NUREG-0797
Supplement No. 7

Safety Evaluation Report

related to the operation of
Comanche Peak Steam Electric Station,
Units 1 and 2

Docket Nos. 50-445 and 50-446

Texas Utilities Generating Company, et al.

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

January 1985

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ABSTRACT

Supplement 7 to the Safety Evaluation Report for the Texas Utilities Electric Company application for a license to operate Comanche Peak Steam Electric Station, Units 1 and 2 (Docket Nos. 50-445, 50-446), located in Somervell County, Texas, has been jointly prepared by the Office of Nuclear Reactor Regulation and the Comanche Peak Technical Review Team of the U. S. Nuclear Regulatory Commission. This Supplement provides the results of the staff's evaluation and resolution of approximately 80 technical concerns and allegations in the areas of Electrical/Instrumentation and Test Programs regarding construction and plant readiness testing practices at the Comanche Peak facility. Issues raised during recent Atomic Safety and Licensing Board hearings will be dealt with in future supplements to the Safety Evaluation Report.

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ACRONYMS AND ABBREVIATIONS

AA - independent assessment program allegation
AB - American Bridge
AB - bolt allegation
AC - concrete/rebar allegation
ACI - American Concrete Institute
AD - design of pipe/pipe support allegation
ADS - audit discrepancy report
AE - electrical allegation
AEOD - Office for Analysis and Evaluation of Operational Data (NRC)
AFW - auxiliary feedwater system
AH - hanger allegation
AI - intimidation allegation
AISC - American Institute of Steel Construction
AM - miscellaneous allegation
ANI - authorized nuclear inspector
ANS - American Nuclear Society
ANSI - American National Standards Institute
AO - protective coating allegation
AP - pipe and pipe support allegation
APC - AMP Product Corporation
AQ - quality assurance/quality control allegation
AQB - QA/QC bolt allegation
AQC - QA/QC concrete/rebar allegation
AQE - QA/QC electrical allegation
AQH - QA/QC hanger allegation
AQO - QA/QC coating allegation
AQP - QA/QC pipe and pipe support allegation
AQW - QA/QC welding allegation
ARMS - Automated Records Management System
ASLB - Atomic Safety and Licensing Board
ASME - American Society of Mechanical Engineers
ASTM - American Society for Testing and Materials
AT - acceptance test
AT - test program allegation
AV - vendor/generic allegation
AW - welding allegation

B&PVC - Boiler & Pressure Vessel Code
B&R - Brown & Root, Inc.
BRIR - Brown & Root Inspection Report
BRHl - Brown & Root Hanger Locations
BRP - Brown & Root piping isometric drawing

CAR - Corrective Action Request
CASE - Citizens Association for Sound Energy

C&L - Corner and Lada (computer program)
C&S - civil and structural
CAT - Construction Appraisal Team (NRC)
CB&I - Chicago Bridge & Iron Company
CCS - Component Cooling System
CEL - Coating Exempt Log
CFR - Code of Federal Regulations
CHN - construction hold notice
CILRT - containment integrated leak rate test
CMC - component modification cards
COT - construction operation traveler
CP - Comanche Peak
CP - construction permit
CPPE - Comanche Peak Project Engineering
CPSES - Comanche Peak Steam Electric Station
CPSIG - Comanche Peak Seismic Interaction Group
CSTS - Construction and Startup/Turnover Surveillance Group (TUEC)
CVCS - chemical and volume control system
CZ-11 - Carboline Carbo zinc 11

DBA - design basis accident
DCA - design change authorization
DCC - Document Control Center (TUEC)
DCTG - Design Change Tracking Group
DCVG - design change verification group
DE - Division of Engineering (NRC)
DFT - dry film thickness
DL - Division of Licensing (NRC)
D-6 - Ameron Dimetcote 6

EDO - Executive Director for Operations (NRC)
E&I - Electrical and Instrumentation
ETG - Electrical Test Group (TUEC)

FDSG - Field Damage Study Group (TUEC)
FJO - field job orders
FP - fire protection
FSAR - Final Safety Analysis Report
FW - field weld

GAP - Government Accountability Project
GDC - general design criteria
GE - General Electric Corporation
GED - General Equivalency Diploma
G&H - Gibbs & Hill
GHH - Gibbs & Hill hanger (isometric drawing)

HFT - hot functional test
HIR - hanger inspection report
HP - hanger package
HVAC - heating, ventilation and air conditioning system
HX - heat exchangers

IAP - Independent Assessment Program
IE - Office of Inspection and Enforcement (NRC)
IEEE - Institute of Electrical and Electronics Engineers
IM - interoffice memorandum (TUEC)
INPO - Institute for Nuclear Power Operations
IR - inspection report (NRC)
IRN - item removal notice
ITT-G - ITT Grinnell

JTG - Joint Test Group (TUEC)
JUMA - Joint Utility Management Assessment Group

LOCA - loss of coolant accident
LP - liquid penetrant

MAR - maintenance action request
M&P - mechanical and piping
MCC - motor control center (GE)
MDB - master data base
MIFI - mechanical fabrication inspector
MIL - material identification list (or log)
MIME - Mechanical Equipment Inspector
MQE - Mechanical Quality Engineering
MRS - manufacturer's record sheet
MWDC - multiple weld data card

N/A - not applicable
NCR - nonconformance report (TUEC)
NDE - nondestructive examination
NDT - nondestructive testing
NI - never incorporated
NONSAT - nonsatisfactory
NOV - Notice of Violation (NRC)
NPSI - Nuclear Power Service Incorporated
NRC - U.S. Nuclear Regulatory Commission
NRR - Office of Nuclear Reactor Regulation (NRC)
NSSS - nuclear steam supply system

O&M - Operations and Maintenance (TUEC)
OBE - operating basis earthquake
OI - Office of Investigations
OJT - on-the-job training

OL - operating license
ORNL - Oak Ridge National Laboratory

PC - protective coating
PET - permanent equipment transfer
PFG - paper flow group
PFS - pipe fabrication shop
PSAR - Preliminary Safety Analysis Report
PSE - Pipe Support Engineering (TUEC)
PT - preoperational test
PWR - pipe whip restraints
P-305 - Carboline Phenoline 305

QE - quality engineer
QA - quality assurance
QAI - quality assurance investigation (TUEC)
QC - quality control

RCB - Reactor Containment Building
RES - Office of Nuclear Regulatory Research (NRC)
RFIC - request for information or clarification (B&R)
RG - Regulatory Guide (NRC)
RI - NRC Region I Office
RIR - receipt inspection report (TUEC)
RIV - NRC Region IV Office
RHRS - residual heat removal system
RPI - rod position indication
RPS - report process sheet (TUGCO)
RPV - reactor pressure vessel
RPVI - reactor pressure vessel reflective insulation
RRI - Resident Reactor Inspector (NRC)
RV - reactor vessel
RWN - room work notifications

SAP - startup administration procedure
SALP - Systematic Assessment of Licensee Performance (NRC)
SAT - satisfactory
SAVC - structural assembly verification card
SER - Safety Evaluation Report (NRC)
SIS - Special Inspection Services
SMAW - shielded metal arc welding
SNM - special nuclear material
SORC - Station Operations Review Committee
SRIC - Senior Resident Inspector for Construction (NRC)
SRT - Special Review Team (NRC)
SSE - safe shutdown earthquake
SSER - Safety Evaluation Report Supplement
SSPC - Steel Structures Painting Council
SSWP - station service water pumps
SSI - safe shutdown impoundment

STE - system test engineer
SWA - startup work authorization

TDCR - test deficiency change request
TDR - test deficiency report
10 CFR 50 - Title 10 Code of Federal Regulations Part 50
TIDC - Division of Technical Information and Document Control (NRC)
TNE - TUEC Nuclear Engineering
TP - test program
TPD - test procedure deviation
Tr - transcript
TRT - Technical Review Team (NRC)
TSI - thermolag
TSMD - Technical Services Mechanical Drafting
TSP - tri-sodium phosphate
TUEC - Texas Utilities Electric Company
TUGCO - Texas Utilities Generating Company
TUSI - Texas Utilities Service, Inc.

UCC - University Computing Company
UT - ultrasonic test

VCD - vendor-certified drawing
VT - visual weld (inspector)

WDC - weld data card
WFML - weld filler metal log
WPS - welding procedure specification

1 INTRODUCTION

On July 14, 1981, the U. S. Nuclear Regulatory Commission (NRC) issued a Safety Evaluation Report (SER) (NUREG-0797) related to the application by the Texas Utilities Electric Company (TUEC) for a license to operate Comanche Peak Steam Electric Station (CPSES) Units 1 and 2. Subsequently, six supplemental Safety Evaluation Reports (SSERs) were issued by the staff. This report, Supplement No. 7, is the first of a series of SSERs dealing with various technical concerns and allegations about construction practices at Comanche Peak. This report addresses approximately 80 technical concerns and allegations in the areas of Electrical and Instrumentation and Test Program. Appendix J to this report provides details of the staff's evaluation and findings of these technical concerns and allegations.

The technical concerns and allegations about Comanche Peak were part of the regulatory issues that remained outstanding toward the completion of construction of the Comanche Peak facility. The NRC's Executive Director for Operations (EDO) issued a directive on March 12, 1984, establishing a program for assuring the overall coordination/integration of these issues and their resolution prior to the staff's licensing decision. In response to the EDO's directive, a program plan was developed and approved on June 5, 1984, by the Directors of NRC's Office of Inspection and Enforcement, Office of Nuclear Reactor Regulation, and the Administrator of NRC's Region IV Office. This program plan, entitled Comanche Peak Plan for the Completion of Outstanding Regulatory Actions, specified the critical path issues, addressed the scope of work needed, and provided a projected schedule for completion. Attachment 1 to Appendix J is a listing of the technical concerns and allegations in the aforementioned areas which are grouped according to their areas of discipline.

On September 18, 1984, the NRC provided the results of the staff's evaluation of the technical concerns and allegations in the electrical and instrumentation, civil and structural, and test program areas, identifying potential safety concerns and requesting additional information, including a program and schedule for completing a detailed and thorough assessment of the concerns identified. (See Attachment 3.) This requested information was submitted by TUEC on October 8, 1984, in the form of a proposed program plan. TUEC has partially revised this program plan in a letter to NRC of November 21, 1984. The revised program plan, once approved, as well as its implementation, will be evaluated by the staff before NRC considers the issuance of an operating license for Comanche Peak Unit 1. Attachment 2 to Appendix J provides the staff's detailed assessment of the individual technical concerns and allegations in the electrical and instrumentation and test program areas.

Management and coordination of all the outstanding regulatory actions for Comanche Peak are under the overall direction of Mr. Vincent S. Noonan, the NRC Comanche Peak Project Director. Mr. Noonan may be contacted by calling 301-492-7903 or by writing to the following address:

Mr. Vincent S. Noonan
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Copies of this Supplement are available for public inspection at the NRC's Public Document Room at 1717 H Street, NW, Washington, D. C. 20555, and the Local Public Document Room, located at the Somervell County Public Library On The Square, P. O. Box 1417, Glen Rose, Texas, 76043. Availability of all material cited is described on the inside front cover of this report.

The Comanche Peak Technical Review Team for SER Supplement 7

Beahm, D.	-	Idaho National Engineering Laboratory
Brown, C.	-	EG&G, San Ramon
Calvo, J.	-	Office of Nuclear Reactor Regulation, NRC
Gagliardo, J.	-	Reactor Training Center, IE, NRC
Haughney, C.	-	COMEX Corporation
Hofmayer, C.	-	Brookhaven National Laboratory
Ippolito, T.	-	Office of Analysis and Evaluation of Operational Data, NRC
Johnson, A.	-	Region IV, NRC
Keimig, R.	-	Region I, NRC
Laudenbach, D.	-	EG&G, San Ramon
Li, H.	-	Office of Nuclear Reactor Regulation, NRC
Mackley, A.	-	Idaho National Engineering Laboratory
Marini, W.	-	Resource Technical Services, Inc.
Marinos, E.	-	Office of Nuclear Reactor Regulation, NRC
Myers, G.	-	Parameter
Noonan, V.	-	Office of Nuclear Reactor Regulation, NRC
Oliu, W.	-	Division of Technical Information and Document Control, NRC
Poslusny, C.	-	Office of Nuclear Reactor Regulation, NRC
Selan, J.	-	Lawrence Livermore National Laboratory
Smith, W.	-	Region IV, NRC
Tang, R. C.	-	Office of Nuclear Reactor Regulation, NRC
Vietti, A.	-	Office of Nuclear Reactor Regulation, NRC
Wessman, R.	-	Office of Nuclear Reactor Regulation, NRC
White, R.	-	Lawrence Livermore National Laboratory

APPENDIX J

STATUS OF STAFF EVALUATION AND RESOLUTION OF TECHNICAL CONCERNS AND ALLEGATIONS IN THE AREAS OF ELECTRICAL/INSTRUMENTATION AND TEST PROGRAM REGARDING CONSTRUCTION AT COMANCHE PEAK STEAM ELECTRIC STATION UNITS 1 AND 2

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1. Introduction

As construction of the Comanche Peak Steam Electric Station was nearing completion, issues that remained to be resolved prior to the consideration of issuance of an operating license were complex, resource intensive, and spanned more than one NRC office. To ensure the overall coordination and integration of these issues, and to ensure their resolution prior to licensing decisions, the NRC's Executive Director for Operations (EDO) issued a memorandum on March 12, 1984, directing the NRC's Office of Nuclear Reactor Regulation to manage all necessary NRC actions leading to prompt licensing decisions, and assigning the Director, NRC's Division of Licensing, the lead responsibility for coordinating and integrating the related efforts of various offices within the NRC.

The principal areas needing resolution before a licensing decision on Comanche Peak can be reached include: (1) the completion and documentation of the staff's review of the Final Safety Analysis Report (FSAR); (2) those issues in contention before the NRC's Atomic Safety and Licensing Board (ASLB); (3) the completion of necessary NRC regional inspection actions; and (4) the completion and documentation of the staff's review of technical concerns and allegations regarding design and construction of the plant.

Technical concerns and allegations about Comanche Peak, totalling approximately 600, have been raised mainly by the quality assurance/quality control (QA/QC) personnel working or having worked on site. Their job responsibilities involve or involved QA/QC aspects of safety-related structures, systems, and components to determine whether and to what extent such items are manufactured, purchased, stored, maintained, installed, tested, and inspected as required by project documents and procedures. Many of these allegations were made orally to NRC Region IV staff, NRC Comanche Peak Site Resident Inspectors, NRC investigators, or in letters to the NRC, as well as in testimony before the Atomic Safety and Licensing Board (ASLB). Individuals with allegations were also sponsored by the intervenor group Citizens Association for Sound Energy (CASE) and the Government Accountability Project (GAP). General allegations about poor construction work at Comanche Peak were also made in several newspaper articles in the Dallas/Fort Worth, Texas areas.

By the end of April 1984, the staff identified approximately 400 technical concerns and allegations related to the construction of the Comanche Peak facility, including findings by NRC's Special Review Team. (See Section 2.1 below.) During its investigation of a concern or allegation, the TRT identified additional concerns. Interviews with allegers also yielded additional concerns. By December 1984, approximately 600 concerns and allegations had been identified.

These technical concerns and allegations were grouped by subject into the following areas:

- Electrical and Instrumentation
- Civil and Structural
- Mechanical and Piping

- Quality Assurance and Quality Control (QA/QC)
- Coatings
- Test Program
- Miscellaneous

This report is the first of a series of reports dealing exclusively with the NRC staff's efforts to evaluate and resolve the technical concerns and allegations raised by various parties and individuals regarding construction practices at the Comanche Peak facility. An allegation or concern was assessed as having no safety significance if, based on technical findings, the assessment showed that a structure, component, or system would perform its intended function. Subject areas covered in this report include electrical and instrumentation and test program. The technical concerns and allegations in the areas of civil and structural, mechanical and piping, coatings, QA/QC, and miscellaneous issues, as well as the remaining areas of outstanding regulatory actions, will be addressed in future supplements to the Comanche Peak Safety Evaluation Report (SER).

The staff's findings for electrical and instrumentation and test program allegations or concerns are summarized in Section 3 of this Appendix. Details of the assessment and findings on individual concerns or allegations appear in Attachment 2 to this Appendix. Those aspects of the concerns or allegations that pertain to wrongdoing (e.g., falsification of records) were forwarded to the NRC's Office of Investigations (OI) for followup because they are outside the scope of the technical staff's review.

A number of potential violations of NRC rules and regulations have been identified during the course of the TRT investigation. These potential violations have not been addressed in this SSER, but will be further reviewed by the NRC Region IV staff, which will determine appropriate followup actions.

2. Comanche Peak Technical Concerns and Allegations Management Program

2.1 Background

Shortly after the EDO's issuance of the March 12, 1984, directive, the staff found it necessary to (1) obtain current information relative to TUEC's management control of the construction, inspection, and test program and (2) obtain necessary information to establish a management plan for resolution of all outstanding licensing actions. In order to achieve these goals in an expeditious and objective manner, a Special Review Team (SRT) was formed to conduct an unannounced review of the Comanche Peak plant. The SRT consisted of eight reviewers and one team leader, all from NRC's Region II Office, and a team manager from NRC headquarters. The SRT spent over 800 hours, from April 3 to April 13, 1984, performing this review. The SRT concluded that TUEC's programs were being sufficiently controlled to allow continued plant construction while the NRC completed its review and inspection of the Comanche Peak facility.

The SRT review also provided a basis for the development of an NRC management plan for the resolution of all outstanding licensing actions. This plan was approved on June 5, 1984, by the Directors of NRC's Office of Inspection and Enforcement, Office of Nuclear Reactor Regulation, and the Administrator of NRC's Region IV Office. The purpose of the plan was to ensure the overall coordination and integration of the outstanding regulatory actions at Comanche Peak and their satisfactory resolution prior to a licensing decision by the NRC. In accordance with the plan, a Technical Review Team (TRT) was formed to evaluate and resolve technical issues and those allegations that had been identified. On July 9, 1984, the TRT began its 10-week (five 2-week sessions) onsite effort, including interviews of allegers and TUEC personnel, to determine the validity of the technical concerns and allegations, to evaluate their safety significance, and to assess their generic implications. The TRT consisted of about 50 technical specialists from NRC headquarters, NRC Regional Offices, and NRC consultants, who were divided into groups according to technical discipline. Each group was also assigned a group leader.

2.2 Review Approach and Methodology

2.2.1 Concern and Allegation Tracking System

A tracking system was developed for identifying and listing each concern or allegation. These technical concerns and allegations were grouped according to their topical areas or disciplines, and were listed numerically within each group in the order that they were identified by the TRT. The tracking system included a description of the concern or allegation; its status or the actions taken to resolve it; the nature of the sources of the concern or allegation (i.e., anonymous or confidential); a code for the individual who identified the concern or allegation (instead of the individual's name); the date when the concern or allegation was received by the TRT; the source document (e.g., letter, NRC inspection report, hearing transcript, etc.); cross reference; etc. At the end of each 2-week session, the concern/allegation tracking system was updated, as needed, to reflect the status of each concern or allegation, as well as any new ones that had been added.

2.2.2 Review Methodology

The technical concerns or allegations similar in subject were combined and evaluated as one category. For each concern/allegation or concern/allegation category, an approach to resolution was developed by the cognizant reviewer(s). Each approach to resolution was reviewed and approved by the responsible group leader. The group leaders and reviewers were instructed to:

- develop and maintain a work package for each issue or category of issues that contained or referenced pertinent documentation associated with the issue(s) and the ultimate resolution, including records of interviews and inspections for supporting the final NRC staff decisions regarding the issue(s); and to

- protect the identity of the allegers, as a matter of NRC practice. Such efforts included limited and controlled distribution of allegation-related documentation and correspondence; minimal use of names, identifying titles, or position descriptions in written material; enlarged sampling of activities to prevent direct links by non-NRC personnel between the activity under investigation and the alleger; and other indirect approaches toward investigating the allegations.

During TRT onsite sessions, daily meetings were held at the review group level to assess progress, to adjust the inspection and evaluation approach as needed, and to provide a forum for the reviewers to interact with one another or to discuss problems and to arrive jointly at resolutions. Similar daily meetings were also held at the management level where the group leaders interacted with one another and with the Project Director, his assistant and staff.

In evaluating the technical concerns and allegations, the TRT reviewers examined areas in the plant where direct observation could provide information needed for evaluating an allegation or concern. During its onsite sessions, the TRT interviewed the allegers as needed to clarify their concerns or allegations. To the extent possible, the TRT contacted allegers after its onsite review to discuss preliminary TRT findings and to obtain any additional comments from them. (See Section 2.2.3 below.) The TRT also interviewed TUEC and TUEC contractor personnel as was warranted by the evaluation. In addition to these contacts, the TRT reviewed various project documents, including specifications, engineering drawings and analyses, procedures, instructions, NRC Region IV inspection reports, and applicable sections of the Final Safety Analysis Report (FSAR) and NRC regulations pertinent to the allegation or sample selected by the TRT for inspection. The TRT also examined construction records, such as design change authorizations, construction work packages, QC inspection reports, nonconformance reports, deficiency logs, lists and reports, and QC inspector training and certification records. In addition, the TRT reviewed pertinent transcripts from recent ASLB hearings and depositions of TUEC personnel and former employees.

Based on these reviews and interviews, the TRT determined the validity of each technical concern or allegation and assessed its safety significance, its potential generic implications, and any indications of potential management breakdown. Detailed documentation of the TRT assessment and final determinations of each technical concern or allegation appear in Attachment 2 to this Appendix.

2.2.3 Interviews with Allegers

Approximately 600 technical concerns and allegations regarding the construction of the Comanche Peak facility have been raised by approximately 70 allegers through various mechanisms. During its onsite work, the TRT interviewed 18 individuals in person, some of whom received followup interviews by telephone. For ten allegers, the TRT reviewers were able to obtain the needed information by telephone and determined that personal interviews would not be necessary. Three allegers contacted by the TRT declined being interviewed. Five allegers could not be located during the TRT's onsite sessions because their current addresses and telephone numbers were not available. They have not responded to correspondence from the TRT sent to their last known addresses expressing the TRT's intention to discuss their concerns with them. Efforts to locate these individuals included inquiries through the NRC's Office of Investigations, NRC's Region IV staff, the telephone company and U.S. Postal Service, selected inquiries of their relatives and former co-workers, confidential examination of the personnel files of TUEC and its contractors, and in some cases, inquiries to the intervenor group, the Citizens Association for Sound Energy (CASE), and the Government Accountability Project (GAP).

To the extent possible, the TRT kept a transcript for each personal interview conducted during its onsite sessions. The names and identities of the allegers had been deleted from the transcripts, as well as from other pertinent reference or source documents, before TRT reviewers were given any portions of these documents for review and follow-up. During the TRT's onsite work, the original transcripts were kept in a locked file in the TRT Project Director's office. The distribution of these transcripts within the NRC, and even within the TRT, was limited and controlled.

Subsequent to its onsite work, and at the completion of its evaluation, the TRT attempted to contact each alleger to discuss the TRT's findings regarding their original concerns, and to obtain additional comments from them, if any. Thirty allegers have received such followup interviews. A total of 19 allegers could not be located. Some of these individuals had received initial TRT interviews but had since left the area. Three allegers declined to have further contacts with the TRT. Interviews with the remaining allegers are planned during January and February of 1985. The outcome of followup interviews conducted through December 1984, is briefly discussed in the individual SSER sections in Attachment 2. Transcripts were kept for all followup interviews conducted either by telephone or in person.

2.3 Communications with TUEC

Whenever the TRT reviewers encountered problems during their evaluations, the TRT Project Director and/or his designee resolved them through discussions with TUEC management onsite. There were also frequent staff-level contacts between TRT members and TUEC personnel during the TRT's onsite activities. In keeping with the NRC practice of promptly notifying applicants of outstanding information/evaluation needs that could potentially affect plant safety, the staff held several meetings with TUEC representatives at NRC headquarters toward the end of the TRT's review. These meetings were held to discuss potential safety concerns and to request additional information needed by the TRT to complete its review.

The NRC staff met with TUEC representatives for the first of these meetings on September 18, 1984, to discuss TRT findings for electrical and instrumentation, civil and structural, and test program allegations and concerns. A letter documenting these findings and a request for additional information was issued to TUEC on the day of the meeting (Attachment 3). TUEC later submitted the requested information in the form of a proposed program plan, delineating planned actions to address the deficiencies identified by the TRT. The TRT met with TUEC representatives to discuss this proposed program plan on October 19 and 23, 1984. TUEC submitted a partially revised program plan to NRC on November 21, 1984. On November 29, 1984, NRC sent a letter to TUEC containing potential open issues and requesting additional information and proposed program plans for mechanical and piping and miscellaneous allegations and concerns. The letter also provided TUEC with the status of NRC's evaluation of coatings allegations. Informal telephone discussions between TRT group leaders and their TUEC counterparts regarding these letters have been ongoing. (Reports documenting these discussions have been made available to CASE and are available for inspection at the NRC Public Document Room, 1717 H St., N.W., Washington, D.C. 20555, and at the Comanche Peak Local Public Document Room, Somervell County Public Library On The Square, P.O. Box 1417, Glen Rose, Texas 76043.) On January 8, 1985, the NRC issued a letter to TUEC informing them of the TRT's findings in the construction QA/QC area and requesting a program and schedule for completing a detailed and thorough assessment of the QA issues presented in the letter. A meeting between TUEC and the TRT was held on January 17, 1985, to discuss potential open issues in the QA/QC area. TUEC's proposed program plan for each of the subject areas and its implementation of the plan will be evaluated by the NRC staff prior to the NRC licensing decision on Comanche Peak.

3. Summary of Evaluations

3.1 Electrical and Instrumentation (E&I) Group Summary

3.1.1 Scope of Concerns and Allegations

The concerns in the E&I area relate to construction activity including equipment installation, specifications, drawings, procedures, personnel training and qualification records, and inspections. There are 53 concerns and allegations in this area, 20 of which are hardware related and 33 of which are QA/QC related. The E&I Group reviewed an additional item of concern identified by the SRT regarding overloading of cable trays due to the installation of "thermolag" material. The above concerns and allegations were consolidated by subject into nine separate categories. A concern or allegation may have been assigned to several applicable categories if it raised issues that were common to the subject categories. When assigning QA/QC-related allegations to subject categories, those with available information on specific equipment location were also assigned to the hardware-related categories such that a direct inspection of the equipment installation involved would be performed. The nine categories and their characterizations are as follows:

Category No.	Subject	Characterization of Concerns and Allegations
1	Electrical Cable Terminations	Improper-sized lugs, improper use of cable butt splices in panels and cable terminations not conforming with drawings.
2	Electrical Cable Tray & Conduit Installation	Problems with cable tray seismic supports, clearance of process pipes from cables in cable trays and loose conduit fittings.
3	Electrical Equipment Separation	Violation of the cable separation criteria between separate cables, trays and conduits and inconsistency between specifications and regulatory requirements.
4	Control Room Ceiling Fixture Supports	Field run conduit, drywall and lighting supports in the control room classified as non-seismic.
5	Electrical Noncomformance Report (NCR) Activities	Improper generation and disposition of electrical NCRs.
6	Electrical QC Inspector Training and Qualifications	Inspectors inadequately qualified and received help to pass certification tests.
7	Electrical Cable Installation	Cable tray overfill, cable spliced in trays and improper cable dressing.

8	Electrical Procedures	Changes requirements for electrical inspection procedures without proper justification.
9	Electrical Inspection Reports, Inspection Item Removal Notices and In-Process Inspections	Inspection reports written without reinspections; in-process inspections not conducted.

3.1.2 Electrical and Instrumentation Group

The E&I Group consisted of seven reviewers who, collectively, represent 140 years of engineering experience, of which 90 years were in the nuclear industry in electrical and instrumentation engineering design, quality assurance and control, inspection, construction, project management and regulatory activities. The E&I Group members included two representatives from the Office of Nuclear Reactor Regulation, one from the NRC Region IV Office, three from a national laboratory, and two from consulting firms.

3.1.3 Findings for Electrical and Instrumentation Issues

Each of the E&I SSER categories lists and characterizes all the concerns raised in the allegations and by the Special Review Team. In some instances, the E&I Group, during its evaluation of an allegation, discovered a new concern unrelated to the original allegation. These new concerns were also evaluated and reported in the appropriate category.

An assessment of the safety significance of the concerns, as well as the generic implications of the findings and the root cause of each situation, as appropriate, are also presented. In addition category includes conclusions, staff positions, and actions required of TUEC.

On September 18, 1984, the TRT presented at a public meeting the E&I findings, as well as the actions required by TUEC to reach final resolution of the issues. The TRT noted at that meeting that the E&I findings, as well as the actions required of TUEC, could not be considered final until they were integrated with the results of the overall programmatic review being conducted by the QA/QC Group. Since then, minor modifications were made to these findings and actions to include the results of the review of additional information and to integrate them with the results of the review by the QA/QC Group. The QA/QC areas involved are referenced in the E&I categories.

The E&I Group found no problems with the concerns raised by the allegations or the Special Review Team regarding the installation of electrical cables; nor could the E&I Group find any evidence of discrepancies in the electrical NCR activities, electrical procedures, electrical inspection reports, inspection removal notices and in-process inspections. The E&I Group concludes that the concerns in these areas either could not be substantiated or have no safety significance with respect to the items identified.

In the cable terminations area, the E&I Group found problems with the installation and inspection procedures and documentation of butt splices in panels; the documentation of safety-related and associated terminations in panels; and the disposition of NCRs related to vendor-installed terminal lugs. The E&I Group concludes that there are concerns about the adequacy of TUEC's QC inspection program. (See Attachment 2, E&I Category 1.)

The E&I Group found only one problem in the installation of electrical cable tray and conduit: craft personnel lacked training in the use of an installation manual for conduit and junction box supports. (See Attachment 2, E&I Category 2.)

In the area of electrical equipment separation, the E&I Group found several cases of separate safety- and nonsafety-related cables and flexible conduits (containing safety- and nonsafety-related cables) inside main control room panels that did not meet minimum separation requirements. The TRT found no evidence to justify this lack of separation. The E&I Group found two instances of violation of the separation criteria concerning separation of redundant instrumentation and field wiring by barrier. The E&I Group also found that TUEC's existing analysis substantiating the acceptability of the criteria for separation between independent conduits and cable trays had not been reviewed by the NRC staff. The E&I Group therefore concludes that there are concerns about the adequacy of TUEC's QC inspection program. (See Attachment 2, E&I Category 3.)

The potential safety significance and generic implications concerning the control room ceiling fixture supports was jointly reviewed by the E&I and the civil and mechanical Groups. Regarding the electrical aspects of this concern, the E&I Group concludes that the installation of the nonsafety-related conduit in the control room was inconsistent with seismic requirements and that the suspended drywall ceiling and lighting supports appeared to satisfy seismic requirements, but no analysis could be found that confirmed the adequacy of the supports. The E&I Group also inspected selected seismic Category I areas of the plant and concludes that the installation of nonsafety-related conduits of less than or equal to 2 inches in diameter is inconsistent with seismic installation requirements. (See Attachment 2, E&I Category 4.)

The last issue of potential safety significance concerned the lack of programmatic control of the electrical QC inspector qualification program, which may be indicative of inadequate qualification for some electrical QC inspectors. Since the training and certification program is the same for all disciplines (except ASME), the E&I Group concludes that the deficiencies identified with the electrical QC inspector training and qualifications may have implications for other construction disciplines. The implications of the E&I Group findings were further assessed by the TRT QA/QC Group as part of the overall programatic review of QC inspector training and qualification. (See Attachment 2, E&I Category 6; also see QA/QC Category 4, "Training and Qualification.")

The E&I findings and actions required by TUEC (presented in Section 4 of this SSER) as related to the specific concerns and allegations were discussed with those individuals responsible for raising them and willing to participate in these discussions. Any disagreements with the E&I findings noted by these individuals, as well as the E&I Group resolutions concerning them, are reported in the appropriate E&I category.

3.1.4 Overall Assessment and Conclusions

Most of the concerns and allegations were raised by electrical quality control (QC) inspectors and were found to be very general, and often without any specific connection between the concern and plant safety. These problems were apparent in several of the concerns and allegations addressing problems with nonsafety-related equipment. Further contact with the individuals raising the concerns did not provide the required specificity to focus on the concerns. The general nature of the concerns and the absence of specific exploration of safety significance of the concern may be an indication of lack of proper training in electrical QC inspection, even though some QC inspectors had experience on this type of work at nuclear power plant facilities other than CPSES.

In general, the quality of the E&I installations reviewed by the E&I Group was found to be acceptable, except for those cases which the E&I Group determined to have safety significance. To determine the extent of the generic implication of these concerns, TUEC is required to conduct further review and inspections. (See Section 4, below.)

The E&I Group concludes that the problems found with electrical cable terminations, electrical equipment separation and control room ceiling fixture supports, together with the findings concerning inadequate training and qualification of electrical QC inspections, are an indication of programmatic weakness in QC.

The deficiencies identified during the E&I review of both hardware installation and QA/QC-related matters indicate weaknesses in the QA/QC program and are considered in the overall programmatic review by the QA/QC Group. The QA/QC programmatic review will consider the breadth and depth of the actions required by TUEC to resolve not only the specific E&I concerns identified in this report, but also other programmatic concerns related to construction activities of E&I installations. Therefore, the E&I Group concludes that any actions taken by TUEC to resolve the specific E&I concerns identified, or to establish root causes and appropriate corrective actions concerning them, should not be considered final until they are properly integrated with the results of the programmatic review performed by the QA/QC Group.

3.2 Test Program (TP) Group Summary

3.2.1 Scope of Concerns and Allegations

The technical concerns and allegations in the Test Program area involve the prerequisite and preoperational testing phases for CPSES Unit 1. There were a total of 18 concerns and allegations in the Test Program area, as originally determined by the TRT. (Several closely related allegations were combined.) Thirteen of these were contained in a proposed contention (No. 26) proffered by the Citizens Association for Sound Energy (CASE) on October 13, 1983, to the Atomic Safety and Licensing Board (ASLB) sitting in the Comanche Peak operating license hearing. While the proposed contention was ultimately not admitted by the ASLB, the technical concerns expressed by CASE were considered by the TRT in its evaluations. The remaining five allegations were brought forward by the Government Accountability Project (GAP) and CASE, which had received them from a confidential source during conversations, and later in the form of an affidavit. The TRT reviewed the affidavit and pursued information from it.

The technical concerns and allegations in the Test Program area were categorized into the following seven general topics:

Category Number	Subject	Characterization of Concerns and Allegations
1	Hot Functional Testing (HFT)	HFT was deficient in that not all components and equipment were installed at the time of testing; neither TUEC nor the NRC Region IV staff noticed this condition; neither kept the ASLB informed of the problems encountered during HFT; TUEC and the NRC Region IV staff were willing to accept deficient test results; the HFT did not take accident conditions into consideration; TUEC and the NRC Region IV staff were willing to accept deficient test results.
2	Unit 2 Testing	Although the NRC requires that each unit at a multi-unit site undergo a test program which complies with Regulatory Guide 1.68, TUEC would not conduct a test program on Unit 2, but rather would rely on the results of Unit 1 testing, unless otherwise ordered by the ASLB.

Category Number	Subject	Characterization of Concerns and Allegations
3	Containment Leak Testing	The leaks encountered during the containment integrated leak rate test (CILRT) were numerous and of such magnitude that the CILRT should have been repeated after repairs.
4	Prerequisite Testing	The prerequisite testing was being conducted by craft personnel who were not properly qualified; system test engineers (STEs) are signing off tests that were actually conducted by craft personnel without the STEs having personally witnessed the tests; and, test documentation was being signed by STEs, thereby making it look as though the tests were performed by STEs.
5	Preoperational Testing	The preoperational testing was flawed because several system test engineers may work on the same system or one may test a part of many systems, a condition causing confusion and the possibility of omissions; there was a dual numbering system causing confusion, overlap, and possible omissions; STEs were not provided with a computer printout informing them of all required system tests; calculations for the instantaneous trip settings for approximately 100 circuit breakers were incorrectly performed; portions of prerequisite tests were used to meet Final Safety Analysis Report (FSAR) commitments; system prerequisite and preoperational tests did not always include an energized functional test; and STEs were not provided with current design information.
6	Management Attitude	TUEC startup management had a tendency to relax standards whenever interpretation of commitments or NRC requirements allowed, instead of taking a conservative approach in the interest of public health and safety.

7	QA Surveillance of Testing Activities	There was minimum surveillance by QA of testing activities.

3.2.2 Test Program Group

TRT reviewers were assigned to the Test Program Group based on their technical expertise, capabilities and experience in nuclear power plant operations, testing, QA/QC, inspection program management, and regulatory activities. The Group consisted of a leader from the NRC Region I staff who had previous experience with nuclear power plant testing programs and allegation followup; the NRC Resident Reactor Inspector (operations) who had recently been assigned to CPSES; and two NRC contractor personnel from EG&G, Idaho. In total, the Group represented over 99 years of experience in the nuclear power field.

3.2.3 Findings for Test Program Issues

The Test Program Group found the concerns and allegations in Categories 2 (Unit 2 Testing) and 7 (QA Surveillance of Testing Activities) to be without basis. (See Attachment 2, TP Categories 2 and 7.) The allegation in TP Category 6 (Management Attitude) yielded some isolated cases which could have been perceived to be less than conservative and, therefore, was considered to have a valid basis. (See Attachment 2, TP Category 6.)

The concerns and allegations in TP Categories 1 (Hot Functional Testing), 4 (Prerequisite Testing), and 5 (Preoperational Testing) were generally found to have valid bases. However, none were found to be of safety significance or, with the exception of one in Test Program Category 1 and one in Test Program Category 5, to have generic implications. In general, the testing activities reviewed by the TRT were carried out in compliance with NRC regulations and FSAR commitments. However, during its review of TP Category 1, the TRT found that three HFT data packages were approved by the TUEC Joint Test Group (JTG) that failed to meet all of the objectives stated in the test procedures. These appeared to violate 10 CFR 50, Appendix B, Criterion V. (See Attachment 2, TP Category 1.) In Category 4, the TRT found that TUEC startup management authorized, by memorandum, test support craftsmen to verify initial conditions for certain prerequisite test procedures in violation of Startup Administrative Procedure CP-SAP-21, "Conduct of Testing." This instruction also appears to be a violation of 10 CFR 50, Appendix B, Criterion V. In TP Category 5, the TRT found that system test engineers (STEs) were not on controlled distribution for design changes applicable to systems to which they were assigned; rather, they were required to obtain this information on their own initiative from the document control center prior to starting a test and were then required to incorporate that information, as applicable, into the test procedure. While the TRT did not identify any specific problems as a result of this practice, it considers this practice to be weak since it relies too heavily on the motivations and initiatives of test personnel to ensure that they have current design information when they are developing test procedures and before conducting tests. Typically, these are periods when they could be under more than normal pressure. Additionally, because of the number and nature of the problems found in the document control system by the TRT QA/QC Group, the TRT could not reasonably conclude that the document control system problems identified did not affect testing activities. (See Attachment 2, TP Category 5.)

The Group found no safety significance for the allegations in TP Category 3 (Containment Integrated Leak Rate Testing), but concluded that a generic problem could exist because when the CILRT leakage rate was calculated by a method different from that which was committed to in the FSAR, the FSAR had not been amended to reflect that change. The TRT questioned the TUEC procedure for documenting and identifying FSAR deviations to the NRC. The TRT also questioned that method of calculation, which was not endorsed by the NRC. Additionally, the TRT found that the preoperational CILRT was conducted with three isolated electrical penetrations, a condition which did not provide the configuration that the Containment Building would have during normal operation. These items were considered unresolved on the TRT and were forwarded to the NRC Office of Nuclear Reactor Regulation for action. The latter two have since been resolved to the satisfaction of the NRC as reflected in Item (36) in Section 1.7 of Comanche Peak SSER 6. (See Attachment 2, TP Category 3.)

3.2.4 Overall Assessment and Conclusions

Except for those unresolved issues identified in the foregoing sections, the testing activities included in the TRT review effort were generally found to have been carried out in compliance with NRC regulations and FSAR commitments.

Adequate administrative controls had been established for the testing program, and it appeared that they were generally implemented properly. The test engineers were appropriately experienced and qualified to conduct and supervise a testing program, and were found by the TRT to be generally dedicated and responsible individuals, which contributed significantly to the success of the program. The startup group personnel, in interviews conducted by the TRT, were found to be candid, knowledgeable, and very responsive to TRT requests for information.

The TUEC startup group relies heavily on the accuracy and completeness of the design documents, which are included in the document control system, in its preparation of test procedures and during the conduct of testing. A number of problems were identified in the document control system by the TRT QA/QC Group during its review. While the TRT Test Program Group did not find that these problems adversely affected those portions of the testing program that it included in its review, the TRT cannot conclude with reasonable assurance that the document control system problems had no adverse effect on testing activities. Therefore, the TRT will require TUEC to provide NRC with assurance that all structures, systems, and components were properly and completely tested before it can draw a final conclusion with regard to the testing program.

4. Actions Required of TUEC

TUEC shall submit additional information to the NRC, in writing, including a program and schedule for completing a detailed and thorough assessment of the issues identified in the following subsections. This program plan and its implementation will be evaluated by the staff before NRC considers the issuance of an operating license for Comanche Peak, Unit 1. The program plan should address the root cause of each problem identified and its generic implications on safety-related systems, programs, or areas. The collective significance of these deficiencies should also be addressed. The program plan should also include the proposed TUEC action to assure that such problems will be precluded from occurring in the future. The specific actions required of TUEC are described in the following sections.

4.1 Electrical and Instrumentation (E&I) Area

4.1.1 Electrical Cable Terminations (See Attachment 2 for E&I Category 1)

- Reevaluate and redisposition all NCRs related to vendor-installed terminal lugs in ITT Gould-Brown Boveri switchgear; and perform and document the results of engineering analyses to justify any resulting "use-as-is" dispositions.

- Develop adequate installation and inspection procedures to ensure (1) the operability of those circuits which contain butt splices in panels, (2) that the wire splicing materials and methods used are qualified for anticipated services conditions, and (3) that splices are not located adjacent to each other.

- Reinspect all safety-related and associated terminations in the control room panels and in the termination cabinets in the cable spreading room to verify that their locations are accurately depicted on all current design documents. Should the results of this reinspection reveal an unacceptable level of nonconformance to design documents, the scope of this reinspection effort shall be expanded to include all safety-related and associated terminations at CPSES.

- Clarify procedural requirements and provide additional QC inspector training with respect to the areas in which nuclear heat-shrinkable sleeves are required on splices, and ensure that (1) such sleeves are installed where required, (2) all QC inspections requiring witnessing for splices have been performed and properly documented, and (3) all butt splices are properly identified on the appropriate design drawings and are physically identified within the appropriate panels.

- Evaluate the adequacy of the QC inspection program as related to the deficiencies identified above to establish root causes and appropriate corrective actions. These actions shall be integrated with other actions addressed under QA/QC Category 8, "As Built."

4.1.2 Electrical Cable Tray and Conduit Installation (See Attachment 2 for E&I Category 2)

- Evaluate the adequacy of craft personnel training in the use of installation manuals to establish root causes and appropriate corrective actions. This action shall be integrated with other actions concerning craft personnel training addressed under QA/QC Category 8, "As Built."

4.1.3 Electrical Equipment Separation (See Attachment 2, E&I Category 3)

- Reinspect all panels at CPSES, in addition to those in the main control room for Units 1 and 2, that contain redundant safety-related cables within conduits or safety and nonsafety-related cables within conduits, and either correct each violation of the separation criteria, or demonstrate by analysis the acceptability of the conduits as a barrier for each case where the minimum separation is not met.

- Reinspect all panels at CPSES, in addition to those in the main control room identified in Table 1 of SSER for E&I Category 3, and either correct each violation of the separation criteria concerning separate cables and cables within flexible conduits, or demonstrate by analysis the adequacy of the flexible conduit as a barrier.

- Correct two instances of violation of the separation criteria inside panels CPI-EC-PRCB-09 and CPI-EC-PRCB-03 concerning a barrier that had been removed and redundant field wiring not meeting minimum separation.

- Submit the analysis that substantiates the acceptability of the criteria stated in the electrical erection specifications governing the separation between independent conduits and cable trays.

- Evaluate the adequacy of the QC inspection program as related to the deficiencies identified above to establish root causes and appropriate corrective actions. These actions shall be integrated with other actions addressed under E&I Category 6, "Electrical QC Inspector Training and Qualifications," and QA/QC Category 8, "As Built."

4.1.4 Control Room Ceiling Fixture Supports (See Attachment 2, E&I Category 4)

- Substantiate (1) the adequacy of the overall seismic support system installation for all the items located above the ceiling in the control room, including nonsafety-related conduit, suspended ceiling and lighting and (2) the adequacy of the seismic support system installation for nonsafety-related conduit in Seismic Category I areas of the plant other than the control room. This action shall be integrated as appropriate with other actions addressed under Civil/Structural Category 14, "Seismic Design of Control Room Ceiling Elements."

4.1.5 Electrical QC Inspector Training/Qualifications (See Attachment 2, E&I Category 6)

- Evaluate the testing program for QC electrical inspector qualifications and develop a testing program which optimizes administrative guidelines, procedural requirements and test flexibility to assure that suitable proficiency is achieved and maintained.

Review all the electrical QC inspector training, qualification, certification, and recertification files against the project requirements as documented in the FSAR and provide the information in such a form that each requirement is clearly shown to have been met by each inspector. If an inspector is found to not meet the training, qualification, certification, or recertification requirements, TUEC shall then review the records to determine the adequacy of inspections made by the unqualified individuals and provide a statement on the impact of the deficiencies noted on the safety of the project.

- Justify the allowance to administer separate (waiver) tests, as permitted by procedures, in lieu of examinations administered by independent professional eye specialists.

These actions shall be integrated, as appropriate, with other actions addressed under QA/QC Category 4, "Training and Qualifications."

4.2 Test Program (TP) Area

4.2.1 Hot Functional Testing (HFT) (See Attachment 2, TP Category 1)

- Review all completed preoperational test data packages to ensure there are no instances where test objectives were not met, or prerequisite conditions were not satisfied. Address the four items identified by the TRT, along with appropriate resolution.

- Since the review of data obtained from the deferred preoperational testing is a function of the Station Operations Review Committee (SORC), amend the FSAR to reflect that the SORC, and not the Joint Test Group (JTG), will perform these reviews.

- Incorporate the information necessary to provide traceability between thermal expansion test monitoring locations and measuring instruments. Also establish administrative controls to ensure appropriate test and measuring equipment traceability during future testing and plant operations.

4.2.2 Containment Integrated Leak Rate Testing (CILRT) (See Attachment 2, TP Category 3)

- TUEC has identified deviations from FSAR commitments related to the CILRT. TUEC shall identify all other deviations from FSAR commitments which were not previously identified to NRC.

4.2.3 Prerequisite Testing (See Attachment 2, TP Category 4)

- Rescind the startup memorandum (STM-83084), which was issued in conflict with CP-SAP-21, and ensure that no other memoranda were issued which are in conflict with approved procedures. Also, conduct a review of all other prerequisite test records to determine those that had prerequisites signed by craft personnel, and assess the impact of those improperly verified on subsequent testing activities.

4.2.4 Preoperational Testing (See Attachment 2, TP Category 5)

- Establish measures to provide greater assurance that STEs and other responsible test personnel are provided with current controlled design documents and change notices.

- Provide NRC with reasonable assurance that the document control system problems identified by the TRT QA/QC Group did not affect the testing activities.

One action required in the enclosure to the NRC letter of September 18, 1984, to TUEC (Attachment 3) was that "TUEC shall evaluate the required plant conditions for the deferred preoperational tests against limiting conditions in the proposed technical specifications and obtain NRC approval where deviations from the technical specifications are necessary." This requirement is no longer applicable since the TRT has been informed by TUEC that these tests will be conducted prior to fuel load.

TUEC was also required in the September 18, 1984, letter to "justify to NRC the conduct of preoperational CILRT (Type A Test) with penetrations isolated and leakage rate calculation in accordance with ANSI/ANS 56.8 rather than ANSI N45.4-1972" and to "identify to NRC any other differences in the conduct of the CILRT as a result of using ANSI/ANS 56.8 rather than ANSI N45.4-1972." These issues have been resolved (see page J-83); accordingly, the actions are no longer required.

ATTACHMENT 1

LISTING OF TECHNICAL CONCERNS AND ALLEGATIONS

I. Electrical and Instrumentation

Allegation Number	Chacterization	Category	Page Number
AQE-1	An electrical inspector was pressured not to write nonconformance reports (NCRs) in several instances. In one case, a QC Supervisor instructed him not to write an NCR for control room cables that were removed without proper documentation.	5	J-49
AQE-2	A cable was removed from the Safeguards Building without proper documentation. An NCR was prepared, but it was uncertain whether that NCR was fully generated, processed, and disposed.	5	J-49
AQE-3	An inspector was told to close-out an NCR that described repair of a flexible conduit in the Fuel Handling Building when the conduit had been replaced rather than repaired.	5	J-49
AQE-4	Unqualified inspectors were told to close-out NCRs.	5, 6	J-49, J-55
AQE-5	An inspector was asked to close-out an NCR on a cable tray to allow craft personnel to pull cable. The inspector did not close out the NCR because the nonconforming conditions, including trash in the tray, cuts in cable jackets, and interwoven cable, still existed. The supervisor assigned another inspector who closed out the NCR.	5, 7	J-49, J-59
AQE-6	Electrical inspectors were directed by a QC supervisor to violate inspection procedures.	3, 8	J-37, J-63
AQE-7	A QC supervisor instructed electrical inspectors not to perform required in-process inspections, but only to inspect completed work.	9	J-67

I. Electrical and Instrumentation (Continued)

Allegation Number	Characterization	Category	Page Number
AQE-8	Some electrical inspectors were not adequately qualified, were given help to pass their certification tests, and had incorrect descriptions of prior electrical or inspection experience on their employment applications.	6	J-55
AQE-9	Field copies of drawings used by electrical inspectors to perform inspections were not always the most up-to-date version. (Transferred to the QA/QC Category 2.)		
AQE-10	Craftsmen installing conduit supports were not properly trained, thus necessitating extensive rework.	2	J-33
AQE-11	QC Supervisors were overly sympathetic to the needs of production managers.	3	J-37
AQE-12	Some electrical terminations were accepted by inadequately qualified inspectors; these terminations did not conform with the drawings.	1, 5, 6	J-27, J-49, J-55
AE-13	Terminal lugs of improper size and type were used in certain panels, and improper cable splices existed within various panels.	1	J-27
AE-14	Attachments were installed on cable trays and hangers at the 810-ft elevation of the Safeguards Building without required and approved design changes.	2	J-33
AE-15	Installed safety-related cables and conduits in the reactor control panel in the control room did not conform to separation criteria.	3	J-37
AE-16	A Safeguards I panel at the 790-ft elevation had loose bus bars and ground wire connections.	1	J-27
AE-17	Field run conduit, drywall, and lighting installed above control room panels were classified nonseismic and inadequately supported.	4	J-45
AE-18	Cables were butt spliced inside panels in violation of procedures.	1, 8	J-27, J-63

I. Electrical and Instrumentation (Continued)

Allegation Number	Characterization	Category	Page Number
AE-19	Cable trays were overfilled.	7	J-59
AE-20	Separation requirements in the Electrical Erection Specification for the cable spreading room were inconsistent with the requirements of Regulatory Guide (R.G.) 1.75. The installation of independent safety-related cable trays and conduit between safety-related and nonsafety-related raceway did not conform with R.G. 1.75.	3, 8	J-37, J-63
AQE-21	(This allegation is assessed in Test Programs, Category 5, "Preoperational Test Program.")		
AE-22	Cable butt splices existed in panels without authorization or documentation on drawings.	1, 5	J-27, J-49
AQE-23	Many requirements were deleted by revisions to post-construction electrical inspection procedures.	8	J-63
AE-24	A cable tray supported by a temporary hanger fell, damaging instrumentation cables entering the control room.	5	J-49
AQE-25	Electrical QC inspectors were required to submit draft NCRs to their supervisors for approval in contradiction of site procedures.	5	J-49
AE-26	Conductors with two different gauges were terminated at some lugs, and many terminations were loose.	1	J-27
AE-27	Loose elbow termination conduit fittings were found at the east and south ends of the Unit 1 diesel generators. NCRs were written, but dispositioned use-as-is.	2, 5	J-33, J-49
AE-28	Cables were not trained by use of good workmanship in the Unit 1 cable spreading room and in junction boxes 1058 and 1059. An NCR dispositioned this condition as acceptable because of proper cable bend radii, but the workmanship problem was not addressed.	7	J-59

I. Electrical and Instrumentation (Continued)

Allegation Number	Characterization	Category	Page Number
AE-29	Sides were added to some cable trays because the trays were overfilled.	2, 7	J-33, J-59
AE-30	There may be density and compaction problems in cable trays with excessive fill.	7	J-59
AE-31	There were instances of inadequate separation between process piping and cables that required that notches be made in insulation and in metal barriers between insulation and cables.	2	J-33
AQE-32	Because of complaints from craft personnel, four revisions were made to QI-QP 11.14-12 that deleted inspection requirements.	8	J-63
AQE-33	There were prevalent use-as-is dispositions written for NCRs generated with respect to the Electrical Erection Specification.	5	J-49
AQE-34	A cable jacket was damaged when a Bisco Seal was removed using a threaded rod. The resulting NCR was dispositioned use-as-is.	5	J-49
AQE-35	Non-Q fuse blocks were installed where Q blocks were required. The NCR was dispositioned use-as-is because both types of blocks were ordered under the same material specification.	5	J-49
AQE-36	Vendor-installed terminal lugs in General Electric motor control centers were excessively bent, and the resulting NCR had not been dispositioned.	1, 5	J-27, J-49
AQE-37	The dispositions of NCRs involving rework of terminal blocks were questionable.	5	J-49
AQE-38	An individual performed an undocumented repair to a solenoid.	5	J-49
AQE-39	Post-construction inspection procedures were revised to delete requirements after numerous loose terminations were found in lighting system terminal boxes.	1, 8	J-27, J-63

I. Electrical and Instrumentation (Continued)

Allegation Number	Characterization	Category	Page Number
AQE-40	Some NCRs were closed out by stating that the nonconforming condition was not addressed in the Electrical Erection Specification.	5	J-49
AQE-41	An NCR was written because worn lighting restraint cable crimp gauges were causing indeterminate inspection results. (Also addressed under QA/QC Category 6, "QC Inspection.")*	5	J-49
AQE-42	An individual was pressured not to write NCRs during turnover.	5	J-49
AQE-43	Some inspection reports were written without the reinspection needed to clear cable tray inspection item removal notices.	9	J-67
AQE-44	An individual was not satisfied with a use-as-is disposition for an NCR involving a cable separation problem in the Fuel Handling Building.	3, 8	J-37, J-63
AQE-45	There were questionable dispositions for NCRs involving inadequate thread engagement between a conduit fitting and damaged cable.	5	J-49
AQE-46	Post-construction inspection procedures were revised to delete attributes with frequent problems, such as loose lighting terminations.	1, 8	J-27, J-63
AQE-47	Many NCRs were dispositioned use-as-is.	5	J-49
AQE-48	Some NCR evaluations inaccurately described workmanship as "not compromised" when it had been poor.	5	J-49
AQE-49	Excessive rework was required to achieve proper separation.	3	J-37

*The TRT evaluation of QA/QC allegations is in progress and will be published in a subsequent supplement to this SSER.

I. Electrical and Instrumentation (Continued)

Allegation Number	Characterization	Category	Page Number
AE-50	Cables in the cable spreading room were spliced in violation of regulatory requirements.	5, 7	J-49, J-59
AE-51	A conduit was about 3 feet below a cable tray in the Control Room Building, perhaps violating separation criteria.	3	J-37
AQE-52	Revision 15 to a post-construction inspection procedure eliminated the requirement to inspect large pieces of equipment such as 6.9 kV motors.	8	J-63
AQE-53	Separation between two conduits was accomplished only after improper conduit bending.	3	J-37
AQE-54	Ladder type cable trays should not qualify as barriers; therefore, the 1-inch separation criteria between ladder-type trays and conduits routed under the trays should not apply.	3	J-37
AH-14	Attachments were installed on cable trays and hangers without required design changes. (Also, inadequate spacing of seismic supports for cable trays and material traceability for cable tray supports.)	2	J-33
SRT-10	The effect of the weight of thermolag material on cable trays requires evaluation.	7	J-59

II. Test Programs

Allegation Number	Characterization	Category	Page Number
AT-1	The Hot Functional Test was deficient in that major components and equipment were not installed at the time of testing.	1	J-69
AT-2	Significant modifications have been made or planned which invalidate the Hot Functional Test.	1	J-69
AT-3	TUEC does not intend to confirm performance of major components and equipment until after fuel loading.	1	J-69

II. Test Programs (Continued)

Allegation Number	Characterization	Category	Page Number
AT-4	Neither TUEC nor NRC Region IV staff noticed that major components and equipment were not installed prior to the Hot Functional Test.	1	J-69
AT-5	The Hot Functional Test was inadequate because it did not include accident conditions, such as earthquakes and Loss of Coolant Accidents (LOCAs); the deficiencies found during the Hot Functional Test demonstrate that the plant cannot be operated successfully during an accident.	1	J-69
AT-6	The willingness of both the applicant and the NRC Region IV staff to accept Hot Functional Test results which are deficient makes it impossible to rely on the test results to prove CPSES is safe.	1	J-69
AT-7	Problems revealed by the Hot Functional Test, and related containment and leak-rate tests, are so extensive and of such magnitude that they must be corrected before fuel load.	3	J-81
AT-8	In order for the health and safety of the public to be assured, Texas Utilities Electric Company (TUEC) must correct problems in design and construction, following which they must conduct additional tests, including a Hot Functional Test, until such time as the tests can be run successfully with all finalized equipment in place.	1	J-69
AT-9	Neither the NRC staff nor TUEC has informed the Atomic Safety and Licensing Board (ASLB) of the extent and magnitude of the problems uncovered in the test program.	1	J-69
AT-10	The ASLB itself should closely monitor the successful completion of tests and reinspections.	1	J-69

II. Test Programs (Continued)

Allegation Number	Characterization	Category	Page Number
AT-11	The ASLB should recognize that test result evaluations performed by TUEC and the NRC staff were incomplete and inaccurate. The ASLB should consider these inadequacies when examining testimony given by TUEC and the NRC staff and when making its decisions.	1	J-69
AT-12	Separate tests should be required for Unit 2, rather than relying on tests performed for Unit 1 to reveal problems.	2	J-79
AT-13	The ASLB should order a complete reinspection of all components, equipment, welding, and "everything" before allowing fuel loading.	1	J-69
AT-14	Prerequisite testing was performed by unqualified craft personnel; system test engineers (STEs) were signing test documents for tests performed by craft personnel when the STEs were not present; and test documentation reflected test performance by STEs when tests were actually performed by craft personnel.	4	J-85
AT-15	The preoperational test program was flawed because: (1) there was a dual numbering system causing confusion, overlap, and possible omissions; (2) STEs were not provided with a computer printout informing them of all required system tests; (3) calculations for the instantaneous trip settings for approximately 100 circuit breakers were incorrectly performed; (4) portions of prerequisite tests were used to meet Final Safety Analysis Report (FSAR) commitments; (5) system prerequisite and preoperational tests did not always include an energized functional test; and (6) STEs were not provided with current design information.	5	J-91
AT-16	TUEC upper management liberally interpreted their FSAR commitments.	6	J-97
AT-17	There were numerous problems with the thermal expansion test.	1	J-69
AT-18	There was minimal QA surveillance of test program activities.	7	J-99

ATTACHMENT 2

ASSESSMENT OF INDIVIDUAL TECHNICAL CONCERNS AND ALLEGATIONS IN ELECTRICAL AND INSTRUMENTATION AND TEST PROGRAM AREAS

1. Allegation Category: Electrical and Instrumentation 1, Electrical Cable Terminations

2. Allegation Number: AE-13, AE-16, AE-18, AE-22, AE-26, AQE-12, AQE-36, and parts of AQE-39 and AQE-46.

3. Characterization: It is alleged that:

   - Terminal lugs of improper size and type were utilized on cables in various panels and that improper cable splices existed within certain panels (AE-13).
   - Loose bus bar and ground wire connections existed in a safeguards panel (AE-16).
   - Cables were butt spliced inside panels in violation of procedures (AE-18).
   - Cable butt splices existed in panels without authorization or without being documented on drawings (AE-22).
   - Cable termination connections were loose and improper-sized lugs were used on cable terminations (AE-26).
   - Cable terminations not in conformance with drawings were accepted by quality control (QC) personnel (AQE-12).
   - Vendor-installed terminal lugs were excessively bent and corresponding nonconformance reports (NCRs) were improperly dispositioned (AQE-36).
   - Certain quality assurance/quality control (QA/QC) matters related to cable terminations were improperly implemented.

The general concerns expressed in these allegations are within the scope of the above allegations and are addressed below as appropriate (parts of AQE-39 and AQE-46).

4. Assessment of Safety Significance: The implied safety significance of these allegations is that improper installation of butt splices and cable connections, disagreement of the installation with as-built drawings, or

improperly dispositioned NCRs could place the quality of the installation in question.

Sample of Safety-Related Termination Installation. Since many of the alleged conditions identified in AE-13, AE-16, AE-26, parts of AQE-39 and AQE-46 were located in equipment containing nonsafety-related cabling, the NRC Technical Review Team (TRT) also sampled safety-related installations to determine whether similar conditions existed within them. Sixteen safety-related items (control panels, annunciator cabinets, termination cabinets, motor control centers, and switchgear) were inspected for the following items:

- Proper size lugs used relative to cable size and screw size (AE-13).
- Tightness of bus bar and ground wire connections and terminal lugs on terminal blocks (AE-16).
- General workmanship for such items as shaved lugs, proper washers, and bend radii (AE-26).

The TRT found no unacceptable conditions with the terminations inspected, including those associated with AE-13, AE-16, AE-26 and parts of AQE-39 and AQE-46.

Butt Splices. Allegations AE-13, AE-18, and AE-22 concerned butt splices in panels that could be in violation of regulatory requirements and site procedures. The practice of butt splicing cables in panels was allowed on a limited basis, as specifed in Section 8.1.5.2.4 of Amendment 44 to the Final Safety Analysis Report (FSAR). The NRC staff reviewed Texas Utilities Electric Company's (TUEC's) justification for permitting butt splices inside panels (correspondence from M. Srinivasan, NRC Power Systems Branch to B. J. Youngblood, NRC Licensing Branch, July 30, 1984), and concluded that the practice is acceptable on a limited basis, subject to the following conditions:

- That adequate provisions be included in the installation procedures to verify operability of those circuits for which splices are being used,
- That the wire splices used are qualified for anticipated service conditions, and
- That splices are staggered within the panel so that they are not adjacent to each other in the same wire bundle and pressing against one another.

The TRT inspected butt splices in safety-related panels to determine whether they were installed in accordance with the requirements stated in Texas Utilities Generating Company (TUGCO) procedure QI-QP-11.3-28, Revision 21, "Class 1E Cable Terminations." The TRT also interviewed one alleger to clarify one allegation concerning butt splices.

The TRT found the splices to be in conformance with all procedural requirements set forth by TUGCO which did not include the three conditions for acceptability stated above, which the NRC considers important to assure the adequacy of these splices, with the following exception. All splices inspected were missing the "nuclear heat-shrinkable cable insulation sleeves," as required by paragraph 3.2.15 of the procedure for 600-volt control and instrumentation connections. Due to this recurrent condition, the TRT reviewed the QC inspection reports for 12 butt splices and found the following:

- Nine of these splices were documented on the inspection form designated in paragraph 3.3 of the procedure for post-installation inspections instead of on the correct form designated for witnessing-type inspections. It should be noted that all splices were required to be witnessed by QC personnel per paragraph 3.1.d of the procedure.

- Six of the nine incorrect forms contained handwritten notes by the inspector indicating that he had witnessed the splice; however, no reference was added to indicate that the installation of the heat-shrinkable sleeves was required to be witnessed.

- The remaining three of the nine incorrect forms did not indicate that the splices had been witnessed.

- For three splices which were documented on the correct forms, the forms all contained an "N/A" (not applicable) handwritten by the inspector on the line indicating that the installation of the heat-shrinkable sleeve was witnessed.

In summary, the lack of awareness of where the heat-shrinkable sleeves should be installed, as reflected in the QC inspection form, when the high percentage of missed and/or improperly documented inspections requiring witnessing, indicated that craft and inspection personnel lacked familiarity with these procedural requirements. This apparent lack of familiarity may be indicative of poor training. (See Electrical and Instrumentation Category 6, "Electrical QC Inspector Training/ Qualification.")

Nonconformance of Cable Terminations with Drawings. Allegation AQE-12 involves QC inspectors "buying off" terminations that did not conform to drawing requirements. In view of the lack of specific information concerning this allegation, the TRT selected 380 cables, involving 1600 individual terminations, and inspected them in detail with respect to drawing requirements. This inspection revealed that six cables (five of which are safety-related) were not terminated in accordance with current drawings. These six cables are:

(1) E0139880 in panel CP1-ECPRCB-14,
(2) E0110040 in panel CP1-ECPRTC-16,
(3) E0118262 in panel CP1-ECPRTC-16,
(4) NK139853 in panel CP1-ECPRCB-02 (non-safety),
(5) EG104796 in panel CP1-ECPRTC-27, and
(6) EG021856 in panel CPX-ECPRCV-01.

Terminal Lugs. Allegation AQE-36 involved vendor-installed Amp Product Corporation (APC) terminal lugs in ITT Gould-Brown Boveri, 6.9 kV switchgear being excessively bent in the area between the ring and the barrel. The TRT discovered 16 NCRs (E-84-01066 through E-84-01081) issued early in April 1984, which documented this condition. The TRT review of TUEC action taken regarding these NCRs revealed the following:

- The NCRs described the APC lugs either as being bent in excess of 60 degrees or twisted.

- The documented record of a telephone conversation between TUEC and the representative of the lug manufacturer (reference letter VBR-16624) stated that lugs bent to 90 degrees one time were to be considered acceptable; that lugs bent to 120 degrees could be acceptable after utilizing an engineering evaluation by the end-user; and that although lugs bent to 120 degrees would not maintain their full mechanical strength, they would maintain their electrical characteristics. This acceptance criteria for field bent lugs was changed by APC due to the dispositioning of NCR E-84-00972 regarding the General Electric (GE) motor control center (MCC) thermal overload relay replacement program.

The TRT findings regarding the disposition of these NCRs were as follows:

- The disposition block of the NCR form stated that many of the lugs were "determined not to pose an equipment serviceability problem." However, there was no reference to or evidence of an engineering evaluation, as required by the lug manufacturer prior to a change in the acceptance criteria on NCR E-84-00972.

- Only the "bent" condition of the lugs was addressed by both the vendor representative and TUEC engineering. Neither the mechanical strength nor the electrical characteristics were ever addressed with respect to "twisted" lugs.

The TRT determined that these NCRs were improperly dispositioned in that the full scope of the identified problem was not addressed and the "use-as-is" dispositions were not adequately justified.

5. Conclusions and Staff Positions: The TRT concludes that concerns exist in the following areas relative to cable terminations:

- The adequacy of butt splices in safety-related panels concerning operability, qualification for service conditions, and relative location of splices to each other (AE-13, AE-18 and AE-22).
- The acceptability of vendor-installed terminal lugs in ITT Gould-Brown Boveri switchgear (AQE-36).
- Safety-related terminations which are not in conformance with current drawings (AQE-12).
- The adequacy of QC inspections and supporting documentation, particularly with respect to termination activities requiring witnessing by QC personnel.

6. Action Required: TUEC shall accomplish the following actions prior to fuel load:

(a) Reevaluate and redisposition all NCRs related to vendor-installed terminal lugs in ITT Gould-Brown Boveri switchgear, taking into consideration the effects of twisted as well as bent lugs, and perform and document the results of engineering analyses to justify any resulting "use-as-is" dispositions.

(b) Develop adequate installation and inspection procedures to reinspect all existing butt splices to ensure (1) the operability of those circuits which contain butt splices in panels, (2) that the wire splicing materials and methods used are qualified for anticipated service conditions, and (3) that splices are staggered within the panel so that they are not adjacent to each other in the same bundle.

(c) Reinspect all safety-related and associated terminations in the control room and in the termination cabinets in the cable spreading room to verify that their locations are in accordance with all current design documents. Should the results of this reinspection reveal an unacceptable level of nonconformance to design documents, the scope of this reinspection effort shall be expanded to include all safety-related and associated terminations at Comanche Peak Steam Electric Station (CPSES).

(d) Provide additional QC inspector training with respect to the areas in which nuclear heat-shrinkable sleeves are required on splices and ensure that (1) such sleeves are installed where required, (2) all QC inspections requiring witnessing for splices have been performed and properly documented, and (3) all butt splices are properly identified on the appropriate design drawings and are physically identified within the appropriate panels.

(e) Evaluate the adequacy of the QC inspection program as related to the deficiencies identified above to establish root causes and appropriate corrective actions. These actions shall be integrated with other actions addressed under QA/QC Category 8, "As Built."*

*TRT evaluation of QA/QC allegations is in progress and will be published in a subsequent supplement to this SSER.

1. Allegation Category: Electrical and Instrumentation 2, Electrical Cable Tray and Conduit Installation

2. Allegation Number: AQE-10, AE-14, AE-27, AE-29, AE-31 and AH-14.

3. Characterization: It is alleged that, in general, there were problems with:

   - Cable tray support installation without required design changes (AH-14).
   - Addition of higher sides to cable trays due to overfill (AE-29).
   - Inadequate clearance of process pipes from cables in cable trays (Q&A specification 2323-ES-100, not met) (AE-31).
   - Loose conduit fittings (AQE-27).
   - The adequacy of training of personnel installing conduit supports (AQE-10).
   - The cable tray attachments (clamps) to the seismic supports without approved design changes (AE-14, AH-14).
   - Inadequate spacing of the seismic supports for cable trays (AH-14).
   - Inadequate material traceability for cable tray supports (AH-14).

4. Assessment of Safety Significance: The implied safety significance of these allegations is that the quality of the installation of cable trays and their supports or conduit fittings could be in question.

   The NRC Technical Review Team (TRT) determined that the first two concerns (AH-14 and AE-29) related to whether the positions of Regulatory Guide 1.29, "Seismic Design Classification," as augmented by Final Safety Analysis Report (FSAR) Section 3.2, were considered by the Texas Utilities Electric Company (TUEC) during design of the support systems for both safety-related and nonsafety-related cable trays.

   The TRT examined cable tray support installation notes and detail drawings, design change authorizations (DCAs), work packages, physical configuration drawings, and other documents pertinent to its sampling of 29 supports in the Safeguards, Auxiliary, and Control Buildings. The TRT found no deviations from the acceptable criteria for the installation of supports. Welds were not included in this examination; the inspection of electrical cable tray support welds is addressed under QA/QC Category 8, "As Built." The TRT also evaluated a sample of cable trays in the cable spreading room to assess the concern about the higher cable tray sides. This evaluation and its conclusions are presented in Electrical Instrumentation Category 7, "Electrical Cable Installation."

   The third concern (AE-31) related to process-pipe-to-cable-tray clearances not meeting the Gibbs & Hill (G&H) electrical specification 2323-ES-100, as amended by DCA 13045 and DCA 15917. The TRT conducted a walkdown inspection of approximately 2500 feet of cable tray in the auxiliary building and identified 16 cases that appeared not to meet installation guidelines set forth by the acceptable specification above. However, after an examination of the DCAs pertaining to each of the 16 cases, the TRT determined that the DCAs will satisfactorily correct deviations from specifications in the installations for all 16 cases.

   The fourth concern (AE-27) was the "use-as-is" disposition on a nonconformance report (NCR) which reported two loose conduit elbow fittings

on the south and east end of the Unit 1 diesel generator. The TRT inspected the Unit 1 diesel generator conduit and found two loose fittings. However, the TRT determined that in the unlikely event of failure of the cables in the loose fittings, the functional capability of the diesel generators would not be affected because those cables were not important in the operation of the diesels.

The fifth concern (AQE-10) was the lack of training of personnel installing conduit supports. The TRT interviewed craft personnel, craft supervisors, and training personnel to determine the availability and effectiveness of the training program, and found that there was a training program for newly hired personnel or transfers into the installation. This training program included periodic briefings on procedure changes. The interviews revealed that the training program was not effective because 7 of the 11 crew members interviewed were not cognizant of Manual 2323-S-0910, "Conduit and Junction Box Supports," which is the primary reference manual for installation of supports. Although these seven crew members indicated that they had no need to use this manual in their job assignments, the TRT could not substantiate this assertion. Hence, the lack of awareness of this procedure by craft personnel may be indicative of poor training in the area of procedural requirements. Similar findings in other construction crafts are addressed under QA/QC Category 8, "As Built."

The sixth concern (AE-14, AH-14) was that cable tray attachments (clamps) to the seismic supports were not installed according to design. The TRT inspected 60 cable tray attachments in the Safeguards Building and found no unacceptable cable tray attachments in the sample.

The seventh and eighth concerns (AH-14) were that the designed spacing of the seismic cable tray supports was not adhered to during construction and that the supports did not have proper material traceability. The TRT conducted a walkdown inspection of seismic cable tray supports in the Safeguards and Auxiliary Buildings, and compared the installed cable tray support spacing with the designed support spacing, including identification of material traceability for the supports. Two deviations in support spacing were located out of 40 examples inspected. The TRT asked TUEC engineering to provide the analyses for these two deviations because they were outside the designed support spacing. A review of TUEC's documentation of analyses indicated that the spacing maintained was adequate to meet regulatory requirements.

5. Conclusion and Staff Positions: Based on the review of engineering drawings and direct inspection of the installation, the TRT found no indication of construction which was contrary to commitments made in the FSAR Section 3.2, as related to AH-14, AE-29. The TRT determined that DCAs 13045 and 15917 will satisfactorily correct the process-pipe-to-cable tray clearance deviations from specification 2323-ES-100 for every case identified during the walkdown inspection (AE-31). The TRT found no problems with cable tray attachments (clamps) to seismic supports (AH-14, AE-14). The TRT determined that the cable tray support spacing meets design requirements and has proper identification for material traceability, except for two deviations concerning support spacing which were previously analyzed by TUEC. These analyses were found to be acceptable by TRT (AH-14). With regard to loose conduit fittings (AQE-27), the TRT

concludes that the deficiency raised by the NCR has no safety significance; therefore, the NCR was properly dispositioned.

The TRT concludes that the concern highlighted by AQE-10 may be indicative of poor training in the area of procedural requirements.

6. Action Required: Prior to fuel load TUEC shall accomplish the following action:

Evaluate the adequacy of craft personnel training in the use of installation manuals to establish root causes and appropriate corrective actions. This action shall be integrated with other actions concerning craft personnel training addressed under QA/QC Category 8, "As Built."*

*The TRT evaluation of QA/QC allegations is in progress and will be published in a subsequent supplement to this SSER.

1. Allegation Category: Electrical and Instrumentation 3, Electrical Equipment Separation

2. Allegation Number: AQE-6, AQE-11, AE-15, AE-20, AQE-49, AE-51, AE-53, AQE-54 and Part of AQE-44.

3. Characterization: It is alleged that:

   - Installation of safety-related cables and conduits inside the reactor control panels in the main control room did not conform to the cable separation criteria (AE-15).

   - Separation between independent safety-related cable trays and conduits, and between them and nonsafety-related trays and conduits in the cable spreading room did not conform to the positions set forth in Regulatory Guide (RG) 1.75, "Physical Independence of Electric Systems." It is also alleged that the separation requirements in Gibbs & Hill (G&H) specification 2323-ES-100, "Electrical Erection Specification," applicable to the cable installation in the cable spreading room, was inconsistent with the separation criteria in the Institute of Electrical and Electronics Engineers (IEEE) Standard 384-1974, "IEEE Trial-Use Standard Criteria for Separation of Class 1E Equipment and Circuits," as augmented by RG 1.75 (AE-20).

   - Ladder type cable trays did not qualify as acceptable barriers; therefore, the 1-inch minimum separation criteria between separate trays and conduits routed under the trays are not applicable (AQE-54).

   - Nonconformance Report (NCR) E-84-007095 was dispositioned to achieve the required separation between conduits ESB1-4 and C14K30975 without approved conduit bending equipment (AE-53).

   - Post-construction inspection of electrical equipment and raceways in the Fuel Handling Building concerning a cable separation problem was dispositioned "use-as-is" (part of AQE-44).

   - Conduit 22G06343, located in the Control Room Building at the 854-foot elevation, was about 3 feet below cable tray T13OCCP38 and thought to violate separation criteria (AE-51).

   - Inspection of the separation of cables did not follow established procedures (AQE-6); quality control (QC) inspection acceptability regarding separation of equipment may have been compromised to meet the needs of production management (AQE-11); and, in numerous cases rework was done to obtain proper separation (AQE-49).

   These three allegations, in very general terms, raise concerns with cable separation, but do not specifically identify the location of problem areas in the facility. The following discussion will focus on the specific installation concerns of cable separation raised by the allegations. However, the concerns highlighted by AQE-6, AQE-11 and AQE-49 were pursued during the review and inspection of cable separation installations in the various areas of the plant inspected.

Therefore, the NRC Technical Review Team (TRT) findings concerning cable separation disposed of both specific and general concerns raised by the allegations. Quality assurance/quality control (QA/QC) matters raised by allegation AQE-6 are addressed under Electrical and Instrumentation Category 8, "Electrical Procedures."

4. Assessment of Safety Significance: The implied safety significance of these allegations is that lack of separation may result in a loss of redundancy during design basis accidents and a loss of capability to mitigate the consequences of accidents or to achieve safe shutdown.

Control Room Panels (AE-15, AE-20, AQE-6, AQE-11, and AQE-49). The criteria governing the separation of cables inside panels are stated in Section 5.6.2 of IEEE Standard 384-1974, which is endorsed by RG 1.75. Sections 7.1.2.2 and 8.3.1.4 of the Final Safety Analysis Report (FSAR) commit Texas Utility Electric Company (TUEC) to these criteria.

Section 5.6.2 of IEEE Standard 384 states, in part, that the minimum separation distance between redundant Class 1E equipment and wiring internal to the control switchboards (panels) can be established by analysis of the proposed installation. Where the control switchboard materials are flame retardant and analysis is not performed, the minimum separation distance shall be 6 inches. In the event these separation distances are not maintained, barriers shall be installed between redundant Class 1E equipment and wiring. The criterion specifying a 1-inch separation between redundant conduits which are considered enclosed raceways is stated in Section 5.1.3 of IEEE Standard 384.

The TRT examined the electrical erection specifications, cable and raceway separation engineering drawings, design change authorizations (DCAs), work packages, and other documents pertinent to the separation of cables, conduits, and devices inside the main control room panels. The TRT also inspected cables, flexible conduits, terminations, and devices inside six safety-related panels to determine that this equipment was installed in accordance with established separation requirements. In addition, the TRT inspected the separation of cable trays and rigid conduits entering the bottom of the panels from the cable spreading room.

The TRT found that the minimum 6-inch air gap or fire retardant barrier between redundant Class 1E panel-mounted devices (including their cable or wire connections) and nonsafety-related devices and their connections was maintained in all six panels inspected, except for an instance where a fire-retardant barrier had been removed. The devices involved were FI-2456A, PI-2453A, PI-2475A, and IT-2450, associated with train A, and FI-2457A, PI-2454A, PI-2476A, and IT-2451, associated with train B. These devices were located in auxiliary feedwater panel CP1-EC-PRCB-09.

The TRT also found (in panel CP1-EC-PRCB-03, adjacent to the six panels inspected) another instance of redundant safety-related field wiring not being separated by either the 6-inch minimum distance or by a barrier. The field wiring was associated with devices HS-5423 (train B) and HS-5574 (nonsafety related).

The TRT found no deficiencies in the separation of vertical cable trays and rigid conduits entering the bottom of the panels in the control room floor.

The TRT found several instances where (1) redundant safety-related flexible conduits inside the panels were in direct contact with each other and (2) safety and nonsafety-related flexible conduits inside the panels were in direct contact with each other. The TRT also found various cases where safety and nonsafety-related cables were in direct contact with safety-related cables within flexible conduits associated with the other redundant train inside the panels. These are identified in Table 1.

Table 1

Safety or Nonsafety-Related Cables
in Contact with Other Safety-Related Conduits in Control Room Panels

1. Control Panel CP1-EC-PRCB-02: Containment Spray System

Cable No.	Train	Related Instrument
EG139373	B (green)	Undetermined
E0139010	A (orange)	Undetermined

2. Control Panel CP1-EC-PRCB-07: Reactor Control

Cable No.	Train	Related Instrument
EG139383	B (green)	Reactor manual trip switch
E0139311	A (orange)	Undetermined
E0139310	A (orange)	Undetermined
EG139348	B (green)	Undetermined

3. Control Panel CP1-EC-PRCB-06: Chemical and Volume Control System

Cable No.	Train	Related Instrument
EG139335	B (green)	LCV-112C
E0139301	A (orange)	Undetermined
E0139305	A (orange)	LCV-112B
NK139605	Nonsafety (in bundle)	CSALB-6AB

4. Control Panel CP1-EC-PRCB-09: Auxiliary Feedwater Control System

Cable No.	Train	Related Instrument
E0139753	A (orange)	FK-2453A
E0139754	A (orange)	FK-2453B
EG139756	B (green)	FK-2454A
EG139288	B (green)	FK-2454B
EG145780	B (green)	FK-2454A
EG145781	B (green)	FK-2460A
A0138622	A (orange Assoc.)	HS-2452G-H
NK139647	Nonsafety	HS-2383

Table 1, continued

5. Control Panel CP1-EC-PRCB-08: Feedwater Control

Cable No.	Train	Related Instrument
EG140309	B (green)	PK-2324
EG139757	B (green)	PK-2328
NK13957	Nonsafety	HS-211A

The TRT discussed with TUEC and G&H representatives the apparent violation of the required 1-inch separation between separate flexible conduits and 6-inch separation between separate cables and cables within flexible conduits inside the panels. TUEC and G&H representatives indicated that redundant flexible conduits in contact with each other were permitted, as indicated in the cable and raceway separation typical details drawings, but cables in contact with cables within flexible conduit were not permitted. However, the TRT brought to the attention of the TUEC and G&H representatives that this type of conduit installation is permitted by Section 5.6.2 of IEEE Standard 384 if such installation can be substantiated by analysis. The TRT considered the apparent discrepancies described above to be a deviation from the engineering drawings and inconsistent with regulatory requirements.

Cable Spreading Room (AE-20, AQE-6, AQE-11, and AQE-49). The criteria governing the separation of redundant safety-related cable trays and conduits in the cable spreading room appear in Section 5.1.3 of IEEE Standard 384-1974, as augmented by RG 1.75. IEEE Standard 384 states, in part, that the minimum separation distance between redundant Class 1E cable trays in the cable spreading area can be determined by analysis of the proposed cable installation or, where the conditions of Section 5.1.1.3 (which defines an acceptable tray system) are met, there shall be 1 foot between trays separated horizontally and 3 feet between trays separated vertically. Where the minimum separation distance cannot be met, the redundant circuits shall be run in enclosed raceways that qualify as barriers, or other barriers shall be provided between redundant circuits. The minimum distance between these redundant enclosed raceways and between barriers and raceways shall be 1 inch.

The TRT compared these criteria to the requirements set forth in G&H electrical erection specifications and engineering drawings, concerning cable tray and conduit separation in the cable spreading room, and identified no deviations.

The TRT also examined DCAs, work packages, and other documents pertinent to this issue. In addition, the TRT directly inspected the installation of numerous cable raceways and five termination cabinets in the cable spreading room. The TRT found no deviations from separation requirements in the cable raceways and termination cabinets inspected.

Fuel Handling Building Area (Part of AQE-44, AQE-6, AQE-11 and AQE-49). The TRT inspected the cable separation installation in the Fuel Handling Building area and found that most of the cable trays and conduits were designated as nonsafety related. The only safety-related electrical equipment installation in the fuel building area that needed to satisfy

separation requirements was associated with the spent fuel system. The TRT found that redundant spent fuel system equipment was located in separate adjacent rooms, except for a common control panel. After examining the separation of cable raceways in the fuel building area and terminations and the cables, wires, and devices inside the common control panel, the TRT found no deviations from separation requirements.

Potential Harsh Environment Areas (AQE-6, AQE-11, and AQE-49). The TRT examined cable separation installations in those areas of the plant where a high-energy line break could compromise the independence of redundant safety-related equipment. TUEC's damage study group performed studies to determine the need to protect equipment, including cable raceways, that could be affected by a high-energy line break. Jet shields were installed to protect safety-related raceways, as required. In the areas where the installation of jet shields was not possible, the affected cable raceways were to be rerouted.

The TRT inspected two typical jet shield installations located in the chemical and volume control system (CVCS) piping and valve area and steam generator blowdown area and found that cable separation in these two areas was in accordance with IEEE Standard 384-1974, as augmented by RG 1.75.

Remote Shutdown and Transfer Switch Panel Areas (AE-15, AE-53, AQE-6, AQE-11, and AQE-49). The TRT reviewed engineering drawings and electrical erection specifications pertinent to the separation of the safety-related equipment located inside the remote shutdown and transfer switch panels. The TRT also inspected the cables, wires, and devices (including their cables and wire connections) inside these two panels and the cables entering the top of the panels to determine whether this equipment was installed in accordance with established separation requirements. The TRT found no deviations from separation requirements in these two panels.

NCR E-84-007095 concerns the separation between two specific conduits (AE-53) located in the Unit 1 safeguard area, which was established by bending the conduits with unapproved bending equipment. The TRT determined that both conduits dispositioned "use as is" in the NCR were nonsafety-related and concurred with the "use as is" disposition.

Electrical Erection Specification for Separation Criteria (AQE-6, AQE-54, and AE-51). The criteria set forth in IEEE Standard 384-1974, as augmented by RG 1.75 and Sections 7.1.2.2 and 8.3.1.4 of the FSAR, have been expressed in specific terms in G&H specification 2323-ES-100, "Electrical Erection Specification." It is alleged that the requirements set forth in this specification governing the separation between independent trays and rigid conduits is inconsistent with the criteria stated in IEEE Standard 384-1974, as augmented by RG 1.75, particularly when ladder type trays and conduits were used as barriers to maintain a 1-inch minimum separation between separate trays and conduits routed under the trays.

During its assessment of this allegation, the TRT found a requirement in the electrical erection specification that permitted nonsafety-related rigid conduits to have a minimum separation of 1 inch from the top of open safety-related trays. These requirements appear to be inconsistent with the aforementioned standard and guide.

The TRT determined that no information was included in the FSAR that supported the 1-inch separation between trays and conduits, which is at variance with the requirements of IEEE Standard 384-1974 and RG 1.75. However, the TRT reviewed an existing G&H analysis, including test results, which was used to establish the requirements set forth in specification 2323-ES-100 for a separation of 1 inch between conduits and trays (G&H memorandum EE-863, January 17, 1984, "Cable Tray Conduit Separations"). In essence, the analysis concluded that rigid conduits constituted an acceptable barrier by themselves between the cables inside the conduit and cables inside ladder or open-type trays.

Based on the review of electrical specifications, engineering drawings and analyses, inspection reports, procedures, and other pertinent documents and on direct inspection of the installation of cables, conduits, cable trays, terminations and panels in the main control room, cable spreading room, Fuel Handling Building area, potential harsh environment areas, and remote shutdown and transfer switch panel areas, the TRT determined that in general the requirements set forth in IEEE Standard 384, as augmented by RG 1.75 and Chapters 7 and 8 of the FSAR, were satisfied in the areas inspected, except for the following items:

- The TRT could find no evidence that an analysis was performed to support the practice that allowed certain separate safety- and nonsafety-related flexible conduits inside control room panels to be in direct contact with each other or to be separated by less than 1 inch, as required by Section 5.6.2 of IEEE Standard 384 (AE-15).

- The TRT determined that the installation of certain safety- or nonsafety-related cables inside control room panels, which were in direct contact with safety-related flexible conduits associated with the other redundant trains (see Table 1), was inconsistent with engineering drawings and regulatory requirements (AE-15 and AQE-6). Because acceptability of the flexible conduit as a barrier was not established by analysis, as required by Section 5.6.2 of IEEE Standard 384, the cables must be separated from the conduits inside the panels by a minimum distance of 6 inches, as required by Section 5.6.2 of IEEE Standard 384. (AE-15)

- The TRT determined that the missing barrier (used to separate redundant devices in auxiliary feedwater panel CP1-EC-PRCB-09) and the field wiring not being separated by the required 6 inches (inside panel CP1-EC-PRCB-03) were the only two instances of Class 1E panel-mounted devices in violation of the separation criteria which require corrective action. (AE-15)

- The TRT found no evidence that the existing G&H analysis for establishing the criteria for a 1-inch separation between rigid conduits and cable trays, as stated in G&H Electrical Erection specification 2323-ES-100, had been evaluated by the NRC staff for Comanche Peak. This analysis should have been referenced in the FSAR. (AE-20)

5. Conclusions and Staff Positions: The TRT concludes that the installations reviewed, in general, meet established separation requirements, except for certain safety- and nonsafety-related cables and flexible conduits inside

control room panels which did not meet minimum separation requirements (AE-15). The TRT found no evidence that the lack of separation was justified by analysis. The TRT also concludes that in the absence of analysis to support the lack of minimum separation between separate flexible conduits inside the main control room panels, the existing design arrangement is in violation of regulatory requirements. Furthermore, the lack of separation in the installation of certain cables and flexible conduits is also inconsistent with TUEC's engineering drawings and documents (AQE-6). The lack of analysis to substantiate the adequacy of separation in the above cases may be an indication of weakness in the QA/QC program concerning design control. This area is addressed in QA/QC Category 1, "Design Process."*

The TRT concludes that the unjustified installation of cables and flexible conduits inside panels that do not meet minimum separation requirements has potential generic implications. (AE-15)

In regard to the criteria for 1-inch separation between rigid conduits and cable trays stated in G&H specification 2323-ES-100 (AQE-54 and AE-51), the TRT concludes that the analyses performed by G&H to support acceptability of these criteria require NRC evaluation. The present FSAR contains no reference to this analysis. (AE-20)

The TRT also concludes that the missing barrier in the auxiliary feedwater panel and the field wiring not being separated by the required 6 inches are two isolated instances of nonconformance and do not have generic implications.

The TRT findings on cable separation may be indicative of poor QC personnel training in procedural requirements for installation and inspection. This subject is further addressed under Electrical and Instrumentation Category 6, "Electrical QC Inspector Training and Qualifications." Similar findings in other installations are addressed under QA/QC Category 8, "As Built."

6. Action Required: TUEC shall accomplish the following actions prior to fuel load:

   (a) Reinspect all panels at Comanche Peak Steam Electric Station, in addition to those in the main control room for Units 1 and 2, that contain (1) redundant safety-related conduits, or (2) safety- and nonsafety-related conduits. TUEC shall either correct each violation of the separation criteria or demonstrate by analysis the acceptability of the conduit as a barrier for each case where the minimum separation is not met. This analysis shall be accomplished in accordance with the requirements specified in Section 5.6.2 of IEEE Standard 384-1974. Furthermore, in the event that the acceptability of the conduit as a barrier cannot be demonstrated, TUEC shall correct the engineering drawings and related documents to indicate the revised minimum separation of conduits inside the panel for each case.

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*The TRT evaluation of QA/QC allegations is in progress and will be published in a subsequent supplement to this SSER.

(b) Either correct each of the violations of separation criteria concerning separate cables and cables within flexible conduits found in contact with each other inside main control room panels (Table 1) or demonstrate by analysis the adequacy of the flexible conduit as a barrier. TUEC shall also reinspect all remaining panels in the control room and other areas of the plant containing separate cables and cables within flexible conduit and shall take the same corrective actions as those outlined in Table 1.

This analysis shall be accomplished in accordance with Section 5.6.2 of IEEE Standard 384-1974. In the event that the acceptability of the conduit as a barrier cannot be demonstrated, TUEC shall separate cables and cables within flexible conduits by a minimum distance of 6 inches, as required by Section 5.6.2 of IEEE Standard 384. Furthermore, TUEC shall correct all appropriate drawings and documents to indicate the revised minimum separation.

(c) Take corrective measures to provide a barrier in auxiliary feedwater panel CP1-EC-PRCB-09 separating redundant flow and pressure instruments.

(d) Take corrective action to ensure that the required minimum separation of the redundant field wiring identified inside panel CP1-EC-PRCB-03 is maintained either by distance or by an acceptable barrier.

(e) Submit to the NRC the analysis substantiating the acceptability of the criteria stated in G&H electrical erection specification governing the separation between separate conduits and cable trays. This analysis shall be supported with the necessary documentation in sufficient detail to perform an independent evaluation of how these criteria were established based on the analysis.

(f) Evaluate the adequacy of the QA/QC program as related to the deficiencies identified above to establish root causes and appropriate corrective actions. These actions shall be integrated with other actions addressed under Electrical and Instrumentation Category 6, "Electrical QC Inspector Training and Qualifications," QA/QC Category 8, "As Built," and QA/QC Category 1, "Design Process."

1. Allegation Category: Electrical and Instrumentation 4, Control Room Ceiling Fixture Supports

2. Allegation Number: AE-17

3. Characterization: It is alleged that the field run conduit, drywall, and lighting installed in the area above the equipment panels in the control room were classified as nonseismic, and as such were only supported by wires.

4. Assessment of Significance: The implied safety significance is that the seismic qualification of certain equipment located above the ceiling in the control room could be indeterminate and consequently its behavior during a seismic event could not be predicted.

   The central concern of this allegation is whether Texas Utilities Electric Company (TUEC) considered the positions of Regulatory Guide (RG) 1.29, "Seismic Design Classification," as augmented by Final Safety Analysis Report (FSAR) Section 3.2.1.2, "Seismic Category II," during the design of the support systems in the control room for the nonsafety-related field run conduit, for the suspended drywall ceiling, and for the lighting fixtures.

   Regulatory Guide 1.29 states that nonsafety-related structures, systems, or components whose failures could reduce the functioning of any plant feature to an unacceptable safety level or could result in incapacitating injury to occupants of the control room should be designed and constructed so that the safe shutdown earthquake (SSE) would not cause such failure. FSAR Section 3.2.1.2 provides TUEC's commitments to these positions, and designates as seismic Category II the nonsafety-related equipment that will be encompassed by the positions of RG 1.29.

   Field Run Conduit. The NRC Technical Review Team (TRT) examined conduit seismic installation notes and detail drawings, design change authorizations (DCAs), work packages, physical configuration drawings and other documents pertinent to this issue. The TRT also inspected conduit installation in the area above the control room ceiling and determined that the safety-related conduit was fastened by seismic Category I supports typical of those used in other areas of the facility. The nonsafety-related conduit was secured by supports which were of a different design than those for safety-related conduit. None of the nonsafety-related conduits examined by the TRT were greater than 2 inches in diameter. In addition, they were not supported by seismic Category I supports and did not have seismic Category II cable restraints. The TRT determined that engineering drawing 2323-S-0910, "Conduit and Junction Box Supports," did not require seismic Category II cable restraints for nonsafety-related conduits less than or equal to 2 inches in diameter, but required them for conduits greater than 2 inches in diameter.

   The TRT also examined similar nonsafety-related conduit installations in other seismic Category I areas of Unit 1 and found that seismic Category II stainless steel cable restraints were used as backup to the nonseismic dead weight supports for the conduits greater than 2 inches

in diameter. The TRT staff also found that the installation of nonsafety-related conduit less than or equal to 2 inches in diameter in the control room was consistent with that used throughout the plant.

Suspended Drywall Ceiling. The TRT found that the suspended ceiling above the central part of the control room was made of drywall sheets arranged to form a sloping wall around that area. These drywall sheets were fastened to a metal framework (metal batten) supported by thin-walled channels (1-1/2-inch by 1/2-inch) attached to the primary building concrete. The metal framework was also attached to the concrete by a system of 1/8-inch stainless steel cables such that if the thin-walled channel supports failed during a seismic event, the weight of the framing and drywall would be assumed by the cabling.

Lighting Fixtures. The TRT reviewed the installation of the lighting fixtures over the control panels and central part of the control room and found that they were supported from an intermediate substructure of "unistrut" by light-weight conduit. The substructure was likewise supported by light-weight conduit from the primary building ceiling. The conduit used is typical of that supporting the light fixtures in suspended ceiling applications. Parallel with each lighting support conduit are two 1/8-inch stainless steel cables which would assume the load if the support conduit or its attachment were to fail. Other individual light and reflector assembly fixtures, separate from those supported by the intermediate "unistrut" substructure, were secured by a similar type of conduit and backup cable design arrangement with the cable attached to the edge of the light reflector assembly.

Based on the review of engineering drawings and direct inspection of the installation, the TRT determined that the positions of RG 1.29, as augmented by FSAR Section 3.2.1.2, were not met by the installation of the fixtures located in the area above the panels and central part of the control room.

As discussed above, the nonsafety-related conduit in the area above the control room suspended ceiling was not fastened by seismic Category I supports and/or seismic Category II cable restraints. With regard to the suspended drywall ceiling, it appeared that the installation met TUEC commitments to the positions of RG 1.29. However, the final resolution of this technical issue, including the nonsafety-related conduit support system, will depend on the review and approval by the TRT of an analysis to be provided by TUEC concerning the adequacy of the seismic support system installation in the control room.

The TRT inspected selected seismic Category I areas of the plant, reviewed associated engineering drawings, and determined that only nonsafety-related conduits of less than or equal to 2 inches in diameter were not fastened by seismic Category II cable restraints.

5. Conclusions and Staff Positions: The TRT concludes that the installation of the nonsafety-related conduit in the control room appears to be inconsistent with the positions of RG 1.29. Accordingly, this part of the allegation is of concern. With regard to the suspended ceiling and

lighting supports, the acceptability of the installation will depend on the approval by the TRT of the analysis to be provided by TUEC concerning the adequacy of the seismic Category II restraints in the control room. This technical issue, including the nonsafety-related conduit support system, will be resolved after the review of TUEC's seismic analysis substantiating the adequacy of the overall seismic support system installation in the control room. The results of the TRT review of TUEC's analysis will be reported in a supplement to this SSER.

Based on the review of other seismic Category I areas of the plant, the TRT concludes that the acceptability of the installation will depend on TRT approval of TUEC's analysis of the adequacy of the seismic support installation for nonsafety-related conduits in areas of the plant other than the control room.

The TRT further concludes that the lack of analysis to substantiate the adequacy of the seismic design installations inspected may be an indication of weakness in the QA/QC program concerning design control. This area is addressed under the QA/QC Category 1, "Design Process."*

5. Action Required: TUEC shall perform the following actions prior to fuel load:

(a) Provide the TRT with analyses that substantiate (1) the adequacy of the overall seismic support system installation for all the items located above the ceiling in the control room, including nonsafety-related conduit, suspended ceiling, and lighting fixtures and (2) the adequacy of the seismic support system installation for nonsafety-related conduit in seismic Category I areas of the plant other than the control room. This action shall be integrated as appropriate with other actions addressed under Civil and Structural Category 14, "Seismic Design of Control Room Ceiling Elements."

(b) Evaluate the adequacy of the QA/QC program related to the deficiencies identified above to establish root causes and appropriate actions. These actions should be integrated with other actions addressed under the QA/QC Category 1, "Design Process."

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*The TRT evaluation of QA/QC allegations is in progress and will be published in a subsequent supplement to this SSER.

1. Allegation Category: Electrical and Instrumentation 5, Electrical Nonconformance Report (NCR) Activities

2. Allegation Number: AQE-1, AQE-2, AQE-3, AQE-4, AQE-5, AQE-25, AQE-33, AQE-34, AQE-35, AQE-37, AQE-38, AQE-40, AQE-41, AQE-42, AQE-45, AQE-47, AQE-48, AE-24, and parts of AE-22, AE-27, AQE-12, AQE-36 and AE-50.

3. Characterization: It is alleged that the validity of the generation and disposition of electrical nonconformance reports (NCRs) was suspect.

4. Assessment of Safety Significance: The implied safety significance of these allegations is that the quality of the electrical installation could be indeterminate.

   These allegations pertain to various concerns involving the NCR program, and include:

   - Prevalent "use-as-is" dispositions of NCRs (AQE-33, AQE-47, AQE-34, AQE-35, Parts of AE-27 and AQE-36).
   - Inaccurate evaluation in the generation of NCRs to indicate workmanship not compromised (AQE-48).
   - The closing out of NCRs by unqualified inspectors (either intentionally or under coercion) (AQE-4).
   - Pressure not to generate NCRs (AQE-42).
   - The traceability of "Q" items (non-Q fuse blocks were installed where Q blocks were required) (AQE-35).
   - Restraint cable (mechanical) crimp gauge calibration (AQE-41).
   - Failure to follow procedures, specifications, and drawings (AQE-25, AQE-40, part of AQE-12).
   - Splicing of safety-related electrical cables in violation of regulatory requirements (part of AE-50).
   - Questionable dispositions for NCRs involving inadequate thread engagement on a conduit fitting and damaged cable (AQE-45).
   - Electrical cable tray fell, damaging cables entering the control room (AE-24).
   - No documentation available for butt splices in panels (part of AE-22).
   - Conduit replaced in Fuel Handling Building was dispositioned as repaired rather than replaced (AQE-3).

   In addition to these general concerns, several allegations contained specific information about questionable NCR dispositions, which includes:

- Improper documentation was kept for the removal and pulling of damaged cables (AQE-1, AQE-2, AQE-5).

- Disposition of NCR on terminal block rework was questionable (AQE-37).

- Excessively bent terminal lugs in motor control centers (part of AQE-36).

- Unauthorized solenoid repair (AQE-38).

- Loose elbow termination conduit fittings found on the Unit 1 diesel generators (part of AE-27).

The NRC Special Review Team (SRT) also had concerns with respect to the Texas Utilities Electric Company (TUEC) management response to the so-called "T-shirt" incident because of its potential effect on the morale of QC electrical inspectors, which in turn could have affected their workmanship. (For detailed discussion of the "T-shirt" incident, see QA/QC Category 6, "QC Inspection," AQ-46.*)

The Final Safety Analysis Report (FSAR), Section 17.1, "Quality Assurance During Design and Construction," commits TUEC to a quality assurance (QA) program, as required by 10 CFR 50, Appendix B. FSAR Section 17.1.10, "Inspection," outlines the inspection plans which will ensure that construction tasks conform to procedures, drawings, specifications, codes, standards, and other documentation. These plans are augmented by TUGCO procedure CP-QP-16.0, which established the methods for generating and dispositioning reported items of nonconformance. The NRC Technical Review Team (TRT) reviewed pertinent TUEC documentation to determine that the procedures and instructions for generating and dispositioning reported items of nonconformance were adequate as related to the concerns raised by the allegations.

The TRT reviewed a random sample of 75 electrical NCRs and conducted numerous interviews with QA/QC and engineering personnel. (See also Electrical and Instrumentation Category 6, "Electrical QC Inspector Training/Qualifications.") The TRT reviewed 25 of the 75 electrical NCRs to determine if the QC inspectors who "closed out" the NCRs were qualified to do so. The TRT found that in all 25 cases the QC electrical inspectors were qualified and their certification files were current (AQE-4).

Equipment installation matters raised by these allegations are addressed under:

- Electrical and Instrumentation Category 1, "Electrical Cable Terminations," for parts of AE-22, AQE-12 and AQE-36.

- Electrical and Instrumentation Category 2, "Electrical Cable Tray and Conduit Installation," for the alleged loose conduit fittings for part of AQ-27.

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*The TRT evaluation of QA/QC allegations is in progress and will be published in a subsequent supplement to this SSER.

- Electrical and Instrumentation Category 7, "Electrical Cable Installation," for the alleged splicing of safety-related cables in raceways and cable damage where trays contained trash and hazardous debris, for part of AE-50 and AQE-5.

The TRT interviewed a TUEC electrical engineer and a lead quality engineer (QE) about the "use-as-is" disposition of electrical NCRs (AQE-33, AQE-47, AQE-34, AQE-35 and parts of AE-27, and AQE-36). The TRT determined that for an NCR to receive a "use-as-is" disposition, an independent verification inspection by an electrical engineer had to be made for each reported item of nonconformance. Based on that inspection, and on an evaluation with regard to procedures, specifications, drawings (including applicable codes and standards), and other related documentation, a "use-as-is" disposition could be applied. Final approval of such a disposition required two QE signatures. The TRT also reviewed the 75 NCRs to determine if there were any with the disposition "use-as-is" with the explanation "not addressed in ES-100," as alleged. The TUEC engineer indicated that should an NCR be received with this type of disposition, it would be "kicked back" and would require more justification.

The TRT determined that if the nonconformance indeed was not addressed in ES-100, then a document, such as a procedure or other specification, that did address this nonconformance item would be required to be referenced in the NCR. Of the 75 NCRs examined, the TRT could identify no "use-as-is" dispositions which deviated from applicable design requirements, except for those identified in Electrical and Instrumentation Category 1, "Electrical Cable Terminations," and Electrical and Instrumentation Category 2, "Electrical Cable Tray and Conduit Installation," regarding NCRs identifying bent terminal lugs in motor control centers (part of AQE-36) and reporting two loose conduit elbow fittings (part of AE-27), respectively. These TRT findings were discussed with the allegers, one of whom disagreed with the TRT findings as related to AQE-34 and AQE-35 and provided additional information. The TRT is currently evaluating this new information and will report its findings in a supplement to this SSER.

The TRT also interviewed a TUEC electrical engineer about NCR dispositions with respect to "replace versus repair" (AQE-3) and "compromised workmanship" (AQE-48). The TRT determined that replacing a reported item instead of repairing it as originally dispositioned would require a revision to the original NCR. The disposition of the NCR for replacement would be based on an engineering evaluation. The TRT determined that on a case-by-case basis where workmanship might have been compromised, the inspecting engineer would apply engineering judgment to determine that the quality of workmanship did not degrade the installation below an acceptable level. From the 75 NCRs examined the TRT could not find any evidence of unacceptable installation. (See also Electrical and Instrumentation Category 8, "Electrical Procedures," regarding correction of installation deficiencies for lighting terminations.)

The TRT searched the records for the number of NCRs and inspection reports written and for the amount of cable pulled for a 57-day period prior to and a 57-day period following the so-called "T-shirt" incident. This search was conducted to determine if the incident had any effect on

the workmanship of the electrical QC inspectors. The TRT could find no evidence that inspectors were affected by the incident as a result of management reaction to it.

The TRT interviewed the quality control (QC) supervisor of the calibration lab and reviewed pertinent procedures that were followed to ensure that construction tools which required periodic calibration were maintained (AQE-41). The TRT found that lab controls, procedures, and tool traceability, if properly implemented, would ensure that tool calibration was maintained. Adequate procedures also existed to ensure that corrective actions would be taken if a tool did not meet calibration specifications and tolerances. The TRT reviewed NCR documentation on tool calibration and found it to have been dispositioned in accordance with procedures that ensured the integrity of the construction (See also QA/QC Category 6, "QC Inspection," for the disposition of the specific concern raised by AEQ-41.)

The TRT interviewed QC and purchasing personnel and an electrical general foreman for construction and reviewed pertinent documentation to determine the adequacy of traceability of safety-related (noted as "Q") items (AQE-35). The TRT determined that procedures and controls, if properly followed, were adequate to ensure the traceability of "Q" items and that they would preclude the possibility of substituting "non-Q" for "Q" items. The TRT reviewed a large number of installation documents and found all the required traceability documentation.

In regard to AQE-42, the TRT's interviews with QC personnel could not substantiate the allegation that an individual was pressured not to issue NCRs. (See also QA/QC Category 6, "QC Inspection," AQ-35.)

To address the specific technical concerns raised in the above allegations, the TRT examined the NCR log books, interviewed allegers, and selected a random sample of NCRs pertaining to specific items of concern. The TRT determined that:

- The allegation (AQE-36) of excessive bending of AMP Product Corporation compression lugs in ITT Gould-Brown Boveri switchgear was substantiated. This issue is addressed in Electrical and Instrumentation Category 1, "Electrical Cable Terminations."

- The allegations of improper documentation of cable removal (AQE-1 and AQE-2); repair rather than replacement of flex conduit (AQE-3); damaged cable as a result of a fallen cable tray (AQ-24); failure to follow procedures and specifications (AQE-25 and AQE-40); damaged cable due to inadequate thread engagement on a conduit (AQE-45); and rework of terminal blocks (AQE-37) could not be substantiated, since in its review of a random sample of 75 NCRs on these issues the TRT could not identify any inconsistencies or deficiencies that would raise a safety question. These findings were discussed with some of the individuals responsible for raising these concerns, one of whom disagreed with the TRT determination concerning AQE-37 and provided additional information. The TRT is currently evaluating this new information and will report the results in a supplement to this SSER.

- The alleger clarified AQE-38 during an interview with the TRT, indicating that the concern related to the repair of an off-the-shelf solenoid (glueing the connecting terminal to the solenoid coil and resoldering the coil lead to the terminal). The alleger believed that the solenoid was used in a safety-related system, but could not remember which system. Moreover, the alleger indicated that there was no written record of the repaired solenoid. The TRT could not substantiate the concern raised by this allegation.

- The allegation concerning the loose elbow termination conduit fittings in the diesel generator rooms for Unit 1 (Part of AE-27) has merit. The TRT examined the NCR log book and found the specific NCRs for this item. The TRT also inspected the diesel generator rooms of Unit 1 and found two loose elbow conduit fittings. This issue is addressed in Electrical and Instrumentation Category 2, "Electrical Cable Tray and Conduit Installation."

5. Conclusions and Staff Positions: Based on the reviews of the pertinent documentation, examination of NCRs, and the information obtained from the interviews, the TRT concludes that adequate procedures, controls, and process checks exist for the generation and disposition of reported items of nonconformance as related to the concerns raised by the above allegations. The TRT also concludes that of the allegations identified at the outset of this section, only a few specific instances were found which raised questions concerning the adequacy of safety-related items. These are discussed above and are discussed further in other sections of the report.

   The results of this evaluation will be further assessed as part of the overall programmatic review of all NCRs, addressed under QA/QC Category 5, "Nonconformance Reports," and under QA/QC Category 6, "QC Inspection." Therefore, the final acceptability of this evaluation will be predicated on the satisfactory result of the overall programmatic review on these subjects. Any adjustments to these conclusions will be reported in a supplement to this SSER. The results of the TRT review of new information concerning allegations AQE-34, AQE-35 and AQE-37 will also be reported in a supplement to this SSER.

6. Action Required: None.

1. Allegation Category: Electrical and Instrumentation 6, Electrical Quality Control (QC) Inspector Training/Qualifications

2. Allegation Number: AQE-8, Parts of AQE-4 and AQE-12.

3. Characterization: It is alleged that some electrical QC inspectors were inadequately qualified, that they received help in passing certification tests, and that their previous experience was inadequate to fulfill the job requirements.

4. Assessment of Safety Significance: The implied safety significance of these allegations is that the lack of training or qualification of electrical QC inspectors could result in inadequate inspections of safety-related components.

   The allegations question whether the positions of American National Standards Institute (ANSI) Standard N45.2.6-1978, "Qualifications of Inspection, Examination, and Test Personnel for the Construction Phase of Nuclear Power Plants," as augmented in the Final Safety Analysis Report (FSAR) Section 17.1.2, "Quality Assurance Program," were considered by Texas Utility Electric Company (TUEC) in the development of the quality assurance (QA) program at the Comanche Peak Steam Electric Station (CPSES). Regulatory Guide (RG) 1.58, Revision 1, "Qualification of Nuclear Power Plant Inspection, Examination, and Testing Personnel," endorses the positions of ANSI N45.2.6-1978.

   RG 1.58, Revision 1, and ANSI N45.2.6-1978 set forth positions stating the education and experience requirements for the various capability levels of inspectors (I, II, and III). Both documents, however, state that these requirements are not absolute when other factors may provide reasonable assurance that a person can competently perform a particular task. They require that all records or qualifications shall be maintained by TUEC in an individual's personnel file.

   In assessing these allegations, the NRC Technical Review Team (TRT) examined Texas Utilities Generating Company (TUGCO) procedures, QC inspector training and certification files, testing program requirements, on-the-job training (OJT) requirements, and recertification program requirements. The TRT also conducted interviews with the training coordinator, two Level I QC electrical technicians, four Level II QC electrical inspectors, one Level III quality engineer (QE), one Level II lead QC electrical inspector, one lead QE, and the QE Supervisor.

   Procedures. The TRT found that TUGCO Procedure CP-QP-2.1, "Training of Inspection Personnel," commencing with Revision 8 (July 1981), contained education and experience requirements consistent with RG 1.58, Revision 1, and ANSI N45.2.6-1978. Revision 7 (June 1981) of the above procedure, Section 3.1.d, "Technical Training" contained the statement:

   > Minimum training, education, and experience requirements will be defined in technical training outlines prepared for specific inspection activities (civil, electrical, etc.).

After a discussion with the training coordinator and an examination of the technical training outlines, the TRT discovered that the education and experience requirements were never defined, and that only the training requirements had been defined. After examining other related procedures, the TRT found the following deficiencies.

Training and Certification Files. The TRT examined in detail six electrical QC inspectors' training and certification files (two Level I and four Level II). The examination revealed the following two instances where TUGCO Procedure CP-QP-2.1, Revisions 8 through 15, RG 1.58, Revision 1, and ANSI N45.2.6-1978 requirements for qualification were not being met:

(a) There was no documentation of a high school diploma or General Equivalency Diploma (GED) for one of the inspectors selected. The file on this inspector contained only a telephone conference note that a call had been made in 1982 requesting information from a high school.

(b) There was no documentation to waive the remaining 2 months of the required 1 year of experience for a Level I technician before the individual became a Level II inspector after successfully passing the required examinations.

The TRT also found one case where a Level I QC technician had not passed the required color vision examination, which was to be administered by an independent professional eye specialist. A makeup test using colored pencils was administered by a QC supervisor, was passed, and then a waiver was given. A TUGCO procedure allowed for a waiver on a case-by-case basis. In addition to the above, the TRT staff also found two cases where the experience requirements to become a Level I technician were met only marginally. In one case, no documentation was found in the training and certification files substantiating that the person met the experience requirements or providing the basis for determining that the person could, with reasonable assurance, competently perform the particular task without having the required related experience.

Testing Program Requirements. The TRT examined the testing, retesting and scoring methods applicable to Level II qualification and found some guideline inconsistencies and procedural deficiencies. Specifically, they included:

(a) No time limit or additional training requirements between a failed test and a retest. In practice, the time varied from a few days to months.

(b) No controls to assure that the same test would not be given if the taker previously failed it.

(c) No consistency in scoring. Two different scoring techniques were used to average the results when two tests were taken. Combined test scores could vary slightly, depending on which technique was used. These slight variations could make the difference between passing or failing the tests - - a condition resulting solely from

the scoring technique used. Seven out of 25 tests used one test scoring technique instead of the other.

(d) No guidelines or procedures to control the disqualification of questions from the test. In one instance a question was disqualified after the test was administered, thus allowing two people to pass the exam that they would have otherwise failed.

(e) No program for establishing new tests (except when procedures changed). The same tests had been utilized for the last 2 years.

On-The-Job (OJT) Training Requirements. The TRT examined the OJT training for QC electrical inspectors and found sufficient documentation in the training and certification files that adequate OJT was being obtained. Numerous cases were found where a portion (10%-20%) of the required OJT was being waived only after applicants successfully passed the Level II examinations.

Recertification Program Requirements. The TRT examined the recertification program and found that there was no required documentation to assure that recertification requirements were being met. The present system only requires a simple "yes" or "no" answer from an inspector's lead QC inspector that the individual had been active in the area in the last 6 to 12 months and was knowledgeable about current procedure requirements. The lead QC inspectors did not maintain any written record of a subordinate inspector's activity.

Interviews. The TRT interviewed 11 people, including the training coordinator and Level I QC technicians on up to the QE supervisor. The consensus of those interviewed was that the training program was adequate and had improved over the last couple of years. Some thought additional OJT would have been more beneficial in lieu of "book time."

Based on reviews of the QC inspector training and qualification aspects of the electrical QA program, the TRT determined that current procedures in effect beginning with Revision 8 of the CP-QP-2.1 meet the requirements of ANSI N45.2.6-1978, as augmented in the FSAR and endorsed by RG 1.58, Revision 1. Prior to Revision 8, TUGCO procedures did not define the education and experience recommended in the above regulatory documents. TUGCO was not committed to these requirements until April 30, 1981. The TRT review of the training and certification files determined that some supportive documentation, as required by procedures and regulatory positions, was lacking.

The TRT determined that the testing program lacks guidelines and procedural requirements covering, but not limited to, such items as test question disqualifications, scoring, retests, and the prolonged use of the same tests.

The TRT also determined that the inspector recertification program lacks programmatic controls to assure that the recertification requirements in the different electrical quality instructions are being met.

5. Conclusions and Staff Positions: Based on its review of the pertinent documentation and its interviews, the TRT concludes that there is evidence to indicate that the electrical QC inspector qualification program lacked programmatic controls, which may be indicative that the required level of

qualification was not obtained for some electrical QC inspectors. Specifically, the lack of programmatic controls to assure that suitable proficiency is achieved and maintained (as required by 10 CFR 50, Appendix B) was found in:

- The supportive documentation of qualifications, as required by procedures and regulatory requirements in the training and certification.
- The testing program for Level II qualification.
- The recertification program requirements in electrical quality instructions.

The TRT concludes that the lack of these programmatic controls in the electrical QC inspector qualification program is of concern.

Since the training and certification program is the same for all disciplines (except ASME), the TRT concludes that the deficiencies in procedural requirements and guidelines in the testing program and the lack of documentation in isolated cases have generic implications to the other construction disciplines. The implications of the TRT's findings concerning electrical QC inspector training and qualification will be further assessed as part of the overall programmatic review of QC inspector training and qualification, which is addressed under QA/QC Category 4, "Training and Qualification."*

6. Action Required: TUEC shall accomplish the following prior to fuel load:

(1) Evaluate the testing program for QC electrical inspector qualifications and develop a testing program which optimizes administrative guidelines, procedural requirements, and test flexibility (e.g., computer-generated tests) to assure that suitable proficiency is achieved and maintained. These guidelines and/or procedures shall include such items as scoring, retests, and question disqualification.

(2) Justify the allowance in the procedure for administering separate (waiver) vision tests in lieu of examinations administered by an independent professional eye specialist.

(3) Review all electrical QC inspector training, qualification, certification and recertification files against the project requirements as documented in the FSAR, and provide the information in such a form that each requirement is clearly shown to have been met by each inspector. If an inspector is found to not meet the training, qualification, certification, or recertification requirements, TUEC shall then review the records to determine the adequacy of inspections made by unqualified individuals and provide a statement on the impact of the deficiencies noted on the safety of the project.

(4) Integrate these actions, as appropriate, with other actions addressed under QA/QC Category 4, "Training and Qualifications."

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*The TRT evaluation of QA/QC allegations is in progress and will be published in a subsequent supplement to this SSER.

1. Allegation Category: Electrical and Instrumentation 7, Electrical Cable Installation

2. Allegation Number: AE-19, AE-28, AE-30, AE-50, Parts of AQE-5 and AE-29 and Special Review Team SRT-10

3. Characterization: It is alleged that:

   - Cable trays were overloaded (AE-19).
   - Cables were not "trained" in a workmanlike manner in the cable spreading room and in junction boxes 1058 and 1059 (AE-28).
   - Higher siderails were added to cable trays due to tray overfill conditions (Part of AE-29).
   - Cable density/compaction problems may exist due to tray overfill conditions (AE-30).
   - Cables were spliced in cable trays in the cable spreading room in violation of regulatory requirements (AE-50).
   - A nonconformance report pertaining to trash in cable trays, damaged cable, and improperly trained cable was improperly closed (Part of AQE-5).

   The Special Review Team Report on July 13, 1984, identified the issue of overloaded cable trays due to the installation of "thermolag" material (SRT-10).

4. Assessment of Safety Significance: The implied safety significance of these allegations is that improperly trained cables, improper cable splices and overloaded cable trays could place the quality of the installation in question.

   Cable Splices in Raceways. Allegation AE-50 involved the alleged splicing of safety-related cables in raceways in violation of regulatory requirements. The NRC Technical Review Team (TRT) reviewed NRC Region IV (RIV) inspection report 83-03 (November 8, 1982) and found that the RIV investigation of the two cables specifically identified by the alleger adequately addressed this allegation. The RIV investigation determined that one cable no longer performs a safety-related function, and the other cable had become a "spare" and was removed from the raceway. The TRT determined that similar-appearing items in the same area were not splices, but were, in fact, acceptable methods of repairing minor cable jacket damage. The TRT concurs with the RIV determination but notes that regulatory requirements discourage the use of splices in raceways, as stated in position 9 of Regulatory Guide (RG) 1.75, "Physical Independence of Electric Systems." If splices are made, the resulting design should be justified by analysis. This area is further addressed under QA/QC Category 8, "As Built."*

   The TRT examined the cable spreading room, identified two cables installed in raceway, which to the untrained eye could appear to have been spliced, and inspected them in their as-installed condition. The TRT also reviewed the applicable installation/inspection records. This inspection and

*The TRT evaluation of QA/QC allegations is in progress and will be published in a subsequent supplement to this SSER.

review revealed that there were cable jacket repairs and that they were properly identified, repaired, and documented in accordance with applicable procedures.

Poor Workmanship. Allegation AE-28 and part of AQE-5 involved instances of improper cable "training" (or dressing), poor workmanship in cable installation, and cables installed in raceways containing trash and hazardous debris. The issues of improper "training" of cables and poor workmanship in junction boxes 1058 and 1059 were inspected by the TRT. The TRT findings agree with the previous NRC RIV determination that these cables, which are nonsafety-related, were properly trained and that they exhibited an acceptable degree of workmanship. These findings were discussed with the alleger who indicated that the junction box numbers may not have been correct and provided additional information concerning the location of the boxes in the plant. The TRT is currently evaluating this new information and will report the results in a supplement to this SSER. The alleger did not identify which trays contained trash and hazardous debris at the time of cable installation, so the TRT randomly inspected approximately 2,000 feet of cable trays containing safety-related cables and found no instances of improper training, trash, hazardous debris, or poor workmanship.

Tray Overfill. Allegations AE-19 and AE-30 involved various concerns related to cable trays possibly being overfilled. The alleger specifically identified tray T130CC007 in the cable spreading room. The TRT inspection of this tray revealed the following:

(a) Siderails were installed on this tray, adding approximately 2 inches to its height. When inspected, no cables extended above the level of the siderails.

(b) Per nonconformance report (NCR) E-82-1073R1, eight spare cables were removed from this tray in January 1983, in conjunction with the removal of 42 spare cables from tray T130ECC82 because the tray was identified overloaded.

(c) Calculation of the actual weight of cables currently installed in this tray indicated loading of approximately 22 pounds per square foot, compared with the maximum allowable value of 35 pounds per square foot, as specified in seismic supporting requirements.

(d) Calculation of the square area fill of cables currently installed in this tray indicates an actual fill of 28%, compared with the maximum recommended value of 40%, as stated in IEEE Standard 422, "Guide for the Design and Installation of Cable Systems in Power Generating Stations." The TRT selected nine additional sections of tray containing large quantities of cables. These quantities ranged from 57 to 300 cables per tray section. The square area fill and weight per square foot values for these trays were reviewed for conformance with the stated maximum values. The results of this review were as follows:

(1) All nine trays were loaded at less than 28 pounds per square foot.

(2) Seven of the trays had square area fill less than 40%.

(3) The two remaining trays had square area fills of 41% and 42%; however, Section 8.3.3.1 of the Final Safety Analysis Report (FSAR) justifies exceeding the 40% value if cables do not extend above the siderails of the tray, and do not violate seismic supporting requirements. The NRC staff considers this justification acceptable.

This review revealed that all trays sampled comply with seismic supporting requirements and, because no cables extended above the tray siderails, that no deficiencies existed within the sample selected.

Added Loads on Trays. Part of allegation AE-29 and concern SRT-10 involved the addition of higher siderails and "thermolag" material to existing cable trays, conditions which could cause trays to become physically overloaded.

Regarding the higher siderails, the TRT discovered that siderails were fabricated using 6-inch high by 16-gauge galvanized sheet metal. As such, the addition of this material would increase tray loading by approximately 2½ pounds per foot. Using the above sample of cable trays, which the TRT considers representative of some of the most highly loaded trays at Comanche Peak Steam Electric Station (CPSES), Unit 1, this added height would bring the most highly loaded tray to approximately 30.5 pounds per square foot, compared with the maximum allowable value of 35 pounds per square foot.

Regarding the "thermolag" material, the TRT reviewed procedure CP-EI-4.0-49, Revision 1, "Evaluation of Thermolag (TSI) Fire Barrier Material on Class 1E Electrical Raceways." From this review the TRT determined that the procedure was adequate if properly followed to assure that, should overloading occur due to the addition of thermolag material, these instances would be identified, evaluated, and if necessary, corrected prior to the installation of the thermolag. The TRT then selected two raceways (one cable tray and one conduit) with thermolag installed and reviewed the evaluations performed in accordance with the above procedure. The TRT found that the requirements of the procedure had been met, and therefore, determined that the addition of tray siderails and thermolag material poses no hazard to the structural integrity of the raceway system.

5. Conclusions and Staff Positions: Based on the inspection of the cable installations for cable splices in cable trays, workmanship, cable tray fill, added load on cable trays by thermolag material, and review of pertinent criteria, procedures, RIV inspection reports, installation/inspection reports, and NCRs, the TRT concludes that the various aspects of the cable installation on raceway fill reviewed and inspected meet established installation requirements. Therefore, the TRT concludes that these allegations could not be substantiated. The results of the TRT review of new information concerning allegation AE-28 will be reported in a supplement to this SSER.

6. Action Required: None.

1. Allegation Category: Electrical and Instrumentation 8, Electrical Procedures

2. Allegation Number: AQE-23, AQE-32, AQE-39, AQE-44, AQE-46, AQE-52 and Parts of AQE-6, AE-18 and AE-20.

3. Characterization: It is alleged that:

   - Requirements were deleted in the procedural revision for post-construction inspection of electrical equipment and raceways and electrical QC inspectors were directed by a supervisor not to follow procedures (AQE-23 and part of AQE-6).

   - The number of required inspections was reduced in the inspection procedure for reverification of seismic electrical equipment mounting details (AQE-32).

   - Revisions to the procedure for post-construction inspection of electrical equipment and raceways were made to accommodate numerous problems with loose terminations found in the lighting system terminal boxes during past inspections (AQE-39 and AQE-46).

   - Revision 15 to the procedure for post-construction inspection of electrical equipment and raceways omitted requirements for inspections of large pieces of equipment, such as 6.9-kilovolt (kV) motors (AQE-52).

   - A cable separation problem identified in the Fuel Handling Building was dispositioned "use-as-is," contrary to procedure (AQE-44).

   - Insulated butt splices were being used inside panels in violation of the in-process inspection procedure for cable terminations (Part of AE-18).

   - Separation criteria between redundant cable trays and conduits in the cable spreading room were not consistent with the requirements of the in-process inspection procedures for verifying electrical separation (Part of AE-20).

4. Assessment of Safety Significance: The implied safety significance of these allegations is that the quality of the electrical installation may be in question because requirements were deleted from procedures, required inspections were reduced in frequency, and installation was being done contrary to procedures.

   The NRC Technical Review Team (TRT) examined nine in-process inspection procedures used during plant construction, one post-construction inspection and walkdown procedure, and four turnover inspection procedures for final acceptance of station systems, structures, and equipment by TUEC startup and operations. The TRT reviewed in-place procedures, historical procedure files, inspection reports (IRs), IR deficiency logs, post-construction deficiency lists, electrical equipment punch lists, electrical separation deficiency reports, test release/return to contractor custody/startup release to operations forms, construction

operation travelers, startup work authorizations, and systems/area testing, drawing, walkdown results/review forms. The TRT also interviewed QC management personnel and allegers. The TRT examined the above documents for programmatic weaknesses in the electrical procedures which may have negated quality assurance/quality control (QA/QC) inspection activities during construction of the plant.

Procedures for Post-Construction Inspection of Electrical Equipment and Raceways (AQE-23, AQE-52 and Part of AQE-6). The TRT review of procedure QI-QP-11.3-40, "Post-Construction Inspection of Electrical Equipment and Raceways," revealed that most deficiencies identified by QA/QC personnel during post-construction and walkdown inspections of electrical equipment and raceways was based on this procedure, which provides adequate guidance for electrical equipment and raceway inspections.

The TRT found that this post-construction walkdown procedure had undergone 18 revisions. Before Revision 15, QC inspectors were using this procedure extensively to reinspect in-process inspection activities (e.g., Sections 3.1.1 through 3.1.4 of Revision 14, requiring verification of cable, cable tray, conduit, and equipment installation, which were rewritten under Sections 3.1.1 and 3.1.2 of Revision 15, entitled, "Raceway Inspection" and "Equipment Inspection"). Revision 15, Section 3.1.2, covers requirements for inspection of large Class 1E equipment. Therefore, 6.9-kV motors, considered to be large equipment, would have been covered by the procedure, if classified 1E. However, since they are not Class 1E, they could be excluded from inspections.

Some of the revisions of this procedure came as a result of the many test deficiency change requests (TDCRs) based on TUGCO procedure CP-SAP-3, "Custody Transfer of Station Components." These deficiencies evolved from the startup performance testing of components and systems that B&R and other contractors had turned over to TUGCO. Other revisions were made to include the experience gained during the reinspection of the in-process inspection activities.

After a review of QI-QP-11.3-40 and CP-SAP-3, as well as other pertinent electrical in-process inspection and startup administrative procedures, the TRT did not find any omissions in requirements for inspection of electrical equipment and raceways (AQE-23 and part of AQE-6).

Procedures for Lighting Termination and Wiring (AQE-39 and AQE-46). The TRT found that safety-related lighting terminations and wiring were required to be inspected under TUGCO in-process procedures QI-QP-11.3-23, "Class 1E Conduit Raceway Inspections," QI-QP-11.3-26, "Electrical Cable Installation Inspections," QI-QP-11.3-28, "Class 1E Cable Terminations," and QI-QP-11.3-40, "Post-Construction Inspection of Electrical Equipment and Raceways."

The TRT found that the inspections of emergency lighting and associated terminations were being performed under Revision 15 or earlier revisions of procedure QI-QP-11.3-40, even though the procedure was not specifically addressing the emergency lighting inspections. Revision 16 of this procedure was made specifically to address raceway lighting inspections (Section 3.3.1).

The TRT found that the loose terminations within the lighting termination boxes occurred as a result of an installation deficiency by craft personnel involving the Thomas and Betts RP-12 crimp-type insulated connectors. A document change notice (DCN) was issued changing the engineering instruction used by craft personnel (EE-8) to improve installation of lighting terminations; thereafter the number of deficiency reports in lighting termination boxes was greatly reduced. (See also QA/QC Category 8, "As Built," for conclusions regarding craft personnel training.)

The TRT found that the revisions to procedure QI-QP-11.3-40 regarding emergency lighting inspections were justified to eliminate unnecessary inspection requirements.

Other Electrical Procedures (AQE-32, AQE-44 and Parts of AE-18 and AE-20). After a review of procedure QI-QP-11.14-12, "Reverification of Seismic Electrical Equipment Mounting Details," the TRT could find no requirements in Revision 0 through 4 that established a fixed frequency for reverification of inspections concerning bolt tightening of seismic electrical equipment mountings. However, the procedure provided for reverification of inspections on a "case-by-case" basis (AQE-32).

The TRT also reviewed the following in-process inspection procedures with respect to electrical equipment separation and the use of butt splices in panels (parts of AE-20 and AE-18):

(a) Procedure QI-QP-11.3-29, "Electrical Separation," (b) Procedure QI-QP-11.3-29.1, "Verify Electrical Separation," (c) Procedure QI-QP-11.3-28, "Class 1E Cable Terminations."

The TRT determined that in-process inspection procedures QI-QP-11.3-29 and QI-QP-11.3-29.1, and post-construction procedure QI-QP-11.3-40, were used to identify deficiencies in the Fuel Handling Building and that these procedures allow the "use-as-is" disposition of nonconformance reports (NCRs). The subject of "use-as-is" disposition of NCRs (AQE-44) is discussed in Electrical and Instrumentation Category 5, "Electrical Nonconformance Report (NCR) Activities."

The separation of electrical equipment and installation of terminations in accordance with procedures, drawings, and specifications are discussed in Electrical and Instrumentation Category 1, "Electrical Cable Terminations," for part of AE-18 and Electrical and Instrumentation Category 3, "Electrical Equipment Separation," for part of AE-20.

In a TRT review of otner electrical procedures, the TRT found no omissions in requirements for inspection of electrical equipment.

5. Conclusions and Staff Positions: Based on its review of procedures for in-process inspections, post-construction, and turnover inspections, the TRT concludes that no significant concerns exist with electrical procedures. However, equipment installation problems as related to nonconformance with procedures are being addressed in the hardware-related E&I categories. The TRT, therefore, concludes that these electrical procedure-related allegations could not be substantiated.

The results of this evaluation will be further assessed as part of the overall programmatic review concerning the post-construction verification program addressed under QA/QC, Category 8, "As Built."* Therefore, the final acceptability of this evaluation will be predicated on the satisfactory results of the overall programmatic review on this subject. Any adjustments to these conclusions will be reported in a supplement to this SSER.

6. Action Required: None.

*The TRT evaluation of QA/QC allegations is in progress and will be published in a subsequent supplement to this SSER.

1. Allegation Category: Electrical and Instrumentation 9, Electrical Inspection Reports, Inspection Item Removal Notices and In-Process Inspections.

2. Allegation Number: AQE-7 and AQE-43

3. Characterization: It is alleged that the per procedure number of required in-process inspections was not being conducted and that inspection reports (IRs) were being written without reinspections to close out inspection item removal notices (IRNs).

4. Assessment of Safety Significance: The implied safety significance of these allegations is that a reduction of in-process inspections and an omission of reinspections could compromise the quality of the installation of safety-related components.

   In-Process Inspections (AQE-7). The NRC Technical Review Team (TRT) examined current and past inspection procedures in the electrical area to determine the number of in-process inspections required. The TRT found that Texas Utilities Generating Company (TUGCO) procedure QI-QP-11.3-28, "Class IE Cable Terminations," was the only electrical inspection procedure which defined a specific number of required in-process inspections. Through Revision 4 (dated July 16, 1980), the procedure required a minimum of 10 in-process inspections per shift; revision 5 of the procedure (August 7, 1980) changed the quantity required to "a weekly" in-process inspection.

   The TRT interviewed quality control (QC) personnel to learn the basis for the substantial revision to the procedure. However, the individuals responsible for this revision were no longer employed at Comanche Peak Steam Electric Station (CPSES) and could not be contacted. Current QC personnel could only speculate that an increase in level of confidence was the basis for the reduction in inspections. The TRT interviewed the project engineering manager to determine the the amount of Class 1E cable termination activity at the time the procedure was revised. From the discussion, the TRT determined that there was less cable termination activity in early 1980 (before the procedure was revised) than in late 1980 to mid-1981, when cable termination activity was approaching its peak. Comparing the number of NCRs for cable termination activity for 2 years before revision 5 with the results of the quality assurance (QA) trend reports for 1980 (third and fourth quarters) and 1981 (first and second quarters), the TRT determined that the number of NCRs for cable termination activity remained the same during this period, despite the much smaller number of in-process inspections. This may be indicative that the fewer inspections under revision 5 were much more thorough than those before revision 5. However, the TRT could not substantiate the improvement of the quality of the installation in view of the problems found with the electrical terminations discussed in Electrical and Instrumentation Category 1, "Electrical Cable Terminations."

   Inspection Reports and Inspection Item Removal Notices (AQE-43). The TRT examined TUGCO procedure CP-QP-18.0, "Inspected Item Removal Notice Form," for its adequacy to control the inspection process. The TRT determined that this procedure was adequate to assure that reinspections

were performed, when required, to verify that the item subject to the IRN was still in conformance with the requirements.

The TRT also interviewed two paper flow group (PFG) coordinators, a PFG IR clerk, and a lead QC electrical inspector, and examined 20 IRs and IRNs. The TRT determined that because of the checking and paper processing involved with IRs and IRNs, a PFG coordinator would not be able to recognize that a signed-off inspection report had been completed without reinspection actually occurring. After discussing this issue with QC inspectors, the TRT determined that an inspection could be made without an inspection report in hand and after that inspection a report could be completed away from the inspection site, from which the inference could be made that an inspection had not been made. The TRT found that there are no requirements in the procedures that inspection reports be in-hand before reinspections are conducted; hence, it can be construed that inspections may have been performed also without all required documentation in-hand. The TRT contacted the alleger, who provided no additional information about the allegation. Further, the alleger acknowledged when making the allegation and again during discussions with the TRT that this allegation was based on hearsay information.

5. Conclusions and Staff Positions: Based on its review of the pertinent documents and interviews, the TRT concludes that the allegations about changing the frequency of in-process inspections for cable terminations were unsubstantiated. However, cable termination problems that could be related to the concerns highlighted by these allegations are discussed in Electrical and Instrumentation Category 1, "Electrical Cable Terminations."

   The results of this evaluation will be further assessed as part of the overall programatic review of TUEC's deficiency identification program in-process inspections addressed under QA/QC Category 5, "Nonconformance Reports."* Therefore, the final acceptability of this evaluation will be predicated on the results of the overall programmatic review of this subject. Any modifications to these conclusions will be reported in a supplement to this SSER.

6. Action Required: The actions required in Electrical and Instrumentation Category 1, "Electrical Cable Terminations," address the concerns with regard to reduction in cable termination inspections discussed above.

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*The TRT evaluation of QA/QC allegations is in progress and will be published in a subsequent supplement to this SSER.

1. Allegation Category: Test Program 1, Test Program Surfaced Numerous Deficiencies

2. Allegation Number: AT-1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13 and 17

3. Characterization: In support of a proposed contention (No. 26), the intervenor, Citizens Association for Sound Energy (CASE), alleges that: (1) TUEC failed to conduct an adequate prefueling hot functional test (HFT) program, in that not all components or modifications were installed which require hot functional testing; (2) TUEC did not intend to check some components and systems until heatup to hot standby or during power escalation; (3) TUEC and the NRC Region IV staff failed to notice this condition and did not keep the ASLB informed of the problems encountered; (4) numerous problems were identified during the conduct of the thermal expansion test, as evidenced by Test Deficiency Reports (TDRs) 853 and 855; (5) the HFT was conducted without consideration of accident conditions; and, (6) TUEC and the NRC Region IV staff were willing to accept deficient test results. For these reasons, CASE asserts that there was a lack of candor on the part of the NRC Region IV staff and TUEC and that the ASLB cannot rely on the NRC staff to monitor plant testing.

4. Assessment of Safety Significance: The implied significance of these allegations is that if the HFT program was improperly conducted, the adequacy of the plant to operate safely cannot be assured.

   The NRC requires that a preoperational testing program on a nuclear power plant be conducted to demonstrate that plant structures, systems, and components meet their safety-related design specifications, as stated in the utility's Final Safety Analysis Report (FSAR), before the plant goes into operation. The NRC Technical Review Team (TRT) conducted a review on 17 of 25 completed test data packages pertaining to HFT (which is a preoperational test) and interviewed cognizant TUEC personnel during the course of this review. The review included follow-up inspections on TDRs that were generated as a result of testing deficiencies found prior to and during HFT. The TRT also reviewed pertinent Startup Administrative Procedures, NRC Inspection Reports, the preoperational test index with schedule, and a Master System/Subsystem Index. The TRT reviewed this documentation against the FSAR and the applicable NRC requirements and guidance (10 CFR 50 and Regulatory Guide 1.68) to evaluate TUEC's compliance.

   (1) The TRT confirmed that the HFT was conducted with some components and equipment not having been installed at the time of the test and with modification. remaining to be completed after the test.

   In order to determine whether TUEC had a technical basis for proceeding with the HFT when it was conducted, the TRT reviewed NRC Construction Appraisal Inspection Report 50-445/83-18 (conducted January 24, 1983 through February 4, 1983), Inspection Report 50-445/83-23 (conducted May 23, 1983 through June 10, 1983) and Inspection Report 50-445/84-16 (conducted May 14, 1984 through June 20, 1984). This review was undertaken to determine if, prior to the start of the TRT's review effort, any NRC inspections around the time of the HFT had

identified missing components and equipment which had not been properly documented in accordance with TUEC's established administrative controls. None were identified in those inspection reports. This provided a basis for the TRT to consider that those administrative controls had been properly implemented through issuance of a TDR or Test Procedure Deviation (TPD). A TDR documents components and equipment found to be deficient or defective at the time of the test and for which some action must be taken to correct the problem; a TPD documents an approved change or deviation from the procedure as originally written. TDRs and TPDs become part of the completed test record which must be reviewed by the TUEC Joint Test Group (JTG) prior to its final acceptance of the test results.

Approximately 95 percent of the TDRs issued relative to HFT documented piping and equipment supports and restraints not installed prior to the start of the test, as evidenced by the TRT's review of TDRs 680, 722, 746, 747, 837, 1006, 1032, 1243, 1244, 1665, 1674, 1724, 1786, 1799, 1851, 2034, 2106, 635, 709, and 732. Additionally, TPD-1, issued against 1CP-PT-34-05, "Steam Generator Narrow Range Level Verification," identified that a substitution was made for steam generator water level detectors. TPD-2, issued against 1CP-PT-22-01, "Process Sampling," identified that three radiation monitors were not installed at the time of the test and stated that they were not needed to meet the test objectives.

In every case reviewed by the TRT, missing components and equipment were identified and documented in the completed test record. Any outstanding testing which remained because components and equipment were not installed at the time of the test was tracked by a deferred preoperational testing program schedule implemented by STA-805, Revision 0, "Deferred Preoperational Testing." STA-805 is a CPSES administrative procedure. In interviews with TUEC personnel, the TRT determined that the decision to proceed with the HFT despite missing equipment was made to minimize the economic impact of delaying the testing program and was deliberated on and concurred in by senior TUEC management, the architect-engineer, and the nuclear steam system supplier.

The TRT also reviewed a master data base computer printout of work items requiring thermally hot plant conditions in order to retest. As alleged, there were modifications (about 74), most of which were on hangers, snubbers, and other pipe supports, that required thermally hot plant conditions, such as during the HFT, for valid retesting.

Thus, the TRT found that while some components and equipment were not installed during the initial (1983) HFT, they were documented and tracked to be included in the deferred preoperational testing.

(2) In assessing the allegation that TUEC does not intend to check or monitor some components and systems until "heat-up to hot standby" or "during power ascension," the TRT reviewed Integrated Plant Operating Procedure IPO-001A, "Plant Startup From Cold Shutdown to

Hot Standby." This procedure specifies that the plant be taken to normal operating pressure and temperature using reactor coolant pumps (not the reactor) as the heat source. This is what was done during the initial HFT. However, it should be noted that some preoperational tests can be done only after fuel loading because the reactor core must be installed to conduct a valid test. Examples of these are: ISU-022A, "RCS Boundary Pressure Test and Leakage"; ISU-022B, "Incore Moveable Detector System Alignment"; ISU-021A, Pressurizer Spray & Heater Capacity Test"; and ISU-228A, Control Rod Drive Mechanism Operational Test." At the time of its review, the TRT learned that TUEC had plans to conduct tests on components and equipment not installed during the initial HFT and tests which require the reactor core to be in place, after fuel load, but before the reactor was placed into operation. However, TUEC now plans to complete those tests, which do not require the reactor core to be installed, prior to fuel loading as sufficient time is now available. The results of those tests and the tests which require the reactor core to be in place must be found to be satisfactory prior to initial reactor criticality. The TRT also learned that there are no HFT items scheduled to occur "during power ascension" except those that require more heat input than can be obtained by the use of reactor coolant pumps alone. For example, steam and feed water piping does not achieve design temperatures until there is sufficient flow, which only occurs at a power level of 25-30%. In order to attain this power level, heat input from the reactor is required. Accordingly, this testing cannot be completed until the reactor is made critical and that power level is attained. Section 14.2 of the FSAR and Regulatory Guide 1.68 specify those tests which are to be conducted during power ascension.

(3) It is alleged that neither TUEC nor the NRC Region IV staff noticed that major components or equipment were not installed prior to HFT and failed to keep the ASLB informed of the problems encountered.

The TRT reviewed HFT-related TDRs and the master data base to determine whether TUEC had documented all outstanding work on the master data base for the Lead Startup Engineer to review prior to each test and that components not installed at the time of testing, but needed for eventual system operation, were documented on TDRs or TPDs, as required by CPSES administrative procedures. For example, as discussed in paragraph 4(1) above, there were 20 TDRs identifying the missing hangers and supports associated with 1CP-PT-55-11, "Thermal Expansion." Each was initiated by the Startup Group and evaluated by TUEC engineering for its impact on the test results. TUEC performed calculations and installed temporary supports and weights during the test so that installed supports, which in normal operation would interact with missing supports, would not yield erroneous data.

The TRT also determined that the reason there was no documentation in NRC Inspection Reports to indicate that the Region IV staff was aware of missing components was because the missing components were documented and tracked in accordance with the TUEC administrative procedures which provide for such possibilities, and because they were

included in planned and documented future testing activities, i.e., in the deferred preoperational tests. It is not unusual for an applicant for an NRC operating license to defer certain equipment installation in order to proceed with HFT. However, the NRC routine inspection program verifies, before the fact, that a viable system exists to document and track such missing equipment and to ensure that the equipment is satisfactorily tested when it is finally installed, and during testing, that the system is being implemented. This was done by NRC's Region IV staff during various routine inspections of TUEC administrative procedures and was confirmed by the TRT during its review, as described in the preceding sections.

It is also alleged that TUEC and NRC Region IV did not keep the ASLB informed of problems encountered during the HFT. Prior to and during its review, the TRT found no instances involving the testing program where ASLB notification by the NRC staff should have been provided and was not. The matter of TUEC not keeping the ASLB informed was raised by CASE directly to the ASLB and is properly a matter for the ASLB to decide.

(4) It is alleged that 60 percent of the test points of 1CP-PT-55-11, "Thermal Expansion," failed the acceptance criteria, that the traceability of the measuring devices was lost because they were not logged with the data, and that TUEC engineering had provided no justification for the "use as is" determination on piping which did not meet expected thermal expansion values.

The TRT staff determined, through discussions with TUEC personnel and by a review of the completed portions of 1CP-PT-55-11, that about 28 percent of the test points (referred to by TUEC as "monitoring locations") failed the acceptance criteria. TDRs were issued to document all test failures so that TUEC could provide corrective actions and establish retest requirements. Additionally, about 12 percent of the monitoring locations were not measured because of missing equipment at the time of the tests; about 7 percent were invalidated because equipment was removed during the test; and about 3 percent were invalidated because of modifications to equipment after the test. Therefore, about 50 percent of the monitoring locations still required measurements after the thermal expansion test was completed. These locations are included in the deferred preoperational tests.

Another related allegation was that, although temperatures were taken and logged during the test, the specific measuring device used at each monitoring location was not logged. As a result the calibration of the measuring device could not be traced to the monitored location with the information contained in the test data packages. The TRT found that the completed test data packages did contain the calibration data for the measuring devices used, but as alleged, the devices could not be traced directly to specific monitoring locations. While pursuing this matter, the TRT interviewed TUEC personnel who participated in the testing and found that a test coordinator maintained a

log which tied the devices to the specific monitoring locations; however, the log was not made a part of the test data package. The TRT pointed out to TUEC that while the direct connection was not required by the test procedure as written, the data must be included as part of the test data package.

The TRT's review of representative TDRs, including TDR-853, 854, 855, 1033, 1034, 1035, 1112, and 1113, identifying questionable data or deficiencies revealed no cases where TUEC engineering had not provided back-up data and/or calculations supporting a justification for the "use as is" disposition of a TDR.

(5) It is alleged that in conducting the HFT, TUEC considered only normal operating conditions and did not consider accident conditions, such as loss-of-coolant accident (LOCA) or an earthquake.

Each applicant for a permit to construct a nuclear power plant must include the principal design criteria for the proposed facility in its application to the NRC. The principal design criteria in 10 CFR 50, Appendix A, establish the necessary design, fabrication, construction, testing and performance requirements for structures, systems, and components important to safety which provide for reasonable assurance that the facility can be operated without undue risk to the health and safety of the public, including during accident conditions, such as LOCAs and earthquakes.

During its review of preoperational test procedures, the TRT found that TUEC tested safety systems with consideration for accident conditions to the extent possible by simulating certain parameters such as temperature, pressure, flow, etc., that might be encountered during an anticipated accident or emergency condition. This method is permitted by NRC RG 1.68 and, therefore, satisfies NRC requirements.

(6) It is alleged that TUEC and the NRC Region IV staff were willing to accept HFT results which were deficient.

Final acceptance by TUEC of HFT results does not occur until the Joint Test Group (JTG) has conducted its review of the data and approves the completed test data package. In a sample of 17 out of 25 completed HFT data packages, the TRT found four instances in which not all of the test objectives had been met, yet the JTG had completed their review and had approved the test data package. These instances were:

(a) Preoperational test procedure 1CP-PT-02-12, "Bus Voltage and Load Survey," intended to demonstrate that during all modes of plant operation, optimum current and voltage will be present at all the buses and associated equipment. After the test was completed, the STE noted in review of test data that the voltages recorded in paragraphs 7.8.2.1 and 7.8.3.1 did not meet the acceptance criteria specified in the test procedure. A test

deficiency report (TDR) was initiated. Subsequent TUEC engineering evaluation of the out-of-tolerance voltages documented in the TDR required that changes to some of the transformer output settings used during the conduct of the test were necessary to bring the voltages within the originally specified acceptance criteria. In accordance with the test procedure, these changes necessitated that some portions of the test be performed again. However, the JTG approved the data package without requiring these portions of the test to be performed again. Therefore, the test data package contained invalid data for that test; thus, the test objective had not been met.

(b) Procedure 1CP-PT-34-05, "Steam Generator Narrow Range Level Verification," intended to demonstrate at hot, no-load conditions, that the specified narrow range level channels for each steam generator indicate properly at the upper and lower instrument taps and compare properly with each other for actual changes in steam generator water level. The transmitters for level detectors 1-LT-517, 518, and 529 were found defective prior to initiation of testing and, thus, temporary equipment was substituted. The test was performed with the temporary equipment and declared successful. After the test, the specified transmitters were installed. The Joint Test Group (JTG) approved the completed test package containing data taken with temporary transmitters. The only retest required after installation of the detectors was cold calibration (not calibration at hot, no-load conditions); thus, this test objective was not met and no other requirements were imposed by the JTG to monitor performance when the transmitters are placed in service.

(c) Procedure 1CP-PT-55-05, "Pressurizer Level Control," intended to demonstrate the control aspects of the system in conjunction with the chemical and volume control system. In addition, there was a note on page 12 of the procedure that stated, "This test is provided to verify the capability of the pressurizer level control system to monitor pressurizer level over the range of installed instrumentation and to observe that all alarm and control functions are operational." A prerequisite condition (paragraph 6.13) required the plant to be in hot standby condition. During conduct of pressurizer level indication testing in accordance with the procedure (paragraph 7.1), the System Test Engineer (STE) noted that a level detector (1-LT-461) was registering marginal readings. He documented this and recommended a calibration check of the detector. After the test was completed, this was done, and it was determined that the detector was out of calibration, and attempts to calibrate it were unsuccessful. The corrective action was to replace the detector and perform a cold calibration (not calibration in hot standby condition); thus, this test objective was not met. The JTG-approved test data package contained level data taken with a detector that subsequently proved to be out of calibration, thereby invalidating the test data and no other requirements were imposed by the

JTG to monitor the performance of the new detector when it was placed in service.

(d) Additionally, during the conduct of Procedure ICP-PT-55-05 discussed in (c) above, the speed of the recording chart for the pressurizer level was changed from 2.5 cm/minute, as required by paragraph 7.2.6c, to 15 cm/hour. The TRT determined that this was done to avoid running out of chart paper during the test. This deviation from the approved test procedure should have been documented on a TDR even though, in this case, the chart speed was inconsequential since the recorded trace data were not being relied upon to prove any of the system's performance features.

The TRT discussed these findings with startup management, including the Startup Manager, who is a JTG member. The Startup Manager informed the TRT that with respect to ICP-PT-34-05 and ICP-PT-55-05, the JTG had made a conscious decision not to require hot calibrations on the instruments in question since the accuracy of their calibrations could be determined during a subsequent plant heatup. While the TRT understood this, it pointed out that the JTG had not specified in the retest requirements that these hot calibration determinations must be made; it only specified a cold calibration. Therefore, there was no mechanism to draw attention to the fact that these instruments had not been operationally tested previously under hot plant conditions. The TRT, therefore, did not consider the test objectives to have been fully met. With respect to ICP-PT-02-12, when the TRT identified the need to perform some portions of the test again as a result of the actions taken to implement TUEC's engineering evaluation of the out-of-tolerance voltages, a TDR was immediately initiated by the startup group. The need for performing portions of the test again was apparently overlooked by the JTG during its review. The TRT, therefore, considered that the test objectives had not been fully satisfied and that the JTG review of this data package had been less than adequate.

With respect to the alleged acceptance of deficient test results by the NRC Region IV staff, when the TRT review began, the Region IV staff had not yet begun their inspections of HFT-completed test packages. This NRC inspection effort has as an objective to assure that all test data are either within previously established acceptance criteria, or that deviations are properly documented, evaluated and dispositioned. Since Region IV inspection had not yet begun, the implication that the Region IV staff was willing to accept deficient results was not appropriate. Thus, there is no support for the assertion of a lack of candor on the part of the NRC Region IV staff or for the assertion that the ASLB cannot rely on the NRC staff to monitor plant testing.

With respect to TUEC, the TRT Test Program Group's findings, discussed elsewhere in this SSER, indicate that the problems identified during HFT were, in general, appropriately and clearly documented and tracked for resolution, in accordance with TUEC administrative procedures developed for those purposes. The TRT review found that

documentation in the startup group was maintained in an orderly, systematic and readily retrievable manner. Additionally, in its review the TRT Test Program Group interviewed and met with startup personnel, including the Manager of Startup, lead startup engineers, startup test engineers and others involved in the testing program. The TRT did not discern any hesitation, lack of knowledge concerning responsibilities, or lack of candor on the part of those personnel, nor did the TRT identify any conflicting statements among those interviewed. Additionally, the TRT conducted a random sample of current startup personnel qualification records and found that the personnel possessed the necessary background and experience to carry out the responsibilities of their positions. The TRT found no indication of a lack of candor on the part of TUEC startup personnel.

5. Conclusion and Staff Positions: The TRT's review of the overall HFT program and a sample of 17 out of 25 completed HFT data packages disclosed 4 instances in 3 test data packages where not all of the test objectives had been met, although the JTG had reviewed and approved the completed test. These deficiencies were not part of any specific allegation. However, the TRT considers them to be oversights on the part of the JTG which raised concerns regarding their review/approval process. Therefore, the matter is considered to have potential generic implications and to require follow-up action by TUEC.

With regard to the specific allegations, the HFT portion of the preoperational test program was found to be comprehensive and, in general, conducted with adequate administrative controls and test procedures. Although the HFT was incomplete, TUEC's plan to complete it after fuel loading and prior to initial criticality appeared technically sound and without any safety implications. Subsequently, TUEC altered these plans and will conduct those tests which can be performed without the reactor core installed prior to fuel loading, since time is now available.

The TRT found no instances involving the testing program when the NRC staff should have provided notification to the ASLB. With respect to TUEC's notification to the ASLB of problems encountered during the HFT, since CASE raised this directly to the ASLB, it is properly a matter for the ASLB to decide. While problems were encountered during the thermal expansion test, the TRT found that they had been properly documented in accordance with administrative controls established for that purpose. The TRT also found that TUEC had tested with consideration of accident conditions to the extent possible as required by NRC guidance. The TRT found no support for the assertion that the NRC Region IV staff was willing to accept deficient HFT results since they had not yet begun their review. And, while TUEC's JTG, in the opinion of the TRT, approved two test data packages without imposing appropriate measures to ensure that certain instrumentation was accurately calibrated and properly functioning before the plant is made operational, and approved one test data package without recognizing the need to perform portions of the test again, the TRT did not consider these to indicate a willingness on the part of TUEC to accept deficient test results. There was no evidence found that either TUEC or the NRC Region IV staff was willing to accept deficient test results or that either had exhibited a lack of candor in identifying problems during HFT. It appeared that the overall objectives of the CPSES Unit 1 preoperational test program

were being satisfactorily met, thus providing reasonable assurance that the plant is properly designed and constructed and that its operation will not pose a threat to public health and safety. While some of the allegations had valid bases, none was considered to have safety significance or generic implications.

The findings and conclusions of the TRT with regard to these allegations were presented to the intervenor (CASE) in a meeting on November 7, 1984. CASE had no comments at that time but requested time to review the transcript of that meeting and to provide any comments thereafter. The TRT agreed to their request. A portion of the allegation discussed in paragraph 4(4) of this SSER was brought forward by a confidential source. The alleger was not available to discuss the TRT's findings and conclusions.

6. Action Required:

a. Section 4(6) of this report refers to three preoperational tests conducted during HFT that the TRT determined were not completed to the extent required by the objectives stated in the test procedures. Accordingly, TUEC shall review all complete preoperational test data packages to ensure there are no other instances where test objectives were not met, or prerequisite conditions were not satisfied. The four items identified by the TRT staff shall be addressed, with appropriate resolution, in the deferred preoperational tests.

b. TUEC has informed the TRT that the Station Operation Review Committee (SORC) will review deferred preoperational test data. Since the review of data obtained from the deferred preoperational tests is a function of the SORC, TUEC shall amend the FSAR to reflect their commitment to the TRT that the SORC and not the JTG will perform these reviews. This requirement, not included in the Sept. 18, 1984, letter to TUEC, is necessary because the current version of the FSAR states that the JTG is responsible for reviewing preoperational test data.

c. The TRT determined, as indicated in 4(4) of this report, that 1CP-PT-55-11 "Thermal Expansion," did not include information needed to trace the measuring devices to the monitored locations, although the information was available in a log maintained by TUEC. TUEC shall incorporate the information contained in the log into the official 1CP-PT-55-11 data package so that the traceability is maintained, and shall also establish administrative controls to assure appropriate test and measuring equipment traceability during future testing and plant operation.

1. Allegation Category: Test Program 2, Unit 2 Test Program

2. Allegation Number: AT-12

3. Characterization: In support of a proposed contention (No. 26), the intervenor, Citizens Association for Sound Energy (CASE), alleges that unless ordered to do so by the NRC Atomic Safety and Licensing Board (ASLB), Texas Utilities Electric Company (TUEC) will not conduct a testing program on Unit 2, but will rely instead on the results of the Unit 1 testing program to support Unit 2 operation.

4. Assessment of Safety Significance: The implied safety significance of this allegation is that safety-related structures, systems, and components associated with Unit 2 would not undergo a testing program to verify that the plant has been properly designed and constructed to assure public health and safety.

   The NRC Technical Review Team (TRT) reviewed TUEC's preoperational testing program for Comanche Peak, Unit 2. The TRT also reviewed TUEC's Final Safety Analysis Report (FSAR), Chapter 14.0, "Initial Test Program," and found it to be consistent with NRC Regulatory Guide (RG) 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," and RG 1.68, "Initial Test Programs for Water Cooled Nuclear Power Plants." TUEC is committed in the FSAR to meeting both of these regulatory guides. Regulatory Guide 1.68 requires that all structures, systems, and components that are important to safety be tested.

   The Comanche Peak FSAR Chapter 14.2.1, "Summary of Test Programs and Objectives," states that the purpose of the startup program for Comanche Peak Steam Electric Station (CPSES) is to assure that the installed station structures, systems, and components will be subjected to tests to verify that the plant has been properly designed and constructed and is ready to operate in a manner that will not endanger the health and safety of the public. The FSAR for Comanche Peak encompasses both Unit 1 and Unit 2. Figure 14.2-3, "Preoperational Test Schedule," and Figure 14.2-4," Initial Startup Test Schedule," indicate that the respective schedules are applicable to both Unit 1 and Unit 2. Accordingly, this statement does not imply that testing will be conducted only on Unit 1.

   The TRT also reviewed TUEC's "AT/PT Test Index with Schedule, Unit 2-CPSES," (July 18, 1984). This document provided an index of acceptance tests (ATs) and preoperational tests (PTs), including test numbers, revision numbers, and procedure titles for the projected Unit 2 testing program. Due to the uncertainty of when Unit 2 construction would be completed, this document did not show a projected schedule for testing. The TRT compared the Unit 2 index with RG 1.68 and with the Unit 1 index and found them to be consistent. Only systems which are shared by Unit 1 and Unit 2 and were fully and successfully tested during the Unit 1 testing program were not scheduled to be tested during the Unit 2 testing program. Examples of "shared" system tests (which were listed on "AT/PT Test Index with Schedule, Unit 1 and Common," dated July 9, 1984) included: Waste Gas System Leak Check; Control Room Heating and Ventilation System; Telephone and

Radio Systems; Primary Plant Ventilation System; and Primary Plant Ventilation Supply System Cooling. The control room heating and ventilation system is typical of the commonality of these shared systems. Units 1 and 2 share the same control room, which has one heating and ventilation system. Because the heating and ventilation system was tested satisfactorily when Unit 1 testing occurred, it need not be tested during the Unit 2 test program. In fact, if Unit 1 is operational, this system will already be in operation when Unit 2 testing takes place, as will be true for the other shared systems.

5. Conclusion and Staff Positions: The TRT concludes that this allegation is without basis. TUEC has committed to the NRC staff that Unit 2 would undergo a test program subject to NRC requirements and the TRT confirmed that a Unit 2 test program is planned. Accordingly, this allegation has neither safety significance nor generic implications.

   The findings and conclusions of the TRT with regard to this allegation were presented to the intervenor, CASE, in a meeting on November 7, 1984. CASE had no comments at that time, but requested time to review the transcript of that meeting and to provide any comments thereafter. The TRT agreed to their request.

6. Action Required: None.

1. Allegation Category: Test Program 3, CILRT

2. Allegation Number: AT-7

3. Characterization: In support of a proposed contention (No. 26), the intervenor, Citizens Association for Sound Energy (CASE), alleges that the leaks encountered during the containment integrated leak rate test (CILRT) were numerous and of such magnitude that they would have to be corrected and the test repeated before fuel loading.

4. Assessment of Safety Significance: The implied significance of this allegation is that the containment building might not be capable of meeting its intended safety function of acting as the final barrier against the release of significant amounts of radioactive fission products to the environment in the event of an accident unless the CILRT was performed again with no leaks detected.

   A condition for an operating license for a water-cooled power reactor, such as Comanche Peak Unit 1, is that the primary reactor containment building meets the leakage test requirements set forth in 10 CFR 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Reactors."

   Appendix J of 10 CFR 50 requires preoperational testing of the overall leak tightness of the containment building (CILRT or Type A test) and establishes acceptance criteria for the test. The testing is conducted to assure that total leakage through all designated penetrations and building flaws, if any, does not exceed the value specified in Appendix J or the CPSES Technical Specifications (which are currently under review by the NRC as part of the operating license review process).

   Both 10 CFR 50, Appendix J, and the Comanche Peak Steam Electric Station Final Safety Analysis Report (CPSES/FSAR), Amendment 12, October 8, 1980, specify the use of the American National Standard Institute (ANSI) N45.4-1972, "Leakage Rate Testing of Containment Structures of Nuclear Reactors," March 16, 1972, to carry out the test. A later revision of the ANSI standard (ANSI/ANS 56.8, "Containment System Leakage Testing Requirements") prescribes essentially the same test procedure for the CILRT as ANSI N45.4-1972, but prescribes another method for calculating the leakage rate. ANSI/ANS 56.8 has not been endorsed by NRC and is not prescribed in 10 CFR 50, Appendix J.

   The TRT reviewed the as-performed CILRT procedure, 1-CP-PT-75-02, "Structural Integrity Test and Integrated Leak Rate Test," Revision 0 and the resultant test data to determine compliance with 10 CFR 50, Appendix J and the proposed Technical Specifications. The TRT determined that, as alleged, numerous leaks were detected during the first two of three attempts to measure the containment building leakage rate. On each of the first two attempts, when it was determined that the leakage rate would exceed the maximum allowable rate, the test was terminated, the containment pressure reduced to a safe level for entry into the building, and the suspected leaks corrected. Prior to the third attempt, test personnel identified three containment electrical penetrations (E-49, E-62, and E-68) for

which the individual leakage rates were excessive, but for which a method to stop the leakage was not then apparent. These three penetrations were isolated prior to the third attempt and documented on test deficiency reports (TDRs) for later disposition. The result of the third CILRT attempt was considered satisfactory by TUEC. The CILRT was observed by two NRC inspectors (reference NRC Region IV Inspection Report 50-445/83-04) to ascertain whether the test was conducted in accordance with the approved TUEC preoperational test procedure. The NRC inspectors also independently calculated the leakage rate using the method defined in ANS N45.4-1972 and Draft 3 of ANSI/ANS 56.8-1981 to determine the validity of TUEC's test results.

Subsequent to the third attempt, the three isolated electrical penetrations were individually leak tested to establish their specific leakage rates prior to repair. The cause of the leakage was identified as improper assembly of the penetration seals. The penetrations were reassembled and individually leak tested again, with satisfactory results. (Four other penetrations that, in accordance with the test procedure, were required to be open in order to conduct the CILRT were also individually leak tested.) The measured leakage rates from the repaired electrical penetrations (and the measured leakage rates from the four penetrations used to conduct the test) were added to the measured leakage rate from the CILRT. This addition was insignificant and did not alter the least significant digit in the previous total leakage rate. The total resultant leakage rate was less than the allowed maximum for the containment building under the proposed CPSES Technical Specifications and 10 CFR 50, Appendix J.

During the third attempt, test personnel recorded data and calculated containment building leakage rates as prescribed by ANSI N45.4. These leakage rates remained consistently lower than the maximum allowed in 10 CFR 50, Appendix J, and the proposed CPSES Technical Specifications. However, the calculation of the containment leakage rate included in the summary report submitted to the NRC, as required by 10 CFR 50, Appendix J, ("Comanche Peak Steam Electric Reactor Containment Building Unit One Preoperational Integrated Leak Rate Test," 1983, Docket Number 50-445, Texas Utilities Generating Company and Addendum, July 1983) was performed using the method prescribed by ANSI/ ANS 56.8. This value was consistent with the value calculated by using the method in ASNI N45.4 and confirmed that the containment building leakage was less than that allowed by the CPSES Technical Specifications and 10 CFR 50, Appendix J.

5. Conclusions and Staff Positions: The TRT determined that numerous leaks were encountered as alleged during the first two attempts to conduct the CILRT, but that these leakage paths were identified and the leakage was stopped prior to the successful completion of the CILRT, with the exception of three electrical penetrations. The leakage rates from these penetrations (and four penetrations which were needed to conduct the test) were later measured and added to the total leakage rate. The preoperational leakage rate was calculated and found to be lower than the maximum allowed by NRC regulations, a determination verified through independent calculations by NRC inspectors and confirmed by the TRT. The CILRT was performed again without encountering numerous leaks and, therefore, the Containment Building proved to be capable of meeting its intended safety function.

However, the method for calculating the leakage rate, as reported to the NRC, was as prescribed by ANSI/ANS 56.8-1981, which is not consistent with TUEC's FSAR commitment. While this method differs from that prescribed in ANSI N45.4-1972, to which TUEC had committed, because of the stable and consistent data obtained during the test, the leakage rate which resulted from the use of the calculation method in ANSI/ANS 56.8-1981 would be essentially equivalent to the results which would be obtained using the method in ANSI N45.4-1972. However, it is the TRT's position that TUEC should have either used ANSI N45.4-1972, or provided the NRC with justification for using a calculational method not endorsed by the NRC to report the results of the CILRT. Further, the TRT considers that conducting the CILRT with three electrical penetrations isolated, though technically insignificant with respect to the test results, does not fully meet the intent of the preoperational CILRT and should not have been done without specific approval of the NRC staff. These matters were forwarded to the NRC Office of Nuclear Reactor Regulation (NRR) for action. NRR has requested additional information from TUEC, identified as FSAR question Q022.22. In a letter dated December 21, 1984, TUEC responded and submitted appropriate changes to the FSAR text which will be a part of Amendment 54 of the CPSES FSAR. On January 17, 1985, NRR concluded that these matters were resolved as reflected in Item (36) in Section 1.7 of Comanche Peak SSER 6. While these were not safety significant in this case, the deviation from an FSAR commitment, made without identifying it to the NRC, could be indicative of a generic weakness, if other deviations occurred and were not documented and reported to NRC.

The findings and conclusions of the TRT with regard to this allegation (with exception of the final NRR disposition noted above) were presented to CASE in a meeting on November 7, 1984. CASE had no comments at that time, but requested time to review the transcript of that meeting and to provide any comments thereafter. The TRT agreed to their request.

6. Action Required: Prior to fuel loading, TUEC shall identify all other deviations from FSAR commitments which have not been identified previously to the NRC.

1. Allegation Category: Test Program 4, Prerequisite Testing

2. Allegation Number: AT-14

3. Characterization: It is alleged that: (1) prerequisite testing was performed by craft personnel not qualified in accordance with ANSI N45.2.6, "Qualification of Inspection, Examination, and Testing Personnel for Nuclear Power Plants"; (2) System Test Engineers (STEs) were signing for tests that were conducted by craft personnel when in the majority of cases the STEs were not present during testing; and (3) test documentation was made to look as if the tests were performed by STEs, when in fact tests were performed by craft personnel and the STEs only reviewed the data. (An allegation similar to (1) and (2) above was also evaluated by the QA/QC Group under QA/QC Category 4, where it was identified as allegation QA-91.)

4. Assessment of Safety Significance: The implied safety significance of these allegations is that if prerequisite testing activities were performed by craft personnel not trained and qualified in accordance with industry standards endorsed by NRC, errors could be made which could affect the prerequisite test results.

   The CPSES Final Safety Analysis Report (FSAR), Section 14.2, describes the initial test program. It was implemented by Texas Utilities Electric Company (TUEC) through a series of administrative procedures contained in the "Startup Administrative Procedure Manual." The CPSES initial test program is divided into three successive phases: (1) prerequisite testing, (2) preoperational testing (which occurs prior to fuel load), and (3) initial startup testing (which occurs after an operating license that permits fuel load is issued by the NRC). These allegations address the preoperating license category of "prerequisite" testing, the first phase in the initial test program. "Prerequisite" testing is performed to verify the complete installation, cleanliness, and initial operability of individual plant components and is also referred to as initial checkout. Testing in this phase is conducted using a series of generic instructions contained in the TUEC "Startup Prerequisite Test Instruction Manual" and involves checks of such things as electrical resistance, transformer polarity, relay and circuit breaker operability, motor rotation and initial operation, initial pump operability, systems cleanliness, and piping support adjustments. "Preoperational" testing follows the "prerequisite" testing phase and is conducted prior to fuel loading to demonstrate the capability of components, systems, or structures to meet safety-related performance requirements as stated in the FSAR and as accepted by the NRC. These tests can only be conducted and supervised by personnel who are qualified to ANSI N18.1-1971, "Selection and Training of Nuclear Power Plant Personnel."

   In assessing the allegation that prerequisite testing is being performed by craft personnel who do not meet the qualification standards of ANSI N45.2.6,

"Qualification of Inspection, Examination, and Testing Personnel for Nuclear Power Plants," the TRT found that TUEC was using craft personnel who do not qualify as "test personnel" under that standard to assist with prerequisite testing. The TRT interviewed TUEC management representatives who stated that STEs are permitted to use qualified craft personnel to assist with prerequisite testing. TUEC's position was that craft personnel who support testing are not required by ANSI N45.2.6 to be qualified as test personnel. The TRT reviewed TUEC's FSAR, ANSI N45.2.6 and NRC RG 1.58 ("Qualification of Nuclear Power Plant Inspection, Examination and Testing Personnel") and, in particular, Regulatory Position C.7 of that guide. The TRT found that it permitted the use of craft personnel for data-taking and equipment operation provided they are supervised by a qualified individual and that they have sufficient training to assure an acceptable level of performance. The TRT determined from review of selected prerequisite test instructions that the tests involved work normally within the expertise of journeyman level craft personnel. The TRT reviewed the personnel records of craft personnel who are used to assist with prerequisite testing and found that they were generally at the journeyman level in their crafts. They were also receiving indoctrination in the testing work; e.g., the Electrical Test Group (ETG) craftsmen were required to read and understand 10 pertinent startup administrative procedures and 14 prerequisite test instructions. The TRT interviewed STEs, ETG craft persons, and the ETG foreman. In addition, one of the TRT members, who has been assigned as a NRC Resident Inspector at CPSES since December 1983, periodically observed ETG craft persons at work in the field assisting in testing activities. No apparent qualification deficiencies were found for the type of work they were performing and, in some instances observed, the ETGs' knowledge of the components and test equipment directly contributed to the successful completion of the test.

The TRT reviewed TUEC Administrative Procedure CP-SAP-21, "Conduct of Testing" to determine the administrative controls established for the use of craft personnel to assist with prerequisite testing. The TRT found that in all cases with prerequisite tests, the test engineer, usually an STE, first ensures that all conditions required to proceed with the test are satisfied, as stated in the test instruction. The STE must indicate this by signing that step in the test procedure. If an STE assigns a craft person to assist with a portion of the prerequisite test, the STE must first assure that the craft person is adequately experienced to do the work by having directly observed him in that activity. When a craft person is used to measure and record data, that person must sign for the data he/she has recorded in the same manner as if it had been recorded by an STE. Since the STE is directly responsible for the proper conduct of the test, the STE must evaluate the completed test and resulting data against the test acceptance criteria to determine if it is satisfactory. The STE signs the test data sheet to indicate the satisfactory completion of that review. The TRT considered that TUEC's practice of utilizing craft personnel to assist with prerequisite testing to be consistent with the applicable industry guides and standards and in conformance with the FSAR commitment.

The allegation also implied that STEs were signing for testing by craft personnel when the STEs were not present during the testing. The TRT determined that in some instances this could occur, i.e., while a craft person was measuring and recording data he may not have been directly observed by the STE. However, since an STE has to initiate a test and execute steps in the test which involve equipment operation, an STE has to be present for the test to proceed. In light of the experience level of the craft personnel, the nature of the work they performed, the administrative controls established by CP-SAP-21 and the responsibilities of the STEs for proper completion of the test, including test data review, the TRT did not consider that continual observation of craft personnel engaged in prerequisite testing was warranted since it appeared to fall within the generally accepted definition of a supervised activity and is not required by applicable industry standards and guides.

It was also alleged that documentation of prerequisite testing can mislead a person into believing that an STE conducted the test when, in fact, it was performed by craft personnel. The TRT's review of 35 test data packages and interviews with startup personnel confirmed that craft personnel, when used to measure and record data on a prerequisite test data sheet, did sign for the data they recorded. The craft persons' signatures on the data sheets clearly indicated that they had recorded the data; however, the STE was held responsible for the satisfactory completion of the test, evaluation of the resultant data, and for signing the data sheets. The data sheets were also signed by a test engineer with higher qualifications than the STE to indicate his review of the recorded data. This practice is in accordance with TUEC's Administrative Procedure, CP-SAP-21. However, in its review of the 35 test data packages, the TRT review found that craft personnel verified and signed for initial conditions on some prerequisite test data sheets, contrary to Section 4.10.9 of CP-SAP-21, "Conduct of Testing," which requires that this be done by the STE. Further investigation revealed a memorandum issued by the Lead Startup Engineer on March 31, 1983, countermanding this requirement of CP-SAP-21. The subject of the memorandum (STM-83084) was "ETG Personnel Schedule Change," but it also indicated that craft personnel (ETG) may verify prerequisite conditions for Prerequisite Test Instructions XCP-EE-1 and XCP-EE-14. Issuing such a memorandum in lieu of executing a properly approved change to CP-SAP-21 is in violation of CP-SAP-1, "Startup Administrative Procedures Manual," Section 4.4.3.1, which requires a permanent or interim change to be approved and issued to all manual holders in accordance with CP-SAP-1. It appears that as a result of the memorandum, 24 of the 35 tests reviewed by the TRT had prerequisite conditions improperly verified by craft support personnel. Fifteen were XCP-EE-14, but nine were XCP-EE-24, "Fixed Battery Pack Operated Emergency Lighting Units," which were not authorized by the memorandum.

5. Conclusion and Staff Positions: As alleged, TUEC utilized craft personnel who were not qualified to ANSI N45.2.6 standards to assist with prerequisite testing activities. While qualifying craft personnel to that standard would be more conservative, the method utilized by TUEC is permitted by ANSI N45.2.6, as augmented by NRC Regulatory Guide 1.58 (Regulatory Position 7), which permits personnel who do not meet ANSI N45.2.6 to engage in data-taking and equipment operation provided they are supervised by a qualified individual and that they have sufficient knowledge to ensure an acceptable level of performance. Based on its review, the TRT found that the craft personnel used to assist with prerequisite test activities were appropriately indoctrinated in the administrative and prerequisite test procedures applicable to their work, performed the work under STE supervision, and performed work that was within the journeyman level of expertise. While they may not have been under the constant supervision of an STE, as the allegation implies, this is not required by ANSI N45.2.6 or Regulatory Guide 1.58. The TRT considers that because of the relatively routine nature of the work, and because the prerequisite test results were reviewed and evaluated against the acceptance criteria by the STE responsible for the test, and were subsequently reviewed by a test engineer with higher qualification than the STE, adequate technical supervision and oversight were being exercised. The TRT did not find, as alleged, that the test documentation was made to look as if an STE performed the test when, in fact, it had been performed by a craft person. The TRT found that when craft personnel took and recorded test data, they signed the entry, and the STE's signature on the data sheet only indicated that the resultant data had been evaluated against the acceptance criteria by the STE and was found to be satisfactory. This practice is consistent with the TUEC procedure CP-SAP-21 which directs the conduct of testing activities. This procedure was widely disseminated onsite and was contained in TUEC's system of manuals and procedures. Therefore, the TRT concludes that the practice is not misleading and, as implemented, is satisfactory. Accordingly, this allegation has neither safety significance nor generic implications.

However, the results of the evaluation pertaining to inadequate qualifications of preoperational test personnel will be further assessed as part of the overall programmatic review concerning procedures addressed under QA/QC Category 4.*

This allegation was brought forward by a confidential source. The alleger was not available to discuss the TRT's findings and conclusions.

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*The TRT evaluation of QA/QC allegations is in progress and will be published in a subsequent supplement to this SSER.

6. Action Required: TUEC shall rescind memorandum STM-83084 of March 31, 1983, which was issued in conflict with CP-SAP-21, and take action to ensure that there are no other memoranda issued which conflict with approved procedures. TUEC shall also conduct a review of all other prerequisite test records to determine those that had prerequisites signed by craft personnel, and assess the impact of those improper verifications on subsequent testing.

1. Allegation Category: Test Program 5, Preoperational Testing

2. Allegation Number: AT-15

3. Characterization: It is alleged that the preoperational test program is flawed because (1) several system test engineers (STEs) for electrical/mechanical plant systems may work on the same system, or one STE may test a part of many systems, a condition causing confusion and the possibility of omissions, (2) there is a dual numbering system which causes confusion and overlaps, (3) STEs are not provided with a "computer printout" which informs them of all tests required on a system, (4) calculations for instantaneous trip settings on approximately 100 breakers were not performed correctly, (5) portions of prerequisite tests are being used to meet Final Safety Analysis Report (FSAR) commitments, (6) a system can pass through both the prerequisite test and the preoperational test without ever undergoing an energized functional test, and (7) STEs are not provided with current design information and, therefore, must spend too much time researching and validating drawings.

4. Assessment of Safety Significance: The implied safety significance of these allegations is that if safety-related systems described in the FSAR were not properly tested, there would not be sufficient assurance that the systems will meet their intended safety functions in service.

   The TRT reviewed the "prerequisite" testing method used by TUEC to ensure that the systems were ready for preoperational testing. Through a series of generic tests, such as XCP-EE-1, "Megger Hi/Pot Testing," XCP-EE-8, "Control Circuit Functional Testing," or XCP-ME-1, "Initial Pump Operation," TUEC verified that construction was completed as required in order for structures, systems, and components to undergo preoperational testing. The prerequisite testing phase included such tests as initial instrument calibration, system piping flushes and cleaning, wiring continuity and separation checks, hydrostatic pressure tests, and initial functional tests of components. Prerequisite testing is discussed further in Test Program Category 4. These tests facilitate the safe and orderly progression to the preoperational testing phase, as outlined in Regulatory Guide 1.68, and as committed to in the CPSES FSAR, which determines whether structures, systems, and components meet their safety-related design functions.

   In assessing the allegation that STE assignments are responsible for confusion and possible omissions, the TRT discussed TUEC's process for STE plant system assignments during an interview with startup management personnel. The TRT found that each STE was assigned by the startup group leader to a system or subsystem. More complex systems were divided into subsystems and had two or three STEs assigned, with one STE designated as the leader. These assignments were based upon the individual STE's background and experience and were documented on a "System Assignments" sheet, which the STEs used to keep track of who was responsible for each system. System assignment sheets have been in use since about mid-1983. Prior to that time, STE system assignments were documented on a Master System/Subsystem Index, which provided essentially the same information. The TRT reviewed a Master System/Subsystem Index from January 15, 1980, which included STE system assignments, and which indicated to the TRT that this information was available at least since that date.

In interviews with startup personnel which included STEs, the TRT found no indication of confusion or gaps between systems and subsystems because of the STE system assignment process. As documented in CP-SAP-2, "Startup Program Organization and Responsibilities," and CP-SAP-21, "Conduct of Testing," the STEs are responsible for ensuring that their assigned systems are properly tested and that their tests are coordinated with other STEs responsible for interconnecting system tests. The STEs were also responsible for cooperating with other STEs when the scope of testing overlapped subsystems under their respective responsibilities. The same practice of cooperation is implemented in cases where startup work authorizations (SWAs) applied to more than one system or subsystem. An SWA is documentation of work which is required on structures, systems, and components under the custody of the startup group. The master data base, a multi-functional computerized tracking system initiated in May 1983, listed and tracked outstanding work and deficiencies on subsystems. Prior to May 1983, a similar, manual listing and tracking system for outstanding work and deficiencies, called the Master Systems Punch List, provided for this. The TRT considered that the STEs had adequate information and administrative controls to preclude confusion among STEs regarding system assignments and that adequate administrative controls had been established to avoid omissions.

The allegation also implied that the numbering system used to identify subsystems was a "dual" system which caused confusion. The TRT determined that one component could appear on two interconnecting system or subsystem diagrams if it happened to be on a boundary between the two systems. An example of such a "dual" numbered component could be a motor-operated valve. The valve appears on the fluid system diagram under the fluid system designation number, while the motor and control circuits appear on the electrical system diagram under the electrical system designation number. In most cases, different STEs are assigned to the two systems; thus, the valve would be included in the testing of both systems, creating an overlap. The TRT does not consider this practice to be confusing, but rather conservative, since the component is tested twice. But if an electrical work item (SWA) was generated on such a component and it was erroneously assigned to the STE who had responsibility for the fluid side of the component, it would be necessary for the STE who was assigned in error to coordinate with the other STE to ensure the work item was followed to completion and the component tested again as required. Based on interviews, the TRT found that this degree of cooperation was common among STEs and did not cause problems. Additionally, the TRT found that the master data base system, in conjunction with other administrative controls, ensured that open work items and retesting would be completed as required. The TRT found no indication of confusion or gaps (missed tests) between systems and subsystems because of the "dual" numbering system.

As alleged, the TRT found that the STEs are not initially provided with a computer printout of testing that is required on a system. At other plants, an index of required tests may be provided as a package by a contractor. However, at CPSES, the startup program was undertaken by TUEC. As part of TUEC's program, the STE is responsible for making an initial determination of what testing is required using design specifications, drawings, the FSAR, and other applicable documents. When the STE has made this determination, the startup group leader and the Joint Test Group (JTG) review it for

completeness. When it is complete, a test index is published which lists the number and name of the tests and, after testing begins, the status of all tests. The test index is routinely issued to the group leaders and is available to all STEs. The TRT considers this practice to be acceptable.

In its investigation of the allegation related to incorrect instantaneous breaker trip settings, the TRT found that instantaneous trip points for 74 miscellaneous circuit breakers had been set at the specific values called for in the design drawings provided by the plant's architect-engineer (A/E) early in prerequisite testing. None of these 74 circuit breakers were safety related. As a result of a few "nuisance" trips, i.e., some breakers instantaneously tripping at locked rotor current values, TUEC startup engineering contacted the A/E concerning that problem, and in September of 1980, this resulted in a revision to XCP-EE-14, "Molded Case Circuit Breaker and Thermal Overload Relay/Heater Testing," which is the generic procedure for testing circuit breakers. The revision incorporated a formula for determining the correct trip settings by actual calculations. The calculation method includes the motor starting kVA, horsepower, voltage, and full-load current; factors which may not have been known precisely when the setpoints were previously calculated by the A/E. Therefore, using the actual factors from motor name plate data resulted in a more accurate calculation for the setpoint for a particular circuit breaker. This allegation stems from a situation on or about March 15, 1984, when an ETG technician, who was verifying data from the results of circuit breaker testing, using XCP-EE-14 in order to establish a computerized data base, found minor variances in trip setpoints for 21 circuit breakers. The technician was using the calculational method of determining the setpoints included in the current revision of XCP-EE-14. He informed startup management of this finding and the startup group pursued the apparent variances. Shortly thereafter, the startup group realized that the reason for the variances was that the trip setpoints for those circuit breakers had not been calculated on site per XCP-EE-14, but had been set in accordance with the trip points provided by the A/E prior to the revision of XCP-EE-14 which incorporated the formula for calculating the trip setpoints. Since the differences were small (within ± 10%) and the circuit breakers and their associated equipment were not safety related, TUEC did not reset the trip setpoints. The TRT found that the equipment involved included the turbine building roof exhaust fan, circulating water traveling screen, polymer mixer, and other similar components. The TRT noted that TUEC engineering had appropriately considered the situation, confirmed that no safety-related equipment was affected, and that the problem did not involve an error in calculations.

It was also alleged that some prerequisite testing was not repeated as part of the preoperational testing, and that, therefore, the prerequisite tests were being used to prove FSAR commitments. FSAR Section 14.2.1 states that prerequisite testing is one of the three major phases of the initial test program at CPSES; the other two are preoperational and initial startup testing. Since it is the initial testing phase and is included in the overall program, there is no need to repeat successful prerequisite tests during the preoperational tests.

The allegation also implied that a "system" can pass through both prerequisite and preoperational testing without ever undergoing an energized functional

test and that it was highly probable that it has happened with "light indicators." An energized functional test is one which is conducted with electrical power supplied to the particular component being tested (primarily control circuits) to ensure that it operates correctly. It is initially done at CPSES during prerequisite testing using procedure XCP-EE-8, "Control Circuit Functional Testing." However, in some instances it may not be possible or practical to provide the component (circuit) with electrical power. In such instances, only a continuity test is conducted. This is permitted by XCP-EE-8. A continuity test ensures that there is an electrical conductor (wire) between two specified points in question, but does require that the component be energized. This is generally a sufficient alternative method for initial testing of control circuits and, in particular, for testing indicating light circuits when power is not available. The TRT found that there were cases where some circuits, particularly those for lights indicating valve and breaker positions, may only have had continuity checks during prerequisite testing without having been included as a specific step in the preoperational testing procedure. However, in interviewing startup personnel, the TRT found that even if an indicating light circuit were not energized during prerequisite testing, it is energized during the preoperational testing of the components to which it is connected, since preoperational testing is performed with components in an electrically energized condition. When a preoperational test requires a motor-operated valve to be opened, it must be energized, and the operator would expect to see a change in the position indicating light when the position of the valve changes from closed to open. If this did not happen, the operator would indicate that deficiency to the STE so that the cause could be investigated. Most of the time when this happens, it is caused by a burned out bulb, which the operator replaces on the spot. If not, the STE documents it for resolution. The TRT considered this approach to be reasonable in light of a successful continuity test and the fact that plant operators monitor indicating lights on a routine basis. The TRT could not identify any safety-related circuit which would not be energized during preoperational testing of its associated component in which a deficiency would not be evident.

It was also alleged that system drawing packages were being provided to the STEs by the Document Control Center (DCC) with design change authorizations (DCAs) several years old that were not reflected on the current design drawings; that packages were being issued to STEs with DCAs issued against other packages; that print changes were being issued with no DCAs in the packages; and, that there was no procedure to ensure that the STE had current drawings and design information with which to conduct a valid test. The TRT interviewed three STEs who were responsible for major fluid and electrical systems at CPSES. At each interview, the STE commented that the substance of the allegation relative to outdated design drawings had been true in the past, but that improvements have since been made. That portion of the allegation dealing with the lack of procedures could not be substantiated because those STEs interviewed insisted that there were always procedures which charged the STE with the responsibility of ensuring that he had the latest design information. The TRT confirmed that CP-SAP-21, "Conduct of Testing," Section 4.9, required the STE to use current information when he was preparing to conduct a test. Thus, the responsibility was placed on the STE to ensure he was working with current information. To accomplish this, the STE was required to go to the document control

center and update the documents. This apparently was very time-consuming and burdensome. The STEs who were interviewed told the TRT that after much discussion with TUEC management, the design information provided to STEs had improved greatly and, at the present time, only systems such as vents and floor drains continue to be a problem. The STEs are now able to obtain current drawings from a satellite document control center located closer to their work station, which makes this task less burdensome. During the TRT's review of the Test Program area, it did not find any indication of deficient testing activities which could be attributed to this problem, either past or present. However, in light of the number and nature of the problems found in the document control system by the TRT QA/QC Group (reference QA/QC Category 5, "Document Control"), the TRT does not consider that there is a sufficient certainty that these document control problems did not affect the testing program. The TRT believes that TUEC must provide NRC with assurance that all structures, systems, and components were appropriately and adequately included in the testing program. Additionally, the TRT believes that TUEC should review the process by which test personnel ensure that the latest design information is used when preparing, reviewing, and approving test procedures, conducting tests, and reviewing and approving test results in an attempt to reduce the heavy reliance on the motivation and initiative of individuals, as is required by the current process.

5. Conclusion and Staff Positions: While some of the allegations were found to have a valid basis, the TRT concludes that the allegations have neither safety significance nor generic implications with the exception of 7, below, the significance of which will be dependent upon the results of information that TUEC provides to NRC about how past document control system problems may have affected the testing program.

With regard to the specific allegations, the TRT reached the following conclusions:

(1) The process for STE assignment to systems did not cause confusion or omissions, and the STEs appeared to be in control of the systems for which they were responsible.

(2) The "dual numbering" system did not cause confusion, but overlaps did occur at system boundaries. These overlaps could only have caused a component to have been tested more than once, which is conservative.

(3) STEs are not provided with a computer printout detailing the testing required on systems to which they are assigned. The STEs are responsible for making this determination, and it is reviewed and, when complete, approved by the STE's supervisor and the JTG. The TRT found this acceptable.

(4) Calculations, when required, were performed properly for the instantaneous trip settings on circuit breakers, and variances found by an ETG technician were not the result of calculational errors and were of no safety-related consequence.

(5) Portions of prerequisite tests are being used to satisfy initial test requirements, but, as stated in the FSAR, prerequisite testing is a

major phase of the initial test program. Therefore, the prerequisite tests, in conjunction with the preoperational tests, satisfy FSAR commitments.

(6) Although some electrical circuits, including indicating lights for components may not be specifically subjected to an energized functional test, the preoperational test program subjects all systems and components committed to in the FSAR to an energized operating condition as a minimum and, as such, any deficiences would be apparent.

(7) No problems were identified by the TRT as a result of the STEs having to pursue design information updates on their own initiative. During the timeframe that the alleged difficulties in obtaining current design information occurred, there was a problem. Care was not being adequately exercised in providing updated packages to the STEs, and the Document Control Center (DCC) was not conveniently accessible to STEs, thus making the STEs' job burdensome. As a result of an upgrade in the document control system in April 1983, satellite DCCs were established to bring necessary information closer to personnel needing it. The TRT determined, through interviews with STEs assigned to fluid and electrical systems, that the problem no longer exists to any degree of significance. However, the TRT believes that TUEC should establish measures which do not rely so heavily on an STE's motivation and initiative to obtain current design information. Additionally, as a result of problems identified in the document control system by the TRT QA/QC Group, TUEC shall provide NRC with reasonable assurance that past document control system problems did not adversely affect the testing program.

6. Action Required: TUEC shall establish measures to provide greater assurance that STEs and other responsible test personnel are provided with current design documents and change notices. Additionally, TUEC shall provide NRC with reasonable assurance that past document control system problems did not adversely affect the testing program.

1. Allegation Category: Test Program 6, Lack of Management Conservatism

2. Allegation Number: AT-16

3. Characterization: It is alleged that Texas Utilities Electric Company (TUEC) startup management had a tendency to interpret its commitments to the Final Safety Analysis Report (FSAR), Chapter 14, "Initial Test Program," and to applicable NRC Regulatory Guides (RGs) liberally rather than conservatively.

4. Assessment of Safety Significance: The implied safety significance of this allegation is that such tendencies could lead to plant testing at a standard below that required by the NRC, which in turn could potentially affect public health and safety.

   The primary basis for this allegation appeared to be that the TUEC Start-up Group did not require craft personnel who support testing activities to be qualified to ANSI N45.2.6-1978. The TRT review of that allegation, presented in Test Program Category 4, concluded that, while qualifying those personnel to ANSI N45.2.6 would have reflected a more conservative management attitude, TUEC did not commit to that level of qualification in the FSAR. ANSI N45.2.6-1978, Section 1.2, leaves the imposition of its requirements to the discretion of the employer for personnel who perform work which is well within their normal craft expertise, e.g., calibration and installation checkouts. TUEC exercised its discretion and did not qualify craft personnel who supported the testing activity to ANSI N45.2.6. Additionally, at Comanche Peak Steam Electric Station (CPSES) that work is performed by craft personnel under varying degrees of supervision provided by qualified System Test Engineers (STEs) who are held fully responsible for the correct performance of that work and for the review of data recorded.

   In order to determine if there were any other bases for this allegation in the test program area, the NRC Technical Review Team (TRT) reviewed FSAR Chapter 14, which describes how the testing program is to be carried out, and the RGs to which TUEC committed. These were compared with TUEC's Startup Administrative Procedures and Startup Quality Assurance Plan, which prescribe in detail the conduct of the testing program. In addition, the TRT reviewed procedures related to the test program in Test Program Categories 1 through 5 and 7. With the exception of some minor deficiencies identified in Test Program Categories 1, 3, and 4, the TRT did not find any substantive evidence that the Startup Group interpreted FSAR commitments or RGs in a nonconservative manner.

   The TRT found, however, that some of the decisions made by startup management may have appeared to be less than conservative. Through discussions with startup management personnel, the TRT perceived this to be due to the heavy workload and schedule pressures inherent in a testing program of such magnitude. These burdens apparently resulted in decisions by startup management, in the interest of expediency, to delay some parts of a particular test to a later date when the workload and impact on schedule would be lessened. The TRT found several examples of this with respect to preoperational testing.

One such example was the TUEC decision to conduct the containment integrated leak rate test (CILRT) with three electrical penetrations isolated. While it was technically reasonable to do that (as long as certain controls were maintained), it is preferred by the NRC that this test be conducted with the Containment Building as close as possible to the configuration it will be in during normal plant operation, i.e., with no penetrations isolated. An allegation concerning how the CILRT was conducted is discussed in detail in Test Program Category 3.

Another such example concerned preoperational tests which were originally scheduled to be performed prior to fuel load, but for which TUEC was seeking NRC approval to defer until after fuel load. The Hot Functional Test, in particular, is discussed in detail in Test Program Category 1. These decisions were apparently made because of schedule considerations and, while not the most conservative course of action, nonetheless were acceptable from the point of plant safety. However, TUEC currently plans to perform these tests prior to fuel loading, since additional time is now available.

5. Conclusion and Staff Positions: The TRT found no substantive reason to believe that TUEC startup management has a tendency to liberally interpret FSAR commitments and NRC Regulatory Guides in the area of testing. As discussed above, startup management has made decisions which the alleger could have construed as being less than conservative. The TRT found that the administrative controls that TUEC had developed and is implementing for the conduct and surveillance of preoperational testing, are sufficiently comprehensive to reveal safety-significant or generic problems. Accordingly, this allegation has neither safety significance nor generic implications.

   This allegation was brought forward by a confidential source. The alleger was unavailable to discuss the TRT's findings and conclusions.

6. Action Required: None.

1. Allegation Category: Test Program 7, QA Program for Startup Testing Activities is Minimal

2. Allegation Number: AT-18

3. Characterization: It is alleged that the quality assurance (QA) program for startup testing activities is minimal.

4. Assessment of Safety Significance: The implied safety significance of this allegation is that the QA program for testing activities may not have been sufficient to ensure that the testing program met its objective, that is, demonstrated that plant structures, systems, and components were capable of performing their intended safety-related functions.

   Title 10 of the Code of Federal Regulations Part 50 (10 CFR 50) Appendix B, Criterion XI, requires a testing program to be identified that will demonstrate the satisfactory performance of safety-related structures, systems, and components, and that the testing be conducted in accordance with written procedures which incorporate the requirements and acceptance criteria of applicable design documents. Appendix B, Criterion X, requires an inspection program to be established to ensure that activities affecting quality, such as testing of safety-related structures, systems, and components, are carried out properly. The NRC Technical Review Team (TRT) reviewed the programs that Texas Utilities Electric Company (TUEC) had established and implemented in order to meet these NRC requirements. The TRT's review of the prerequisite and preoperational testing programs is described in Test Program Categories 1 through 6.

   The TRT reviewed TUEC's QA program for inspection of testing activities. The QA program is described in the Comanche Peak Steam Electric Station (CPSES) Final Safety Analysis Report (FSAR), Chapter 17, and in the CPSES Startup Quality Assurance Plan. This plan delineates responsibilities and measures for accomplishing and controlling testing activities. TUEC's Quality Assurance Manager was responsible for verifying proper implementation of the plan. QA surveillance activities were assigned to the Construction and Startup/Turnover Surveillance (CSTS) Group which was located on the plant site and reported directly to the Quality Assurance Manager. QA audit activities were assigned to the TUEC Corporate QA group.

   In order to determine the extent of the CSTS Group's surveillance of testing activities, the TRT reviewed CP-QP-19.6, "Surveillance of Construction and Startup/Turnover Activities" and referenced documents which prescribed the method for, and frequency of, conducting surveillances. The TRT found that a surveillance schedule, which was updated monthly to accommodate changes in the testing schedule, dictated the frequency of the QA surveillances by the CSTS group. The schedule was prepared by the CSTS staff and approved by the CSTS Supervisor, as required by CP-QP-19.6. The schedule required surveillance of certain attributes during the conduct of each preoperational test and a minimum of 30 percent of the prerequisite tests associated with each preoperational test. The prerequisite test procedures are generic, i.e., the same procedure is used to test each similar component for some basic functional attribute. Prerequisite tests are performed to verify such things as complete installation, functional operability, and cleanliness. Therefore, the

smaller sample size for surveillance of prerequisite test activities is appropriate. Preoperational tests, on the other hand, are not generic, i.e., each procedure is different and is especially prepared to test performance characteristics to verify that structures, systems, and components meet their safety-related design functions. Preoperational tests are the NRC-required performance proof tests. The TRT considered that the surveillance frequency established by TUEC was consistent with general industry practice and was being carried out in accordance with the surveillance schedule.

The CSTS surveillance schedule also covered reviews of the administrative procedures by which the startup group conducted its program. These reviews were scheduled to cover each administrative procedure at least annually.

The TRT found that a detailed checklist was prepared by the assigned CSTS surveillance specialist for each test surveillance. These checklists referenced applicable drawings, procedures, and regulatory requirements, and included such attributes as the qualifications of startup personnel, verification of equipment performance characteristics, proper documentation of test results, witnessing of testing activities to verify adherence to procedures, use of correct revisions to applicable testing documents, and proper completion of prerequisite conditions. Additionally, the TRT noticed that QA "hold points" were designated in these preoperational test procedures, which were reviewed as part of the TRT's review discussed in Test Program Categories 1, 3, 4, and 5. The existence of QA hold points in the test procedures indicates that the CSTS group also performed specific reviews of these test procedures before the start of a particular test, in order to determine which portion needed to be verified by QA. The TRT reviewed the results of 30 planned surveillances (out of 174) conducted during 1982, 1983, and the first half of 1984, as well as 5 unplanned surveillances (out of 37) conducted during 1983 and the first half of 1984 and found that they had been adequately implemented. The findings indicated that generally thorough surveillances had been conducted.

In addition to these surveillances, the TRT reviewed the results of five audits (out of seven) conducted by TUEC's Dallas QA group between late 1982 and the first half of 1984 to determine the extent of involvement by TUEC Corporate QA in the testing program. These audits were found to be comprehensive, and the frequency at which they were conducted was consistent with that established by DQP-CS-4, "Procedure to Establish and Apply a System of Pre-Award Evaluations, Audits, and Surveillances." The audits were also commensurate with the safety significance and pace of the preoperational testing activities discussed in NRC Regulatory Guide 1.33.

5. Conclusions and Staff Position: The TRT concludes that the frequency and degree of TUEC's QA program for testing activities was appropriate, commensurate with the safety significance of the specific activity under surveillance, and in compliance with NRC requirements. Accordingly, this allegation has neither safety significance nor generic implications.

This allegation was brought forward by a confidential source. The alleger was unavailable to discuss the TRT's findings and conclusions.

6. Action Required: None.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Dockets: 50-445
50-446

SEP 18 1984

Texas Utilities Electric Company
Attn: M. D. Spence, President, TUGCO
Skyway Tower
400 North Olive Street
Lock Box 81
Dallas, Texas 75201

Dear Mr. Spence:

SUBJECT: COMANCHE PEAK REVIEW

On July 9, 1984, the staff began an intensive onsite effort designed to complete a portion of the reviews necessary for the staff to reach its decision regarding the licensing of Comanche Peak Unit 1. The onsite effort covered a number of areas, including allegations of improper construction practices at the facility.

The NRC assembled a Technical Review Team (TRT) responsible for evaluating most of the technical issues at Comanche Peak, including allegations. The TRT has recently identified a number of items that have potential safety implications for which we require additional information. These items are listed in the enclosure to this letter. Further background information regarding these issues will be published in a Supplement to a Safety Evaluation Report (SSER), which will document the overall TRT's assessment of the significance of the issues examined.

The items in the enclosure to this letter, which are in the general areas of electrical/instrumentation, civil/structural and test programs, cover only a portion of the TRT's effort. The TRT evaluation of items in the areas of mechanical, QA/QC, and coatings, and its consideration of the programmatic implications of these findings, are still is progress. A summary of these issues will be provided to you at a later date.

You are requested to submit additional information to the NRC, in writing, including a program and schedule for completing a detailed and thorough assessment of the issues identified. This program plan and its implementation will be evaluated by the staff before NRC considers the issuance of an operating license for Comanche Peak, Unit 1. The program plan should address the root cause of each problem identified and its generic implications on safety-related systems, programs, or areas. The collective significance of these deficiencies should also be addressed. Your program plan should also include the proposed TUGCO action to assure that such problems will be precluded from occurring in the future.

This request is submitted to you in keeping with the NRC practice of promptly notifying applicants of outstanding information/evaluation needs that could potentially affect the safe operation of their plant. Further requests for additional information of this nature will be made, if necessary, as the activities of the TRT progress.

Sincerely,

Darrell G. Eisenhut, Director
Division of Licensing, NRR

Enclosure:
As stated

cc w/enclosure
See next page

Mr. M. D. Spence
President
Texas Utilities Generating Company
400 N. Olive St., L.B. 81
Dallas, Texas 75201

cc: Nicholas S. Reynolds, Esq.
Bishop, Liberman, Cook,
Purcell & Reynolds
1200 Seventeenth Street, N. W.
Washington, D. C. 20036

Robert A. Wooldridge, Esq.
Worsham, Forsythe, Sampels &
Wooldridge
2001 Bryan Tower, Suite 2500
Dallas, Texas 75201

Mr. Homer C. Schmidt
Manager - Nuclear Services
Texas Utilities Generating Company
Skyway Tower
400 North Olive Street
L. B. 81
Dallas, Texas 75201

Mr. H. R. Rock
Gibbs and Hill, Inc.
393 Seventh Avenue
New York, New York 10001

Mr. A. T. Parker
Westinghouse Electric Corporation
P. O. Box 355
Pittsburgh, Pennsylvania 15230

Renea Hicks, Esq.
Assistant Attorney General
Environmental Protection Division
P. O. Box 12548, Capitol Station
Austin, Texas 78711

Mrs. Juanita Ellis, President
Citizens Association for Sound
Energy
1426 South Polk
Dallas, Texas 75224

Ms. Nancy H. Williams
CYGNA
101 California Street
San Francisco, California 94111

Mr. James E. Cummins
Resident Inspector/Comanche Peak
Nuclear Power Station
c/o U. S. Nuclear Regulatory
Commission
P. O. Box 38
Glen Rose, Texas 76043

Mr. John T. Collins
U. S. NRC, Region IV
611 Ryan Plaza Drive
Suite 1000
Arlington, Texas 76011

Mr. Lanny Alan Sinkin
114 W. 7th, Suite 220
Austin, Texas 78701

B. R. Clements
Vice President Nuclear
Texas Utilities Generating Company
Skyway Tower
400 North Olive Street
L. B. 81
Dallas, Texas 75201

William A. Burchette, Esq.
1200 New Hampshire Avenue, N. W.
Suite 420
Washington, D. C. 20036

Ms. Billie Pirner Garde
Citizens Clinic Director
Government Accountability Project
1901 Que Street, N. W.
Washington, D. C. 20009

David R. Pigott, Esq.
Orrick, Herrington & Sutcliffe
600 Montgomery Street
San Francisco, California 94111

Anthony Z. Roisman, Esq.
Trial Lawyers for Public Justice
2000 P. Street, N. W.
Suite 611
Washington, D. C. 20036

ENCLOSURE 1

REQUEST FOR ADDITIONAL INFORMATION

I. Electrical/Instrumentation Area

a. Electrical Cable Terminations

The Technical Review Team (TRT) inspected random samples of safety-related terminations, butt splices inside panels, and vendor-installed terminal lugs in General Electric (GE) motor control centers, and reviewed documentation relative to the installations.

1. The TRT found a lack of awareness on the part of quality control (QC) electrical inspectors to document in the inspection reports when the installation of the "nuclear heat-shrinkable cable insulation sleeves" was required to be witnessed.

   Accordingly, TUEC shall clarify procedural requirements and provide additional inspector training with respect to the areas in which nuclear heat-shrinkable sleeves are required on splices and assure that such sleeves are installed where required.

2. The TRT found inspection reports that did not indicate that the required witnessing of splice installation was done. Examples are as follows:

IR ET-1-0005393	IR ET-1-0005396
IR ET-1-0005394	IR ET-1-0006776
IR ET-1-0005395	IR ET-1-0014790

   Accordingly, TUEC will assure that all QC inspections requiring witnessing for butt splices have been performed and properly documented; and verify that all butt splices are properly identified on the appropriate drawings and are physically identified within the appropriate panels.

3. The TRT found a lack of splice qualification requirements and provisions in the installation procedures to verify the operability of those circuits for which splices were being used.

   Accordingly, TUEC shall develop adequate installation/inspection procedures to assure that the wiring splicing materials are qualified for the appropriate service conditions, and that splices are not located adjacent to each other.

4. Selected cable terminations were found that did not agree with their locations on drawings. Examples are as follows:

Panel CP1-ECPRCB-14, Cable E0139880
Panel CP1-ECPRTC-16, Cable E0110040
Panel CP1-ECPRTC-16, Cable E0118262
Panel CP1-ECPRTC-27, Cable EG104796
Panel CPX-ECPRCV-01, Cable EG021856
Panel CP1-ECPRCB-02, Cable NK139853 (nonsafety)

Accordingly, TUEC shall reinspect all safety-related and associated terminations in the control room panels and in the termination cabinets in the cable spreading room to verify that their locations are accurately depicted on drawings. Should the results of this reinspection reveal an unacceptable level of nonconformance to drawings, the scope of this reinspection effort shall be expanded to include all safety-related and associated terminations at CPSES.

5. The TRT found cases where nonconformance reports (NCRs) concerning vendor-installed terminal lugs in GE motor control centers had been improperly closed. Examples are NCR Nos. E-84-01066 through NCR E-84-01076, inclusive.

   Accordingly, TUEC shall reevaluate and redisposition all NCRs related to vendor-installed terminal lugs in GE motor control centers.

b. Electrical Equipment Separation

The TRT reviewed the separation criteria between separate cables, trays and conduits in the main control room and cable spreading room in Unit 1, and the compatibility of the electrical erection specifications with regulatory requirements. The TRT reviewed documentation and inspected random samples of separation between safety-related cables, trays and conduits and between them and nonsafety-related cables, trays and conduits.

1. In numerous cases, safety-related cables within flexible conduits inside main control room panels did not meet minimum separation requirements. Examples are as follows:

   Panel CP1-EC-PRCB-02
   Panel CP1-EC-PRCB-07
   Panel CP1-EC-PRCP-06
   Panel CP1-EC-PRCB-08
   Panel CP1-EC-PRCB-09

   Accordingly, TUEC shall reinspect all panels at CPSES, in addition to those in the main control room for Unit 1, that contain redundant safety-related cables within conduits, or safety and non-safety related cables within conduits, and either correct each violation of the separation criteria, or

demonstrate by analysis the acceptability of the conduit as a barrier for each case where the minimum separation is not met.

2. In several cases, separate safety and nonsafety-related cables and safety and nonsafety-related cables within flexible conduits inside main control room panels did not meet minimum separation requirements (Table 1 identifies examples of these cases). No evidence was found that justified the lack of separation.

   Accordingly, TUEC shall reinspect all panels at CPSES, in addition to those in the main control room of Unit 1, and either correct each violation of the separation criteria concerning separate cables and cables within flexible conduits, or demonstrate by analysis the adequacy of the flexible conduit as a barrier.

3. The TRT found that the existing TUEC analysis substantiating the adequacy of the criteria for separation between conduits and cable trays had not been reviewed by the NRC staff.

   Accordingly, TUEC shall submit the analysis that substantiates the acceptability of the criteria stated in the electrical erection specifications governing the separation between independent conduits and cable trays.

4. The TRT found two minor violations of the separation criteria inside panels CP1-EC-PRCB-09 and CP1-EC-PRCB-03 concerning a barrier that had been removed and redundant field wiring not meeting minimum separation. The devices involved with the barrier were FI-2456A, PI-2453A, PI-2475A, and IT2450, associated with Train A; and FI-2457A, PI-2454A, PI-2476A, and IT-2451, associated with Train B. The field wiring was associated with devices HS-5423 of Train B and HS-5574, nonsafety-related.

   Accordingly, TUEC shall correct two minor violations of the separation criteria inside panels CP1-EC-PRCB-09 and CP1-EC-PRCP-03 concerning a barrier that had been removed and redundant field wiring not meeting minimum separation.

Table 1

Examples of Cases of Safety or Nonsafety-Related Cables

In Contact With Other Safety-Related Cables Within Conduits in Control Room Panels

1. Control Panel CP1-EC-PRCB-02 - Containment Spray System

Cable No.	Train	Related Instrument
EG139373	B (green)	Undetermined
E0139010	A (orange)	Undetermined

2. Control Panel CP1-EC-PRCB-07 - Reactor Control System

Cable No.	Train	Related Instrument
EG139383	B (green)	Reactor manual trip switch
E0139311	A (orange)	Undetermined

3. Control Panel CP1-EC-PRCP-06 - Chemical & Volume Control System

Cable No.	Train	Related Instrument
EG139335	B (green)	LCV-112C
E0139301	A (orange)	Undetermined

4. Control Panel CP1-EC-PRCB-09 - Auxiliary Feedwater Control System

Cable No.	Train	Related Instrument
E0139753	A (orange)	FK-2453A
E0139754	A (orange)	FK-2453B
E0139756	B (green)	FK-2454A
EG139288	B (green)	FK-2454B

c. Electrical Conduit Supports

The TRT examined the nonsafety-related conduit support installation in selected seismic Category I areas of the plant. The support installation for non-safety related conduits less than or equal to 2 inches was inconsistent with seismic requirements and no evidence could be found that substantiated the adequacy of the installation for nonsafety-related conduit of any size. According to Regulatory Guide 1.29 and FSAR Section 3.7B.2.8, the seismic Category II and nonseismic items should be designed in such a way that their failure would not adversely affect the function of safety-related components or cause injury to plant personnel.

Accordingly, TUEC shall propose a program that assures the adequacy of the seismic support system installation for nonsafety-related conduit in all seismic Category I areas of the plant as follows:

1. Provide the results of seismic analysis which demonstrate that all nonsafety-related conduits and their support systems, satisfy the provisions of Regulatory Guide 1.29 and FSAR Section 3.7B.2.8.

2. Verify that nonsafety-related conduits less than or equal to 2 inches in diameter, not installed in accordance with the requirements of Regulatory Guide 1.29, satisfy applicable design requirements.

d. Electrical QC Inspector Training/Qualifications

The TRT examined electrical QC inspector training and certification files, and requirements for personnel testing, on-the-job training, and recertification. The TRT also interviewed selected electrical QA/QC personnel.

1. The TRT found a lack of supportive documentation regarding personnel qualifications in the training and certification files, as required by procedures and regulatory requirements. Also, the TRT found a lack of documentation for assuring that the requirements for electrical QC inspector recertification were being met. Specific examples are:

   - One case of no documentation of a high school diploma or General Equivalency Diploma.

- One case of no documentation to waive the remaining 2 months of the required 1 year experience.

- One case where a QC technician had not passed the required color vision examination administered by a professional eye specialist. A makeup test using colored pencils was administered by a QC supervisor, was passed, and then a waiver was given.

- Two cases where the experience requirements to become a Level 1 technician were only marginally met.

- One case of no documentation in the training and certification files substantiating that the person met the experience requirements.

Accordingly, TUEC shall review all the electrical QC inspector training, qualification, certification and recertification files against the project requirements and provide the information in such a form that each requirement is clearly shown to have been met by each inspector. If an inspector is found to not meet the training, qualification, certification, or recertification requirements, TUEC shall then review the records to determine the adequacy of inspections made by the unqualified individuals and provide a statement on the impact of the deficiencies noted on the safety of the project.

2. The TRT found a lack of guidelines and procedural requirements for the testing and certifying of electrical QC inspectors. Specifically, it was found that:

   - No time limit or additional training requirements existed between a failed test and retest.

   - No controls existed to assure that the same test would not be given if an individual previously failed that test.

   - No consistency existed in test scoring.

   - No guidelines or procedures were available to control the disqualification of questions from the test.

   - No program was available for establishing new tests (except when procedures changed). The same tests had been utilized for the last 2 years.

   Accordingly, TUEC shall develop a testing program for electrical QC inspectors which provides adequate administrative guidelines, procedural requirements and test flexibility to assure that suitable proficiency is achieved and maintained.

The deficiencies identified with the electrical QC inspections have generic implications to other construction disciplines. The implications of these findings will be further assessed as part of the overall programmatic review of QC inspector training and qualification and the results of this review will be reported under the QA/QC category on "Training and Qualification."

II. Civil/Structural Area

a. Unable to Justify Reinforcing Steel Omitted in the Reactor Cavity

The TRT investigated a documented occurrence in which reinforcing steel was omitted from a Unit 1 reactor cavity concrete placement between the 812-foot and 819-foot ½-inch elevations. This reinforcement was installed and inspected according to drawing 2323-S1-0572, Revision 2. However, after the concrete was placed, Revision 3 to the drawing was issued showing a substantial increase in reinforcing steel over that which was installed. Gibbs & Hill Engineering was informed of the omission by Brown & Root Nonconformance Report CP-77-6. Gibbs & Hill Engineering replied that the omission in no way impaired the structural integrity of the structure. Nevertheless, the additional reinforcing steel was added as a precaution against cracking which might occur in the vicinity of the neutron detector slots should a loss of coolant accident (LOCA) occur. A portion of the omitted reinforcing steel was also placed in the next concrete lift above the 819-foot ½-inch level. This was done to partially compensate for the reinforcing steel omitted in the previous concrete lift and to minimize the overall area potentially subject to cracking.

The TRT requested documentation indicating that an analysis was performed supporting the Gibbs & Hill conclusion. The TRT was subsequently informed that an analysis had not been performed. Therefore, the TRT cannot determine the safety significance of this issue until an analysis is performed verifying the adequacy of the reinforcing steel as installed.

Accordingly, TUEC shall provide an analysis of the as-built condition of the Unit 1 reactor cavity that verifies the adequacy of the reinforcing steel between the 812-foot and 819-foot ½-inch elevations. The analysis shall consider all required load combinations.

b. Falsification of Concrete Compression Strength Test Results

The TRT investigated allegations that concrete strength tests were falsified. The TRT reviewed an NRC Region IV investigation (IE Report No. 50-445/79-09; 50-446/79-09) of this matter that included

interviews with fifteen individuals. Of these, only the alleger and one other individual stated they thought that falsification occurred, but they did not know when or by whom. The TRT also reviewed slump and air entrainment test results of concrete placed during the period the alleger was employed (January 1976 to February 1977) and did not find any apparent variation in the uniformity of the parameters for concrete placed during this period. Although the uniformity of the concrete placed appears to minimize the likelihood that low concrete strengths were obtained, other allegations were raised concerning the falsification of records associated with slump and air content tests. The Region IV staff addressed these allegations by assuming that concrete strength test results were adequate. Furthermore, a number of other allegations dealing with concrete placement problems (such as deficient aggregate grading and concrete in the mixer too long) were also resolved by assuming that concrete strength test results were adequate. The TRT agrees with Region IV that, while the preponderance of evidence suggests that falsification of results did not take place, the matter cannot be resolved completely on the basis of concrete strength test results, especially if there is any doubt about whether they may have been falsified. Due to the importance of the concrete strength test results, the TRT believes that additional action by TUEC is necessary to provide confirmatory evidence that the reported concrete strength test results are indeed representative of the strength of the concrete installed in the Category I concrete structures.

Accordingly, TUEC shall determine areas where safety-related concrete was placed between January 1976 and February 1977, and provide a program to assure acceptable concrete strength. The program shall include tests such as the use of random Schmidt hammer tests on the concrete in areas where safety is critical. The program shall include a comparison of the results with the results of tests performed on concrete of the same design strength in areas where the strength of the concrete is not questioned, to determine if any significant variance in strength occurs. TUEC shall submit the program for performing these tests to the NRC for review and approval prior to performing the tests.

c. Maintenance of Air Gap Between Concrete Structures

The TRT investigated the requirements to maintain an air gap between concrete structures. Based on the review of available inspection reports and related documents, on field observations, and on discussions with TUEC engineers, the TRT cannot determine whether an adequate air gap has been provided between concrete structures. Field investigations by B&R QC inspectors indicated unsatisfactory conditions due to the presence of debris in the air

gap, such as wood wedges, rocks, clumps of concrete and rotofoam. The dispositior of the NCR relating to this matter states that the "field investigation reveals that most of the material has been removed." However, the TRT cannot determine from this report (NCR C-83-01067) the extent and location of the debris remaining between the structures.

Based on discussions with TUEC engineers, it is the TRT's understanding that field investigations were made but that no permanent records were maintained. In addition, it is not apparent that the permanent installation of elastic joint filler material ("rotofoam") between the Safeguards Building and the Reactor Building, and below grade for the other concrete structures, is consistent with the seismic analysis assumptions and dynamic models used to analyze the buildings, as these analyses are delineated in the Final Safety Analysis Report (FSAR). The TRT, therefore, concludes that TUEC has not adequately demonstrated compliance with FSAR Sections 3.4.1.1.1, 3.8.4.5.1, and 3.7.B.2.8, which require separation of Seismic Category I buildings to prevent seismic interaction during an earthquake.

Accordingly, TUEC shall:

1. Perform an inspection of the as-built condition to confirm that adequate separation for all seismic category I structures has been provided.

2. Provide the results of analyses which demonstrate that the presence of rotofoam and other debris between all concrete structures (as determined by inspections of the as-built conditions) does not result in any significant increase in seismic response or alter the dynamic response characteristics of the Category I structures, components and piping when compared with the results of the original analyses.

d. Seismic Design of Control Room Ceiling Elements

The TRT investigated the seismic design of the ceiling elements installed in the control room. The following matrix designates those ceiling elements present in the control room and their seismic category designation:

1.	Heating, Ventilating and Air Conditioning	- Seismic Category I
2.	Safety-Related Conduits	- Seismic Category I
3.	Nonsafety-Related Conduits	- Seismic Category II
4.	Lighting Fixtures	- Seismic Category II
5.	Sloping Suspended Drywall Ceiling	- Non-Seismic
6.	Acoustical Suspended Ceiling	- Non-Seismic
7.	Lowered Suspended Ceiling	- Non-Seismic

According to Regulatory Guide 1.29 and FSAR Section 3.7B.2.8, the seismic Category II and nonseismic items should be designed in such a way that their failure would not adversely affect the functions of safety-related components or cause injury to operators.

For the nonseismic items (other than the sloping suspended drywall ceiling), and for nonsafety-related conduits whose diameter is 2 inches or less, the TRT could find no evidence that the possible effects of a failure of these items had been considered. In addition, the TRT determined that calculations for seismic Category II components (e.g., lighting fixtures) and the calculations for the sloping suspended drywall ceiling did not adequately reflect the rotational interaction with the nonseismic items, nor were the fundamental frequencies of the supported masses determined to assess the influence of the seismic response spectrum at the control room ceiling elevation would have on the seismic response of the ceiling elements.

Accordingly, TUEC shall provide:

1. The results of seismic analysis which demonstrate that the nonseismic items in the control room (other than the sloping suspended drywall ceiling) satisfy the provisions of Regulatory Guide 1.29 and FSAR Section 3.7B.2.8.

2. An evaluation of seismic design adequacy of support systems for the lighting fixtures (seismic Category II) and the suspended drywall ceiling (nonseismic item with modification) which accounts for pertinent floor response characteristics of the systems.

3. Verification that those items in the control room ceiling not installed in accordance with the requirements of Regulatory Guide 1.29 satisfy applicable design requirements.

4. The results of an analysis that justify the adequacy of the nonsafety-related conduit support system in the control room for conduit whose diameter is 2 inches or less.

5. The results of an analysis which demonstrate that the foregoing problems are not applicable to other Category II and nonseismic structures, systems and components elsewhere in the plant.

e. Unauthorized Cutting of Rebar in the Fuel Handling Building

The TRT investigated an alleged instance of unauthorized cutting of rebar associated with the installation of the trolley process aisle rails in the Fuel Handling Building. The claim is that during installation of 22 metal plates in January 1983, a core drill was used to drill about 10 holes approximately 9 inches deep. The TRT reviewed the reinforcement drawings for the Fuel Handling Building and determined that there were three layers of reinforcing steel in the top reinforcement layer of the slab. This reinforcement layer consisted of a No. 18 bar running in the east-west direction in the first and third layers, and a No. 11 bar running in the north-south direction on the second layer. The review also revealed that the layout of the reinforcement and the trolley rails was such that the east-west reinforcement would interfere with the drilling of holes along only one rail location. However, if 9-inch holes were drilled, both the first and third layers of No. 18 reinforcement would be cut. Design Change Authorization No. 7041 was written for authorization to cut the uppermost No. 18 bar at only one rail location, but did not reference authorization to cut the lower No. 18 bar. DCA-7041 also stated that the expansion bolts and base plates may be moved in the east-west direction to avoid interference with reinforcement running in the north-south direction. The information, described in DCA-7041, was substantiated by Gibbs & Hill calculations. If the ten holes were actually drilled 9 inches deep, then the allegation that the reinforcement was cut without proper authorization would be valid.

Accordingly, TUEC shall provide:

1. Information to demonstrate that only the No. 18 reinforcing steel in the first layer was cut, or

2. Design calculations to demonstrate that structural integrity is maintained if the No. 18 reinforcing steel on both the first and third layers was cut.

III. Test Programs Area

a. Hot Functional Testing (HFT)

The TRT reviewed a sample of the completed data packages for HFT preoperational test procedures, pertinent startup administrative procedures, NRC inspection reports, and the preoperational test index and its schedule. The TRT also inspected test deficiency reports

(TDRs) that were generated as a result of test deficiencies found prior to and during HFT.

1. Chapter 14 of the FSAR and Regulatory Guide 1.68 provide requirements for the conduct of preoperational testing. In reviewing test data packages, the TRT found that certain test objectives were not met. It appears that the Joint Test Group approved incomplete data packages for at least three preoperational hot functinal tests. These were:

Test Procedure	Deficiency
1CP-PT-02-12, "Bus Voltage and Load Survey"	Because acceptable voltages could not be achieved with the specified transformer taps, they were changed. A subsequent engineering evaluation required returning to the original taps, but no retest was performed.
1CP-PT-34-05, "Steam Generator Narrow Range Level Verification"	Level detectors 1-LT-517, 518 and 529 were replaced with temporary equipment of a design that was different from that which was to be eventually installed
1CP-PT-55-05 "Pressurizer Level Control"	Level detector 1-LT-461 appeared to be out of calibration during the test and was replaced after the test. The retest approved by the JTG was a cold calibration rather than a test consistent with the original test objective, which was to obtain satisfactory data under hot conditions.

Accordingly, TUEC shall review all complete preoperational test data packages to ensure there are no other instances where test objectives were not met, or prerequisite conditions were not satisfied. The three items identified by the TRT shall be included, along with appropriate justification, in the test deferral packages presented to the NRC.

2. The TRT noted during a review of HFT completed test data that the JTG did not approve the data until after cooldown from the test. The tests are not considered complete until this approval is obtained. In order to complete the proposed post-fueling, deferred preoperational HFT, the JTG, or a similarly qualified group, must approve the data prior to proceeding to initial criticality. The TRT did not find any document providing assurance that TUEC is committed to do this.

   Accordingly, TUEC shall commit to having a JTG, or similarly qualified group, review and approve all post-fueling preoperational test results prior to declaring the system operable in accordance with the technical specifications.

3. The TRT pointed out that in order to conduct preoperational tests at the necessary temperatures and pressures after fuel load, certain limiting conditions of the proposed technical specifications cannot be met, e.g., all snubbers will not be operable since some will not have been tested.

   Accordingly, TUEC shall evaluate the required plant conditions for the deferred preoperational tests against limiting conditions in the proposed technical specifications and obtain NRC approval where deviations from the technical specifications are necessary.

4. Data for the thermal expansion tests (which have not yet been approved by the JTG) did not provide for traceability between the calibration of the measuring instruments and the monitored locations, as required by Startup Administrative Procedure-7. The information was separately available in a personal log held by Engineering.

   Accordingly, TUEC shall incorporate the information necessary to provide traceability between thermal expansion test monitoring locations and measuring instruments. TUEC shall also establish administrative controls to assure appropriate test and measuring equipment traceability during future testing.

b. Containment Intergrated Leak Rate Testing (CILRT)

The TRT reviewed the data package for the CILRT performed on Unit 1, and discussed the conduct of the test with TUEC and NRC personnel who participated in or witnessed it.

Apparently after repairing leaks found during the first two attempts, the third attempt at a CILRT was successful. It was successfully completed after three electrical penetrations were isolated because the leakage through them could not be stopped. Though the leaks were subsequently repaired and individually tested with satisfactory results, NRC approval was not obtained to perform the CILRT with these penetrations isolated. In addition, leak rate calculations were performed using ANSI/ANS 56.8, which is neither endorsed by the NRC nor in accordance with FSAR commitments.

Accordingly, TUEC shall identify to NRC any other differences in the conduct of the CILRT as a result of using ANSI/ANS 56.8 rather than ANSI N45.4-1972. Additionally, TUEC shall identify to NRC all other deviations from FSAR commitments.

c. Prerequisite Testing

The TRT reviewed FSAR commitments, startup administrative procedures, prerequisite test records, craft personnel qualification records, and discussed them with startup and craft management personnel. The TRT also observed test support craft personnel at work and interviewed some of them to gain familiarity with their attitudes and capabilities.

The review of test records revealed that craft personnel were signing to verify initial conditions for tests in violation of startup Administrative Procedure-21, entitled: "Conduct of Testing" (CP-SAP-21). This procedure requires this function to be performed by System Test Engineers (STE). Startup management had issued a memorandum improperly authorizing craft personnel to perform these verifications on selected tests.

Accordingly, TUEC shall rescind the startup memorandum (STM-83084), which was issued in conflict with CP-SAP-21, and ensure that no other memoranda were issued which are in conflict with approved procedures.

d. Preoperational Testing

The TRT assessed the preoperational test program by reviewing administrative procedures, interviewing startup personnel, and examining test records, schedules, system assignments, subsystem definition packages, and the master data base.

Problems found with test data are addressed in section III.a of this enclosure. The TRT also found that STEs were not being provided with current design information on a routine, controlled basis, and had to update their own material when they considered it appropriate.

Accordingly, TUEC shall establish measures to provide greater assurance that STEs and other responsible personnel are provided with current controlled design documents and change notices.

Attachment 4

Docket Nos.: 50-445
and 50-446

OCT 5 1984

Texas Utilities Electric Company
Attn: M. D. Spence, President, TUGCO
Skyway Tower
400 North Olive Street
Lock Box 81
Dallas, Texas 75201

Dear Mr. Spence:

Subject: September 18, 1984 Letter, D. G. Eisenhut to M. D. Spence,
Re: Comanche Peak Review

During our meeting on September 18, 1984 at Bethesda, Maryland, we discussed the technical issues regarding Comanche Peak which the NRC Technical Review Team identified as having potential safety implications and thus requiring additional information. The subject letter listing these items and the information that we requested were provided to you during that meeting.

We have since discovered some typographical errors in the Enclosure to the September 18, 1984 letter and provided Mr. John Merritt of your staff with a marked-up copy of that letter on September 21, 1984. Enclosed for your information is an errata to the letter.

Sincerely,

Original signed by
Darrell G. Eisenhut

Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc w/enclosure:
See next page

Errata
To Enclosure 1 to September 18, 1984 Letter,
D. G. Eisenhut to M. D. Spence

1. Page 2, line 1,

   Panel CP1-ECPRCB-14
   should be
   Panel CP1-ECPRCB-04

2. Page 2, 8th line from bottom of page

   Panel CP1-EC-PRCP-06
   should be
   Panel CP1-EC-PRCB-06

3. Page 4, item 3

   Control Panel CP1-EC-PRCP-06
   should be
   Control Panel CP1-EC-PRCB-06

4. Page 9, 3rd line from bottom of first full paragraph

   Sections 3.4.1.1.1
   should be
   Sections 3.8.1.1.1

5. Page 10, top of page, item 7

   Lowered Suspended Ceiling
   should be
   Louvered Suspended Ceiling

Mr. M. D. Spence
President
Texas Utilities Generating Company
400 N. Olive St., L.B. 81
Dallas, Texas 75201

cc: Nicholas S. Reynolds, Esq.
Bishop, Liberman, Cook,
Purcell & Reynolds
1200 Seventeenth Street, N. W.
Washington, D. C. 20036

Robert A. Wooldridge, Esq.
Worsham, Forsythe, Sampels &
Wooldridge
2001 Bryan Tower, Suite 2500
Dallas, Texas 75201

Mr. Homer C. Schmidt
Manager - Nuclear Services
Texas Utilities Generating Company
Skyway Tower
400 North Olive Street
L. B. 81
Dallas, Texas 75201

Mr. H. R. Rock
Gibbs and Hill, Inc.
393 Seventh Avenue
New York, New York 10001

Mr. A. T. Parker
Westinghouse Electric Corporation
P. O. Box 355
Pittsburgh, Pennsylvania 15230

Renea Hicks, Esq.
Assistant Attorney General
Environmental Protection Division
P. O. Box 12548, Capitol Station
Austin, Texas 78711

Mrs. Juanita Ellis, President
Citizens Association for Sound
Energy
1426 South Polk
Dallas, Texas 75224

Ms. Nancy H. Williams
CYGNA
101 California Street
San Francisco, California 94111

Mr. James E. Cummins
Resident Inspector/Comanche Peak
Nuclear Power Station
c/o U. S. Nuclear Regulatory
Commission
P. O. Box 38
Glen Rose, Texas 76043

Mr. John T. Collins
U. S. NRC, Region IV
611 Ryan Plaza Drive
Suite 1000
Arlington, Texas 76011

Mr. Lanny Alan Sinkin
114 W. 7th, Suite 220
Austin, Texas 78701

B. R. Clements
Vice President Nuclear
Texas Utilities Generating Company
Skyway Tower
400 North Olive Street
L. B. 81
Dallas, Texas 75201

William A. Burchette, Esq.
1200 New Hampshire Avenue, N. W.
Suite 420
Washington, D. C. 20036

Ms. Billie Pirner Garde
Citizens Clinic Director
Government Accountability Project
1901 Que Street, N. W.
Washington, D. C. 20009

David R. Pigott, Esq.
Orrick, Herrington & Sutcliffe
600 Montgomery Street
San Francisco, California 94111

Anthony Z. Roisman, Esq.
Trial Lawyers for Public Justice
2000 P. Street, N. W.
Suite 611
Washington, D. C. 20036

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Supplement No. 7

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5. DATE REPORT COMPLETED
MONTH: January YEAR: 1985

6. AUTHOR(S)

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Docket Nos. 50-445 and 50-446

14. ABSTRACT (200 words or less)

Supplement No. 7 to the Safety Evaluation Report for the Texas Utilities Generating Company application for a license to operate the Comanche Peak Steam Electric Station located in Somervell County, Texas has been jointly prepared by the Office of Nuclear Reactor Regulation and the Technical Review Team of the U. S. Nuclear Regulatory Commission. This Supplement provides the results of the staff's evaluation and resolution of approximately 80 technical concerns and allegations in the areas of Electrical/Instrumentation and Test Program regarding construction practices at the Comanche Peak facility.

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