

EMPLOYEE CONCERNS SPECIAL PROGRAM

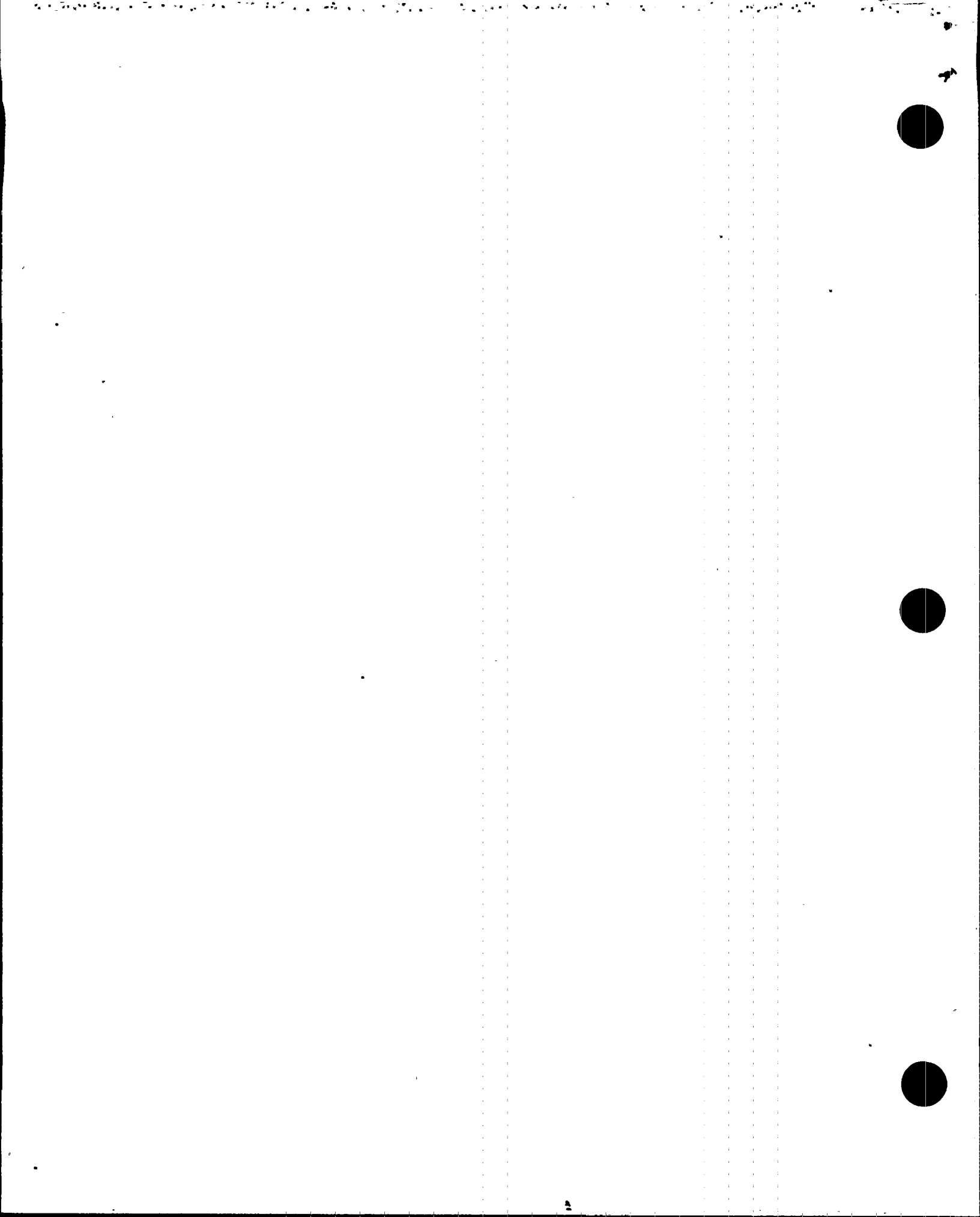
**VOLUME 2
ENGINEERING CATEGORY**

**SUBCATEGORY REPORT 21300
ELECTRICAL TESTING AND PLANNING**

UPDATED

**TVA
NUCLEAR POWER**

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TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM

REPORT NUMBER: 21300

REPORT TYPE: SUBCATEGORY REPORT FOR
ENGINEERING

REVISION NUMBER: 2

TITLE: ELECTRICAL TESTING AND PLANNING

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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).

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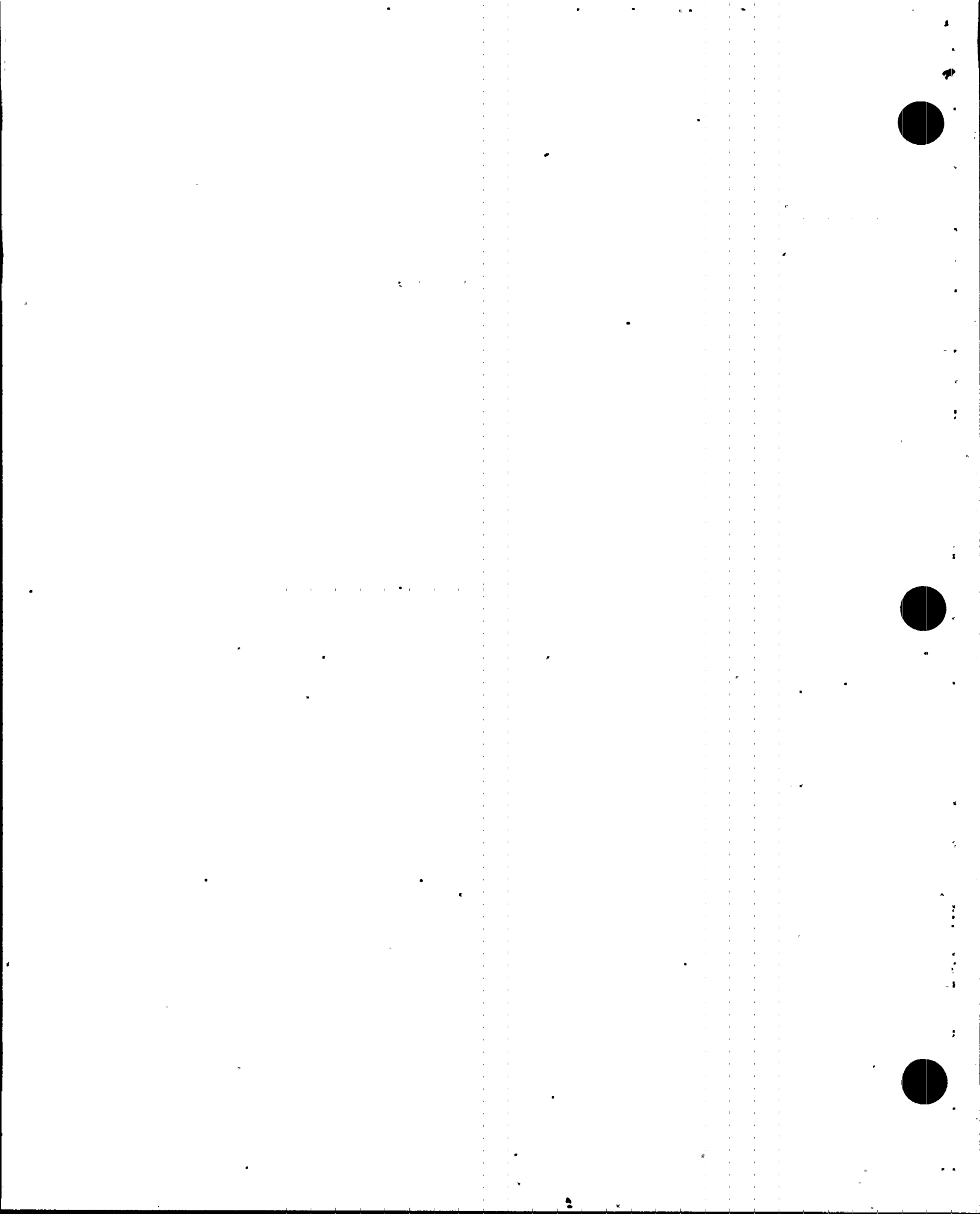
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* SRP Secretary's signature denotes SRP concurrences are in files.



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.

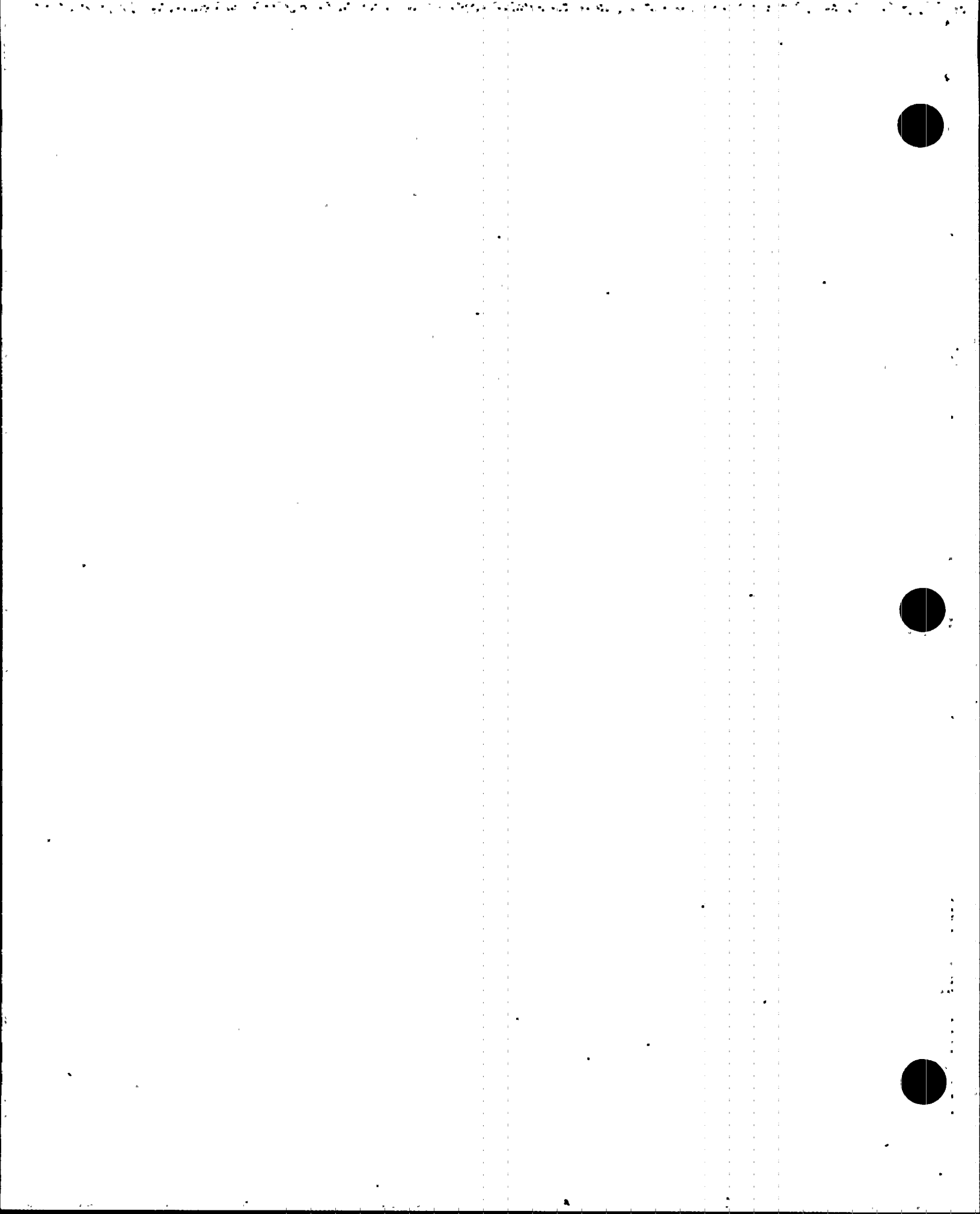
Causes for the negative findings relate to engineering procedures and site standard practices, in some instances, not being followed; procedures not being fully adequate to cover all requirements; lack of documentation for acceptance of test deficiencies based on engineering judgment (Watts Bar, Browns 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.

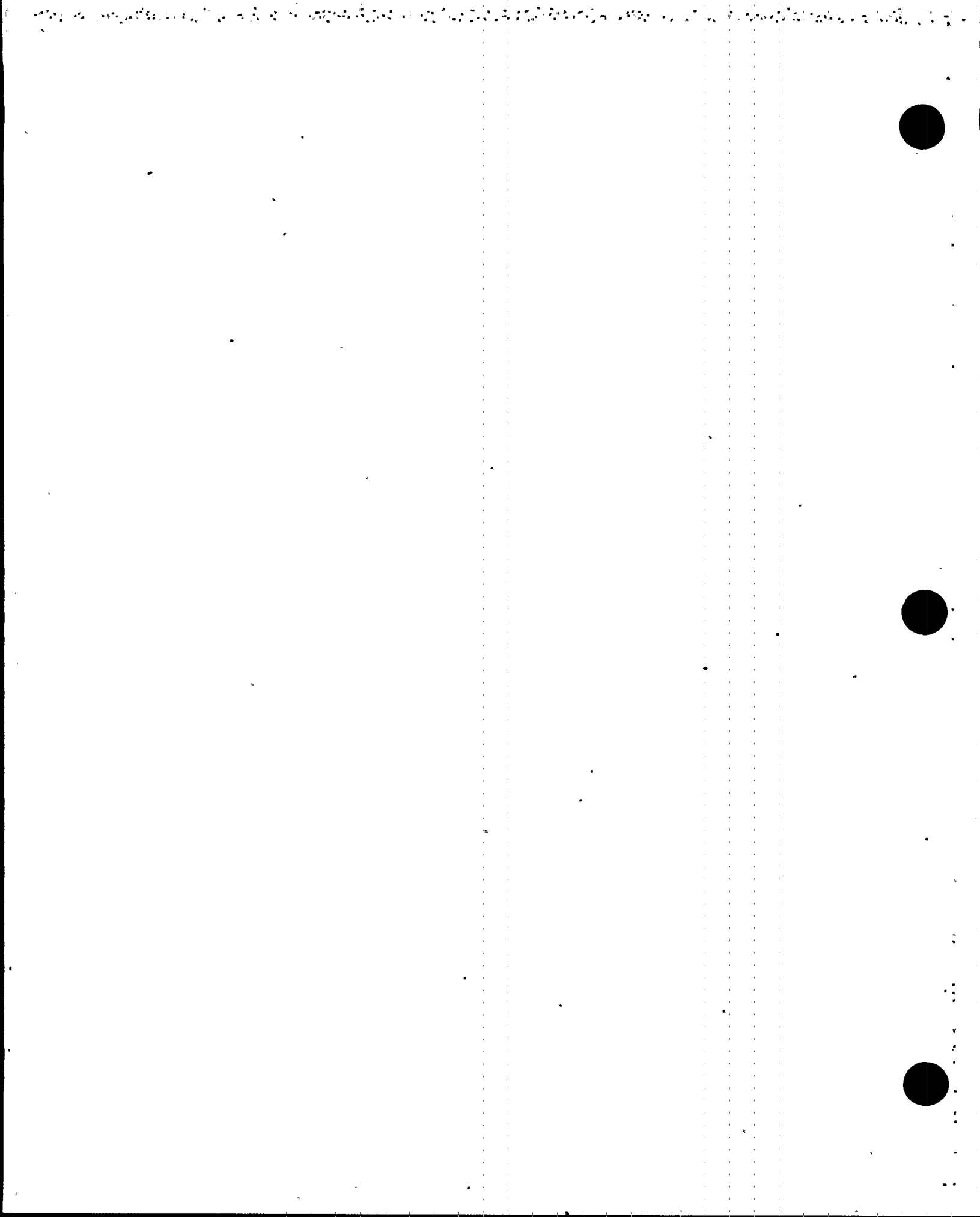
The causes identified and the other evaluation results will be reexamined from a wider perspective during the Engineering category evaluation.



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.

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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.

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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) |

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| | |
|--------|---|
| 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 |

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| | |
|--------|---|
| 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 |

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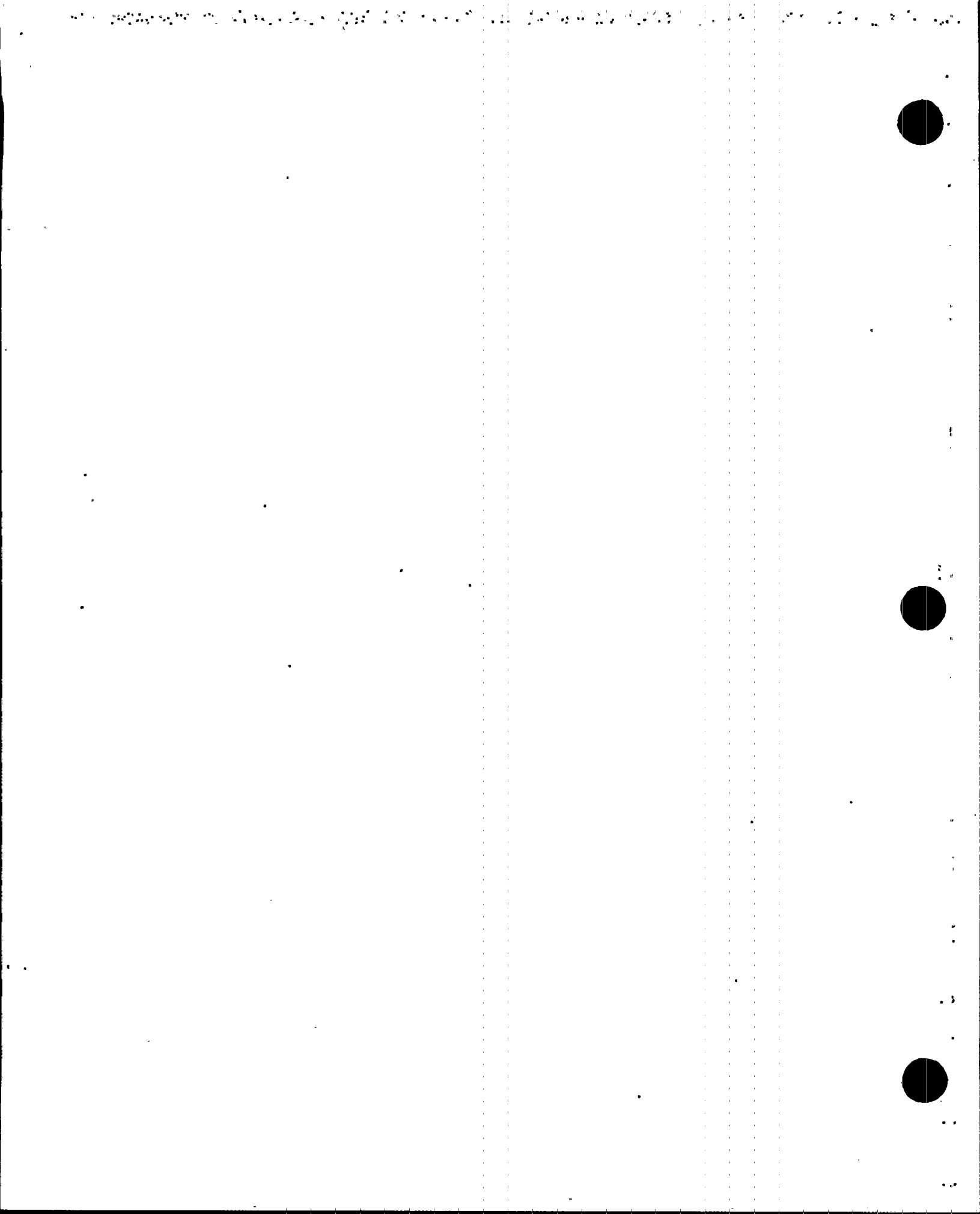
| | |
|-------|--|
| QCP | Quality Control Procedure |
| QTC | Quality Technology Company |
| RIF | Reduction in Force |
| RT | Radiographic Testing |
| SQN | Sequoyah Nuclear Plant |
| SI | Surveillance Instruction |
| SOP | Standard Operating Procedure |
| SRP | Senior Review Panel |
| SWEC | Stone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

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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-138 and TVA-138RT; 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 | D2 |
| | | - | D4 | - | D4 |
| | | - | D6 | D6 | D6 |
| | d | A | D3 | D2 | D2 |
| | | - | D6 | D6 | D6 |
| | | - | - | - | D4 |
| | e | - | E3 | E3 | E3 |
| | | - | 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 |

TABLE 3
MATRIX OF ELEMENTS, CORRECTIVE ACTIONS, AND CAUSES
SUBCATEGORY 21300

REVISION NUMBER: 2
PAGE 14 OF 17

| ELEM | FINDINGS/ CORRECTIVE ACTION CLASS.** | CORRECTIVE ACTION | CAIU | CAUSES OF NEGATIVE FINDINGS * | | | | | | | | | | | | | | | | | Signifi- cance of Corrective Actions* | | | |
|--------|---|--|------------------|----------------------------------|-------------------------------|------------------------------------|---|--|-----------------------------------|---------------------------|------------------------------------|------------------------------------|------------------------|----------------------|-----------------------------|--------------------------|----------------------------------|-----------------------------------|-------------------------------|-----------------|--|---|---|---|
| | | | | MANAGEMENT EFFECTIVENESS | | | | | | | DESIGN PROCESS EFFECTIVENESS | | | | | | | TECHNICAL ADEQUACY | | | | | | |
| | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | D | M | H | |
| | | | | Frags- Organ- iza- tion | Inade- quate Q- trng | Inade- quate Proce- dures | Proce- dures Not Fol- lowed | Inade- quate Com- muni- cation | Un- timely Res of Issues | Lack of Atten- tion | Inade- quate Design Bases | Inade- quate Recon- cili. | As-bit of Detail | Lack of Design | Judg- ment not Met | Crit/ Commit- ment | Verif Docu- ment- ation | Insuf- ficient Not lowed | Stds Not Engrg Error | Vendor Error | | | | |
| 213.2 | D3, D6 | Review test results packages for procedural deficiencies and/or evaluation inconsistencies and correct as necessary. Also, develop new engineering project procedures. | WBN U3 | | | X | X | | | | | | | | | | | | | | A | - | - | |
| | E3, E6 | Review and document previously completed test and retest results packages for the implementation of design changes made by ECNs. | WBN U1 | | | | X | | | | | | | | | | | | | | | A | P | P |
| | D3, D6 | Document technical justification to support engineering judgment in the acceptance of preoperational test deficiencies. | WBN U2 | | | | X | | | | | | | X | | | | | | | | A | P | P |
| | D2, D6 | Review and revise existing site director standard practices for procedural control of engineering activities and to require engineering approval for correction of design-related test deficiencies. | BFN U4 BFN U5 | | | X | | | | | | | | | | | | | | | | A | - | - |
| TOTALS | | | | | 1 | 7 | 4 | | | | | 1 | | | | 3 | | | | | | | | |

* Defined in the Glossary Supplement.

** Defined in Table 1.

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:

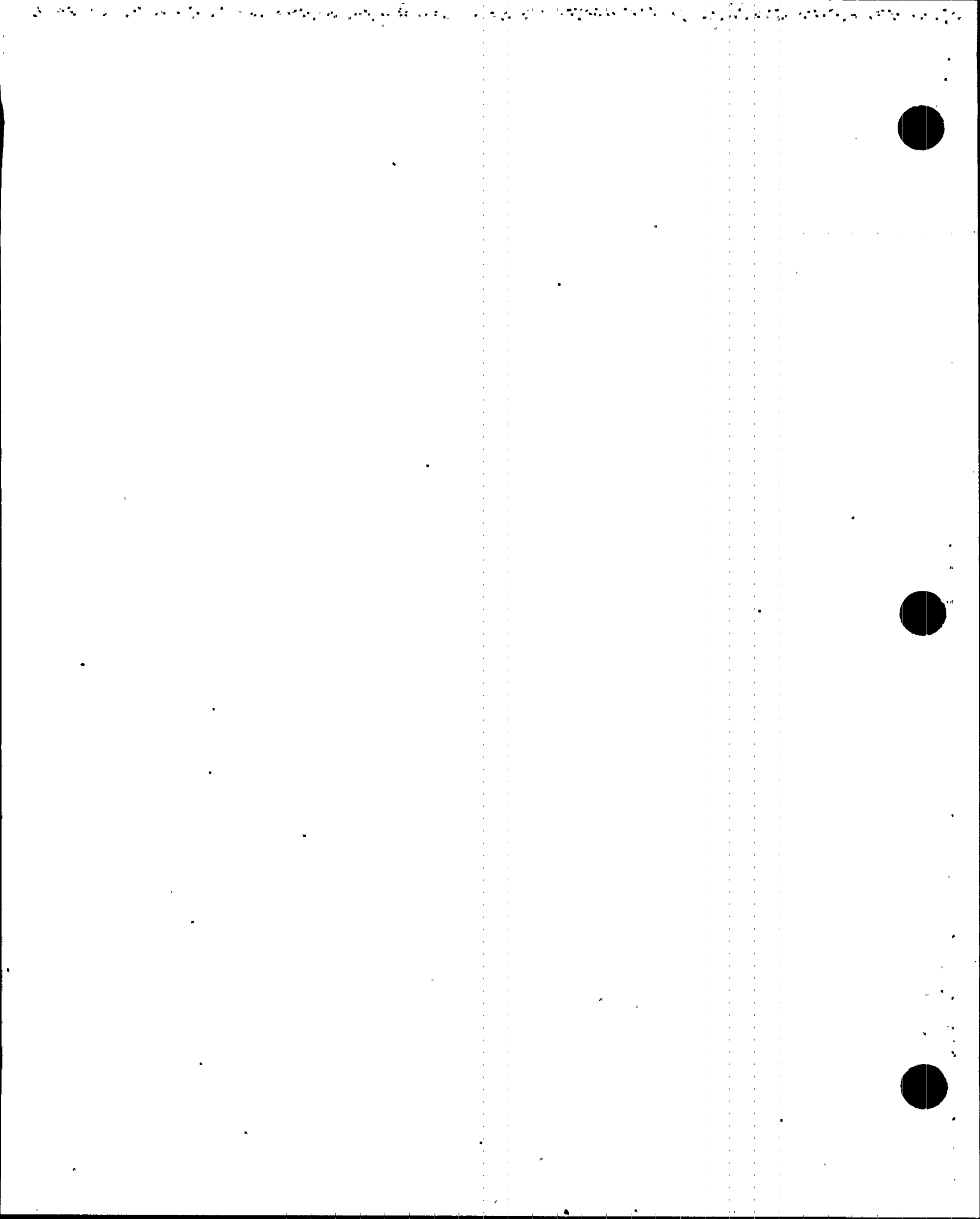
1. Hardware - physical plant changes
2. Procedure - changed or generated a procedure
3. Documentation - affected QA records
4. Training - required personnel education
5. Analysis - required design calculations, etc., to resolve
6. Evaluation - initial corrective action plan indicated a need to evaluate 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.



TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM

REPORT NUMBER: 21300
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Page A-1 of 2

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* |
|---------|----------------|----------------|---------------|-----|-----|-----|---|
| | | | SUN | WUN | BFN | BLN | |
| 213.2 | WI-85-100-018 | WUN | 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 | WUN | 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 QIC, withheld due to confidentiality. CI has no further information. NUC POWER concern." (SR) |

* SSS indicates safety related, not safety related, or safety significant per determination criteria in the LCIG Program manual and applied before evaluations.

ATTACHMENT B

SUMMARY OF ISSUES, FINDINGS, AND
CORRECTIVE ACTIONS FOR
SUBCATEGORY 21300

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 an employee concern. These are classified as "E" in Tables 1 and 2 of this report.

ATTACHMENT B
SUMMARY TABLE OF SUBCATEGORY ELEMENTS
SUBCATEGORY 21300

REVISION NUMBER: 2
Page 8-2 of 29

| Issues | Findings | Corrective Actions |
|---|--|--------------------|
| ***** | | |
| Element 213.2 - Inadequate Electrical Testing and Planning | | |
| ***** | | |
| SQN | SQN | SQN |
| a. The electrical test program and planning are inadequate. | a. Engineering participation in the overall preoperational and postmodification test programs was found to be adequate based on evaluation of test scoping documents and test results packages (Ref. 24). | a. None required. |
| b. Engineering participation in the program in providing acceptance criteria is inadequate. | b. On the basis of the test packages reviewed (Ref. 24), Engineering participation in the program for providing acceptance criteria is adequate. PTIs, PMTIs, and acceptance criteria were properly reviewed and documented by TVA Engineering. | b. None required. |
| c. Engineering participation regarding the conduct of the tests and review of the test results is inadequate. | <p>c. The following problems regarding Engineering participation in the review of test results were identified:</p> <ul style="list-style-type: none"> o Engineering was not properly advised in a timely manner of a milestone change for the completion of test deficiencies or of completion and closure of certain test deficiencies. o A suggested modification was assigned a deficiency number by mistake. o Engineering erroneously gave full approval for a test results package with an outstanding deficiency. o A deficiency for a test results package was not closed out, although resolution of the deficiency was submitted to Engineering. o Engineering received a test results package erroneously indicating an open deficiency that had already been resolved. | c. None required. |
| | <p>Although the above items remained open for several years after completion of the preoperational tests, they are now closed and an adequate system was in place at the time of this evaluation to assure the resolution and closure of similar items.</p> | |

ATTACHMENT B
SUMMARY TABLE OF SUBCATEGORY ELEMENTS
SUBCATEGORY 21300

REVISION NUMBER: 2
Page B-3 of 29

| Issues | Findings | Corrective Actions |
|--|--|--|
| Element 213.2 - SQN (Continued) | | |
| <p>d. Deviations to preoperational test acceptance criteria were accepted by Engineering without justification (CI indicates written justification is necessary.) Documentation of the Engineering evaluation of preoperational test deviations (deficiencies) was inadequate.</p> | <p>d. Deviations (deficiencies) from preoperational test acceptance criteria were accepted by EN DES in accordance with IVA procedural requirements contained in EN DES-EP 6.01. Supporting documentation of EN DES acceptance of preoperational test deficiencies was adequate to determine the extent of the Engineering evaluation performed.</p> | <p>d. None required.</p> |
| WBN | WBN | WBN |
| <p>a. The electrical test program and planning are inadequate.</p> | <p>a. Engineering participation in the overall preoperational test program was found to be adequate based on the evaluation of test scoping documents and test results packages (Ref. 26).</p> <p>Initial test identification is the responsibility of Engineering with review inputs received from the site test coordinator. The responsibility for scheduling and planning resides with the site test coordinator with review inputs from Engineering.</p> <p>In recognition of the fact that most of the engineering functions are unscheduled support activities, the evaluation team found no evidence that staffing was inadequate to provide reasonable test activity support.</p> | <p>a. None required</p> |
| <p>b. Engineering participation in the program providing acceptance criteria is inadequate.</p> | <p>b. On the basis of the 13 test packages reviewed (Ref. 26), Engineering participation in the establishment of acceptance criteria was found to be adequate.</p> | <p>b. None required.</p> |
| <p>c. Engineering participation regarding the conduct of the tests and review of the test results is inadequate.</p> | <p>c. The evaluation team reviewed 13 test results packages that were prepared for nine systems. These packages reviewed included Scoping Documents and Preoperational test Instructions (PTIs). Engineering participated during the testing on an as-needed basis for observation and guidance. Test results packages, including PTIs and acceptance criteria, were reviewed and documented by Engineering. QA involvement was not required by procedure; however, QA coverage was provided through periodic audits of the program.</p> | <p>c. IVA commits to review the procedural deficiencies and inconsistencies within the nine Bechtel-reviewed results packages and complete any required corrective action prior to unit 1 fuel load. A CAQ report will be prepared if a condition adverse to quality is identified as a result of this review. In addition, test representatives will be trained on revised Procedure NEB-D1-125.03 and new WDEP Procedures 8.02, 8.03, and 8.04. (CATD 207 03 WBN 03)</p> |

ATTACHMENT B
SUMMARY TABLE OF SUBCATEGORY ELEMENTS
SUBCATEGORY 21300

REVISION NUMBER: 2
Page B-4 of 29

Issues

Findings

Corrective Actions

Element 213.2 - WBN (Continued)

The procedural deficiencies or inconsistencies are not significant and do not invalidate the overall adequacy of the engineering participation in the preoperational test program.

Several examples of the types of procedural deficiencies or inconsistencies observed by the evaluation team are cited below:

- o Some Scoping Documents did not include a change sheet, or an explanation for the revision as required by EP 6.01, R5, Section 4.2.
- o Scoping Documents were not referenced in Appendix A of some PTIs.
- o The mechanism by which scope document changes have been incorporated into the PTIs was not evident.
- o Some PTIs did not reference the applicable FSAR section numbers in Appendix A.
- o Closure of engineering comments on some PTIs and closure of general comments on some test results were not evident.
- o Preoperational Test #W-4.1. Deficiency DN¹³⁹ (PT²²⁶) was closed by PI 225, R1, Supplement 1, and PI 224, R1, Supplement 1. In addition, PT 226 was tied to PI 224 and PI 225 in Appendix B (test deficiencies and exceptions) in the column for "Disposition of Deficiency," but there was no mention of PT 226 in the Test Report Form #4 (description of final resolution of deficiencies, exceptions, or open items).

- Notes: 1. DN is a test deficiency found during the test.
2. PI is a test deficiency requiring design engineering resolution. Every PI will have a corresponding DN:

ATTACHMENT B
SUMMARY TABLE OF SUBCATEGORY ELEMENTS
SUBCATEGORY 21300

REVISION NUMBER: 2
Page B-5 of 29

Issues

Findings

Corrective Actions

Element 213.2 - WBM (Continued)

- o Preoperational test #TVA-13B. NCR (no number) dated May 11, 1981 (page 23 p. 7 of the test results package) was tied to Trouble Report (TR) 38110 and Deficiency UN21. This deficiency was not mentioned in the Test Summary Report but dispositioned in Appendix B as closed by TR 38110. This NCR (PHBC box relay failed to operate) was not approved either by Engineering or by the Office of Nuclear Power (NUC PR). Even though Deficiency DN-22 was not mentioned in the Test Summary Report, this was dispositioned as closed in Appendix B and Engineering commented that no further action was needed by NUC PR.

Data sheet 5.2.1 did not include all the information required by Scope Document No. TVA-13, paragraph 8.7.c (1 through 5).

- o Preoperational Test #TVA-13BRT. Test Record Form #4 was neither submitted nor mentioned in the test results package transmittal form for Deficiencies DN53, DN54, and EX 33. However, these were dispositioned as closed in Appendix B. There was no clear evidence to identify that Engineering had approved Deficiencies DN53, DN54, or EX 33. EX 32 was approved by Engineering even though the acceptance criteria were not met.
- o Preoperational Test #TVA-1. Even though Deficiency DN6 is an open item per Appendix B and the Test Summary Report, Engineering approved the test results package as a complete package without resolving the item.
- o Preoperational Test #TVA-15. Deficiency UN11 (PT42) was approved by Engineering with a comment, "Control power key diagram to be revised to show the sync signal circuit breaker on the distribution panel as normally open, No". No evidence was found to identify that the key diagram has been revised. The scope document has been revised to clear the Deficiency UN11 but no change notice was issued for P11. The scope document also stipulated, "Also the removal of sync signal to the inverter section of the UPS must not deform the output waveform magnitude by any more than 2%". Test results were found to be deficient in this requirement.

ATTACHMENT B
SUMMARY TABLE OF SUBCATEGORY ELEMENTS
SUBCATEGORY 21300

REVISION NUMBER: 2
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Issues

Findings

Corrective Actions

Element 213.2 - WBN (Continued)

Engineering approved the test results as a complete package without approving the Deficiency DN14 (PT 537). Test Record Form #4 included PT 537 but not DN14. Appendix B also dispositioned this deficiency as closed.

- o Preoperational test #IVA-16A. NCR #925R was issued on 09/19/77 prior to testing. There is no evidence in the result package that the corrective action (breaker replacement) was completed prior to testing.

Test Record Form #4 is not in the file for the closure of EX 1, 3, 5, and 7 by test #10.10. Even in Preoperational Test #10.10, it is difficult to identify the closure of these exceptions if one does not know the exact annunciator window numbers. However, Engineering approval of the test results was not dependent on the satisfactory completion of Preoperational Test #10.10.

- o Preoperational Test #IVA-18B. Work on test restraint PR305 was completed during the system testing. However, this PR did not list all ECNs required for the completion of testing. Retesting of most of the affected valves relating to exception EX2 had been postponed and now is scheduled to be completed as a postmodification test. Engineering gave final approval to the test results as a complete package in spite of the comment, "The post modification testing should verify that the valves open and close in 60 seconds or less as an acceptance criteria."

- o Preoperational test #IVA-18C. Deficiency DN7 has not been dispositioned in Appendix B.

Engineering gave final approval to the test results as a complete package even though new exceptions EX 29 through 36, 38 through 41, and new Deficiencies DN 26 through 45 have not been approved. Neither Test Record Form #4 nor the transmittal letter for the test results package mentioned the above exceptions and deficiencies. These were dispositioned as closed in Appendix B.

ATTACHMENT B
SUMMARY TABLE OF SUBCATEGORY ELEMENTS
SUBCATEGORY 21300

REVISION NUMBER: 2
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Issues

Findings

Corrective Actions

Element 213.2 - WBN (Continued)

d. Deviations to preoperational test acceptance criteria were accepted by Engineering without justification. (CI indicates written justification is necessary.) Documentation of the Engineering evaluation of preoperational test deviations (deficiencies) was inadequate.

d. To evaluate Issue "d," the evaluation team reviewed 438 preoperational test deficiency reports processed from 02/84 through 07/87. Deficiency reports were dispositioned on a printed form identified with a sequential number preceded by PT, i.e., PT-001 through PT-741. Deficiency reports numbered PT-301 through PT-741 were reviewed. Within this group, 211 PTs were found to have an "acceptable deficiency" disposition. The basis for acceptance of these deficiencies was provided in all cases. The evaluation team grouped the acceptance basis into six categories:

| | |
|---|-----|
| 1. Acceptance based on engineering judgment | 101 |
| 2. Fire/smoke damper problems addressed in Subcategory Report 23000, Element 230.1 | 58 |
| 3. Acceptance based on ECH, vendor drawing changes, satisfactory retest, procedural changes, or field correction of problem | 25 |
| 4. Instruction error or deficiency outside of the test scope | 17 |
| 5. Licensing issues resolved by Tech Spec/FSAR change or NRC acceptance | 6 |
| 6. Recalculation to confirm adequacy of result | 4 |
| Total | 211 |

Fire/smoke damper problems have been addressed in Subcategory Report 23000, Element 230.1 and are not addressed further in this element, except to note that the resolution of the problem was well documented on the PT forms. Acceptable deficiencies placed in categories 3 through 6 were resolved or corrected by clearly documented methods. The remaining deficiency reports were given an acceptable disposition on the basis of engineering

d. Provide technical justification documentation for numerous WBN PT deficiencies to support how they were dispositioned. This will be accomplished in three phases defined in the following paragraphs. During each phase, a technical adequacy review of the identified PT-Item will be conducted by either the design test representative or by a technically qualified engineer. The review will consist of examining the deficiency, reviewing the resolution, determining the appropriateness of the resolution, and developing a written technical rationale to support the resolution, as needed. Documentation supporting PT resolution will be included in the site QA test results package, and a copy will be retained with the engineering design test files. A CAQ report will be prepared if a CAQ is identified during the implementation of this CAID. Additional procedures will be developed as outlined in the committed action to issue c.

Phase I will review the 33 deficiencies identified by the Bechtel employee concern evaluation team. This review will be completed in accordance with the above discussion prior to unit 1 fuel load.

Phase II will review the remaining items of the 441 reviewed by Bechtel to determine if further documentation is required. This review will supplement the Bechtel review and provide additional assurance that PT resolutions are adequately supported in the test packages.

ATTACHMENT B
SUMMARY TABLE OF SUBCATEGORY ELEMENTS
SUBCATEGORY 21300

REVISION NUMBER: 2
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Issues

Findings

Corrective Actions

Element 213.2 - WBN (Continued)

judgment. The evaluation team found no requirement in the applicable procedures that defined or addressed the extent of written technical justification required to support a decision based upon engineering judgment.

To evaluate this issue, the evaluation team looked to ANSI N45.2.11 which states, in part, that design activities be prescribed in ". . . written form, which provides adequate control and permits reviewing, checking, or verifying the results of the activity by personnel who are experienced in the subject activity." The issue of adequate technical support level for technical justification of engineering judgment is also addressed in a supplement to NRP-3.2. The supplement to NRP-3.2 requires that the written basis for an engineering judgment be ". . . sufficiently clear to permit another engineer versed in the particular discipline to understand the preparer's thought process."

On the basis provided by ANSI N45.2.11 and the Supplement to NRP-3.2 the evaluation team found that a significant number of the deficiencies given an acceptable disposition had insufficiently documented technical justification for acceptance.

Phase III will review the PTs not reviewed by Bechtel (PT-001 through PT-300) to determine if their resolutions are adequately supported.

Phases II and III shall be completed before unit 1 fuel load.
(CATD 207 03 WBN 02)

ATTACHMENT B
SUMMARY TABLE OF SUBCATEGORY ELEMENTS
SUBCATEGORY 21300

REVISION NUMBER: 2
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Issues

Findings

Corrective Actions

Element 213.2 - WBN (Continued)

e. Peripheral finding.

- e. The evaluation team found one significant deficiency which is characterized below.

Two Engineering Change Notices (ECNs) 2786 and 2799 were found for preoperational test IVA-138, "Onsite Ac Distribution System." P11 paragraph 2.3.3 stated that these ECNs will ". . . substantially impact and invalidate portions of the test." The test was completed and the results approved by engineering even though the test director did not sign paragraph 2.2.3.1 to signify that the ECNs listed in paragraph 2.3.3 did not invalidate the test results. The evaluation team found no evidence that retesting was undertaken following implementation of the ECNs.

- e. The IVA corrective action plan is to have the design test representative responsible for tests IVA-138 and IVA-138 Retest (RT), complete a documentation and a technical adequacy review, and prepare documentation of these reviews. This documentation will be included within the two test results packages.

This review will entail thoroughly reviewing ECNs 2786 and 2799 for technical content and then reviewing IVA-138 (RT) results package to ensure that all aspects of the technical content of the subject ECNs were adequately retested and that acceptance criteria were met. If a condition adverse to quality (CAQ) is identified during the implementation of this CATU, a CAQ report will be prepared.

This review and the associated documentation will be completed before unit 1 fuel load.
(CATU 207 03 WBN 01)

BFH

- a. The electrical test program and planning are inadequate.

BFH

- a. The initial preoperational test program was not well developed. Subsequent test programs have improved over the years. IVA will test most of the systems during the RTP for unit 2 in accordance with SUSP-12.1. This program was evaluated and found to include steps to make it an adequate test program. There is no restart test program currently in place for units 1 and 3. No applicable procedures were found that directly controlled engineering activities associated with RTP.

With regard to planning, initial test identification was the responsibility of Engineering with review data from the preoperational test coordinator/site test director. The responsibility for scheduling and planning resided with this individual, with review data from Engineering. In recognition of the fact that most of the engineering functions are unscheduled support activities, the evaluation team found no evidence that staffing was inadequate to provide reasonable test activity support.

BFH

- a. Engineering Activities Associated with RTP

SUSP 12-1, "Restart Test Program," Rev. 1 (Section 7.0 and form SUSP-97) and NEP 10.4, Rev. 0 (Section 3.0) identify engineering activities associated with the Restart Test Program. Hence no further corrective action is required for this item.

Restart Test Program for Units 1 and 3

The intent is to implement a units 1 and 3 restart program similar to that formulated for unit 2. Restart test programs for units 1 and 3 will be addressed in a timely manner subsequent to restart of unit 2.
(CATU 213 02 BFH 04)

ATTACHMENT B
SUMMARY TABLE OF SUBCATEGORY ELEMENTS
SUBCATEGORY 21300

REVISION NUMBER: 2
Page 8-10 of 29

Issues

Findings

Corrective Actions

Element 213.2 - BFN (Continued)

- | Issues | Findings | Corrective Actions |
|--|---|--|
| b. Engineering participation in the program in providing acceptance criteria is inadequate. | b. On the basis of information reviewed, engineering participation in the program for providing acceptance criteria was not adequate during the initial stage. After the AEC audit in 03/72, the evaluation team noted improvement in the stipulation of acceptance criteria by Engineering to scoping documents, preoperational retest programs, and postmodification test programs. The evaluation team reviewed the DUE program in the form of the test scoping documents provided by DNE for a couple of restart systems and noted that adequate acceptance criteria are provided. The RTP test instructions are based on DUE and system test specifications, and many systems will be tested under RTP. | b. See corrective actions for issue c. |
| c. Engineering participation regarding the tests and review of the test results is inadequate. | c. Engineering review of the test results was not adequate to the extent that: o For Test IVA-20, unit 2, "Secondary Containment Leak Rate Test," it is stated in the disposition of Exception 2 that "... the work remaining on the roof will not affect the test results, and this exception will be cleared at a later date." However, the test package did not include the documentation for the closure of this exception. The exception disposition also states that "the standby gas treatment switchover logic has not been installed because of lack of material; therefore, it will not be tested until some later date." The test package did not include any documentation to identify the completion of installation and testing of the circuitry. Furthermore, it is stated "In paragraph 6.5.4 that the secondary containment thermal expansion test will be conducted in the hot functional testing." No documentation was added to the test results package to identify that the test had been performed. | c. TVA has developed an extensive and coordinated program to re-verify plant design. This resulted in a major restart program. This program includes the following: 1) A Design Baseline and Verification Program (DB&VP), coordinated by DNE to verify system design/configuration 2) Necessary test requirements generated by DNE to verify systems design functions required for safe shutdown of the plant. 3) Several systems which provide direct support to plant operations but not required for safe shutdown will be tested by system test specifications (STS). 4) Those systems not important to safety will be addressed by a system checklist. 5) All identified systems will utilize a system checklist to record the system status and documentation as a result of review of system procedures, hold orders, temporary alterations, engineering change notices, significant open maintenance requests, and system walkdowns. |

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Element 213.2 - BFN (Continued)

- o For Test GE-5, unit 1, "Residual Heat Removal (RHR) System," acceptable deficiencies for Change Sheet 9 stipulated "verify that 10A-K3BA and B did energize at this point in the test." The test result package did not include any documentation to verify that this test had been implemented. Also, in paragraph 6.2.4 of the preoperational test instruction, it is stated that "shutdown cooling mode operation cannot be verified until the Power Test Program when the reactor vessel can be heated up." No documentation or reference was included in the test results package to identify that the test has been implemented.
- o For Test GE-31-2A, unit 1, "Standby Diesel Generator A," GE letter GE-198, dated 06/13/73, referred to Exceptions 30, 33, 35, and 37 whereas the exceptions in the test result package were listed as 1, 2, 3, 4. Exceptions 1, 2, 3, 4 were properly dispositioned and approved by Engineering. The test package did not correlate these exceptions with Exceptions 30, 33, 35, and 37.
- o For Test GE-32, unit 2, "DC Power System," although the test result package did not include Engineering approval of supplemental disposition of Exceptions 4 and 5, the evaluation team determined that these exceptions have been satisfactorily dispositioned by the preoperational test engineer.

The above described activities are project commitments and programs which have been coordinated with TVA management and the NRC. Completion of these activities will yield a quality product and should resolve any employee concern for quality of testing/review performed during the initial preoperational test program. For the above reasons, the original test results packages will not be reopened or reviewed. With the exception of the following two concerns, the RTP program will resolve the listed concerns.

- 1) There is no requirement for "the secondary containment thermal expansion test in the hot functional testing." The "secondary leak rate test" utilizes existing surveillance instruction SI 4.7.C to verify system operation/integrity. No restart test program test will be performed.
- 2) Incorporation of temporary changes into SIs is now addressed by SUSP 2.11, Section 6.3. SIs have been successfully utilized for several years and any required temporary changes have been incorporated or deleted. Hence no further corrective action is required.

The corrective action will be completed prior to each unit restart.
(CATD 213 02 BFN 02)

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Element 213.2 - BFN (Continued)

- o For Retest RI-J2, units 1 and 2, "Raw Cooling Water System," the PWRK review checklist identified Exception/Deficiencies J and S to be placed on an action list. Equipment for these exceptions were placed on hold, and the disposition of the exceptions stated that this did not affect the test. The test package did not include any documentation to identify the removal of the hold orders.
- o For Retest RG-J0, unit 1, "Primary Containment Isolation System," the PWRK review checklist identified Exception E-1 to be placed on the pre-fuel loading checklist. Disposition of the exceptions stipulated that this exception did not affect the acceptance criteria of the test. The test package did not include any documentation relating to the closure of this exception.

Also listed in the checklist is Exception E-6. The disposition stipulated that "this will be cleared by performing the test under RG-2J, unit 1." The test package did not include any documentation to verify that this exception had been closed.

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Element 213.2 - BFN (Continued)

- o For Retest RG-J1-3, unit 1, "AC Emergency Power System Operation, ECCS Testing on Normal Auxiliary Power and Diesel Generator Power," the PURC review checklist identified exceptions/deficiencies E2, E5, E6, U4, U5, and U9 to be included on the pre-fuel loading checklist. The test result package did not include any documentation for the closure of these exceptions/deficiencies. Equipment items covered by these deficiencies/exceptions were not available for retest because of maintenance or because they were under hold. During the test, availability of voltage at the breaker terminals was checked to ensure that on removal of the hold the equipment would operate as required. This did not, however, prove the functionality of the equipment in question. For the disposition of a few other deficiencies/exceptions, the same philosophy had been used.
- o For Retest RG-J1-3, unit 2, "AC Emergency Power System Operation, ECCS Testing on Normal Auxiliary Power and Diesel Generator Power," closure of Exceptions/Deficiencies E2, E3, E6, E7, and U6 was required before the fuel loading and engineering had approved the exceptions/deficiencies without ascertaining the closure of these items. The test result package did not include the pre-fuel loading checklist, nor the documentation for the closure of these exceptions/deficiencies. As mentioned for Retest RG-J1-3, unit 1, tests were performed to ensure the availability of the power supply so that on removal of the hold, the equipment would operate as required. Also, for disposition of Exceptions/Deficiencies, such as E1, U8, U20, and U33, changes were made without proper documentation. Deficiencies U1 and U38 for retest of unit 1 and unit 2, respectively, were placed on the PURC action item log in accordance with the PURC review checklist. The test results packages did not include any documentation to identify the closure of these deficiencies. The evaluation team determined that these deficiencies were closed by disconnecting the affected equipment from the diesel generator battery and supplying the same from the 250 V dc supply panel 8 by ECH L-1794 and Work Plan 5841.

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Element 213.2 - BFN (Continued)

- o Retest RG-32-2, units 1 and 2, "125 V dc Power System," identified, during the discharge test under Surveillance Instruction (SI) 4.9.A.2.c, the terminal voltage for the 60 cells of diesel generator battery A as approximately 105 V. Individual cell voltage readings were taken and two cells were found to have terminal voltages below 1.5 V. This implies that these two cells may be defective. However, Engineering did not question these readings.

A few temporary changes were made to SI 4.9.A.2.c during the test. It was not evident that, or if, this document was revised to reflect these changes.
- o Environmental conditions for the tests were not stipulated.
- o The mechanism by which the temporary changes to the surveillance instructions (SIs) have been incorporated into the original documents was not evident.
- o Preoperational test, preoperational retest, and postmodification instructions did not reference the FSAK and scoping documents.
- o Preoperational tests with a TVA prefix and all retest results packages did not include evaluations of the effects of any outstanding ECHs on the tests.
- o Test GE-1, unit 1, "Feedwater Control System," contained four exceptions with one exception accepted without engineering justification.
- o Test GE-2, unit 1, "Reactor Water Cleanup System," contained 26 exceptions with resolution of 14 exceptions deferred until maintenance was performed or the installation was completed. No evidence was found that these exceptions were properly resolved.
- o Test TVA-08, unit 1, "Primary Containment Atmosphere Control," contained 17 exceptions, one of which was accepted by Engineering without justification.

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Element 213.2 - BFM (Continued)

- o Test Gt-5, unit 2, "Residual Heat Removal System," contained nine acceptable deficiencies. The deficiency relating to achievement of required flow rate in the torus cooling loop was accepted by OED with minimal justification even while acknowledging that the globe valve in each loop was undersized.
- o Retest RG-6, unit 1, "Reactor Core Isolation Cooling System," identified one instance of an on-the-spot replacement of a hand switch without an evaluation of the cause for switch contact failure.
- o Retest RG-22C, unit 1, "Average Power Range Monitoring System" disclosed a faulty electrical penetration. A spare electrical connection was used to repair the detected fault, but there is no evidence that this information was used to revise the applicable drawings.
- o Retest RG-32-2, units 1 and 2, "125 Vdc Power System," noted several alarms that were resolved by changing the alarm setpoints. No engineering justification was provided for acceptance of this change.
- o Retest RI-1J, units 1 and 2, "Fire Protection System," identified two circuits that did not function properly because the wrong handswitches were installed. No information was found to indicate that the affected documentation had been revised to reflect the switch changes. These changes also raise the possibility that these circuits did not function properly during the original preoperational test or during plant operation.

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Element 213.2 - BFN (Continued)

d. Deviations to preoperational test acceptance criteria were accepted by Engineering without justification. (CI indicates written justification is necessary.) Documentation of the Engineering evaluation of preoperational test deviations (deficiencies) was inadequate.

d. The preoperational test results package contained a number of deficiencies that were accepted "as-is" without engineering justification. The evaluation team did not find the number of deficiencies accepted without engineering justification to be excessive, particularly when viewed against the standards and regulatory requirements in place when these tests were being conducted.

The retest program allowed on-the-spot changes to correct deficiencies. This method did not allow a deliberate engineering evaluation. Engineering justification for acceptance of test deficiencies was inadequately documented and, on numerous occasions, documentation of justification was nonexistent.

The early PMI program was under the procedural control of the applicable portion of the plant modification instruction, BF-8.3. The applicable portions of BF-8.3 were subsequently deleted and a new more effective program was defined in procedure, SUSP-17.2. The evaluation team looked at several PMI results packages and found that engineering evaluation of test deficiencies was evident.

The restart test program procedure SUSP-12.1 for unit 2 was evaluated and found to include procedural controls for the handling of test deficiencies, but the expedience of on-the-spot corrections of deficiencies still exists. Independent audits could be used effectively to verify that on-the-spot corrections do not affect design. No results packages were reviewed as no tests have been completed yet.

d. SUSP 12.1 "Restart Test Program," Rev. 1, (Section 6.6) and SUSP 17.2, "Post Modification Test Program" provide means of documenting deficiencies. Engineering will be involved in any design changes resulting from these programs since some form of design change documents must be issued to physically change plant design. Also, BFN Standard Practice BF 8.3, Revision 9 (Section 9.3) states "Test Deficiencies shall be handled in accordance with SUSP 17.2." Engineering involvement in design changes is documented in both NEP 6-1, Rev. 0 and PI-86-03, Rev. 2 adequately. Also see corrective actions for issue c. (CATD 213 U2 BFN 05)

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Element 213.2 - BFN (Continued)

e. Peripheral finding.

e. The evaluation team found discrepancies between the FSAR, Section 13.4 (test summary), and the test result packages described below.

- o Test GE-31-2A, unit 1; Retest RG-31-3, unit 1; and Retest RG-31-3, unit 2 - FSAR Section 8.5 stipulates that IVA meet the diesel generator capacity requirement of AEC Safety Guide 9. Section 8.5.4.2 and Figure 8.5-19 of the FSAR indicate that computer studies have been conducted to represent the most severe loading that the pumps and motors (and therefore the diesel generator) can encounter. The most severe voltage drop occurs on starting the 2,000 hp RHR pump motor, plus miscellaneous 480 V loads. The calculated results show that the voltage initially dips to approximately 47 percent motor voltage and recovers to 80 percent voltage in 1.4 seconds. The RHR pump motor comes to full speed at 3.5 seconds, whereas in actual tests, the RHR pump motor accelerated at 3.5 seconds without the miscellaneous 480 V loads. The FSAR also states that the motors involved have been checked with the manufacturer to verify that they will reach full speed under load for the condition stated above. In none of the above tests and retests were 480 V loads automatically sequenced per the established loading sequencing of the plant. IVA also did not measure the frequency dip during the load sequencing of diesel generators. Even though Safety Guide 9 was not met literally, the intent appeared to have been met, but no justification was provided for not sequencing the 480 V loads.

The test summary under "Standby AC Power System test GE-31," of Section 13.4 of the FSAR, contains commitments to (1) check automatic redistribution of load after failure of one diesel, and (2) perform an integrated test to demonstrate operation of all plant safety systems subsequent to a loss of offsite power. The evaluation team interpreted this second requirement to mean loss of offsite power to all three units.

- e. A review of the "FSAR Commitment" will be performed by Browns Ferry Nuclear Project. FSAR corrections and/or RIP modifications will be made as required by the results of that review. CAQR BFF870088 corrective action defined an extensive program for updating and correcting FSAR inaccuracies. The corrective action will be completed before unit 2 restart.
(CAIU 213 02 BFN 01)

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Element 213.2 - BFN (Continued)

The test result packages reviewed by the evaluation team did not contain any tests to meet the commitment (1) above. For commitment (2), IVA has conducted loss-of-offsite-power tests on a unit basis only. Diesel generator loading, including the degree of commitment to AEC Safety Guide 9, is discussed in Subcategory Report 24600, Element 243.0.

- o The test summary under "4.16 kV Electrical System - Normal Auxiliary Power System (IVA-9)," of Section 8.4 of the FSAR, stipulates to (1) demonstrate loading and voltage regulation design objectives under design criteria loading (i.e., under the most degraded conditions) and (2) verify short-circuit and inverse-time protection of all 4 kV circuit breakers supplying power to class 1 boards.

The test result packages for test IVA-9 and Retest RT-9 did not include any tests to meet the above stipulations. It is not feasible to verify by test the loading and voltage regulation under the most degraded voltage condition. However, Section 8.4 of the FSAR states that IVA has performed voltage drop analyses to verify that the AC auxiliary power system is capable of supplying sufficient voltage to successfully start and run all safety motors without transfer to onsite (diesel) power for normally expected system loading. Bechtel North American Power Corporation (BNAPC) has performed a load flow study for the adequacy of the AC auxiliary power system. In the study, BNAPC has identified the requirements of NRC-Branch Technical Position PSB-1, Section B4 to verify the analytical techniques and assumptions used in the voltage drop analyses results by actual measurements.

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Element 213.2 - BFN (Continued)

With reference to FSAR stipulation (2), it is also not feasible to verify the short circuit rating of the breakers in the plant. The short-circuit capability of the breakers is tested in the manufacturer's plant and certified. The TVA Electrical Engineering Branch determines the rating of the breakers required for the plant from short-circuit studies. Inverse-time overcurrent relay coordination study are prepared by the TVA Protection Analysis group, and the DPSU engineering group calibrates the relays on a routine basis.

- o The test summary under "Emergency Equipment Cooling Water System (IVA-4)," of Section 13.4 of the FSAR, stipulates to verify the capability of the system to automatically supply raw river water to the assigned receivers upon initiation by an accident signal or by signal from the assigned receivers. Test IVA-4 did not include any test to verify the above stipulation. However, the emergency equipment cooling water system (EECW) has been tested for automatic initiation by an accident signal during the preoperational testing of the diesel generators. Also, in accordance with SI-4.2.B-67, the EECW system is tested once every 6 months for automatic initiation on raw cooling water system distribution system (assigned receivers) low pressure.

While reviewing the test results for RG-J1-3, unit 2, the evaluation team noted that test steady-state voltages for diesel generators A, B, C, and D were high. The voltage for diesel generator A was particularly high, 5250 V, when compared with a nominal voltage of 4160 V (Ref. Data Sheets 5.5.B, 5.6.A, and 5.7.A). Such a high voltage could stress the winding of the generators and cause damage to the insulation unless the problem is rectified expeditiously. Engineering did not question high test steady state voltage for diesel generators.

There remains some uncertainty whether the high voltage actually existed or operator error occurred when reading the instrumentation. Subsequent performance of monthly surveillance instruction SI 4.9.A.1 resulted in proper steady state voltage for the affected diesel generators. Even though no further corrective actions are required, TVA intends to include the voltage tolerance in their restart test procedures for all diesel generators. Any case of voltage exceeding the tolerance will be recorded and evaluated. This will be completed before unit 2 restart.
(CATD 213 02 BFN 03)

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|---|--|--------------------|
| Element 213.2 - BLN | BLN | BLN |
| a. The electrical test program and planning are inadequate. | a. Engineering participation in the overall preoperational test program was found to be adequate based on evaluation of test scoping documents and test results packages (Refs. 33 and 34). With regard to planning, initial test identification is the responsibility of Engineering with review information received from the site test coordinator. The responsibility for scheduling and planning resides with the site test coordinator with review information received from Engineering. In recognition of the fact that most of the engineering functions are unscheduled support activities, the evaluation team found no evidence that staffing was inadequate to provide reasonable test activity support. | a. None required. |
| b. Engineering participation in the program in providing acceptance criteria is inadequate. | b. On the basis of the completed test packages and PIs reviewed (Refs. 33 and 34), Engineering participation in the establishment of acceptance criteria was found to be adequate. | b. None required. |

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Element 21J.2 - BLM (Continued)

c. Engineering participation regarding the conduct of the tests and the review of the test results is inadequate.

c. The packages reviewed included scoping documents and PTIs. Engineering participated during testing on an as-needed basis for observation and guidance. Test results packages, including PTIs and acceptance criteria, were reviewed and documented by Engineering. The evaluation team also found a number of procedural deficiencies or evaluation inconsistencies.

The procedural deficiencies or evaluation inconsistencies observed by the evaluation team are not significant and do not invalidate the overall adequacy of the Engineering participation in the preoperational test program. Several examples of the types of procedural deficiencies or evaluation inconsistencies observed by the evaluation team are cited below:

o For Test PT-EB-01, unit 1, "TVA Offsite (Preferred) Power System (Unit Boards)," a change was made without proper documentation for the disposition of Deficiency DN-4. Deficiency DN-9 was encountered at test steps 5.3.2.8 and 5.3.2.14. Change number CN-14 was issued to disposition DN-9 but this contained only step 5.3.2.8. Also, test instructions for step 5.3.2.14 did not reference CN-14. Engineering comment 1 on page 2 of the approval form is still open. Scoping document step 7.2(g) states, "when that feeder voltage has been restored to 90 percent of nominal, ACB 52H-151 will automatically reclose." Sections 5.5 and 5.6 of the test results package did not include any steps to verify the voltage.

c. The preoperational test program has been suspended and all completed tests will be redone when the test program is reactivated. With this preface, the emphasis of the corrective action will be to improve the existing program to minimize procedural deficiencies and inconsistencies within the Bellefonte preoperational test program. Though the identified findings of this report will certainly be retained and specifically applied to each individual test, where appropriate, the existing documentation will not be corrected since it will be completely redone.

The following steps will be accomplished to improve the overall test program:

1) within ONE,

a) ULN-specific engineering procedures will be developed to ensure all aspects of preoperational testing, including documentation, is handled in a quality manner (this will include ensuring that design criteria in the FSAR and test documents are consistent.)

b) ONE test representatives will be trained in the use of the procedures. Per NEP 10.4, the scoping documents are now considered a design output document requiring verification of technical content and are to be maintained current. This will be implemented upon reactivation of the preoperational test program.

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Element 213.2 - BLH (Continued)

- o For Test PI-IL-01A, unit 1, "Solid State Control System (Diesel Generator Loading Logic)," no environmental condition was stipulated, although the scoping document required that area environmental conditions must be maintained within the tolerances specified in FSAR Table 3.11.1-2 for normal conditions throughout the test period. In Section 3.0 of the scoping document, it was stated that Test PI-EJ-01, "120 V Vital AC Power System," should have been completed to provide the required power supplies to the solid-state control system (SSCS). Test PI-EJ-01 has not yet been completed. To clear Deficiency DN-3, the sequence controller card was replaced without proper documentation. The method by which general Engineering comments are resolved is not evident.
- o For Test PI-IL-01B, unit 1, "Solid-State Control System (Alarm Verification)," Appendix A referenced Test Scoping Document PI-IL-01. This document did not address alarm verification; it dealt only with Test PI-IL-01A. For disposition of Deficiencies DN-6, DN-10, and DN-11, changes were made without proper documentation.
- o For Test PI-GC-01B, unit 1, "CO₂ Fire Protection System (UG Building)," there was no evidence that punch list items 8 and 9 of draft 2 of the PTI have been resolved. The root valve to IGCV-IPI-010 was placed on hold "Exception." In the disposition of Exception EH-7, it was stated that this unresolved item did not affect the test. The test package did not include any documentation to identify the removal of the hold order. For the disposition of Deficiencies DN-7, DN-13, and DN-15, changes were made without proper documentation. There was no evidence that Engineering general comments on the test results package were resolved. After the issuance of the test scoping document for Test PI-GC-01B, a few change sheets were issued for PI-GC-01, even though these are related to PI-GC-01B. Engineering dispositioned Test Deficiency report PI-22 (DN-15) as unacceptable. Deficiency DN-15 has been closed by installing resized nozzles, but Test Deficiency Report PI-22 has not been closed.

- 2) All preoperational testing is scheduled to be accomplished/reevaluated.
- 3) With NUC PR, administrative procedure BLA-7.4 will be revised to ensure procedural deficiencies and inconsistencies are minimized.
- 4) A special independent evaluation team will be assembled by NSU staff to verify that program requirements are implemented.

The above actions should minimize the procedural deficiencies as noted in the findings.

The corrective actions will be completed prior to fuel load.
(CATD 213 02 BLN 01)

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Element 213.2 - BLN (Continued)

- o For test PI-VP-01, units 1 and 2, "Intake Pumping Station Heating and Ventilating System," the fan motor RPM has not been recorded as required by paragraph 5.8 of the test scoping document. Paragraph 5.8 has been indicated as part of "Prerequisites." In actuality, this paragraph should be part of the test. The test results package did not address the environmental conditions in accordance with the test scoping documents. Deficiency UN-2 should be referenced to step 5.1.4 and not to step 5.1.5. Paragraph 4.2 of the test scoping document required an alarm in the main control room for high limit thermostats in each essential raw cooling water (ERCW) pump room. The test results package did not include any step to verify this.
- o For Test PI-VG-01, unit 1, "Diesel Generator Building Environmental Control System," method by which general engineering comments were resolved is not evident. Step 6.11 of the acceptance criteria should read, "the set points were correct to within $\pm 3^{\circ}\text{F}$ " instead of " $\pm 3\%$."
- o For Test PI-NF-01C1, unit 2, "Fuel Handling Equipment (Spent Fuel Rack Dry Test," paragraph 3.1, under "Precautions," it was stated, "Avoid excessive actuation of grapple mechanism while dry. A limit of (10) cycles of the fuel grapple in one hour is recommended before the grapple must be immersed in, or sprayed with water for lubrication." Test scoping document PI-NF-01 specified a limit of 100 cycles, but did not stipulate any interval time. No appendix has been added to the test results package for "Test Record Drawings."
- o For Test PI-NF-01A, unit 1, "Fuel Handling Equipment, Fuel Storage Handling Bridge, and New Fuel Elevator," disposition of Deficiencies UN-9 and UN-15 was made without proper documentation. The method by which general Engineering comments were resolved is not evident.

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Element 213.2 - BLN (Continued)

o For Test PF-NF-01A, unit 2, "Fuel Handling Equipment - Fuel Storage Handling Bridge, and New Fuel Elevator," actuators for limit switches LS-32 and LS-33 were not installed but necessary steps to perform the tests were added. The test results package did not include any action item list for the installation of the actuators. Similarly, no action item list was included for the installation of PFU relays. Appendix E (Test Record Drawings) did not include Stearns Rogers Drawings L22355, Sheet 96, as referenced in Deficiency Report TDR-4. For the disposition of Deficiency U-11, changes were made without proper documentation. For Test PF-NF-01A, unit 1, steps 5.4.27 to 5.4.36 have been changed to accommodate the dummy fuel assembly being located in the fuel storage racks. For unit 2, similar changes were not made.

o For Test PT-EU-01A, R1, unit 1, "125V Class 1E DC Vital Power System (System Test)," Appendix A of the PFI should reference Test Scoping Document PT-EU-01A, not PT-EU-01. FSAR Section 14.2 should also be referenced in Appendix A.

Section 4.0 of the test scoping document stated, "Before starting the test, the battery initial conditions . . . requirements of paragraph 5.1 of reference 1.11." It should state paragraph 6.1 of reference 1.11. Also, the test scoping document stated the thermometer accuracy as $\pm 1^{\circ}\text{F}$, whereas the PFI stated the accuracy to be $\pm 2^{\circ}\text{F}$. Service tests should reflect the battery's ability to satisfy the design requirements (battery duty cycle) of the dc system.

o For Test PT-EJ-01, R0, unit 1, "120V Vital AC Power System," the test scoping document referred to Test TVA-16 under Section 4, "Prerequisites." The correct reference should be Test PT-EU-01A and B. Also, this document did not reference the FSAR. In addition, the PFI did not reference the test scoping document or the FSAR.

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Element 213.2 - BLN (Continued)

- o For Test PT-IV-01, Draft 1, units 1 and 2, "Environ Radiation Monitoring System," Appendix A did not reference the test scoping document or the FSAR. The document itself did not reference the FSAR.
- o For Test PT-NU-01A, Draft 4, "Decay Heat Removal System (Component Checkout)," the decay heat removal system was divided into three separate tests: PT-NU-01A; PT-NU-01B, "Decay Heat Removal System (Fuel Pool Support Test)"; and PT-NU-01C, "Decay Heat Removal (Hot Functional)." However, there was only one Test Scoping Document, PT-NU-01. The document did not indicate the portions applicable to each individual test. The document needed a revision to reflect all the requirements of FSAR Section 14.2. Valve numbering in the scoping document did not agree with the PII. The PII did not reference this document or the FSAR.
- o For Test PT-KE-01A, RO, "Essential Raw Cooling Water (ERCW) System (Functional Pkg 1)," the ERCW system was divided into three separate tests: PT-KE-01A; PT-KE-01B, "Essential Raw Cooling Water System (Functional Pkg 2)" and PT-KE-01C, "Essential Raw Cooling Water System (Flow Balance)." There were three tests even though there was only one Test Scoping Document, PT-KE-01. The scoping document did not indicate the portions applicable to each individual test. Steps should be added to the PII for Test PT-KE-01A for automatic shutdown of all operating ERCW pumps and subsequent startup of all ERCW pumps on a simulated loss of offsite power to agree with the scoping document. Section 5.1, "Unit 1 Test (under Unit 2 Construction)" of the test scoping document should be added under "Precautions" of the PII. The scoping document did not address the environmental conditions. FSAR Section 14.2 was not referenced in Appendix A of the PII.

ATTACHMENT B
SUMMARY TABLE OF SUBCATEGORY ELEMENTS
SUBCATEGORY 21300

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Issues

Findings

Corrective Actions

Element 213.2 - BLN (Continued)

- o For Test PI-KL-UIC, Draft 2, "Essential Raw Cooling Water System (Flow Balance)," some items of the data sheets for the PFI Flow Requirements Data did not agree with the test scoping document tables, "Alignment for Flow Balance Test."
- o In many instances, a preoperational test for a system was divided into multiple preoperational tests, but there was only one test scoping document for the system. The document did not indicate portions applicable to each individual test.
- o Some PFIs did not reference scoping documents with revisions in Appendix A. None of the PFIs referenced environmental conditions. Some of the scoping documents also did not reference environmental conditions.
- o The method by which scope document changes have been incorporated into the PFIs or vice versa was not evident.
- o Some PFIs did not reference the applicable FSAR section in Appendix A. Only one PFI referenced FSAR Section 14.2 in Appendix A. Some of the scoping documents did not reference the applicable FSAR section.

ATTACHMENT B
SUMMARY TABLE OF SUBCATEGORY ELEMENTS
SUBCATEGORY 21300

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| Issues | Findings | Corrective Actions | | | | | | | | | | |
|---|--|---|----|--|---|----------------------------|---|----------------------|----------|-------|----|---|
| Element 213.2 - BLN (Continued) | | | | | | | | | | | | |
| <p>d. Deviations to preoperational test acceptance criteria were accepted by Engineering without justification. (CI indicates written justification is necessary.) Documentation of the Engineering evaluation of preoperational test deviations (deficiencies) was inadequate.</p> | <p>d. To evaluate Issue "d," the evaluation team reviewed all preoperational test deficiency reports processed to date. Deficiency reports were dispositioned on a printed form identified with a sequential number preceded by PT, i.e., PT-01 through PT-88. Within this group, 35 PTs were found to have an "acceptable deficiency" disposition. The basis for acceptance of these deficiencies was provided in all cases. The evaluation team grouped the acceptance basis into four categories:</p> <table style="margin-left: 40px;"> <tr> <td>1. Acceptance based on engineering judgment</td> <td style="text-align: right;">18</td> </tr> <tr> <td>2. Acceptance based on satisfactory retest</td> <td style="text-align: right;">4</td> </tr> <tr> <td>3. Acceptance based on ECN</td> <td style="text-align: right;">8</td> </tr> <tr> <td>4. Instruction error</td> <td style="text-align: right;"><u>5</u></td> </tr> <tr> <td style="text-align: center;">Total</td> <td style="text-align: right;">35</td> </tr> </table> <p>Acceptable deficiencies placed in categories 2 through 4 were resolved or corrected by clearly documented methods. The remaining deficiency reports were given an acceptable disposition on the basis of engineering judgment. The evaluation team found no requirement in the applicable procedures that defined or addressed the extent of written technical justification required to support a decision based upon engineering judgment.</p> <p>To evaluate this issue, the evaluation team reviewed ANSI N45.2.11 which states, in part, that design activities be prescribed in ". . . written form, which provides adequate control and permits reviewing, checking, or verifying the results of the activity by personnel who are experienced in the subject activity." The issue of adequate technical support level for technical justification of engineering judgment is also addressed in a supplement to NEP-3.2. The supplement to NEP-3.2 requires that the written basis for an engineering judgment be ". . . sufficiently clear to permit another engineer versed in the particular discipline to understand the preparer's thought process."</p> | 1. Acceptance based on engineering judgment | 18 | 2. Acceptance based on satisfactory retest | 4 | 3. Acceptance based on ECN | 8 | 4. Instruction error | <u>5</u> | Total | 35 | <p>d. As noted in the corrective action to issue c, the preoperational tests for Bellefonte are scheduled to be reaccomplished. Therefore, these identified deficiencies will be voided and no action will be taken to resolve the specific deficiencies. However, the lessons learned will be factored into the procedures and training program as outlined in the corrective action to issue c. Furthermore, supplement to NEP 3.2 requires engineering judgment to be documented by providing technical justification for the acceptance of test deficiencies. The corrective action will be completed before unit 1 fuel load. (CATU 213 02 BLN 02)</p> |
| 1. Acceptance based on engineering judgment | 18 | | | | | | | | | | | |
| 2. Acceptance based on satisfactory retest | 4 | | | | | | | | | | | |
| 3. Acceptance based on ECN | 8 | | | | | | | | | | | |
| 4. Instruction error | <u>5</u> | | | | | | | | | | | |
| Total | 35 | | | | | | | | | | | |

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SUMMARY TABLE OF SUBCATEGORY ELEMENTS
SUBCATEGORY 21300

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Issues

Findings

Corrective Actions

Element 213.2 - BLN (Continued)

On the basis provided by ANSI N45.2.11 and the supplement to NLP-3.2, the evaluation team found that a significant number of the deficiencies given an acceptable disposition had insufficiently documented technical justification for acceptance.

e. Peripheral finding.

e. The evaluation team found discrepancies in the acceptance criteria among test scoping documents, PTIs, and the FSAR for Tests PT-EU-01A, PT-EJ-01, and PT-KE-01C. In addition, there was no statement in the acceptance criteria of the test results package for Test PT-VP-01 to demonstrate electrical independence as stated in FSAR Section 14.2.

e. TVA recognizes that FSAR Chapter 14 is out of date.

The corrective action plan is as follows:

- 1) Incorporate the proposed major revision to Chapter 14 of the FSAR
- 2) Sort and retain by test each of the identified findings in the BLN Preop Test Records Management Files (maintained by DNE-NEB Preop Section) to be resolved upon reactivation of test program.
- 3) Ensure through development/revision of procedures and training as proposed in corrective action to issue c that the requirements/objectives/methods, etc., for the various preoperational tests are uniformly and accurately reported in all affected documents.

The corrective action will be completed before unit 1 fuel load. (CAID 213 02 BLN.03)

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SUMMARY TABLE OF SUBCATEGORY ELEMENTS
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| Issues | Findings | Corrective Actions |
|---------------------------------|--|---|
| Element 213.2 - BLN (Continued) | The evaluation team considered the starting of standby exhaust fans, in the event of CO ₂ simulation for completed Test PT-VG-01, to be a design error. | The steps as written for the preoperational test instruction PT-VG-01 allows the starting of standby fan and then stopping the fan by simulated CO ₂ initiation. The CO ₂ logic including the stopping of both normal and standby fans simultaneously was tested in Test PT-GC-01B - Fire Protection System (DG Building). The corrective action plan is as follows: The appropriate steps in Test PT-VG-01 will be clarified to indicate its intent of stopping the running fan and to record the starting time of the standby fan. A statement will also be added that this step and the test are not to verify the CO ₂ system logic. A further statement will be added to indicate that CO ₂ logic and equipment (i.e. PE-2 relay) will be tested in test PT-GC-01B. The corrective action will be completed prior to unit 1 fuel load. (CATD 213 02 BLN 04) |



ATTACHMENT C

REFERENCES

1. Sequoyah Element Report 213.2, "Inadequate Electrical Testing, Planning, and Electrical Participation; Deviations to Preoperational Test Acceptance Criteria," Rev. 2 (05/07/87)
2. Watts Bar Final Safety Analysis Report (FSAR), Chapters 8 and 14, updated through Amendment 55 (04/15/85)
3. Browns Ferry Final Safety Analysis Report (FSAR), Chapters 8 and 13, Amendment 31
4. Bellefonte Final Safety Analysis Report (FSAR), Chapters 8 and 14, updated through Amendment 27 (06/20/86)
5. Sequoyah Final Safety Analysis Report (FSAR), Chapters 8 and 14, updated through Amendment 3 (04/86)
6. NRC memo from Schwencer to Watson (TVA) attaching "Supplement #1 to Safety Evaluation Accepting Proposed Preoperational Retest Program for Units 1 and 2," (06/18/76) (BFN)
7. EN DES-EP 6.01, Preoperational Testing Documents - Processing, Rev. 1 (07/24/77); Rev. 2 (10/05/78); Rev. 3 (05/25/79); Rev. 4 (10/28/80); Rev. 5 (01/12/83)
8. NEB-DI-125-03, Preoperational Testing Documents - Processing, Rev. 0 (07/01/85)
9. NEP-3.2, "Design Input," Rev. 0 (07/01/86)
10. AI-6.2, "Watts Bar Nuclear Plant - Administrative Instruction - Preoperational Test Program," Rev. 0 (08/10/82)
11. TVA memo from Cantrell to Those Listed, "DNE Interim Order - Supplement to NEP-3.2," [B05 861222 502], (12/22/86)
12. Preoperation and Review of Preoperational Test BF-87, Part 1, 11 and 111, 12/09/70, 09/07/72 and 01/07/74, respectively, (canceled after the commercial operation of the units)

13. Procedure for Performance of Preoperational Test BF-100, Rev. 0 (11/17/71), Rev. 1 (10/11/72), Rev. 2 (03/13/73), Rev. 3 (05/24/76), canceled on 11/30/76
14. Preoperational Retest Program BFA-70, Rev. 0 (08/27/75), canceled on 03/16/77
15. Plant Modifications, Standard Practice BF+8.3, Rev. 0 (08/80)
16. Handling of Test Deficiencies BF-10.9, Rev. 0, (06/28/83)
17. Postmodification Test Program, SD SP-17.2, Rev. 0, (11/06/86) (BFN)
18. Restart Test Program, SDSP-12.1, Rev. 0 (01/21/87) (BFN)
19. BLA 7.4, "Bellefonte Nuclear Plant, Standard Practice - Preoperational Test Program," Rev. 10 (12/12/85)
20. TVA Topical Report, TR 75-1A, "Quality Assurance Program Description for the Design, Construction, and Operation of TVA Nuclear Power Plants," Rev. 8, (04/09/85)
21. TVA Nuclear Quality Assurance Manual (NQAM) (06/20/86) Part II, Section 4.1, "Preoperational Program"
22. TVA Interdivisional Quality Assurance Procedures Manual for Nuclear Power Plants (IPM):
IN-QAP-11.1 "Preoperational Testing" (10/20/86)
23. TVA Nuclear Performance Plans:
Revised Corporate Nuclear Performance Plan, Volume 1 (03/86)
Revised Sequoyah Nuclear Performance Plan, Volume 2 (03/87)
Browns Ferry Nuclear Performance Plan, Volume 3 (08/86)
Watts Bar Nuclear Performance Plan, Volume 4 (03/87)
24. Sample of preoperational test results package reviewed (SQN):
TVA-15 and 15RT "Vital 120-V AC Power System"
TVA-16 "Vital 125-V AC Power System"
TVA-41 "Containment Isolation System"
W-2.2 "Residual Heat Removal System"
TVA-13B1 "Onsite AC Distribution System"
TVA-1 "Emergency Gas Treatment System"
TVA-18A "Essential Raw Cooling Water System"
TVA-30 "Condenser Vent System"
TVA-33 "Radiation Monitoring System"

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25. Deficiency Reports PT-001 through PT-800 (SQN)
26. Sample of preoperational test results packages reviewed (WBN):
- TVA-1 "Shield Building Inleakage Rate Test - EGTS Functional"
 - TVA-13B "Onsite AC Distribution System (Diesel Generator
TVA-13BRT Loading Logic)"
 - TVA-15 "Vital 120-V AC Power System"
 - TVA-16A "Vital 125-V DC Power System"
 - TVA-16B "Battery Load Verification"
 - TVA-18A "Essential Raw Cooling Water System"
 - TVA-18B "Essential Raw Cooling Water System - Flow Balance"
 - TVA-18C "Essential Raw Cooling Water System - Flow Balance"
 - TVA-30 "Condenser Vent Systems"
 - TVA-33 "Environ's Monitoring System"
 - TVA-41 "Containment Isolation System"
 - W-4.1 "Residual Heat Removal System"
27. Preoperational Test Deficiency Report No. PT-301 through PT-574 (02/84 through 08/84, WBN)
28. Preoperational Test Deficiency Report No. PT-576 through PT-651 (08/84 through 12/84, WBN)
29. Preoperational Test Deficiency Report No. PT-653 through PT-741 (01/85 through 02/87, WBN)
30. Samples of preoperational test results packages reviewed (BFN):
- TVA-4 "Emergency Equipment Cooling Water System," unit 1
 - TVA-6B "Primary Containment Atmosphere Control," unit 1 (Reviewed by evaluation team only for issue "d" of the element)
 - TVA-9 and 9A "4.16 kV Electrical System - Normal," unit 3
 - TVA-20 "Secondary Containment Leak Rate Test," unit 2

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- TVA-23 "Environs Monitoring," units 1, 2, and 3
 - TVA-32 "Raw Cooling Water System," unit 2
 - * GE-1 "Feedwater Control System," unit 1
 - * GE-2 "Reactor Water Cleanup System," unit 1
 - GE-5 "Residual Heat Removal System," unit 1
 - GE-30 "Primary Containment Isolation System Test," unit 1
 - GE-31-2A "Standby Diesel Generator A," unit 1
 - GE-32 "DC Power System," unit 2
 - GE-32-2 "DC Power System," unit 3
 - GE-33 "Unit Preferred Power System (120 V ac)," unit 1
31. Samples of preoperational retest results packages reviewed (BFN):
- RT-9 "4.16 kV Electrical System (Normal)," unit 1
 - * RT-13 "Fire Protection System (Water and CO₂)," units 1 and 2
 - RT-32 "Raw Water Cooling System," units 1 and 2
 - * RG-6 "RX Core Isolation Cooling System," unit 1
 - * RG-22C "Average Power Range Monitoring System," unit 1
 - RG-30 "Primary Containment Isolation System," unit 1
 - RG-31-3 "AC Emergency Power System Operation, ECCS Testing on Normal Auxiliary Power and Diesel Generator Power," unit 1
 - RG-31-3 "AC Emergency Power System Operation, ECCS Testing on Normal Auxiliary Power and Diesel Generator Power," unit 2
 - RG 32-1 "DC Power System (250 V)," units 1 and 2
 - RG 32-2 "DC Power System (125 V)," units 1 and 2
32. Samples of postmodification test result packages reviewed (BFN):
- PMT-08A "500 kV SWYD System as One Offsite Power System," units 1, 2, and 3

* Reviewed only for issue "d" of the element.

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PMT-109 "RHR Return Line Orifice," units 1, 2, and 3

PMT-118 "DG Paralleling Circuit Test," units 1, 2, 3

33. Samples of completed preoperational test results packages reviewed (BLN):

PT-EB-01 "TVA Offsite (Preferred) Power System (Unit Boards)," units 1 and 2

PT-GC-01B "CO₂ Fire Protection System (DG Building)," unit 1

PT-IL-01A "Solid State Control System (Diesel Generator Loading Logic)," unit 1

PT-IL-01B "Solid State Control System (Alarm Verification)," unit 1

PT-NF-01A "Fuel Handling Equipment - Fuel Storage Handling Bridge and New Fuel Elevator," unit 1

PT-NF-01A "Fuel Handling Equipment - Fuel Storage Handling Bridge and New Fuel Elevator," unit 2

PT-NF-01B "Fuel Handling Equipment (New Fuel Storage Racks Draft test and New Fuel Handling Tool)," units 1 and 2

PT-NF-01C "Fuel Handling Equipment (Spent Fuel Racks Drag Test and Fuel Handling Tools)," unit 1

PT-NF-01C1 "Fuel Handling Equipment (Part 1 Spent Fuel Racks Drag and Index Test)," unit 2

PT-VG-01 "Diesel Generator Building Environmental Control System," unit 1

PT-VP-01 "Intake Pumping Station Heating & Ventilating System," units 1 and 2, common

PT-XE-01A "500kV Switchyard System as One Offsite Power System (Switchyard)," unit 1

PT-XE-01B "500kV Switchyard System as One Offsite Power System (Transformers)," unit 1

PT-XE-01B "500kV Switchyard System as One Offsite Power System (Transformers)," unit 1

34. Samples of preoperational test instructions and test scoping documents reviewed (BLN):

PT-EJ-01 "120V Vital AC Power System," unit 1

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- PT-EU-01A 125V Class 1E DC Vital Power System," unit 1
- PT-IV-01 "Environs Monitoring System," units 1 and 2
- PT-KE-01A "Essential Raw Cooling Water System (Functional Pkg 1),"
unit 1
- PT-KE-01B "Essential Raw Cooling Water System (Functional Pkg 2),"
unit 1
- PT-KE-01C "Essential Raw Cooling Water System (Flow Balance)," unit
1
- PT-ND-01A "Decay Heat Removal System (Component Checkout)," unit 1
35. Preoperational Test Deficiency Report No. PT-01 through PT-88 (05/79
through 07/85, BLN)
36. 10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power
Plants," Criteria 17 and 18 (07/71 and 01/01/73)
37. 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power
Plants and Fuel Reprocessing Plants," (as amended 01/75)
38. Regulatory Guide 1.64, "Quality Assurance Requirements for the Design of
Nuclear Plants," (06/76)
39. Regulatory Guide 1.68, "Initial Test Program for Water-Cooled Nuclear
Power Plants," (11/73, 01/77, and 08/78)
40. AEC Guide for Planning of Preoperational Testing Programs, (12/07/70)
41. AEC Safety Guide 9, "Selection of Diesel Generator Set Capacity for
Standby Power Supplies," (03/07/71)
42. NRC Branch Technical Position PSB-1, Adequacy of Station Electric
Distribution System Voltage, Rev. 0, (07/81)
43. Regulatory Guide 1.108, "Periodic Testing of Diesel Generator Units Used
As Onsite Electric Power Systems at Nuclear Power Plants," Rev. 1, (08/77)
44. ANSI N45.2.11-1974, "Quality Assurance Requirements for the Design of
Nuclear Power Plants," (06/06/74)
45. Letter from B. J. Youngblood, NRC, to S. A. White, TVA, with the attached
transcript of the investigative interview conducted by the NRC on
02/21/86 at the First Tennessee Bank Building in Knoxville, TN,
[845 860714 832], (06/25/86)

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46. TVA memo from Green to Sprouse, "Preoperational Testing Program Phaseout," [L41 820317 818], (03/23/82) (SQN)
47. TVA memo from Sprouse to Green, "Preoperational and NCS (Noncritical System) Testing Programs Phaseout," [NEB 820512 274], (05/12/82), (SQN)
48. TVA memo from Raulston to Campbell, "Preoperational Test Program Phaseout," [NEB 820728 261], (07/28/82), (SQN)
49. TVA memo from Cottle to Parris, "Operational Readiness Review," [A02 851113 016], (11/14/85) (SQN)
50. TVA memo from Pierce to Ballentine, "EN DES Certification for Fuel Loading," [NEB 800227 209], (02/27/80), (SQN)
51. TVA memo from Dunham to Fox, "EN DES Certification for Fuel Loading," [NEB 800229 273], (02/29/80), (SQN)
52. TVA memo from Cantrell to Ballentine and Stack, "EN DES Certification for Fuel Loading," [SWP 810616 001], (06/12/81), (SQN)
53. TVA memo from Sprouse to Green, "EN DES Certification for Fuel Loading," [NEB 810701 272], (07/01/81), (SQN)
54. TVA memo from D. R. Patterson to Those Listed, "Electrical Engineering Branch Review of Electrical and Instrumentation in Control Systems Preoperational Test," (09/19/75), (SQN)
55. TVA memo from D. R. Patterson to Those Listed, "Preoperational Testing Program - Electrical Engineering Branch Review," [NEB 790302 361], (03/01/79), (SQN)
56. TVA memo from J. A. Raulston to Those Listed, "Preoperational Testing Program - Electrical Engineering Branch Review," [NEB 810210 251], (02/09/81), (SQN)
57. TVA memorandum from Raughley to Those Listed, "Sequoyah Nuclear Plant (SQN) - Potential Generic Condition Evaluation," [B25 870207 036], (02/07/87), [B26 870226 457], (02/26/87)
58. TVA memo from Durham to Those Listed, "Designation of DED Test Representatives for Preoperational Retesting of Units 1 and 2 after March 22, 1975, Cable Tray Fire - Test Program and Documentation," (05/20/75) (BFN)
59. TVA memo from Weaver to Mechanical Design Branch Preop Test Representatives and Results Reviewers and Their Supervisors, "Preoperational Test Program," (03/06/73) (BFN)
60. TVA memo from Parrish to Kellegham, "Browns Ferry Nuclear Plant Preoperational Test Program," (10/30/70)

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61. TVA memo from Durham to Benkus (GE), "Preoperational Testing NIM-1, NIM-300 & BFN-63," (08/02/71) (BFN)
62. INPO Report, Evaluation of Tennessee Valley Authority (TVA), Watts Bar Nuclear Plant (06/85)
63. Review of Design and Configuration Control on Watts Bar by Stone & Webster Engineering Corporation, (02/86 Draft)
64. Assessment of Engineering Design Control for Browns Ferry Nuclear Plant by Bender, Cole, Laurent, Sabin, (09/85)
65. TVA Problem Identification Report by E. C. Mathews relating to testing of diesel generators, [B21 870306 019], (03/06/87), and corrective action [B21 870519 013], (05/19/87) (BLN)
66. Letter from R. C. Lewis, NRC, to H. G. Parris, TVA, with attached Inspection Report Nos. 50-390/83-51 and 50-391/83-40, [NEB 840118 220], (01/12/84)
67. Letter from D. M. Verrelli, NRC, to H. G. Parris, TVA, with attached Inspection Report Nos. 50-390/84-81 and 50-391/84-55, [L44 841119 641], (11/13/84) (WBN)
68. Letter from D. M. Verrelli, NRC, to H. G. Parris, TVA, with attached Inspection Report Nos. 50/390/84/87 and 50-391/84-59, [L44 841227 526], (12/24/84) (WBN)
69. Letter from D. M. Verrelli, NRC, to H. G. Parris, TVA, with attached Inspection Report Nos. 50-390/85-10 and 50-391/85-10, [L44 850313 163], (03/11/85) (WBN)
70. Letter from J. N. Grace, NRC, to H. G. Parris, TVA, with attached SALP Board Report 50-390/85-05 [L44 850401 007], (03/26/85) (WBN)
71. Letter from D. M. Verrelli, NRC, to H. G. Parris, TVA with attached Inspection Report Nos. 50-390/85-19 and 50-391/85-17 [L44 850404 460], (04/03/85) (WBN)
72. Letter from D. M. Verrelli, NRC, to H. G. Parris, TVA, with attached Inspection Report Nos. 50-390/85-42 and 50-391/85-33, [L44 850625 075], (06/11/85) (WBN)
73. Letter from R. C. Lewis, NRC, To H. G. Parris, TVA, with attached Inspection Report 50-390/82-35 and 50-391/82-32, [NEB 821110 218], (11/02/82) (WBN)

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74. Letter from R. D. Walker, NRC, to H. G. Parris, TVA, with attached Inspection Report 50-390/85-40 and 50-391/85-31, [B45 850729 830], (07/19/85) (WBN)
75. Letters from D. M. Verrelli, NRC, to H. G. Parris, TVA, with attached Inspection Reports 50-390/84-13 and 50-391/84-11, [A02 840314 008], (03/13/84); 50-390/84-28 and 50-391/84-23, [A02 840515 001], (05/11/84); 50-390/85-08 and 50-391-85-08 [A02 850402 003], (03/29/85); 50-390/85-33 and 50-391/85-28 [A02 850510 006], (07/05/85) (WBN)
76. Letter from L. M. Mills, TVA, to J.P. O'Reilly, NRC, "Watts Bar Nuclear Plant Units 1 and 2 - NRC OIE Region II Inspection Reports 50-390/83-51 and 50-391/83-40, Response to Violations," [A27 840214 019], (02/14/84)
77. TVA memorandum from Raulston to Those Listed, "Watts Bar Nuclear Plant - Preoperational Testing - NRC Violation," [NEB 840215 251], (02/15/84)
78. Letter from L. M. Mills, TVA, to J. P. O'Reilly, NRC, "Watts Bar Nuclear Plant Units 1 and 2 - NRC OIE Region II Inspection Reports 50-390/83-51 and 50-391/83-40 - Revised Response to Violation," [A27 840409 012], (04/09/84)
79. TVA memorandum from Standifer to Wadewitz, "Watts Bar Nuclear Plant - NRC Violation," [NEB 840813 276], (08/13/84)
80. TVA memorandum from Standifer to Those Listed, "Watts Bar Nuclear Plant - Preoperational Testing - NRC Violation - Test Representative and Supervisor Meeting," [NEB 850219 260], (02/19/85)
81. TVA memorandum from Standifer to Wadewitz, "Watts Bar Nuclear Plant - OE Follow-Up to Preoperational Testing Violation 50-390/83-51-02 and 50-391/83-46-02 and Inspector Followup Item 390/84-81-01 and 391/84-55-01," [B45 850314 254], (03/14/85)
82. TVA memorandum from Reed to Electrical Engineering Files, "Watts Bar Nuclear Plant - Class 1E Batteries - Technical Specifications (TS) and Surveillance Instructions (SI)," [B43 850701 936], (06/28/84)
83. Letter from Varrelli, NRC, to Parris, TVA, "Report Nos. 50-390/85-10 and 50-391/85-10," [L44 850313 163], (03/11/85) (SQN)
84. Letter from Varrelli, NRC, to Parris, TVA, "Report Nos. 50-390/85-19 and 50-391/85-17," [L44 850404 460], (04/03/85) (SQN)
85. AEC memo from Davis to Watson (TVA), "03/72 Audit Findings on Preoperational Test Program," (05/04/72) (BFN)

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86. TVA memo from Patterson to Mechanical Design Files, "Preoperational Testing, AEC Concerns - Notes of Meeting in Knoxville on May 11, 1972," (05/15/72) (BFN)
87. TVA memo from Weaver to Sprouse and Lacy, "Preoperational Testing - AEC Concerns," (05/25/72) (BFN)
88. TVA memo from Parrish to Thomas and Kellegham, "Proposed Modifications to Preoperational Test Program," (06/07/72) (BFN)
89. TVA memo from Patterson to Calhoun, "Preoperational Retesting - Revision of Retest Scoping Documents to Agree with RO Preoperational Retest Instructions," (09/08/75) (BFN)
90. TVA memo from Russell to Hathcote, "Unit 3 Review of Approval Cycle for Preoperational Test Procedure Documents," (11/21/75) (BFN)
91. TVA memo from Weber, "Meeting with AEC Compliance of May 4, 1972 on Browns Ferry Quality Assurance Program" (05/16/72) (BFN)
92. TVA memo from Weber, "Meeting with AEC Compliance of May 4, 1972 on Browns Ferry Quality Assurance Program" (05/16/72)
93. NRC memo from C. Lewis to H. G. Parris, TVA, with attached Inspection Reports 50-438/83-31 and 50-439/83-31 [A02 840105 005], (01/04/84) (BLN)
94. NRC memo from J. A. Olshenski to S. A. White, TVA, with attached Inspection Reports 50-438/86-02 and 50-439/86-02 [A02 860424 004], (04/21/86) (BLN)
95. TVA memo from A. M. Qualls to L. S. Cox, attaching "Corrective Action Report BLN-CAR-84-02," [C20 850301 005], (02/27/85) (BLN)
96. TVA memo from R. M. Hodges to L. S. Cox, attaching NRC letter of 11/02/82 [NEB 821110 218], and Reports 50-390/82-35 and 50-391/82-32 related to motor-to-pump misalignment [MEB 821227 031], (12/27/82) (BLN)
97. TVA memo from L. S. Cox, R. M. Hodges, related to "Motor to Pump Misalignment," [BLN 830128 069], (01/28/83) (BLN)
98. TVA memo from J. R. Parrish to Those Listed, "Browns Ferry Nuclear Plant - Quality Assurance Manual," (06/20/72) (BLN)
99. TVA memo from Price to Hathcote - Browns Ferry QA Audit Compliance Audit 74-16 - Preoperative Testing, (07/22/74) (BLN)

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100. TVA memo from Price to Hathcote - Browns Ferry QA Audit Compliance Audit 75-14 - Preoperational Test, (12/03/75) (BLN)
 101. TVA memo from R. A. Costner to M. N. Sprouse - Office of Quality Assurance Audit Report D20-A-84-002, [OQA 840104 513], (01/04/84) (BLN)
 102. Joint Quality Assurance Audit Report JA-8000-02, [QAM 800222 003], (01/14-15/80) (BLN)
 103. Joint Quality Assurance Audit Report JA-8000-11, [QAM 801231 003], (11/24-26/80) (BLN)
 104. Joint Quality Assurance Audit Report JA-8100-05, [QAM 811008 001], (08-09/81) (BLN)
 105. TVA memo from G. W. Killian to A. M. Qualls, Transmittal of QAB Audit Report QBL-A-85-004, [L1750822 800], (08/22/85) (BLN)
 106. Memo from Sprouse to Knight, "OEDC Audit MBO-4," [QTS 800606 800] (06/06/80) (SQN)

