TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM

REPORT NUMBER: 213.2(B)

REPORT TYPE: SEQUOYAH ELEMENT

REVISION NUMBER: 1

TITLE: ELECTRICAL TESTING AND PLANNING
Inadequate Electrical Testing, Planning, and Engineering Participation

REASON FOR REVISION:

TVA comments

PREPARATION

PREPARED BY:

SIGNATURE — DATE: 11-26-86

REVIEWS

~~PEER~~: REVIEW COMMITTEE

SIGNATURE — DATE: 11/26/86

TAS:

SIGNATURE — DATE: 12/15/86

CONCURRENCES

CEG-H: DATE: 11-26-86

SRP: SIGNATURE * DATE: 12-17-86

SIGNATURE — DATE

APPROVED BY:

ECSP MANAGER — DATE: 12-18-86

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

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

1. CHARACTERIZATION OF ISSUES:

Concern:	Issues:
WI-85-100-018 "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."	a. Inadequate test program and planning as applied to electrical systems and equipment. b. Inadequate engineering participation in the program in providing acceptance criteria. c. Inadequate engineering participation regarding the conduct of the tests and reviewing the test results.

2. HAVE ISSUES BEEN IDENTIFIED IN ANOTHER SYSTEMATIC ANALYSIS? YES ___ NO X

Identified by N/A

Date N/A

Documentation Identifiers:

N/A

3. DOCUMENT NOS., TAG NOS., LOCATIONS OR OTHER SPECIFIC DESCRIPTIVE IDENTIFICATIONS STATED IN ELEMENT:

No further information available.

4. INTERVIEW FILES REVIEWED:

File WI-85-100 was reviewed and no additional unreviewed information for Sequoyah regarding this concern was identified.

5. DOCUMENTS REVIEWED RELATED TO THE ELEMENT:

See Appendix A.

6. WHAT REGULATIONS, LICENSING COMMITMENTS, DESIGN REQUIREMENTS OR OTHER APPLY OR CONTROL IN THIS AREA?

See Appendix A.

7. LIST REQUESTS FOR INFORMATION, MEETINGS, TELEPHONE CALLS, AND OTHER DISCUSSIONS RELATED TO ELEMENT.

See Appendix A.

8. EVALUATION PROCESS:

a. Reviewed available transcripts of NRC investigative interviews for additional information regarding this concern.

b. Reviewed design criteria, scoping documents, FSAR, and any other applicable documents to establish extent of past and current SQN preoperational testing requirements.

c. Reviewed Construction, QA/QC, Operations, and Material Control reports for Employee Concern Evaluation Program for applicability.

d. Reviewed past and current test programs (preoperational and postmodification) for compliance with regulations, general design criteria, and licensing commitments.

e. Reviewed sample preoperational test procedures and results for adequacy of:

- o Acceptance criteria
- o Resolution of test closure
- o Followup for test exception closure

f. Reviewed sample postmodification test procedures and results for adequacy same as "e" above.

9. DISCUSSION, FINDINGS, AND CONCLUSIONS:

Discussion:

On the basis of comments in the transcript of the NRC investigative interview made by the concerned individual regarding inadequate electrical testing and planning, the evaluation team interpreted the concern as inadequacies in the Sequoyah preoperational test and postmodification test programs.

The primary objectives of a suitable testing program as stated in Reg. Guide 1.68 are:

"1) To provide additional assurance that the facility has been adequately designed and, to the extent practical, to validate the analytical models and to verify the correctness or conservatism of assumptions used for predicting plant responses to anticipated transients and postulated accidents."

"2) To provide assurance that construction and installation of equipment in the facility have been accomplished in accordance with the design."

With these regulatory objectives established, the evaluation team reviewed a sample of nine systems (App. A, 5.e) to determine the adequacy of the Sequcyah preoperational test program. The first step in a preoperational test, in accordance with EN DES-EP6.01, is to prepare a test scoping document. Test scoping documents are prepared by the Division of Nuclear Engineering and are intended to completely describe the preoperational test to be performed for each system. In addition, scoping documents are intended to reflect the commitments to the various applicable regulatory requirements and acceptance criteria stated in design documentation and the FSAR. Review of the scoping documents for the nine systems determined that licensing commitments were properly included and acceptance criteria per FSAR adequately reflected. In general, the scoping documents were prepared and structured in accordance with EN DES-EP6.01 requirements and provided adequate references to design documentation for functional requirements.

Using the scoping documents, the preoperational test group (Nuclear Power) prepares the preoperational test instructions (PTIs). For the nine systems reviewed, the evaluation team determined that the PTIs were based on the scoping document and adequately follow step-by-step the requirements in procedure EN DES-EP6-01. They include system design criteria, FSAR, technical specification, design drawings, and other applicable design requirements.

Once PTIs are completed, Engineering reviews Revision 0 (R0) of each PTI to ensure that the scoping document and applicable FSAR commitment are adequately covered. At this time, Engineering either submits comments to the preoperational test group or approves R0. If Engineering comments are extensive, the preoperational test group prepares a new revision of the PTI and resubmits it for review. Engineering approves the PTI only after all comments have been implemented. The evaluation team determined that this approval cycle

for the nine systems was properly carried out and Engineering adequately ensured that requirements and comments were properly implemented in the PTIs.

Prior to performing any preoperational testing, the test director must obtain from the Engineering representative approval of the test drawings and an evaluation of the impact of any outstanding ECNs on testing. The evaluator reviewed and verified that this approval process is properly documented in the PTIs and complies with TVA Engineering Procedure EN DES-EP 6.01 "Preoperational Test Documents Processing."

After conducting the preoperational test, the test director prepares a test results package for Engineering approval. The Engineering representative reviews the entire test results package and "full approval" is given if there are no open exceptions or unacceptable deficiencies. Unacceptable deficiencies are deficiencies that have not been satisfactorily resolved. Full approval may also be given if only acceptable deficiencies exist. Acceptable deficiencies are deficiencies that have been satisfactorily resolved. Final approval of the test results depends on satisfactory resolution of all the deficiencies and exceptions.

The evaluation team reviewed the nine test results packages applying the following considerations:

- Engineering participation in preoperational tests
- Adequacy of the actual tests compared to the Engineering specified scope of testing and comparison of the test results with the specified acceptance criteria
- Evaluation of "closed" test exceptions and/or deficiencies
- Evaluation of all "open" or unresolved test exceptions and/or deficiencies
- Certification that the system or component did functionally operate in accordance with the acceptance criteria

No indication was detected by the evaluation team of inadequate engineering participation during the testing of the nine systems. Also, test results were properly recorded, exceptions and/or deficiencies identified and sent to engineering for evaluation, and test results packages submitted to and reviewed by engineering for approval. The deficiencies and/or exceptions identified in the test package were adequately resolved except for the following:

- For test No. TVA-1, although Engineering indicated after review of the test results that deficiencies DN[1]-7 (PT[2]-352), DN-9 (PT-417), DN-15 (PT-418), DN-20 (PT-352), and DN-16 required resolution prior to initial criticality, resolution and closure did not occur until after initial criticality. Determination was made, however, by Engineering that no plant safety implications existed. Review of these deficiencies by the evaluation team determined that their original classification as "required prior to initial criticality" was not required.

- For test No. TVA-1, although Engineering was aware of the resolution of deficiencies PT-386 and PT-427, it failed to issue the required closure forms.

- For test No. TVA-30, deficiency number PT-250 was assigned by error to a suggested modification. Although the error was recognized, it was not corrected and, therefore, the deficiency remained outstanding until 1986.

- For test No. TVA-18A, "Essential Raw Cooling Water," Engineering erroneously gave full approval to the test results although deficiency D-11 (PT-85) was outstanding. The deficiency, however, had been classified as not required for any major milestone (e.g., fuel load, initial criticality, etc.) as it did not affect plant safety.

- For test No. TVA-33, although the test deficiency resolution (DN-6 and DN-7) had been submitted to Engineering for review and approval, Engineering overlooked PT-298 as being associated with these deficiencies and PT-298 was outstanding for several years (1979 to 1986).

Notes: 1. DN is a test deficiency found during the test. It may or may not require design engineering resolution; therefore, every PT will have a corresponding DN except for PTs assigned after the test is completed and closed.

2. PT is a test deficiency that required design engineering resolution so that the site people can successfully complete the test. Also it could be a generic deficiency that was found in a different plant and required investigation to determine applicability after test completion.

- For test No. TVA-41, the evaluator found that deficiency D-19 was dispositioned by maintenance request (MR) prior to review by Engineering; however, no MR number was identified and no record of the sign-off sheet or closure form was included in the test results package.

The evaluation team found that all problems identified above had no plant safety implications and are currently corrected. The program that detected and corrected these problems evolved as described below.

TVA memo from Pierce to Ballentine (App. A, 5.oo; 02/27/80) indicated that Engineering will make an evaluation of all changes approved but not implemented and of unimplemented original design for Unit 1 to determine that the unit is safe for startup with the unimplemented items. Included in those items were open preoperatinal test items.

TVA memo from Dunham to Fox (App. A, 5.pp; 02/29/80) determined that the unit is safe for startup with the unimplemented items.

TVA memo from Sprouse to Knight (App. A, 5.qq; 06/06/80) refers to the development and drafting of an engineering procedure which evolved into EN DES-EP 2.13 (App. A, 5.hh) addressing evaluation of unimplemented design items. This procedure also employs methods developed and used by engineering to evaluate SQN engineering change notices (ECNs).

A similar evaluation was made on SQN Unit 2, and TVA memo from Sprouse to Green (App. A, 5.tt; 07/01/81) determined that the unit is safe for fuel loading with the unimplemented items.

In connection with Engineering participation in the closeout of the preoperational test deficiencies/exceptions and incomplete tests, TVA memo from Green to Sprouse (App. A, 5.ii; 03/23/82) proposed to transfer all open preoperational test deficiencies/exceptions by systems to a postmodification test (PMT) and to reissue all incomplete preoperational tests as PMTs. These proposed actions would allow the closeout of the existing preoperational testing program and provide a means for completing existing incomplete preoperational testing requirements through an established PMT program. Memo from Sprouse to Green (App. A, 5.jj; 05/12/82) concurred with the proposed action and indicated that Engineering would review incomplete preoperational test activities to determine which of these activities were to be included in the program and which could be closed out.

TVA memo from Raulston to Campbell (App. A, 5.kk; 07/28/82) furnished PMT numbers for tracking unresolved preoperational test items. On 10/22/83, a deficiency log was issued providing a preoperational test program history. This log included the status for each deficiency as

of that date. A postmodification and remaining open preoperational test items program was issued for Sequoyah on 04/18/85 (Preop-278). TVA memo from Vineyard to Raulston (App. A, 5.mm; 06/28/85) provided a scope of work by Office of Engineering/Nuclear Engineering Branch (OE/NEB) for establishing the status of the SQN PREOP/PMT program and to develop an administrative/procedural process to handle this program. This ultimately resulted in the current program for SQN for identifying, tracking, and resolving test deficiencies/exceptions including the establishment of a computer program (App. A, 5.h) for use as a management tool.

Also, TVA memo from Cottle to Parris (App. A, 5.ll; 11/14/85) addressed the performance of an independent assessment and resulting efforts initiated by Sequoyah site management in preparation for returning the units to service. One item requiring correction prior to restart is review of the outstanding preoperational test open items to determine whether their status constitutes an unreviewed safety question. The evaluation concluded that there are no apparent weakness, either programmatic or personnel-related, which would prevent the return of Sequoyah Units 1 and 2 to service.

The original procedure established for handling postmodification testing documents was Engineering Procedure (EP) 6.03 (App. A, 5.uu; 06/09/81). This procedure has recently been replaced by NEB-DI 125.05 (App. A, 5.dd; 07/01/85). Other procedures (App. A, 5.i, 5.j, 5.cc) have also been issued to cover the Division of Nuclear Engineering (DNE) processing of postmodification testing documents for modification to the equipment and systems. The current procedures establish administrative controls for handling test deficiencies identified during the conduct of tests. The procedures also describe how to document, report, and resolve test deficiencies discovered during testing activities. In addition, a computer program (App. A, 5.h) has been established for use as a management tool. This program tracks all open deficiencies and exceptions to prevent recurrence of the above problems.

To verify compliance with current procedures mentioned above, the evaluation team reviewed two postmodification test programs, PMT-50 (Pressurizer PORV Test) and PMT-38 (Containment Isolation System). The review found the tests were in accordance with postmodification testing documents (Ref. 5.dd), and no deficiencies were identified regarding preparation of scoping documents and postmodification test instructions (PMTIs), conduct of tests, coordination between Engineering and the test group, resolution of test exceptions and deficiencies, and approval of test results.

The evaluation team has also reviewed two violations that were identified in early 1984 by the NRC at the Watts Bar Nuclear Power Plant. The first violation, 390/83-51-01 and 391/83-40-01, concerned failure to follow procedures during performance of preoperational test TVA-14E. This was also identified as a generic problem concerning the inadequate review and documentation of preop test results. Based on the NRC review of the corrective action taken by TVA (correction of minor documentation problems), the violation was closed per NRC letter to TVA (App. A, 5.vv; 03/11/85). The second violation, 390/83-51-02 and 391/83-40-02, concerned inadequate evaluation and documentation of test results for preoperational test TVA-14E. This was also identified as a generic concern along with the review of test data packages. Based on TVA corrective action (retraining of certain test personnel) and the results achieved, NRC concluded that the inadequate reviews appeared to be limited to a few test representatives, and NRC letter to TVA (App. A, 5.ww; 04/03/85) closed the second violation. The documentation of the DNE s review of test deficiencies and additional information regarding preoperational testing are further discussed in Sequoyah Element Report 207.3.

Findings:

a. Although some minor deficiencies, as described in "c" below, were identified, the overall preoperational and postmodification test programs for electrical systems and equipment were found to be adequate.

b. On the basis of the information reviewed, Engineering participation i the program for providing acceptance criteria is adequate with some minor discrepancies identified in "c" below. PTIs, PMTIs, and acceptance criteria were properly reviewed and documented by TVA Engineering.

c. The following problems regarding Engineering participation in the review of test results were identified:

- 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.
- A suggested modification was assigned a deficiency number by mistake.
- Engineering erroneously gave full approval for a test results package with an outstanding deficiency.
- A deficiency for a test results package was not closed out although resolution of the deficiency was submitted to Engineering.
- Engineering received a test results package erroneously indicating an open deficiency that had already been resolved.

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.

Conclusions:

The concern about adequacy of electrical systems and equipment testing programs and about Engineering's participation in them has some validity but little significance. Engineering input to scoping documents and to preoperational and postmodification test instructions is adequate to furnish acceptance criteria. A few test deficiencies and exceptions were not administratively followed through, but none of them were items that could compromise safe plant operation. Although these items remained open for several years, they have been adequately resolved and are currently closed. To prevent recurrence of these problems, TVA has established an internal computer program and procedures for tracking test deficiencies. This will facilitate the proper identification of their status, resolution, and closure.

10. CORRECTIVE ACTION

Corrective action has been implemented and no further corrective action is required.

APPENDIX A

5. DOCUMENTS REVIEWED RELATED TO THE ELEMENT:

a. General Design Criteria (10CFR50, App. A Criteria 17 and 18)

b. Regulatory Guide 1.68, "Initial Test Program for Water-Cooled Nuclear Power Plants"

c. Regulatory Guide 1.108, "Periodic Testing of Diesel Generator Units Used As Onsite Electric Power Systems at Nuclear Power Plants"

d. FSAR, Section 8.3.11 and 14.1.1

e. Sample of preoperational test results package:

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-1381 "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"

f. Sample of Post Modification Test Procedures and Results (PMT-50) "Pressurizer PORV Test," and (PMT-38) "Containment Isolation System-Containment Vacuum Relief Isolation Valve

g. Test Scoping Documents and Instruction (NEP-10.4) Rev. 0 (07/01/86)

h. Internal computer program for tracking open deficiencies and exceptions, "Report of Modification Testing by PMT No." (03/25/80)

i. Sequoyah Engineering Procedure (SQEP)-14, R0, "Assembly and Evaluation of Electrical Test Results," (05/15/86)

j. Nuclear Engineering Procedure (NEP)-10.3, R0, "Testing," (07/01/86)

k. Division of Engineering Design - Engineering Procedure (EN DES-EP) 6.01, R5, "Preoperation Testing Documents - Processing" (01/12/83)

l. Preoperational Procedure No. 5, "PMT Identification and Handling"

APPENDIX A (Cont'd)

m. Preoperational Procedure No. 7 (handling test results packages) (03/15/84)

n. EN DES Test representative handbook R2 (4/83)

o. TVA memo from Raulston to Campbell, "Post Modification Test Program - Post modification Test PMT-5" (02/28/83)

p. TVA memo from Vineyard to Rankin, "Post Modification Test Program - Post modification Test PMT-22A" (07/03/85)

q. TVA memo from Raulston to Dewease, "Post Modification Test PMT-5" (02/09/81)

r. TVA memo from Raulston to Campbell, "Post Modification Testing of the Additional Diesel Generator System" 05/26/82

s. TVA memo from Rankin to Vineyard, "Review of Test Results," (12/19/85)

t. TVA memo from Rankin to Vineyard, "Post Modification Test Program - Review of Test Results," (12/30/85)

u. TVA memo from Patterson to Green, "Interim Review and Approval of Preoperational Test Results TVA-18A," (09/13/79)

v. TVA memo from Dilworth to Green, "Final Review and Approval of Preop. Test Results - Preop. Test TVA-33," (12/20/79)

w. TVA memo Rankin to Vineyard, "Post Modification Test Program - Review of Test Results" (12/16/85)

x. TVA memo from Vineyard to Rankin, "Final Review and Approval of Post Modification Test Results PMT-TVA-33," (01/02/86)

y. TVA memo from Rankin to Vineyard, "Post Modification Test Program - Review of Test Results," (12/12/85)

z. TVA memo from Vineyard to Rankin, " Final Review and Approval of Post Modification Test Results PMT-TVA-30," (01/08/86)

aa. TVA memo from Patterson to Green, "Final Review and Approval of Preop. Test Results - Preop. Test TVA-30," (10/16/79)

bb. TVA memo from Featherston to Nuclear Engineering Branch File, "SQN/WBN Nuclear Plant - Diary Note No. 56" (06/28/84)

APPENDIX A (Cont'd)

cc. TVA Nuclear Quality Assurance Manual, Part II, Section 4.9, RO, (06/20/86), "Handling of CSSC Test Deficiencies"

dd. "Fost Modification Testing Documents-OE Processing After Issuance of Operating License," NEB-DI-125.05 Rev. 0 (07/01/85)

ee. "Control of Modifications," NQAM, Part V, Section 2.4 (ID-QAP-2.4), (07/10/85)

ff. 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 (06/25/86)

gg. Division of Engineering Design - Engineering Procedure (EN DES-EP) 6.01, R3, "Preoperation Testing Documents - Processing" (05/25/79)

hh. Division of Engineering Design - Engineering Procedure (EN-DES-EP) 2.13, R3, "Initial Fuel Loading Safety Evaluation - Handling" (11/29/84)

ii. TVA memo from Green to Sprouse, "Preoperational Testing Program Phaseout," (03/23/82)

jj. TVA memo from Sprouse to Green, "Preoperational and NCS (Noncritical System) Testing Programs Phaseout," (05/12/82)

kk. TVA memo from Raulston to Campbell, "Preoperational Test Program Phaseout," (07/28/82)

ll. TVA memo from Cottle to Parris, "Operational Readiness Review," (11/14/85)

mm. TVA memo from Vineyard to Rankin, "Preoperational (PREOP) Test Program - Scope-of-Work Proposal," (06/28/85)

nn. Document Routing/Task Management Assignment TVA Number PREOP-278

oo. TVA memo from Pierce to Ballentine "EN DES Certification for Fuel Loading," (02/27/80)

pp. TVA memo from Dunham to Fox "EN DES Certification for Fuel Loading," (02/29/80)

APPENDIX A (Cont'd)

qq. TVA memo from Sprouse to Knight "OEDC Audit MBO-4," (06/06/80)

rr. TVA memo from Cantrell to Ballentine and Stack, "EN DES Certification for Fuel Loading," (06/12/81)

ss. TVA memo from Stack to Cantrell, "Status of Construction Items Required for Fuel Loading," (06/16/81)

tt. TVA memo from Sprouse to Green, "EN DES Certification for Fuel Loading," (07/01/81)

uu. Division of Engineering Design - Engineering Procedure (EN DES-EP) 6.03, R3 "Postmodification Testing Documents - EN DES Processing After Issuance of Operating License," (06/09/81)

vv. Letter from Varrelli, NRC, to Parris, TVA, "Report Nos. 50-390/85-10 and 50-391/85-10," (03/11/85)

ww. Letter form Varrelli, NRC, to Parris, TVA, "Report Nos. 50-390/85-19 and 50-391/85-17," (04/03/85)

6. WHAT REGULATIONS, LICENSING COMMITMENTS, DESIGN REQUIREMENTS OR OTHER APPLY OR CONTROL IN THIS AREA?

a. General design criteria (10CFR50, App. A Criteria 17 and 18)

b. Regulatory Guide 1.68, "Initial Test Program for Water-Co led Nuclear Power Plants," R2, (08/78)

c. Regulatory Guide 1.108, "Periodic Testing of Diesel Generator Units Used As Onsite Electric Power Systems at Nuclear Power Plants," R1, (08/77)

d. FSAR, Section 8.3.11 and 14.1.1

e. Division of Engineering Design - Engineering Procedure (EN DES-EP) 6.01, R3, "Preoperation Testing Documents - Processing," (05/25/79)

f. Division of Engineering Design - Engineering Procedure (EN-DES-EP) 2.13, R3, "Initial Fuel Loading Safety Evaluation - Handling," (11/29/84)

7. LIST REQUESTS FOR INFORMATION, MEETINGS, TELEPHONE CALLS, AND OTHER DISCUSSIONS RELATED TO ELEMENT.

a. Visit to TVA Knoxville office by A. Rifai, Bechtel, to review and evaluate test procedures and test results packages (10/09/86)

b. Meeting Featherston, TVA, Rifai, Bechtel (10-9-86)

c. Telephone conversation, McKeehan, TVA, Don-Doncow and Rifai, Bechtel (11/10/86)

CATEGORY: EN DES PROCESS & OUTPUT SUBCATEGORY: 21302 INADEQUATE ELECTRICAL TESTING AND PLANNING

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	GENERIC APPL B F	B L	S Q	W B	QTC/NSRS INVESTIGATION REPORT	P S R	CONCERN* DESCRIPTION	KEYWORD A / KEYWORD B / KEYWORD C / KEYWORD D
WI -85-100-018 T50212	EN	21302	N	WBN	Y	Y	Y	Y	REPORT	SR	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. CI HAS NO FURTHER INFORMATION. ANONYMOUS CONCERN VIA LETTER.	TESTING / NONCONFORMANCE / ELECTRICAL / EQUIPMENT

1 CONCERNS FOR CATEGORY EN SUBCATEGORY 21302