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

Report No.: 50-395/91-11

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

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

Facility Name: V. C. Summer

Inspection Conducted: June 10-14, 1991

Inspectors: McKenzie Thomas 7/10/91
M. Thomas Date Signed

for McKenzie Thomas 7/10/91
J. Lenahan Date Signed

Approved by: Frank Jape 7/10/91
F. Jape, Chief Date Signed
Test Programs Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine announced inspection was conducted in the areas of design changes and modifications and engineering support activities.

Results:

In the areas inspected, violations or deviations were not identified.

The modifications packages reviewed were well documented, thorough, and technically adequate. Licensee management has been extensively involved in engineering support activities. The training and qualification program for engineering personnel is well defined, however, improvement is needed in implementation. Engineering personnel are actively involved in day-to-day plant activities and provide timely support to operations and maintenance. Nonconformance notices reviewed were thorough and detailed, however, the determination and identification of causes for the applicable problems did not appear to be adequately addressed in some instances.

1 OP

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*M. Browne, Manager, Systems and Performance Engineering
*B. Christiansen, Manager, Technical Services
*H. Donnelly, Senior Engineer, Nuclear Licensing
T. Estes, Acting Associated Manager, Design Engineering
*A. Koon, Manager, Nuclear Licensing
*G. Lin, Engineer, Independent Safety Engineering Group
*M. Quinton, General Manager, Engineering Services
*J. Skolds, Vice President, Nuclear Operations
*G. Soult, General Manager, Nuclear Plant Operations
*R. Waselus, Acting Manager, Design Engineering

Other licensee employees contacted during this inspection included engineers, operators, technicians, and administrative personnel.

NRC Resident Inspector(s)

*R. Haag, Senior Resident Inspector
*L. Keller, Resident Inspector

*Attended exit interview

2. Design Changes and Modifications (37700)

The inspectors reviewed the modification request forms (MRF) listed below to determine the adequacy of the evaluations performed to meet 10 CFR 50.59 requirements; verify that the modifications were prepared and installed in accordance with licensee administrative procedures and applicable industry codes and standards; verify that the changes were reviewed and approved in accordance with Technical Specifications (TS) and administrative controls; verify applicable plant operating documents were revised to reflect the subject modifications; verify the modifications were reviewed and incorporated into operations training program as applicable; and verify that post-modification test requirements were specified and adequate testing performed. The following modifications were reviewed:

a. MRF 20913, RHR Suction Isolation

This modification involved removal of the autoclosure interlock feature from the residual heat removal (RHR) system suction/isolation valves XVG 8701A, 8701B, 8702A, and 8702B. With removal of the autoclosure interlock feature the above valves no longer close automatically on increasing reactor coolant system (RCS)

pressure. Alarms were added for each of the RHR system suction/ isolation valve that actuate in the main control room when one of the valves is not fully closed and RCS pressure increases above the alarm setpoint.

During review of the MRF, the inspectors reviewed the associated 10 CFR 50.59 safety evaluation to verify that the safety evaluation addressed applicable design input information. This included inputs such as RHR system relief valve capacity; assurance that this MRF did not affect the function of the open permissive circuitry of the RHR suction/isolation valves; electrical separation per IEEE-279, Appendix R; and electrical system load change review.

By letter dated July 21, 1989, and supplemented December 11 and December 18, 1989, the licensee submitted a TS change to delete the surveillance requirement to verify isolation of the RHR system from the RCS by using the RHR autoclosure interlocks. The NRC issued a license amendment and supporting safety evaluation report on March 6, 1990, in response to the licensee's request.

b. MRF 21223, Motor Driven Emergency Feedwater Pump Piping and Valve Modifications

This modification involved replacing emergency feedwater (EFW) system swing check valves XVC-1015A-EF and XVC-1015B-EF with new dual seat tilt disk check valves. The new valves have a faster closure time which prevents over pressurization of the motor driven EFW pump suction and the dual seat reduces leakage at both high and low back pressures.

This modification also involves replacing the hinge in swing check valves XVC-1013A-EF, XVC-1013B-EF, XVC-1034A-EF, and XVC-1034B with an extended hinge. The extended hinge decreases the chances of the disk impacting the body during operation.

During review of the 10 CFR 50.59 safety evaluation for this MRF the inspector verified that the evaluation adequately addressed selected design inputs. These included but were not limited to replacement valves weights, center of gravity, Appendix R requirements, applicable sections of the ASME Code, and load change review.

c. MRF 21320, Backwalk for Manipulator Crane

This modification involved the addition of a platform walkway on the back section of the refueling manipulator crane. Although the crane is not considered to be safety-related, it is seismically designed. Therefore, the licensee designed the backwalk to maintain the seismic design parameters for the crane. The inspector reviewed the modification package, including the

licensee's 10 CFR 50.59 safety evaluation. The modification did not affect the Technical Specifications, and did not result in any unreviewed safety questions.

d. MRF 21509, Mid Loop Level Monitor

This modification involved the installation of an ultrasonic level measurement system on the hot leg loops "A" and "C" piping. This modification was implemented in response to Generic Letter 88-17 to provide instrumentation to monitor level, flow and temperature characteristics during midloop operations. Prior to completion of this modification, the licensee utilized temporary level indication to monitor flow during midloop operations. The inspector reviewed the licensee's safety evaluation for this modification. The safety evaluation included a detailed 10 CFR 50.59 safety evaluation which concluded that the modification would not increase the consequences or probability of occurrence of any accident, would not affect equipment operation, and would not reduce the margin of safety detailed in the Technical Specifications. In order to install the instrumentation, it was necessary to machine a flat surface or the piping. Prior to machining the pipe the safety evaluation and modification procedures required determining the existing pipe wall thickness utilizing ultrasonic techniques to verify that the minimum pipe wall thickness would be maintained. After machining the pipe surface, the pipe wall thickness was rechecked, the machined surfaces were polished, and a visual examination was conducted using non-destructive examination techniques, specifically Liquid Penetrant exams. After the modification was completed, the instrumentation was calibrated and functionally tested. The 10 CFR 50.59 analysis also considered an Appendix R review, electrical load changes, HVAC system changes, effects on instrument loop accuracy readings, and seismic design requirements. The inspector concluded that this modification did not create any unreviewed safety questions.

e. MRF 32995, AB El 463 and IB 451 Pressure Barriers

This modification involved sealing two areas in the auxiliary building and the intermediate building from potential damage to equipment as a result of steam line breaks. The modification involved installation of walls and barriers, relocation of equipment, and installation of loop seals in floor drains. The modification covered permanent repair of a problem which was identified as a design error by the architect/engineer in the original plant design. This problem was documented and dispositioned on NCN 2995 and LER 88-008, Steam Path for Affecting Safe Shutdown Equipment. The licensee took immediate corrective action by installing temporary seals in various areas. The inspector reviewed the modification package which included the licensee's 10 CFR 50.59 safety evaluations which considered changes

to electrical loads, fireloads, flood level changes and seismic design criteria. This modification did not create any unreviewed safety questions.

The inspectors concluded from review of the MRFs discussed above that the overall quality and technical content of the modification packages were good. The modification packages were thorough and well documented, each containing an adequate safety evaluation, a record of interdisciplinary reviews, and verification that various design attributes (i.e., codes, standards, regulatory requirements, design interface requirements, procurement parts, and acceptance criteria for post-modification testing) had been addressed. The inspectors noted that the post-modification tests reviewed provided adequate detail to ensure that the modifications were installed in accordance with design requirements.

Violations or deviations were not identified in the areas inspected.

3. Engineering Technical Support

The inspectors reviewed the activities of several station groups which provide engineering support to the plant operations and maintenance staffs and are involved in day-to-day support of plant activities. These groups included the performance engineering staff, systems engineers, and activities of design personnnel involved in dispositioning nonconformance reports. The review focused on the timeliness and thoroughness of engineering involvement in the on-site problem identification and resolution process.

a. Systems Engineering

The licensee's Systems Engineering program was identified as a weakness in the NRC maintenance team inspection, conducted November 13 to December 14, 1990, documented in NRC Inspection Report No. 50-395/90-32. The inspectors performed an evaluation of this group to determine its effectiveness in supporting plant activities, and also reviewed changes within the systems engineering group to respond to weaknesses identified by the maintenance team. The inspectors reviewed the following Engineering Services (ES) procedures which control system engineering activities:

- Procedure ES-102, Personnel Indoctrination and Training/Qualification
- Procedure ES-157, System Engineer
- Procedure ES-158, Lead Engineer
- Procedure ES-502, System File

These procedures specify the requirements for training and qualification of system engineers, define the duties of system engineers, and define the system file to be maintained by each system engineer for his/her defined system. The purpose of the system file is to have readily retrievable technical data on each system for reference when problems are identified. The system file includes references to design documents, system performance data, systems operations and testing results, system maintenance history, and general technical data which may not be readily available. The development of the system file is a requirement for qualification as a system engineer. A weakness identified by the maintenance team was failure of system engineers to complete the qualification requirements on their systems. Since the maintenance inspection was completed, the licensee has qualified three additional systems engineers, and several others are close to completing their qualification requirements. Several other system engineers have almost completed their requirements to qualify on a second assigned system. Completion of the qualification program has been made a goal by licensee management.

The inspector interviewed four system engineers. Only one of these engineers had completed his qualification requirements (in 1989), while the remaining three had been assigned to the system engineering group for one year. Interviews with these three engineers disclosed that two of the three would complete their qualification program in approximately one month, while the remaining engineer had been delayed in the qualification process since he has been extensively involved in implementing modifications and troubleshooting on one of his assigned systems. All four system engineers had fairly completed system files for their primary systems, had completed system indexes for other assigned systems, and had completed or were in the process of completing their system compositions. The engineers were found to have a good working knowledge of their assigned systems. Review of the system engineer assignments and interviews with system engineers indicated that the workload was fairly evenly distributed, although some of the more experienced engineers were assigned more systems than recently hired engineers. The inspector examined training and qualification records for 18 system engineers. All the engineers had degrees in engineering from an accredited college/university engineering department, and the majority were licensed as Registered Professional Engineers. Their experience ranged from 1 1/2 years to 20 years, with the average being approximately 8 to 10 years of work experience since completing their degree requirements. Discussion with licensee personnel disclosed that the system engineers were involved in support of day-to-day plant operations activities, including review of maintenance work requests, performing monthly system walkdowns, assisting in implementation of system modifications, troubleshooting system problems and supporting maintenance personnel. The inspector discussed the System Engineering Goals for 1991 with the Manager of the System and

Performance Engineering Section. Qualification of additional system engineers is one of the primary goals and the assignment of the majority of backup system engineers is another goal expected to be completed in 1991. All positions in the systems engineering group have been filled, and consideration is being given to adding another system engineering position within the group. The inspectors also reviewed Surveillance Report Number 06-CDT-91-G which was conducted by licensee QA personnel to assess the implementation of systems engineers' training. The report concluded that although not all systems engineers have been fully qualified, the personnel within the systems engineering group have completed adequate indoctrination or training to perform their present duties, pending becoming fully qualified on their systems. The inspectors concur. The licensee has acquired additional personal computers for use by system engineers, and licensee management indicated more would be acquired if demand for additional computers increase within system engineering group. There are also several terminals within the system engineering group for access to the SCE&G computer database system. The inspectors concluded that the implementation of the licensee's system engineering program has shown improvement since completion of the maintenance team inspection. System engineers are becoming more and more involved in day-to-day activities, and a large number are expected to complete their formal system engineering qualification programs within the next few months.

b. Performance Engineering

Performance engineering is an engineering support function located within the System and Performance Engineering Section. This group is responsible for the predictive maintenance program, which involved vibrational analysis, thermography, reliability centered maintenance, and a heat exchanger performance program. The NRC maintenance team identified weaknesses in trending and utilization of data obtained from the programs, and noted administrative procedures controlling the programs were inadequate.

(1) Vibration Analysis

The licensee has prepared a new procedure number ES 560.42, Vibrational Analysis, which currently is in the review and comment stage, prior to final approval and incorporation into the licensee's formal predictive maintenance program. The licensee has also recently purchased state of the art vibration data collection equipment which will be used in their vibrational analysis program. Monthly measurements are being taken on more than 100 pieces of rotating equipment, including safety-related pumps and motors. Data trending and evaluation will be performed by engineers in the Performance Engineering group.

(2) Oil Analysis

The oil analysis program is administrated by the chemistry department. This program was reviewed by the NRC maintenance team which indicated that this program was very good, except for lack of details in controlling procedures regarding trending of data. The data trending will be performed by the performance engineering group. A controlling procedure will be developed to detail this program.

(3) Thermography

The licensee has developed a draft procedure, ES 560.401, Infrared Thermography, which will control data collection, evaluation, and trending for this program. The licensee has been collecting and evaluating data using recently purchased state-of-the-art equipment. The licensee is currently developing a program which will specify frequency of data collection, and identify equipment to be monitored. Data collection and evaluation will be performed by specialist in the Performance Engineering Group.

(4) Reliability Centered Maintenance (RCM)

The licensee has written a specification which will be sent out to consultants in the near future for bids and proposals on the development of a comprehensive RCM program. The licensee has recently prepared the follow procedures to control the program:

- Procedure ES 550.100, RCM Program, approved 12/90
- Procedure ES 550.120, Functional Failure Analysis, approved 12/90
- Procedure ES 550.130, Critical Component Selection, approved 1/91
- Procedure ES 550.140, Failure Modes, Cause and Effects Analysis, approved 1/91
- Procedure ES 550.150, Preventive Maintenance Task Evaluation (DRAFT)
- Procedure ES 550.160, Preventive Maintenance Task Comparisons (DRAFT)

Discussions with licensee engineers disclosed that development and implementation of the RCM program will take approximately one year.

The inspectors noted improvements in the predictive maintenance program and increased activities of performance engineering to write and improve procedures to correct weaknesses identified by the NRC maintenance team. The increased involvement of engineering personnel is evident in these activities, and can be cited as an improvement in the licensee's engineering support activities.

c. Design Engineering

The inspectors reviewed selected activities performed by Design Engineering in their efforts to support the plant. Design Engineering is part of the Engineering Services organization. Activities reviewed included MRFs and NCNs.

(1) MRFs

One of the primary responsibilities of Design Engineering incudes all activities related to the development and implementation of MRFs. Results of the inspectors' review of this activity are discussed in paragraph 2 of this inspection report. In addition to reviewing the MRFs the inspectors also reviewed the timeliness in which the MRFs were prepared. The inspectors reviewed applicable documentation which showed that Design Engineering met its goal for having the MRFs originally planned for this upcoming refueling outage completed at least six months prior to the beginning of the scheduled refueling outage.

(2) Nonconformance Notices (NCN)

The inspectors reviewed selected NCNs and related licensee actions to resolve the NCNs. NCNs are the top priority items for which Design Engineering has responsibility. NCNs are handled in accordance with Engineering Services Procedure ES 407, Disposition of Site Nonconformance, Revision 8.

In reviewing selected NCNs, the inspectors noted that engineering's initial evaluation and disposition of NCNs to support operations and operability questions when needed were very timely. The evaluations were generally thorough and detailed. Procedure ES 407 allows multiple dispositions of NCNs where necessary to achieve a final resolution. In reviewing NCNs where multiple dispositions were involved the inspectors noted that some of the due dates passed before the applicable dispositions were completed. These dispositions generally did not involve any equipment or hardware problems that had potential operability or operational concerns. During further review of the NCNs the inspectors noted that the determination and identification of causes for the applicable nonconformances did not appear to be adequately addressed in some instances. The inspectors discussed this question with Design Engineering personnel who stated that the cause of the nonconformances could generally be determined from the description of the problem. If the cause was not evident from the description of the problem, then per procedure ES 407, Design Engineering would provide comments and disposition regarding the cause of the nonconformance and corrective actions to be taken to prevent

recurrence of the problem if requested by Quality Control (QC). The inspectors questioned whether the controls, which allowed Design Engineering to only provide comments and dispositions regarding the causes of nonconformances when requested by QC, ensured that adequate corrective actions were specified. The inspectors considered this to be a minor deficiency in the licensee's controls for dispositioning NCNs.

4. Exit interview

The inspection scope and results were summarized on June 14, 1991, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.