6366

RELATED CORRESPONDENCE

WORSHAM, FORSYTHE, SAMPELS & WOOLDRIDGE

THIRTY-TWO HUNDRED 2001 BRYAN TOWER
DALLAS, TEXAS 75201

TELEPHONE (214) 979-3000

May 19, 1988

Peter B. Bloch, Esquire
Chairman
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Kenneth A. McCollom
Administrative Judge
1107 West Knapp
Stillwater, Oklahoma 74075

Dr. Walter H. Jordan
Administrative Judge
881 West Outer Drive
Oak Ridge, Tennessee 37830

Elizabeth B. Johnson
Oak Ridge National Laboratory
P. O. Box X, Building 3500
Oak Ridge, Tennessee 37830

Re: Texas Utilities Electric Company, et al
(Comanche Peak Steam Electric Station,
Units 1 & 2); Docket Nos. 50-445 and 50-446 -OL

Dear Administrative Judges:

We recently received a copy of a letter from Anthony Z. Roisman to the Board dated May 6, 1988, enclosing certain reports recently produced in the ongoing state court litigation involving Comanche Peak. In reviewing his letter, we noted Mr. Roisman's statement that he understood that the documents listed in his letter "were delivered to the Applicants some time ago." We would like to advise the Board that the documents referred to by Mr. Roisman consist of reports produced by parties opposing TU Electric in the state court litigation and were received by TU Electric May 2, 1988, earlier in the same week of Mr. Roisman's letter. They are presently under review and until that review is complete, TU Electric can express no opinion on the possible relevance of those documents to the ongoing licensing proceedings. However, in reviewing Mr. Roisman's list of reports, we noted that the reports prepared for TU Electric were missing. For the sake of completeness, we have enclosed copies of those reports with this letter. These reports are not being submitted as evidence in the ongoing licensing proceedings.

Respectfully submitted,

Robert A. Wooldridge

RAW/klw
Enclosures
cc: Service List

D503

No. 86-6809-A

TEXAS UTILITIES ELECTRIC COMPANY Plaintiff, v. TEX-LA ELECTRIC COOPERATIVE OF TEXAS, INC., AND BRAZOS ELECTRIC POWER COOPERATIVE, INC. Defendants.	§	IN THE DISTRICT COURT OF DALLAS COUNTY, TEXAS 14th JUDICIAL DISTRICT

REPORTS OF TU ELECTRIC'S DESIGNATED EXPERT WITNESSES

TO THE HONORABLE COURT:

In accordance with the Court's scheduling order, Plaintiff and Cross-Defendants ("TU Electric") file the attached reports of designated persons who may be called upon to render opinions and give testimony as expert witnesses during the trial of this case.

Attachment "A" contains reports of persons who are not present or former employees of TU Electric; attachment "B" contains the reports of persons who are now or have been employees of TU Electric. With respect to all reports, the terms "Texas Utilities", "TU Electric", and "TU" refer to Texas Utilities Electric Company or its predecessor, affiliated or related entities, including Cross-Defendants, as appropriate.

For each and all of the reasons stated in TU Electric's designation filing of December 1, 1987, TU Electric further

reserves the right to offer opinions expressed by expert witnesses during their oral depositions and to make future designations of persons who may be called to give direct or rebuttal testimony as expert witnesses at trial.

JACKSON, WALKER, WINSTEAD
CANTWELL & MILLER
6000 InterFirst Plaza
901 Main Street
Dallas, Texas 75202
(214)953-6000

H. Dudley Chambers (#04072000)
T. Michael Wilson (#21724000)
John B. Kyle (#11783000)
Mary Emma Karam (#00830200)

ACKELS, ACKELS & ACKELS
404 Landmark Center
1801 North Lamar
Dallas, Texas 75202
(214) 748-2468

Lawrence E. Ackels, Jr.
State Bar No. 00830100
Henry J. Ackels
State Bar No. 00829950
Joseph E. Ackels
State Bar No. 00829980

HUNTON & WILLIAMS
One Hannover Square
Suite 1400
Raleigh, North Carolina 27602
(919) 899-3033

Edgar M. Roach, Jr. (N.C. #6360)

ATTORNEYS FOR TU ELECTRIC

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the above and foregoing Reports of TU Electric's Designated Expert Witnesses was forwarded to Defendants' local counsel of record via hand-delivery and all other counsel of record via Federal Express on this the 2nd day of May, 1988.

T. Michael Wilson

2505i

ATTACHMENT "A"

FRANCIS J. ANDREWS, JR.
AND PATRICK A. NEVINS

Either or both Mr. Francis J. Andrews, Jr., a Certified Public Accountant and a Principal with the management consulting firm of Cresap, a Towers Perrin company, located at 245 Park Avenue, New York City, New York 10167, or Mr. Patrick A. Nevins, also a Principal with Cresap and a Registered Professional Engineer, located at 1100 Superior Avenue, Cleveland, Ohio 44114, may testify about the increases in the cost of the Comanche Peak Steam Electric Station (Comanche Peak or CPSES) since the June 1977 cost estimate. The testimony of Mr. Andrews or Mr. Nevins will focus on the reasons for the difference between the June 1977 and November 1986 estimates of the cost of Comanche Peak, although they also may offer testimony about the cost increases identified in the March 1988 Comanche Peak estimate. Their analysis is on-going (particularly with respect to the 1988 estimate) and both the overall and specific conclusions stated herein are subject to revision and supplementation. Mr. Andrews and Mr. Nevins also may testify on matters about which they may be asked to give opinions in any deposition in this proceeding.

With regard to the reasons for the difference between the June 1977 and November 1986 cost estimates, Mr. Andrews or Mr. Nevins, or both, would offer the following overall conclusion based on the specific opinions and facts set out below:

* Excluding the allowance for funds used during construction (AFUDC) and after the effects of inflation are taken into account, changes in regulation, licensing requirements, and the regulatory and licensing environment caused the most significant portion of the cost increase between the 1977 and 1986 Comanche Peak cost estimates. To a lesser extent, the cost increase also was caused by factors generally characterized as changes in business and economic circumstances, evolution of plant design, expenses associated with operating personnel and activities prior to commercial operation, plant betterment, and maintenance of the project schedule. Finally, a smaller portion of the cost increase is made up of (1) evolution and refinement of the project estimate as engineering and construction progressed and (2) other factors not readily characterized into one of the previously mentioned categories.

The following opinions, based on the facts indicated, also would be offered by Mr. Andrews or Mr. Nevins, or both:

* The effects of inflation account for a significant portion of the cost variance between the 1977 and 1986 Comanche Peak cost estimates.

- Changes in regulation, licensing requirements, and the regulatory and licensing environment had the most significant impact on the amount of the cost increase attributable to the effects of inflation

* After the effects of inflation are taken into account, approximately 60% of the cost increases were caused by regulatory or licensing requirements that, subsequent to the June 1977 estimate, were issued, revised, interpreted or reinterpreted and changes in the regulatory and licensing environment. Examples include:

  - Implementation of Three Mile Island requirements
  - Implementation of expanded QA/QC requirements
  - Response to Construction Appraisal Team (CAT) findings and proceedings before the ASLB
  - Implementation of ASME Subsection NF and process pipe and hanger design analysis
  - Implementation of expanded fire protection requirements

* Approximately 10% of the cost increase resulted from completion of the detail design, and from alterations in baseline scope of work activities that were caused by changes in design techniques, changes in construction methods and changes required to accommodate previously unforeseeable constraints. Examples include:

- Additional labor, materials and engineering were required as design details evolved for systems and commodities such as coatings, equipment (which required blockouts), instruments and control devices, cable and raceway, HVAC ductwork, lighting, and gas bulk storage

* Unanticipated changes in financial, labor and material markets and other economic factors caused about 6% increase in the cost of CPSES. Examples include:

  - Payroll tax rate increases in excess of inflationary increases
  - Vendor charge rate increases in excess of inflationary increases
  - Increased welder training due to unavailability of qualified welders

* Additional costs, amounting to approximately 6% of the increase, resulted from changes initiated to improve plant reliability, operability and maintainability. Examples include:

  - Retubing the main condensers
  - Adding a waste water management system

* The remainder of the cost increase between the June 1977 and November 1986 estimates was caused by a variety of factors, including:

  - The recorded cost of CPSES increased as operating costs were capitalized in accordance with accounting requirements that operating expenses on a new plant be capitalized until the plant is in commercial operation. Examples include the costs of operations staff (at the 1977 estimate manpower level), insurance premiums and ad-valorem taxes

  - Unanticipated costs resulted from efforts to enhance or maintain existing project schedules. For example, night shift premiums and other costs were incurred to preserve the scheduled turnover of systems to startup for testing

  - Additional costs were associated with 1977 baseline scope of work items that were either omitted from the 1977 estimate or were estimated too low. (These additional costs, however, did not exceed the amount provided for contingencies in the June 1977 estimate). Examples include the omission of an estimate of labor and material costs for metal reflective insulation and for the turbine-generator stator cooling water system

- Other cost variances were specifically identified but did not fit in the above groupings

In March 1988, the estimated cost of Comanche Peak (without AFUDC) increased by $1.35 billion to $6.62 billion. With regard to that cost increase, Mr. Andrews or Mr. Nevins, or both, would offer the following conclusions:

* Engineering accounts for about 50% of the cost increase reflected in the March 1988 estimate. Construction activities and materials together represent more than 25% of the cost increase. The remainder of the cost increase relates to the operations, administration and support, and projects groups.

  - A significant portion of the cost variance relates to the implementation and completion of programs that had only recently commenced at the time the November 1986 estimate was prepared, as well as efforts that evolved from those programs
  - A portion of the variance also relates to the extension of the project schedule

In reaching their conclusions, Mr. Andrews and Mr. Nevins relied upon their background and experience, information obtained from project personnel, reviews of project documents, reviews of NRC regulations and documents, and the opinions of other experts who may testify on behalf of TU Electric.

Information was obtained from individuals involved in different facets of the project, including project management; construction general foremen, superintendents and supervisors; field and design engineering management and discipline engineers; operations managers; accounting, purchasing, warehouse, and security management personnel; cost estimators; QC inspection supervisors; labor, material and subcontract vendors; and engineering contractors.

Documents reviewed included project cost reports, invoices, project manhour and commodity quantity reports, personnel records, procurement records including purchase orders and contracts and their supplements, project estimates and supporting workpapers, engineering design drawings and estimate take-off sheets, engineering and construction progress reports, organization charts, staffing records, work sampling and other studies, pour and pull cards, construction procedures, NRC regulations, NRC prepared documents, documents submitted to the NRC, and project correspondence and memoranda.

1848u

WILLIAM E. AVERA
BRUCE H. FAIRCHILD

Dr. William E. Avera, a Chartered Financial Analyst, and Dr. Bruce H. Fairchild, a Certified Public Accountant, Principals in the consulting firm of FINCAP, Inc., located at 3907 Red River Street, Austin, Texas 78751, may testify as expert witnesses regarding certain of the damages alleged to have been suffered by Brazos Electric Power Cooperative, Inc. and Tex-La Electric Power Cooperative, Inc. (collectively, the co-owners). Drs. Avera and Fairchild also may testify on matters about which they may be asked to offer opinions in any deposition in this proceeding. But until the filing of the reports of the co-owners' damages experts and the discovery of the workpapers, calculations, assumptions, documents and data supporting those reports, the analysis by Drs. Avera and Fairchild of the co-owners' alleged damages cannot proceed.

12710

THOMAS J. FLAHERTY

Thomas J. Flaherty is a partner with Touche Ross & Company, located at 2001 Bryan Tower, Suite 2400, Dallas, Texas 75201-2170. Mr. Flaherty may testify regarding Brazos' and Tex-La's ("Joint Owners") entry into the Joint Ownership Agreement (JOA), the Joint Owners' exercise of rights under the JOA to participate in project decision making and to obtain information regarding Comanche Peak, TU Electric's provision to the Joint Owners of information and access to information regarding Comanche Peak and the Joint Owners' monitoring of Comanche Peak.

Mr. Flaherty's opinions, and the bases for those opinions are as follows:

1. TU Electric did not mislead or misinform Brazos or Tex-La about Comanche Peak prior to their execution of the JOA.

- TU Electric apprised Brazos and Tex-La of the project's status, as well as associated risks and uncertainty prior to execution of the JOA and provided to the Joint Owners and their consultants appropriate information access.

- The analyses and feasibility studies prepared by Joint Owner consultants acknowledged that project and industry uncertainty existed.

- The JOA was negotiated at arms length in a business-like fashion.

- To the extent the Joint Owners did not avail themselves of available facts and information, they did not perform a reasonable investigation.

- Ample information was available to the Joint Owners to apprise them of the risks and uncertainties of nuclear power.

2. TU has reasonably complied with the provisions of the JOA with respect to providing the Joint Owners information and access to information.

- The JOA provides for appropriate mechanisms for Joint Owner representation and involvement which compare favorably with other contemporaneous joint nuclear project agreements.

- The Owners Committee has met regularly since its inception and the Joint Owners have had an adequate opportunity to participate in these meetings and project oversight.

- TU has provided to the Joint Owners or their representatives adequate access to the plant, project personnel and project documents.

- Information on project status, progress, key events, problems and potential impacts was provided to the Joint Owners through the Owners Committee meetings, direct personal contact, status reports or public sources.

- Information in response to Joint Owner requests or questions at Owners' Committee meetings was provided through these meetings or through separate responses.

- The reports of Tex-La's consultant, Southern Engineering, confirm TU Electric's openness and cooperation in providing project information.

- TU's replies to Joint Owner requests for information have been responsive and generally provided in a timely manner.

3. TU Electric's compliance with the JOA's disclosure obligations did not relieve the Joint Owners of the responsibility to protect their interests through active project monitoring and analysis of available information. To the extent the Joint Owners did not fully appreciate the status of the project or react appropriately to developments it was due to their own failure to exercise an adequate amount of project monitoring and not to any failure of TU Electric to provide the Joint Owners information and access to information.

- Brazos did not perform any active project monitoring prior to 1985.

- The Joint Owners do not appear to have provided input regarding Owners Committee agenda items prior to 1984, to have taken advantage of opportunities to express their concerns, if any, or to make recommendations to the project manager.

- The Joint Owners do not appear to have actively pursued specific information regarding Comanche Peak through the Owners Committee meetings until after 1984.

- Prior to 1985, Brazos generally limited its information requests to the preparation of power supply and financing related documents for funding approval, and did so irregularly.

- Although properly furnished information and access to information regarding Comanche Peak developments by the project manager, Brazos, prior to 1985, did not take adequate advantage of information available from TU Electric or other sources.

- While Brazos was apprised of and acknowledged nuclear industry volatility and increased risk, it made minimal attempts to respond to or investigate such risks as an owner until after 1984.

Ongoing discovery and investigations may result in this report being supplemented or amended. Mr. Flaherty also may testify on matters about which he may be asked to give opinions in any deposition in this proceeding.

Mr. Flaherty's opinions are based upon his review of project documents and information produced during discovery, his discussions with representatives of TU Electric, his education, his training and experience as a management consultant and his study of other nuclear projects of electric utilities.

1307u

GARY FOUTS

Mr. Gary Fouts, Vice President of Challenge Consultants, P.O. Box 3734, Shawnee Mission, KS 66203 will testify on issues concerning Construction Management. Mr. Fouts' opinions and the bases for such opinions are as follows and in each of these areas in which Mr. Fouts will offer his opinion, he has found and will state that TU Electric (TU) has acted reasonably and in accordance with "Prudent Utility Practice" as defined in the Joint Ownership Agreement:

I. TU Construction Management Organization evolved adequately to meet the changing needs of Comanche Peak (CPSES or Project).

A. In the early to mid 1970's TU managed the contractors in an oversight manner consistent with the effort used at other nuclear construction sites.

1. TU Construction Management personnel initially assigned to the site were experienced in power plant construction and were trained and advised by consultants and the Architect/Engineer's Resident Engineer and his staff experienced in nuclear plant construction.

B. TU Construction Management's role properly increased in 1977 and evolved into full construction management over contractors.

1. Cost and schedule changes in the construction effort required a more active role.
2. The Office of Project General Manager was established on site.
3. Additional management staff were assigned to the site.
4. Contractors came under more intense scrutiny by TU.

C. TU Construction Management modified the Construction field organization management concept to manage the construction effectively as it progressed from phase to phase.

1. TU changed from a discipline management concept to an area management concept when bulk commodities were near completion.
2. TU changed from an area management concept to a building management concept to support systems completion and building turnovers.
3. Additional nuclear experienced construction managers from outside TU were brought in as the work required this expertise.

D. TU Construction Management managed the Construction activities during the Design Validation Phase in an effective manner.

II. Construction Management utilized reasonable and prudent management practices to control the construction effort.

A. TU and Brown & Root construction planning commenced in 1973 and continued throughout the project to assure that construction activities were completed efficiently.

B. Brown & Root identified the need for a craft hiring program in 1973 and developed a hiring and training program to meet Comanche Peak's staffing requirements.

C. TU required Brown & Root and Subcontractors to maintain work procedures to meet the project's requirements.

D. Brown & Root furnished experienced managers and craft supervisors, many with nuclear experience.

E. The Field Engineering group supported construction and evolved to meet changing construction needs.

1. Brown & Root furnished appropriately qualified field engineers, many with nuclear experience.

2. Field Engineering support was enhanced in 1978 by combining the Gibbs & Hill, TU and Brown & Root engineering groups into one group, Comanche Peak Project Engineers (CPPE).

3. Westinghouse and United Engineers personnel were added in 1981.

F. Construction identified certain work functions that could be performed by Subcontractors and assigned the management of these Subcontractors to its Subcontracts Department.

1. TU and Brown & Root Construction Management met with the Subcontracts Department and Subcontractors to coordinate their efforts with other Subcontractors. Brown & Root and TU Management also monitored Subcontractors' performance and made changes as appropriate.

III. Construction Management established adequate control programs to plan and execute the work and modified those programs as project needs changed.

A. TU and Brown & Root instituted construction scheduling methods that integrated the numerous construction activities and modified those methods as the project progressed.

1. TU and Brown & Root established a schedule variance monitoring program in 1974 and the schedule was updated monthly. Beginning in 1977 quantity monitoring occurred weekly.

2. Subcontractors established schedule monitoring programs to reflect their schedule status.

B. TU and Brown & Root instituted cost programs necessary to manage construction costs to account for labor, equipment and material costs.

C. TU and Brown & Root established a quantity tracking program early in the project and expanded the operation into the Production Control Group in 1978.

D. Brown & Root established crew sizes and journeymen-to-helper ratios to minimize labor costs.

E. TU and Brown & Root utilized craft monitoring programs to minimize labor costs.

1. TU initiated work sampling programs to monitor and control craft labor.

2. TU and Brown & Root initiated crew audits to help control craft labor.

3. TU and Brown & Root initiated foreman delay studies to control craft direct activities.

4. TU and Brown & Root controlled overtime usage by advance planning, review and approval of overtime activities and staffing levels.

5. TU and Brown & Root controlled craft work congestion by utilizing shift work whenever necessary.

F. TU and Brown & Root established production and productivity monitoring programs to measure the progress of the construction work and to monitor the rate of work by the crafts.

G. Brown & Root and TU established a backcharge program to identify, bill and collect costs, where appropriate, from vendors and subcontractors for work performed by TU and Brown & Root personnel on vendor or subcontractor items.

H. TU managed the development and administration of the Brown & Root construction contract to minimize construction costs.

I. TU Construction Management reviewed and approved nearly all Brown & Root purchases during 1973-1978 and thereafter was directly involved in the field purchasing activities.

J. TU and Brown & Root began using the Construction Hold Notice in April 1977 as a method to reduce rework, to minimize costs and to minimize Quality interface concerns.

K. TU and Brown & Root utilized internal and external organizations to audit various work activities and perform special studies.

1. The TU internal audit group conducted numerous operational and accounting audits of the construction activities of Brown & Root and others.
2. Brown & Root's home office personnel performed project audits of selected activities for compliance with procedures and programs.
3. TU used outside consultants for work sampling studies.
4. Independent organizations audited construction and startup/operations.
5. Consultants were utilized for specific assistance.

IV. Construction Management coordinated interfaces with Engineering, Quality Assurance/Quality Control, Startup/Operations, Procurement and Support Groups.

A. Construction Management interfaced with Engineering through written procedures, meetings, schedules, reports and lists of required information.

1. Construction Management established working level meetings with Engineering.

2. Schedules were developed to coordinate Engineering and Construction activities.

3. Summit Meetings were held at which TU's officers, contractors' officers and project level personnel discussed the status of the project.

4. Procedures were developed for coordinating Construction and Engineering activities.

5. The establishment of the Office of Project General Manager in 1977 brought Construction Management and Engineering Management into closer coordination.

B. Construction coordinated with Quality Assurance/Quality Control.

1. TU Construction and Quality Managers were members of the Quality Surveliance Committee formed early in the Project.

2. Brown & Root (Houston) formed the Quality Assurance Management Review Board in 1974 whose

members were Brown & Root officers and whose purpose was to overview the Quality Program.

3. Construction and Quality Managers and Supervisors attended progress, coordination and Summit meetings to maintain an awareness of the project's status and the needs of others.
4. TU and Brown & Root Construction and Quality developed procedures for their work which provided interface with the other organizations.
5. TU and Brown & Root Construction and Quality prepared reports which were distributed to the other organizations for information, statusing and on-going activities.
6. Brown & Root and TU Construction and Quality used several methods to make Quality Inspectors aware that hardware was ready for inspection.

C. Construction interfaced with Startup/Operation beginning as early as 1975 and continuing throughout the project life.

1. TU Construction and Startup Managers attended Monthly Progress Status Meetings beginning in 1975.
2. Startup participated in the development of the Project schedule.
3. TU Startup reviewed systems in January 1976 and established system boundaries for use by construction.

4. Construction and Startup developed procedures to control their interface.

5. Construction and Startup held meetings at appropriate intervals over the Project life.

6. Construction and Startup utilized a Completions group to assure that systems were ready for Startup.

D. Construction interfacing with Procurement commenced prior to the start of construction in 1974 and continued throughout the Project.

1. Construction developed required delivery dates for material and equipment and provided those dates to Engineering and Procurement for purchasing and expediting.

2. Construction and Procurement Management attended Monthly Progress, Summit and other meetings to coordinate their activities.

3. Construction and Procurement utilized schedules to coordinate their activities.

4. Procurement centralized the Expediting efforts at the site in 1978 to better serve the Project.

5. Procurement issued reports on material and equipment deliveries to enable Construction to plan accordingly.

V. Construction Completion and Startup was adequately managed and the startup testing and preoperational testing was performed in an adequate manner.

A. Construction Completion and Startup developed procedures to interface with each other.

B. Construction Completion coordinated closely with Startup through the Startup turnover schedule.

C. Construction Completion and Startup held meetings periodically to discuss systems/building completions and turnovers.

VI. Operations was involved in the Engineering, Construction and Startup activities of the plant and was prepared to support a fuel load by early 1985.

A. Operations interfaced with Engineering through the Operations Design Review Committee, schedules, meetings, reports and on-site personnel.

B. Operations interfaced with Construction through schedules, meetings, reports, and on-site personnel.

C. Operations interfaced with Startup through schedules, meetings, reports and on-site personnel.

Mr. Fouts also may testify on matters about which he may be asked to give opinions in any deposition in this proceeding. Moreover, ongoing discovery and investigations may result in this report being supplemented or amended.

In reaching these opinions, Mr. Fouts relied on his background, experience, training and his knowledge of CPSES and the nuclear industry and its regulations as well as on the following:

- Information received from current and former employees of TU and its contractors.
- Review of Project documents, including reports, correspondence, minutes of meetings, organization charts and business memoranda.

1825u

JOHN L. HANSEL

Mr. John L. Hansel, an officer with ERC International, Inc., located at 3211 Jermantown Road, Fairfax, Virginia 22030, may testify at trial regarding the quality of construction and the QA/QC program and its implementation at Comanche Peak Steam Electric Station (CPSES).

The opinions of Mr. Hansel that may be offered at trial are based on information received and assessments completed to date. Ongoing discovery and investigations may result in this report being supplemented or amended. With respect to each of the subject areas on which Mr. Hansel may offer an opinion, he has concluded and will state that TU Electric has acted reasonably and in accordance with "Prudent Utility Practice," as that term is defined in the Joint Ownership Agreement.

In addition to opinions regarding subject matters about which Mr. Hansel may be asked during his deposition, he may also offer the following opinions concerning the quality of construction and the QA/QC program and its implementation. In each case, reference to TU Electric means TU Electric or the appropriate contractor/subcontractor.

Quality of Construction

TU Electric managed the construction work in a manner that resulted in the installed equipment achieving a satisfactory level of conformance with design requirements. This conclusion is supported by the results of the Quality of Construction effort undertaken by CPRT and the Project organization. The results of the Quality of Construction effort compare favorably with other sampling programs with which Mr. Hansel is familiar. TU Electric's overall performance was consistent with the following criteria:

- -- design documentation provided the necessary requirements and acceptance criteria to craft personnel
- -- procedures for craft personnel provided sufficient direction for task performance
- -- the selection and training of craft personnel resulted in the accomplishment of work to acceptable standards
- -- procedures to assess the acceptability of craft work and identify deviations from requirements were provided to inspection personnel
- -- inspection personnel were selected and trained to inspect completed work to design requirements

Thus, TU Electric has reasonable assurance that the plant was constructed in accordance with prudent utility practice and will meet SAR requirements.

QA/QC Program and Its Implementation

The QA/QC program applied to the design and construction of CPSES satisfied the applicable requirements of 10 C.F.R. Part 50, Appendix B. Certain weaknesses that were identified by the CPRT and CAP are not inconsistent with the overall conclusion that 10 C.F.R. Part 50, Appendix B was satisfied. The specific weaknesses identified have been or are being appropriately addressed.

The following is an analysis of the 10 C.F.R. Part 50, Appendix B criteria against which a utility's QA/QC performance is measured:

CRITERION I

ORGANIZATION

TU Electric has continuously maintained an organization throughout the life of the project that satisfied the requirements of Criterion I. The satisfaction of Criterion I included TU Electric's extension of Criterion I requirements to others such as subcontractors for design and construction. The organization inclusive of subcontractors provided independence from cost and schedule and the authority and freedom to identify, recommend and verify implementation of solutions to quality problems. TU Electric selected personnel to develop, manage, and implement the quality program consistent with industry practices. TU Electric also selected subcontractors with nuclear power generation experience. Additionally, TU Electric utilized opportunities to observe QA organizations at other nuclear plants in order to improve its organization.

CRITERION II

QA PROGRAM

TU Electric developed and maintained a QA program that satisfied the requirements of Criterion II. There were certain isolated weaknesses regarding a subcontractor's QA program, addressed in more detail in Criterion VII, and the lack of formal reviews by management of the QA program.

Notwithstanding the lack of formal reviews by management, managers and corporate officers were aware of the status and adequacy of the QA program by virtue of their day to day involvement in that program. They utilized quality committees, documented management reviews and independent evaluations as well as internal audit reports and reports from independent consultants to monitor the QA program.

Formal procedures have been in effect since September 1985 requiring QA program assessments and reviews to focus management's attention on the QA program.

CRITERION III

DESIGN CONTROL

Although TU Electric has determined that the design control measures did not always meet current standards of acceptability, both the program and the implementation of the program generally met the requirements of Criterion III at the time the work was performed. The Corrective Action Program has ensured that the existing design control programs meet the current standards of acceptability.

CRITERION IV

PROCUREMENT DOCUMENT CONTROL

TU Electric's QA program provided measures to assure that applicable regulatory, design basis and other quality requirements were included in the documents for procurement of material, equipment, and services. These measures satisfied the requirements of Criterion IV and were satisfactorily implemented over the life of the project.

CRITERION V

INSTRUCTIONS, PROCEDURES AND DRAWINGS

TU Electric's QA program provided measures that assured that activities affecting quality were accomplished through written documented instructions, procedures and drawings that satisfied the requirements of Criterion V.

The implementation of these measures also satisfied the requirements of Criterion V. There were weaknesses in isolated areas. The effect of these weaknesses was limited as reflected by the results of the Quality of Construction effort undertaken by CPRT and the Project organization.

TU Electric has instituted programs and procedures to ensure that any problems with instructions, procedures, and drawings do not recur.

CRITERION VI

DOCUMENT CONTROL

TU Electric's QA program provided measures that satisfied the requirements of Criterion VI. Document control activities were delegated to Brown & Root, Gibbs & Hill, and Westinghouse and monitored by TU Electric. These measures were satisfactorily implemented.

CRITERION VII

CONTROL OF PURCHASED MATERIAL, EQUIPMENT AND SERVICES

TU Electric's QA program provided measures for the control of purchased material, equipment and services that satisfied the requirements of Criterion VII.

The implementation of these measures also satisfied the requirements of Criterion VII. There were weaknesses in implementation identified in connection with the work of one site subcontractor. For this subcontractor, TU Electric monitored its performance through audits and surveillance activity, and identified certain problems with the subcontractor.

The response by the subcontractor was inadequate. The subcontractor has been replaced and TU Electric is assessing its completed work to assure that it meets requirements. Additionally, TU Electric has implemented a more rigorous review process of subcontractors' performance through audits and surveillance activity.

CRITERION VIII

IDENTIFICATION AND CONTROL OF MATERIAL, PARTS AND COMPONENTS

TU Electric's QA program provided measures for the identification and control of materials, parts and components that satisfied the requirements of Criterion VIII. These measures were satisfactorily implemented over the life of the project.

CRITERION IX

CONTROL OF SPECIAL PROCESSES

TU Electric's QA program established measures for the control of special processes that satisfied the requirements of Criterion IX. These measures were satisfactorily implemented over the life of the project.

CRITERION X
INSPECTION

TU Electric's QA program provided measures for the inspection of activities affecting quality that satisfied the requirements of Criterion X. Although there were limited weaknesses, the implementation of these measures satisfied the requirements of Criterion X. These weaknesses had limited effect. This is reflected by the results of the Quality of Construction effort undertaken by CPRT and the Project organization. In addition, TU Electric has instituted a program to correct these weaknesses.

CRITERION XI
TEST CONTROL

TU Electric's QA program provided measures for test control that satisfied the requirements of Criterion XI. These measures were satisfactorily implemented over the life of the project.

CRITERION XII
CONTROL OF MEASURING AND TEST EQUIPMENT

TU Electric's QA program provided measures for the control of measuring and test equipment that satisfied the requirements of Criterion XII. These measures were satisfactorily implemented over the life of the project.

CRITERION XIII
HANDLING, STORAGE AND SHIPPING

TU Electric's QA program provided measures for the handling, storage and shipping of material and equipment that satisfied the requirements of Criterion XIII. These measures were satisfactorily implemented over the life of the project.

CRITERION XIV
INSPECTION, TEST, AND OPERATING STATUS

TU Electric's QA program provided measures to indicate the status of inspections and tests and the operating status of structures, systems and components that satisfied the requirements of Criterion XIV. These measures were satisfactorily implemented over the life of the project.

CRITERION XV
NONCONFORMING MATERIALS, PARTS, OR COMPONENTS

TU Electric's QA program provided measures to control nonconforming materials, parts or components that satisfied the requirements of Criterion XV. Although there were limited weaknesses, the implementation of these measures satisfied the requirements of Criterion XV. TU Electric has revised procedures to correct weaknesses noted and is assessing past records to assure that they meet requirements.

CRITERION XVI
CORRECTIVE ACTIONS

TU Electric's QA program provided measures for corrective action that satisfied the requirements of Criterion XVI. These measures were satisfactorily implemented over the life of the project.

CRITERION XVII
QUALITY ASSURANCE RECORDS

TU Electric's QA program provided measures for QA records that satisfied the requirements of Criterion XVII. These measures were satisfactorily implemented over the life of the project.

CRITERION XVIII
AUDITS

TU Electric's QA audit program provided measures for a comprehensive system of audits that satisfied the requirements of Criterion XVIII. The implementation of the QA audit program satisfied the requirements of Criterion XVIII.

There were isolated areas of weakness identified specifically with the nondelegated QA audit activities. TU Electric's audit program has been improved and all weaknesses corrected. In addition, TU Electric has instituted technical audits to evaluate the effectiveness of corrective actions.

1978 MAC Report

The May 17, 1978 Management Analysis Company (MAC) Report entitled "Management Quality Assurance Audit," which was conducted for Texas Utilities Generating Company, has been reviewed and the following opinions may be offered.

- The report is typical of the type of report performed as an independent QA/QC audit.
- The report included favorable observations, recommendations for improvement and findings capable of being corrected.
- The report did not identify a breakdown in the CPSES QA/QC program.

The opinions that may be offered are based on Mr. Hansel's background, experience and training as a professional engineer, his knowledge, experience and involvement at CPSES, and his familiarity with the nuclear industry and its regulation. Mr. Hansel is a Past President and Chairman of the Board of the American Society of Quality Control (ASQC) and a Founding Director of the American Quality Foundation.

The opinions that Mr. Hansel may present are also based upon the following:

- Results and Conclusions of the CPRT
- Information obtained from TU Electric and CPSES project personnel
- Reviews of QA program documents and contracts
- Results of assessments, evaluations and inspections performed at other nuclear power plants
- Reviews of TU Electric's audit and inspection reports
- Reviews of external source reports
- Reviews of contemporaneous requirements and guidelines
- Reviews of the work of other experts designated by TU Electric, including but not limited to, Walter Mikesell and Charles Huston.

1288u

HARRY HOLLINGSHAUS

Mr. Harry Hollingshaus is a Vice President and Manager of Engineering with Bechtel Western Power Company. His address is 50 Beale Street, San Francisco, California 94105, (415) 768-0788. Mr. Hollingshaus may testify at trial regarding the impact on the nuclear industry caused by changes in the regulatory environment during the period from 1973 to the present. He may also offer conclusions regarding the impact of these changes on selected areas of the Comanche Peak Steam Electric Station (CPSES) project. As part of his testimony, Mr. Hollingshaus may focus on a selected regulatory change affecting CPSES that caused in its implementation changes or modifications to other structures, systems, or components ("ripple effect"). In addition, Mr. Hollingshaus may testify on matters about which he may be asked to give opinions in any deposition in this proceeding.

Mr. Hollingshaus' opinions are based on his background, education, training as a professional engineer, and his nearly 30 years experience in the nuclear industry, including his direct involvement with the design and construction of over 24 nuclear power plants. Further, his opinions are based on information received from TU Electric (TU) and other project personnel, a review of certain project documentation, and his examination of the CPSES project.

The opinions of Mr. Hollingshaus that may be offered at trial are based on information reviewed and assessments completed to date. Ongoing discovery and investigations may result in this report being amended or supplemented.

Mr. Hollingshaus may offer an overall opinion that the uncertain and changing regulatory environment in the United States from 1973 to the present had a profound impact on those designing and constructing nuclear power plants during this period. Further, the increasingly prescriptive nature of changing regulations and changing regulatory interpretations, as well as increasingly stringent quality assurance requirements, resulted in more iterations in an inherently iterative design process. As a result, the ability of designers and constructors to complete large nuclear power plants was affected significantly.

In addition, Mr. Hollingshaus may offer the following specific opinions:

Regulatory Process Overview

In 1973, the nuclear regulatory process was limited to a relatively few safety guidelines. At about that time, regulation of the nuclear industry began to increase greatly, both through changes in regulations and through changes in the interpretations of existing regulations. These changes resulted in regulation becoming much more prescriptive.

The following is a list of a few of the most important changes in both regulations and the regulatory process:

- the change from the AEC to the NRC completely altered the nature of the regulatory process
- the changes from Safety Guides to Regulatory Guides and their increasing numbers
- the increase in quantity and detail required by the regulator in 1975 with Branch Technical Positions and Standard Review Plans
- the changes in regulation following the Three Mile Island accident in 1979
- increased quality assurance scrutiny
- the changes in fire protection regulation since the Browns Ferry fire in 1975 and the continued uncertainty regarding fire protection requirements through 1986.

Impact of Regulatory Evolution on Design and Construction

The design and construction of any large engineering project, particularly a nuclear power plant, is complex and iterative in nature. Throughout the 1970s and 1980s, the constant state of uncertainty in the nuclear regulatory process and the increasingly prescriptive nature of the regulations and their interpretations caused many features of nuclear plants to be redesigned and changed mid-course through the entire design process. Sometimes steel or concrete components already constructed or installed had to be modified or even removed or replaced.

- New regulations often took many months to interpret and sometimes required the development and implementation of new or advanced analytical techniques. The acceptance of these new techniques and methods often required many more months of

review by and negotiation with the NRC before acceptance. Some examples are Seismic Analysis, Fire Protection, and Pipe Support Design.

- The changing regulatory requirements often resulted in new and/or more complex systems, with increased quantities of commodities such as piping, steel, concrete, electrical raceway, and electrical cable.

- The increased quantities of commodities often had to be placed in structures whose dimensions were already determined. The designer was faced with designing more into this fixed space. Construction was sometimes already completed in the areas affected, forcing the constructor to deal with increased congestion and complexity resulting in a decrease in productivity.

- The increasingly prescriptive nature of regulation coupled with the escalation in quality assurance scrutiny severely limited the traditional use of engineering judgment and placed new emphasis on detailed engineering calculations and detailed documentation. As a result, there was a dramatic increase in the engineering manhours necessary to design, construct and test a nuclear plant.

The effect of regulatory changes on the design of structures and equipment is best illustrated by examining several specific systems and several specific areas of regulatory evolution. The design and construction process, however, is an interdependent activity that ties together the work of each discipline. A change in one area of the design "ripples" through the plant to affect many other areas.

Impact of Regulatory Evolution on Piping Systems

The regulatory changes in the area of piping system design and construction after 1973 greatly affected the quantity of pipe, the number and size of pipe supports, the complexity of piping systems, and the documentation required by the regulator.

- The piping and pipe support design process as it existed in 1973 was straightforward and based on processes developed on earlier power plants.

- In 1973, changes in regulations and regulatory interpretations began to change the entire design and construction process for piping systems. These changes included the supporting systems for piping and the attachment of the supporting systems to the structures. Changes having major impact included increased analysis and design in the areas of pipe break, seismic category II/seismic category I, seismic analysis, ASME Code Section III-NF, and As-built Reconciliation.

- Support components evolved from simple rod or strut designs to complex multi-directional engineered structures.

- Documentation of every design detail became necessary as well as documentation of every minor change that was made.

- The area of arbitrary intermediate break locations, evolving over a period of fourteen years, illustrates the often unpredictable regulatory environment.

CPSES would have been significantly affected by this changing regulatory environment in the piping systems area. Moreover, the experience of CPSES was consistent with other plants of its vintage in the industry.

Impact of Regulatory Evolution on Electrical Systems

The electrical systems in nuclear power plants were greatly affected by the increase in the number and nature of regulations and their changing interpretations after 1973.

- The complexity and number of electrical systems has greatly increased from those anticipated in 1973.

- The technical and documentation requirements imposed on these larger and more complex electrical systems created a much more difficult design and construction effort.

- The requirements for fire protection and general electrical separation required increased spatial separation in already congested areas of the plant.

- Post-TMI requirements for additional control and instrumentation to allow alternative shutdown capabilities and to provide additional information to both operators and regulators often caused plants under construction to stop, redesign, and many times add or reroute significant quantities of electrical commodities such as cable trays, conduit, and control and power cables. In addition, barriers between redundant electrical systems had to be added.

The design and construction of the electrical portions of CPSES would have been significantly affected by this instability in the regulatory environment.

Impact of Regulatory Evolution on Equipment Qualification

The nature and level of Equipment Qualification (EQ) of equipment important to safety escalated significantly during the period from the early 1970s to the present. This escalation had repercussions on virtually every aspect of a nuclear plant's design and construction.

- The EQ process as viewed and planned by the industry in 1973 was relatively simple and was primarily a requirement for certification by the manufacturer that the equipment would continue to operate in the environment specified in the purchase contracts.

- Beginning in 1974, the NRC began to issue regulations that prescriptively specified the types and numbers of tests required and the specific nature of the verifying documentation to be maintained on each piece of equipment. During the following decade, over 100 industry standards, Regulatory Guides, NRC Branch Technical Positions, IE Bulletins, NUREGs, policy statements, and regulations relating to EQ were issued. Many times the process for interpreting and implementing the new requirements was complex, with their actual impact unknown for years.

- Requalifying components that were already tested and often shipped, or even installed, was difficult and time consuming.

- The concomitant effect of increased quality assurance and record maintenance made EQ a bookkeeping nightmare.

As a result, CPSES would have had to develop EQ test programs and maintain EQ documentation on plant equipment in accordance with the new regulatory requirements. These escalating requirements would have had a significant impact on CPSES.

Impact of Regulatory Evolution on Fire Protection Systems

The fire protection regulatory environment was an area of regulatory instability for a period of many years.

- The regulatory response to the Browns Ferry fire in 1975 was to change from industrial standards to NRC regulatory standards.

- The uncertain nature and the varied interpretations of the series of NRC fire protection regulations over the next decade caused massive disruption of the design and construction of nuclear power plants.

- The regulatory uncertainty in the fire protection area continued following the issuance of Appendix R in 1980. By 1984, the NRC found it necessary to hold meetings to explain its requirements. Thereafter, the NRC issued a series of clarifying generic letters over the period from 1984 through 1986.

- The changes in fire protection requirements caused conflicts with other criteria. An example is the regulatory requirement for redundant, diverse fire protection systems in cable spreading rooms.

CPSES would have been significantly affected by the instability in the area of fire protection. This effect was particularly pronounced because of the difficulty of incorporating fire protection changes in a substantially completed plant.

13250

CHARLES L. HUSTON

Mr. Charles Huston, President of Challenge Consultants, P. O. Box 3734, Shawnee Mission, KS 66203 will testify on issues concerning Engineering Management. Mr. Huston's opinions and the bases for such opinions are listed below. His overall conclusions are applicable to each of the subject areas addressed in this report. Ongoing discovery and investigations may result in this report being supplemented or amended. Mr. Huston also may testify on matters about which he may be asked to give opinions in any deposition in this proceeding.

ENGINEERING MANAGEMENT
OVERALL CONCLUSIONS

I. Texas Utilities (TU) managed engineering activities for the Comanche Peak Steam Electric Station (CPSES) reasonably and in accordance with "Prudent Utility Practice" as defined in the Joint Ownership Agreement (JOA) and in accordance with generally recognized and accepted industry standards and practices. Engineering, equipment, and material of CPSES are of high and proven quality which should result in high reliability during operations. This overall conclusion is supported by the specific opinions and facts presented below.

MANAGEMENT OF DESIGN

II. Texas Utilities engineering management organization evolved adequately to meet the changing needs of the Project.

A. TU management appropriately selected and organized the principal design contractors for CPSES, its first nuclear power project.

1. In 1971 TU established organizations to plan for future nuclear plants, including developing Architect-Engineer (A/E) and construction requirements and performing bid evaluations.

2. TU retained Gibbs & Hill (G&H) to assist in review of nuclear steam supply system (NSSS) bids and in August 1972 selected G&H as the A/E and Westinghouse Electric Corp. (W) to supply the NSSS.

3. The A/E and NSSS scopes and the G&H and W engineering organizations were consistent with industry practice.

4. TU established a project engineering organization to administer the design contracts, review the design and procurement documents, and develop recommendations for management on major technical, cost, schedule, and licensing decisions.

B. The organization for management of engineering during the civil construction phase (late 1974-1977) was appropriate and consistent with domestic utility practice.

1. TU established a site engineering organization which interpreted the drawings and specifications, assisted the constructor in resolving problems, and facilitated communications. The TU Engineering group in Dallas continued review of design documents.

C. TU made appropriate changes to utility organizations and design contractor responsibilities during the bulk commodity phase (1977-1981) to reflect changing project needs and to respond to problems.

1. In 1977, the TU engineering group responsible for drawing and specification review was moved to the site, a full-time TU Resident Engineer was assigned to monitor G&H in New York, and the Office of the Project General Manager (OPGM) was established at the site responsible for all CPSES engineering, procurement, and construction.

2. In 1978, all engineering functions at the site were consolidated into Comanche Peak Project Engineering (CPPE).

3. In early 1978, an Interference Elimination Group was established to coordinate pipe support installation. This group evolved into the Pipe Support Engineering Group (PSE).

4. In late 1978, at TU's request, G&H assigned the Engineering Vice President to be in charge of the CPSES project.

5. Immediately after the TMI incident in March 1979, TU formed high level groups, the Engineering Review Committee and the Design Review Team, to evaluate the incident and make recommendations for TU actions. The Technical Support Group (TSG) was formed in December 1980 to coordinate design and procurement activities for modifications arising from TMI.

D. TU made appropriate changes to utility organizations and design contractor responsibilities during the project completion phase (1981-1985) to reflect utility needs and capabilities and to promote timely implementation of TMI changes.

1. TU TSG evolved into TUGCO Nuclear Engineering (TNE). TNE was established in late 1982 and was intended to be the basis for the CPSES engineering organization during operations. In general, TNE was responsible for changes in the original design, including modifications resulting from TMI, while G&H completed the basic design.

2. TU transferred design responsibilities to the field and took direct utility control of design in the plant completion phase as has been found to be necessary and appropriate on other projects.

E. The current organization is appropriate for management of design validation and the Corrective Action Program (CAP).

1. In 1984 TU established an independent organization, the Comanche Peak Response Team (CPRT), to evaluate issues that had been raised at CPSES and to prepare a plan for resolving those issues.

2. TU has established an engineering management organization which effectively controls and coordinates the work of three A/E firms with extensive nuclear experience under highly qualified officers.

MAJOR DESIGN DECISIONS

III. TU management was actively and appropriately involved in initial major design concept decisions.

A. Prior to start of construction, TU provided input to the plant layout and design criteria through drawing and specification review and coordination with the AEC, Gibbs & Hill (G&H), Westinghouse and the constructor, Brown & Root. Major decisions were made by TU management after review of studies by G&H.

B. During the initial design stages of Comanche Peak, TU commissioned G&H to perform numerous studies to evaluate the technical adequacy, licensability and cost of major concept options. Those studies included:

1. NSSS type and Vendor
2. Containment type

3. Cooling Water System
4. Motor Voltage Selection
5. Switchyard Arrangement
6. Two vs. Three Feedwater Heater Trains
7. Use of Rock Anchors for the Containment Liner
8. Offsite Power Study
9. Condenser for the Boiler Feed Pump Turbine Exhaust
10. Containment Spray System vs. Safety Grade Fan Coolers

IV. TU management was actively and appropriately involved in decisions to implement major design changes to improve plant capital cost and performance. These changes were timely and technically sound.

A. TU increased on-site spent fuel storage capabilities to accommodate all fuel that would be discharged in approximately eight years of operation and has verified that the existing storage pools can accommodate all fuel that would be discharged during the life of the plant.

B. TU took the lead to resolve performance concerns with the W Model D steam generators. After review of industry experience with W steam generators, TU elected to purchase improved models. This avoided potential downtime for modifications after operation.

C. Because of industry problems with corrosion in steam generators and condensers, TU implemented timely changes including:

1. Full flow condensate polisher
2. Increased capacity blowdown systems
3. Titanium condenser tubes
4. Stainless steel moisture separator reheaters.

D. TU management took a leadership role in the TDI Owners Group which addressed and resolved problems arising from failure of emergency diesel generators designed and manufactured by Transamerica Delaval (TDI) encountered at another nuclear facility.

V. TU Management was actively and appropriately involved in formulating responses to changing regulatory requirements.

A. Maintained close contact with the AEC/NRC staff in order to anticipate problems and resolve them expeditiously.

B. Required the design contractors to evaluate trends and changes in requirements.

C. Participated in industry activities and special task forces and groups.

D. Took a leadership role in implementing new requirements in areas such as response to TMI and systems interaction studies.

VI. TU appropriately anticipated and complied with regulatory change by implementing timely and technically sound major changes in design analyses and qualification. These changes included:

A. Turbine changed from tangential to radial orientation.

B. W released new data which, combined with evolving AEC requirements for containment pressure analysis, required TU and G&H to increase the volume of the containment to accommodate for mass and energy releases during the postulated design basis accident.

C. New requirements for seismic and environmental qualification of equipment.

D. Enhanced fire protection.

E. Enhanced the ability to safely shut down the plant assuming postulated equipment failure and fires.

F. Modifications of structures in the steam tunnel areas due to new requirements for postulated pipe breaks.

VII. TU developed timely and appropriate plans to respond to the TMI incident.

A. A panel of senior management and technical experts promptly evaluated the impact of the incident on the then current design of CPSES.

B. Staffing and operating requirements were modified.

C. TU made appropriate commitments to the NRC to address new regulatory requirements ensuing from TMI. The resulting modifications to the design caused extensive rework and relocation of installed commodities, significantly increased the number of electrical cables and required the addition of new systems and equipment, including:

1. New technical support facility
2. Additional emergency response facilities
3. Additional post accident sampling system
4. Extensive control room modification
5. Additional radiation monitoring systems
6. New control room simulator
7. Additional post accident monitoring equipment

FIELD DESIGN CHANGES

VIII. In the late 1970s and the 1980s, TU and the nuclear industry needed to implement and document increasing numbers of minor design changes to respond to changing design and documentation requirements and expectations.

A. New code requirements such as ASME Section III, Subsection NF, and new NRC requirements such as IE Bulletins 79-02, 79-04 and 79-14, coupled with increased NRC scrutiny of design and construction documentation resulted in documentation in detail not required earlier.

B. Documentation requirements were exacerbated by constant changes in design resulting from evolving regulatory requirements.

IX. TU responded to changing project needs and problems by implementing and modifying design change control policies and systems.

A. TU implemented adequate and effective systems to identify, report and resolve non-conforming conditions.

B. During 1978, TU revised the policies and procedures for field design changes to provide methods similar to that employed on other projects by which field changes could proceed prior to the final G&H home office design review.

X. Based upon review of procedures and audits, TU design change control policies met regulatory requirements, as has been verified by internal audits, NRC audits, and third-party reviews.

A. Prior to September 1984, NRC audits of the CPSES design control process made few adverse findings.

B. Prior to September 1984, special inspections and audits on the CPSES design control process certified compliance with regulations:

1. 1981 audit of 165 design change documents by NRC Resident Inspector.

2. 1983 NRC Construction Appraisal Team (CAT) inspection.

3. Independent Design Verification by CYGNA, Phases 1 and 2.

4. NRC Special Inspection Team (SIT) in 1982-1983.

ENGINEERING SCHEDULES AND COST

XI. TU implemented appropriate systems for coordinating engineering, procurement and construction schedules which were consistent with and in some instances more advanced than systems used on other projects.

A. TU employed critical path schedules to control and integrate design, procurement and construction.

B. G&H maintained detailed status reports of individual design documents.

C. Detailed manual schedules, reports and lists, combined with coordination meetings were used at appropriate stages of the project.

XII. TU implemented appropriate cost controls for engineering activities for the CPSES project.

A. Overall Gibbs & Hill staffing levels were controlled by annual budget authorizations which were approved by TU after detailed and aggressive review.

B. TU maintained close surveillance over Gibbs & Hill discipline and support group staffing levels and performance.

C. TU engineering organization staffing was controlled by annual budget reviews and approved by TU Management.

D. TU maintains comprehensive and appropriate cost control systems for the Corrective Action Program (CAP) and project completion engineering contractor activities.

PROCUREMENT OF ENGINEERED EQUIPMENT AND MATERIALS

XIII. TU appropriately established policies, organizations and responsibilities for procurement of engineered materials and equipment.

A. G&H was responsible for preparing specifications and bid inquiries, evaluating technical and commercial aspects of bids, making award recommendations, preparing purchase documents for balance of plant and expediting material and equipment. W was responsible for manufacturing and procuring equipment within the NSSS scope. B&R was responsible for procuring non-engineered materials and construction service contracts, with the assistance and advice of G&H.

B. TU retained responsibility for approving procurement actions, executing contracts and purchase orders, and administering contracts. Major procurements, in excess of $3 million, were subject to approval of TU's Administrative Committee.

C. TU and G&H developed suitable procedures for preparing bid documents, reviewing bids and proposals, facilitating TU review and approval, and contract administration.

XIV. TU appropriately modified procurement organizations and responsibilities for procuring engineered materials and equipment to respond to project needs.

A. In 1978, TU established the Procurement Management Group (PMG) at the site to assist in procurement.

B. In 1980, the PMG assumed purchasing responsibilities and all expediting responsibilities.

XV. The TU procurement organizations effectively resolved delivery problems.

A. The PMG assigned each order to a specific PMG member.

B. The PMG established short-term and long-term objectives for equipment delivery.

C. Aggressive expediting and management actions were employed by TU to overcome potential construction delays due to equipment and material deliveries. Nevertheless, certain commodity and equipment deliveries were delayed by regulatory change and supplier problems.

ENGINEERING SUPPORT OF CONSTRUCTION

XVI. Engineering supported the construction schedule with timely design data. Delays were largely caused by external factors.

A. TU management placed major emphasis on the coordination of engineering and construction activities. Accordingly, management formed utility and contractor organizations to meet project needs.

1. TU management recognized the importance of timely engineering support, and devoted constant, high level attention to maintain an effective A/E-Constructor schedule interface.

2. TU originally established a small utility site organization to oversee the site liaison engineers provided by G&H and ensure coordination between G&H and B&R.

3. As the Project became more complex, TU consolidated site engineering activities to provide more responsive support.

4. TU steadily increased the design capabilities of the site engineering organizations to facilitate construction and startup and to prepare for operations.

B. During the bulk commodity and project completion phase, design changes required because of major regulatory changes impaired the ability of engineering to support construction.

1. Design of piping and pipe supports was delayed by factors such as implementation of Subsection NF of ASME Section III requirements and increasingly complex seismic design practice and regulatory expectation.

2. Changes required as a result of increased and continually evolving fire protection requirements, particularly new requirements for cold, remote shutdown with safety grade equipment caused rework and delay.

3. Changes required as a result of the TMI incident, particularly modifications to the main control board, ERF computer system, post accident sampling, and enhanced radiation monitoring required extensive redesign of and addition of new systems and commodities to the essentially completed plant.

4. Other changes, such as pipe break criteria and equipment qualification, added cost and delay.

DESIGN QUALITY

XVII. The TU design organizations and the major design contractors were properly structured and implemented procedures to assure design quality.

A. TU established necessary policies and organizations and contractual requirements to assure that CPSES would be designed to meet applicable regulatory and code requirements.

1. TU required G&H to develop and implement procedures to comply with regulatory requirements of Appendix B and good engineering management practice.

2. W had AEC pre-approved design quality programs.

3. The AEC approved the CPSES Quality Assurance program prior to award of the Construction Permit.

B. As the project progressed and increased design responsibilities were assumed by TU CPPE and TNE and by the two pipe support vendors (ITT-Grinnell and NPSI), policies and procedures to ensure design quality meeting NRC requirements and industry standards were developed and implemented. These procedures provided for design review and verification of original design and design changes.

C. TU, NRC and other third party audits prior to the design validation and corrective action phase verified substantial programmatic compliance with regulations.

1. Beginning in 1974, TU performed a series of 27 audits of Gibbs & Hill (Audits TGH-1 through TGH-27). TU discovered delay in G&H's implementation of commitments and took management actions to improve G&H performance. The NRC audited G&H 14 times between 1974 and 1984.

2. TU audited Westinghouse 42 times between 1974 and 1986 (Audits TWH-1 to TWH-42). The NRC audited Westinghouse 30 times between 1975 and 1984.

3. PSE, TNE and CPPE, the major TU design organizations, were continuously audited by the TU QA organization.

4. The design process employed by ITT Grinnell was audited by TU, NRC and other external organizations as well as by 15 ITT Grinnell QA audits. In addition, approximately 10 internal audits per year were performed by ITT.

5. NPSI was audited by TU, ASME, the NRC and other outside organizations including CYGNA and Teledyne.

DESIGN VALIDATION AND CORRECTIVE ACTION

XVIII. Specific and generic concerns related to design adequacy are being resolved successfully through the Design Adequacy Program (DAP) under CPRT and the Corrective Action Program (CAP).*

A. As a result of ASLB concerns and allegations, the NRC's Technical Review Team (TRT) conducted an intensive investigation in 1984. Although the TRT resolved most allegations, TU decided first to perform an independent assessment of design and construction quality, and later a design validation under the CAP.

XIX. The design that existed in 1984 was adequate. The plant could have operated without undue risk to the health and safety of the public.

A. A large portion of hardware design changes recommended by the CAP were a result of design evolution and changes in regulatory requirements and/or standards and their interpretation.

B. The relatively few hardware design changes recommended to correct design errors and the nature of those changes indicate that CPSES could have operated without undue risk to the health and safety of the public.

C. Relatively few field modification changes were required to conform to the design requirements. The vast majority of inspection points and document review points reinspected by CPRT were either in conformance with design requirements or constituted insignificant deviations (99.5%). These results compare favorably with necessary field modifications required for a typical nuclear power plant. The nature of the field modifications indicates that CPSES could have operated without undue risk to the health and safety of the public.

D. A review of the identified technical concerns that were resolved by additional analysis and/or document change has shown that CPSES could have operated without undue risk to the health and safety of the public.

---

* Mr. Huston evaluated the DAP and CAP programs as applied to the Mechanical, Electrical, Instrumentation and Control, Equipment Qualification disciplines and systems aspects of the HVAC discipline. Walter Mikesell of R. L. Cloud and Associates evaluated the programs as applied to the Civil-Structural discipline, piping and pipe supports and electrical and HVAC supports. The conclusions of the Challenge evaluations are presented in Sections XIX through XXI.

XX. The majority of the technical concerns identified by the Design Adequacy Program (DAP), external sources and the CAP design validiation were addressed by analysis, documentation change, field modification, or were found not to be valid.

A. Over 1600 technical concerns were identified by DAP and external sources and CAP.

B. Of the approximately 1600 technical concerns identified, roughly 40% have been found not to be valid or to be simply an observation requiring no action to resolve.

C. It is estimated that of the roughly 1600 technical concerns, approximately 55% were resolved as a result of additional analyses, documentation change and/or field rework and less than 5% of the technical concerns were resolved by recommending hardware changes.

XXI. A large portion of hardware design changes recommended by the CAP have resulted from changes in regulatory requirements and interpretation and/or standards and design evolution.

A. From 1975 through the middle of 1986, the NRC fire protection requirements and their interpretation evolved rapidly and significantly.

B. Equipment qualification requirements have been dynamic and the NRC continues to define ever more stringent acceptance criteria.

C. Later versions of the ASME codes and interpretations of the ASME codes have been imposed on the design of CPSES.

D. A review of all recommended hardware design changes resulting from the CAP indicates that a relatively small number were recommended to correct design errors.

XXII. Other hardware changes not part of the CAP have been implemented or recommended primarily to enhance plant operability and reliability.

A. The majority of the cost of these other changes is attributable to enhancement of plant operability and reliability; essentially all of the balance of cost is attributable to changes in requirements and design evolution.

B. The cost of these other changes attributable to correction of design errors is not substantial.

XXIII. The DAP, CAP and findings by other reviewers have shown that the documentation of design for CPSES did not always meet current standards of acceptability. As evidenced by the small number of required hardware changes, however, CPSES was adequately designed compared to other nuclear plants licensed in the mid 1980's.

A. The CAP has enhanced the design documentation and design control for CPSES to current standards. Improvements were made in calculations, procedures, specifications, design basis documents, consistency between interfacing design documents, vendor documentation and resolution of inconsistencies in flow diagrams. This enhancement was necessary to meet the more rigorous documentation requirements that now apply.

B. The CAP has resulted in an improved equipment qualification master list and the development of 650 equipment qualification summary packages.

C. The technical concerns requiring hardware changes were small compared to the total number of identified technical concerns that could have resulted in recommended hardware changes but were resolved in other ways, as described elsewhere.

D. The 1984 design was adequate and the systems, structures and components were comparable to other nuclear plants licensed in the mid-1980's.

E. As a result of the CAP, CPSES is the most thoroughly analyzed, documented and audited plant in the United States today of which Mr. Huston is aware.

XXIV. All activities in the CAP were performed under a rigorously implemented quality assurance program.

A. Audits and surveillances of all activities have been performed by the contractor organizations, and by TU and independent teams of outside consultants, including Engineering Assurance Audits and the Technical Audit Program.

B. TU has initiated the Engineering Functional Evaluation program to perform an in-depth independent technical evaluation of CAP to provide additional assurance that the CAP is effectively implemented.

C. CPSES has a detailed quality control inspection program.

D. CPSES has surpassed the industry standard of resources currently devoted to quality assurance.

E. The NRC Office of Special Projects has performed and is performing inspections, technical evaluations and audits of the CAP activities and the overall quality assurance program.

In reaching these opinions, Mr. Huston has relied on the following: his background, experience, and his training as a professional engineer; his knowledge of the design and construction of CPSES; his knowledge of the nuclear industry and applicable regulatory requirements; information obtained from current and former TU employees and TU contractors involved in Engineering Management; and review of Project documents, including reports, correspondence, minutes of meetings, organization charts and business memoranda.

1277u

CHARLES HUSTON

Mr. Charles Huston, President of Challenge Consultants, P.O. Box 3734, Shawnee Mission, KS 66203 will testify on issues concerning Project Management. Mr. Huston's opinions and the bases for such opinions are as follows and in each of these areas in which Mr. Huston will offer his opinion, he has found and will state that TU Electric (TU) has acted reasonably and in accordance with "Prudent Utility Practice" as defined in the Joint Ownership Agreement:

I. The Board of Directors and Executive Management of TU were continuously involved in the overview of Comanche Peak (CPSES or Project).

   A. Board of Directors frequently reviewed the status of CPSES at its regular meetings.

   B. Executive Management was involved in the management of CPSES.

      1. Administrative Committee reported to and consulted with TU management regarding early decisions on Project (e.g. site selection, major contractor selections, and other decisions).

      2. TU management got more involved with CPSES as cost and schedule changes at the project increased.

      3. Weekly briefings were given to TU management.

4. TU management attended Progress Meetings, bi-monthly Summit meetings on site and other meetings with senior representatives of major contractors, which fostered constant awareness of the status of the Project.

5. TU Management also established several internal meetings at which CPSES was discussed.

6. TU management utilized outside consultants to augment or review existing Project programs.

7. TU Project Manager, in residence on site since 1977, was elected Vice President of TUSI in 1980 and remained on site as Project Manager until 1986.

C. Project Management organization and operation were modified as the needs of the Project changed.

D. TU Management participated in nuclear industry groups which enhanced its understanding of known and emerging nuclear issues.

II. TU Management s major Project decisions were reasonable and consistent with industry practices.

A. Decision to hire separate Architect/Engineer and Constructor -- this was accepted industry practice and the concept had been successfully used on other projects by TU.

B. Decision to hire Gibbs & Hill as the Architect/ Engineer -- Gibbs & Hill had proven and successful nuclear plant experience.

C. Decision to hire Brown & Root -- Brown & Root was the lowest bidder and was experienced in nuclear plant construction.

D. Decision to augment project management by hiring outside consultants and specialty engineering firms.

E. Decision to buy Westinghouse nuclear steam supply system (NSSS) -- Westinghouse had experience and technical expertise, and a cost evaluation supported this decision.

F. Decision to buy Allis Chalmers' turbine generators -- Allis Chalmers had technical experience and a cost evaluation supported this decision.

G. Decision to form Comanche Peak Response Team.

H. Decision to change Executive and Project Management in 1985.

I. Decision to implement Corrective Action Program (CAP).

III. TU properly assumed more direct control of CPSES and contractors as cost and schedule changes at the Project increased.

A. TU initially determined (1971) that TUSI/TUGCO would monitor the design, construction, and operation of CPSES.

1. TUSI's management had participated in the nuclear industry prior to Comanche Peak.
2. TUSI's management and employees had experience in design/construction of large generating units.
3. TUSI could provide experienced construction management personnel to CPSES.
4. TUGCO had experience in the operation of TU's power plants.

B. TU's assumption of an enhanced role in Project Management in 1977 was timely, properly implemented and on the forefront of industry practice.

1. The overall management effort changed when TU Project Management was shifted to the site and direct management of the contractors increased.
2. TU phased in the assumption of its increased management role to provide a controlled transfer of responsibilities.
3. TU continued its practice of using outside expertise to augment its Project Management.
4. Other utilities took similar action in the late 1970's and early 1980's time frame.

IV. Coordination between TU Project Management and various CPSES groups (Engineering, Construction, Startup, Operations, Procurement and Quality) was accomplished in

accordance with prudent utility practice through various means, including written procedures, meetings, schedules, reports and drawing reviews.

A. Coordination with Engineering was accomplished through reports, schedules and meetings involving TU, Brown & Root, Gibbs & Hill, and Westinghouse.

1. Progress of Engineering work was monitored through Project reports received from Gibbs & Hill's personnel located at the site and at its New York headquarters and reviewed by TU managers who frequently visited or were assigned to Gibbs & Hill's offices.

2. Schedules were used to coordinate Engineering efforts with the Project goals.

3. Various meetings were held between TU and Gibbs & Hill to assess the Engineering efforts.

4. TU assigned a Senior Engineer to the Gibbs & Hill office in 1978 and later sent personnel to Gibbs & Hill on a weekly basis.

5. Gibbs & Hill and TUSI personnel at the site were integrated into a single site engineering group to support construction and field engineering.

6. TU formed a Blue Ribbon Panel in 1979 to review design changes required as a result of the Three Mile Island accident.

B. Coordination with Construction was accomplished through reports, schedules and meetings involving TU, Brown & Root and Gibbs & Hill.

1. Progress of construction work was monitored through Project reports and schedules received from Brown & Root and other Project contractors.

2. TU enhanced the management of construction in 1977 when it assumed more direct management of Brown & Root through its on-site Resident Manager.

3. TU closely monitored the construction organization and made management concept changes as the Project progressed.

4. Construction schedule and costs were regularly reviewed by TU Management and appropriate measures taken.

C. Coordination with Procurement was accomplished through schedules, reports, and meetings to identify and status the forecasted and actual delivery of equipment and material.

1. Required delivery dates were identified by schedules and reports and reviewed frequently in meetings.

2. TU formed a single expediting group at the site in 1978 for all major purchase orders.

3. TU assumed a more active role in expediting all equipment and material from vendors, especially pipe and hangers, by 1980.

4. TU obtained alternate vendors when schedules so required.

D. TU Management established a Startup Program that supported the Project Schedule. Startup activities were measured through reports, schedules and meetings.

1. TU Management established the Startup Group on Site in 1975.

2. TU developed startup systems early in the Project to provide input to the Construction and Engineering schedules, including the identification of equipment and components required for system turnover.

3. TU Startup personnel were informed of Construction and Engineering progress at Project meetings attended by Construction/Engineering personnel.

E. TU Management established the Operations Department early in the Project and coordinated its work with Engineering, Construction and Startup through reports, schedules, meetings and procedures to ensure that Operations was prepared to operate the Plant when it was ready.

1. Five key Operations personnel were assigned to the Project in 1973.

2. The Operations Design Review Group was formed in 1973 to interface with Engineering and to review layouts and design for access, maintenance and operability.

3. Operations and Startup coordinated their work through schedules and procedures to provide an orderly startup-preoperational effort.

4. Operations personnel attended numerous meetings to assist them in planning and executing their work.

5. Operations awarded a contract to Westinghouse to develop a Managed Maintenance Program in 1978.

6. Management took measures to assure that personnel received adequate training.

   a. Personnel were sent to at least five other plants to participate in startup activity.

   b. Training programs were established for all required personnel.

F. TU Management maintained an ongoing awareness of Project cost and schedules through reports, schedules, meetings and plant visits and took action as appropriate.

1. TU established baseline Project costs and schedules in the Definitive Schedule and Estimate and later schedules and estimates; TU measured costs and schedule variances against those baslines.

2. TU Executive Management and Project Management were informed routinely as to the Project cost and schedule through reports.

3. TU performed an annual review of future costs and schedules.

4. TU used consultants to assist in developing management systems and later to evaluate the schedule programs.

G. TU Management established a Quality Assurance Program in 1972 and enhanced and expanded it over the Project life to monitor the Quality Assurance activities of its major contractors.

V. TU Management had an independent audit program utilizing TU personnel and an outside organization that reviewed procedures and internal controls and their implementation.

A. The Internal Auditing Group conducted over 98 contract compliance audits beginning January, 1978 and is still active on the Project.

B. The Internal Auditing Group conducted over 53 operational audits beginning March, 1977 and is still active on the Project.

C. Outside organizations performed Management, Engineering, Startup and Construction audits of CPSES.

D. An outside accounting firm performed audits beginning December, 1978 and is still being used.

VI. The results of the Comanche Peak Response Team (CPRT) and the Corrective Action Program (CAP) are consistent with a finding that CPSES was as of the end of 1984, and is currently, engineered and constructed in accordance with prudent utility practices. Although costs have been incurred to correct certain design and construction work which did not meet standards of acceptability at the time such work was performed, the great majority of costs attributable to CPRT and CAP have been incurred to assure compliance with today's enhanced standards of acceptability and to improve plant operability.

Mr. Huston also may testify on matters about which he may be asked to give opinions in any deposition in this proceeding. Moreover, ongoing discovery and investigations may result in this report being supplemented or amended.

In reaching these opinions, Mr. Huston has relied on his background, experience, training as a professional engineer, and his knowledge of CPSES and the nuclear industry and its regulations as well as the following:

- Information and opinions from other experts designated by TU Electric, and particularly Walter Mikesell and Gary Fouts, to the extent their scope of effort is relevant to the subject matter of this report.
- Information received from current and former employees of TU and its contractors.
- Review of CPSES documents, including reports, correspondence, minutes of meetings, organization charts and business memoranda.

1828u

DANIEL C. KASPERSKI

Dr. Daniel C. Kasperski, a Managing Consultant with the management consulting firm of Cresap, a Towers Perrin company, located at 200 West Madison Street, Chicago, Illinois 60606, may testify about the cost controls of the Comanche Peak Steam Electric Station. The opinions that Dr. Kasperski may offer are based on information reviewed and assessments completed to date. Ongoing discovery and investigation may lead this report to be supplemented or amended.

With respect to each of the subject areas on which Dr. Kasperski may offer his opinion, he has found and will state that TU Electric has acted reasonably and in accordance with "Prudent Utility Practice" as defined in the Joint Ownership Agreement in that:

* The cost control function was appropriately organized and staffed, proper processes were in place to prepare and use estimates and budgets, and appropriate processes were utilized to track actual project expenditures so that corrective action could be taken, when necessary.

In addition to opinions on matters about which he may be asked to testify in any deposition in this proceeding, the following specific opinions, based on the facts indicated, also would be offered by Dr. Kasperski:

* The project cost controls organization was appropriately planned and staffed, and responsibilities were properly assigned and implemented.

  - The project cost controls organization was clearly defined, and was structured to facilitate implementation of its role.

  - Roles and responsibilities within the project cost controls organization were clearly defined and implemented.

  - The evolution of functional representation and staffing levels within the project cost controls organization were consistent with project requirements, considering the required technical expertise, scale of project activities, and assigned responsibilities.

  - Key project cost controls personnel had appropriate relevant experience for the roles assigned, and staffing policies allowed for changes in key personnel while facilitating continuity of project-specific experience.

- The project cost controls organization communicated with other project groups to facilitate coordination of interrelated activities, and utilized specialized expertise to address specific issues on an as-needed basis.

* Project cost estimates were prepared, reviewed, approved and updated in a manner which allowed management to plan for future expenditures.

  - Project costs were estimated on the basis of a scope of work and a schedule that were as precise as reasonably possible at the time each estimate preparation was begun.

  - Estimates were prepared in sufficient detail to provide a substantial amount of information on the expected cost of each specific area of activity.

  - Initial estimates were developed using contemporaneous information available to the engineer and the constructor such as actual man-hours expended and unit rates achieved on other nuclear projects.

- The project estimate was periodically reviewed and updated based on actual performance to date and scope of work yet to be completed.

- Initial and revised estimates were reviewed and approved at appropriate levels of project management.

* Project cost accounting, cost monitoring, and cost reporting systems were developed and implemented in a manner which allowed management to compare actual and budgeted expenditures, and to take corrective action when warranted.

  - The cost accounting system used to generate project cost reports provided cost information in sufficient detail to allow project management to track project performance against budget.

  - Cost information reported to the various levels of project management were tailored to the needs and responsibilities of the individual recipients, were issued frequently and on a timely basis, and precipitated specific action plans which addressed deviations from expected results.

- Project cash requirements were budgeted and communicated to project participants on a regular and timely basis, and actual cash expenditures were monitored and compared against budgeted amounts.

- Project management was sufficiently involved to have reasonable confidence that key cost monitoring information (e.g., actual versus budget) provided by the engineer and constructor was accurate and timely.

- The evolution of cost estimating and accounting tools and approaches used by the project were consistent with general industry practices.

In reaching his conclusions, Dr. Kasperski has relied upon information obtained from project personnel, a review of project documents, and his background, training and experience, including his background and experience with cost control systems used by other nuclear power plant construction projects.

1272u

JOSEPH E. MANZI

Joseph E. Manzi, P.E., the President of J. E. Manzi & Associates, Incorporated, located at 1700 Higgins Road, Suite 210, Des Plaines, Illinois 60018, may testify regarding the schedule for the Comanche Peak Steam Electric Station (CPSES). First, Mr. Manzi may testify about the scheduling process used to plan, monitor and control the engineering, procurement, construction and licensing of CPSES. Second, Mr. Manzi may testify about the planned and actual duration of activities that paced completion of CPSES, and the reasons for delays in the completion of those activities. Mr. Manzi also may testify on matters about which he may be asked to give opinions in any deposition in this proceeding.

Mr. Manzi would offer the following overall conclusions based on the facts and opinions described in more detail below:

1. The scheduling processes used to plan, monitor and control the completion of CPSES were reasonable, were in accordance with "Prudent Utility Practice," as defined in the Joint Ownership Agreement, and served as a useful management tool and an effective project control.

2. The completion of CPSES Unit 1 was extended for reasons beyond the control of TU Electric (TU), including the additional time and effort required to respond to new, revised and reinterpreted regulatory requirements.

In reaching his conclusions, Mr. Manzi relied upon information obtained from project personnel (including current and former employees of Texas Utilities Services, Inc. (TUSI), Texas Utilities Generating Company (TUGCO), Brown & Root, Gibbs & Hill, and other contractors, vendors and consultants), a review of project documentation, his knowledge of CPSES, his knowledge of the nuclear industry and the regulations applicable thereto, his background, education, and training as an engineer and his prior experience with schedule issues faced by other nuclear and non-nuclear construction projects. Documents reviewed included TUSI and TUGCO corporate and CPSES plant records, personal files of current and former project personnel, and project scheduling documents.

In addition, Mr. Manzi has relied on the opinions of other experts who may testify on behalf of Texas Utilities on subjects that relate to the project's duration.

Mr. Manzi's conclusions are outlined in more detail below, first as regards the scheduling processes and then as regards schedule duration. Ongoing discovery and investigations may result in this report being supplemented or amended.

I. Scheduling Processes

The scheduling processes implemented at CPSES were reasonable, were in accordance with "Prudent Utility Practice," as defined in the Joint Ownership Agreement, were appropriately planned, and served as a useful management tool and an effective project control. The project scheduling organizations were

appropriately staffed and organized; suitable functional and integrated schedules were available for use by project personnel; the schedule development and control procedures were appropriate and consistent with the needs of the project; and procedures were implemented to provide project management timely and accurate information regarding schedule progress.

A. The project scheduling organizations were appropriately staffed and organized.

- Scheduling organizations were properly placed within the overall project structure.
- The scheduling groups evolved as the project progressed to serve the information and planning needs of project management.
- Scheduling personnel had direct access to sources and users of schedule information.

B. Appropriate project schedule development methods were implemented to produce schedules consistent with the needs of the project.

- Schedules were prepared using appropriate tools, both manual and computerized, and were supported and verified by suitable data bases, tracking mechanisms and field verification.
- The schedule development methods appropriately integrated engineering, procurement, construction and testing activities.

- Comprehensive project schedules were developed and used to plan, forecast and monitor overall progress.
- Summary level schedules were developed from the comprehensive schedules to inform management of progress and forecasts.
- Detailed, short-interval, activity and functional schedules were developed within the framework of the comprehensive project schedule and were used to plan and monitor particular work activities.
- Appropriate schedules and work plans were provided to craft supervision to support construction progress.
- The various levels of schedules were appropriately integrated.
- The schedule development processes were reviewed periodically and revised as necessary to conform with the anticipated needs of the project.

C. The schedule updating and change procedures were appropriate and consistent with the needs of the project.

- Schedule updating and change procedures incorporated data from all aspects of the project.
- Management participated at appropriate points in the schedule development process, and changes in major project milestone and completion schedules were reviewed and approved by management.
- The scheduling change processes incorporated consideration of prior experience, available resources,

alternative working plans, engineering and equipment deliveries and construction progress.

- The results produced by the application of the schedule change process were reasonable based on the information available at the time.

D. Procedures were implemented to keep project management informed regarding progress and schedule variance.

- Reports and other information were provided at an appropriate level of detail. Adequate schedule records were maintained to support the information needs of project management.
- Management regularly reviewed the overall schedule, as well as particular issues that affected portions of the schedule.
- The monitoring and reporting processes were timely and permitted management to implement appropriate corrective actions, if needed.
- Schedule information provided to management was an integral part of the project planning and decision-making process.

II. Schedule Duration

The schedule for CPSES Unit 1 was extended beyond the commercial operation date forecast in the schedule supporting the definitive estimate for reasons beyond the control of Texas Utilities, including the need to respond to new, revised and reinterpreted regulatory requirements.

Although the schedules for both Unit 1 and Unit 2 were extended, the schedule for the lead unit paced the overall completion of the project. As a result, analysis of the duration of particular Unit 1 activities best characterizes the overall progress of the project.

As the result of extended durations of as-planned activities and time spent to perform previously unanticipated (but required) activities, construction of Unit 1 was not substantially complete to support fuel load until January 1985. Commercial operation could have followed fuel load after a power ascension phase of approximately six months. The regulatory environment faced by CPSES and other applicants for operating licenses after 1983 caused CPSES to have to satisfy new, revised or reinterpreted licensing requirements imposed by the Nuclear Regulatory Commission (NRC). As a result of this regulatory environment, TU was required to implement the Comanche Peak Response Team (CPRT) program and Corrective Action Program (CAP). Since January 1985, activities relating to the CPRT and CAP have paced completion of Unit 1. Even if there had been no extension of the project's completion due to CPRT and CAP programs, the completion of Unit 1 to support operation at significant power levels probably would have been extended to late 1986, if not beyond, absent the NRC's waiver or exemption of certain new, revised, or reinterpreted licensing requirements.

A. The time required to respond to regulatory requirements arising out of the NRC's response to the accident at Three Mile

Island Unit 2 (TMI) would have precluded CPSES Unit 1 from receiving an operating license prior to November 1984.

1. TU's overall engineering, procurement, construction and licensing responses to regulatory requirements arising out of the TMI accident were timely and reasonable.

2. TU was required to design and implement an Emergency Response Facility (ERF), including an ERF computer and Safety Parameter Display System (SPDS), to provide plant operators with information regarding vital safety information. The ERF computer system and SPDS were not developed, installed and tested prior to September 1984.

3. TU was required to redesign its control room instrumentation, particularly the main control boards, to incorporate Human Factors Engineering (HFE) requirements imposed by the NRC. TU promptly performed the HFE review, made the modifications and reperformed the preoperational testing necessary to make the control boards ready to support fuel load. The HFE modifications were not completed until November 1984.

4. As a result of the accident at TMI, the NRC required TU to expand substantially its Radiation Monitoring System to provide additional information to plant operators regarding radiation levels in the containment and in the ambient environment. The expanded Radiation Monitoring System was not completed until July 1984.

5. Installation of a new Post Accident Sampling System (PASS) was required by the NRC following the accident at TMI to enhance the timeliness and level of information provided to plant operators under accident conditions. The new PASS was not completed until June 1984.

B. As a result of problems encountered at two other nuclear plants with emergency diesel generators supplied by Transamerica Delaval Incorporated (TDI), the NRC imposed new requirements on operating license applicants to demonstrate the safety and reliability of their emergency diesel generators. The TDI diesel generator requalification program was performed by TU, under supervision of the NRC and other utilities, in a timely and reasonable manner. Because of the overall time needed to perform the required diesel generator requalifications and related retesting, Unit 1 would have been precluded from obtaining an operating license prior to the end of January 1985.

C. The time required to implement new fire protection requirements imposed on CPSES by the NRC following the fire at the Brown's Ferry Nuclear Plant in 1975 would have prevented CPSES Unit 1 from receiving an operating license prior to July 1984. TU's design of a revised fire protection system and procurement of necessary electrical and mechanical hardware was timely and in compliance with the NRC's requirements known to TU at that time.

D. The completion of CPSES Unit 1 was delayed as a result of the extended durations of activities critical to completion,

including the installation of pipe and pipe supports, the pulling and terminating of electrical cables, and the testing and startup program. Some of the delays experienced in these activities were concurrent with each other as well as with delays already addressed.

1. The installation of pipe and pipe supports in Unit 1 and the common facilities was substantially completed by December 31, 1982 to support commencement of hot functional testing. Completion of this activity took longer than originally planned as a result of several factors, including an increase in the complexity and number of pipe supports actually installed in Unit 1; unanticipated difficulty in the installation of pipe supports; delays in the receipt of final pipe support designs and pipe supports; time required to overcome interferences resulting from increased complexity; field work necessary in connection with as-built structural verification programs; and other field corrections and repairs on installed pipe and pipe supports in connection with construction or design changes. The causes of these factors include the combined effects of evolving regulatory and code requirements; industry-wide shortages of engineers and fabrication shop space; and the increasing complexity of the design process and techniques used.

2. The pulling and terminating of electrical cables took longer than planned. Completion of cable installation

critical to construction completion was dictated by the time required to install and test the additional cables resulting from modifications made in response to regulatory requirements, including TMI and Appendix R modifications.

3. The duration of the testing and startup program was extended as a result of several factors, including time required for substantial inspections and rework on electrical cable separation in control room cabinets and penetrations and cable spread room risers as a result of TMI and Appendix R modifications; the inspection and recrimping of cable terminations in the main control boards; and additional testing and retesting as a result of modifications made to the plant in response to new regulatory requirements.

E. The time required to respond to new, revised and reinterpreted regulatory requirements imposed on CPSES by the NRC after 1984, and the time required to close out open licensing items not previously required to be closed by the NRC before issuance of an operating license, would have delayed the licensing or operation of Unit 1 at significant power levels to late 1986, if not beyond, absent the NRC's waiver or exemption of such licensing requirements. New requirements imposed on CPSES in the post-1984 period include, but are not limited to, requirements for enhancements to the fire protection systems, additional equipment qualification criteria, resolution of pump and valve operability questions, and the correction of concerns raised by vendors of equipment.

1829u

ROGER J. MATTSON
JOHN A. OLSHINSKI

Roger J. Mattson may testify regarding the effects of Nuclear Regulatory Commission (NRC) regulation on the Comanche Peak Steam Electric Station (CPSES) project. He is Vice President of SCIENTECH, Incorporated, 11821 Parklawn Drive, Rockville, Maryland 20852.

John A. Olshinski may testify regarding the effects of NRC regulation on the CPSES project. He is General Manager of Nuclear Energy Consultants, Incorporated, 1000 Johnson Ferry Road, Suite D120, Marietta, Georgia 30068.

Dr. Mattson and Mr. Olshinski may also describe changes in NRC's policies and practices for regulation of nuclear power plants in the 1970s and 1980s and give examples of their effects on CPSES. They may describe the effects of other factors on the licensing of CPSES, including the actions of NRC Region IV, intervention in the CPSES operating license hearing, allegations of construction and design deficiencies, and the growth in the use of reinspection, reverification, and revalidation techniques by the NRC and the nuclear industry during the construction of CPSES. Dr. Mattson and Mr. Olshinski may also evaluate, from an NRC perspective, the overall regulatory performance of TU Electric (TU).

The opinions of Dr. Mattson and Mr. Olshinski that may be offered at trial are based on information reviewed and assessments completed to date. Ongoing discovery and investigations may result in this report being amended or supplemented.

With respect to each of the following subject matters on which Dr. Mattson and Mr. Olshinski may offer opinions, they have reached and may render the overall conclusion that the performance of TU was reasonable and consistent with "Prudent Utility Practice," as that term is defined in the Joint Ownership Agreement. In addition to opinions regarding subject matters about which they may be asked during their respective depositions, they may also offer the following specific opinions.

Regulatory Process

A complex process has been established by the NRC to fulfill the federal government's responsibility for regulating the safety of nuclear power plants. The regulatory process includes the setting and interpreting of licensing requirements, a two-step licensing review of each plant, inspection of construction and operation of each plant and its suppliers, and enforcement of licensing requirements. There are many parties involved in the licensing process, including the NRC staff, the Commissioners themselves, the Advisory Committee on Reactor Safeguards, the Atomic Safety and Licensing Board, the applicant, and interested members of the public. In addition, the NRC licensing process lends itself to delay by public intervention. The NRC investigates allegations of construction and design deficiencies or unsafe practices whether or not those allegations are made in the context of the licensing proceeding. When allegations are made near the end of construction of a plant coincident with contested issues in the operating license hearing, the licensing process is especially difficult to complete.

- In the earliest days of the nuclear power plant licensing process, there was little intervention or serious opposition to the issuance of licenses. Intervention has greatly increased since that time, affecting the licensing process. One such effect has been to make license reviewers of the NRC less willing to accept alternative methods of meeting the NRC requirements. Increased intervention has also made the NRC staff less flexible in interpreting the NRC regulations and, hence, more conservative over the years in deciding what constitutes adequate margins for safety.

- Changes have also occurred in NRC practices regarding allegations. In recent years, the NRC has required that all allegations raised at a plant be addressed and documented to the fullest extent possible before licensing. The staff is required to follow stringent administrative procedures for investigating allegations. When allegations are admitted to the hearing process the potential for delay is increased. The procedures restrict communication with the license applicant on these and related matters.

Therefore, the combination of determined intervention and allegations produces a synergistic effect which can cause significant delays. This effect has resulted in major licensing delays for several plants.

- The licensing of CPSES has been affected by persistent intervention, allegations of deficiencies, and the litigation of allegations in the licensing proceeding. The significant intervention experienced at CPSES has made issue resolution with the NRC more difficult. Additionally, the synergism between allegations and intervention has further impeded the resolution of issues.

- The changes in the NRC regulators to whom TU was accountable were so numerous as to impede the licensing process at CPSES. An unusual turnover in NRC personnel associated with CPSES coupled with changes in assignments of responsibility among applicable NRC organizations resulted in licensing uncertainty and delay. This licensing disruption was unique to CPSES.

Regulatory Change

The regulatory requirements applicable to nuclear construction projects and interpretations of these requirements have changed during the construction period for CPSES. Regulatory change affects all plants, especially those seeking a license to operate subsequent to the accident at Three Mile Island (TMI). The overall effect has been to raise the level of safety sought by NRC and the degree of assurance required to demonstrate that the new level of safety has been attained. These changes were unpredictable and costly. Moreover, they resulted in a lengthening of construction schedules.

- During the construction of CPSES the NRC issued new licensing requirements as a result of a variety of factors, one of the most important of which was the accident at TMI. These new licensing requirements increased the effort necessary to complete CPSES.

- The NRC Inspection and Enforcement program has undergone significant revision and growth during the construction of CPSES, especially since 1981. This revision and growth has resulted in

increased attention to detail in design, construction and preparation for operations by both the NRC and its license applicants. The changes in NRC policies and practices in inspection and enforcement have been implemented largely by NRC regional offices through the application and interpretation of the NRC's quality assurance requirements. More detail has been required in documentation of construction and design adequacy. Plants under construction experienced higher than anticipated costs and longer construction periods because of these regulatory changes. These changes applied to CPSES.

- Licensing and operating experience from 1982 to the present have resulted in changes in NRC policies and practices regarding transition from construction to operation. The NRC required greater assurance that new plants had been designed and constructed in accordance with regulatory requirements, had been substantially completed, and would not experience startup and operational problems. This was especially true for first units at a site and first units for a utility. The changes in NRC policies and practices have resulted in delayed startup and increased construction costs. Consequently, first units at a site and first units for a utility were generally not licensed on the schedules perceived to be possible in early 1984, and additional costs have been incurred as a result. This effect, even if the plant was otherwise complete, would have prevented CPSES from receiving an operating license in 1984.

- Until the events at TMI and the subsequent changes in the regulatory environment as a result of TMI, the NRC grandfathered some plants from new requirements. This practice was abandoned after TMI and most requirements, old and new, were applied to most plants. CPSES has not been grandfathered from regulatory requirements.

- In the 1980s, the NRC has increasingly required utilities with plants nearing the completion of construction to perform some form of reverification, reinspection, or overinspection program.

The effects on construction schedules and costs in implementing regulatory change are substantial. This is because the changes often require designs to be reanalyzed or redesigned, new equipment to be procured, new construction procedures to be developed, work to be redone, construction to be performed out of sequence, and the work to be accomplished in more crowded conditions than would otherwise be the case. Additionally, plants under construction are typically the last to receive the materials to complete the changes, last to receive a regulatory review, and are allowed fewer exceptions.

Major licensing changes affecting CPSES include, but are not limited to, the following:

- CPSES was not reviewed to the Standard Review Plan (SRP) at the construction permit stage, but the NRC staff now reviews all operating license applications, including the application for CPSES, against the SRP.

- The events at and following TMI led to a number of new regulatory requirements that were applied to CPSES by the NRC. The magnitude of effort required at CPSES, and other plants, to comply with these regulations has been greater than anticipated.

- The design requirements for piping, pipe supports, and pipe restraints have evolved since the ASME Boiler and Pressure Vessel Code was first endorsed by the NRC. TU committed to the 1974 requirements. Since then, additional requirements and interpretations associated with piping supports and restraints have been applied, based on NRC guidance documents and the SRP. Many of the new requirements and interpretations have been applied by the NRC to CPSES. Their effect has been to increase costs and lengthen schedules by increasing the scope, engineering, quality assurance (QA) and unit rates experienced in the construction of CPSES.

- Equipment important to safety must be able to perform its design function during normal operation and under accident conditions. Aging of components is also a factor. Establishing that aged equipment will work under conditions of high temperature, pressure, humidity, radiation and vibration is called equipment qualification (EQ). Beginning in 1974, AEC specified tests to

be performed to demonstrate adequate EQ; TU was required to commit to meet these stringent requirements. Over the next 10 years, NRC reinterpreted the EQ criteria and required all plants, including CPSES, to meet the new requirements. As a result, equipment had to be reanalyzed, redesigned, replaced, or requalified.

- Changing NRC requirements in fire protection affected all plants under construction, including CPSES. New fire protection guidelines (Branch Technical Position 9.5-1) were issued in 1976. As a result TU had to perform an additional fire protection evaluation and a safe shutdown analysis resulting in changes in the design of the plant. Fire protection requirements continued to evolve as research continued by NRC; controversy in the NRC and the industry eventually led to the issuance of a new regulation and detailed requirements (Appendix R to 10 CFR Part 50) in 1980. NRC eventually required TU to compare CPSES, like all recent plants, with the fire protection requirements of Appendix R and identify deviations for NRC's consideration in its own review of CPSES against Appendix R. Guidance on the requirements continued to be issued in the form of workshops in early 1984, and generic letters with further guidance were issued in 1985 and 1986. CPSES was further changed to meet these evolving requirements.

Regulatory Performance

TU managed the NRC regulatory interface effectively. In keeping with prudent utility practices the TU organizational structure and management systems were modified to respond to the changing requirements during construction of CPSES.

- From an NRC perspective, TU effectively managed the licensing of CPSES. The TU licensing organization was reasonably structured and staffed and has evolved appropriately to address the changes in the status of CPSES. The performance of the licensing organization was adequate and effective in closing licensing issues and responding to NRC questions and position statements. Senior management was appropriately involved in the licensing process.

- TU took an active part in generic safety and licensing activities so as to have a voice in the safety community. TU staff maintained regular contacts with other nuclear utilities through participation on industry comittees, owners groups and other industrial forums. TU management was appropriately involved in executive level coordination of these same areas.

- TU responded appropriately to unanticipated regulatory changes. For example, TU responded in a timely and effective manner to the new requirements promulgated after the accident at Three Mile Island.

- TU established an adequate and effective interface with NRC Region IV during construction of CPSES to receive and respond to NRC input and feedback. The feedback TU received from NRC Region IV concerning the adequacy of the CPSES construction and design programs was essentially positive. Based on this feedback, TU acted reasonably in believing that prior to 1984 its engineering, construction and QA programs did not suffer from significant shortcomings. The adequacy of the Region IV inspection program was later criticized by the NRC.

- Special areas that have become important in the licensing of nuclear power plants in recent years include the management of allegations, fitness for duty programs, and the harassment and intimidation of inspectors. Many plants have had difficulty in these areas because of the inability to know the specifics surrounding the work or act after the fact. TU has acted consistent with prudent utility practice in implementing programs to deal with these special areas at CPSES.

- Third party audits were performed to provide TU with independent assessments of the CPSES construction project. Other utilities have similarly used third party audits, and NRC encourages this practice.

- TU responded appropriately to a significant licensing issue involving the Transamerica Delaval Incorporated (TDI) diesels. The failure of the main crankshaft on a TDI diesel at Shoreham in 1983 brought into question all diesel

generators manufactured by TDI that were used in safety systems at a number of plants. NRC's investigation discovered a broad pattern of deficiencies involving critical engine components. All of the diesels were eventually qualified for nuclear safety service. The NRC investigation of this matter did not fault any licensee or applicant for failures related to the TDI diesels. TU helped resolve the issue and reduce the costs by participating in the TDI owners group, which it chaired.

NRC Region IV did not implement the new inspection, enforcement and QA policies and practices of the NRC after approximately 1981 as effectively as other NRC Regions.

- The applicant is ultimately responsible for assurance of quality. However, in evaluating the adequacy of the QA program and its implementation, the applicant receives its most important feedback from the NRC. This feedback is especially important in times of significant change in the policies and practices of the NRC.

- NRC has said that it was unable to rely on Region IV to provide verification that CPSES construction and design were adequate. This was the primary reason for the Technical Review Team (TRT).

- NRC has said in retrospect that its guidance and feedback to TU were inadequate prior to 1984.

From a regulator's view, the Comanche Peak Response Team (CPRT) is an acceptable, reasonable and necessary response to resolve the NRC concerns emanating from the TRT and others. Given these concerns, the regulatory environment existing at the time, and the intervention in the licensing process coupled with allegations raised regarding CPSES, TU management acted in accordance with prudent utility practice in establishing the CPRT as a focal point to develop and implement a methodology to address systematically the issues raised. Based on these same considerations, the subsequent revisions of the CPRT were reasonable and necessary. The acceptance criteria used were appropriate for the purposes of CPRT.

The Corrective Action Program (CAP) established by TU, including the later addition of the post-construction hardware validation program, was a reasonable, appropriate and necessary means to resolve open items, including those

that had been raised in the course of the CPRT work. Additionally, CAP was a means to satisfy the licensing requirements for CPSES and to assure that the plant will operate reliably. The methodology used by the CAP contractors supports both the validation of acceptable design and hardware, and the development and performance of necessary corrective and preventive actions called for as a result of CPRT and CAP.

The scrutiny of CPSES is unprecedented in the nuclear industry.

In forming the above opinions, Mr. Olshinski and Dr. Mattson have relied on numerous source documents including, but not limited to, the following:

NRC Regulations
NRC Regulatory Documents
NRC Inspections
NRC and TU Correspondence
Special Reports
Safety Evaluation Reports and Supplements
ASLB Memoranda, Orders, and Transcripts
History of Allegations at CPSES and Other Plants
Memoranda and Letters
Organization Charts
NRC Transcripts
CPSES Documents and Records

In reaching their conclusions, Dr. Mattson and Mr. Olshinski relied upon their background, training, and experience; reviews of project documentation; their experience with licensing, inspection, enforcement and quality assurance issues faced by other nuclear power plant construction projects; information obtained from TU personnel; and information obtained from other sources.

1403u

WALTER R. MIKESELL, JR.

Mr. Walter R. Mikesell, Jr., President of Robert L. Cloud & Associates, 125 University Avenue, Berkeley, California 94710, will testify on issues concerning technical adequacy in the Piping and Pipe Support, Conduit Support, Cable Tray Hangers, HVAC Supports and Civil/Structural disciplines. He will also testify regarding the design control at CPSES. Mr. Mikesell's opinions and the bases for such opinions are as follows*, and in each of these areas in which Mr. Mikesell will offer his opinion he has found and will state that Texas Utilities has acted reasonably and in accordance with "Prudent Utility Practice" as defined in the Joint Ownership Agreement and in accordance with generally recognized and accepted industry standards and practices:

DESIGN ASSESSMENT AND CORRECTIVE ACTIONS

I. INTRODUCTION AND SUMMARY

The following terminology is used throughout this report:

technological changes - includes changing computation methods, new interpretation of codes and standards, evolution of industry practices,

additional regulatory requirements - includes new or revised Regulatory Guides, Standard Review Plans (SRP's), IE Bulletins and new interpretation and expectations of the requirements stated in these documents,

design improvements or refinements - includes design modifications for the purpose of improving design reliability, operability, and maintainability.

A. Original Design Process

The original (pre-1984) design process was fundamentally sound. The plant design was based on practices consistent with the approaches then used in other contemporary nuclear plants.

---

* Mr. Mikesell also may testify on matters about which he may be asked to give opinions in any deposition in this proceeding.

Ongoing discovery and investigation may result in this report being supplemented or amended.

B. Original Design Adequacy

CPSES has been subject to constantly evolving regulation and interpretation. The original design was technically and structurally adequate, conceived and implemented with due regard to the health and safety of the public. The CPRT and CAP programs have revealed that some parts of the original design did not meet existing standards of acceptability when it was subsequently reviewed. The work performed by the Project has produced hardware and a design basis which meet existing standards of acceptability applied by the regulator.

C. Nature of Technical Issues

The technical issues raised are primarily the result of technological changes, additional regulatory requirements and expectations, and design improvements or refinements.

D. Significance of Technical Issues

The majority of technical issues have ony minor engineering significance. The plant's design safety, maintainability and reliability are being further enhanced by the successful resolution of these issues.

E. Resolution of Technical Issues

The CPRT program and the design validation process have resolved or are effectively resolving the technical issues.

F. Final Design Adequacy

The final design will be adequate and will meet all currently existing requirements for licensing.

II. TECHNOLOGICAL AND REGULATORY EVOLUTION

The imposition of numerous new regulatory requirements and the publication of many new codes, standards and technical papers by the nuclear industry during design and construction severely impacted CPSES.

A. The PSAR and FSAR (which provided the basis for the design and safety analysis for CPSES) were revised through the years. Each revision carries with it additional requirements imposed by the Nuclear Regulatory Commission (NRC) or changes resulting from the evolution of the state of the art technology and industry practice.

B. The Federal Government published numerous regulatory guides and NUREG reports for the design of nuclear power plants from the early to the late 1970's. In general, additional design conservatisms were imposed by these new requirements.

C. New and revised codes and standards have been promulgated by the industry on a continuous basis. Adoption of any of the published new guidelines generally means more design qualification efforts or additional conservatisms, or both.

D. From late 1970's to date, guided by the industry's operating experience learned from the increasing number of plants in operation, the NRC has concentrated its effort on plant operation. This effort culminated in the issuance of many additional requirements for design improvements and enhancements in the form of Inspection and Enforcement (IE) Bulletins and Compliance Bulletins.

III. LICENSING EVENTS PRECEDING CPRT

The unusually close scrutiny received by CPSES was the principal reason CPSES has been unable to obtain an operating license to date. It has not been because the design was inadequate and unsafe.

A. NRC/SIT report states that:
"There was no indication of serious deficiencies in the piping support design or construction."

B. CYGNA Phases I & II report states that:
"The overall design activities on CPSES are adequate and the design control program has been properly implemented."

C. NRC/SRT report states that:

"Management control over the construction, inspection, and testing program is generally effective, and is receiving proper management attention."

D. NRC/TRT report, SSER No. 8, states that:
"The civil and structural construction within the scope of the TRT C&S group review effort was adequate and was for the most part, well documented."

E. NRC/TRT report, SSER No. 10, states that:

"Although about 60 issues were at least partially substantiated, most did not affect plant safety because the concerns, though valid, would not have prevented the equipment, component or system of concern from performing its intended function."

IV. CPRT AND CORRECTIVE ACTION PROGRAMS

The Design Adequacy Program under CPRT and the Corrective Action Program (CAP) are successfully resolving the technical issues.

A. TENERA reviewed the resolution methodology of the DSAP's for four disciplines. It confirmed that the methodology adopted is adequate.

B. The design validation of all safety-related aspects of design by the CAP will further demonstrate that the design of systems, structures and components complies with the licensing commitments.

C. The CAP will either demonstrate that the existing systems, structures, and components are in compliance with the design, or will ensure that modifications are made to bring systems, structures and components into compliance with the design.

V. MARGINS

Both the original design and the final (post CAP) design are safe because they provide substantial safety margins.

A. The industry has maintained the practice of providing ample design margins to account for design uncertainties.

B. The seismic design input used for the CPSES site is very conservative when considering the site historical data.

C. The analytical approach used and the modelling parameters chosen in the seismic response analysis are conservative.

D. The allowable limits used to evaluate the design adequacy of ASME components and systems are more conservative than if the ASME Code recommendations were strictly followed. All other structures, components and systems were evaluated using the allowable limits and requirements of the applicable codes and standards.

E. The cumulative effects of these and other conservatisms result in a large design margin in the original design.

F. Modifications resulting from the Design Validation and Corrective Action Programs have further strengthened the original design, increasing the already large design margin.

VI. PIPING AND PIPE SUPPORTS

A. Original Design Process

The original design process was fundamentally sound and was based on accepted engineering practices consistent with the approaches used at the time in other contemporary nuclear plants.

1. The original design process utilized an iterative design, construction and verification approach. This process was typical of that used in other nuclear plants at the time and is still used today.

2. The role of engineering judgment in the design process was greater in the past. Professional engineering must now be supported by detailed and documented analytical techniques, but engineering judgment is still a necessary ingredient in a valid design process.

B. Original Design Adequacy

The original design was adequate.

1. The AEC and the NRC, respectively, reviewed and approved the PSAR and FSAR, which provided the basis for the design.

2. An independent analysis of a sample piping system verified that the system was properly analyzed and met the applicable ASME Code requirements.

3. An NRC review included the inspection of 100 pipe support designs that had been design reviewed. The review considered the potential impact of the Walsh-Doyle allegations. No violations of NRC regulations were found. Further, the SIT review did not uncover any discrepancies that might indicate deficiencies in TU Electric's design verification program.

4. An NRC report concluded that most of the issues reviewed would not have prevented the equipment, component or system of concern from performing its intended design functions.

C. Nature of Technical Issues

The technical issues are primarily the result of technological changes, design refinements, and the need to meet regulatory requirements and expectations.

1. Not all issues resulted in modifications to pipe supports. The primary causes for modifications to hardware by the CAP relate to technical issues that are the result of the evolution of design practices and technology in the industry, and additional regulatory requirements and expectations.

2. The technical issues have been reviewed and were found to be the result of technological changes and/or refinements in the design approach.

D. Significance of Technical Issues

The technical issues are typical of those issues that could be raised if other contemporaneously designed nuclear plants were subjected to similar scrutiny. The plant's design safety, maintainability and reliability are being further enhanced by the successful resolution of these issues.

Few technical issues are attributable to correcting design errors. The resolutions of these issues have resulted in support modifications that were not substantial in engineering significance. The remaining modifications are due primarily to refinements in the original design approach and changing technology.

E. Resolution of Technical Issues

The CPRT program and the design validation process have resolved or are resolving the technical issues, ensuring that the final design will meet all currently existing requirements for licensing.

1. The third-party review concluded that the large bore pipe stress reanalysis and pipe support requalification program is comprehensive and capable of resolving known technical issues. In addition, the procedure for qualifying the as-built small bore piping was accepted by the third-party.

2. Several piping stress problems and pipe support calculations representative of the CAP work have been reviewed. The calculation packages demonstrated that documentation is consistent with current engineering practices.

3. The TU Technical Audit Program is reviewing the design validation program to assure quality and implementation of the procedures.

F. Final Design Adequacy

The final design will be adequate and will meet all currently existing requirements for licensing.

1. The resolution of the technical issues in conjunction with the CAP's design validation effort for piping and pipe supports will provide a design representative of the current state of the industry.

2. Independent parties have reviewed and accepted the resolution of the technical issues as presented by the DAP. This review work has also provided assurance that the design conforms to the licensing commitments.

3. CYGNA, in the Independent Assessment Program, and TENERA, in the third-party review, have been closely reviewing the CAP work.

VII. CABLE TRAY HANGERS

A. Original Design Process

The original design process was based on accepted engineering practice used on other contemporaneously designed nuclear plants.

1. The original design was based on an iterative design process that was used in other contemporary nuclear plants. Standardized hanger designs were developed to accommodate a variety of situations. These standardized hangers enveloped the effect of different heights, widths, span lengths, and loads.

2. It was a standard practice to specify loading combinations and design codes and to allow the engineer flexibility in determining the method and format of the calculation.

3. The design validation process has verified the validity of the design approach used by the A/E.

B. Original Design Adequacy

The original design was adequate.

1. The number of supports modified is less than 8% of the total supports. Only 3% are major modifications. These modifications are the result of stricter regulatory and licensing expectations.

2. The original system would not have failed because there is significant margin as substantiated by dynamic tests.

3. The original design by equivalent static calculations is shown to be more conservative than design by dynamic analysis procedures. This has been substantiated by the CAP work and by dynamic testing.

C. Nature of Technical Issues

The technical issues are primarily the result of technological changes, additional regulatory requirements and expectations.

1. The majority of the issues are the direct result of technology changes, additional regulatory requirements and expectations and design evolution.

2. Several of the issues developed because the assumptions used were not documented. These issues are primarily the result of changing regulatory requirements on documentation control. Most of these assumptions have been validated.

D. Significance of Technical Issues

The 35 issues raised by the Generic Issues Report (GIR) and the 9 Significant Deficiency Analysis Reports (SDARs) related to cable tray hangers do not impact the design significantly.

1. A study of 600 configurations was performed using the Dynamic Amplification Factor (DAF) method. From this study, approximately 90% of the hangers could be justified conservatively using a DAF of 1.0 or less. Only 2 of the hangers studied required a DAF of more than 1.25. In addition, comparison of the dynamic analysis approach with the DAF approach shows that the dynamic analysis approach requires fewer support modifications. Therefore, the DAF of 1.0 used in the original design is acceptable in most cases.

2. The issue of the controlling load case for anchor bolts resulted in support modifications of less than 2% of the total supports.

3. The design validation process is addressing the cumulative effects and assuring design adequacy. The resulting modifications are less than 8% of the total supports.

E. Resolution of Technical Issues

The design validation process, the Comanche Peak Response Team (CPRT) program and the CAP are resolving effectively all technical issues, ensuring that the final design is adequate and safe, and meets all currently existing requirements for licensing.

1. CYGNA closed out all but a few subissues in the latest revision of the Review Issues List (RIL).

2. TENERA stated in the Results Report for the CPRT Design Adequacy Program that the design validation program is comprehensive and capable of resolving all known issues and assuring the design will meet the FSAR and licensing commitments.

F. Final Design Adequacy

The final design will be adequate and will meet all currently existing requirements for licensing.

1. TENERA stated in the Results Report for the CPRT Design Adequacy Program that the design validation program is comprehensive and capable of resolving all known issues and assuring that the design will meet the FSAR and licensing commitments.

2. The PSR states that the Unit 1 and Common cable tray hangers comply with the CPSES licensing commitments, and as-built hangers comply with the validated design and with the CPSES licensing commitments. It also states that cable tray hangers will perform their safety-related functions. CYGNA, in the Independent Assessment Program, has been closely reviewing the CAP work and has accepted the resolution of the technical issues. This review work has also provided assurance that the designs conform to licensing commitments.

VIII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) SUPPORTS

A. Original Design Process

The original design process was consistent with contemporaneous industry engineering practice.

1. It was and is a common practice in the industry to use an iterative design process. Standardized supports were developed that would envelop the effect of different duct sizes, duct span lengths, and loadings.

B. Original Design Adequacy

The original design was adequate.

1. A total as-built walkdown has been completed for HVAC supports in Unit 1 and Common. A total of 19% of supports require modifications. Of these, about 55% require only minor modifications, such as changes in welds or anchor bolts. In the remaining modifications, 35 new supports were added. The rest involve mainly the replacement or addition of a member.

C. Nature of Technical Issues

The technical issues resulted primarily from technological changes, additional regulatory requirements and design evolution.

1. Many of the issues raised for HVAC are taken from issues for cable trays and conduits. They result primarily from technological changes, additional regulatory requirements and expectations and design evolution (as stated previously).

D. Significance of Technical Issues

The technical issues related to HVAC supports do not have a significant impact on the design adequacy or safety of the plant.

1. There are 59 Generic Issues and 2 Significant Deficiency Analysis Reports (SDARs) relating to HVAC. 31 of these were taken from the Cable Tray and Conduit GIR's, many of which have little or no impact on the HVAC supports.

2. The original design used a DAF of 1.0 in the static analysis whereas the validation effort is using 1.5. A study completed for cable tray hangers demonstrates that the original factor used is acceptable for most hangers. Since the HVAC system is more rigid than the cable tray system, a smaller DAF would be acceptable for the HVAC supports. Therefore, the original factor used for HVAC would also be acceptable.

3. The design validation program has demonstrated that the cumulative effects of all HVAC design issues will result in 19% of the total supports being modified.

E. Resolution of Technical Issues

The CPRT program and the design validation process have effectively resolved all technical issues, ensuring that the final design is adequate and meets all currently existing requirements for licensing.

1. An audit of the design validation work demonstrated that the calculations reviewed were in compliance with the technical requirements.

F. Final Design Adequacy

The final design is adequate and meets all currently existing requirements for licensing.

1. A review of the current design procedures and design criteria shows that the design validation process ensures compliance with all licensing requirements.

2. The Comanche Peak Technical Audit Team is performing audits on an on-going basis to ensure the quality of the design validation and the implementation of the procedures.

IX. CONDUITS - TRAINS A, B and C

A. Original Design Process

The original design process was fundamentally sound. It was based on accepted engineering practices consistent with the approaches used in the contemporary nuclear industry.

1. Trains A and B, and C Larger Than Two Inches

a. Essentially the same design process is being used in the design validation work as was used in the original design. This process uses a set of rules to determine support locations and types. The original design was qualified by documenting conformance to these rules rather than by analysis of each configuration.

2. Train C Two Inches and Less

a. The original design process used span rules based on gravity loading. It was assumed that typical supports would be adequate to restrain the light, small diameter conduits for seismic loading. The adequacy of this approach

is demonstrated by the insignificant number of modifications (less than 1% of the supports) identified through the CAP.

B. Original Design Adequacy

The original design was adequate.

1. Trains A and B, and C Larger Than Two Inches

a. CYGNA reviewed the original design. CYGNA's findings are presented in the Conduit Supports Review Issues List. The CAP is addressing each of CYGNA's findings.

b. The modifications resulting from the CAP are not extensive. Specifically, less than 7% of the total supports in Unit 1 are being modified due to all of the issues. More than a third of the modifications are for the removal or replacement of Unistrut supports. About half of these modifications are to assure compliance with stated design allowable stresses. Most of the replacements were made because it was not economical to establish their capacity.

2. Train C Two Inches and Less

a. Less than 1% of the supports had to be modified as a result of the CAP.

b. The level of stress in the supports which were modified would not have resulted in failure.

C. Nature of Technical Issues

The technical issues are primarily the result of technological changes, additional regulatory requirements, and design improvements or refinements.

1. Trains A and B, and C Larger Than Two Inches

a. The use of a DAF of 1.00 was consistent with contemporary industry practice.

b. A more recent study shows that the DAF is usually below 1.25 and does not exceed 1.5.

c. Tests were performed prior to the CAP to determine Unistrut support capacities because simple analytical procedures were not available for the proposed application.

2. Train C Two Inches and Less

a. The usual assumption of seismic adequacy of small diameter conduit was not acceptable to the NRC and as a result, more explicit documentation was required.

D. Significance of the Technical Issues

The majority of technical issues have only minor engineering significance. The resolution of these issues further enhances the plant design safety and reliability.

1. Trains A and B, and C Larger Than Two Inches

a. Few issues resulted in hardware modifications.

b. The total number of modifications is less than 7% of all supports in Unit 1.

2. Train C Two Inches and Less

a. There is only one technical issue, and this issue had minimal impact on modifications.

b. Less than 1% of the supports had to be modified as a result of the CAP.

c. The level of stress in the supports which were modified would not have resulted in failure.

E. Resolution of Technical Issues

The CPRT program and the design validation process have resolved or are effectively resolving the technical issues, ensuring that the final design is adequate and will meet all currently existing requirements for licensing.

1. Trains A and B, and C Larger Than Two Inches

a. TENERA reviewed and approved the resolution methods for the issues and the overall adequacy of the validation program.

b. CYGNA is reviewing the design validation program but has not issued a final report. This review has not resulted in any significant changes to the program.

c. The NRC audited the as-built field verification program and concluded that the procedures and implementation to be adequate with the exception of a few documentation findings.

d. The TU Technical Audit Program is performing audits on a regular basis. All findings are addressed and procedures changed as necessary.

e. All of the Ebasco analysis procedures and calculation files that were reviewed were of acceptable quality.

f. The NRC is in the process of reviewing the resolution of the issues and the entire conduit support corrective action program.

2. Train C Two Inches and Less

a. The resolution methods for the NRC issue and the overall adequacy of the design validation program have been reviewed and accepted by TENERA.

b. The NRC audited the as-built verification program. This included a review of design criteria, procedures, and calculation packages. This review covered the overall design methodology used to qualify conduits and conduit supports.

c. The TU Technical Audit Program is performing audits of the CAP work on a regular basis. All findings are addressed and procedures changed as necessary.

F. Final Design Adequacy

The final design will be adequate and will meet all currently existing requirements for licensing.

1. Trains A and B, and C Larger Than Two Inches

a. CYGNA, TENERA and the NRC have reviewed the original design thoroughly as part of the DAP and the Independent Assessment Program (IAP). This review resulted in a number of questions or issues. This review, in conjunction with the resolution of all issues resulting from the review, ensures that the final design will be adequate.

b. The CAP is performing a validation of all design and construction. This effort resolves or removes all of the issues and provides an independent check of the original design. CYGNA and TENERA are reviewing the entire program, in addition to reviewing the resolution of the issues. Also, the TU Technical Audit Program is auditing the effort.

2. Train C Two Inches and Less

a. A validation of all design and construction is being performed as part of the CAP. TENERA is reviewing this effort. This work is also being audited under the TU Technical Audit Program, and has been audited by the NRC.

X. CIVIL/STRUCTURAL

A. Original Design Process

The original design process was sound and was based on engineering practices generally recognized and accepted by the nuclear industry at the time.

1. The PSAR and FSAR (which provided the basis for the design and safety analysis) were reviewed and approved by the AEC and NRC, respectively.

2. Gibbs & Hill specifications used for the design of civil structures were reviewed in detail and concluded to be adequate by TENERA.

B. Original Design Adequacy

The original civil/structural design was based on accepted engineering practice in the contemporary nuclear industry. The resulting civil structures will perform their intended functions.

1. The NRC/TRT examined and documented in SSER No. 8 approximately 60 concerns and allegations primarily related to the construction of civil structures, and identified 8 "potential" safety-significant issues. Two of the 8 issues were identified and resolved under the QA/QC program at the time of the TRT review. Most of the 8 issues are not related to the adequacy of the original design.

2. Few design changes and hardware modifications have been identified, even after extensive independent reviews of the original design and construction.

3. Loads were determined conservatively for the original design of civil structures for the CPSES plant.

C. Nature of Technical Issues

The majority of the design-related technical issues resulted primarily from technological changes, additional regulatory requirements and design enhancements.

1. The majority of the DIRs prepared by TENERA and considered to be valid by SWEC are related to technological changes, additional regulatory requirements and design enhancements.

2. The few potentially significant technical issues that resulted from concerns raised by the NRC/TRT, CYGNA and TENERA are due to technological changes or design enhancements.

D. Significance of Technical Issues

The majority of technical issues have minor engineering significance.

1. Three potentially significant technical issues raised by the NRC/TRT have been demonstrated by the CPRT to have no engineering significance.

2. One potentially significant technical issue originally identified by the NRC/TRT and further explored by the CPRT was determined to have engineering significance.

3. Three potentially significant technical issues raised by the NRC/TRT resulted from violation of construction procedures. Two of these issues, however, required only minor design modifications and the other has minor engineering significance.

4. Two potentially significant technical issues identified to date have resulted from allegations made by CASE and concerns raised by CYGNA and TENERA. These issues have been demonstrated to have minor engineering significance.

E. Resolution of Technical Issues

The technical issues have been, or will be, resolved by either the CPRT or the CAP.

1. The Issue Specific Action Plan (ISAP) Results Reports have addressed all the NRC/TRT issues. The majority of the issues have been resolved and the remainder are being resolved.

2. Technical issues other than those identified by the NRC/TRT either have been or are being resolved as presented in Significant Technical Issue Reports (STIRs) and ISAP Results Reports.

F. Final Design Adequacy

The final design will be adequate and safe, and will meet all currently existing requirements for licensing.

1. The original design, as described in Section X(B), has been demonstrated to be adequate.

2. Design changes, hardware modifications, and better documentation of the analysis and design performed by the CAP follow the current industry practice and enhance both the safety and licensability of the plant.

XI. DESIGN CONTROL

A. Introduction and Summary

Adequate design control programs were in effect during all phases of the Project. Design activities were controlled via the implementation of measures required by Criterion III of 10 CFR 50, Appendix B. The CPSES program for design control can be divided into eight elements.

B. Organizational Responsibilities and Personnel Training and Qualifications

Adequate programs and procedures to define the responsibilities of design organizations to evaluate and document personnel qualifications, and train personnel for their assigned activities were in place.

C. Design Input and Design Interfaces

There were adequate programs providing for input of design information including regulatory requirements and design commitments to all phases of the design process. Interface instructions or policies existed to control the transfer of information between design organizations.

D. Preparation of Drawings, Field Design Changes and As-Built Verification

Adequate programmatic controls were in effect to provide for communication of designs by engineering drawings to fabrication, construction and installation organizations. Design changes originating in the field generally were subject to procedures and instructions for documentation of changes as an integral part of the engineering records. The as-built verification program required that final design documents would reflect actual configurations and conditions as constructed and installed.

E. Performance of Analyses, Calculations, and Supporting Documentation

Adequate programmatic controls were in effect governing the preparation of design calculations and analyses and other documents supporting the design.

F. Preparation of Vendor Specifications

Adequate procedural controls were in place covering the preparation of specifications for equipment, parts, materials and processes.

G. Independent Checking and Design Review

Adequate programmatic controls provided for the independent checking and review of design documents, including drawings, calculations, and specifications for technical adequacy and conformance to commitments and requirements.

H. Performance and Documentation of Qualification Testing

Adequate instructions and procedures provided for the performance and documentation of testing where designs could best be validated by testing.

I. Design Document Issuance, Approval and Revision

There were adequate procedures in effect controlling the approval and issuance of documents by the responsible organization and the review, issuance and incorporation of changes into the design basis.

In reaching these opinions, Mr. Mikesell has relied on the following:

--His background, experience, his training as a professional engineer, his knowledge of the design and construction of CPSES, knowledge of the nuclear industry and applicable regulatory requirements, and information obtained from current and former TU employees and TU contractors involved in Engineering Management.

--Review of CPSES Project documents, including reports, correspondence, minutes of meetings, organization charts and business memoranda.

13910

PATRICK A. NEVINS

Mr. Patrick A. Nevins, a Principal with the management consulting firm of Cresap, a Towers Perrin company, located at 1100 Superior Avenue, Cleveland, Ohio 44114, may testify at trial regarding licensing management of the Comanche Peak Steam Electric Station (CPSES). The opinions of Mr. Nevins that may be offered at trial are based on information reviewed and assessments completed to date. Ongoing discovery and investigations may result in this report being supplemented or amended. With respect to the subject areas on which Mr. Nevins may offer an opinion, Mr. Nevins has concluded and will state that TU Electric (TU) has acted reasonably and in accordance with "Prudent Utility Practice," as that term is defined in the Joint Ownership Agreement.

In addition to opinions regarding subject matters about which Mr. Nevins may be asked during his deposition, he may also offer the following specific opinions:

- The TU licensing organization was appropriately planned, structured and staffed, with responsibilities properly assigned and implemented.

- The TU licensing organization was clearly defined and structured to facilitate the implementation of its assigned role.

  - Roles and responsibilities within the TU licensing organization were clearly defined and implemented.

  - The evolution of functional representation and staffing levels within the TU licensing organization was consistent with the project's requirements considering the required technical expertise, scale of project activities, and assigned responsibilities.

  - Key TU licensing personnel had appropriate and relevant experience for the roles assigned.

  - TU's staffing policies allowed for changes in key licensing personnel while facilitating continuity of project-specific experience.

  - The TU licensing organization used specialized expertise to address specific licensing and regulatory issues as needed.

  - The TU licensing organization communicated with other project groups to facilitate the coordination of interrelated activities.

- TU has facilitated the implementation of the CPSES licensing function by establishing appropriate licensing procedures and processes throughout the project.

  - TU established and maintained a proactive approach to the licensing process, including communicating on a frequent and timely basis with regulatory agencies.

  - The TU licensing organization established policies and procedures to facilitate the systematic performance of licensing activities.

  - TU and its contractors had input to and provided support of the project's licensing policies and activities.

  - TU and its contractors generally identified and obtained licenses and permits in a timely manner to support the project schedule.

- TU's senior management displayed appropriate involvement in the licensing process throughout the project.

Mr. Nevins' opinions are based on information obtained from TU Electric, project personnel, and information obtained from other experts designated by TU Electric, including Roger Mattson, a review of project documentation, a review of related depositions and sworn testimony of witnesses at various hearings, and his training as a professional engineer and his background and experience with licensing management issues faced by other nuclear power plant construction projects.

24591

ROBERT G. SHIELDS

Mr. Robert G. Shields, a Managing Consultant with the management consulting firm of Cresap, a Towers Perrin company, located at 200 West Madison Street, Chicago, Illinois 60606, may testify at trial regarding quality assurance (QA) management of the Comanche Peak Steam Electric Station (CPSES). The opinions of Mr. Shields that may be offered at trial are based on information reviewed and assessments completed to date. Ongoing discovery and investigations may result in this report being supplemented or amended. With respect to each of the subject areas on which Mr. Shields may offer an opinion, Mr. Shields has concluded and will state that TU Electric (TU) has acted reasonably and in accordance with "Prudent Utility Practice," as that term is defined in the Joint Ownership Agreement.

In addition to opinions regarding subject matters about which Mr. Shields may be asked during his deposition, he may also offer the following specific opinions:

* Management policies concerning project quality were appropriately defined, formally promulgated and visibly supportive of quality efforts.
  - Management policies concerning project quality were formally promulgated and reflected a determination to achieve quality objectives.
  - Management was visibly involved in and provided evident support of quality efforts.
* The QA function was separated from the functions it directly monitored, yet retained adequate influence over other project functions.
  - Reporting relationships for the QA function were separated from those of the project functions directly monitored by QA, thereby avoiding undue influence of cost, schedule and other concerns on project quality.
  - The QA function had appropriate influence over other project functions, including the authority to stop work.

* The QA organization was appropriately planned, structured and staffed, with responsibilities properly assigned and implemented.

  - The QA organization was clearly defined and structured, thereby facilitating implementation of its assigned role.

  - The assignment of roles and responsibilities within the QA organization was clearly defined and implemented.

  - The evolution of functional representation and staffing levels within the QA organization was consistent with project requirements considering the required technical expertise, scale of project activities, and assigned responsibilities.

  - QA staffing policies allowed for changes in key personnel while facilitating continuity of project-specific experience.

  - Key QA personnel had appropriate and relevant experience for the roles assigned.

  - TU used specialized expertise as needed to address specific QA issues.

* The systems and processes for providing management information and control concerning project quality were clearly defined and implemented.

  - Plans, procedures and performance in monitoring and auditing the quality program were comprehensive and regularly reviewed by management.

  - Systems were in place and used to keep management informed of quality problems in facilitating identification and correction of programmatic weaknesses.

  - Correction of quality deficiencies included analysis of trends, determination of root causes, and monitoring for timely completion of assigned corrective actions.

  - The procedures for documenting project quality and retaining quality records met the project's needs and regulatory requirements.

Mr. Shields' opinions are based on information obtained from TU Electric and CPSES project personnel; an extensive review of project documentation, related depositions and sworn testimony of witnesses at various hearings; his training as a professional engineer; and his background and experience, including his experience with quality assurance management issues faced by managers at other nuclear power plant construction projects.

24571

ATTACHMENT "B"

JOHN W. BECK

John W. Beck, 400 North Olive Street, L.B. 81, Dallas, Texas 75201, may be called upon at trial to offer the opinions and conclusions set forth below. With respect to the subject matter of these opinions and conclusions, Mr. Beck has concluded that the performance of TU Electric (TU) has been reasonable and consistent with "Prudent Utility Practice" as that term is defined in the Joint Ownership Agreement.

Mr. Beck may also offer opinions regarding matters about which he may be asked during his deposition in this proceeding. The opinions of Mr. Beck that may be offered at trial are based on information received and assessments completed to date. Ongoing discovery and investigations may result in this report's being supplemented or amended.

- The TU Quality Assurance Program satisfies the applicable requirements of 10 C.F.R. Part 50, Appendix B.

- The TU licensing organization is appropriately planned, structured and staffed, follows appropriate licensing procedures and processes, enjoys appropriate involvement by senior TU management and is responsive to NRC and applicable regulatory requirements.

- In order to license a nuclear power plant, an applicant must make judgments about the standards of acceptability that NRC will apply.

- NRC's standards of acceptability constantly evolve and change.

- NRC's evolving standards of acceptability have become more stringent and burdensome over time.

- CPSES has been held to an unprecedented level of regulatory scrutiny.

- The Comanche Peak Response Team program (CPRT) was a reasonable and necessary response by TU to the regulatory environment in which TU found itself in late 1984; the CPRT was designed and implemented in a reasonable manner.

- Revision 4 to CPRT was reasonable.

- The Corrective Action Program (including the 100% design validation, the design basis consolidation program and the post construction hardware validation plan) is a reasonable and necessary response to the regulatory environment in which TU found itself in early 1986 and thereafter.

- Regulatory change affects most severely those plants that are in the late stages of design and construction.

- In his opinion CPSES should receive an operating license.

Mr. Beck's opinions and conclusions are based upon his background and training, his experience in the nuclear power industry, including his employment at Vermont Yankee Nuclear Power Corporation as Executive Vice President, his employment as Vice President of TERA Corporation, and his employment at TU, first as Executive Assistant to the President, then as Manager, Nuclear Licensing, then as Vice President, Licensing, Fuels, Quality Assurance, and currently as Vice President, Nuclear Engineering. The factual basis for his opinions and conclusions include his dealings with NRC, information received as Chairman of the CPRT Senior Review Team, evaluations and reports prepared by contractors, internal evaluations and reports and his day-to-day involvement with CPSES.

1404u

PERRY G. BRITTAIN

Mr. Perry G. Brittain, 6806 Hyde Park Drive, Dallas, Texas 75231, may testify on the involvement of senior management of TU Electric (TU) in the planning and management of the construction of Comanche Peak. Mr. Brittain would opine that the involvement of senior management of TU in Comanche Peak was constant and adequate to assure the proper planning and construction of the project. These opinions would include that TU has acted reasonably and in accordance with "Prudent Utility Practice" as defined in the Joint Ownership Agreement and would be based on Mr. Brittain's background, training and experience, his knowledge of Comanche Peak and his knowledge of similar construction programs by other electric utilities in the construction of nuclear generating units.

Mr. Brittain also may testify on matters about which he has been asked to give opinions in any deposition in this proceeding. Ongoing discovery and investigations may result in this report being supplemented or amended.

1399u

DAVID N. CHAPMAN

David N. Chapman may be called upon at trial to offer opinions regarding the quality assurance (QA) organization and program at CPSES. If offered, his opinions are limited to the time periods for which he had responsibility at CPSES for the areas to which his respective opinions relate. Mr. Chapman's business address is 400 North Olive, L.B. 82, Dallas, Texas 75201.

Mr. Chapman may offer opinions regarding matters about which he was asked during his deposition in this proceeding. The opinions that may be offered are based on information reviewed and assessments completed to date. Ongoing discovery and investigations may result in this report being supplemented or amended.

Mr. Chapman may offer at trial an opinion that the overall performance of the TU Electric (TU) QA organization and program at CPSES was reasonable and consistent with "Prudent Utility Practice," as that term is defined in the Joint Ownership Agreement. Mr. Chapman may also offer the following specific opinions:

- That the TU QA organization and program generally was appropriately structured and staffed, with responsibilities appropriately defined, assigned and implemented.

- That the TU QA organization generally established and implemented appropriate policies, procedures and processes to verify the implementation of 10 CFR Part 50, Appendix B.
- That the TU QA organization generally maintained appropriate relationships with other project functions and organizations.
- That the management of the TU QA organization, as well as other TU management, generally was aware of, involved in, and provided support for the QA program and its implementation.
- That during the CPSES project, regulatory standards, guidelines, and interpretations evolved and changed, often unpredictably, affecting the entire project.
- That those implementing the TU QA program were required to exercise judgment regarding standards of acceptability.
- That the judgments made and the activities performed by the TU QA organization generally were informed, reasonable, and appropriate.

Mr. Chapman's opinions are based on his background, training, employment and experience, including his position as Manager, Quality Assurance from 1976 to 1985. The foundation for his opinions include his interactions with the NRC, other utilities and utility organizations, and consultants; his

knowledge and review of evaluations and reports prepared by the NRC and other third parties; his knowledge and review of internal memoranda, reports, evaluations, and correspondence; and his day-to-day activities relating to CPSES.

2471i

B. R. CLEMENTS

B. R. Clements may be called upon at trial to offer opinions regarding nuclear operations and the quality assurance (QA) organization and program at CPSES, as well as the performance of senior management relating to CPSES. If offered, his opinions are limited to the time periods for which he had responsibility at CPSES for the areas to which his respective opinions relate. Mr. Clements' business address is 115 West Seventh Street, Fort Worth, Texas 76101.

Mr. Clements may offer opinions regarding matters about which he was asked during his deposition in this proceeding. The opinions that may be offered are based on information reviewed and assessments completed to date. Ongoing discovery and investigations may result in this report being supplemented or amended.

Mr. Clements may offer at trial an opinion that the overall performance of both the TU Electric (TU) QA organization and program and the nuclear operations organization and program at CPSES, as well as CPSES-related senior management involvement in QA and nuclear operations, were reasonable and consistent with "Prudent Utility Practice," as that term is defined in the Joint Ownership Agreement. Mr. Clements may also offer the following specific opinions:

- That the TU QA organization and program and the TU nuclear operations organization and program generally were appropriately structured and staffed, with responsibilities appropriately defined, assigned and implemented.
- That the TU QA organization generally established and implemented appropriate policies, procedures, and processes to verify the implementation of 10 CFR Part 50, Appendix B.
- That the TU nuclear operations organization generally established and implemented appropriate policies, procedures and processes to achieve defined objectives.
- That the TU QA organization and the TU nuclear operations organization generally maintained appropriate relationships with other project functions and organizations.
- That the management of the TU QA organization, as well as other TU management, generally was aware of, involved in, and provided support for the QA program and its implementation.
- That during the CPSES project, regulatory standards, guidelines, and interpretations evolved and changed, often unpredictably, affecting the entire project.
- That those implementing the TU QA program and the nuclear operations program were required to exercise judgment regarding standards of acceptability.

- That the judgments made and the activities performed by the TU QA organization and the nuclear operations organization generally were informed, reasonable, and appropriate.
- That appropriate senior management of TU was informed of and provided the necessary support for the CPSES project.

Mr. Clements' opinions are based on his background, training, employment and experience, including his experience and training in the United States Navy Nuclear Program and his CPSES-related positions as Manager of Nuclear Operations, Vice President and Manager of Nuclear Operations and Vice President, Nuclear. The foundation for his opinions include his interactions with the NRC, other utilities and utility organizations, and consultants; his knowledge and review of evaluations and reports prepared by the NRC and other third parties; his knowledge and review of internal memoranda, reports, evaluations, and correspondence; and his day-to-day activities in the United States Navy Nuclear Program and his activities relating to CPSES.

2471i

WILLIAM G. COUNSIL

With respect to subject matters which Mr. Counsil may offer opinions, Mr. Counsil has concluded that the performance of TU Electric was reasonable and consistent with "Prudent Utility Practice" as that term is defined in the Joint Ownership Agreement. Mr. Counsil, 400 North Olive, Dallas, Texas 75201, may be called upon at trial to offer the opinions and conclusions which are as follows:

--That the CPRT Program and the Corrective Action Program and all of their related programs were a reasonable and prudent response to the regulatory environment; the implementation and procedures used in said programs were prudent; and said programs were necessary in order to obtain a license in the current regulatory environment.

--That nuclear power is an important, safe, and reliable energy source for the United States.

--That CPSES is a very well-built plant that will provide a necessary supply of electricity to this area reliably and efficiently.

--That the staff at TU Electric has an impressive level of expertise and is dedicated to doing their job properly.

--That TU Electric has a total management and employee commitment to safety.

--That the experience of CPSES is very similar to that of other nuclear power plants in the nation that have been targeted by sophisticated anti-nuclear groups.

--That the nature of the nuclear regulatory process in the United States has resulted in no nuclear units being ordered since 1978.

--That in order to obtain a license for the operation of a nuclear power plant, an applicant must make judgments about the standards of acceptability the regulator will apply.

--That the standards of acceptability applied by the regulator constantly evolve and change.

--That the evolving standards of acceptability applied by the regulator have become more stringent.

--That with respect to the matters with which he is familiar, the judgments made by TU Electric have been reasonable and prudent responses to expected standards of acceptability.

--That CPSES has been held to an unprecedented level of regulatory scrutiny.

--That regulatory change impacts most severely those plants which are in the late stages of design and construction.

--That in his opinion CPSES will receive an operating license.

Mr. Counsil's opinions and conclusions are based upon his experience, training, knowledge, and background in the nuclear power industry for over 20 years including his employment at Northeast Utilities and his position as Executive Vice President of Nuclear Engineering and Operations for TU Electric. The factual basis for his opinions and conclusions also include: his extensive interaction with the Nuclear Regulatory Commission; his participation in various committees; the evaluations and reports prepared by contractors retained by TU Electric, and internal memoranda, reports, and evaluation generated by TU Electric; and his day-to-day management of CPSES.

Ongoing discovery through litigation and investigations in connection with the CPRT and CAP programs may result in this report being supplemented or amended.

Mr. Counsil may also testify on matters about which he may be asked to give opinions in any deposition in this proceeding.

9598d

LOUIS F. FIKAR

Mr. Louis F. Fikar, 3736 Echo Trails, Fort Worth, Texas 76109, may testify on the involvement of senior management of Texas Utilities Services, Inc. (TUSI) in the management of Comanche Peak from 1976 to 1985. Mr. Fikar would opine that Project Management was properly organized and staffed and that the decisions made were proper and based on adequate experience and information. Mr. Fikar would also opine that the contractual relationships between TUSI and the major contractors were proper and changes were agreed upon to reflect the evolution of the construction and engineering efforts in the project. These opinions would include that TUSI acted reasonably and in accordance with "Prudent Utility Practice" as defined in the Joint Ownership Agreement and would be based on Mr. Fikar's background, training and experience, his knowledge of Comanche Peak, and his knowledge of similar construction programs by other electric utilities in the construction of nuclear generating units.

Mr. Fikar also may testify on matters about which he may be asked to give opinions in any deposition in this proceeding. Ongoing discovery and investigations may result in this report being supplemented or amended.

JOHNSON L. FORBIS

Mr. Johnson L. Forbis, 9838 Cloister, Dallas, Texas 75201, may testify as to the planning and early construction of Comanche Peak from 1971 to 1975. Mr. Forbis would testify that the planning for the construction of the project, the selection of major contractors and the early construction of Comanche Peak were well conceived and properly executed. These opinions would include that TU Electric acted reasonably and in accordance with "Prudent Utility Practice" as defined in the Joint Ownership Agreement and would be based on Mr. Forbis' background, training and experience as well as his knowledge of Comanche Peak and similar construction programs by other electric utilities in the construction of nuclear generating units.

Mr. Forbis also may testify on matters about which he may be asked to give opinions in any deposition in this proceeding. Ongoing discovery and investigations may result in this report being supplemented or amended.

1399u

ROBERT J. GARY

Robert J. Gary may be called upon at trial to offer opinions regarding nuclear operations and the quality assurance (QA) organization and program at CPSES, as well as the performance of senior management relating to CPSES. If offered, his opinions are limited to the time periods for which he had responsibility at CPSES for the areas to which his respective opinions relate. Mr. Gary's business address is 400 North Olive, Dallas, Texas 75201.

Mr. Gary may offer opinions regarding matters about which he was asked during his deposition in this proceeding. The opinions that may be offered are based on information reviewed and assessments compieted to date. Ongoing discovery and investigations may result in this report being supplemented or amended.

Mr. Gary may offer at trial an opinion that the overall performance of both the TU Electric (TU) QA organization and program and the nuclear operations organization and program at CPSES, as well as CPSES-related senior management involvement in QA and nuclear operations, was reasonable and consistent with "Prudent Utility Practice," as that term is defined in the Joint Ownership Agreement. Mr. Gary may also offer the following specific opinions:

- That the TU QA organization and program and the TU nuclear operations organization and program generally were appropriately structured and staffed, with responsibilities appropriately defined, assigned, and implemented.
- That the TU QA organization generally established and implemented appropriate policies, procedures, and processes to verify the implementation of 10 CFR Part 50, Appendix B.
- That the TU nuclear operations organization generally established and implemented appropriate policies, procedures, and processes to achieve defined objectives.
- That the TU QA organization and the TU nuclear operations organization generally maintained appropriate relationships with other project functions and organizations.
- That the management of the TU QA organization, as well as other TU management, generally was aware of, involved in, and provided support for the QA program and its implementation.
- That during the CPSES project, regulatory standards, guidelines, and interpretations evolved and changed, often unpredictably, affecting the entire project.

- That those implementing the TU QA program and the nuclear operations program were required to exercise judgment regarding standards of acceptability.
- That the judgments made and the activities performed by the TU QA organization and the nuclear operations organization generally were informed, reasonable, and appropriate.
- That appropriate senior management of TU was informed of and provided the necessary support for the CPSES project.

Mr. Gary's opinions are based on his background, training, employment and experience, including his position as Executive Vice President and General Manager of TUGCO. The foundation for his opinions include his interactions with the NRC, other utilities and utility organizations, and consultants; his knowledge and review of evaluations and reports prepared by the NRC and other third parties; his knowledge and review of internal memoranda, reports, evaluations, and correspondence; and his day-to-day activities relating to CPSES.

2471i

MICHAEL HALL

Mr. Michael Hall, Farm Road 56 North, Glen Rose, Texas 76043, has been affiliated with the Comanche Peak Steam Electric Station since August of 1977 when he became the project accountant. Mr. Hall has knowledge of and may testify about estimating, budgeting, cost reporting and cost increases at Comanche Peak. Mr. Hall may offer his opinion, based on his education, background, training and experience, that the estimating, budgeting, and cost reporting systems were reasonable and adequate and in conformance with "Prudent Utility Practice" as defined in the Joint Ownership Agreement. Mr. Hall also may testify on matters about which he may be asked to offer opinions in any deposition in this proceeding. Ongoing discovery and investigations may result in this report being supplemented or amended.

2464i

JOHN T. MERRITT

Mr. John T. Merritt, 400 North Olive, Dallas, Texas 75201, may testify on the organization and management of the construction and engineering efforts on Comanche Peak from 1977 to 1986. In addition, Mr. Merritt may testify as to the management and organization of the Startup program from 1982 to 1983. Mr. Merritt would opine that the organization, staffing and management of these efforts were reasonable and prudent throughout the relevant time periods and fully in conformance with standards in the electric utility industry during the relevant periods. Mr. Merritt's opinions would include that TU Electric acted reasonably and in accordance with "Prudent Utility Practice" as defined in the Joint Ownership Agreement and would be based on his background, training and experience, his knowledge of Comanche Peak and his knowledge of similar construction programs by other electric utilities in the construction of nuclear generating units.

Mr. Merritt also may testify on matters about which he may be asked to give opinions in any deposition in this proceeding. Ongoing discovery and investigations may result in this report being supplemented or amended.

LARRY D. NACE

Mr. Nace, 400 North Olive, Dallas, Texas 75201, may be called upon at trial to offer the following opinions and conclusions:

- That the CAP programs have progressed in a timely and efficient manner.

- That the costs of the CAP programs have been reasonable and necessary.

- That the implementation of the design basis consolidation program was a reasonable management decision and necessary to the licensing and operation of CPSES.

- That the implementation of the configuration management program was a reasonable management decision and necessary to the licensing and operation of CPSES.

- That the implementation of the Technical Audit Program and CAP Engineering Functional Evaluation were reasonable management decisions and necessary to the licensing and operation of CPSES.

- That the implementation of the Post Construction Hardware Validation Program was a reasonable management decision and necessary to the licensing and operation of CPSES.

- That the implementation of the design validation through the Corrective Action Program was a reasonable management decision and necessary to the licensing and operation of CPSES.

- That in order to license a nuclear power plant, an applicant must make judgments about the standards of acceptability the regulator will apply.

- That the standards of acceptability applied by the regulator constantly evolve and change.

- That the evolving standards of acceptability applied by the regulator have become more stringent and burdensome.

- That the judgments made by TU have been reasonable and appropriate responses to expected standards of acceptability.

- That CPSES has been held to an unprecedented level of regulatory scrutiny.

- That regulatory change impacts most severely those plants which are in the late stages of design and construction.

- That TU has acted reasonably and in accordance with "Prudent Utility Practice" as that term is defined in the Joint Ownership Agreement.

Mr. Nace's opinions and conclusions are based upon his background, his training as a professional engineer, and experience in the nuclear power industry, including his employment at Stone & Webster and as Vice President of Engineering and Construction for TUEC. The factual foundation for his opinions and conclusions include: his extensive interaction with the Nuclear Regulatory Commission; the evaluations and reports prepared by the regulator and contractors retained by TUEC, and internal memoranda, reports, and evaluations generated by TUEC; and his day-to-day management of the engineering and construction of the Project.

Mr. Nace also may testify on any matters about which he has been asked to give opinions in his deposition in this proceeding. Ongoing investigation and discovery may result in this report being supplemented or amended.

10880

MICHAEL D. SPENCE

Mr. Michael D. Spence, 400 North Olive, Dallas, Texas 75201, may testify on the involvement of executive management of TU Electric (TU) in the construction of Comanche Peak Steam Electric Station (CPSES) from 1981 to present. In addition, Mr. Spence may testify on the reasons for and implementation of the Comanche Peak Response Team initiated in 1984. Mr. Spence may opine that nuclear power is an important, safe, reliable, and needed energy source. He may also opine that there was sufficient and proper senior management review of the construction effort at CPSES during the relevant years and that the formulation and implementation of the Comanche Peak Response Team were necessary and reasonable in order to satisfy regulatory requirements and obtain an operating license for CPSES. These opinions would include that TU acted reasonably and in accordance with "Prudent Utility Practice" as defined in the Joint Ownership Agreement and would be based on Mr. Spence's background, training and experience as well as his knowledge of Comanche Peak and similar construction and licensing programs by other electric utilities in the construction and licensing of nuclear generating units.

Mr. Spence also may testify on matters about which he may be asked to give opinions in any deposition in this proceeding. Ongoing discovery and investigations may result in this report being supplemented or amended.

JOHN F. STREETER

John F. Streeter may be called upon at trial to offer opinions regarding the quality assurance (QA) organization and program at CPSES. Mr. Streeter's business address is 400 North Olive Street, L.B. 81, Dallas, Texas 75201.

Mr. Streeter may offer opinions regarding matters about which he may be asked during his deposition in this proceeding. The opinions that may be offered are based on information received and assessments completed to date. Ongoing discovery and investigations may result in this report being supplemented or amended.

Mr. Streeter may offer at trial an opinion that the overall performance of the TU Electric (TU) QA organization and program at CPSES was and is reasonable and consistent with "Prudent Utility Practice," as that term is defined in the Joint Ownership Agreement. Mr. Streeter may also offer the following specific opinions:

- That the TU QA organization and program generally was and is appropriately structured and staffed, with responsibilities appropriately defined, assigned and implemented.
- That the TU QA organization generally established and implemented appropriate policies, procedures, and processes to verify the implementation of 10 CFR Part 50, Appendix B.

- That the TU QA organization generally maintained and continues to maintain appropriate relationships with other project functions and organizations.
- That the management of the TU QA organization, as well as other TU management, generally was aware of, involved in, and provided support for the QA program and its implementation and continues to do so.
- That during the CPSES project, regulatory standards, guidelines, and interpretations evolved and changed, often unpredictably, affecting the entire project.
- That those implementing the TU QA program were and are required to exercise judgment regarding standards of acceptability.
- That the judgments made and the activities performed by the TU QA organization generally were and continue to be informed, reasonable, and appropriate.

Mr. Streeter's opinions are based on his background, training, employment and experience, including his present position as Director, Quality Assurance, and his experience with the NRC. The foundation for his opinions include his knowledge of and interactions with the NRC, other utilities and utility organizations, and consultants; his knowledge and

review of evaluations and reports prepared by the NRC and other third parties; his knowledge and review of internal memoranda, reports, evaluations, and correspondence; and his day-to-day activities relating to CPSES.

1329u

MAX H. TANNER, JR.

Mr. Max H. Tanner, Jr., 400 North Olive, Dallas, Texas 75201, may testify on the involvement of senior management of TU Electric (TU) in administering the flow of information between TU and the Minority Owners. Mr. Tanner would opine that the Company provided full and accurate information to the Minority Owners concerning the construction of Comanche Peak and provided all information that was available and requested by the Minority Owners concerning that construction. Mr. Tanner would further opine that the Company's resource planning decisions were reasonable throughout the planning and active construction period of Comanche Peak. These opinions would include that TU acted reasonably and in accordance with "Prudent Utility Practice" as defined in the Joint Ownership Agreement and would be based on Mr. Tanner's background, training and experience as well as his knowledge of Comanche Peak and similar programs by other electric utilities in the construction of jointly-owned nuclear generating units.

Mr. Tanner also may testify on matters about which he may be asked to give opinions in any deposition in this proceeding. Ongoing discovery and investigations may result in this report being supplemented or amended.

1399u

ANTONIO VEGA

Antonio Vega may be called upon at trial to offer opinions regarding the quality assurance (QA) organization and program at CPSES. If offered, his opinions are limited to the time periods for which he had responsibility at CPSES for the areas to which his respective opinions relate. Mr. Vega's business address is 1506 Commerce Street, Dallas, Texas 75201.

Mr. Vega may offer opinions regarding matters about which he was asked during his deposition in this proceeding. The opinions that may be offered are based on information received and assessments completed to date. Ongoing discovery and investigations may result in this report being supplemented or amended.

Mr. Vega may offer at trial an opinion that the overall performance of the TU Electric (TU) QA organization and program at CPSES was reasonable and consistent with "Prudent Utility Practice," as that term is defined in the Joint Ownership Agreement. Mr. Vega may also offer the following specific opinions:

- That the TU QA organization and program generally was appropriately structured and staffed, with responsibilities appropriately defined, assigned, and implemented.

- That the TU QA organization generally established and implemented appropriate policies, procedures, and processes to verify the implementation of 10 CFR Part 50, Appendix B.
- That the TU QA organization generally maintained appropriate relationships with other project functions and organizations.
- That the management of the TU QA organization, as well as other TU management, generally was aware of, involved in, and provided support for the QA program and its implementation.
- That during the CPSES project, regulatory standards, guidelines, and interpretations evolved and changed, often unpredictably, affecting the entire project.
- That those implementing the TU QA program were required to exercise judgment regarding standards of acceptability.
- That the judgments made and the activities performed by the TU QA organization generally were informed, reasonable, and appropriate.

Mr. Vega's opinions are based on his background, training, employment and experience, including his position as QA Senior Engineer, QA Services Supervisor, and Site Quality Assurance Manager. The foundation for his opinions include his interactions with the NRC, other utilities and utility

organizations, and consultants; his knowledge and review of evaluations and reports prepared by the NRC and other third parties; his knowledge and review of internal memoranda, reports, evaluations, and correspondence; and his day-to-day activities relating to CPSES.

2471i