



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

Report Nos.: 50-400/94-20

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

Docket Nos.: 50-400

License Nos.: NPF-63

Facility Name: Shearon Harris Nuclear Power Plant Unit 1

Inspection Conducted: October 3 - 7 and 24 - 28, 1994

Inspector: Caul J. Fillion 11/2/94
P. Fillion Date/Signed

Approved by: M. Shymlock 11-9-94
M. Shymlock, Chief Date Signed
Plant Systems Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, announced inspection was conducted in the areas of Station Blackout Rule and maintenance of electrical systems.

Results:

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

In the area of Station Blackout Rule, no problems were identified. The licensee's analysis and plant configuration were consistent with the submittals reviewed and approved by the NRC staff. Procedures were in place to support the implementation.

The inspector's overall conclusion with regard to the conduct of maintenance on electrical equipment was that the licensee's performance was good. Evaluations of problems took a sufficiently broad view to address adverse trends, generic implications and anticipation of problems. Specific examples are given in section 3. of the report details.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *B. Christiansen, Maintenance Manager
- *T. Cockerill, Manager, I&C/Electrical, Nuclear Engineering and Design
- *J. Donahue, Plant Manager
- *R. Duncan, Manager, Technical Support
- *R. German, Manager, Plant Support Services
- T. Halker, Supervisor, Electrical Maintenance
- *K. Heffner, Manager Planning
- *M. Hill, Manager, Nuclear Assessment
- M. Macon, Project Electrical Engineer, Nuclear Engineering and Design
- J. Nevill, Manager, Nuclear Engineering and Design
- *R. Prunty, Manager, Licensing and Regulatory Compliance
- *B. Robinson, Vice President Harris Plant
- *G. Rolfson, Manager, Harris Engineering Support Services
- *C. Rose, Manager, I&C/Electrical Maintenance
- J. Royal, Senior Engineer, Nuclear Engineering and Design
- *A. Taylor, Manager, Document Services
- *M. Wallace, Sr. Specialist, Regulatory Affairs

NRC Employees

- *S. Elrod, Senior Resident Inspector
- *T. Le, Licensing/Project Manager, Nuclear Reactor Regulation
- D. Roberts, Resident Inspector

2. Station Blackout Rule (92701)

10 CFR Part 50.63 requires that plants be able to cope with a loss of alternating current (AC) power sources. Regulatory Guide 1.155 defines which AC sources must be postulated to fail, specifies the required coping duration and provides guidance on how to demonstrate rule implementation. Nuclear Management Resources Council (NUMARC) document 87-00, Rev. 1, provides guidance and methodologies for implementing the NUMARC Station Blackout initiatives.

Pursuant to 10 CFR Part 50.63, the licensee made submittals describing their approach to meeting the Station Blackout Rule. The initial submittal was made on March 3, 1989. An additional submittal was made on March 30, 1990. The NRC Safety Evaluation was issued on October 16, 1991. The licensee responded to the Safety Evaluation on January 16, 1992, and provided additional information on March 20, 1992. The NRC issued a Supplementary Safety Evaluation on June 16, 1992.

The essential feature of the licensee's approach to meeting the Station Blackout Rule was that they had demonstrated by analysis that the plant had the capacity and capability to cope with a loss of all AC sources for four hours and recover from this event.

The inspection of Station Blackout Rule implementation focused on four topics: Battery capacity, modifications, diesel generator reliability and operating procedures. First, the inspector reviewed the methodology for calculating voltage in the DC System. The inspector reviewed Calculation E4-0008, "Verification of the Size of the 1E Batteries for Station Blackout," Rev. 1, dated February 14, 1994. The inspector verified that the battery capacity contained a ten percent design margin as recommended in the NRC Supplementary Safety Evaluation. The calculation of battery capacity incorporated the assumption that certain loads would be manually shed during a Station Blackout event. The inspector verified that Emergency Operating Procedure EPP-001, "Loss of AC Power to 1A-SA and 1B-SB Buses," Rev. 9, dated June 22, 1994, contained load shedding instructions consistent with the E4-0008 calculation.

Second, the inspector reviewed the following three Plant Change Records which had been prepared specifically to comply with the Station Blackout Rule:

- * PCR 4404, "Permanent Access Platform for Valve 2CS-V517SB-1"
- * PCR 2706, "Emergency Lighting at PORVs in Main Steam Tunnel and Seal Injection Isolation Valves and Component Cooling Water Thermal Barrier Return Valve"
- * PCR 2707, "Platform in Main Steam Tunnel Steam Generator Power Operated Relief Valve Catwalk and Head Phone Jack"

These Plant Change Record (PCR) packages contained design details, design verifications and reviews, seismic design analysis, work instructions and post-modification test requirements. Records showed that all the PCRs had been implemented and the PCRs were closed. Selected at random from the three PCRs, the inspector verified by field inspection that the permanent access platform for valve 2CS-V517SB-1 was installed and would facilitate manual operation of this valve. Based on this review, the inspector concluded that the necessary modifications had been implemented.

Third, the inspector reviewed the diesel generator reliability records and discussed them with the system engineer for diesel generators. The diesel generator reliability record for the Unit was compiled according to NUMARC 87-00, Rev. 1. There were zero failures in the last 20 valid tests and three failures in both the last 50 and 100 valid tests. These failure rates were below the trigger values given in NUMARC 87-00. Any Work Request that was reviewed as part of the electrical maintenance inspection (refer section 3) and indicated a diesel generator failure was compared to the data in the reliability tracking program. The diesel generator start and run log was reviewed for the last 20 valid demands on each generator to verify the reliability figure given above.

Fourth, the inspector reviewed Dispatching Office System Operations Procedure DTRM-GP-2, "Restoration of Service Following a System Shutdown," Rev. 16, dated November 30, 1993. This procedure provided adequate guidance to the power system operators to help ensure the restoration of power to the Harris plant following a total grid collapse in the shortest time possible. Also, Operating Procedure OP-126, Main Steam, Extraction Steam and Steam Dump Systems, Rev. 4, dated February 24, 1991, contained a section on local manual operation of the power operated relief valves with a hand pump which would be followed during a Station Blackout event.

The conclusion drawn from the above stated reviews of selected topics was that the licensee was implementing the Station Blackout Rule as described in their submittals. The battery had ten percent design margin as recommended in the Supplemental Safety Evaluation. Modifications described in the submittals had been implemented. The diesel generator reliability program was according to NUMARC guidelines. Operating procedures were in place to cover the Station Blackout scenario.

3. Maintenance of Electrical Equipment (62705)

This inspection was performed to ascertain whether corrective maintenance activities related to electrical components and systems were conducted in accordance with licensee-approved procedures and instructions. The inspection was designed to ascertain whether these procedures and instructions met the requirements of Technical Specifications, Regulatory Guides, and applicable industry standards. Electrical maintenance activities were reviewed with the objective of determining whether corrective actions for the various maintenance problems were adequate.

The inspector reviewed the summary of Work Request for corrective maintenance performed by the electrical maintenance work crews completed (or opened) since January 1, 1993. The summary contained about 1400 entries. The inspector also reviewed the summary of Adverse Condition and Feedback Reports covering the same period and sorted by certain key words to focus on electrical systems. This summary contained about 300 entries. Approximately 30 Work Request and 30 Adverse Condition Feedback Reports, which initially appeared to represent significant conditions or trends were reviewed with regard to the corrective action taken. Several were discussed in considerable detail with the responsible engineers. In addition, site-specific long term maintenance issues such as the 480 V LK-16 breaker problems and the discoloration of certain battery plates were discussed to evaluate the progress and status of the corrective actions.

The inspector performed walkdown inspections of the battery rooms, battery chargers, inverters and diesel generator buildings. No problem conditions were identified during these inspections. The inspector went to the control room to see whether any alarms were present related to electrical systems. None were present.

Overall the inspector concluded that the conduct of maintenance had been carried out in accordance with procedures and requirements, and corrective actions for the various maintenance problems were adequate.

The inspector concluded that the licensee had done a good job in identifying and correcting problems. Examples of this were as follows:

- * The licensee had used computer based non-intrusive current monitoring equipment, which was commercially available, to detect degradation in the rotor of a non-safety-related motor. The motor was for the Non-essential Chilled Water System chiller compressor WC-4. It was rated 6600 V, 925 HP, and had a cast aluminum rotor. Subsequent investigation revealed that all the rotor bars were cracked half way through at the end ring. The licensee recognized that motors of this same construction and approximate size were in service for two safety-related compressors: 1A-SA and 1B-SB. The licensee evaluated the condition of the safety-related motors by using the same diagnostic equipment and saw no indication of rotor degradation. The level of degradation was seen to be a function of the number of starts, and the WC-4 motor had been subjected to many more starts than experienced by the safety-related motors. The licensee continues to periodically monitor the rotor condition of these motors.
- * Adverse Condition Feedback Reports had indicated that a certain type of plug connector used at motor control centers could become loose. The loose connection point could cause control circuits to not function correctly. To prevent recurrence of any problems in the future the license initiated an aggressive program to replace the plug connectors with hard connections.
- * Troubleshooting related to a few cases of breakers failing to operate in a post-maintenance test, identified that the cause of the failures was interference between wiring bundles and the secondary contacts when the breaker was being racked into position. The wire bundles were properly formed and restrained, but clearances were tight. The resolution of this problem was to put a caution in the operating instructions to check that no interference occurs when inserting the breakers into the cubicles. This step seems to have eliminated the problem.
- * Due to continued problems with the 480 V power circuit breakers, all of these circuit breakers were being replaced in safety-related applications and in frequently cycled non-safety-related applications. This project was about 50 percent complete at the time of this inspection. The project involved a large amount of wiring work. The licensee monitored the quality of wiring work and determined that Quality Control inspectors and post-modification testing were detecting some wiring errors made by the craftpersons. This potential problem was detected early on in the project, and special training was given to the craftpersons. After the training, wiring errors by craftpersons were almost

eliminated. Although the problem of wiring errors will require continued attention, the identification of and approach to the problem indicated an effective quality assurance program.

4. Exit Meeting (62705)

The inspection scope and results were summarized on October 28, 1994, with those persons indicated in section 1. The inspector 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.