



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

Report No.: 50-425/88-67

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

Docket No.: 50-425

License No.: CPPR-109

Facility Name: Vogtle 2

Inspection Conducted: October 31 - November 3, 1988

Inspector: M. D. Hunt 11/23/88
M. D. Hunt Date Signed

Team Members: C. Paulk, Reactor Inspector Region II
C. G. Bruch, Consultant, Region II (EG&G Idaho, Inc.)

Approved by: T. E. Conlon 11-23-88
T. E. Conlon, Section Chief Date Signed
Division of Reactor Safety

SUMMARY

Scope: This special announced inspection was conducted in the areas of close out of Readiness Review Modules 6, 12, 17/19 and 20 findings, CDRs, IFIs, URIs and Violations. Also included was a review of the NRC's electrical cable and equipment inspection program for completion for Vogtle Unit 2.

Results: No violations or deviations were identified during this inspection. The licensee made every effort to cooperate and furnish the information necessary to close the open items. The licensee management continues to impress on the personnel the need to perform all tasks properly and only once.

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REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *A. B. Callant, Project Compliance Coordinator
- *E. D. Groover, QA Site Manager, Construction
- *H. M. Handfinger, Project Startup Manager
- *A. W. Harrelson, Construction Electrical Discipline Manager
- *C. W. Hayes, Vogtle QA Manager
- *R. E. Hollands, Electrical Coordination
- *A. N. Lankford, Assistant Manager, QC
- *D. C. McAfee, Senior QC Specialist
- *R. W. McManus, Assistant Project Construction Manager
- *K. Pointer, Senior Plant Engineer
- *R. J. Poper, Mechanical Field Office Staff Engineer
- *J. E. Sanders, Assistant Project Manager

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

Other Organizations

- *J. P. Hawley Project Engineer, Bechtel Power Corporation (BPC)
- *R. C. Sommerfeld, Readiness Review - Mechanical, BPC
- *P. R. Thomas, Readiness Review Team Leader, BPC
- *S. K. Owen, Project Engineering Manager, Southern Company Services

NRC Resident Inspector

- *R. J. Scheppens

*Attended exit interview

2. Action of Previous Inspection Findings (92701, 92702)

(Closed) VI0 50-425/88-07-01, Failure to Follow Procedure for High Potential Testing of Cable. During an NRC inspection conducted February 1-4, 1988, the failure to follow the procedure for high potential testing of cable was identified. The licensee concurred with the citation via letter dated April 14, 1988. The response was reviewed and determined to be acceptable. Discussions were held with responsible licensee representatives and supporting documentation was reviewed to verify that the corrective actions identified in the response have been completed. Reviews and evaluations were performed on all completed high potential test documentation packages. Three retests were required and were completed satisfactorily. Procedure 25733-C, High Potential Testing

Cable, was revised to clarify the voltage level and time period required for testing. The revision ensured that the requirements were within the guidelines of industry standards and included the referenced standards. Based on the above, this item is closed.

(Closed) URI 50-425/88-07-02, Variation of Industry Standard Used for High Potential Test Procedure (Cable). During an NRC inspection conducted February 1-4, 1988, an apparent discrepancy was noted in Procedure 25733-C, High Potential Testing Cable. The revision in effect at the time did not reference the standards used to develop the procedures. Although not referenced, the procedure was in accordance with ICEA Publication No. S-68-516, Ethylene-Propylene-Rubber Insulated Wire and Cable for Transmission and Distribution of Electrical Energy, and AEIC C 56-82, Specification for Ethylene Propylene Rubber Insulated Shielded Power Cables Rated 5 through 69KV. The procedure has been revised to clarify the length of time required for the test and to add the appropriate references. Based on the above, this item is closed.

(URI) 425/88-26-01, Resolve the Items identified in Readiness Review Module 17/19. Three elements were identified. A description of each element and the basis for closure are as follows:

- Incomplete Verification of Safety Train Separation Criteria Application. The licensee had installed electric cables at numerous locations in the plant that did not provide the three feet horizontal and five feet vertical separation specified by Regulatory Guide 1.75. The original intent was to substitute Fire Safety Barriers for spacing distance. After noting the large number of fire safety barriers required, the licensee then engaged an independent laboratory to make specific tests in accordance with IEEE Standard 384 as allowed by RG 1.75. These tests provided the basis for eliminating of Fire Safety Barriers in many of the locations. The test results, interpretation and complexity of application resulted in criteria for judging the acceptable field conditions for eliminating the requirement for Fire Safety Barriers. The development of the criteria did not provide uniformity of presentation among different governing documents covering criteria, installation and inspection requirements. The licensee asserted that application of the various documents was both conservative and conformative on the basis that the most stringent requirements document was applied first. The most stringent document also was the earliest and did not completely implement the less stringent requirements of the later independent laboratory tests. Any deficiencies so disclosed by field inspection were to be checked using the newer criteria of the higher level documentation which incorporated the later independent laboratory tests. This review process conservatism and efficacy was not readily apparent due to the substantial differences of presentation among the various documents. The licensee response was the preparation of an extensive matrix which showed a case-by-case comparison of each field situation covered by the documentation. This verified that the review process was conservative and would

result in unambiguous application of the reduced fire safety barriers requirements actually justified by the two laboratory test series. This element of URI 88-26-01 was closed.

- Thermal Separation. Field inspection by NRC inspectors disclosed one case where flexible conduit had been installed in contact with a higher temperature regulating transformer. Heat from the transformer was damaging the jacket at the point of contact and offering the possibility of overheating the conduit interior. Check of Procedure ED-T-02 failed to disclose a requirement for maintaining thermal separation between electrical raceways and higher temperature components other than piping. The licensee's response to this was the preparation of a draft change to Procedure FP-4 (High Temperature and Equipment/Electrical Raceway Separation Finalization) for Unit 2. This revision identifies higher temperature components throughout Unit 2, specifies separation criteria and requires a specific walkdown to check for inadequate thermal separation. This element of URI 88-26-01 is closed based on the expected licensee use of the draft procedure revision.
- Cable Tray Cover Installation. The NRC inspector's review of Module 17-19 disclosed that the Readiness Review Team did not assess total cable tray installation activities due to incomplete installation and the module-publication cutoff date. The licensee's response to this was to perform a field verification of the tray cover installation activities at a later date using the originally developed Readiness Review Team check sheets. NRC inspectors also inspected tray cover installations and did not find deficiencies. This element of URI 88-26-01 is closed based on the foregoing.

(Closed) URI 88-27-01 Resolve Items Identified in Readiness Review Module 6. This URI contained four elements. A description of each element of the URI and the basis for closure is as follows:

- Nonspecified Color Coding. Field inspection by the NRC inspector disclosed that certain installed components had a black identification label (indicating nonsafety related) along with a colored identification label (indicating safety related and the specific safety train). Discussion with GPC personnel indicated that this could be traced to procurement specifications and was common in Unit 2. The licensee response was to set up an inspection for (1) those components (panels) listed in NRC Report 50-425/88-27, (2) Unit Diesel Generator Panels, and (3) Unit 2 Electrical Panels requiring color coded labels. The purpose of the inspection will be to assure that the color of labels (or panels requiring color coded labels) is consistent and in conformance with applicable codes, specification, commitments, and criteria. This element of URI 88-27-01 is closed based on the licensee's commitment to perform the inspection and to take such corrective action as is indicated thereby.

- Inadequate Drip Loops. Field inspection by NRC inspectors disclosed the lack of drip loop configuration for some cables entering cabinet 2-1805-53-BBB, a 480 V Motor Control Center. Absence of cable drip loops could increase water entry into the cabinet during operation of the fire sprinkler system. The licensee response to this was a walkdown of the Unit 2 Power Block which identified 468 items of equipment as requiring water protection. The lack of drip loops was to be addressed by closing the cable entry point with an appropriate sealant material rather than reforming the cable into a drip loop. The requirements for the foregoing were entered into the project Master Tracking System as open items until such time as the moisture sealant has been applied. Work was complete on November 3, 1988. This element of URI 88-27-01 is closed based on the licensee's action to provide full correction of the deficiency and on NRC observation of the work while in process.

- Potential Junction Box Overheating. Field inspection by NRC inspectors noted the relatively high operating temperatures of Sola Regulating Transformers. The possibility, of convection currents carrying some of the transformer heat to junction boxes above the transformers, resulted in a concern that cabling terminating in these boxes could become overheated. The licensee conducted a specific investigation using a high-low indicating thermometer inside of the junction box for a typical installation. Data taken over a 25 hour period disclosed that temperatures inside the junction box did not exceed the room (ambient) air temperature by more than 2.5°F. Transformer surface temperatures, during this same period, were never less than 34°F above ambient air temperature. The NRC inspectors reviewed the licensee's data and the transformer installation tested. It was noted that the conduit surface temperature was very sensibly lower than transformer temperature one foot away from the transformers and close to room temperature (temperature of nonheated components) at the junction box. This confirmed data recorded by the licensee employee. Also, the NRC inspectors reinspected the transformer installation referred to in NRC Report 50-425/88-27 which reported the basis for URI 88-27-01. The conduit surface temperatures were found to be near ambient. The licensee was considered to have demonstrated adequately that no unsafe temperature condition existed and this URI element was closed.

- Inadequate Component Clearance. Field inspection by NRC inspectors disclosed the lack of minimum required clearance (1-1/2 inches) between cabinet 2-1806-03-DA1 and an adjacent cable tray support arm. The licensee presented a calculation showing that the existing 1-1/4 inch clearance would be degraded by 0.04 inches during an Operating Basis Earthquake (OBE). The calculation was reviewed by the NRC inspectors and considered to be adequate. This URI element was closed based on the results of this calculation.

(Closed) URI 88-27-02, Incorporate Protective Relaying Design into the FSAR. Review by NRC inspectors disclosed that FSAR Section 1.4.5.3 made a

general design responsibility assignment to the Bechtel Power Company. The design of protective relaying, however, was found as being performed by the Georgia Power Company Protection Engineering Group who were not part of either Bechtel or the Vogtle project. The licensee response to this anomaly was to initiate a FSAR change to clearly assign this work to the Protection Engineering Group and the audit responsibility to the Vogtle Quality Assurance Manager until such time as the plant is accepted for operation. This FSAR change maintains the licensee practice of having a single technical group accomplish protection design for all licensee plants but provides overview by the Vogtle project through the means of Quality Assurance audits. This URI is closed based on the wording of a draft FSAR change currently undergoing licensee review and will be part of FSAR Amendment 39 to be released later this calendar year (1988). This FSAR change is considered to provide adequate Vogtle project control of the GPC Protection Engineering Group's design of protection relaying at VEGP.

(Closed) URI 425/88-40-01, Damage to Cable During Installation of Stainless Steel Tie Wraps. The inspector reviewed an engineering report which evaluated the use of stainless steel tie wraps to support cables in long vertical cable trays. This evaluation explored the aspects of a cable construction, weight/force margins, angles of incidence of the cable tie, cable aging, and industry studies and experiences. Based on this report it was concluded that the stainless steel tie wraps will not cause unacceptable deterioration of the cables over the forty year life of the plant. The two manufacturers of the cables used in the most Class 1E applications that presented the most likely and possible damaging situations vertically installed cable runs were contacted and given the engineering evaluation. Both vendors concurred that the stainless steel tie wraps would not damage or compromise the integrity of their cables.

An employee concern had also been submitted to the Quality Concerns Unit expressing the same concern as this URI. The inspector reviewed the response to the concerned employee and noted that the individual had accepted the response and had no further concerns. This item is closed.

(Closed) Violation 425/88-48-01, Failure to Properly Tighten Flexible Conduits in Containment. The licensee's actions to correct the condition cited was verified by the inspector. A walkdown of the areas which contain the conduits in question was made by the inspector to verify that the conduit fittings were now tight and that compliance was achieved as of November 3, 1988. This item is closed.

(Closed) URI 88-48-02, Resolve Items Identified in Readiness Review Module 12. A description of the separate elements of the URI and basis for closure are as follows:

- Penetration Loading Calculations. The licensee reported in Module 12 that module-publication deadline had not permitted review of the electrical penetration assemblies (EPA) loading calculations by the Readiness Review Team. Credit had been taken for the review of

program controls made during the Module 6 review of Unit 1. The NRC inspectors' examinations of that review did not support the credit taken since it did not show specific review of the EPA loading calculations for Unit 1. The licensee response to this URI was to select three Unit 2 penetrations and to perform the originally planned review of the calculations for these three. The NRC inspectors examined the Readiness Review Team check sheets and the actual calculations related thereto. No verification errors were found during this examination. This element of URI 88-48-02 was closed.

- Cable Tray Edge Protection. Field walkdowns by the NRC inspectors disclosed several cases where cables were in contact with cable tray edges without the benefit of edge protectors as had been installed at numerous other cable transition locations. The licensee response was to correct the five locations reported in NRC Report 50-425/88-48. The licensee inspected other trays in the general area and found the similar problems which were corrected. A further licensee inspection at areas (rooms) released to the Operations Department disclosed additional instances of inadequate edge protection. This has resulted in the modification of Exhibit 01 (Facility Walkdown Electrical Checklist) of Procedure ED-T-33 [Electrical Facility (AREA) Completion and Turnover]. The licensee use of this procedure is expected to embrace all safety related areas and components of Unit 2 and thus will provide a final assurance of adequate edge protection. This element of URI 98-48-02 was closed based on the licensee's use of the modified checklist for Area turn-over of Unit 2.
- Controls Cable Ampacity Derating. The NRC inspector review of licensee FSAR commitments for Module 12 disclosed that Design Criteria DC-1809 (Cable System) did not require cable ampacity derating analysis for power tray fills exceeding 30% or control cable fills exceeding 40%. This analysis was required by FSAR Section 8.3.1.4.2 (Cable System). The licensee offered evidence (1) based on the ICEA 46-426 application of temperature provision of the National Electric Code, (2) on the basis of minimum wire sizes used for control cables, and (3) on current limitations of control circuits. This showed that control cables would always be within normal industry temperature limitations and thus derating would not be required. The licensee showed that the EE-580 (Cable and Raceway Tracking and Control System) always flagged power cable fills exceeding 40%. These were checked for derating requirements by PFE-X3DI06 Desk Instructions. The foregoing offered acceptable evidence that the intent of FSAR Section 8.3.1.4.2 had been carried out for power trays. The URI was written to recognize the anomaly that existed between the FSAR and the actual practice. The licensee response was to draft a change to DC-1809 to address the FSAR requirements by (1) requiring power cable trays having fills greater than 30% to be analyzed for ampacity derating and (2) referring to calculation X3CKD3B for control cables where tray fills exceed 40%

(calculation demonstrating that ampacity derating is not required since control cables are never less than 12 or 14 A.W.G. and never carry more than 10 Amperes). This element of URI 88-48-02 was closed based on the expected prompt issue of DMCN DC-1809-12.

(Closed) Violation 425/88-49-01, Failure to Protect Installed Equipment. The inspector verified that the licensee had taken the corrective actions required as committed to in their response to this violation. The area turnover process had been reviewed to insure that adequate inspection of installed instrumentation components is accomplished and items needing repair are identified. The licensee appeared to be in compliance as of November 3, 1988. This item is closed.

(Closed) URI 50-425/88-49-02, Resolve Items Identified in Readiness Review Module 20. During an NRC Vogtle Readiness Review Team inspection, a discrepancy was noted concerning color coding and tagging instruments by construction. Procedure X4AZ01, Div. P2, Rev. 19, Instrumentation Installation Construction Specification required color coding and tagging of instruments and sensing lines. Contrary to this requirement, several instruments were identified in the previous report as not meeting the requirements of X4AZ01 Div P2. The licensee stated that the markings required were for the construction phase only, and were not required to be maintained after acceptance by Nuclear Operations. All instruments identified had previously been accepted by Nuclear Operations and were not under the jurisdictional control of construction.

In order to alleviate any further concerns X4AZ01 Div P2 was revised on October 19, 1988. The revision addresses the purpose of the construction markings as construction aids for insuring that proper trair separation is verified, the need to maintain the markings is no longer necessary. Based on the above, this items is closed.

3. Electric Cable - Work Observation and Record Review (51063, 51065)

The licensee has recently completed a Readiness Review Module No 17/19, Electrical Raceways and Supports. The module results were examined and accepted under Inspection Report 50-425/88-26 issued on August 24, 1988. The module assessment using an approved check list which incorporated all the inspection attributes of Field Procedure ED-T-02-Raceway Installation verified the following numbers of hardware and documentation.

<u>Item</u>	<u>Quantity</u>
Trays	39 Locations
Conduits	25 each
Raceway Documentation	64 sets
Tray Supports and Documentation	16 each
Conduit Supports and Documentation	25 each

Additionally, an NRC independent sample verification was performed for 14 individual raceways and associated supports. This task involved a broad range of hardware types in Class I locations. The independent verification included the following attributes:

- Design Conformance
- Support Location
- Identification Marking
- Bolt Torque
- Welding (if not concealed by subsequent painting)
- Separation Criteria
- Cable Tray Cleanliness
- Cable Tray to Cable Program Correlation
- Tray Cover Installation
- Deviation Report Documentation
- QC Inspection

The sample listed in Table 2 of Inspection Report 50-425/88-26 includes both conduit and cable trays for power, control and instrumentation cables.

The licensee's receipt and inspection activities were reviewed at various times during the NRC inspection program.

4. Electrical Components and Systems - Work Observation and Records Review (51053) (51055)

During the NRC review of Readiness Review Module # 6 the following items were selected for record and walkdown verification. In certain instances followup walkdowns of the licensee's verification and walkdowns of items included in the module report were performed. These items are identified below:

<u>Equipment TAC Number</u>	<u>Description</u>	<u>RRT Sample</u>	<u>NRC Sample</u>
2-1804-S3-A03	Med voltage SWGR 2BB03	*	
2-1805-S3-BBB	480 V MCC 2BBB	*	*
2-1806-B3-BYA	125 V dc battery		*
2-1806-B3-CBB	Battery charger		*
2-1806-B3-BYB	125 V dc battery and rack 2801B	*	
2-1806-Q3-DA1	125 V dc dist. panel	*	*
2-1806-S3-DA1	125 V dc dist. panel		*
2-1806-S3-DSB	125 V dc switch gear		*
2-1807-Q3-VII	125 V dc dist. panel		*
2-1807-Q3-VI6	125 V dc dist. panel		*

<u>Equipment TAC Number (cont'd)</u>	<u>Description</u>	<u>RRT Sample</u>	<u>NRC Sample</u>
2-1807-Y3-IB12	Inverter		*
2-1807-Y3-RX7	Regulating transformer		*
2-1808-T3-106	Regulating transformer	*	
2-1816-U3-007	Elect. aux. board		*
2-1818-H3-P13	M.V. penetration	*	*
2-1818-H3-P29	480 V penetration	*	
2-1821-H3-P50	Control penetration	*	
2-1818-H3-P71	Instrumentation penetration	*	
2-1821-U3-001	Safety feat. seq. board' inn. A.	*	*
2-1825-S3-BAB	13.8 KV RCP SWGR		
2-1801-Q5-MCG	Main cntl. board Sect. A01	*	
2-1601-U3-T27	Termination cabinet		*
2-1605-Q5-SPA	Solid state protected system		*

5. Licensee Identified Items - 10 CFR 50.55(e), Construction Deficiency Reports (CDR)

(Closed) CDR-84-59, Transamerica Delaval D/G Thrust Bearing Lubrication. This item was reported to the NRC on March 23, 1984, and the final report was submitted on November 12, 1984. The problem was proper lubrication of the turbo charger thrust bearing during a quick start after a long standby period. The modifications were unique for each TDI D/G and required testing to determine the corrective actions required. Close out action approval by Q/C for the Unit 2 D/Gs was dated March 1, 1988, for D/G 2A and July 21, 1988, for D/G 2B. This items is closed.

(Closed) CDR 85-98 - Transamerica Delaval Diesel Generator Cylinder Head Weld Repair - This item was reported to the NRC on December 4, 1985. The final report was submitted on January 23, 1986. At that time the licensee committed to return any Unit 2 diesel generator cylinder heads that had been repaired using the questionable weld repair procedure to the vendor.

The cylinder heads for both Unit 2 diesel generator engines were inspected and the following cylinder heads wer identified as unacceptable and were returned to the vendor and replaced:

Diesel Generator 2A

Cylinder head ID
2 Left Bank
8 Left Bank
1 Right Bank
4 Right Bank
8 Right Bank

Diesel Generator 2B

Cylinder Head ID
2 Left Bank
2 Right Bank

The diesel generators have been reassembled and operational testing is in progress. This item is closed.

(Closed) CDR-86-123, Diesel Generators (D/G) Control Panels Relay. This item was reported to the NRC on August 6, 1986. The final response was submitted on November 20, 1986. General Electric Company relays were wired in reverse polarity by the diesel generator engine control panel fabricator causing burnout of some relays in Unit 1 D/G panels.

Corrective actions were taken which modified the existing wiring in the engine control panels for the Unit 2 D/Gs and replacement of the under frequency relay. A review of QC inspection records indicated that the work was satisfactorily completed on March 29, 1986, and operational testing accomplished by Preop Test 2-BKJ-06. This item is closed.

(Closed) CDR 87-140, Electrical Cable Separation Within Panels. The licensee submitted what they considered their final report on February 24, 1988, concerning electrical cable separation within panels. The report was reviewed and determined to be acceptable. Discussions were held with responsible licensee representatives and supporting documentation was reviewed to verify that the evaluations, reviews, and corrective actions have been completed. Additional testing was performed by Wyle Laboratory and evaluations were performed that indicate the instances where separations criteria did not meet the requirements of RG 1.75 were acceptable. Changes have been made to the FSAR to reflect the results of Wyle Test Reports 48141-02 and 17959-02 and to incorporate the changes that resulted from their findings. These changes were submitted to the NRC by letter dated March 14, 1988. Based on the above, this item is closed.

(Closed) CDR 88-142, Electrical Cable Tray Separation. The licensee submitted what they considered their final report on May 10, 1988, concerning cable tray separation and lack of cable tray covers. The report was reviewed and determined to be acceptable. Discussions were held with responsible licensee representatives and supporting documentation was reviewed to verify that the evaluations, reviews, and

corrective actions have been completed or are being tracked to ensure completion. The evaluations and reviews were included with those performed to resolve CDR 87-140 (discussed above) and corrective actions are being implemented to resolve any discrepancies identified. Completion of the corrective action items is being tracked via FSBRs and MTS. Based on the above, this item is closed.

6. Exit Interview

The inspection scope and results were summarized on November 3, 1988, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed above. Although reviewed during this inspection, proprietary information is not contained in this report.