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

Report No.: 50-400/91-07

Licensee: Carolina Power and Light Company
P. O. Box 1551
Raleigh, NC 27602

Docket No.: 50-400 License No.: NPF-63

Facility Name: Shearon Harris

Inspection Conducted: April 29 - May 3, 1991

Inspectors: McKenzie Thomas 6-5-91
M. Thomas Date Signed

for McKenzie Thomas 6-5-91
M. Glasman Date Signed

Accompanying Personnel: D. Roberts

Approved by: Frank Jape 6/6/91
F. Jape, Chief Date Signed
Test Program Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, unannounced inspection was conducted in the areas of design changes and engineering and technical support activities.

Results:

In the areas inspected, violations or deviations were not identified. The quality and technical content of the modification packages reviewed were good. The technical support and engineering staffs were actively involved in plant activities and provided timely support to the plant. The interface and cooperation among the technical support, engineering and various other plant staffs were positive contributors to the timely resolution of plant issues.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*H. Beane, Manager, Quality Control
A. Cockerill, Manager, Electrical/I&C Unit, Harris Engineering Support Section (HESS)
*J. Collins, Manager, Operations
*J. Hammond, Manager, Engineering/Technical Support Assessment, Nuclear Assessment Department
*C. Hinnant, General Manager, Harris Plant
*S. Mabe, Manager, Engineering Support, Technical Support Department
*D. McCarthy, Manager, Site Engineering Unit, HESS
*T. Morton, Manager, Maintenance
*C. Olexik, Manager, Regulatory Compliance
W. Ponder, System Engineer, Technical Support Department
*R. Richey, Vice President, Harris Nuclear Project
R. Stewart, Manager, Mechanical Engineering Unit, HESS
*F. Strehle, Manager, Quality Assurance Engineering
*W. Szuba, Supervisor, Modification Management
*R. VanMetre, Manager, Harris Engineering Support Section
*M. Wallace, Senior Specialist, Regulatory Compliance
*L. Woods, Manager, Systems Engineering

Other licensee employee contacted during this inspection included craftsmen, engineers, operators, mechanics, technicians, and administrative personnel.

Other Organizations

*M. Staton, Site Representative, Power Agency

NRC Resident Inspector

*J. Tedrow, Senior Resident Inspector
M. Shannon, Resident Inspector

*Attended exit interview

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

2. Design, Design Changes and Modifications (37700)

The inspectors reviewed the PCRs listed below to determine the adequacy of the evaluations performed to meet 10 CFR 50.59 requirements; verify that the design changes were prepared and installed in accordance with licensee administrative procedures and applicable industry codes and standards;

verify that changes were reviewed and approved in accordance with TS and administrative controls; verify by field walkdown that selected design changes were installed in accordance with their applicable PCR modification packages; 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:

PCR 2898, RHR System Automatic Closure Interlock (ACI) Removal.

This modification deleted the ACI function from RHR suction valves 1RH-1, 1RH-2, 1RH-39, 1RH-40. An alarm was added for each valve to warn operations personnel when a valve is not shut and RCS pressure becomes high. The ACI was removed as a result of growing NRC and industry concerns over the potential for loss of RHR capability during cold shutdown and refueling operations due to inadvertent isolation caused by ACI circuitry failure. Westinghouse, which is the NSSS supplier for Shearon Harris, proposed removal of the ACI to the NRC in Westinghouse topical report WCAP-11736. This WCAP outlines the requirements to be met for ACI deletion. A safety evaluation documenting the NRC review of WCAP-11736 was issued on August 8, 1989. The safety evaluation concluded that a net safety benefit would result from removal of the ACI from the RHR system.

By letter dated November 16, 1990, and supplemented December 21, 1990, CP&L submitted a TS change to delete the surveillance requirements to verify operability of the ACI for the RHR system suction/isolation valves on RCS high pressure.

In their submittal the licensee committed to reset the opening torque switch setting for the aforementioned valves in order to ensure that the RHR suction/isolation valves would not be able to open against the differential pressure caused by normal operating RCS pressure. The NRC issued a license amendment and supporting SER on March 4, 1991, in response to the licensee's request.

During implementation of this modification, diagnostic testing of these valves indicated that the open torque limit switch could not be adjusted to ensure that the valve could not be opened against full RCS pressure while still allowing operation at its design basis conditions. The inspectors reviewed diagnostic test data for the subject valves and were in agreement with the licensee's conclusions. In a letter to the NRC dated April 23, 1991, the licensee proposed restoring the valve open torque switch setting to its original configuration. The NRC accepted the licensee's latest request in a letter to the licensee dated May 2, 1991.

PCR 4489, Mid-Loop Modifications

The purpose of this modification was to provide more reliable indication of residual heat removal (RHR) pump performance during mid-loop operation. The RHR pumps are much more susceptible to ingestion of air during mid-loop operation. The intention of this modification was to provide rapid indication of RHR pump status to operators should this occur. The modification added a main control board (MCB) indication of RHR pump differential pressure (DP), an indication of RHR DP to the Emergency Response Facility Indication System (ERFIS) computer, and a MCB alarm of low RHR DP. The inspectors reviewed the PCR package to determine if the licensee made a quantitative determination of alarm setpoints. This was accomplished using Westinghouse and vendor data. The inspectors also noted that the package was thoroughly reviewed by the system engineer and the package also contained comments from operations. In addition, the inspectors interviewed cognizant operations personnel to determine their knowledge of the intent and scope of this modification. Further, the inspectors viewed the installed hardware in the plant and in the control room. Results of the interviews and inspections were satisfactory.

PCR 4491, RCS Standpipe Level Indication in Control Room

This modification enhanced the RCS standpipe local level indication previously added under PCR 502. A level transmitter which indicates RCS standpipe level in the control room, and a RCS low level alarm in the control room were added by this modification.

Prior to this modification, an operator had to be posted at the standpipe in containment to report on RCS standpipe level. The inspector viewed the installation of this modification, reviewed background documentation, and found that the modification was effectively implemented.

PCR 4940, 1 SW-233 Worn Hinge

This plant change modified the internals of a containment isolation valve (1SW-233) which supplies service water to the containment fan coil units. This valve, which had failed its 1989 local leak rate test, was originally found to have been severely worn in the hinge joint and disk pin areas. During a root cause analysis, it was determined that the wear on the valve could be attributed to unstable operations caused by minimum flow line velocities. The resolution incorporated by this modification was to replace the worn valve hinge with a new hinge with an extended stop limiting the valve opening angle to 60% of its original value, thereby reducing the required pipe line velocity needed to sustain stable disk operation. The modification also added satellite bushings in the worn areas, and installed a new elastomeric dual seat for greater wear and leak resistance.

This package contained a thorough history/root cause analysis which had involved effective communications between the licensee and the valve vendor. Having performed such an analysis, the licensee was able to fully define and implement the scope of this modification. This plant modification demonstrated appropriate implementation of licensee design controls.

PCR 5788, Relief Valve Upgrade

This PCR was an engineering analysis done to upgrade the status of two replacement relief valves from Non-Q to Radwaste-Q prior to field installation. The valves were originally sold to a non-qualified supplier as surplus equipment by the licensee when SHNPP Unit 2 was cancelled. The valves were bought back from the non-qualified supplier by the licensee. This PCR did not install any modification in the field, but was required for accepting the two Radwaste-Q valves, to be used as spares for the steam generator blowdown magnetic filter system, from the non-qualified supplier. The evaluation involved reviewing old receiving inspection reports, material test reports and certificates of compliance from the valves' initial procurement stages in 1980. The licensee also had to verify that the valves have since been under a controlled and approved storage program by the non-qualified supplier as specified in ANSI 45.2.2.

The scope description of this modification package was complete, with acceptance criteria for the valves adequately stated. The licensee addressed EQ and design basis requirements and performed a complete safety evaluation. This package demonstrated adequate implementation of design change and procurement process controls.

PCR 5655, Condenser Baffle Plate Design Integrity

On December 1, 1990, baffle plates on penetrations 46 and 47 failed, and in doing so, were propelled into a number of condenser tubes by the high-energy flow. The baffle plate at penetration 46 impacted the condenser tubes in its path and the unit was shutdown for repairs. The purpose of this modification was to evaluate the integrity of all baffle plates at condenser penetrations and make necessary modifications. In addition, the licensee found a number of eroded tubes and missing structural supports (eroded or torn away) during a walkdown of the condenser.

As a result of these failures and observations, the licensee designed replacement baffle plates made of stainless steel for the high-energy penetrations in the condenser, and installed snap-on erosion shields over suspect tubes. Further, the licensee installed baffle plates on the reheat vent pipes which penetrate the floor of the condenser, directly below the condenser tube bundle. This will prevent direct impingement of steam/water on the condenser tubes and will prevent tube erosion.

The inspectors entered the condenser and viewed the modified baffle plates and erosion shields. The inspectors concluded that this modification was a necessary improvement, and was effectively implemented.

PCR 5874, Feedwater Flow Element Modification

This modification altered the main feedwater/bypass flow distribution on the "C" steam generator feedwater line in an effort to reduce the main feed flow into the preheater section of the steam generator. This would preclude possible steam generator tube damage in the preheater section due to tube vibration caused by excessive flow through the main nozzle. The amount of flow reduced to the main nozzle would be bypassed to the auxiliary nozzle by plugging two holes in an orifice plate on the main feedwater line.

This package provided a comprehensive scope description with a detailed history/root cause analysis. Adequate consideration was given to the potential effects of the modification of the feedwater system (e.g., pump performance, bypass line erosion, SG pressure). The licensee performed a detailed safety analysis and developed specified post modification testing requirements.

The inspectors concluded from review of the PCRs discussed above that the overall quality and technical content of the modification packages were good. The modification packages were comprehensive and well documented, each containing an adequate safety evaluation, a record of interdisciplinary reviews, and a thorough design review check sheet which provided 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. The inspectors also noted the interface, coordination, and timely support of System Engineering, Modification Management, and Harris Engineering Support in their efforts to resolve problems which arose during implementation of the various modification packages. Although most of the field installation was complete, post-modification testing and final review and acceptance was not completed for most of the modifications reviewed.

Violations or deviations were not identified in the areas inspected.

3. Engineering Support Activities

The inspectors reviewed various activities performed by the Technical Support Department, Modification Management Unit, and the Harris Engineering Support Section, in an effort to assess how the engineering staffs respond to problems and concerns identified in the plant.

a. System Engineering

The system engineering group was evaluated to determine its effectiveness as an integral part of the Technical Support Department organization. The responsibilities of the system engineer are delineated in Shearon Harris Technical Support Management Manual Procedure TMM-100, Technical Support Conduct of Operations, Revision 4. Some of the routine activities for which the system engineers are responsible include providing direct on-call support to the shift foreman and maintenance foreman for resolution of immediate plant problems, observing system operation and performing periodic system walkdowns, evaluating system performance by trending selected parameters, and assisting with the planning and coordination of outage work on assigned systems. Due to the plant's refueling outage status at the time of this inspection, the inspectors were able to assess the system engineer's responsibilities in one major program, the plant modification process. Some of these responsibilities included reviewing the modification package (PCR) and subsequent revisions for feasibility and accuracy, attending the walkdown of the installed modification, and specifying requirements for the revision of procedures, drawings and system description documents. System engineers also verify that specified modification testing requirements are adequate.

System engineers are assigned selected plant systems, typically four or five each. A new procedure, TMM-117, System Engineer Walkdown Procedure, was approved by SHNPP in January 1991 which outlined the engineers' walkdown responsibilities for their assigned systems. Discussions with engineers indicated that the system engineers were knowledgeable of their assigned systems and the modifications affecting them. The inspectors' review of PCRs indicated that the system engineers were actively involved in plant activities surrounding their systems. One engineer's involvement in the major steam generator maintenance activities during the refueling outage indicated that system engineering was supportive to other departments as well.

b. Engineering Support

Engineering Support is part of the site Technical Support Department and is primarily responsible for component engineering (including failure analysis), the MOV program, and predictive maintenance, among other areas. These services are provided to maintenance, system engineering, and other organizations, as necessary. The group consists of five engineers and specialists, four engineering technicians, and the Manager - Engineering Support.

The inspectors reviewed Engineering Support group efforts in several of the above areas, and interviewed several staff members. Results of these reviews and interviews are discussed below.

Motor Operated Valve Program

The licensee recently formed a corporate task force in response to NRC Generic Letter (GL) 89-10 and developed an action plan to ensure consistent response to the requirements of GL-89-10. This action plan provides for design basis evaluations, maintenance, trending, and periodic testing. MOV testing/evaluation is being conducted using the VOTES system at the Harris plant and the other CP&L nuclear sites. Seven engineers and technicians were trained in the use of the VOTES equipment. Training was being conducted on an actual valve operator and valve using VOTES equipment comparable to that being used in the field. The licensee's goals for valve testing during refueling outage three (ongoing at the time of the inspection) had been met. The NRC will perform a more detailed evaluation to assess the adequacy of the licensee's MOV program during future inspections.

Predictive Maintenance

Thermography, vibration testing and lube oil analysis are utilized in predictive maintenance. In addition, MOVs performance is being trended in compliance with GL-89-10. Inspection Results are listed below.

° Thermography

Thermography, while not a formalized program at the time of the inspection, was successfully utilized to identify 27 fuses in PIC cabinets which were operating at elevated temperature levels (130 degrees F to 206 degrees F). A PCR to replace these fuses and some of the fuse holders was completed during refueling outage 3. The identification of these overheating fuses may have averted fuse failure and subsequent challenges to safety systems. In addition to these activities, Harris personnel have visited other CP&L nuclear and non-nuclear sites and identified significant conditions, which results in a more experienced thermography staff. The inspectors also conducted interviews with cognizant staff responsible for thermography and found they were well-trained, competent, and well-equipped. Although the licensee's efforts in thermography have proven successful, the inspectors consider there is a potential that some equipment failures could be missed due to the lack of a formalized program for trending and utilizing thermography results. The licensee indicated to the inspectors that they were in the process of creating a thermography program as part of their 1991 goals.

Lube Oil Analysis

Engineering Support Coordinates lube oil sampling and trends results. Lube oil sampling is performed quarterly on safety-related, non-safety, and balance-of-plant equipment. Included in the sampling route are the cooling tower makeup pump motors, auxiliary feedwater pumps and motors, and the component cooling water pumps and motors. Lube oil analyses have resulted in the identification of undesirable conditions developing in the spare reactor coolant pump motor, 1A condensate pump bearings, containment spray pump motors, and the main feedwater isolation valves (hydraulic fluid) to cite several examples.

° Vibration Testing

Engineering Support performs vibration testing on a monthly basis. Equipment tested includes safety-related, non-safety, and balance-of plant equipment. This includes such equipment as large pumps and motors in the emergency service water system, charging/safety injection pumps and motors, HVAC units, and main feedwater. These efforts are beyond ASME Section XI requirements in that many pieces of equipment on the vibration test procedure do not require testing per ASME Section XI. Recent successes of the vibration monitoring program include hydrogen side seal oil pump motor replacement and changeout of bearings on the 1A motor generator set. Due to the successful identification of many potential equipment failures and the well implemented monitoring program, the vibration testing is considered a strength.

Other Engineering Support Activities

Engineering Support also coordinated installation of the steam generator nozzle dams during the November 1990 steam generator outage. This reduced midloop operation time and enhanced safety. Also, Engineering Support has supported live-load valve packing, modifications of LF-16 breakers, testing of molded case circuit breakers, coordinates responses to generic issues when components are involved. Engineering Support has successfully coordinated outage switchyard activities, which has resulted in rescheduling certain activities because of unacceptable risk of losing offsite power. The above cited work has significantly contributed to safety and is considered a strength.

c. Modification Management Unit

The Modification Management Unit is part of the site Outage Management and Modification Section. Modification Management serves as an interface between the plant (System Engineering) and HESS in the processing, prioritizing, scheduling, and implementation of PCRs. Modification Management personnel serve as project managers for PCRs assigned to them during the implementation process. There are

approximately 1200 PCRs. Of that number, approximately 500 PCRs are in the design closeout phase and another 700 are awaiting release to design. During 1990, 650 PCRs were initiated while 627 PCRs were closed. Licensee personnel stated that PCRs which have not been released to HESS (i.e., no design work had started) are reviewed yearly to evaluate non active PCRs. If the priority of a PCR does not become more important over two review periods, the PCR will be voided. This process of reviewing PCRs was initiated in 1990 in an effort to reduce the backlog of inactive PCRs.

d. Harris Engineering Support Section

The HESS is part of the licensee's Nuclear Engineering Department and primarily provides support during all phases of the development and implementation of plant modifications. During the current refueling outage the HESS Site Unit increased its staff to provide support during modification implementation. The licensee does not have a large HESS site unit due to the closeness of the licensee's corporate offices and HESS (approximately 30 minutes away) to the site. The inspectors noted that various HESS managers were on site each day during this inspection.

In addition to modifications, other areas of emphasis for HESS include design basis reconstitution, vendor manuals, equipment qualification, motor operated valves, and service water issues.

The inspectors noted that HESS has provided timely support to the plant during the current refueling outage. This was evident from reviewing the refueling outage emergent work log, which includes issues that were not part of the outage schedule, but have been identified since the outage began. Of the 68 emergent work items identified since the outage began, approximately 20 percent were assigned to HESS. Of those items assigned to HESS, only one item remained open.

The inspectors observed HESS, Modification Management, and System Engineering personnel during their efforts to resolve a concern when it appeared that the spare parts ordered to rebuild valve 1CS-744 would not arrive in time to support the outage schedule. The valve was a relief valve in the charging pump alternate miniflow line. The various engineering staffs were very timely in their efforts to support the plant. These efforts included interfacing with the valve vendor and the NSSS supplier in trying to locate another valve, and HESS investigating alternative resolutions in the event that the other ongoing efforts proved unsuccessful. At the conclusion of the inspection licensee personnel stated that it appeared the spare parts would arrive in time to support the outage.

Licensee personnel further stated that adverse condition report 91-141 was written to address this issue. The licensee was evaluating this item for reportability to the NRC.

4. Exit Interview

The inspection scope and results were summarized on May 3, 1991, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results. Although reviewed during this inspection, proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

5. Acronyms and Initialisms

ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulations
CP&L	Carolina Power and Light
DP	Differential Pressure
EQ	Environmental Qualification
ERFIS	Emergency Response Facility Indication System
F	Fahrenheit
FL	Generic Letter
HESS	Harris Engineering Support Section
HVAC	Heating Ventilation and Air Conditioning
MCB	Main Control Board
MOV	Motor Operated Valve
NSSS	Nuclear Steam Supply System
PCR	Plant Change Request
PIC	Process Instrument Control
RCS	Reactor Coolant System
RHR	Residual Heat Removal
SG	Steam Generator
SHNPP	Shearon Harris Nuclear Power Plant
SW	Service Water
TS	Technical Specifications
VOTES	Valve Operation Test and Evaluation System