

August 31, 1988

TU Electric - Summary of Meeting on 8/18/88 - 2 -

It was agreed that a follow-up meeting would be scheduled to occur in the next few weeks.

(original signed by)

James H. Wilson, Assistant Director  
for Projects  
Comanche Peak Project Division  
Office of Special Projects

Enclosures:

- 1. Meeting Notice
- 2. Agenda
- 3. List of Attendees
- 4. Presentation Slides

cc: See next page

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- BGrimes
- NRC Participants
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- CPPD-LA
- LShao
- CCheng
- KWichman
- SLee
- LMarsh
- TCollins
- TChan
- PKuo
- S Hou

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

August 31, 1988

Docket Nos. 50-445  
and 50-446

APPLICANT: Texas Utilities Electric Company (TU Electric)  
FACILITY: Comanche Peak Steam Electric Station (CPSES), Units 1 and 2  
SUBJECT: SUMMARY OF MEETING ON AUGUST 18, 1988 - APPLICATION OF  
LEAK-BEFORE-BREAK (LBB) METHODOLOGY TO THE PRESSURIZER  
SURGE LINE

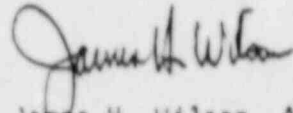
A meeting was held on August 18, 1988 in Rockville, Maryland between NRC staff and representatives of TU Electric to discuss the proposed application of advanced fracture mechanics analyses (also referred to as "leak-before-break methodology") to the pressurizer surge line at CPSES in order to exclude the dynamic effects associated with postulated pipe ruptures as provided in 10 CFR 50, Appendix A, General Design Criterion 4. A copy of the meeting notice, the agenda, the list of attendees, and the slides used in the presentation are provided as Enclosures 1, 2, 3, and 4.

The issue of whether the pressurizer surge line ought to be considered as a candidate for application of leak-before-break methodology was called into question by recent operational events at the Trojan nuclear plant where a previously unanalyzed stress condition was found to result from thermal stratification in that line. TU Electric and its consultants from Westinghouse and R. L. Cloud and Associates provided an overview of a process to analytically bound the stress conditions which might occur in the pressurizer surge line at Comanche Peak. They proposed plans for demonstrating the acceptability of applying LBB methodology to the pressurizer surge line of Unit 1, first for the short-term and then for the 40-year plant life.

The staff indicated that they were interested in meeting further with Westinghouse within about two weeks to discuss the bounding analyses for Comanche Peak. The staff also expressed the need to discuss in greater depth with TU Electric and Westinghouse (1) what specific thermal stratification data is available and why it characterizes the pressurizer surge line at Comanche Peak, (2) what instrumentation TU Electric would install to collect Comanche Peak-specific data and how that data compares to other available data, and (3) what operational method (start-up) is planned for the Comanche Peak pressurizer. These discussions need to occur before the NRC provides an opinion whether the proposed approach is feasible and whether the staff could give further consideration of the pressurizer surge line as a candidate for applying LBB methodology. TU Electric stressed their need for near-term NRC feedback since this issue is critical to their ongoing design validation and corrective action efforts.

TU Electric - Summary of Meeting on 8/18/88 - 2 -

It was agreed that a follow-up meeting would be scheduled to occur in the next few weeks.



James H. Wilson, Assistant Director  
for Projects  
Comanche Peak Project Division  
Office of Special Projects

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2. Agenda
3. List of Attendees
4. Presentation Slides

cc: See next page

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LEAK-BEFORE-BREAK  
PRESENTATION TO THE NUCLEAR REGULATORY COMMISSION

- I) INTRODUCTIONS, IDENTIFICATION OF TOPIC TO BE DISCUSSED.
  - ROGER WALKER
  
- II) SUMMARY OF NRC CONCERNS, OVERVIEW OF OUR PROPOSED SOLUTIONS.
  - JIM MUFFETT
  
- III) WESTINGHOUSE PRESENTATION ON SPECIFIC ANALYSES TO BE PERFORMED.
  - ED JOHNSON, SETH SWAMY
  
- IV) RLCA SUPPORT OF WESTINGHOUSE WORK ON SURGE LINE.
  - BILL SERVER
  
- V) WESTINGHOUSE OWNER'S GROUP-INDUSTRY APPROACH
  - BRAD MAURER
  
- VI) SUMMARY, AND PRESENTATION OF SCHEDULE
  - JIM MUFFETT
  
- VII) QUESTIONS, ETC.
  - ALL

## NRC/TU ELECTRIC MEETING ON COMANCHE PEAK PZR. SURGE LINE

AUGUST 18, 1988

ATTENDEES

<u>Name</u>	<u>Affiliation</u>
W. MUFFETT	TU ELECTRIC
H. A. Maloney	TU Electric
P. D. White	TU Electric
D. M. Rencher	TU Electric
J. S. Wiebe	NRC
J. A. Swamy	Westinghouse
B. F. BEAUDIN	RLCA
W. L. SERVEE	RLCA
B. F. MAURER	WESTINGHOUSE
J. C. MILLER	TENERA, LP
E. R. Johnson	Westinghouse
Paul Smith	CASE
Laval W. Jenkins	Newman & Haltinger
Keith Spelman	NRR/DEST
T. L. CHAN	NRR/DRSP
Melinda Malloy	OSP/CPPD
Jim Wilson	OSP/CPPD
Tim Collins	NRA/SRXB
P. T. Kuo	NRR/EMEB
LARRY SHAO	NRR/DEST
David Terao	NRC/OSP

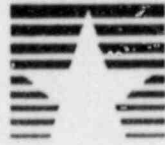
## NRC/TU ELECTRIC MEETING ON COMANCHE PEAK PZR. SURGE LINE

AUGUST 18, 1988

ATTENDEES

<u>Name</u>	<u>Affiliation</u>
SAM LEE	NRR/EMTB
S. Hou	NRR/EMEB
L. B. Marsh	NRR/EMEB
C. Y. Cheng	NRR/EMTB
C. I. GRIMES	OSP/CPRO





TU ELECTRIC  
COMANCHE PEAK  
STEAM ELECTRIC STATION

LEAK-BEFORE-BREAK  
PLAN AND ESTIMATED  
COMPLETION DATES

PRESENTATION TO THE  
NUCLEAR REGULATORY COMMISSION

BETHESDA, MD  
AUGUST 18, 1988

# **NRC CONCERNS WITH CPSES-1 WHIPJET REPORT ON LEAK-BEFORE-BREAK**

## **1) 10" ACCUMULATOR LINES**

### **CONCERN:**

- **THERMALLY-AGED END-OF-LIFE TOUGHNESS PROPERTIES FOR ACCUMULATOR NOZZLES**

### **SOLUTION:**

- **APPLY ACTUAL MATERIAL PROPERTIES IN THE ANALYSIS**
- **RE-CALCULATE LBB PARAMETERS TO DEMONSTRATE ACCEPTABILITY**

# **NRC CONCERNS WITH CPSES-1 WHIPJET REPORT ON LEAK-BEFORE-BREAK**

## **II) 14" PRESSURIZER SURGE LINE**

### **CONCERN:**

- **THERMAL STRATIFICATION EFFECTS OF THE PRESSURIZER SURGE LINE**
- **IMPACT OF STRATIFICATION EFFECTS ON LEAK-BEFORE-BREAK**

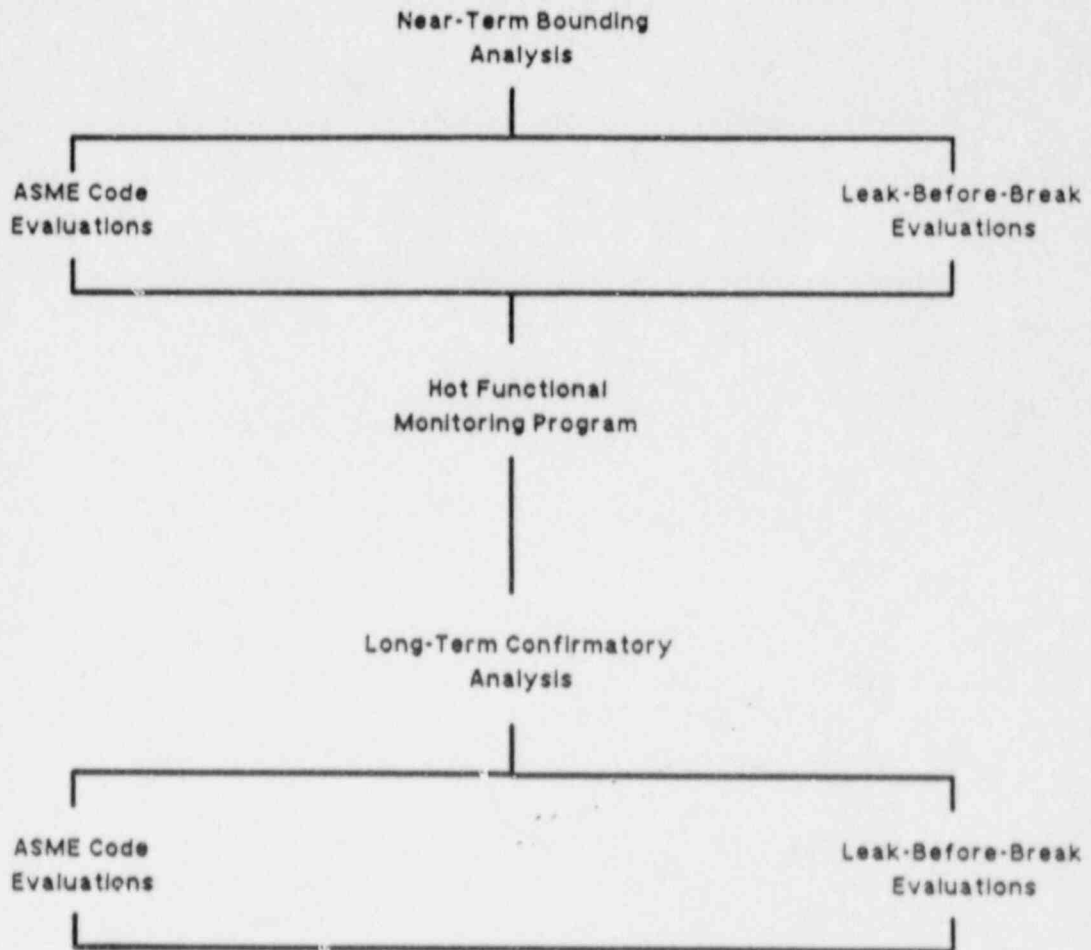
### **SOLUTION:**

- **PERFORM UPDATED DETAILED ANALYSIS INCLUDING BOUNDING THERMAL STRATIFICATION ANALYSIS**
- **DEMONSTRATE LBB ACCEPTABILITY FOR THE SHORT TERM**
- **EXTEND LBB APPLICABILITY FOR 40-YEAR PLANT LIFE**

# COMANCHE PEAK SURGE LINE THERMAL STRATIFICATION AND ACCUMULATOR NOZZLE THERMALLY AGED FRACTURE TOUGHNESS

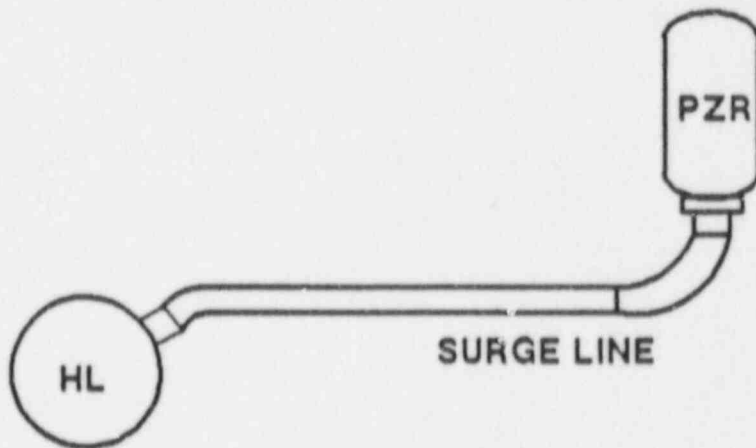
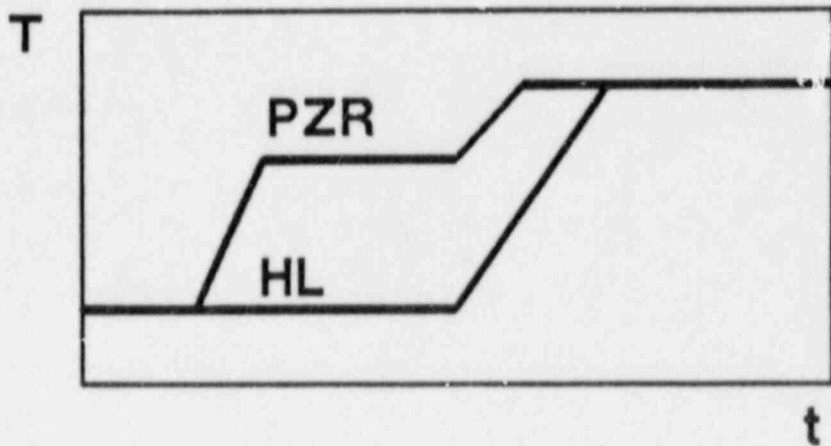
1. FLOW CHART-SURGE LINE
2. SURGE LINE HEATUP AND COOLDOWN
3. DESIGN ANALYSIS
4. SURGE LINE STRATIFICATION
5. NEAR-TERM BOUNDING ANALYSIS PER ASME CODE
6. SURGE LINE PARAMETERS
7. NEAR-TERM BOUNDING ANALYSIS FOR  
LEAK-BEFORE-BREAK
8. LEAK-BEFORE-BREAK IN PRESENCE OF  
STRATIFICATION
9. LONG-TERM CONFIRMATORY ANALYSIS
10. MONITORING PARAMETERS
11. LEAK-BEFORE-BREAK FOR ACCUMULATOR  
NOZZLE LOCATION

# FLOW CHART SURGE LINE THERMAL STRATIFICATION





# SURGE LINE PLANT HEATUP AND COOLDOWN

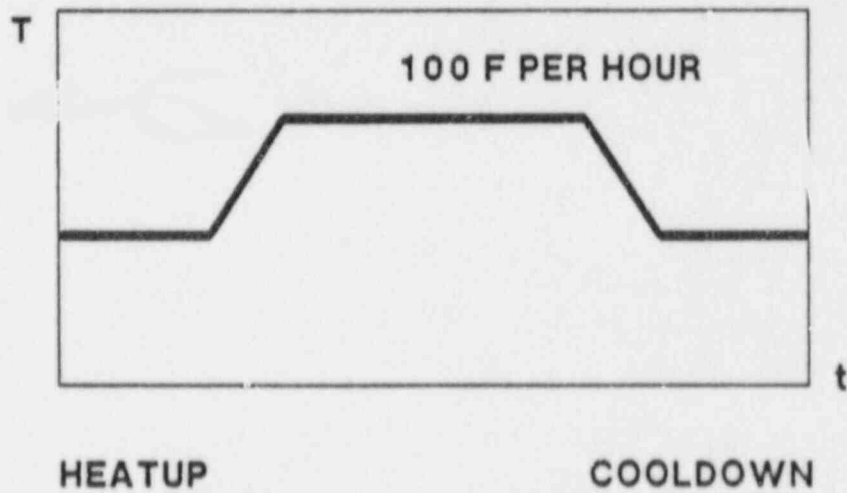


# DESIGN ANALYSIS

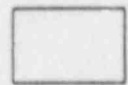
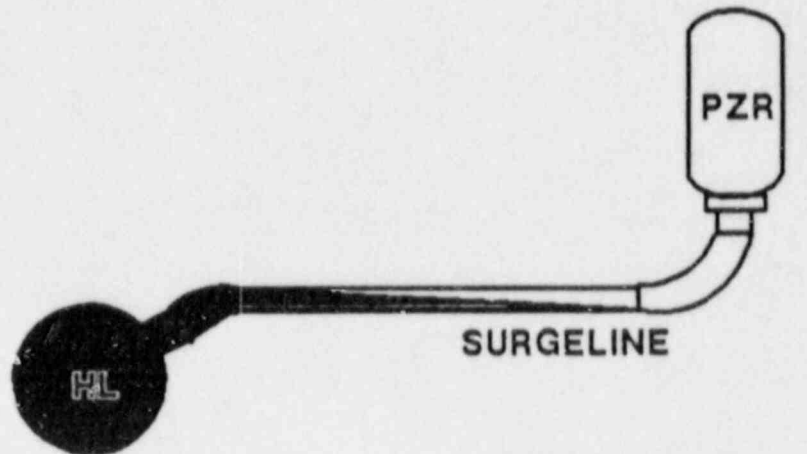
200 HEATUP - COOLDOWN TRANSIENTS  
(FSAR TABLE 3.9N-1)

GRADUAL TEMPERATURE CHANGE (FSAR 3.9N-1)

THERMAL EXPANSION UNIFORM  
TEMPERATURE PROFILE



# SURGE LINE STRATIFICATION



T  
PZR



T  
HL

- UPDATE HEATUP-COOLDOWN TRANSIENTS
- UPDATE THERMAL EXPANSION
- UPDATE TRANSIENT STRESSES
- UPDATE LBB (FCG AND CRACK STABILITY)
- CONFIRMATION: MONITORING PROGRAM



## **NEAR-TERM BOUNDING ANALYSIS PER ASME CODE**

- **DESIGN BASIS - ASME III, 1977 EDITION,  
SUMMER 1979 ADDENDA**
  
- **THERMAL EXPANSION ANALYSIS**
  - **TO ASSURE NO ADVERSE CONTACT WITH  
ADJACENT COMPONENTS**
  
- **ASME STRESS AND FATIGUE ANALYSIS**
  - **TO ASSURE SHAKEDOWN OF THERMAL  
BENDING STRESSES**
  
  - **TO ASSURE NO CRACK INITIATION FOR A  
LIMITED NUMBER OF YEARS OF SERVICE**

## SURGE LINE PARAMETERS

	COMANCHE PEAK	REFERENCE PLANT
HORIZONTAL PIPING LENGTH (FEET)	51.	63.
PIPING DIAMETER (INCHES)	14.	14.
PIPING WALL THICKNESS (INCHES)	1.406	1.406
PIPING MATERIAL	SA 376TP316	SA 376TP316
MAXIMUM DIFFERENTIAL TEMPERATURE (°F)	320.	300.
HL NOZZLE	45° VERTICAL	HORIZONTAL

## **NEAR-TERM BOUNDING ANALYSIS FOR LEAK-BEFORE-BREAK**

- **STABILITY OF THROUGH WALL LEAKAGE CRACK**
- **GROWTH OF PART-THROUGH-WALL CRACKS**

## **DEVELOP JUSTIFICATION FOR LBB IN THE PRESENCE OF STRATIFICATION**

- **DEFINE REPRESENTATIVE TRANSIENTS RESULTING FROM STRATIFICATION USING AVAILABLE DATA**
- **POSTULATE SURFACE FLAWS. DETERMINE FATIGUE CRACK GROWTH.**
- **IDENTIFY UPPERBOUND STRATIFICATION LOADS BASED ON AVAILABLE DATA**
- **DEMONSTRATE PIPING INTEGRITY**
- **PROVIDE JUSTIFICATION FOR LBB IN THE PRESENCE OF STRATIFICATION FOR A LIMITED NUMBER OF YEARS**

# LONG-TERM CONFIRMATORY ANALYSIS

- ESTABLISH MONITORING PROGRAM
  - HOT FUNCTIONAL TESTING - 1988
- CONFIRMATORY ANALYSIS PER ASME CODE
- CONFIRMATORY ANALYSIS FOR LEAK-BEFORE-BREAK



## MONITORING PROGRAM PARAMETERS

- PIPE TEMPERATURE
- PIPE DISPLACEMENT
- FLUID FLOW
- FLUID PRESSURE

## **LBB FOR ACCUMULATOR NOZZLE LOCATION**

- **CAST MATERIAL (SA351 CF8A)**
- **REVIEW OF PLANT SPECIFIC MATERIAL CHEMISTRY FOR THE CAST NOZZLES**
- **EVALUATION OF END-OF-LIFE TOUGHNESS PROPERTIES**
- **GENERIC WCAP 10456 AND WCAP 10931 REV. 1 METHODS AND CRITERIA**
- **SA351 CF8A PROPERTIES FOR LEAK RATE AND FLAW STABILITY ANALYSES**
- **MARGINS ON LEAK RATE, FLAW SIZE, LOADS**



**LBB FOR NOZZLE LOCATION CONSIDERING THE  
EFFECT OF THERMAL AGING**

## CPSES - 1 PRESSURIZER SURGE LINE: LBB RESULTS

- CURRENT NORMAL AND SEISMIC DESIGN LOADS SHOW ADEQUATE LBB MARGINS
  
- L = 5.94 INCHES
  
- MARGIN ON FLAW SIZE  
(> 2.0 REQUIRED):
  - 3.17 (BASE)
  - 2.79 (SAW)
  - 2.92 (SMAW)
  
- MARGIN ON EXCESSIVE LOAD  
(> 1.0 REQUIRED):
  - 2.75 (BASE)
  - 2.27 (SAW)
  - 2.43 (SMAW)



## **CPSES - 1 PRESSURIZER SURGE LINE: LBB SUPPLEMENT**

- **REFORMULATE SURGE LINE LOADS  
TO INCLUDE THERMAL STRATIFICATION  
BOUNDING EFFECTS**
  
- **PERFORM NEW PIPING INTEGRITY ANALYSIS**
  - **DETERMINE NEW LEAK RATE**
  - **DETERMINE NEW MARGIN ON FLAW SIZE**
  - **DETERMINE NEW MARGIN ON  
EXCESSIVE LOADS**
  
- **PROJECTED RESULTS BY 9/30/88**

**PRESSURIZER SURGE LINE  
STRATIFICATION  
WESTINGHOUSE OWNER'S GROUP  
PROGRAM**

- **WOG MATERIALS SUBCOMMITTEE MEETING  
AUGUST 4, 1988 UNANIMOUSLY APPROVED  
WESTINGHOUSE SURGE LINE STRATIFICATION  
PROGRAM**
  
- **WOG MAIN COMMITTEE VOTE OCTOBER 6, 1989**

**PRESSURIZER SURGE LINE  
STRATIFICATION  
WESTINGHOUSE OWNER'S GROUP  
PROGRAM**

- COLLECT DATA FOR WESTINGHOUSE PWR SURGE LINES:
  - DESIGN (LAYOUT, MATERIALS, etc.)
  - LOADING
  - OPERATION
  - ISI
  
- COLLECT APPLICABLE FLOW AND MATERIAL FATIGUE DATA
  
- CATEGORIZE PARAMETERS WHICH INFLUENCE SURGE LINE STRATIFICATION
  
- GENERIC FATIGUE ASSESSMENT
  
- RECOMMENDATIONS

# SCHEDULE

## I) ACCUMULATOR LINES

- COMPLETE PRELIMINARY ANALYSIS 10-28-88
- FINAL ANALYSIS AND REPORT 12-09-88

## II) PRESSURIZER SURGE LINE

- COMPLETE PRELIMINARY ANALYSIS 09-30-88
- FINAL ANALYSIS AND REPORT 10-28-88

## SUMMARY

- PERFORM LBB ANALYSIS ON ACCUMULATOR LINES WHICH WILL EMPLOY THERMALLY-AGED END-OF-LIFE MATERIAL TOUGHNESS PROPERTIES
- DEVELOP UNDERSTANDING OF SURGE LINE BEHAVIOR FOR STRATIFICATION EFFECTS
- SHORT TERM LBB ACCEPTABILITY
- LONG TERM LBB ACCEPTABILITY



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

August 3, 1988

Docket Nos. 50-445  
and 50-446

MEMORANDUM FOR: Christopher I. Grimes, Director  
Comanche Peak Project Division  
Office of Special Projects

FROM: James H. Wilson, Assistant Director  
for Projects  
Comanche Peak Project Division  
Office of Special Projects

SUBJECT: FORTHCOMING MEETING WITH TU ELECTRIC

Date and Time: Thursday, August 18, 1988  
Room 8B-11  
10:00 am

Location: One White Flint North  
11555 Rockville Pike  
Rockville, MD 20855

Purpose: For Applicant and Staff to discuss analyses  
justifying use of leak-before-break methodology  
for pressurizer surge line at Comanche Peak

Participants:* NRC	TU Electric	Westinghouse	Cloud & Assoc.
J. H. Wilson	R. Walker	S. Swamy	W. Server
J. Lyons	D. Rencher	B. Maurer	B. Beaudoin
L. Marsh	T. Marvray	E. Johnson	
C. Y. Cheng	J. Muffett et al		
W. Hodges			
K. Wichman			
M. Malloy			
D. Terao			

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cc: See next page

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\*Meetings between NRC technical staff and applicants for licenses are open for interested members of the public, petitioners, intervenors, or other parties to attend as observers pursuant to "Open Meetings and Statement of NRC Staff Policy," 43 Federal Register 28058, 6/28/78.

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