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

Report Nos.: 50-424/94-28 and 50-425/94-28

Licensee: Georgia Power Company
P.O. Box 1295
Birmingham, AL 35201

Docket Nos.: 50-424 and 50-425 License Nos.: NPF-68 and NPF-81

Facility Name: Vogtle 1 and 2

Inspection Conducted: November 14-18, 1994

Inspector: R. Moore 11/28/94
R. Moore Date Signed

Approved By: M. Shymlock 11-30-94
M. Shymlock, Chief Date Signed
Plant Systems Section
Division of Reactor Safety

SUMMARY

Scope:

This routine inspection reviewed the licensee's corrective actions to resolve items identified by the Electrical Distribution System Functional Inspection (EDSFI) which was performed May 10 through June 11, 1993.

Results:

No Violations or deviations were identified.

The licensee's corrective actions for EDSFI issues were complete. The corrective actions were thorough and adequately resolved the identified issues.

Enclosure

REPORT DETAILS

1.0 Persons Contacted

*W. Burmeister, Engineering Manager
*S. Chestnut, Technical Support Manager
*W. Gabbard, Nuclear Specialist
*W. Kitchens, Assistant General Manager
*G. McCarley, Independent Safety Engineering Group Supervisor
*R. Moye, Plant Electrical Engineering Supervisor
*A. Rickman, Safety Assessment Group
*M. Sheibani, Nuclear Safety Assessment Supervisor
A. Streetman, Licensing Engineer, Southern Nuclear Services
K. Stokes, Senior Engineer
*J. Swartzwelder, Outage and Planning Manager
F. Thompson, Electrical Engineer, Southern Company Services

Other licensee employees contacted included technicians, supervisors, engineers, and office personnel.

NRC Resident Inspectors

*B. Bonser, Senior Resident Inspector
*Attended exit meeting

Abbreviations and acronyms are listed in paragraph 5.0.

2.0 Follow-up on EDSFI (TI 2515/111)

The inspector reviewed the licensee's actions to resolve the issues identified by the EDSFI. These issues are discussed in the following paragraphs.

2.1 (Closed) Violation 50-424,425/93-11-01, Design Control Deficiencies in Calculations

This item addressed electrical calculation assumptions which were incorrect or not adequately justified, and deficiencies in Environmental Qualification (EQ) documents. The licensee determined the cause of these documentation deficiencies to be personnel error. The corrective actions stated in the violation response were to review and revise the effected documents. Additionally, training would be provided on assumption verification and checking of design calculations. Licensee evaluations conducted during the EDSFI determined that the deficiencies did not result in equipment operability concerns with one exception related to the Nuclear Service Water (NSW) cooling water bypass and spray valves. The inspector reviewed the referenced design documents to determine if the licensee's stated corrective actions had been completed.

Control cable calculations for sizing the NSW auxiliary relays incorrectly assumed that control cable lengths were negligible when they were actually several thousand feet in length. As a result of the unaccounted for voltage drop, the relays could not be assured to operate at degraded grid conditions of 80 to 87 volts at the Unit 2 Bypass and Spray valve relays. These calculations were X3CH03, Class 1E 120 VAC Voltage Analysis, revision 0, X3CK05, Power Cable Sizing Detail, revision 12, and X3CK05-A, Unit 2 Power Cable Sizing, revision 1. The EDSFI team concluded that the licensee's immediate interim actions, which determined that there was no immediate safety concern, were adequate.

The licensee's long term resolution was to qualify the relays at the lower voltage through testing. Farwell & Hendricks Seismic Qualification Report (AX3AC03-6317) - Cutler Hammer Relays D26MR22A, dated August 31, 1993, documented that the relays would operate under design seismic conditions at a voltage of 73.73 volts. Revision 2 of calculation X3CH03 included the appropriate cable length and determined the worst case voltage to be 76.7 volts. Calculations X3CK05 and X3CK05-A, were revised to reference this calculation.

Calculation X3CE01, Standby Emergency Diesel Generator (EDG) Steady State Loading Study, revision 3, assumed motor nameplate horse power values for the Auxiliary Feedwater (AFW), Containment Spray (CS) and Residual Heat Removal (RHR) pumps rather than the values corresponding to the accident flow conditions. Revision 4 of this calculation was updated to include the accident flow horsepower values. Additionally, the EQ files for these pumps' motors and the Centrifugal pumps' motors did not consider appropriate design overload horse power conditions in determining qualified motor lives. The licensee's evaluation determined that only the EQ data file (EQDP) for the AFW pump did not account for overload horse power conditions. Revision 7 of EQDP X4AF03, AFW Pumps and Driver, was updated to include the information to account for this factor in the motor life qualification.

Several EQ file cable reports (EQDPs X3AJ01, X3AJ02, and the EQ Report for Instrument and Specialty Cable) included a discrepancy related to containment design basis accident temperatures. A peak containment temperature of 352°F was referenced as the requirement while the cable was tested to 346°F. The licensee's review determined that the 352°F value was based on a preliminary value and the actual peak containment temperature was 303°F, therefore the cable qualification testing was adequate. The EQ files were changed to reflect the 303°F peak containment temperature.

The Final Safety Analysis Report (FSAR) contained incorrect design information. FSAR Section Figure 6.2.1-33 specified a 352°F peak containment temperature and Section 8.3.1.1.8 indicated that the maximum horsepower for the CS, RHR, and AFW pump motors was the nameplate values. An FSAR change request was initiated on September 13, 1993 to correct these errors.

The specific documentation deficiencies identified by the EDSFI were corrected and corrective actions to address the cause were completed. Training documentation demonstrated that the appropriate engineering staff had received training on these deficiencies and specifically on calculation assumption verification. The inspector concluded that this issue had been adequately resolved. This item is closed.

2.2 (Closed) Violation 424,425/93-11-02, Inadequate Post Maintenance Test Following Breaker Replacement

This item was related to a Post Loss of Coolant Accident Purge Fan breaker, 1-ABE-29-2, failure on December 20, 1991, following the return of the equipment to operation after completion of maintenance. No post maintenance test was documented and the failure indicated that adequate post maintenance testing had not been performed. The licensee's corrective action included a review of the post maintenance test procedures and training to emphasize documentation of post maintenance testing. Procedure 29410-C, Maintenance Work Order (MWO) Functional Tests, was revised in revision 8 to specifically state that functional testing for breakers shall include energizing the equipment. A licensee interoffice correspondence dated November 5, 1993, from J. Williams to the Control room Supervisors, emphasized documentation of post maintenance testing and the changes to procedure 29410-C. The inspector reviewed a sample of MWOs for Unit 2 breaker maintenance since the EDSFI was performed and verified that adequate post maintenance testing was performed and documented. The inspector concluded that this item was adequately resolved.

The inspector reviewed a recent deficiency identified by the licensee related to equipment functional testing to determine if it should have been prevented by corrective actions for this violation. Following licensee review of work documentation, a deficiency card (DC 1-94-301) was initiated on November 15, 1994, to address an apparent inadequate functional test on the Unit 1 B piping penetration heater, 1-1561-N7-002-H01. The silicon control rectifiers were replaced during heater maintenance. During the functional test the heater power light was used as acceptance criteria for verification of heater function rather than measurement of power to the circuit which was a criteria used in the Technical Specification surveillance test. The licensee's immediate corrective action was to verify adequate power. This deficiency was not safety significant. The inspector concluded that the unclear specification of acceptance criteria was not a deficiency which would have been prevented by the corrective action for violation 424,425/93-11-02, and that this was not a repeat violation of failure to perform and/or document post maintenance testing.

2.3 (Closed) Inspector Follow-up Item (IFI) 424,425/93-11-03, Incomplete Evaluation of Non-Safety Related Transformer Failures.

This item was related to the licensee's evaluation of transformer failures experienced at the site. The EDSFI team concluded that the evaluation had not adequately addressed the potential plant impact of

the General Electric (GE) 4160/480 VAC non-1E transformers and the SOLA 480/120 VAC regulating transformers. The licensee conducted acoustic testing of the safety-related GE 4160/480 VAC transformers to assess their failure potential on September 28, 1994. The test was observed by the NRC and addressed in NRC Inspection Report 50-424,425/94-25. The licensee concluded that the safety-related GE 4160/480 VAC transformers demonstrated no indications of impending failures. No further testing or evaluation was planned.

Although no failures of 1E SOLA 480/120 VAC regulating transformers had occurred prior to the EDSFI, two failures occurred after the inspection. A licensee review of the potential impact of SOLA transformer failures identified one plant trip vulnerability which was related to the Unit 2 AFW turbine control power. Minor design change 93-V2M030 was implemented on November 3, 1993 to add a backup power source for the AFW pump turbine control and eliminate this plant vulnerability. A deficiency card (1-94-020) root cause and corrective action evaluation for the failed 1E SOLA transformers concluded that the SOLA transformers should be replaced by regulating transformers from a different vendor. Design change requests were initiated for the changeout of both 1E and non-1E transformers and were scheduled for completion over the next four years. The inspector concluded that the transformer failure issues identified by the EDSFI had been adequately addressed. This item is closed.

2.4 (Closed) IFI 424,425/93-11-04, Weakness in Controls to Limit Supervisor Design Verification of Subordinate's Design Activity

This item addressed a weakness in the licensee's design procedures related to limiting supervisor performance of the independent design verification function. Additionally, there were no documented audits which assured that independent verification by supervisors was adequately controlled. The licensee's corrective action for this issue included procedure revision and performing an audit of this issue. System Engineering and Project Support (SEPS) procedure 4.2, Preparing and Reviewing Design Calculations, Reports and Studies, revision 3, included specific limitations on the use of supervisors in performing the independent verification function. A licensee audit of Southern Company Services engineering activities was conducted in December 1993, and included a review of the independence of design verification activities. Additionally, the audit planning guide, OP-13, Design Changes and Plant Modification Control, was updated in December 1993, to include this element in future design audits. The inspector concluded the issue was adequately resolved.

2.5 (Closed) IFI 424,425/93-11-05, Follow-up on Resolution of EDG Fuel Filter Clogging Problems

The EDSFI team noted that the licensee's response to a potential EDG fuel quality problem was not aggressive. A relatively high frequency of fuel filter replacements due to clogged filters had occurred over the previous three years, primarily on the Unit 1 EDGs. The licensee

response to this issue included filtration cleaning of all EDG fuel oil tanks and improving communications between maintenance, chemistry, and engineering organizations in this area. A review of the EDG equipment history since the EDSFI, demonstrated a significant reduction in the occurrences of clogged fuel filters. The inspector concluded that this issue had been adequately addressed. This item is closed.

2.6 (Closed) IFI 424,425/93-11-06, Follow-up on Testing of EDG Air Start Receiver Check Valves

This item addressed the licensee's activities for maintenance of the EDG air start receiver check valves. The routine maintenance to disassemble and inspect the valves was accomplished on a rotating 72 month frequency and did not require a seat leakage test. Additionally, the inspection procedure did not provide well defined acceptance criteria or require further valve inspections if a valve should be found unacceptable. The EDSFI team concluded that this limited maintenance did not provide adequate assurance that the valves would perform their design function. The licensee's corrective action included development of an 18-month-frequency check valve leak test procedure. Procedure 14981-1,2, EDG Air Start Receivers Inlet Check Valves Leak Test, revision 0, addressed the check valve maintenance issues identified by the EDSFI team. The Unit 2 valves were tested in January 1994. The Unit 1 valve tests were scheduled for November 1994. The inspector concluded that the improved check valve maintenance activities provided adequate assurance that the valves would perform their design function.

2.7 (Closed) IFI 424,425/93-11-07, Weakness in Calculations

This item addressed unjustified assumptions in calculations for which there was no apparent impact on equipment. The assumptions were related to cable temperature and length and power factor (pf) values used in the following calculations:

X3CH03, Class 1E 120 VAC Voltage Analysis, revision 0
X3CK05, Power Cable Sizing Details, revision 12
X3CK06, Power Cable Voltage Regulation, revision 6
X3CK03-A, Maximum Control Cable Length, Units and 2, revision 11
X3CK03-B, Control Cable Sizing Details, revision 1
X3CA18, Unit 1 Load Study, revision 0
X3CA19, Motor Operated Valve (MOV) Starting, revision 1
X3CA22, Unit 2 Load Study, revision 0.

The EDSFI team noted that industry practice was to use conductor temperatures of 90°C for voltage drop analysis and 25°C for short circuit analysis; however, the licensee used various values for voltage analysis and 40°C for short circuit analysis. These assumption variations from industry practice were not justified. Design cable lengths were used rather than installed cable lengths which were non-conservative for short circuit analysis. The MOV starting voltage calculation used a non-conservative motor pf value of 0.7. These calculations were revised. The use of values other than 90°C for

voltage analysis was justified. The 40°C value was changed to 25°C and the installed cable lengths were used for short circuit analysis. The pf value was changed to 0.9 for the MOV starting voltage analysis. The inspector verified that the above calculations were revised and concluded that this item had been adequately resolved.

2.8 (Closed) IFI, 424,425/93-11-08, Load Shedding Due to Low Diesel Output Voltage

This item addressed a characteristic of the EDG sequencer loading scheme which prevented more than two successive automatic loading sequences. The condition could occur because the degraded grid relays were not disabled during emergency operation of the EDG. The licensee's basis for this design was that the equipment vendor recommended limiting equipment to two successive hot motor starts. The item was left open pending NRC review of this design feature. The NRC review concluded that this design was acceptable, this item is closed.

3.0 Follow-up Maintenance (92902)

(Closed) Violation 50-424,425/94-12-01, Failure to Follow Maintenance Procedures

This item identified two examples of the licensee's failure to follow procedure during safety related maintenance activity. In one example an EDG air start system parameter (moisture content) was not routinely checked as required following indication of out-of-tolerance dew point condition. In the other example, the EDG control air system configuration was not properly restored following maintenance. The licensee's corrective actions included correction of the discrepant conditions, training to emphasize procedure adherence, and procedure enhancement.

The EDG air start system moisture content was returned to acceptable conditions on February 11, 1994. The responsible Instrumentation & Control maintenance supervisors received training via memorandum dated June 17, 1994, summarizing the issue and emphasizing the requirement to perform the required system moisture checks when air system dew point analysis indicates this parameter does not meet acceptance criteria. The improper air start system configuration was corrected on May 12, 1994. The Generator and Control Panel Functional Test Procedure, 27563-C, revision 9, was revised to included a requirement for independent verification of control air tubing connection. The inspector concluded that the licensee had adequately resolved this item.

4.0 Exit Meeting

The inspection scope and findings were summarized on November 18, 1994, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection findings

listed below. No dissenting comments were received from the licensee. The licensee did not identify as proprietary any of the material provided to the inspectors.

(Closed) Violation 50-424,425/93-11-01, Design Control Deficiencies in Calculations

(Closed) Violation 424,425/93-11-02, Inadequate Post Maintenance Test Following Breaker Replacement

(Closed) IFI 424,425/93-11-03, Incomplete Evaluation of Non-Safety Related Transformer Failures.

(Closed) IFI 424,425/93-11-04, Weakness in Controls to Limit Supervisor Design Verification of Subordinate's Design Activity

(Closed) IFI 424,425/93-11-05, Follow-up on Resolution of EDG Fuel Filter Clogging Problems

(Closed) IFI 424,425/93-11-06, Follow-up on Testing of EDG Air Start Receiver check Valves

(Closed) IFI 424,425/93-11-07, Weakness in Calculations

(Closed) IFI, 424,425/93-11-08, Load Shedding Due to Low Diesel Output Voltage

(Closed) Violation 50-424,425/94-12-01, Failure to Follow Maintenance Procedures

5.0 Abbreviations and Acronyms

| | |
|---|---|
| AFW | Auxiliary Feedwater |
| CS | Containment Spray (system) |
| EDG | Emergency Diesel Generator |
| EQ | Environmental Qualification |
| EDSFI | Electrical Distribution System Functional Inspection |
| EQDP | Environmental Qualification Data Package |
| FSAR | Final Safety Analysis Report |
| GE | General Electric (corporation) |
| LOCA | Loss of Coolant Accident |
| MWO | Maintenance Work Order |
| NSW | Nuclear Service Water |
| MOV | Motor Operated Valve |
| pf | power factor |
| RHR | Residual Heat Removal (system) |
| SEPS | System Engineering and Project Support |
| VAC | Volts Alternating Current |