

TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM

REPORT NUMBER: 21301

REPORT TYPE: SUBCATEGORY REPORT FOR
ENGINEERING

REVISION NUMBER: 2

TITLE: ELECTRICAL TESTING AND PLANNING

Page 1 of 17

REASON FOR REVISION:

1. Revised text to incorporate SRP and TAS comments.
Revised Table 3 for corrective actions.
Revised to rearrange findings and to add corrective actions in Attachment B.
2. Revised to incorporate SRP and TAS comments.
Added Attachment C (References).

PREPARATION

PREPARED BY:

Bhudeb. Lohb

SIGNATURE

Yhs

mt

10/12/87

DATE

REVIEWS

PEER:

REVIEW COMMITTEE:

AW Jordan Karl Wiedener Parkinson

SIGNATURE

10/12/87

DATE

TAS:

James E. Worley III

SIGNATURE

11/4/87

DATE

CONCURRENCES

8711240176 871117
PDR ADOCK 05000259
P PDR

SIGNATURE

DATE

CEG-H: *George R. M. Nutt* *10-29-87*

SRP: *Jimmy W. Joke* *11-10-87*

SIGNATURE

DATE

APPROVED BY:

W. R. Brown *11/11/87*

ECSP MANAGER

DATE

N/A *DATE*
MANAGER OF NUCLEAR POWER
CONCURRENCE (FINAL REPORT ONLY)

* SRP Secretary's signature denotes SRP concurrences are in files.

EXECUTIVE SUMMARY

This subcategory report summarizes and evaluates the results of the element evaluations prepared under the Engineering Subcategory 21300, Electrical Testing and Planning. The element evaluations document the evaluation of 16 issues related to TVA's four nuclear plants, Sequoyah, Watts Bar, Browns Ferry, and Bellefonte. The issues were derived from two employee concerns which cited presumed deficiencies or inadequacies in engineering participation in the preoperational test program of the plant systems. Negative findings previously identified for Sequoyah were closed before the ECTG evaluation.

Causes for the negative findings relate to engineering procedures and site standard practices, in some instances, not being followed; procedures not being fully adequate to cover all requirements; lack of documentation for acceptance of test deficiencies based on engineering judgment (Watts Bar, Browns Ferry, Bellefonte); some final safety analysis report (FSAR) commitments not reflected in the test documents (Browns Ferry); discrepancies between test documents and the FSAR (Bellefonte); and lack of documentation in the test and retest results packages for the implementation of the design changes made by engineering change notices (Watts Bar). Also, at Browns Ferry, the initial preoperational test program was not well developed and did not include documented acceptance criteria.

The major corrective actions include development of a restart test program, development of new site engineering procedures, revision of licensing documents, documentation of engineering judgment for test deficiencies and revision of test documents to correct procedural deficiencies.

On the basis of the observations made, and in spite of the findings identified and of corrective actions mainly in the areas of procedural inconsistencies and deficiencies, overall engineering participation in the preoperational test program appears to be adequate for all plants except Browns Ferry. However, a restart test program has been developed for Browns Ferry to resolve the shortcomings of the preoperational test and retest programs. Implementation of the corrective actions should resolve all the findings identified during the evaluation for WBN, BFN, and BLN. A potential for hardware modification does exist as a result of implementation of corrective actions for Watts Bar and Browns Ferry.

The TVA-developed Nuclear Performance Plans (NPPs) are expected to improve corporate-level management of TVA's nuclear activities. The clarification of responsibility and authority of line management in conjunction with the strengthened role of Quality Assurance (QA) and the establishment of the Engineering Assurance (EA) organization should prevent recurrence of discrepancies identified in this subcategory report.

The causes identified and the other evaluation results will be reexamined from a wider perspective during the Engineering category evaluation.

CONTENTS

<u>Section</u>	<u>Page</u>
Executive Summary	ES-1
Preface	i
ECSP Glossary of Report Terms	iii
Acronyms	v
1 Introduction	3
2 Summary of Issues	4
3 Evaluation Process	5
4 Findings	6
5 Corrective Actions	7
6 Causes	9
7 Collective Significance	9
Glossary Supplement for the Engineering Category	15
 <u>Attachments</u>	
A Employee Concerns for Subcategory 21300	A-1
B Summary of Issues, Findings, and Corrective Actions for Subcategory 21300	B-1
C References	C-1

TABLES

<u>Table</u>	<u>Page</u>
1 Classification of Findings and Corrective Actions	11
2 Findings Summary	12
3 Matrix of Elements, Corrective Actions, and Causes	13

Preface, Glossary, and List of Acronyms
for ECTG Subcategory Reports

HISTORY OF REVISION

REV NUMBER	PAGES REVISED	REASON FOR CURRENT REVISION
3	i	To clarify that one or more attachments will help the reader find where a particular concern is evaluated

Preface

This subcategory report is one of a series of reports prepared for the Employee Concerns Special Program (ECSP) of the Tennessee Valley Authority (TVA). The ECSP and the organization which carried out the program, the Employee Concerns Task Group (ECTG), were established by TVA's Manager of Nuclear Power to evaluate and report on those Office of Nuclear Power (ONP) employee concerns filed before February 1, 1986. Concerns filed after that date are handled by the ongoing ONP Employee Concerns Program (ECP).

The ECSP addressed over 5800 employee concerns. Each of the concerns was a formal, written description of a circumstance or circumstances that an employee thought was unsafe, unjust, inefficient, or inappropriate. The mission of the Employee Concerns Special Program was to thoroughly investigate all issues presented in the concerns and to report the results of those investigations in a form accessible to ONP employees, the NRC, and the general public. The results of these investigations are communicated by four levels of ECSP reports: element, subcategory, category, and final.

Element reports, the lowest reporting level, will be published only for those concerns directly affecting the restart of Sequoyah Nuclear Plant's reactor unit 2. An element consists of one or more closely related issues. An issue is a potential problem identified by ECTG during the evaluation process as having been raised in one or more concerns. For efficient handling, what appeared to be similar concerns were grouped into elements early in the program, but issue definitions emerged from the evaluation process itself. Consequently, some elements did include only one issue, but often the ECTG evaluation found more than one issue per element.

Subcategory reports summarize the evaluation of a number of elements. However, the subcategory report does more than collect element level evaluations. The subcategory level overview of element findings leads to an integration of information that cannot take place at the element level. This integration of information reveals the extent to which problems overlap more than one element and will therefore require corrective action for underlying causes not fully apparent at the element level.

To make the subcategory reports easier to understand, three items have been placed at the front of each report: a preface, a glossary of the terminology unique to ECSP reports, and a list of acronyms.

Additionally, at the end of each subcategory report will be a Subcategory Summary Table that includes the concern numbers; identifies other subcategories that share a concern; designates nuclear safety-related, safety significant, or non-safety related concerns; designates generic applicability; and briefly states each concern.

Either the Subcategory Summary Table or another attachment or a combination of the two will enable the reader to find the report section or sections in which the issue raised by the concern is evaluated.

The subcategories are themselves summarized in a series of eight category reports. Each category report reviews the major findings and collective significance of the subcategory reports in one of the following areas:

- management and personnel relations
- industrial safety
- construction
- material control
- operations
- quality assurance/quality control
- welding
- engineering

A separate report on employee concerns dealing with specific contentions of intimidation, harassment, and wrongdoing will be released by the TVA Office of the Inspector General.

Just as the subcategory reports integrate the information collected at the element level, the category reports integrate the information assembled in all the subcategory reports within the category, addressing particularly the underlying causes of those problems that run across more than one subcategory.

A final report will integrate and assess the information collected by all of the lower level reports prepared for the ECSP, including the Inspector General's report.

For more detail on the methods by which ECTG employee concerns were evaluated and reported, consult the Tennessee Valley Authority Employee Concerns Task Group Program Manual. The Manual spells out the program's objectives, scope, organization, and responsibilities. It also specifies the procedures that were followed in the investigation, reporting, and closeout of the issues raised by employee concerns.

ECSP GLOSSARY OF REPORT TERMS*

classification of evaluated issues the evaluation of an issue leads to one of the following determinations:

Class A: Issue cannot be verified as factual

Class B: Issue is factually accurate, but what is described is not a problem (i.e., not a condition requiring corrective action)

Class C: Issue is factual and identifies a problem, but corrective action for the problem was initiated before the evaluation of the issue was undertaken

Class D: Issue is factual and presents a problem for which corrective action has been, or is being, taken as a result of an evaluation

Class E: A problem, requiring corrective action, which was not identified by an employee concern, but was revealed during the ECTG evaluation of an issue raised by an employee concern.

collective significance an analysis which determines the importance and consequences of the findings in a particular ECSP report by putting those findings in the proper perspective.

concern (see "employee concern")

corrective action steps taken to fix specific deficiencies or discrepancies revealed by a negative finding and, when necessary, to correct causes in order to prevent recurrence.

criterion (plural: criteria) a basis for defining a performance, behavior, or quality which ONP imposes on itself (see also "requirement").

element or element report an optional level of ECSP report, below the subcategory level, that deals with one or more issues.

employee concern a formal, written description of a circumstance or circumstances that an employee thinks unsafe, unjust, inefficient or inappropriate; usually documented on a K-form or a form equivalent to the K-form.

TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM

REPORT NUMBER: 20400

FRONT MATTER REV: 2

PAGE iv OF viii

evaluator(s) the individual(s) assigned the responsibility to assess a specific grouping of employee concerns.

findings includes both statements of fact and the judgments made about those facts during the evaluation process; negative findings require corrective action.

issue a potential problem, as interpreted by the ECTG during the evaluation process, raised in one or more concerns.

K-form (see "employee concern")

requirement a standard of performance, behavior, or quality on which an evaluation judgment or decision may be based.

root cause the underlying reason for a problem.

*Terms essential to the program but which require detailed definition have been defined in the ECTG Procedure Manual (e.g., generic, specific, nuclear safety-related, unreviewed safety-significant question).

Acronyms

AI	Administrative Instruction
AISC	American Institute of Steel Construction
ALARA	As Low As Reasonably Achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
BFN	Browns Ferry Nuclear Plant
BLN	Bellefonte Nuclear Plant
CAQ	Condition Adverse to Quality
CAR	Corrective Action Report
CATD	Corrective Action Tracking Document
CCTS	Corporate Commitment Tracking System
CEG-H	Category Evaluation Group Head
CFR	Code of Federal Regulations
CI	Concerned Individual
CMTR	Certified Material Test Report
COC	Certificate of Conformance/Compliance
DCR	Design Change Request
DNC	Division of Nuclear Construction (see also NU CON)

**TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM**

REPORT NUMBER: 20400

FRONT MATTER REV: 2

PAGE vi OF viii

DNE Division of Nuclear Engineering
DNQA Division of Nuclear Quality Assurance
DNT Division of Nuclear Training
DOE Department of Energy
DPO Division Personnel Officer
DR Discrepancy Report or Deviation Report
ECN Engineering Change Notice
ECP Employee Concerns Program
ECP-SR Employee Concerns Program-Site Representative
ECSP Employee Concerns Special Program
ECTG Employee Concerns Task Group
EEOC Equal Employment Opportunity Commission
EQ Environmental Qualification
EMRT Emergency Medical Response Team
EN DES Engineering Design
ERT Employee Response Team or Emergency Response Team
FCR Field Change Request
FSAR Final Safety Analysis Report
FY Fiscal Year
GET General Employee Training
HCI Hazard Control Instruction
HVAC Heating, Ventilating, Air Conditioning
II Installation Instruction
INPO Institute of Nuclear Power Operations
IRN Inspection Rejection Notice

**TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM**

REPORT NUMBER: 20400

FRONT MATTER REV: 2

PAGE vii OF viii

L/R	Labor Relations Staff
M&AI	Modifications and Additions Instruction
MI	Maintenance Instruction
MSPB	Merit Systems Protection Board
MT	Magnetic Particle Testing
NCR	Nonconforming Condition Report
NDE	Nondestructive Examination
NPP	Nuclear Performance Plan
NPS	Non-plant Specific or Nuclear Procedures System
NQAM	Nuclear Quality Assurance Manual
NRC	Nuclear Regulatory Commission
NSB	Nuclear Services Branch
NSRS	Nuclear Safety Review Staff
NU CON	Division of Nuclear Construction (obsolete abbreviation, see DNC)
NUMARC	Nuclear Utility Management and Resources Committee
OSHA	Occupational Safety and Health Administration (or Act)
ONP	Office of Nuclear Power
OWCP	Office of Workers Compensation Program
PHR	Personal History Record
PT	Liquid Penetrant Testing
QA	Quality Assurance
QAP	Quality Assurance Procedures
QC	Quality Control
QCI	Quality Control Instruction

**TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM**

REPORT NUMBER: 20400

FRONT MATTER REV: 2

PAGE viii OF viii

QCP	Quality Control Procedure
QTC	Quality Technology Company
RIF	Reduction in Force
RT	Radiographic Testing
SQN	Sequoyah Nuclear Plant
SI	Surveillance Instruction
SOP	Standard Operating Procedure
SRP	Senior Review Panel
SWEC	Stone and Webster Engineering Corporation
TAS	Technical Assistance Staff
T&L	Trades and Labor
TVA	Tennessee Valley Authority
TVTLC	Tennessee Valley Trades and Labor Council
UT	Ultrasonic Testing
VT	Visual Testing
WBECSP	Watts Bar Employee Concern Special Program
WBN	Watts Bar Nuclear Plant
WR	Work Request or Work Rules
WP	Workplans

1. INTRODUCTION

This subcategory report summarizes and evaluates the results of the ECSP element evaluations prepared under Engineering Subcategory 21300, Electrical Testing and Planning.

The element evaluations document the evaluation of 16 issues related to TVA's four nuclear plants, Sequoyah, Watts Bar, Browns Ferry, and Bellefonte. The issues were derived from two employee concerns that cited presumed deficiencies or inadequacies in engineering participation in the preoperational test program of the plant systems.

The two employee concerns provide the basis for the element evaluations and are listed by element number in Attachment A. The plant location where the concern was originally identified and the applicability of the concern to other TVA nuclear plants are also shown. The two concerns included in this subcategory were identified for Watts Bar. These concerns were sufficiently broad to apply to all four TVA nuclear plants, as is shown in the applicability column. The concerns were grouped into four element evaluations, one for each of the four nuclear plants.

The evaluations are summarized in the balance of this report as follows:

- o Section 2 -- summarizes the issues stated or implied in the employee concerns
- o Section 3 -- outlines the process followed for the element and subcategory evaluations and cites documents reviewed
- o Section 4 -- summarizes the findings and identifies the negative findings that must be resolved
- o Section 5 -- highlights the corrective actions required for resolution of the negative findings cited in Section 4 and relates them to plant site
- o Section 6 -- identifies causes of the negative findings
- o Section 7 -- assesses the significance of the negative findings
- o Attachment A -- lists each employee concern evaluated in the subcategory. The concern number is given, the plant sites to which it could be applicable are noted, the concern is quoted as received by TVA, and is characterized as safety related, not safety related, or safety significant

- o Attachment B -- contains a summary of the element-level evaluations. Each issue is listed by plant, opposite its corresponding findings and corrective actions. The reader may trace a concern from Attachment A to an issue in Attachment B by using the element number and applicable plant. The reader may relate a corrective action description in Attachment B to causes and significance in Table 3 by using the CATD number which appears in Attachment B in parentheses at the end of the corrective action description.

The term "Peripheral finding" in the issue column refers to a finding that occurred during the course of evaluating a concern but did not stem directly from a employee concern. These are classified as "E" in Tables 1 and 2 of this report

- o Attachment C -- contains the references cited in the text

2. SUMMARY OF ISSUES

The employee concerns listed in Attachment A for each plant have been examined, and the potential problems raised by the two concerns have been identified as four separate issues. Review of these issues has resulted in four element evaluations.

The issues deal with presumed deficiencies in engineering participation in the preoperational test program of the plant systems. More specifically, the issues deal with (1) the adequacy of the electrical test program and planning (the evaluation team interpreted this issue as inadequacies in the preoperational test program), (2) engineering participation in providing acceptance criteria, (3) engineering participation in the conduct of the tests and review of test results, and (4) engineering acceptance of deviations to preoperational test acceptance criteria without justification.

As the following sections show, the issues were determined to have some validity at three of the four TVA nuclear plants (Watts Bar, Browns Ferry, and Bellefonte) and to require corrective actions. Negative findings previously identified for Sequoyah were closed before the ECTG evaluation.

Each issue reviewed within the element evaluations is more completely discussed in Attachment B, which also lists corresponding findings and corrective actions that are discussed in Sections 4 and 5 of this report.

3. EVALUATION PROCESS

This subcategory report is based on the information contained in the applicable element evaluations prepared to address the specific employee concerns related to the issues broadly defined in Section 2 for all four nuclear plants. From the evaluation process described below, together with the references cited, the reader can determine the steps followed for each of the elements and the subcategory:

- a. Defined issues for each element from the employee concerns. Attachment A of this report lists the employee concerns addressed herein.
- b. Reviewed regulatory requirements and industry standards (Refs. 36 through 44) applicable to the preoperational test activity.
- c. Reviewed applicable sections of the FSAR, Safety Evaluation Report (SER) Supplement (Refs. 2 through 6) to understand scope and basis of NRC review, to determine the extent of regulatory compliance, and to identify any open issues or TVA commitments related to the design.
- d. Reviewed other documents applicable to the issues and determined to be needed for the evaluation, such as correspondence (Refs. 45 through 61), INPO report (Ref. 62), Stone & Webster report (Ref. 63), assessment of engineering design control for BFN (Ref. 64), procedures and site standard practices (Refs. 7 through 22), preoperational test scoping documents and preoperational test result packages including test deficiency reports (Refs. 24 through 35), problem identification report (Ref. 65), engineering change notices, NRC inspection reports and TVA responses (Refs. 66 through 97), and quality assurance audit reports (Refs. 98 through 106)
- e. Using the results from steps a through d above, evaluated the issues and documented the findings in element evaluations.
- f. Tabulated issues, findings, and corrective actions from the element evaluations in a plant-by-plant arrangement (see Attachment B).
- g. Prepared Tables 1, 2, and 3 to permit comparison and identification of issues, findings, and corrective actions among the four plants.
- h. Classified the findings and corrective actions from the element evaluations using the ECSP definitions.
- i. On the basis of ECSP guidelines, analyzed the collective significance and causes of the findings from the element evaluations.

- j. Evaluated defined corrective actions to determine if additional actions are required as a result of causes found in step i.
- k. Provided additional judgment or information that may not be apparent at the element level.

4. FINDINGS

The complete findings from each of the four element evaluations for this subcategory are contained in Attachment B, and are listed by element number and plant. The specific findings, with the applicable plant(s) shown in parentheses, are summarized as follows:

- o Negative findings previously identified were closed for Sequoyah before the ECTG evaluation (Ref. 1)
- o Engineering procedures and site standard practices relating to the preoperational test program are not fully adequate to ensure incorporation of all design requirements including procedural requirements for the processing of preoperational test documents and, in some instances, not followed. This has resulted in discrepancies in test results packages (BFN, BLN, WBN).
- o There were no documented acceptance criteria in the initial TVA-prefix test scoping documents and preoperational test instructions. Even Chapter 13.4 of the FSAR Amendment 31 (Ref. 3), does not clearly define the acceptance criteria of each preoperational test; it merely provides a "Test Summary" (BFN).
- o Test results packages were found to have minor procedural inconsistencies and/or deficiencies (WBN, BFN, BLN). In addition, engineering review of test results was not adequate because some test result packages were approved with open exceptions and no documentation was available to identify the closure of same (BFN).
- o There were several instances of no documentation for engineering justification of the acceptance of preoperational test deficiencies (WBN, BFN, BLN).

In addition, the following peripheral findings were identified:

- o In some instances, FSAR commitments are not fully reflected in the acceptance criteria of the test documents (BFN).

- o In isolated cases, there are discrepancies in the acceptance criteria between the FSAR and test documents (BLN).
- o Documentation was not available for two test and retest results packages (TVA-13B and TVA-13BRT; Ref. 26) for the implementation of design changes made by ECNs 2786 and 2799 (WBN).

A summary of the classified findings is provided in Table 1. Class A and B findings indicate there is no problem and that corrective action is not required. Class C, D, and E findings require corrective actions. The corrective action class, defined in the Glossary Supplement, is identified in the table by the numeral combined with the finding class.

Classification of findings are tabulated in Table 2. Where more than one corrective action is identified in Table 1 for a single finding (e.g., Element 213.2, Finding c), Table 2 counts only a single classification. Thus, Table 2 identifies one finding for each issue evaluated. Of the 19 findings identified by classification in Table 1, eight require no corrective action. Of the remaining, eight required new corrective actions to be identified, and three resulted from peripheral findings uncovered during the ECTG evaluation and also required corrective actions. From Table 2, it can be seen that for Watts Bar, where all of the issues originated, two of the four original issues were found to be valid and require corrective action; however, one peripheral issue was identified that also required corrective action.

5. CORRECTIVE ACTIONS

Although the findings for Sequoyah shown in Attachment B remained open for several years after completion of preoperational tests, they were closed and an adequate system was in place at the time of the evaluation. Browns Ferry has developed an extensive and coordinated program to re-verify plant design. As a result, a major restart test program has been developed to resolve employee concerns regarding the quality of testing/review performed during the initial preoperational test and retest programs. The original test results packages will not be reopened or revised. The Bellefonte preoperational test program has been placed on hold and all completed tests will be redone when the program is reactivated. At that time, new site engineering procedures will be developed to prevent recurrence of discrepancies identified. Watts Bar will develop new engineering project procedures. All deficiencies and inconsistencies found in the test results packages will be reviewed and corrected.

The detailed corrective action descriptions are contained in Attachment B. A summary of this information, with the applicable plant identified in parentheses, follows:

- o Develop engineering procedures to prevent: 1) recurrence of procedural deficiencies and/or evaluation inconsistencies in test results packages, and 2) lack of documentation for justifying engineering judgment in the acceptance of test deficiencies, when the test program is reactivated (BLN).
- o Review test packages for procedural deficiencies and/or inconsistencies and revise test results packages as required. Also, develop new engineering project procedures to prevent recurrence of the above shortcomings (WBN).
- o Document technical justification to support engineering judgment in the acceptance of preoperational test deficiencies (WBN).
- o Train personnel in new and revised engineering procedures to prevent recurrence of procedural and documentation deficiencies (WBN, BLN).
- o Develop a restart test program and resolve the shortcomings of the preoperational test and retest programs (BFN).
- o Review and revise existing site director standard practices to include procedural control of engineering activities and to require engineering approval for corrections of design-related test deficiencies.

In addition, the following corrective actions were identified for the peripheral findings:

- o Review the FSAR commitments. Correct FSAR and/or input to the restart test program as necessary (BFN).
- o Revise Chapter 14 of the FSAR and resolve other discrepancies with test documents on reactivation of the preoperational test program (BLN).
- o Review and document previously completed test and retest results packages (TVA-13B and TVA-13BRT; Ref. 26) for the implementation of design changes made by ECNs (WBN).

These corrective actions also appear in Table 3, along with their corresponding finding/corrective action classifications. The table indicates the plant or plants to which a corrective action is applicable by the Corrective Action Tracking Document (CATD) column where the applicable plant is identified by the CATD number.

From the Finding/Corrective Action Classification column of Table 3, it can be seen that of the ten corrective actions identified, one involves development of restart test program, one requires training, five require evaluation and document fix, two involve development of procedures to prevent recurrence of identified problems, and the remaining one requires evaluation to validate the test. A potential for hardware modifications does exist as a result of implementation of corrective actions for Watts Bar and Browns Ferry. Further, it should be noted that for the employee concerns examined no corrective actions were required for Sequoyah, but corrective action is required for the other three plants, Watts Bar, Browns Ferry, and Bellefonte. The evaluation team finds the corrective action plans acceptable to resolve the findings.

6. CAUSES

Table 3 identifies one or more causes for each problem requiring corrective action. For each corrective action, the most important cause is identified; however, in some instances, it was felt that the problem was the result of a combination of causes, each of which should be identified. In those cases, more than one cause is identified for some of the corrective actions. Totals are shown at the end of the table.

The two most frequent causes are (1) procedures not fully adequate in establishing requirements and (2) procedures, in some instances, not followed. This indicates that improvements in the quality of preoperational engineering procedures and site practices, and training, are warranted.

When viewed from a larger perspective, management effectiveness becomes the most frequent cause group, with all ten corrective actions falling into this group. Management did not ensure that adequate engineering procedures and site practices were established, that personnel were trained in the use of procedures, and that procedures were followed.

Two causes are attributed to design process effectiveness. Instances were found where lack of design bases contributed to the incompleteness of Browns Ferry preoperational test program. Moreover, there was a lack of documentation justifying engineering judgment used in the acceptance of preoperational test deficiencies for all plants except Sequoyah.

7. COLLECTIVE SIGNIFICANCE

The negative findings for all plants except Sequoyah center around lack of documentation and lack of fully adequate engineering procedures and site practices in establishing design requirements. FSAR commitments were not, in some instances, fully reflected in the acceptance criteria of the test documents. In several instances, engineering judgments in the acceptance of test deficiencies were not documented. Also, there was a lack of

documentation in the test and retest results packages for the implementation of design changes made by engineering change notices. The Browns Ferry initial preoperational test program was not well developed, and it did not include documented acceptance criteria in test scoping documents and preoperational test instructions. Browns Ferry has now developed a restart test program.

On the basis of the observations made, and in spite of the negative findings identified and of corrective actions mainly in the areas of procedural inconsistencies and deficiencies, overall engineering participation in the preoperational test program appears to be adequate for all plants except Browns Ferry. However, a restart test program has been developed for Browns Ferry to resolve the shortcomings of the preoperational test and retest programs. Implementation of the corrective actions should resolve all the findings identified during the evaluation for WBN, BFN, and BLN. A potential for hardware modifications does exist as a result of implementation of corrective actions for Watts Bar and Browns Ferry.

The TVA-developed Nuclear Performance Plans (NPPs, Ref. 23) is expected to improve corporate-level management of TVA's nuclear activities. The clarification of responsibility and authority of line management in conjunction with the strengthened role of Quality Assurance (QA) and the establishment of the Engineering Assurance (EA) organization are a positive step toward permitting TVA to monitor Engineering's performance in the preoperational test program. In addition, EA and QA should provide additional assurance that engineering procedures and site practices are adequate and are being followed, that FSAR commitments are met, and that engineering judgments in the acceptance of test deficiencies are documented. Furthermore, close coordination and communication between EA and QA to line managements to provide feedback on engineering performance through technical audits should prevent recurrence of the discrepancies identified above.

The results of this subcategory evaluation are being combined with the other subcategory evaluations and reassessed in the Engineering category evaluation.

TABLE 1
CLASSIFICATION OF FINDINGS AND CORRECTIVE ACTIONS

Element	Issue/ Findings**	Finding/Corrective Action Class*			
		SON	WBN	BFN	BLN
213.2 Inadequate Electrical Testing, Planning, and Engineering Participation; Deviations to Preoperational Test Acceptance Criteria	a	A	A	D2	A
		-	-	D6	-
	b	A	A	D2	A
		-	-	D6	-
		c	C3	D3	D2
	c	-	D4	-	D4
		-	D6	D6	D6
		d	A	D3	D2
	d	-	D6	D6	D6
		-	-	-	D4
		e	-	E3	E3
	e	-	E6	E6	E6
		-	-	E2	-

*Classification of Findings and Corrective Actions

- | | |
|---|------------------|
| A. Issue not valid.
No corrective action required. | 1. Hardware |
| B. Issue valid but consequences acceptable.
No corrective action required. | 2. Procedure |
| C. Issue valid. Corrective action initiated before ECTG evaluation. | 3. Documentation |
| D. Issue valid. Corrective action taken as a result of ECTG evaluation. | 4. Training |
| E. Peripheral issue uncovered during ECTG evaluation. Corrective action required. | 5. Analysis |
| | 6. Evaluation |
| | 7. Other |

**Defined for each plant in Attachment B.

TABLE 2
FINDINGS SUMMARY

<u>Classification of Findings</u>	<u>Plant</u>				<u>Total</u>
	<u>SQL</u>	<u>WBN</u>	<u>BFN</u>	<u>BLN</u>	
A. Issue not valid. No corrective action required.	3	2	0	2	7
B. Issue valid but consequences acceptable. No corrective action required.	0	0	0	0	0
C. Issue valid. Corrective action initiated before ECTG evaluation.	1	0	0	0	1
D. Issue valid. Corrective action taken as a result of ECTG evaluation.	0	2	4	2	8
E. Peripheral issue uncovered during ECTG evaluation. Corrective action required.	0	1	1	1	3
Total	4	5	5	5	19

GLOSSARY SUPPLEMENT
FOR THE ENGINEERING CATEGORY

Causes of Negative Findings - the causes for findings that require corrective action are categorized as follows:

1. Fragmented organization - Lines of authority, responsibility, and accountability were not clearly defined.
2. Inadequate quality (Q) training - Personnel were not fully trained in the procedures established for design process control and in the maintenance of design documents, including audits.
3. Inadequate procedures - Design and modification control methods and procedures were deficient in establishing requirements and did not ensure an effective design control program in some areas.
4. Procedures not followed - Existing procedures controlling the design process were not fully adhered to.
5. Inadequate communications - Communication, coordination, and cooperation were not fully effective in supplying needed information within plants, between plants and organizations (e.g., Engineering, Construction, Licensing, and Operations), and between interorganizational disciplines and departments.
6. Untimely resolution of issues - Problems were not resolved in a timely manner, and their resolution was not aggressively pursued.
7. Lack of management attention - There was a lack of management attention in ensuring that programs required for an effective design process were established and implemented.
8. Inadequate design bases - Design bases were lacking, vague, or incomplete for design execution and verification and for design change evaluation.
9. Inadequate calculations - Design calculations were incomplete, used incorrect input or assumptions, or otherwise failed to fully demonstrate compliance with design requirements or support design output documents.
10. Inadequate as-built reconciliation - Reconciliation of design and licensing documents with plant as-built condition was lacking or incomplete.
11. Lack of design detail - Detail in design output documents was insufficient to ensure compliance with design requirements.

12. Failure to document engineering judgments - Documentation justifying engineering judgments used in the design process was lacking or incomplete.
13. Design criteria/commitments not met - Design criteria or licensing commitments were not met.
14. Insufficient verification documentation - Documentation (Q) was insufficient to audit the adequacy of design and installation.
15. Standards not followed - Code or industry standards and practices were not complied with.
16. Engineering error - There were errors or oversights in the assumptions, methodology, or judgments used in the design process.
17. Vendor error - Vendor design or supplied items were deficient for the intended purpose.

Classification of Corrective Actions - corrective actions are classified as belonging to one or more of the following groups:

1. Hardware - physical plant changes
2. Procedure - changed or generated a procedure
3. Documentation - affected QA records
4. Training - required personnel education
5. Analysis - required design calculations, etc., to resolve
6. Evaluation - initial corrective action plan indicated a need to evaluate the issue before a definitive plan could be established. Therefore, all hardware, procedure, etc., changes are not yet known
7. Other - items not listed above

Peripheral Finding (Issue) - A negative finding that does not result directly from an employee concern but that was uncovered during the process of evaluating an employee concern. By definition, peripheral findings (issues) require corrective action.

Significance of Corrective Actions - The evaluation team's judgment as to the significance of the corrective actions listed in Table 3 is indicated in the last three columns of the table. Significance is rated in accordance with the type or types of changes that may be expected to result from the corrective action. Changes are categorized as:

- o Documentation change (D) - This is a change to any design input or output document (e.g., drawing, specification, calculation, or procedure) that does not result in a significant reduction in design margin.
- o Change in design margin (M) - This is a change in design interpretation (minimum requirement vs actual capability) that results in a significant (outside normal limits of expected accuracy) change in the design margin. All designs include margins to allow for error and unforeseeable events. Changes in design margins are a normal and acceptable part of the design and construction process as long as the final design margins satisfy regulatory requirements and applicable codes and standards.
- o Change of hardware (H) - This is a physical change to an existing plant structure or component that results from a change in the design basis, or that is required to correct an initially inadequate design or design error.

If the change resulting from the corrective action is judged to be significant, either an "A" for actual or "P" for potential is entered into the appropriate column of Table 3. Actual is distinguished from potential because corrective actions are not complete and, consequently, the scope of required changes may not be known. Corrective actions are judged to be significant if the resultant changes affect the overall quality, performance, or margin of a safety-related structure, system, or component.

ATTACHMENT A

EMPLOYEE CONCERNS
FOR SUBCATEGORY 21300

Attachment A -- lists each employee concern evaluated in the subcategory. The concern number is given, the plant sites to which it could be applicable are noted, the concern is quoted as received by TVA, and is characterized as safety related, not safety related, or safety significant.

ATTACHMENT A

EMPLOYEE CONCERNS FOR SUBCATEGORY 21300

REVISION NUMBER: 2
PAGE A-2 OF 2

ELEMENT	CONCERN NUMBER	PLANT LOCATION	APPLICABILITY				CONCERN DESCRIPTION*
			SQN	WBN	BFN	BLN	
213.2	WI-85-100-018	WBN	X	X	X	X	"Electrical testing and planning is inadequate. Engineering either does not address testing or does so inadequately. Acceptance criteria for testing is inadequate to non-existent." (SR)
	IN-86-077-001	WBN	X	X	X	X	"Deviations to pre-op test acceptance criteria were accepted by ENDES without written justifications. It cannot be determined by the documentation in the test package whether or not a detailed evaluation of the deviation was performed by ENDES. This concern applies to all pre-op tests. (Unit 1) Details know to QTC, withheld due to confidentiality. CI has no further information. NUC POWER concern." (SR)

* SR/NU/SS indicates safety related, not safety related, or safety significant per determination criteria in the ECTG Program manual and applied by IVA before evaluations.