



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

Report Nos.: 50-269/94-02, 50-270/94-02 and 50-287/94-02

Licensee: Duke Power Company
422 South Church Street
Charlotte, NC 28242

Docket Nos.: 50-269, 50-270, and 50-287

License Nos.: DPR-38, DPR-47,
and DPR-55

Facility Name: Oconee 1, 2 and 3

Inspection Conducted: February 8 - 10, 1994

Inspector: *M. Shymlock for*
P. Fillion

3-1-94
Date Signed

Approved by: *M. Shymlock*
M. Shymlock, Chief
Plant Systems Section
Engineering Branch
Division of Reactor Safety

3-1-94
Date Signed

SUMMARY

Scope:

This routine, announced inspection was conducted in the areas of design and equipment problems in electrical systems.

Results:

In the areas inspected, violations or deviations were not identified. The licensee was effective in addressing the four design/equipment problems reviewed during the inspection.

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REPORT DETAILS

1.0 Persons Contacted

Licensee Employees

- *M. Bailey, Regulatory Compliance
- *S. Benesole, Manager, Regulatory Compliance
- *S. Burton, Operations Manager, Keowee
- *W. Carter, Component Engineer
- *B. Dolan, Manager, Safety Assurance
- J. Edgar, Electrical Engineer
- *T. Grant, Electrical Engineer
- *J. Hampton, Site Vice President
- *B. Peele, Station Manager
- J. Perkins, Component Engineer
- *G. Ridgeway, Operations Support Manager
- *L. Underwood, Electrical Engineer

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

Other NRC Employees

- *K. Poertner, Resident Inspector
- *K. Kavanagh, Intern

*Attended exit meeting

2.0 Inspection Details (92701)

The scope of the inspection was to review activities related to four smaller projects which the licensee had completed or was in the process of doing. The four projects were:

- Evaluate results from tripping characteristic tests on molded-case circuit breakers where the instantaneous (magnetic) tripping occurred at lower current levels than published by the manufacturer.
- Replace four sequence of events recorders.
- Redesign the automatic bus transfer circuit for the auxiliary power buses at the Keowee station.
- Modify the internal closing circuit on certain 600 V power circuit breakers.

Inspection activities included reviewing the basic concepts involved, the safety evaluations, and post-modification and periodic testing.

2.1 Molded Case Circuit Breakers

The out-of-specification breaker tripping problem was identified during routine onsite testing on May 17, 1993. The problem was documented in Problem Investigation Process Report 2-093-0438. An operability evaluation was contained in Calculation OSC-6009, dated June 22, 1993. The problem was limited to 36 circuit breakers (site total) which were rated either 800 A or 1200 A. The majority of these were used in the DC Distribution System and there were a few in the AC Distribution System. Onsite test results were that the breakers in question were tripping magnetically at values as low as 70 percent of the published value for the particular setting. The onsite test results were confirmed by three independent testing laboratories. The licensee's operability evaluation concluded that, even at the 70 percent tripping value, coordination problems would not result, therefore there was no operability concern. Nevertheless, the licensee was moving towards replacing all the problem breakers with a different model. Before the replacement was implemented, a few sample breakers were sent to the manufacturing location for testing. Tests conducted at the manufacturing location indicated that the breakers were tripping within tolerance. In light of this most recent information, the replacement project was on hold. The licensee was attempting to resolve the test differences with the manufacturer. It is possible that variations in test equipment or test setup could explain the different results.

2.2 Sequence of Events Recorders

The licensee was in the process of replacing four sequence of events recorders. The reason for this project was that the equipment was 1960's vintage and was becoming difficult to maintain. The switchyard and the Unit 3 sequence of events recorders were replaced in December 1993 and February 1994 respectively. The Units 1 & 2 and the Keowee station sequence of events recorders were scheduled for replacement in July 1994. The inspector reviewed the following modification packages:

- NSM-32904, Unit 3 Sequence of Events Recorder Replacement
- NSM-52904-AL1, 230 kV Switchyard Sequence of Events Recorder Replacement

The inspector made a walkdown inspection of the newly installed sequence of events recorders and did not see any problems with these installations. The new recorders have performed well, although they have not been challenged by any major events.

2.3 Automatic Bus Transfer Circuit

During a loss-of-offsite power event which occurred on October 19, 1992, (LER 92-04) the automatic transfer circuit for auxiliary power at the Keowee station did not perform properly. Unnecessary transfers took place and the circuit locked up failing to transfer to a good source of power. In addition, the licensee identified that the overall design of

the auxiliary power system at Keowee contained a single failure vulnerability (PIP-5-092-0676) which could be corrected by changing the logic of the transfer circuit. Therefore, the transfer circuit was re-designed, and the modification implemented in July 1993 under modification package NSM-ON-52930. The inspector agreed that the new circuit corrects the previously identified deficiencies.

2.4 Breaker Closing Circuit

As a result of various breaker failures that occurred, a problem with certain 600 V power circuit breakers was identified by the licensee. The problem was with the anti-pump feature. An anti-pump feature is a feature that prevents the breaker from rapidly cycling when simultaneous trip and close signals are present. The root cause of the problem was that the mechanical anti-pump relay could bind which resulted in preventing the breaker from closing. The original solution was to re-design the anti-pump feature using an electrical anti-pump relay. This modification was implemented.

Subsequently, some breaker failures occurred, and the failures were attributed to a problem with the new anti-pump circuit. The breakers involved were solenoid operated breakers. In a solenoid operated breaker all the force for closing the breaker and compressing the tripping spring is provided by the closing solenoid. There are no closing springs. The timing of relays in the closing circuit must be coordinated with the speed of the breaker itself for proper operation. The speed of the breaker is related to the torque provided by the closing solenoid which is proportional to the control circuit voltage. In the modification, as originally implemented, the timing between the relays and the breaker was very close. The breakers worked properly in post-modification testing. However, it was later discovered that occasionally, due to slight variations in relay timing, the breakers would not close. The solution to the problem was to install a timing relay in the anti-pump circuit. The timing relay was set at 325 milliseconds.

The modification was implemented under modification package NSM-ON-52917 and Emergency Change OE-4693 in December 1992. Post-modification testing for the timer modification included low voltage test to demonstrate that the breakers would function properly when the voltage was at the lower end of the acceptable range. The inspector discussed various design considerations with the cognizant engineers and concluded that all relevant design considerations had been addressed.

The overall conclusion with regard to the areas inspected was that the licensee's performance was good. Safety evaluations and test procedures were adequate.

3.0 Exit Meeting

The inspection scope and results were summarized on February 10, 1994, with those persons indicated in section 1. The inspector described the areas inspected and discussed in detail the inspection results.