UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
TEXAS UTILITIES GENERATING COMPANY ET AL.	)	Docket Nos. 50-445 50-446
	)	
(Comanche Peak Steam Electric Units 1 and 2)	)	

NRC STAFF TESTIMONY OF JOSEPH I. TAPIA AND W. PAUL CHEN
IN REBUTTAL TO THE TESTIMONY OF MARK ANTHONY WALSH
CONCERNING THE DESIGN OF PIPE SUPPORTS

Q.1. Mr. Tapia, by whom are you employed, and what is the nature of the work you perform?

A.1. I am a Reactor Inspector in the Engineering Section of the Division of Resident, Reactor Projects and Engineering Programs, Region IV, United States Nuclear Regulatory Commission ("NRC"). In this position, I perform inspections during construction of nuclear facilities, in order to evaluate the status of compliance with design specifications and with the provisions of the construction permit and to analyze whether the quality of engineering and construction reviewed is such that the facility can be operated safely. A statement of my professional qualifications was received into evidence as NRC Staff ("Staff") Exhibit 8 at the Comanche Steam Electric Station ("CPSES") operating license hearing session which commenced on June 7, 1982.

Q.2. Mr. Chen, by whom are you employed and what is the nature of the work you perform?

A.2. I am manager of the Stress Analysis Unit of the Systems Engineering Department of the Energy Technology Engineering Center ("ETEC"). ETEC is a U.S. Department of Energy ("DOE") laboratory which is operated by the Energy Systems Group ("ESG") of Rockwell International ("RI"). ETEC is under contract with the NRC to provide expert technical assistance requested by NRC. A statement of my professional qualifications is attached to my testimony.

Q.3. Mr. Chen, what were your responsibilities regarding CPSES?

A.3. Pursuant to the contract between NRC and ETEC, I supervise and am directly responsible for technical reviews of those stress analyses contained in the Applicants' Final Safety Analysis Report ("FSAR"), which are the review responsibility of the Mechanical Engineering Branch of the NRC. In particular, I supervised the review of the Applicants' pipe support stress analyses for CPSES, which are contained in the CPSES FSAR Section 3.9.3. ETEC's review and evaluation of Section 3.9.3 of the FSAR were provided to the Staff, and were incorporated into Section 3.9.3 of the Staff's Safety Evaluation Report ("SER").

Q.4. What is the purpose of your testimony?

A.4. (Tapia and Chen) The purpose of our testimony is to address five broad areas of concern relating to the design of pipe supports which were raised in the testimony of Mark Anthony Walsh:

(1) Review of the design consideration given to the effects of thermal expansion of pipe support tube steel on concrete inserts,

(2) The associated capacity and failure mode of concrete inserts at ultimate shear load conditions,

(3) The technique for pipe support modeling with respect to welded attachments and their impact on the dynamic response of the piping system,

(4) The effects of variations in tube steel section properties published by separate organizations on the Applicants' pipe supports design.

(5) Review of design considerations given to potential seismic acceleration of pipe support frames.

Q.5. Mr. Tapia, have you reviewed the written testimony of Mark Anthony Walsh, CASE Exhibit 659, and the attachments to his testimony, concerning the design of pipe supports, attachments, and hangers?

A.5 Yes.

Q.6. Have you also heard and considered the testimony of Mr. Walsh under cross-examination by the Applicants' and questioning by the Atomic Safety and Licensing Board ("Board") on July 29, 1982 (Transcript pp. 3090-3197)?

A.6. Yes.

Q.7. How did you investigate Mr. Walsh's concerns?

A.7. (Tapia) Design process responsibilities for the Applicants were identified. The identification of organizational responsibilities included a review of the Texas Utilities Services, Inc. ("TUSI") "Pipe Support Engineering Guidelines" being used on-site. These

proprietary guidelines complement the design specifications for pipe hangers and supports, and also provide specific engineering criteria for pipe support design. Discussions were held with Applicants' supervisory engineers to review the basis for the design criteria used in the generation of the design specifications. The five areas reviewed were specially addressed in the following manner:

(1) Thermal expansion effects on concrete inserts were considered in a report entitled "Evaluation of LOCA Temperature Effects on Pipe Supports." The preliminary issue of this report, dated 8/18/82, was reviewed by NRC representatives. Applicable American Society of Mechanical Engineers ("ASME") Code requirements were reviewed to identify portions applicable to insert design.

(2) Reports of tests conducted by the Polytechnic Institute of Brooklyn on Richmond concrete inserts were reviewed. These test results form the basis for the strength data published in Richmond Screw Anchor Company Bulletin No. 6.

(3) The status of the Applicants' program for as-built piping verification was determined.

(4) The material section properties used in the design process were reviewed.

(5) A review was conducted of the TUSI Pipe Support Engineering Guidelines to identify the consideration given to potential seismic accelerations of frames.

Q.8. What were your findings regarding the design considerations given to the effects of thermal expansion in pipe support tube steel on concrete inserts?

A.8. (Tapia) The jurisdiction of ASME Code Subsection NF includes the means of mechanically attaching the support to the building structure,

but it also defines the jurisdictional boundary as being the surface of the building (See NF-1132.5). "Rules for Evaluation of Faulted Conditions," ASME Section III, Appendix F, excludes thermal stresses resulting from faulted conditions in the design procedures. This exclusion is based on the fact that the thermal stresses are relieved by ductile displacement. The evaluations of plant faulted conditions are intended to demonstrate the structural capability of the system, to ensure operability of the piping. The evaluation allows the material to be stressed above the yield point provided that sufficient ductility exists in the material to allow relaxation of constrained thermal expansion stresses prior to the material reaching failure strain.

Q.9. What were your findings with regard to the capacity and failure made of the concrete inserts at ultimate sheer load conditions?

A.9. (Tapia) As discussed in Answer 8, thermal stresses resulting from faulted conditions were excluded from consideration in the design of the pipe supports because thermal stresses are relieved by ductile displacement of the attachments. This ductile behavior was verified upon review of the load-displacement test results obtained at the Polytechnic Institute of Brooklyn. For the worst case analysis of an eleven foot long member, unrestrained thermal growth resulting from LOCA conditions was computed to be 0.086 inches. This worst-case condition was established by identifying the longest member attached to the concrete. This member was a part of the feedwater system gang hanger located inside containment with an overall span of approximately thirty feet. From the load-displacement curve, the calculated

growth results in an imposed load of approximately 9,000 pounds. The factor of safety against failure for this load is 4. This analysis does not include mechanical shear loads which are limited by a factor of safety of 3. Summation of the factors of safety yields a reserve load capacity of 42 percent of the ultimate load at failure, or 16,000 pounds. The strain required to relieve the applied thermal load represents twenty percent of the failure strain. The margin between the applied and ultimate strain represents sufficient ductility of the concrete inserts.

Q.10. What did you find regarding the Applicants' use of welded pipe attachments ("stanchions")?

A.10. (Tapia) The effects of welded attachments on pipes are addressed in ASME Code Articles NB-3645, NC-3645, and NF-3127. These Code sections require that stresses in the pipe wall resulting from any attachments be considered. The Applicants' program for as-built piping verification, established to meet the requirements of NRC Bulletin 79-14, "Seismic Analysis For As-Built Safety-Related Piping Systems", was reviewed in NRC Inspection Report 82-05 (Attachment 1). Since the Applicants have not submitted a final report in response to Bulletin 79-14, the Staff has not conducted a final inspection of seismic stress calculations based on as-built conditions. As reported in NRC Inspection Report 82-05, the seismic design verification program being implemented was found to conform to the requirements of the Bulletin. An additional inspection is planned to address the forthcoming response to NRC Bulletin 79-14.

Q.11. Mr. Chen, do you agree with Mr. Tapia's statement regarding the requirements of ASME Code Sections NR-3645, NC-3645, and NF-3127, in his Answer to Question 10?

A.11. Yes. In addition, I wish to add that the effects of welded attachments will be reviewed by ETEC as part of the Staff's piping confirmatory analysis for CPSES. The Applicants' final report responding to NRC Bulletin 79-14 will be considered in the Staff's confirmatory analysis.

Q.12. What were your findings with regard to the Applicants' use of the 7th Edition of the Americal Institute of Steel Construction ("AISC") Manual, and the 1st Edition of the Welded Steel Tube Institute's ("WSTI") Property Tables, rather than the current 8th Edition?

A.12. (Tapia) From my discussions with Applicants' supervisory engineers, I learned that all final design verifications will be performed using the properties listed in the 8th Edition of the AISC Manual. This edition of the Manual corresponds with the properties listed in the WSTI most recent 2nd Edition. The 7th Edition of the AISC Manual and the 1st Edition of the WSTI publications varied slightly due to the use of different corner radii. This variance will be accounted for in the Applicants' design verification program by use of the most current and representative section properties.

Q.13. What were your findings with respect to design consideration of seismic acceleration in the design of pipe support frames?

A.13. (Tapia) I found that the TUSI Pipe Support Engineering Guidelines call for consideration to be given to seismic acceleration of large frames in the unbraced direction. All pipe supports are considered to be rigid in the direction of loading due to a maximum pipe de-

fication program will provide three levels of review in which the frame will be evaluated for acceleration in all directions. This review will include the provisions of the Nuclear Power Services, Incorporated's ("NPSI") TUSI Structural Design Manual requirements for out-of-plane bracing to provide stability for seismic vibrations.

Q.14. Mr. Chen, do you wish to add anything to Mr. Tapia's answer to Question 13?

A.14. Yes. The masses and stiffness of pipe supports will be considered in the seismic analysis of the CPSES pipe system, as part of the Staff's confirmatory analysis of the CPSES piping system. The seismic analysis will be conducted by ETEC under my supervision.

Q.15. Is the Applicants' treatment of pipe support design acceptable?

A.15. (Tapia) The information presented in the Section III of Applicants' Final Safety Analysis Report ("FSAR") concerning the structural integrity of ASME Code Class 1, 2, and 3 Components and their supports has been reviewed by the Mechanical Engineering Branch in the NRC's Office of Nuclear Reactor Regulation. The result of this ongoing review will be documented in a Supplement to the Staff's Safety Evaluation Report ("SER"). Individuals from the Division of Engineering and Quality Assurance, Office of Inspection and Enforcement of the NRC and I reviewed additional information regarding specific concerns raised by Mr. Walsh. This review indicates that the pipe supports are capable of maintaining deformations within appropriate limits under LOCA thermal loading conditions to assure

functional capabilities. Additional information will be reviewed by the Staff when the Applicants' as-built design verification program is completed.

Q.16. Mr. Chen, do you wish to add anything to Mr. Tapia's answer to Question 15?

A.16. Yes. ETEC will be conducting the review of the Applicants' pipe system design as part of the Staff's confirmatory analysis for CPSES. The results of this review will be documented in a Supplement to the SER for CPSES.

Q.17. Mr. Chen, if the Staff's confirmatory analysis indicates that CPSES' piping system has been built in accordance with the CPSES FSAR, and relevant committments made by the Applicants, in your professional opinion, will the CPSES piping system and pipe supports pose no safety concern?

A.17. Yes.

Q.18. Mr. Tapia, did any other individuals from the Staff review your findings, and this testimony?

A.18. Yes. My testimony, which contains my findings regarding the Applicants' pipe system design, has been reviewed by representatives of the Division of Engineering and Quality Assurance of the NRC's Office of Inspection and Enforcement.

W. P. CHEN
MANAGER, STRESS ANALYSIS UNIT,
ENERGY TECHNOLOGY ENGINEERING CENTER (ETEC)

EDUCATION B. Eng. Civil Engineering & Applied Mechanics, McGill University, 1959

M. Eng. Civil Engineering & Applied Mechanics, McGill University, 1962

Ph. D. Theoretical and Applied Mechanics, University of Illinois, 1965

EXPERIENCE 1965-1971 Simon Fraser University, Burnaby, B.C., Canada

Teaching and research in the Mechanics of Deformable Media with particular emphasis on problems of limit analysis and contained plastic flow of elastic-plastic media.

1972-1974 Basic Technology, Inc., Pittsburgh, Pa.

Thermal stress analysis of components.

1974-Present Energy Technology Engineering Center

ASME B&PVC compliance analysis of piping and components. NRC LWR licensing support and snubber research activities. Technical support for Solar Central Receiver and Ocean Thermal Energy Conversion projects.

PUBLICATIONS

1. A complementary Linear Theory of Plasticity for Plane Strain, Arch. Mech. Stos., Vol 18, P. 731-749, 1966

2. On Classes of Complete Solutions for Rigid Perfectly Plastic Truncated Wedges in Plane Strain, Arch. Mech. Stos., Vol. 21, P. 469-494, 1969

3. On Uniqueness of the Limit Load for Unbounded Regions, Arch. Mech. Stos., Vol. 21, P. 679-699, 1969

4. On the Collapse of Rigid Perfectly Plastic Tapered Cantilever Beams Under End Shear, Acta. Mech., 1972

5. On Torsion of Elastic - Perfectly Plastic Cylinders of Polygonal Cross Section (In Preparation)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TEXAS 76011

MAY 27 1982

In Reply Refer To:
Dockets: 50-445/82-05

Texas Utilities Generating Company
ATTN: Mr. R. J. Gary, Executive Vice
President and General Manager
2001 Bryan Tower
Dallas, Texas 75201

Gentlemen:

This refers to the inspection conducted by Messrs. R. H. Brickley and C. E. Johnson of our staff during the period April 19-23, 1982, of activities authorized by NRC Construction Permit CPPR-126 for the Comanche Peak facility, Unit 1, and to the discussion of our findings with Mr. R. G. Tolson of your staff at the conclusion of the inspection.

Areas examined during the inspection and our findings are discussed in the enclosed inspection report. Within these areas, the inspection consisted of selective examination of procedures and representative records, interviews with personnel, and observations by the inspectors.

Within the scope of the inspection, no violations or deviations were identified.

One new unresolved item is identified in paragraph 2 of the enclosed NRC Inspection Report 82-05.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosure will be placed in the NRC Public Document Room unless you notify this office, by telephone, within 10 days of the date of this letter and submit written application to withhold information contained therein within 30 days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Report: 50-445/82-05

Docket: 50-445 Category A2

Licensee: Texas Utilities Generating Company
2001 Bryan Tower
Dallas, Texas 75201

Facility Name: Comanche Peak, Unit 1

Inspection At: Comanche Peak Steam Electric Station

Inspection Conducted: April 19-23, 1982

Inspectors: C J Hale 1/by 5/18/82
R. H. Brickley, Reactor Systems Section Date
(Paragraphs 1, 2, 6 & 7)

Claude E. Johnson 5-20-82
C. E. Johnson, Engineering Section Date
(Paragraphs 3, 4, & 5)

Approved: T. V. Westerman 5/21/82
T. Westerman, Chief, Reactor Project Section A, RPB#1 Date

D Hunnicutt 5/20/82
D. Hunnicutt, Chief, Engineering Section, RPB#2 Date

Inspection Summary:

Inspection During April 19-23, 1982 (Report 50-445/82-05)
Areas Inspecated: Special, unannounced inspection of onsite design and construction activities, including site tour; design inspection of pipe supports; and installation of safety-related pipe supports. The inspection involved 77 inspector-hours by two NRC inspectors.

Results: No violations or deviations were identified.

Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

G. L. Madsen, Chief
Reactor Projects Branch 1

Enclosure:
Appendix - NRC Inspection Report 50-445/82-05

cc w/enclosure:

Texas Utilities Generating Company
ATTN: Mr. H. C. Schmidt, Project Manager
2001 Bryan Tower
Dallas, Texas 75201

DETAILS

1. Persons Contacted

Principal Licensee Employees

*J. T. Merritt, TUSI, Manager, E&C
*R. G. Tolson, TUGCO, Site QA Supervisor
R. Michels, TUGCO, QA Specialist Supervisor
J. C. Finneran, TUSI, Project Pipe Support Engineer

Other Personnel

J. P. Patton, B&R, QC Mechanical Superintendent
B. Snellgrove, B&R, Lead QC Mechanical Inspector
D. M. Rencher, B&V, Supervisor, Technical Services Design Review Engineering
S. Desai, ITT Grinnell, Group Lead Engineer

*Denotes those attending the exit interview.

2. Design Inspection - Pipe Supports

a. Procedures and Instructions

Applicable Engineering Procedures (EP's) and Instructions (EI's) were examined to verify that QA program commitments for controlling the design process had been translated into subordinate procedures and instructions. The following procedures and instructions were examined:

CP-EP-2.1, "General Program for Pipe Support Design, Fabrication, and Installation," Rev. 0

CP-EP-4.0, "Design Control General Requirements," Rev. 0

CP-EP-4.4, "Technical Support Group Design Control," Rev. 0

CP-EP-4.5, "Design Verification," Rev. 1

CP-EI-4.0-1, "Design and Design Verification Control for Pipe Support Engineering," Rev. 2

CP-EI-4.0-13, "Control of Stress Analysis for Pipe Support Engineering," Rev. 4

CP-EI-4.5-1, "General Program for As-Built Piping Verification," Rev. 4

CP-EI-4.5-4, "Technical Services Engineering Instruction for Pipe Hanger Design Review," Rev. 3

CP-EI-4.6-8, "Field Design Change Control for Large Bore Pipe Supports," Rev. 2

No violations or deviations were identified.

b. Implementation

Onsite engineering activities, with respect to large bore pipe hangers/supports, consist of translating the vendor design drawing (ITT Grinnell/Nuclear Power Services) into a B&R construction drawing, review and approval of subsequent changes (documented via component modification cards), and producing "as-built" drawings. After a hanger/support has been installed and accepted by QC, the Technical Services Mechanical Drafting Department compiles a hanger/support document package for review by the Technical Services Design Review Engineer (TSDRE). This package typically consists of the latest revision of the vendor drawing, change documents affecting the design, and other related information; i.e., sketches, load changes, etc. The TSDRE, who is the applicable vendor engineer, reviews the changes and conducts any necessary reanalysis. The results of the review and reanalysis are documented in the Design Review File (DRF).

The DRF and corresponding hanger/support document package for those hanger/supports identified by an asterisk in paragraph 4.c were examined by the NRC inspector. The inspector's examination of the analysis performed as a result of changes to hanger/support SI-1-093-011-S4212 disclosed that an error had been made in the calculations of Mc (moment at point c), Vc (vertical stress at point c), and Va (vertical stress at a). TSDRE personnel performed another analysis which confirmed that the changes made to SI-1-093-011-S42R were acceptable. Time did not permit a detailed examination of the new analysis or examination of additional DRFs to determine whether this was an isolated case or generic in nature. This item will be considered unresolved pending the results of additional inspection of this area.

No violations or deviations were identified.

3. Site Tour

The NRC inspector walked through Units 1 and 2 Reactor Containment and Auxiliary Buildings, Safeguards Building, and Control Room. The NRC inspector observed in process construction activities, construction status, and housekeeping.

No violations or deviations were identified.

4. Installation of Safety-Related Pipe Supports

a. Review of Work Procedures

The NRC inspector reviewed Quality Control and construction work procedures pertaining to safety-related pipe supports. All procedures reviewed have been approved by authorized licensee personnel. Means have been established to ensure the technical adequacy of activities pertaining to safety-related pipe supports, and they appear to comply with NRC requirements and licensee commitments. Procedures reviewed are listed below.

(1) QI-QP-11.13-1, Rev. 2, "As-built piping verification instructions"

(2) QI-QAP-11.1-38, Rev. 0 "Fabrication, installation inspections of ASME moment restraints Class 1, 2, and 3"

(3) CP-EP-2.1, Rev. 0, "General program for pipe support design, fabrication and installation activities"

(4) CP-EP-4.6, Rev. 7, "Field design change control procedure"

(5) QI-QP-11.2-3, Rev. 6, "Torquing and spacing of concrete anchor bolts"

No violations or deviations were identified.

b. Observation of Work and Work Activities

The NRC inspector selected approximately 19 completed pipe supports for visual inspection. Supports selected were of various kinds such as spring hangers, sway struts, component support structures for dynamic pipe supports, and multiple pipe supports. During visual examination there was no apparent deformation or forced bending evident, surface of welds appeared to meet applicable code requirements, and spring hangers were provided with indicators to show the approximate "Hot" or "Cold" position.

The NRC inspector noted two discrepancies: (1) One support pin to pin dimension for a dynamic support was not correct as required by design drawing, brackets were not connected and one bracket was missing on a sway strut. Both supports were signed off by quality control. The NRC inspector visually inspected additional supports of the dynamic and sway strut type to determine if this was generic throughout the plant. This discrepancy was determined to be an isolated case by the NRC inspector after the additional support inspections.

The as-built configurations were as the design drawings and component modification cards (CMC) specified, except for the discrepancies identified in the above paragraph.

Approval and subsequent incorporation into final as-built drawings were properly controlled and documented.

No violations or deviations were identified.

c. Review of Records

The NRC inspector reviewed the records of the pipe supports visually examined. All required documents were present. All design changes were incorporated into the traveler package and approved as required. Type and classification of pipe support systems comply with appropriate drawings and/or specifications. Location and as-built configuration were verified by QA/QC. The records confirmed that the specifications and installation procedures were met, and that the required scope of QA/QC inspections were met.

Weld identification/location correspond to respective weld data cards and drawing. New or additional welds were identified on the CMC. Welding material used corresponds to the material specified. Welders were qualified for the welding procedures used.

The examination records are complete and appear to meet NDE procedural requirements, including personnel qualifications.

Records Reviewed: A. Dynamic Pipe Supports

SI-1-088-010-C42K
*SI-1-031-045-Y32K
SI-1-045-041-S42K
SI-1-044-033-S42K
SI-1-031-042-Y32K
AF-1-035-035-Y33K
*SI-1-038-003-S22K

B. Fixed Pipe Supports

*SI-1-029-022-Y32R
*SI-1-029-023-Y32R
*SI-1-032-002-S32R
*SI-1-039-021-S22R
*SI-1-093-008-S32R
*SI-1-093-011-S42R
*SI-1-093-013-S42R
*SI-1-300-005-S32R
SI-1-093-004-S32R
SI-1-093-002-S22R

C. Spring Hangers

SI-1-092-003-C41S
SI-1-089-007-C41S

No violations or deviations were identified.

5. IE Bulletin 79-14 Seismic Analysis For As-Built Safety-Related Piping Systems

The NRC inspector reviewed the as-built program established by TUGCO to meet the requirements of IE Bulletin 79-14. TUGCO's as-built group has a program in progress which documents as-built configurations in accordance with design drawings and current revisions. They document actual dimensions, locations, and distance between supports. They also record actual lengths of pipe runs. All this information is documented on the drawings and submitted to the architect/engineer for seismic analysis. This program appears to conform with the conditions of IE Bulletin 79-14.

No violations or deviations were identified.

6. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. The unresolved item disclosed during the inspection is discussed in paragraph 2.

7. Exit Interview

The NRC inspectors met with licensee representatives (denoted in paragraph 1) and R. G. Taylor (NRC Resident Reactor Inspector) at the conclusion of the inspection on April 23, 1982. The NRC inspectors summarized the purpose, scope, and findings of the inspection.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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TEXAS UTILITIES GENERATING COMPANY, et al.	)	Docket No. 50-445
	)	50-446
(Comanche Peak Steam Electric Station, Units 1 and 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF TESTIMONY OF DAVID M. ROHRER REGARDING EMERGENCY PLANNING (CONTENTION 22)," "FEMA STAFF TESTIMONY OF ALBERT LOOKABAUGH AND JOHN BENTON REGARDING EMERGENCY PLANNING (CONTENTION 22)," AND "NRC STAFF TESTIMONY OF JOSEPH I. TAPIA AND W. PAUL CHEN IN REBUTTAL TO THE TESTIMONY OF MARK ANTHONY WALSH CONCERNING THE DESIGN OF PIPE SUPPORTS," in the above captioned proceeding have been served on the following by deposit in the United States mail, first class, or by Overnight Delivery or Express Mail (***), or by hand delivery (**), or through deposit in the Nuclear Regulatory Commission's internal mail system (*), this 2nd day of September, 1982.

Marshall E. Miller, Esq., Chairman**
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dr. Kenneth A. McCollom***
Administrative Judge
Dean, Division of Engineering, Architecture and Technology
Oklahoma State University
Stillwater, OK 70474

Dr. Richard Cole**
Administrative Judge
U.S. Nuclear Regulatory Commission
Washington, DC 20555

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Geary S. Mizuno
Counsel for NRC Staff