



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
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ATLANTA, GEORGIA 30323

Report No.: 50-425/88-27

Licensee: Georgia Power Company
P. O. Box 4545
Atlanta, GA 30302

Docket No.: 50-425

Licensee No.: CPPR-109

Facility Name: Vogtle Unit 2

Module No. 6, Electrical
Equipment

Reviews Conducted: May 4 - 26, 1988

On-Site Inspections Conducted: May 16-26, 1988

Inspectors: M. D. Hunt
M. D. Hunt, Team Leader

8/17/88
Date Signed

M. D. McCormick
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8/19/88
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SUMMARY

Background: This evaluation was performed for one of eleven Readiness Review Modules produced as part of a Pilot Readiness Review Program being operated by the licensee pursuant to a recommendation contained in NUREG 1055. The NRC agreed to participate in the program by reviewing and commenting on each module.

Scope: This evaluation was performed by reviewing the module report, examining supporting documentation and inspecting associated hardware. The licensee's review was verified by sampling hardware and documentation seen by the licensee's reviewers, sampling hardware and documentation not selected by the licensee's reviewers, by reviewing records of previous NRC inspections at Vogtle and by interviewing licensee personnel who were closely associated with preparing the module.

Results: Major weaknesses and verification errors were not found. Two Unresolved Items (URIs) were identified. One involved inadequate clearance above a cabinet, wrong color code of equipment labels, no drip-loop on equipment cables, and possible heat buildup in the regulating transformers junctions boxes. The other concerns licensee design of protective relaying system which is otherwise specified by the Final Safety Analysis Report (FSAR) for Architect/Engineer accomplishment.

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REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *D. Edenfield, RRT Engineering Supervisor
- *A. Gallant, Technical Support Supervisor
- *A. W. Harrelson, Manager, Electrical Construction
- *R. Hollands, Supervisor, Electrical Compliance
- *E. Laner, Supervisor, Electrical Engineering Group
- *J. Lavoy, RRT I&C Team Leader
- J. Lovekamp Deputy Supervisor, Civil Engineering Group
- D. G. Lunsford, QC Inspector
- *R. McFanus, Manager, Readiness Review
- *W. Ramsey, Manager, Engineering
- *P. D. Rice, Vice President and Project Director
- U. C. Roumillat, Jr., Senior Protection Engineer

NRC Resident Inspector

R. Scheppens, Senior Resident Inspector, Construction

*Attended exit interview

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

2. Module 6 Electrical Equipment

a. Unit 2 Review

The Readiness Review Program is being conducted at the initiative of Georgia Power Company (GPC) management to assure that all design, procurement, construction, and operational commitments have been properly identified and implemented at the Vogtle Electric Generating Plant (VEGP) Unit 2. Module 6, which was submitted on December 17, 1987, presents an assessment of the compliance of the Electrical Equipment contained in Seismic Category I structures with Final Safety Analysis Report (FSAR) commitments and regulatory requirements. This evaluation was conducted to determine if the results of the program review of the design fabrication and installation of Electrical Equipment presented in this module represent an effective and accurate assessment of the requirements, that the requirements were properly implemented, and that the resolutions of the findings identified in Module 6 were correct. It should be noted that a comparable review had been completed for VEGP Unit 1 during 1985 and 1986.

b. NRC Review Objective

The objective of this review and inspection was to evaluate the licensee's VEGP Unit 2 Readiness Review of Electrical Equipment. The evaluation was to be accomplished through a detailed examination of all sections of the module to include:

- Assuring the accuracy of the information contained.
- Verifying that the Electrical Equipment commitments identified in the module are correct along with being in conformance with FSAR commitments and regulatory requirements.
- Checking a representative sample of the documents reviewed by the Readiness Review Staff along with other documents selected by the inspectors.
- Inspecting a representative sample of the Electrical Equipment components currently installed in Unit 2.
- Reviewing reports of past Nuclear Regulatory Commission (NRC) inspections at Vogtle Unit 2 that pertain to Module 6.
- Assessing the Module 6 findings and the licensee's resolution thereof.
- Assuring that the findings and lessons learned from the Unit 1 review were appropriately recognized in the Unit 2 review.
- Verifying that credit can be taken for those aspects of the Unit 1 review that are directly applicable to Unit 2.

c. Review Scope

The total module was reviewed for organization and content. This part of the NRC review disclosed that Module Sections 1, 2, 3, 4, and 5 presented data on module organization, project organization, commitments, program description, audits and special investigations. These sections were descriptive and presented material that was similar to that presented in the similar numbered sections in Module 6 for Unit 1. These sections did not require the review depth given to Sections 6 and 8 which covered the program verification and review assessment-plan respectively. Sections 1 through 5 were reviewed relative to changes that occurred in the Vogtle Project and Readiness Review programs since the Unit 1 review, however. Module Section 7 was similar to Section 8 of the Unit 1 module and consisted of management's certification of the review effort and findings. Section 7 of the Unit 1 module reflected the Independent Design Review made as part of the Unit 1 review. The licensee did not repeat this in the Unit 2 Readiness Review on the basis that the design was essentially similar for both units, was performed by the

same organization and was essentially complete at the time of the Unit 1 Readiness Review. It was considered that reverification of an essentially completed program would be redundant within the Unit 2 review. Sections 6 and 8 contain the majority of the new material and disclosed those aspects of the Unit 2 review that differed from that examined by NRC pursuant to the Unit 1 review. Review of these two sections included an examination of content; a review of findings, concerns and observations; a review of a sample of items reviewed by the GPC Readiness Review Team (RRT); and an examination of an independently selected sample of records and field construction.

d. Site Inspection

The site inspection was conducted at Vogtle Unit 2 during May 16-26, 1988. The following activities were conducted:

- Determining the RRT organizational element responsible for Module 6 and interviewing key staff members.
- Verifying the module review boundary.
- Making a general verification of the material presented in Sections 1 through 5 and 7 of the module report.
- Obtaining supplemental documentation copies required for review use.
- Reviewing programmatic and review methodology changes taking place since the review of Unit 1 Module 6.
- Assessing the licensee's Module Assessment Plan for adequacy of depth and coverage within the module boundary.
- Performing commitment tracing for commitments that were new or changed since the Unit 1 review.
- Performing a construction program verification review of Module Sections 6 and 8.

The new and the changed commitments were traced into selected first and second order verification documents. They were traced backward through the FSAR, or other commitment source, to the parent requirements.

Continued office review was made after the inspection trip to evaluate data gathered, draft the module review report, and identify any items that might require further field review and analysis. The review plan, module report, and examination data gathered to date were checked for potential gaps and incomplete work. The results of the office review disclosed that sufficient information had been obtained during the site visit and that the data gathered fully supports the NRC findings presented in this module review report.

3. Evaluations

The evaluation of each Module 6 section is provided below using a module section-by-section format. Included are a description of the section, subject matter reviewed, the basis for acceptance, and a statement of any required followup or evaluation.

a. Section 1 - Introduction

(1) Review Introduction and Section Examination

This Section of the module provided a description of the intent and contents of Module 6. Also provided was a description of the Vogtle Unit 2 hardware covered within the module, an overview of the project status, and an outline of the module organization. This section was examined by the NRC Region II Inspectors for content, background, and accuracy of information. Clarification of information concerning the module boundary and project status was required. This was accomplished during discussions with the RRT personnel.

(a) Boundary Definition

The information given in Module 6 Subsection 1.1 was reviewed with the RRT counterpart to verify the correctness of the boundary definition information presented. The information gained during the review disclosed that protective relaying was part of this module, although this was not delineated in the outline presented in this subsection of the module.

(b) Module Organization

The Module organization portion of the section was examined by the NRC Inspectors, and no instance of inaccuracies or need for clarification were found.

A specific question was asked concerning the existence of significant changes subsequent to the July 1, 1987 cutoff date for Module 6 data. The RRT counterpart responded with a statement that there were no changes to the information contained in the module. Evidence of significant module-basis change since the July 1, 1987 cutoff date was not discovered during the review.

(c) Project Status

Module 6, Section 1.3, states that the design of the electrical equipment was essentially completed by July 1, 1987, and the overall Unit 2 major electrical equipment installation was mostly complete. Inquiry was made concerning any significant changes that had been made subsequent to the July 1, 1987, cutoff date. The RRT counterpart responded that no changes had been made except that the equipment installation is complete and is about 90% energized.

(2) Inspection Results

The clarifications provided by the RRT, as noted above, correlated with other information reviewed by the NRC Inspectors. The examination did not disclose significant verification errors or a basis for programmatic concern. Followup or additional evaluation of Module Section 1 is not required.

b. Section 2 - Organization

(1) Review Introduction and Section Examination

This section of the module provided a description of the organizations employed for project design and field construction activities. The integration of these into the total project management matrix for the subject of Module 6 also was provided. This section was examined by the inspectors for content and background information. The information presented agreed with that obtained by the inspectors during past inspections at both Unit 1 and Unit 2. No instances of variance from the Section 2 information were found during the course of the total module review. Also, the information presented did not differ essentially from that examined during the review of Unit 1 Module 6, except for engineering and project management changes occurring subsequent to the Unit 1 review. These primarily were the transfer of Bechtel Home Office Engineering (HOE) functions to the Bechtel Project Field Engineering (PFE) office at the plant site. The transfer was accompanied by some reorganization. These changes were found to have low programmatic impact since PFE originally was an extension of HOE, many of the same people were involved and the design was at the nearly-complete stage.

Further evolution of the engineering organization has taken place since the July 1, 1987 module cutoff date. The separate functions of design and installation engineering depicted on Figures 2-2 and 2-3 of the module are undergoing consolidation. This is caused by the decreasing number of personnel required as hardware installation nears completion.

- Inspector Certifications

Module Table 2-1 summarized inspector qualification certification requirements for the hardware covered by Module 6. These were compared with those listed in Unit 1 Module 6 and found to be similar. Penetrations have been added to the Unit 2 list. Credit was taken for previous NRC inspection of Inspector Certifications.

(2) Inspection Results

The examination did not disclose significant verification errors or a basis for programmatic concern. Followup or additional evaluation of Module Section 2 is not required.

c. Section 3 - Commitments

(1) Review Introduction and Section Examination

This section of the module describes the commitment selection and sources along with containing a list of commitments and implementing documents. They are displayed in two matrices. The first is entitled "Commitment Matrix" and lists 197 commitments by the Georgia Power Company for VEGP Unit 2 along with the source document reference for each commitment. The second is entitled "Implementation Matrix" and lists source documents and requirement features referred to within each commitment along with the document reference where the feature has been implemented. An identification review was made to verify if the commitments listed in the Unit 1 Module 6 had been accurately carried forward into Module 6 for Unit 2. A sample was selected and reviewed to verify the proper implementation of the listed commitments. This was accomplished by examining the sample to check the commitment source (typically the FSAR and referenced standards) for the exact requirement and to verify (within the documentation listed in the Implementation Matrix) that the requirement was accurately carried through.

(a) Identification Review

The examination of Section 3 started with a reading of the module for content. The commitment listings of Section 3 of the module were compared with the corresponding listings of Unit 1 Module 6. The following anomalies were discovered:

- Four commitments (1552, 1553, 4688, and 1253) which appeared in the Unit 1 matrix were not listed in the Unit 2 matrix.

- Eleven commitments (1491, 264, 2399, 2445, 3527, 2319, 2320, 4880, 4881, 2905, and 4289) which were listed in the Unit 2 matrix which were not in the Unit 1 matrix.
- During the assessment of the Module 6 Section 6, inconsistencies were noted between the number of design and construction commitments in the matrix and the numbers quoted in the Module 6 Subsection 6.4.1.1. These were 197 design and 12 construction, and 186 design and 16 construction commitments, respectively.

All of the 15 commitment anomalies were resolved during the inspection period. The disposition of the four commitments, which were in the Unit 1 matrix but not in the Unit 2 matrix, was as follows. Commitment 4688 was in the Unit 2 implementation matrix but had been inadvertently left out of the commitment matrix. Commitments 1557 and 1553 were moved to Module 20 because their scope was the protection system. Commitment 1253 was deleted because its requirement had been deleted from the FSAR Subsection 3.11.B.1-2 by Amendment 24.

The disposition of the 11 commitments which were in Unit 2 but not in Unit 1 is as follows. Commitment 2905 was included in the commitment matrix but was inadvertently left out of the implementation matrix. This commitment was generated for this module where previously it had been contained (in a general way) in the Unit Quality Assurance Program General Appendix I. Commitments 4880 and 4881 were moved from Unit 1 Module 20 into Unit 2 Module 6 but were inadvertently left out of the implementation matrix. The remaining 8 commitments were moved from Unit 1 Module 4 to Unit 2 Module 6. All commitment moves between modules were verified by the NRC Inspector.

The Commitments 10, 31, 182, 754, and 2968 were found to have been both design and construction commitments but were not indicated as being construction on the commitment matrix. Also, Commitment 182 was not indicated as being construction on the implementation matrix.

- (b) Implementation Review. Two of the 15 anomalous commitments listed above in Subsection 3.c.1.(a) were selected for verification. An additional 2 were selected independently from the commitment matrix. The examination of this sample consisted of:

- Verifying correspondence between the Module Commitment Matrix and the Module Implementation Matrix for each commitment.

- Reviewing the referenced commitment source-documentation for a clear statement of requirement for each commitment within the sample.
- Checking the document listed in the Module Implementation Matrix for proper first and second order implementation of the requirements embraced by the commitment.

The commitments listed in the Unit 1 Module 6 had been extensively examined by NRC during the review of that module. Accordingly, a detailed examination of commitments carried forward from that module into the Unit 2 Module 6 was limited to a sample of two.

(2) Inspection Results

The individual commitments reviewed along with the review results are listed in Table 1 of this report.

The examination of Module Section 3 did not disclose substantial verification errors, other than noted above, or programmatic concerns. Followup or additional evaluation is not required.

d. Section 4 - Program Description

(1) Review Introduction and Section Examination

This section of the Module describes work process and control for the design and construction of hardware covered by the module. This is supplemented by documentation listings, flow charts, and an outline of program changes. The section was examined by the inspectors for content, background for the review of later sections (especially Section 6, Program Assessment) and for the accuracy of the information presented. A detailed examination of the section was not made by the inspectors since the material contained was largely descriptive and not in the nature of an assessment. Credit was taken for the examination of similar material during the Unit 1 review.

(a) Design

Subsection 4.1 was examined for content and general agreement with information developed during past NRC inspections. In addition, the flow chart referenced in this subsection was reviewed for logic and accuracy. The foregoing provided general agreement between commitments and the activities covered by the Design Program.

(b) Construction

Subsection 4.2 was examined for content and general agreement with information developed during past NRC inspections. The flow charts referenced in this subsection were reviewed for general logic and compared with programmatic documents for accuracy. No anomalies were apparent in the flow charts.

(c) Program Changes

Subsection 4.3 outlined program changes involving activities directly related to Electrical Equipment that had occurred since the Unit 1 Readiness Review. Two of the four items concerned procedures and personnel and another was the initiation of the component removal program. The remaining item was the addition of interdiscipline separation criteria to upfront installation and inspection activities in order to place less reliance on after-the-fact finalization walkdowns. This last item was not discussed in the referenced text location. Review of the documentation covering these changes did not disclose error or ambiguity.

(2) Inspection Results

The Section 4 examination revealed that a discussion of the item above, interdiscipline separation, was not in the text. The RRT counterpart indicated that this had been inadvertently edited out during document review. The NRC Inspector did not consider this to be a serious detriment to the section. No further programmatic concerns were identified. Followup or additional evaluation is not required.

e. Section 5 - Audits and Inspections

(1) Review Introduction and Section Examination

This section provides a discussion of the audits of Module 6 related activities and documents made by GPC and BPC along with the inspections made by NRC. The audits and inspections performed subsequent to the Readiness Review of Unit 1 Module 6 review were those reported. Also included was a discussion of the Unit 1 Readiness Review findings and certain conditions discovered since the Unit 1 Readiness Review that were reportable or potentially reportable under 10 CFR 50.55(e) or 10 CFR 21.

It was noted that Unit 1 General Appendix I entitled "Project Quality Assurance Organization" provides the description and validation of the various audit programs used at VEGP. Individual audits of design and construction activities had been screened by the RRT for items applicable to Module 6. Section 5 of Module 6 provides specific information relative to these in Module Tables 5-1 through 5-4. These tables were reviewed and sampled in order to assess the thoroughness and accuracy of the section preparation.

(a) QA Audits

Table 5-1 is a list of the audits performed by GPC and BPC. GPC performed fourteen audits and listed eight findings specifically on Module 6. BPC made three general audits which included three Module 6 items. The NRC Inspector sampled four GPC audits, two which had resulted in findings and two of which had not. Some of the sampled items had ended in a finding which lead to corrective action. The audit sample-items were found to have been closed satisfactorily and are listed on Table 2.

(b) NRC Inspections

An updated NRC Region II Outstanding Items List dated May 2, 1988 was compared to the Module 6 Table 5-2 list of NRC Inspections to verify completeness of the table. CDR 87-140, which applied to Module 6 but was not included in Table 5-2, was found to be addressed by the licensee's Deficiency Evaluation Report (DER) 186.

(c) Reportability Evaluations

Table 5-3 contains a list of 11 Unit 1 Module 6 deviating conditions applicable to the scope of this module which required formal evaluation for reportability using the DER procedure. The NRC Inspector reviewed two items from this table, one which had been judged to be reportable and one which had not. These were evaluation numbers 108 and 125 respectively. Both items had been processed in a satisfactory manner, although the DER-125 (CDR-M103) was still open. The NRC Inspector verified the licensee's reportability decision for both of these items.

The DER 46 (CDR-M53) was closed out prior to the module cutoff date of July 1, 1987 and did not appear in Table 5-3. This DER package was examined to observe the corrective process where design had not provided adequate protective relaying for a penetration. Both penetrations and protective relaying are part of Module 6, although were not indicated as so in Module Section 1. The review did not disclose verifiable error.

The NRC Inspector investigated omission of DER-186 (CDR-M140) from Table 5-3. The RRT counterpart indicated that this DER was generated by one of the RRT findings after the module cut off date of July 1, 1987. The status of DER 186 (CDR-M140) is that the second Wyle Laboratory report on separation has been submitted to the NRC for approval of reduced separation. NRC evaluation of this report is still underway. The licensee has already redesigned the documentation to incorporate the separation criteria as allowed by both Wyle Laboratory reports in anticipation of approval of the second Wyle report.

Not including DER 186 in Table 5-3 is not considered to reflect incomplete reporting within the Module. Further identification for NRC followup is not required since the item is included within the NRC Outstanding Items List as CDR 87-140.

(d) Unit 1 Finding Followup

Table 5-4 listed 71 Unit 1 audit findings which were followed-up. The RRT reported the examination of a sample of 34 to assess their accuracy and adequacy. A sample of three of these Unit 1 findings were reviewed by the NRC Inspector to verify Unit 2 followup action. The followup action reflected by the sample was satisfactory. Sample details are listed in Table 3 of this report.

A review was made of a sample of six equipment document files selected from the list of Module 6 equipment. Of particular interest was equipment which had been removed to expedite Unit 1 startup and how the restoration was performed. The file on the 480 Volt Motor Control Center (2-1805-53-BBB) was examined to assess the process used by the licensee to track removed equipment and the restoration process. The sample documentation did not disclose error and the restoration process was satisfactory. The Quality Assurance audit book was reviewed in order to assess the RRT checksheets used during the review of the audits. The equipment document files checked and verification results are listed in Table 4 of this report.

(2) Inspection Results

The examination did not disclose significant verification errors or a basis for programmatic concern. Followup or additional evaluation of Section 5 is not required other than for CDR 87-140 listed within the NRC Outstanding Items File.

f. Section 6 - Program Assessment

(1) Review Introduction and Section Examination

This section of the module describes the program developed and actions performed to ascertain whether the design and construction activities related to Electrical Equipment for VEGP Unit 2 have been adequately controlled in the manner that implemented licensing commitments. In addition, it describes the program used to ascertain whether the corrective actions resulting from the Unit 1 Readiness Review were applied to Unit 2, and to verify that design and construction activities conformed to project procedures and design requirements. Subsections were provided for program description, summary and conclusions, assessment activities and results, along with findings. The licensee review specifically was intended to assure that:

- Project procedures implemented licensing commitments.
- Actions taken to resolve problems identified during the Unit 1 Readiness Review have been effective in preventing recurrence in Unit 2.
- Program and organizational enhancements made for Unit 2 have maintained the quality of the design and construction effort.
- Design completion and design change activities complied with engineering controls.
- Installed hardware complied with engineering and vendor requirements.

This section of the module presented most of the new material (Unit 2 specific) and reflected that portion of the licensee's review of matters not covered by the earlier review of Unit 1. Accordingly, this section received a detailed examination by the NRC Inspectors.

(a) Introduction, Program Description and Summary

Subsections 6.1 and 6.2 were read for content and to assure that they were in consonance with material presented earlier in the module. These subsections are largely descriptive and were found to agree with information presented in other sections of the module. Subsection 6.3 summarizes later portions of the module, viz. Sections 6.4, 6.5, and 8. Error in the summary was not found.

(b) Assessment Activities and Results

The licensee assessment activities were divided into three parts as follows:

- Part 1 - Commitment implementation and Unit 1 finding followup.
- Part 2 - Design and Construction Programs and activities.
- Part 3 - Design and Construction Completion.

The licensee reviewed the information presented in Section 5 of the module (Audits and Inspections) along with NRC reports of inspections at four non-GPC plants to identify new areas of industry concern that might have been overlooked. The result of the foregoing was an assessment plan detailed in Section 8 of the module and reported on in Subsections 6.4 and 6.5 of the module. The NRC Inspectors examined a sample of the licensee's verifications in each of the three assessment activity parts along with selecting an independent sample of examination items in assessment Parts 1 and 3.

(2) Part 1 Examination

Part 1 of the licensee's assessment was divided into verification of (1) the commitments listed in Section 3 of the module and (2) followup of the Unit 1 Readiness Review Findings.

(a) Commitment Verification

The RRT found that the design and construction licensing commitments had been appropriately and adequately implemented with one exception, 2RRF-006-011, Level I. Two design findings, 2RRF-006-008 and 2RRF-006-013, both Level III, identified inconsistencies in the method of specifying references to FSAR commitments within the design criteria. The construction commitments findings 2RRF-006-001 (Level II), 2RRF-006-002 (Level III), and 2RRF-006-003 (Level III) were written to identify requirements which were not included in the procedures.

Finding 2RRF-006-011 (Level I) involved differences between the reduced separation criteria (based on testing) presented in the FSAR and that presented in the Construction Specification X3AR01. The deficiency noted in this finding had previously been reported to the NRC in the DER 186 which was scheduled for final evaluations by March 1, 1988.

The NRC Inspectors interviewed licensee personnel and preliminarily reviewed applicable documentation to verify the corrective action taken on this finding. The complexity of the separation criteria and the many supporting documents precluded verification by the Inspectors during the onsite visit. No documentation was offered by the licensee that described differences in the criteria as reflected by the various documents. The difficulty noted in recognizing the differences, in verifying the correctness, and in proving the assertion of a conservative program operation together resulted in a contribution to Unresolved Item 425/88-26-01 detailed in the Unit 2 Module 17/19 Report.

The NRC Inspector reviewed findings 2RRF-006-001, 2RRF-006-003, 2RRF-006-008, and 2RRF-006-013, and the licensee's responses to them in detail. The inspector verified that these RRT findings were adequately incorporated into the Unit 2 commitments.

A sample of two commitments was selected from the commitment matrix in Section 3 of Module 6 for detailed NRC review. In addition, a comparison was made of the Unit 2 and Unit 1 commitment matrices to determine if all applicable commitments were contained in the Unit 2 matrix. As detailed in Subsection 3.c.(1) of this report, 15 commitments were found which appeared to be new or were missing. These additional 15 commitments were reviewed to verify their origin or present location. Commitments transferred from other modules into Module 6 were subject to the same probability of having been sampled during the Unit 1 review as any other commitment. For that reason the 10 commitments transferred into Unit 2 Module 6 were not identified as needing special sampling. There were discrepancies between the number of design and construction commitments referenced in this subsection of the module and the number in the matrices. The discrepancy was due to improperly marked matrices and an arithmetic error. The document sample and examination results are listed in Table 1 of this report.

The examination of the implementation of the commitments resulted in no NRC findings. However, the commitment and implementation matrices contained errors, omissions, and unexplained additions. These items were all satisfactorily resolved during the inspection period.

(b) Unit 1 Findings Followup

The RRT objective of the Unit 1 finding followup was to determine if the corrective actions taken on these findings were sufficient to prevent their recurrence in Unit 2. The RRT Unit 1 finding followup consisted of compiling a list of 71 Unit 1 findings which were applicable to Unit 2.

This list was submitted to the VEGP Project Engineering organization who then determined if:

- This was an isolated occurrence
- The Unit 1 corrective action remained in place
- The Unit 1 corrective action changed but was acceptable
- The corrective action has not been entirely effective

The RRT then sampled the Project Engineering Organization work to validate their results. The NRC Inspector selected a random sample of three findings from the Module 6 Table 5-4. These were reviewed in detail to verify the project's disposition of them. Verification error was not found in the review of the sample. Table 3 of this report contains details of the NRC sample and examination results.

(3) Part 2 Examination

The RRT objectives of Part 2 of the assessment were to examine the in-process activities associated with design procedures and construction processes.

(a) RRT Assessment

The RRT reviewed the design programs used to control design changes and calculation development. Field Change Requests (FCRs) and Design Change Notices (DCNs) were evaluated to assess compliance with applicable procedures and licensing commitments and control of design changes. The review included an evaluation of interdiscipline review, evaluation of effects on FSAR statements, incorporation in drawing within procedural limits, and impact on previous installations and revision of calculations to support the change. The above attributes of the design change program were assessed and determined to be acceptable. Finding 2RRF-006-012 (Level III) identified instances of failure to follow procedures when assigning an approved disposition to FCRs.

Calculations were assessed to evaluate compliance with project calculation control procedures. The review addressed conformance to design criteria, reference to appropriate codes and standards, compliance with guidelines for documenting input data, and proper entry in control logs. The calculations were determined to be acceptable. Finding 2RRF-006-010 (Level III) identified a discrepancy in the listing scheduling of calculations requiring review.

Both of these RRT findings were reviewed by the NRC Inspector and it was verified that appropriate actions had been taken to correct these deficiencies.

The construction portion of Part 2 reported the examination of the process for component removal/replacement, changes to equipment internals performed under the Field Equipment Change Order (FECO) program, in process equipment installation, and changes resulting from Unit 1 findings. The RRT review produced no findings for this subsection.

(b) Component Removal Activities

The NRC examination of the in-process activities consisted of reviewing five complete equipment document files. This sample contained, where appropriate, FCRs, DCNs, FECOs, and Component Removals. Special attention was paid to the methodology of component removal and procurement where electrical equipment components were obtained from Unit 2 to support startup activities in Unit 1. The sample revealed many instances where the components were found to be removed and the component removal documentation was performed after the fact. The NRC inspection verified that the sampled in-process activities documentation and methodology were satisfactory. Table 4 of this report contains the list of the five equipment document files reviewed and the verification results.

(c) Protective Engineering Activities

Traditionally, the task of Protective Engineering, also identified as Protective Relaying, has been accomplished by the GPC System Protection and Control Department. This department's QA program defines the responsibilities as follows.

The System Protection and Control Department is responsible for the development and implementation of the protection policy for the GPC transmission system, generating plants, and distribution substations. The Protection Engineering

Section of this department is responsible for carrying out this policy through specific design activities for all GPC generating plants, including nuclear plants. These design activities include:

- Review of architect-engineer preliminary drawings to ensure that GPC protection policy has been implemented.
- Review of architect-engineer final drawings to verify that protection design meets GPC standards.
- Development of major tripping and control schemas.
- Selection of relay and manufacturer, relay type and model, and specification of CT and PT ratios.
- Calculation and documentation of protective relay settings and their tripping functions.

The design function of the System Protection and Control Department was reviewed during the Readiness Review Module 6 field inspection. Discussions with responsible System Protection and Control Department personnel were held to clarify various items identified in the QA program such as personnel qualification, documentation control, drawing approval and document revision control. During these discussions a deficiency noted earlier by the inspector was confirmed.

The Protection Engineering Group which is part of the System Protection and Control Department has the responsibility for the design of the Relaying Data Sheets. However, this design function is not identified in the FSAR. Subsection 1.4.5.3 of the FSAR specifically assigns design, engineering, and procurement responsibility of the standard power block to the Architect/Engineer (Bechtel Power Corporation). This includes all systems, equipment, and structures for design and specification. There is no provision for BPC to review the set points specified on the Relaying Data Sheets designed by the Protection Engineering Group.

The foregoing deficiency is identified as URI 425/88-27-02, Incorporate Protective Relaying Design into the FSAR.

(4) Part 3 Examination

The RRT objectives of Part 3 of the assessment were to evaluate the design completion process by examining the incorporation of material into documents and drawings, and evaluating the construction completion by physical examination.

The same equipment sample examined during Part 2 was used for the sample during Part 3 by the RRT.

(a) RRT Assessment

The RRT assessment determined that the design completion activities evaluated were performed adequately and in accordance with applicable procedures. One finding, 2RRF-006-007 (Level II) was written to identify a calculation that had not been updated with available data.

The RRT assessed the installed equipment and penetrations for installation attributes directly related to licensing commitment requirements. Those were:

- Attachment to foundation.
- Configuration.
- Clearance from adjacent components or structures.
- Internal separation.
- Installation of replacement components.
- Inspector certification.
- Conformance of inspector document to hardware.

No findings were made by the RRT pursuant to their review of construction completion

The NRC examination of the design completion included reviewing the same five complete equipment document files examined in Part 2. The documentation was found to be complete including Maintenance Work Orders, QA Inspection and drawings. The NRC inspection verified that construction and design completion were satisfactory within the sample. Table 4 of this report contains the list of equipment document files reviewed and the individual verification results.

(b) NRC Independent Sample Verification

An independent sample of 12 components was selected by the NRC Inspector for field walkdown. The sample was selected to provide a broad range of hardware types and Category I locations. The details of the foregoing walkdown are shown in Table 5 of this report. The NRC walkdown included three components which had been part of the RRT sample and 12 new components. Each piece of equipment was inspected for specified checklist items that were selected to reflect problems commonly associated with the individual hardware category. Emphasis was placed on physical attributes such as component clearances, cable and cabinet labeling, support welds, cable entry into cabinets, conduit sealing, and separation of cabling from different trains. The walkdown resulted in IRO 99-27-01 made up of four different elements and detailed below.

Color Labels - The external labels on the electrical equipment associated with a train is required to be color coded according to DC 1816 Rev. 3. Brown, green, blue, and yellow are to correspond to trains A through D respectively. Two examples were found of equipment which had a black external label in addition to the appropriate colored labels. After an investigation, the Operations organization reported that the deficiency was common in Unit 2. The RRT counterpart reported that some of the black labels were vendor mounted because of a deficiency in their specifications. The licensee is continuing to investigate the causes of the mis-labeling.

Cable Drip-Loop - The 480 Volt MCC (2-1805-b3-BBB) was found to have cables routed from one cable tray into the cabinet without a drip-loop in a room containing a sprinkler system. If the sprinkler were activated water would enter the equipment via the cables.

Regulating Transformers - The regulating transformers at full load conditions have high exterior temperatures. In many cases, junction boxes are mounted above the transformer bank and are connected to the transformers by cable enclosed in jacketed flexible metal conduit. Inspection of transformer bank 2-1807-Y3-RX7 revealed that one of the conduits was touching a transformer case and the conduit jacket appeared to be melted where contact was being made to the transformer. The conduit and junction box was hot to the touch. There is a concern that the conduit can channel heated air up into the junction box where transition is made to low temperature wire, and that this wire's ambient temperature specification may be exceeded. This possibility also exists when the conduit was not touching a transformer.

Seismic Clearance - the vertical clearance between the top hat on the 125 Volt dc panel 2-1806-Q3-DA1 and the cable tray support arm was observed to be less than the 1-1/2 inches specified in the X3AR01 Appendix SC, Seismic Criteria Rev 4.

Credit was taken for a previous NRC inspection of the Module 6 electrical equipment which had been released for functional testing. This inspection was of 15 components and included examined of completed work, work in progress, and the QC records associated with receiving, storage, handling, and installation of the equipment. The referenced NRC Inspection is Report Nos. 50-425/88-05, January 1988.

(5) Inspection Results

The examination of the program assessment section of Module 6 resulted in two URIs as follows:

(a) 425/88-27-01. This is comprised of four items found during the NRC independent walkdown.

- The licensee has used unspecified colors on the external cabinet labels on some electrical equipment. Black labels are found on equipment which is otherwise color coded for the particular train.
- No drip-loop was provided in some of the cables entering Cabinet 2-1805-53-BBB in a room containing automatic fire-protection sprinklers.
- The licensee has not provided assurance that there will not be excessive heat buildup in the junction boxes above the Regulating Transformers. The cable conduit could be acting as a convection channel for hot air into the junction boxes. The condition could be aggravated in transformer bank 2-1807-Y3-RX7 where the conduit is in physical contact with the hot transformer.
- The vertical clearance between the 2-1806-Q3-DA1 cabinet and the cable tray support arm is less than the specified 1-1/2 inches.

(b) 425/88-27-02

This was found during the NRC review of the Protective Engineering Program and activities. The GPC Protection Engineering Section designs the relay protection system for

all the GPC generating plants, including the Relaying Data Sheets at VEGP Unit 2. This design function is assigned to the Architect/Engineer (Bechtel Power Corporation) by the FSAR, and no design function is identified for GPC.

- (c) Commitment Verification. During the assessment of the Module 6 Section 6, inconsistencies were found between the number of commitments quoted in the text and those listed in the matrices in Section 3 of the module, as detailed in Section 3.c.1(a) of this report. In addition there were some typographical errors. Followup or additional evaluation is not indicated for the commitment verification errors.

g. Section 7 - Assessment of Module Adequacy

(1) Review Introduction and Section Examination

Section 7 of the module contains certifications by the following:

- Project Engineering Manager
- Vice President Vogtle Construction
- Project Quality Assurance Manager
- Readiness Review Board Chairman

These certifications reflected review by upper management of the module and assurance that it accurately reflected both the review made and the plant/programs reviewed by the RRT. The Readiness Review Board certification added assurance that corrective actions, then proposed, were acceptable and would bring Electrical Equipment into full FSAR compliance upon implementation.

The Inspectors examined the certifications and considered them to reflect the actions of appropriate managers who had the responsibility to closely monitor the Readiness Review and to assure its quality.

(2) Inspection Results

The examination did not disclose error or perfunctory certification. The certifications given are supported by the results found in the NRC examination of the other sections of the module. Followup or additional evaluation of Module Section 7 is not required.

h. Section 8 - Assessment Plans and Checklists

(1) Review Introduction and Section Examination

This section of the module provides the licensee's formal plan for the documentation and hardware to be reviewed for Module 6. The plan details the review approach including objectives, scope, assessment, and general instructions. An extensive set of checklists covering 12 designated review areas included:

- Design Commitment Implementation
- Construction Commitment Implementation
- Design Change Control
- FECOs
- CCPs
- Calculations
- Inprocess Installation and Corrective Actions
- Installed Equipment, Installed Penetrations
- Document - Equipment, Penetrations
- Incorporation of FCRs, DCNs, CSCNs, Finalization Walkdowns
- FP-6
- System Turnover/RFT

Section 8 of the module was read for content. The check lists were examined for relevancy to the objective and scope of the assessment plan. Section 6 of the module was checked to verify that all aspects of the assessment plan were followed in the execution of the Readiness Review. The completed Section 8 check lists were spot checked in the RRT review files to assure that the check lists were used, that relevant information was obtained/analyzed/entered and that all cases of deviation were pursued to an adequate resolution/reporting.

(2) Inspection Results

The Section 8 examination did not disclose substantial verification errors or the basis for programmatic concern. Followup or additional evaluation of Module Section 8 is not required.

4. Review Findings

Two findings were identified during the NRC evaluation of the module. All of the deficiencies noted within these findings are considered to have minimal safety significance at this point of review but should be evaluated further to preclude safety problems. These have been identified as URIs based on the nature of the followup action required. They will be addressed by the NRC during the routine inspection program unless designated as closed in the finding. These URIs are as follows:

a. 425/88-27-01

This was made up of four items found during the NRC independent walkdown.

- The licensee has used unspecified colors on the external cabinet labels on some electrical equipment. Black labels are found on equipment which is otherwise color coded for the particular train.
- No drip-loop was provided in some of the cables entering Cabinet 2-1805-53-BBB in a room containing automatic fire-protection sprinklers.
- The licensee has not provided assurance that there will not be excessive heat buildup in the junction boxes above the Regulating Transformers. The cable conduit could be acting as a convection channel for hot air into the junction boxes. The condition could be aggravated in transformer bank 2-1807-Y3-RX7 where the conduit is in physical contact with the hot transformer.
- The vertical clearance between the 2-1806-Q3-DA1 cabinet and the cable tray support arm is less than the specified 1-1/2 inches.

b. 425/88-27-02

This was found during the NRC review of the Protective Engineering Program and activities.

The GPC Protection Engineering Section designs the relay protection system for all the GPC generating plants, including the Relaying Data Sheets at VEGP Unit 2. This design function was assigned to the Architect/Engineer (BPC) by the FSAR, and no design function was identified for GPC.

5. Conclusions

The NRC has reached the following conclusions for Electrical Equipment at VEGP Unit 2 based on the review of Module 6.

a. Summary of Specific Conclusions

The module sections have been determined to be acceptable with the exception of items and areas discussed earlier in this report. A summary of the report comments for each Module 6 section is as follows:

(1) Section 1 - Introduction

The boundary between Module 6 and the related modules is generally clear as defined in Section 1. Minor clarification of the data presented was required for definition completeness. The module Organization and Project Status were correct as of the date of module publication. Electrical Equipment installation was essentially complete as of the site visit and was about 90% energized.

(2) Section 2 - Organization and Division of Responsibilities

The organization description and responsibility presented in Section 2 of the module were reviewed and verified as being correct as of the time of module preparation. Some minor changes have taken place during the interim to consolidate design and installation functions within the site engineering office. This is an adaptation to the reduced staffing requirements as construction nears completion.

(3) Section 3 - Commitments

The commitments listed in Section 3 were reviewed to determine changes from those listed in the Unit 1 Module 6. Fifteen of 197 gave evidence of change or difference from the Unit 1 review. Examination of these was made to assure correct origin and location. Two other randomly selected commitments were examined for source and implementation. Verification error was not found in this sample.

(4) Section 4 - Program Description

The design program description presented in Section 4 was reviewed and verified as being correct.

(5) Section 5 - Audits and Special Investigations

The audits and special investigations information presented in Section 5 was reviewed and verified as being correct.

(6) Section 6 - Program Verification

The program assessment reported in Section 6 of the Module was verified as being generally adequate. The NRC review disclosed five areas of incomplete verification which resulted in URIs 88-27-01 and 88-27-02. These involved label color coding, component clearances, cable drip-loops, potentially overheated junction boxes, and deviation from FSAR responsibility commitment for protective relaying design. The nine findings by the RRT were found to be clearly stated, adequately documented, and properly recognized by management.

(7) Section 7 - Assessment of Module Adequacy

The certifications presented in Section 7 of the module were found to reflect action on the part of the cognizant managers having responsibility to assure the adequacy of the Readiness Review.

(8) Section 8 - Assessment Plan and Checklist

The assessment plan presented in Section 8 of the module was verified as being adequate for the purpose and being followed substantially during the Readiness Review.

b. General Conclusions

The examination performed by the NRC indicated that GPC management supported the Readiness Review by active participation and adequate resources. No evidence of coercion, or attempt to dilute either the effort or the findings, was disclosed. The RRT displayed the requisite competence and professionalism for a review of this nature. The licensee's program was comprehensive and provided adequate assurance that the plant Electrical Equipment will perform in accord with NRC requirements and FSAR commitments. Possible exception to this are the open Unresolved Items (URI-425/88-27-01 and URI-425/88-27-02) resulting from the NRC examination and which are listed in Section 4 of this report.

It does not appear that the foregoing represent significant programmatic weakness provided that additional licensee response is sufficient to enable closure for currently open NRC item for VEGP Unit 2. Pending resolution of the open items identified above, the NRC concludes that the GPC program for Electrical Equipment complies with NRC requirements and FSAR commitments. This conclusion is based on information currently available to the inspectors and reviewers. Should subsequent contradictory information become available, it will be evaluated to determine what effect it may have on the above conclusion.

6. Exit Interview

The review scope and findings were summarized on May 26, 1988, with those persons indicated in Section 1 of this report. The inspectors described the areas inspected and discussed in detail the inspection findings listed below. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspectors during this inspection.

<u>Item Number</u>	<u>Description and Reference</u>
425/88-27-01	Non-specified color coding of cabinet labels, inadequate cable drip-loops, inadequate component clearance, and potential junction box overheating.
425/88-27-02	Unauthorized relay protection design.

Dissenting comments were not received from the licensee.

7. Acronyms and Abbreviations

BPC	-	Bechtel Power Corporation
CCP	-	Change Control Package
CSCN	-	Construction Specification Change Notices
DC	-	Design Criteria
DCN	-	Design Change Notice
DER	-	Deficiency Evaluation Report
FCR	-	Field Change Request
FECO	-	Field Equipment Change Order
FSAR	-	Final Safety Analysis Report
GPC	-	Georgia Power Company
HOE	-	Home Office Engineering
IEEE	-	Institute of Electrical and Electronic Engineers
NRC	-	Nuclear Regulatory Commission
PFE	-	Project Field Office
QA	-	Quality Assurance
QC	-	Quality Control
RFT	-	Request for Turnover
RG	-	Regulatory Guide
RRT	-	Readiness Review Team
URI	-	Unresolved Item
VEGP	-	Vogtle Electric Generating Plant

TABLE 1. COMMITMENT VERIFICATION

Reference Number	Commitment Source and Section	Commitment Subject	Document/Feature	Verified 1st Order Document ^a	Verified 2nd Order Document ^a	Verified Origin/Location ^a
82	FSAR 8.3.1.4.3	Cable routing--cable separation within panels and control boards.	6 inch separation or barriers are provided	Yes	Yes	--
264	FSAR 5.4.1.1	Design bases.	TMI Action Item 11.k.3.25	--	--	Yes from Module 4
1253	Deleted from FSAR 3.11.8.1-2	BOP EQDP summary--qual. sequence. Electrical penetration assemblies.	IEEE 317 (daughter std.)	Yes	--	Yes deleted
1268	FSAR 3.11.8.2	Qual. tests and analysis accept. crit. env. qual. safety rel. equipment.	IEEE 323-1974 Para. 6.3.2	Yes	--	--
1491	FSAR 1.2.12.1.21	Single failure redundancy and independence criteria.	IEEE 279-1971	Yes	--	Yes from Module 4
1552	FSAR 1.9.5.3	Application of single failure criteria to protection system.	IEEE 379-1972	--	--	To Module 20
1553	FSAR 1.9.5.3	Application of single failure criteria to protection system.	IEEE 279-1971 Section 4.2	--	--	To Module 20
2319	FSAR 10A.2.6	Auxiliary feedwater system physical separation between electrical components.	RG 1.75	--	--	Yes from Module 4
2320	FSAR 10A.2.6	Auxiliary feedwater system physical separation between electrical components.	IEEE 384	--	--	Yes from Module 4
2399	FSAR 6.2.2.1.1.10	Containment coding system safety design.	RG 1.32	--	--	Yes from Module 4
2445	FSAR 6.2.5.2.1	Electric hydrogen recombiner.	Each unit powered from separate 1E bus and panel	--	--	Yes from Module 4
2905	FSAR 17.1.2	Quality Assurance program.	RG 1.30 (8-11-72)	Yes	--	Yes generated
4289	NRC Quest. Corres. Q260,61	Pressurizer relief valve, block valve, level indicator.	Powered from Class 1E systems	--	--	Yes from Module 4

TABLE 1. (continued)

Reference Number	Commitment Source and Section	Commitment Subject	Document/Feature	Verified 1st Order Document ^a	Verified 2nd Order Document ^a	Verified Origin/Location ^a
4688	FSAR 3.7.8.3.6	Seismic subsystem analyses-- 3 components of earth motion.	Effects combined 6 SRSS method analysis	--	--	Yes left out
4880	FSAR 12.3.4.1.6	Power supplies (ARMS).	IE monitors supplied by IE power	--	--	Yes from Module 20
4881	FSAR 12.3.4.1.6	Power supplied (ARMS).	Non-IE monitors supplied by O.G. backed instrument power	--	--	Yes from Module 20
3527	FSAR 9.2.1-3	NSCW component data.	Class IE power supply	--	--	Yes from Module 4

a. A dash (--) in these columns notes verification not made by NRC Inspector.

TABLE 2. GPC QUALITY ASSURANCE AUDITS VERIFICATION

<u>Audit Number</u>	<u>Finding Number</u>	<u>Subject</u>	<u>Verified</u>
CP02-85/77	None	Cannibalization of mechanical and electrical components	Yes
CP09-86/60	AFR 0995	Inverter welding to support with shims	Yes
SP01-87/17	None ^a	Installation and protection of electrical equipment for Module 6	Yes
SP01-87/37	None ^b	Module 6, Part 3, electrical equipment installation	Yes

a. Batteries in Rooms CR32 and CR37 had cell numbers in incorrect sequence. No finding was issued.

b. A later specification change put this finding (AFR 1026) within tolerance.

TABLE 3. VERIFICATION OF UNIT 1 FINDING FOLLOW-UP

<u>Finding Number</u>	<u>Description of Finding</u>	<u>Unit 2 Follow-up Action</u>	<u>Verification</u>
IDR 22-F010	Dc valve specification specified incorrect minimum dc voltage	Same as Unit 1-- Specifications updated and data reviewed to ensure proper performance	Yes
RRF 6-006	ED-T-19 contains conflicting requirement	Same as Unit 1--Procedure revised to agree with vendor requirement	Yes
RRF 6-016	Vendor and field wiring of regulated transformers do not meet separation requirements	Same as Unit 1--Wiring analyzed, field wiring modified	Yes

TABLE 4. AUDIT PACKAGE VERIFICATION

<u>TAG Number</u>	<u>Equipment Description</u>	<u>Verification</u>
2-1805-S3-BBB	480 V MCC	Yes
2-1806-B3-BYB	125 V dc battery and rack	Yes
2-1821-U3-001	Safe feature system board Train A	Yes
2-1806-Q3-DA1	125 V dc distribution panel	Yes
2-1818-H3-P29	Electrical penetration	Yes

TABLE 5. NRC VERIFICATION AND WALKDOWN LIST FOR ELECTRICAL EQUIPMENT

Equipment TAC Number	Description	RRT Sample	NRC Sample	Results ^a
2-1804-S3-A03	Med voltage SWGR 28B03	✓		
2-1805-S3-BBB	480 V MCC 28BB	✓	✓	Wrong color ID label, no cable drip-loop
2-1806-B3-BYA	125 V dc battery		✓	
2-1806-B3-CBB	Battery charger		✓	
2-1806-B3-BYB	125 V dc battery and rack 28D1B	✓		
2-1806-Q3-DA1	125 V dc dist. panel	✓	✓	Seismic clearance less than specifications
2-1806-S3-DA1	125 V dc dist. panel		✓	
2-1806-S3-D5B	125 V dc switch gear		✓	
2-1807-Q3-V11	125 V dc dist. panel		✓	
2-1807-Q3-V16	125 V ac dist. panel		✓	
2-1807-Y3-1812	Inverter		✓	
2-1807-Y3-R17	Regulating transformer		✓	Potential of overheated junction box
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	✓		
2-1818-H3-P50	Control penetration	✓		
2-1818-H3-P71	Instrumentation penetration	✓		
2-1821-U3-001	Safety feat. seq. board Trn. A	✓		
2-1825-S3-BAB	13.8 kV RCP SWGR		✓	
2-1801-Q5-MCB	Main cntl. board Sect. A01	✓		
2-1601-U3-T27	Termination cabinet		✓	
2-1605-Q5-SPA	Solid state protection system		✓	

a. Verification error not found unless specifically listed.