspection Conducted: December 1 through 31, 1995

Inspectors: B. R. Bonser 1/25/96
 B. R. Bonser, Senior Resident Inspector Date Signed
 J. L. Starefos, Resident Inspector
 J. L. Coley, Reactor Inspector, paragraphs 3.1 & 3.2

Approved by: George A. Belisle 1/29/96
 George A. Belisle, Chief Date Signed
 Reactor Projects Branch 5
 Division of Reactor Projects

SUMMARY

Scope:

This routine resident inspection was conducted on site in the areas of plant operations, maintenance, on-site engineering, and plant support.

Results:

Plant Operations

Actions taken by the licensee to ensure turbine driven emergency feedwater (TDEFW) pump operability were adequate following introduction of air into the pump during a post maintenance test. With air trapped in the service water (SW) piping, the TDEFW pump was capable of performing its design function. An Inspection Follow Up Item was opened to review the licensee's investigation into the source of the air in the SW suction piping and their inspection of the pump (paragraph 2.3).

Maintenance

Observations of maintenance activities identified that mechanical and electrical maintenance personnel were knowledgeable and industrious in carrying out their assigned duties (paragraph 3.1).

Observation of surveillance activities also identified that operations and test unit personnel were knowledgeable and industrious in carrying out their assigned duties (paragraph 3.2).

Engineering

A review of the calorimetric concluded that it was technically correct, the computer software was appropriately updated, and the results of the heat balance were accurate. However, the programmatic and quality controls for thermal performance monitoring were weak. An Unresolved Item was identified to evaluate issues concerning active procedures and programmatic controls. (paragraph 4.2).

Plant Support

Concerns were not identified during an Emergency Preparedness Training Drill (paragraph 5.2).

The licensee's emergency preparedness procedure revisions and implementation of siren modification work were well planned and executed, and adequately addressed avoiding an entry into an emergency classification (paragraph 5.3).

Several emergency siren location entries on the growl test printout were listed as successes but showed as low decibel failures. The licensee is working with the vendor to address this indication issue (paragraph 5.4).

REPORT DETAILS

Acronyms used throughout this report are defined in paragraph 8.

1.0 PERSONS CONTACTED

1.1 Licensee Employees

- *Bacon, W., Manager, Chemistry Services
- *Bailey, S., Supervisor, System Engineering
- *Blue, L., Manager, Health Physics
- *Browne, M., Manager, Design Engineering
- *Byrne, S., General Manager, Nuclear Plant Operations
- *Fields, C., Manager, Materials and Procurement
- *Fipps, S., Senior Engineer, Independent Safety Engineering Group
- *Fowlkes, R., Manager, Nuclear Licensing & Operating Experience
- *Franchuk, T., Supervisor, Facilities, Administrative and Document Control
- Furstenberg, S., Manager, Maintenance Services
- *Haselden, R., Supervisor, Instrument & Control
- Hunt, S., Manager, Quality Systems
- *Kelley, V., Coordinator, Emergency Service
- *Lavigne, D., General Manager, Nuclear Safety
- *Loignon, G., Project Coordinator, Nuclear Operations
- *McAlister, T., Supervisor, Quality Control
- *McMillan, M., Supervisor, Electrical
- *Moffatt, G., Manager, Planning and Scheduling
- Nesbitt, J., Manager, Technical Services
- Nettles, K., General Manager, Station Support
- O'Quinn, H., Manager, Nuclear Protection Services
- *Taylor, G., Vice President, Nuclear Operations
- *Walker, G., Supervisor, Craft/Technical Training
- Waselus, R., Manager, Systems & Component Engineering
- *White, R., Nuclear Coordinator, South Carolina Public Service Authority
- *Williams, B., Manager, Operations
- Williams, G., Associate Manager, Operations

Other licensee employees contacted included office, operations, engineering, maintenance, chemistry/radiation, and corporate personnel.

2.0 PLANT OPERATIONS (71707/40500)

2.1 Plant Status

The plant operated at or about full power during the entire inspection period.

2.2 General

The inspectors conducted frequent control room tours to verify proper staffing, operator attentiveness, and adherence to procedures. The inspectors attended daily plant status meetings and shift turnovers to maintain awareness of overall facility operations, and reviewed operator

logs to verify operational safety and compliance with TS. Instrumentation and safety system lineups were periodically reviewed from control room indications to assess operability. Frequent plant tours were conducted to observe equipment status and housekeeping. During the inspection period, the inspectors toured the Auxiliary Building with an auxiliary operator during his rounds. The inspectors observed the auxiliary operator taking readings and recording them on a portable computer. The operator was knowledgeable of his duties.

ONOs were reviewed to assure that potential safety concerns were properly reported and resolved. The inspectors routinely attended plan of the day meetings where management discussed ONO details and proposed actions to resolve the issues.

2.3 Air in SW Piping to Suction of TDEFW Pump

On December 11, the TDEFW pump was removed from service for planned maintenance. The maintenance included work on the pump casing vent valve and the discharge piping vent valve, and required draining the suction header. Following maintenance, the suction header was filled and vented. When the TDEFW pump was started for post maintenance testing, operators in the control room received low suction pressure alarms. Locally, noise was heard from a check valve in the B train SW supply header to the TDEFW pump. In addition, the pressure indicators on the suction and discharge sides of the TDEFW pump fluctuated abnormally. The TDEFW pump was secured and an investigation into the abnormal indications was initiated.

The licensee identified that the cause of the pressure fluctuation was air in the TDEFW pump suction header from the backup B SW supply piping. The B SW supply to the TDEFW pump has a vertical run of piping between a normally closed isolation valve at the high point and a downstream check valve near the inlet to the pump. The licensee determined that this pipe section was drained for the maintenance on December 11 and the procedure to fill the piping was not adequate. On December 12, the licensee wrote a fill and vent procedure to address venting air in this pipe section. During implementation of the revised fill and vent procedure, the licensee identified air in the piping between this isolation valve and another normally closed isolation valve further upstream. The B SW piping to the TDEFW pump was subsequently filled and vented. In addition, stroking the upstream isolation valve verified that no air existed in the SW line upstream of the upstream isolation valve. The identification of air in the SW piping between these normally closed isolation valves raised an operability concern since the air may have been in this piping while the TDEFW pump was considered operable.

The TDEFW pump was tested on December 12, using Procedure STP-220.002, Turbine Driven Emergency Feedwater Pump Test, revision 1, to demonstrate pump operability. The inspectors reviewed the surveillance results and determined that the test data fell within acceptable ranges. The test results mitigated concerns that air may have damaged the pump during the

initial post maintenance test run. Although the test results were within acceptable ranges, the licensee has indicated that the TDEFW pump would be disassembled and inspected for damage during the next refueling outage. Based on the December 12 test results, the inspectors were satisfied that the TDEFW pump was presently operable.

The licensee revised procedure SOP-117, Service Water System, to add two sections for venting train A and train B SW piping to the EFW pumps. The licensee is currently venting the SW piping to the EFW pumps whenever the SW pumps are stopped. In addition, the licensee established a monthly venting PM to remove any air in the SW supply piping to the EFW pumps. The licensee continues to investigate ways that air may have been introduced into the SW system. The inspectors concluded that the licensee's actions were adequate to ensure continued operability of the TDEFW pump should SW become the source. The licensee's investigation into the source of the air in the SW suction piping and the TDEFW pump inspection will be tracked as IFI 50-395/95-20-01, Air in SW Piping to Suction of TDEFW Pump.

The inspectors also reviewed the past TDEFW pump operability concern. The air in the B SW supply to the TDEFW pump had been present during the time that the TDEFW pump was considered operable. Since SW is the backup supply to the EFW system on a loss of the CST, operability of the TDEFW pump was evaluated. The inspectors' review of this issue with NRC staff and the licensee determined that there were no design basis accidents in which SW would be required to supply the TDEFW pump with the CST initially operable before an event. The inspectors concluded that, with the air trapped in the SW piping, the TDEFW pump was capable of performing its design function.

No violations or deviations were identified.

3.0 MAINTENANCE (62703/61726)

3.1 Maintenance Observations

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: 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. WRs were reviewed to determine the status of outstanding jobs and to ensure that priority was assigned to safety-related equipment maintenance. The following maintenance activities were observed:

- Reactor Building Spray Sump Isolation Valve B - Component ID No. XVG03005B: Deficiency Corrected: Boron on Valve and Fasteners, Corrective Maintenance: Cleaned and Adjust Packing, performed by Maintenance Work Order No. 95M3195.
- Reactor Building Spray Sump Isolation Valve B - MOVAT test performed by electrical maintenance: test conducted after above valve maintenance to determine whether baseline setting for motor operated valve had been affected. Preventive Maintenance Task Sheet No. 0191487 and Surveillance Test Task Sheet No. M31499 were used. Valve operator baseline settings had not been affected by the preventive maintenance.

The following approved procedures were also reviewed by the inspectors: Mechanical Maintenance Procedure No. 445.001, Adjusting and Packing Valves, revision 10; Electrical Maintenance Procedure No. 445.007, Baseline Testing of Motor Operated Valves with the Movats 3500 System, revision 8; and Electrical Maintenance Procedure No. 445.016, Installation of Transducers for MOV Testing, revision 0. Mechanical and electrical maintenance personnel were knowledgeable and industrious in carrying out their assigned duties.

3.2 Surveillance Observations

The inspectors observed surveillance activities on safety-related systems and components listed below to ascertain that those activities were conducted in accordance with the TS.

- Diesel Generator B Engine Operability Test - Test was conducted by operations in accordance with STP-125.002, Diesel Generator Operability Test, (Component ID No. XEG0001B-E), revision 17.
- Service Water Pump B and Service Water Booster Pump B Test - Test was conducted by Test Unit in accordance with STP-223.002A, Service Water Pump Test, (Component ID No. XPP0039B), revision 5.

In order to ensure that surveillance testing of these important safety-related components was conducted satisfactory, the inspectors verified the following parameters: procedures were in conformance with the TS, procedures were reviewed and approved by the licensee, administrative approvals had been obtained for the test, test instrumentation was within its current calibration cycle, system line-up was observed, the complete test was observed, system restoration was observed, test data was reviewed for accuracy and completeness, test results were reviewed and found to meet procedure and TS requirements, test personnel qualifications records were reviewed, and discrepancies noted during test which did not affect test results were recorded and maintenance

work orders written to correct the problems. No defects were observed that effected either test witnessed by the inspectors. Operations and test unit personnel were observed to be knowledgeable and industrious in carrying out their assigned duties.

The inspectors also reviewed the following surveillance:

- ES 560.108, Periodic Check of Plant Computer Calorimetric Program, revision 2, - The purpose of this test is to provide an integrity check of the calorimetric program that resides in the plant computer. The inspectors identified no concerns.

No violations or deviations were identified.

4.0 ON-SITE ENGINEERING (37551)

4.1 General

General engineering activities were reviewed to determine their effectiveness in preventing, identifying, and resolving safety issues, events, and problems. During the inspection period, the inspectors interfaced routinely with system and design engineers concerning plant issues. These issues included EFW system and plant thermal performance issues. The inspectors found the engineers knowledgeable of their systems and able to justify technical recommendations.

4.2 Calorimetric Review

The inspectors reviewed the licensee's calorimetric program and the program's controls. The results of the calorimetric are used to determine reactor power, verify the accuracy of the plant nuclear instrumentation, and ensure the plant operates within its licensed limit. The licensee determines reactor power using the FIVCALs calorimetric computer program which calculates core power using installed plant instrumentation. The FIVCALs program in the IPCS provides a real time calculation of power using five different methods. These include: a secondary side calorimetric based on feedwater flow rates; a secondary side calorimetric based on steam flow rates; a primary side calorimetric based on RCS flow rates and delta temperature; and a primary side method based on per cent delta temperature; and a secondary side method based on turbine first stage pressure.

The licensee is currently using the secondary side calorimetric based on the feedwater flow rates as the accurate measure of core power. The FSAR states that power is normally determined from the average of five weighted methods. In the event that one or more methods are deemed unreliable then that method is deleted or weighted less heavily. The licensee determined that the feedwater flow method was the most reliable and chose this as the sole means to accurately verify core thermal power. The inspectors reviewed the heat balance equation used in the computer program to calculate thermal power; reviewed the source of the constants and variables in the heat balance equation; reviewed

instrumentation calibration records from the last refueling outage; reviewed surveillance procedures related to the calorimetric; and reviewed the results of a recent ONO and ISEG report covering calorimetric issues.

The inspectors found that all of the parameters providing an input into the secondary side calorimetric method based on the enthalpy rise from feedwater to main steam and feedwater flow rates were included in the licensee's calculation. The inspectors also found the instrumentation providing inputs into the heat balance were calibrated during the last refueling outage. The instrumentation included feedwater flow, SG blowdown flow, feedwater temperature, low pressure letdown flow and main steam header pressure transmitters. Several constants were also updated and incorporated into the calorimetric following the SG replacement during the last refueling outage. The inspectors found that moisture carryover in the SGs has been higher than expected and the constant used in the calorimetric has resulted in a conservative calculation of thermal power. The licensee is planning a SG modification for the upcoming outage to reduce SG moisture carryover.

The inspectors concluded that the calorimetric method in use was technically correct, the computer software was appropriately updated, and the results of the heat balance were accurate.

The programmatic and quality controls for the monitoring of thermal performance were weak. During the procedure review, the inspectors identified two calorimetric procedures that were still active but had not been updated for use with the IPCS and were not being performed. The procedures were: ES-560.106, Calorimetric Parameter Normalization Surveillance, revision 0, used, in part, to calculate feedwater temperature normalization constants; and ES-560.107, Surveillance of Calorimetric and Heat Rate Results, revision 0, used to assure that error in the calorimetric results was less than two per cent.

The inspectors also identified another issue relating to programmatic controls. These involved changes to the software being done informally and findings from an ISEG report had not been formally acted upon.

Pending further review and resolution of the calorimetric programmatic questions, this issue is identified as URI 50-395/95-20-02, Resolution of Quality and Programmatic Controls Affecting Calorimetric.

No violations or deviations were identified.

5.0 PLANT SUPPORT (71750)

5.1 General

During inspection activities and tours of the plant, the inspectors routinely observed aspects of plant support in the areas of radiological controls, physical security, and fire protection. The level of radiological protection controls applied to work activities observed was

commensurate with the difficulty and risk associated with the task. Effective implementation of the physical security program continued to be demonstrated during inspector observations of: security badge control; search and inspection of packages, personnel, and vehicles; tours and compensatory posting of security officers; and control of protected and vital area barriers. In addition, the inspectors inspected the outside areas of the Protected Area while on tour with a site security officer. The security officer appeared knowledgeable of his duties.

5.2 EP Training Drill

On December 6, an Emergency Preparedness Training Drill was conducted. This drill used a loss of coolant accident of approximately 100 gpm as the initiating event. The inspectors observed portions of the drill from the simulator control room and attended portions of the briefings presented by the licensee to the media. The inspectors did not identify any concerns during the drill.

The licensee determined that the objectives of the drill were met. The licensee's drill critique identified a number of comments. The inspectors reviewed the licensee's comments and concluded that resolution of critique findings could enhance future drill performance.

5.3 EP Sirens Inoperable Due To Radio Antenna Modification

On December 8, the licensee declared the EWSS inoperable for 32 minutes for planned modification work. The modification connected the site radio system into the antenna system for the EWSS.

The licensee's Emergency Action Levels state, "...other significant loss of assessment or communication capability," as an Initiating Condition for a NOUE. One of the detection methods the licensee used to meet this EAL Initiating Condition was, "EWSS declared inoperable." The licensee considered changing the detection method to allow for a 30 minute EWSS inoperability as the most appropriate way to avoid NOUE entry for the condition caused by the modification. The inspectors questioned this approach by the licensee.

After discussion with NRC technical staff, the licensee made procedural revisions to allow for planned maintenance of the EWSS without entering a NOUE emergency classification. Procedures EPP-001, Activation and Implementation of Emergency Plan, revision 23, and EPP-021, Activation of Early Warning Siren System, revision 15, were changed to state that EWSS inoperability did not apply to planned maintenance or repair activities as described in Step 5.6 of EPP-021. Step 5.6 of EPP-021 requires the licensee to develop a work plan outlining the scope of work, including the estimated out-of-service time, and a contingency plan for restoring the system in the event of a plant emergency. EPP-021 also states that both the work plan and the contingency plan shall be approved by the ESU. In addition, Step 5.6 requires that the maintenance or repair activity be coordinated with the control room and

that the licensee obtain verbal concurrence from the South Carolina Emergency Preparedness Division and the four associated counties. The inspectors concluded that these actions were acceptable for planned maintenance on the EWSS for a short time duration without entry into an NOUE emergency classification.

The licensee produced a work and contingency plan associated with the modification. The materials for this job were staged, disassembly and reassembly of the antenna was done in a swift manner (approximately one minute), and sirens 106 & 107 were polled to confirm that communication was reestablished. Following the maintenance activity, a silent test of the EWSS was completed with satisfactory results. The inspectors considered that this work was well planned and executed.

5.4 EWSS Monthly Siren Growl Test

On December 5, 1995, the licensee conducted the EWSS monthly siren growl test in accordance with procedure EPP-104, Verification of Communications Operability, revision 3. The inspectors observed portions of the test at the siren computer in the TSC, where the test was accomplished. The licensee sounds the EWSS on the first Tuesday of each month at noon. The local public was notified by a calendar sent to their home each year by the licensee. The computer polled each of the entire group of sirens in the four affected counties, the results of the growl test were printed, and the ESU representative individually polled failed sirens to verify operability status. In this case, one siren listed on the printout with the communication status failed, communicated as a success when individually polled. The revised number of sirens which responded properly were 98 of 106 tested.

The inspectors discussed with the licensee that several siren location entries on the printout were listed as a Growl Test success but showed as failed under Low dB Alarm with the Peak dB Level reading at 0. The licensee explained that when the Peak dB Level reaches 120, the indication resets to 0 and the Low dB Alarm comes in as failed, even as the siren continues to alarm. The licensee is working with the vendor to address this indication issue.

No violations or deviations were identified.

6.0 OTHER NRC PERSONNEL ON SITE

None

7.0 EXIT

The inspection scope and finding were summarized on January 5, 1996, by B. R. Bonser with those persons indicated by an asterisk in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results. A listing of inspection findings is provided. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

<u>Item Number</u>	<u>Status</u>	<u>Description and Reference</u>
IFI 50-395/95-20-01	Open	Air in SW Piping to Suction of TDEFW Pump (paragraph 2.3).
URI 50-395/95-20-02	Open	Resolution of Quality and Programmatic Controls Affecting Calorimetric (paragraph 4.2).

8.0 ACRONYMS

CFR	Code of Federal Regulations
CST	Condensate Storage Tank
dB	Decibels
DRS	Division of Reactor Safety
EAL	Emergency Action Levels
EFW	Emergency Feedwater
EP	Emergency Preparedness
EPP	Emergency Plan Procedure
ESU	Emergency Services Unit
EWSS	Early Warning Siren System
FSAR	Final Safety Analysis Report
gpm	Gallons Per Minute
IFI	Inspection Followup Item
IPCS	Integrated Plant Computer System
ISEG	Independent Safety Engineering Group
MOV	Motor Operated Valve
NOUE	Notice of Unusual Event
NPF	Nuclear Production Facility [Type of license]
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
ONO	Off Normal Occurrence
PM	Preventive Maintenance
QC	Quality Control
RCS	Reactor Coolant System
RII	Region II
RTS	Regulatory Tracking System
SG	Steam Generator
STTS	Surveillance Test Task Sheet
STP	Surveillance Test Procedure
SW	Service Water
TDEFW	Turbine Driven Emergency Feedwater
TS	Technical Specification
TSC	Technical Support Center
URI	Unresolved Item
WR	Work Request