

MAY 01 1992

*official copy*

Docket Nos. 50-327, 50-328  
License Nos. DPR-77, DPR-79

Tennessee Valley Authority  
ATTN: Dr. Mark O. Medford, Vice President  
Nuclear Assurance, Licensing and Fuels  
3B Lookout Place  
1101 Market Street  
Chattanooga, Tennessee 37402-2801

Gentlemen:

SUBJECT: ENFORCEMENT CONFERENCE SUMMARY (NRC INSPECTION REPORT  
NOS. 50-327/92-09 AND 50-328/92-09)

This letter refers to the Enforcement Conference held at our request on May 1, 1992. This meeting concerned activities authorized at your Sequoyah facility. The issues discussed at this conference related to the apparent weaknesses with the implementation of your Inservice Inspection Program, which did not detect cracks in the feedwater piping before a through wall crack occurred. A list of attendees and a copy of your handouts are enclosed. We are continuing our review of these issues to determine the appropriate enforcement action.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10 Code of Federal Regulations, a copy of the letter and its enclosures will be placed in the NRC Public Document Room.

Should you have any questions concerning the letter, please contact us.

Sincerely,

(Original signed by I. Reyes)

Luis A. Reyes, Director  
Division of Reactor Projects

Enclosures:

1. List of Attendees
2. Feedwater Cracking Handout

cc w/encls: (See page 2)

9205220045 920501  
PDR ADOCK 05000327  
P PDR

11  
IE01

Tennessee Valley Authority

2

cc w/encls:

Mr. John B. Waters, Director  
Tennessee Valley Authority  
ET 12A  
400 West Summit Hill Drive  
Knoxville, TN 37902

Mr. M. J. Burzynski, Manager  
Nuclear Licensing and  
Regulatory Affairs  
Tennessee Valley Authority  
5B Lookout Place  
Chattanooga, Tennessee 37402-2801

TVA Representative  
Tennessee Valley Authority  
Rockville Office  
11921 Rockville Pike  
Suite 402  
Rockville, MD 20852

Mr. Michael H. Mobley, Director  
Division of Radiological Health  
T.E.R.R.A. Building 6th Floor  
150 9th Avenue North  
Nashville, TN 37219-5404

General Counsel  
Tennessee Valley Authority  
ET 11H  
400 West Summit Hill Drive  
Knoxville, TN 37902

County Judge  
Hamilton County Courthouse  
Chattanooga, TN 37402

State of Tennessee

Mr. J. R. Bynum, Vice President  
Nuclear Operations  
Tennessee Valley Authority  
3B Lookout Place  
101 Market Street  
Chattanooga, TN 37402-2801

bcc w/encls: (See page 3)

Ms. Marci Cooper, Site Licensing  
Manager  
Sequoyah Nuclear Plant  
Tennessee Valley Authority  
P. O. Box 2000  
Soddy-Daisy, TN 37379

Mr. Jack Wilson, Vice President,  
Sequoyah Nuclear Plant  
Tennessee Valley Authority  
P. O. Box 2000  
Soddy-Daisy, TN 37379

MAY 01 1992

Tennessee Valley Authority

3

bcc w/encl:

S. D. Ebnetter, RII

L. A. Reyes, RII

J. R. Johnson, RII

G. C. Lainas, NRR

F. J. Hebdon, NRR

P. J. Kellogg, RII

D. E. Labarge, NRR

NRC Document Control Desk

NRC Senior Resident Inspector

U.S. Nuclear Regulatory Commission

2600 Igou Ferry

Soddy-Daisy, TN 37379

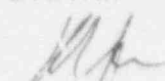
DRP/RII



PKellogg

5/1/92

DRP/RII



BWilson

5/1/92

EICS/RII



BUryc

5/1/92

ENCLOSURE 1

LIST OF ATTENDEES

NRC

J. L. Milhoan, Deputy Regional Administrator, Region II, (RII)  
L. A. Reyes, Director, Division of Reactor Projects, RII  
A. F. Gibson, Director, Division of Reactor Safety (DRS), RII  
E. W. Merschoff, Deputy Director, Division of Reactor Safety, RII  
F. J. Hebdon, Director, Project Directorate II-4, Nuclear Reactor Regulation (NRR)  
C. A. Julian, Chief Engineering Branch, DRS, RII  
J. J. Blake, Chief, Materials and Process Section, DRS, RII  
J. L. Coley, Reactor Inspector, RII  
W. E. Holland, Senior Resident Inspector, RII  
P. J. Kellogg, Chief, Reactor Projects Section 4A, RII  
D. E. LaBarge, Senior Project Manager, NRR  
B. Uryc, Senior Enforcement Specialist, Enforcement and Investigation Coordination Staff, RII  
R. Pedersen, Enforcement Specialist, Office of Enforcement (by telephone)  
C. E. Evans, Regional Counsel  
T. Y. Liu, Reactor Inspector Intern, RII  
W. P. Kleinsorge, Reactor Inspector, DRS, RII

TVA

J. R. Bynum, Vice President, Nuclear Operations  
M. O. Medford, Vice President, Nuclear Assurance, Licensing and Fuels  
N. C. Kazanus, Vice President Completion Assurance  
J. L. Wilson, Vice President, Sequoyah  
R. J. Beecken, Plant Manager  
M. A. Cooper, Site Licensing Manager  
T. A. Flippo, Site Quality Manager  
P. G. Trudel, Engineering Manager  
V. Morton, Engineering Technologist, South West Research Institute  
D. F. Goetcheus, Outage Support Manager  
F. C. Leonard, Technical Specialist Inspection Services  
J. Smith, Regulatory Licensing Manager  
J. P. Maciejewski, Quality Assurance Manager  
J. N. Ward, Engineering and Modifications Manager  
R. Bryan, Manager, NSSS and Analysis  
M. L. Turnbow, Inspection Services Manager  
D. L. Love, Maintenance Planning and Technical Supervisor  
V. A. Zilberstein, Senior Materials Engineer, Stone and Webster

**TVA/NRC ENFORCEMENT CONFERENCE**

**SEQUOYAH NUCLEAR PLANT  
FEEDWATER CRACKING ISSUE**

**IR 50-327,328/92-09**

**MAY 1, 1992**

## AGENDA

- |       |                                 |                         |
|-------|---------------------------------|-------------------------|
| I.    | INTRODUCTION                    | J. BYNUM                |
| II.   | HISTORY FEEDWATER NOZZLE ISSUES | D. GOETCHEUS            |
| III.  | TVA ISI PROGRAM                 | N. KAZANAS              |
| IV.   | TVA ISI EXAMINERS               | N. KAZANAS              |
| V.    | ISI TEAM SELECTION              | F. LEONARD              |
| VI.   | PERSPECTIVES                    | V. MORTON<br>N. KAZANAS |
| VII.  | CAUSE AND CORRECTIVE ACTIONS    | N. KAZANAS              |
| VIII. | SAFETY SIGNIFICANCE             | P. TRUDEL               |
| IX.   | LEAD "F" AND WELD MAP ISSUES    | N. KAZANAS              |
| X.    | SUMMARY/CONCLUSION              | J. WILSON               |

**I. INTRODUCTION**

**J. BYNUM**

## I. INTRODUCTION (CONT'D)

### APPARENT VIOLATIONS

**STAFF PROPOSED 3 VIOLATIONS FOR ESCALATED ENFORCEMENT CONSIDERATION.**

- **FAILURE TO DISCERN CRACK FROM ROOT GEOMETRY CAUSED BY PROGRAMMATIC WEAKNESSES (92-09-01)**
- **TWO MISSING WELDS (IN ONE WELD MAP) CAUSED BY A WEAKNESS IN THE REPAIR AND REPLACEMENT PROCEDURE (92-09-02)**
- **PLACING A LEAD LETTER "F" ON THE PENETRAMETER OF FIVE RADIOGRAPHS INSTEAD OF ADJACENT TO THE PENETRAMETER AS NOTED IN TVA'S PROCEDURE N-RT-1 (92-09-04)**



## I. INTRODUCTION (CONT'D)

### BROAD ISSUES TO RESOLVE

- WERE TVA ACTIONS PRUDENT IN ADDRESSING THE INDUSTRY ISSUE?
- WERE THE TVA ISI TECHNIQUES AND PROCEDURES CONSISTENT WITH INDUSTRY NORMS?
- WERE TVA EXAMINERS AND REVIEWERS QUALIFIED AND PROFICIENT?

## I. INTRODUCTION (CONT'D)

### CONCLUSIONS ON BROAD ISSUES

- TVA ACTED PRUDENTLY IN ADDRESSING IEB 79-13 OVER THE YEARS
- AUGMENTED PROGRAM AND PROCEDURES AT LEAST ON PAR WITH INDUSTRY
- TVA ISI PERSONNEL WELL QUALIFIED AND HIGHLY REGARDED IN INDUSTRY

**REGARDLESS, THE AUGMENTED PROGRAM FAILED TO PERFORM AS INTENDED.**

**EXTENSIVE REVIEW OF THE PROGRAM HAS IDENTIFIED AREAS TO IMPROVE.**

**II. HISTORY OF FEEDWATER  
NOZZLE ISSUES**

**DAVE GOETCHEUS**

**DID TVA RESPOND**  
**PRUDENTLY TO IEB 79-13?**

## II. HISTORY FEEDWATER NOZZLE ISSUES

### TIME LINE OF KEY TVA FEEDWATER NOZZLE ACTIVITIES

1976 LIMITED RT'S OF UNIT 1 WELDS -- NUMEROUS ROOT CONDITIONS IDENTIFIED

1979 BASELINE UT (ASME, XI) -- NUMEROUS GEOMETRIC INDICATORS IDENTIFIED

06/79 IE BULLETIN 79-13

08/79 IE BULLTIN 79-13, REV. 1

09/79 TVA RESPONSE TO IEB 79-13, REV. 0

10/79 IE BULLETIN 79-13, REV. 2

12/79 TVA SUPPLEMENTED RESPONSE TO IEB 79-13, REV. 1

1979 VOLUMETRIC EXAMINATIONS AND SUPPORT/SNUBBER INSPECTIONS PERFORMED PER BULLETIN  
1980 (NO CRACKS/DEGRADATIONS)

01/80 TVA RESPONSE TO IEB 79-13, REV. 2

06/80 WCAP-9693 ISSUED, "INVESTIGATION OF FEEDWATER LINE CRACKING IN  
PRESSURIZED WATER REACTORS"

1982 ADDITIONAL VOLUMETRIC EXAMS AND SUPPORT/SNUBBER INSPECTION OF BOTH UNITS  
PER IEB 79-13 (RESULTS REPORTED)

09/82 TVA LETTER TO NRC REFERENCING FEEDWATER NOZZLE INSPECTION SCOPE

10/82 NRC CONCURRENCE WITH INSPECTION SCOPE

12/82 TVA SUPPLEMENTAL RESPONSE TO IEB 79-13, REV. 2

## II. HISTORY FEEDWATER NOZZLE ISSUES

### TIME LINE OF KEY TVA FEEDWATER NOZZLE ACTIVITIES

1982 UT CHOSEN AS VOLUMETRIC EXAMINATION METHOD FOR AUGMENTED EXAMINATIONS  
1983

TVA INTERNAL DISCUSSION OF METHODS, FREQUENCIES, SCOPE OF UT PROGRAM

1983 AUGMENTED EXAMINATIONS OF FEEDWATER NOZZLES (ONE LOOP PER OUTAGE)  
1984 - NO CRACKS IDENTIFIED

1985 SEQUOYAH UNITS 1 AND 2 SHUTDOWN  
1988

02/88 CAQR TO FURTHER ADDRESS FEEDWATER CRACKING

04/88 UNIT 2 AUGMENTED PROGRAM UT EXAMINATIONS - (ALL FOUR LOOPS) - NO CRACKS  
IDENTIFIED

08/88 FATIGUE USAGE ANALYZED - EXAMINATIONS INCREASE, OPERATIONAL CONTROL

01/89 UNIT 2 AUGMENTED PROGRAM UT EXAMINATIONS (ALL FOUR LOOPS) - NO CRACKS  
IDENTIFIED

03/90 UNIT 1 AUGMENTED PROGRAM UT EXAMINATIONS (ALL FOUR LOOPS) - NO CRACKS  
IDENTIFIED

09/90 UNIT 2 AUGMENTED PROGRAM UT EXAMINATIONS (ALL FOUR LOOPS) - NO CRACKS  
IDENTIFIED

10/91 UNIT 1 AUGMENTED PROGRAM UT EXAMINATION (ALL FOUR LOOPS) - NO CRACKS  
IDENTIFIED

11/91 MODIFICATION OF UNIT 1 MOTOR-DRIVEN AUXILIARY FEEDWATER PUMP PIPING

3/19/92 UNIT 1 LEAK NOTICED

3/20/92 UNIT 1 THROUGH-WALL CRACK DISCOVERED

## II. HISTORICAL FEEDWATER NOZZLE ISSUES (CONT'D)

### TVA RESPONSE TO IE BULLETIN 79-13

- BULLETIN REQUIRED:
  - VOLUMETRIC EXAMINATIONS OF FW WELDS INITIALLY AND AT NEXT OUTAGE
  - VISUAL INSPECTIONS OF SUPPORTS/SNUBBERS INITIALLY AND AT NEXT OUTAGE
  - RESPOND TO BULLETIN AND REPORT RESULTS OF INSPECTIONS
- AS OUTLINED IN TIME LINE, TVA COMPLIED WITH BULLETIN REQUIREMENTS

## II. HISTORY FEEDWATER NOZZLE ISSUES (CONT'D)

### RELATED ACTIONS

- WCAP RECOMMENDATIONS EVALUATED
  - TVA REDUCED DISSOLVED OXYGEN CONCENTRATIONS IN CONDENSATE AND CONDENSATE STORAGE TANKS
- SELF-IMPOSED, AUGMENTED INSPECTIONS INITIATED IN 1983
  - INSPECT ONE NOZZLE PER OUTAGE
- 1988 CAQR WRITTEN TO ADDRESS ADDITIONAL ACTIONS NEEDED RE FEEDWATER NOZZLE CRACKING
  - ENGINEERING EVALUATIONS PERFORMED
    - SON IS ONLY ONE OF THREE DOMESTIC PLANTS TO EVALUATE FATIGUE USAGE
    - FATIGUE USAGE FACTOR OF 1.0 WOULD BE REACHED AT 92 DAYS OF MODE 3 OPERATION
- AS RESULT OF CAQR, AUGMENTED FEEDWATER NOZZLE INSPECTION EXTENDED
  - ALL FEEDWATER NOZZLES EACH REFUELING OUTAGE
  - UT METHOD UTILIZED



## II. HISTORY FEEDWATER ISSUES RELATED ACTIONS (CONT'D)

### RELATED ACTIONS (CONT'D)

- PERFORMED UT PRIOR TO UNIT 2 RESTART TO VERIFY ACCEPTABLE OPERATION WITH FATIGUE CYCLE STATUS
  - PROGRAM EQUAL TO OR BETTER THAN INDUSTRY ACTIONS REGARDING FATIGUE CYCLE STATUS MADE BY TVA
- AFW METHODS OF OPERATION EVALUATED TO MINIMIZE THERMAL STRATIFICATION EFFECTS
  - LESS THAN OPTIMAL DUE TO AFW PRESSURE PULSATION PROBLEM
  - CYCLE 5 OUTAGES ON BOTH UNITS' AFWP RECIRCULATION LINE MODIFICATION COMPLETED
  - OPTIMIZED AFW FLOW FOR STEADY STATE CONDITIONS NOW ACHIEVABLE FOR FEEDWATER NOZZLE CRACKING PROBLEM
- RELIANCE ON INSPECTION FOR DETECTION - ON PAR WITH INDUSTRY
- TVA MET OR EXCEEDED REGULATORY AND INDUSTRY PROGRAMMATIC REQUIREMENTS

DID TVA RESPOND  
PRUDENTLY TO IEB 79-13?

YES

III. TVA ISI PROGRAM/PROCESS

N. KAZANAS

### III. TVA ISI PROGRAM (CONT'D)

#### TVA DID NOT CORRECTLY DIAGNOSE THE CRACK

#### AREAS FOR IMPROVEMENT

- BASELINE LIMITATIONS
- ORGANIZATIONAL INTERFACES
- LEVEL II/LEVEL III INTERFACE
- PROCEDURE/PROCESS
- GEOMETRY OF INSPECTION AREA
- INDUSTRY FOCUS ON IGSCC

### III. TVA ISI PROGRAM (CONT'D)

#### IMMEDIATE TVA ACTIONS IN RESPONSE TO FEEDWATER CRACK

- PROMPT INITIATION OF SELF-CRITICAL INCIDENT INVESTIGATION
- PROMPT METALLURGICAL EXAMINATION TO DETERMINE CRACK MECHANISM
- REPLACEMENT OF ALL STEAM GENERATOR FEEDWATER TRANSITION PIECES & ELBOWS IN UNITS 1 AND 2
- SPECIFIC TRAINING USING CUTOUTS
- PROCEDURE ENHANCEMENTS UTILIZING EPRI RECOMMENDATIONS
- EXTENT OF CONDITION REVIEW & INSPECTIONS - NO PROBLEMS FOUND
- LONG-TERM CORRECTIVE ACTIONS INCLUDE:
  - UPGRADE OF NDE/FATIGUE MONITORING INTERFACES
  - INDUSTRY DEVELOPMENT OF ASME, APPENDIX VIII, PROGRAM

WAS TVA'S ISI PROGRAM AT LEAST ON PAR WITH  
INDUSTRY AND CONSISTENT WITH APPROVED STANDARDS?

### III. TVA ISI PROGRAM (CONT'D)

#### ASME/EPRI TVA KEY EXAMINATION PARAMETER COMPARISON (FEEDWATER)

<u>TECHNIQUE</u>	<u>ASME CODE</u>	<u>TVA (PRIOR TO 3/30/92)</u>	<u>TVA (AFTER 3/30/92) (ASME/EPRI)</u>
1/2 Vee Technique from both sides	Optional	Optional	Mandatory (Except Part Geometry)
Weld Ground Flush (OD)	N/A	Recommended	Mandatory
Characterization Of Thermal Fatigue Cracks	N/A	N/A	Incorporated
Use Of Other Angles For Evaluation Of 45 Degrees Indications	N/A	Allowed	Mandatory
RL Tech Req for 1-Sided Exam	N/A	N/A	Mandatory
Calibration Notch Depth	10%	5%	5%
Non-Geometric Recording Level	50%	> 0%	> 0%
Scanning Speed	6"/Second	3"/Second	3"/Second
Circ. Scan For Axial Reflectors	Welds With Baseline Indic	FW Welds	FW Welds
Skewed Circ. Scans	N/A	Mandatory	Mandatory

### III. TVA ISI PROGRAM (CONT'D)

#### TRAINING

- LICENSEES TYPICALLY USE SNT-TC-1A, AMERICAN SOCIETY OF NON-DESTRUCTIVE TESTING, "PERSONNEL QUALIFICATIONS AND CERTIFICATION IN NON-DESTRUCTIVE TESTING"
- TVA ALSO USES INFO 85002, "ACCREDITATION OF TRAINING IN NUCLEAR INDUSTRY"
  - MORE COMPREHENSIVE
    - \* JOB ANALYSIS
    - \* TASK ANALYSIS
    - \* PROGRAM EVALUATION/TASK-TO-TRAINING MATRIX
  - ONE OF FIRST TO USE THIS MORE DEMANDING APPROACH



### III. TVA ISI PROGRAMS (CONT'D)

#### EPRI ASSESSMENT

- STAINLESS STEEL WELDS EXAMINED AND EVALUATED PROPERLY
- EXAMINATIONS OF STAINLESS STEEL WELDS ARE CONDUCTED DIFFERENTLY THAN FEEDWATER WELDS
  - ATTRIBUTED TO ACCEPTED INDUSTRY TRAINING - IGSCC
- FEEDWATER EXAM TECHNIQUES CORRECTLY RECORDED INDICATIONS - MISINTERPRETED AS GEOMETRY AT SQN
- PROCEDURES IN ACCORDANCE WITH ASME SECTION XI - COULD BE LOOSELY INTERPRETED - RECOMMENDED AREAS THAT SHOULD BE STRENGTHENED
- TRAINING AND CERTIFICATION PROGRAM COMPREHENSIVE
- CAPABILITY DEMONSTRATION USED FOR CONTRACT PERSONNEL - STRENGTH

III. TVA ISI PROGRAM (CONT'D)

NRC IR 50-327, 328/90-12 - UNIT 1

- OBSERVATIONS WERE COMPARED WITH THE APPLICABLE PROCEDURES AND ASME BOILER AND PRESSURE VESSEL CODE IN THE FOLLOWING AREAS: AVAILABILITY OF AND COMPLIANCE WITH APPROVED NDE PROCEDURES; USE OF KNOWLEDGEABLE NDE PERSONNEL; USE OF NDE PERSONNEL QUALIFIED TO THE PROPER LEVEL; TYPE OF APPARATUS USED; CALIBRATION REQUIREMENTS; SEARCH UNITS; BEAM ANGLES; DAC CURVES; REFERENCE LEVEL FOR MONITORING DISCONTINUITIES; METHOD FOR DEMONSTRATING PENETRATION; EXTENT OF WELD/COMPONENT EXAMINATIONS COVERAGE; LIMIT OF EVALUATING AND RECORDING INDICATIONS; RECORDING SIGNIFICANT INDICATIONS; AND ACCEPTANCE LIMITS
- . . . ALL OBSERVED ISI NON-DESTRUCTIVE EXAMINATIONS WERE TECHNICALLY CORRECT.
- NDE PERSONNEL CONDUCTING THE EXAMINATIONS WERE EXCEPTIONALLY WELL QUALIFIED . . .
- ALL PROCEDURES REVIEWED APPEARED TO CONTAIN THE NECESSARY ELEMENTS FOR CONDUCTING THE SPECIFIC EXAMINATIONS.

NRC IR 50-327, 328/90-35 - UNIT 2

- . . . EXAMINATIONS WERE SATISFACTORILY CONDUCTED IN ACCORDANCE WITH THE APPLICABLE PROCEDURES. INDICATIONS OBSERVED DURING THE EXAMINATIONS WERE RECORDED AND DISPOSITIONED AS REQUIRED.
- THE LEVEL III EXAMINERS INVOLVED IN THESE EVALUATIONS PERFORMED HIS DUTIES IN AN OUTSTANDING MANNER.
- REVIEW OF ISI TECHNICAL EVALUATIONS OF REPORTED FINDINGS DETECTED DURING ULTRASONIC EXAMINATIONS OF UNITS 1 AND 2 REVEALED THAT THEY HAD BEEN CONDUCTED IN A VERY PROFESSIONAL MANNER.

### III. TVA ISI PROGRAM (CONT'D)

#### TVA PERSONNEL INVOLVEMENT IN INDUSTRY ACTIVITIES

- ASME CODE
  - SECTION V, CODE COMMITTEE - NON-DESTRUCTIVE TESTING METHODOLOGY
  - CHAIRMAN SECTION V - SUBCOMMITTEE ON RADIOGRAPHY
  - APPENDIX VIII, STEERING COMMITTEE-RESPONSIBLE FOR DEVELOPMENT OF THE PERFORMANCE DEMONSTRATION INITIATIVE
  - SECTION XI, CODE COMMITTEE - PRESERVICE AND INSERVICE INSPECTION REQUIREMENTS
- AMERICAN SOCIETY FOR NON-DESTRUCTIVE TESTING
  - CHAIRMAN - ASNT EDUCATION DIVISION
  - (SNT-TC-1A) REVISION COMMITTEE FOR QUALIFICATION AND CERTIFICATION OF NDE PERSONNEL
  - MEMBER - ASNT NATIONAL LEVEL III CERTIFICATION BOARD
  - MEMBER - ASNT NATIONAL BOARD OF DIRECTORS
- EPRI COMMITTEES
  - ISI GUIDELINE COMMITTEE FOR S/G INSPECTIONS
  - NDE SUBCOMMITTEE FOR RESOLUTION OF NDE ISSUES

### III. TVA ISI PROGRAM (CONT'D)

#### UT PIPING AUGMENTED PROGRAM PROCEDURE KEY PARAMETERS SURVEY

UTILITY	CALIBRATION REFLECTOR		GEOMETRY RECORDED @ % DAC	NON-GEOMETRIC RECORDED @ % DAC
	5% NOTCH	10% NOTCH		
TVA	X		> 50	> 0
A.		X	> 50	Between 20-50 Noted On Data
B.		X	> 20	> 0
C.	Unknown	Unknown	> 50	> 50
D.		X	> 50	> 50
E.		X	> 50	> 50
F.		X	> 50	> 50
G.		X	> 50	> 50
H.	Unknown	Unknown	> 50	> 50
I.	Unknown	Unknown	> 50	> 50
J.		X	> 50	> 50

WAS TVA'S ISI PROGRAM AT LEAST ON  
PAR WITH INDUSTRY AND CONSISTENT  
WITH APPROVED STANDARDS?

YES

IV. TVA ISI EXAMINERS

N. KAZANAS  
F. LEONARD  
M. TURNBOW  
V. MORTON

DID ISI PERSONNEL HAVE SUFFICIENT KNOWLEDGE,  
SKILLS AND EXPERIENCE TO PROVIDE THE  
BEST OPPORTUNITY TO IDENTIFY CRACKS?

# EPRI NDE CENTER

Electric Power Research Institute  
Nondestructive Evaluation Center

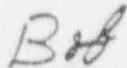
August 2, 1991

Mr. Mike Turnbow  
Tennessee Valley Authority  
P. O. Box 200  
Sequoyah Training Center - 1T  
Soddy-Daisy, TN 37379

Dear Mike,

Enclosed is a copy of the highlights of our NDE Center monthly report. I want to congratulate you and your associates on the outstanding performance of the TVA teams which came over. Of the eleven taking the IGSCC detection course, ten passed. Of the six individuals doing system IGSCC detection, four passed. A fourteen of seventeen success rate in IGSCC detection is the best we have seen. The quality of the TVA preparation before coming to the Center and their performance here were outstanding. Thanks for the role you had in this.

Sincerely,



Robert M. Stone  
Senior Vice President

RMS/ja

cc: H. Stephens

Enclosure



## V. ISI TEAM SELECTION

### DEVELOPMENT OF U1C5 ISI TEAM

- CONTRACT PERSONNEL GIVEN A CAPABILITIES DEMONSTRATION EXAMINATION
- TRAINING SESSION WITH OUTAGE CONTRACTORS CONDUCTED
- SELECTION OF PERSONNEL EXPERIENCED ON FEEDWATER PIPING
- MOST EXPERIENCED EXAMINER ASSIGNED TO EXAMINATION
  - EXAMINER HAD INTENT TO "CRACK PIPE"
- LEVEL III HAD PAST EXPERIENCE WITH CRACKED FEEDWATER LINES
- PERFORMANCE BASED MONITORING WITH GOOD RATINGS

SEQUOYAH NUCLEAR PLANT  
STEAM GENERATOR/FEEDWATER  
TRANSITION SPOOL PIECE

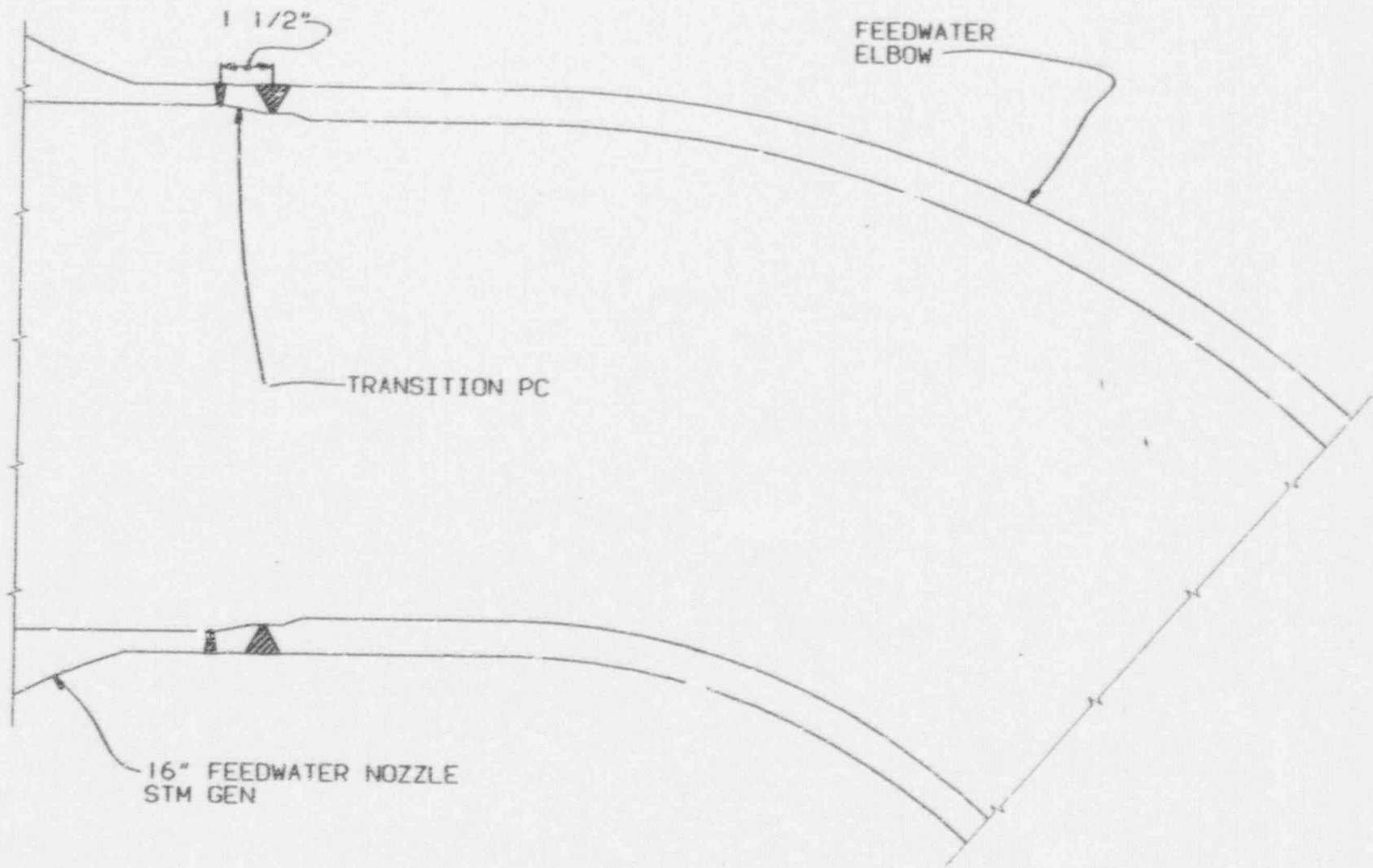


FIG. 1

SEQUOYAH NUCLEAR PLANT  
STEAM GENERATOR/FEEDWATER  
TRANSITION SPOOL PIECE

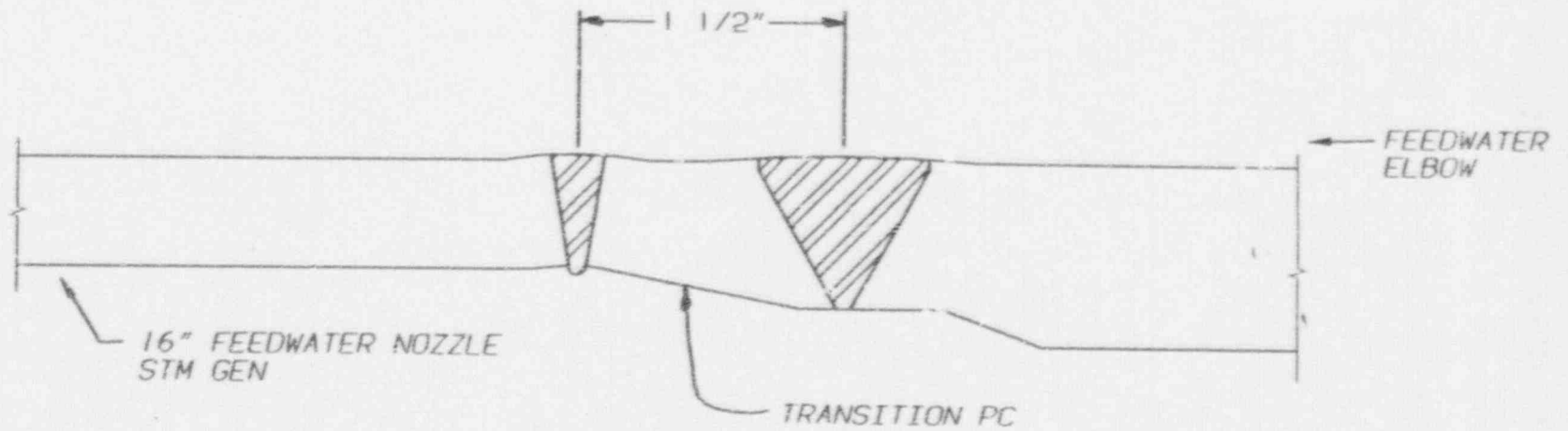


FIG. 2

SEQUOYAH NUCLEAR PLANT  
STEAM GENERATOR/FEEDWATER  
TRANSITION SPOOL PIECE

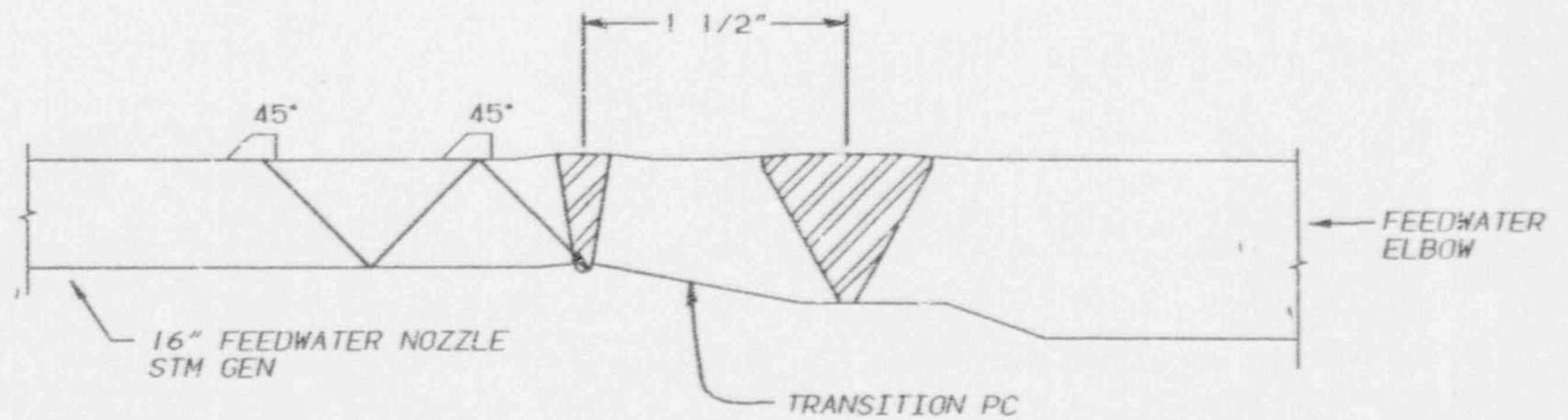
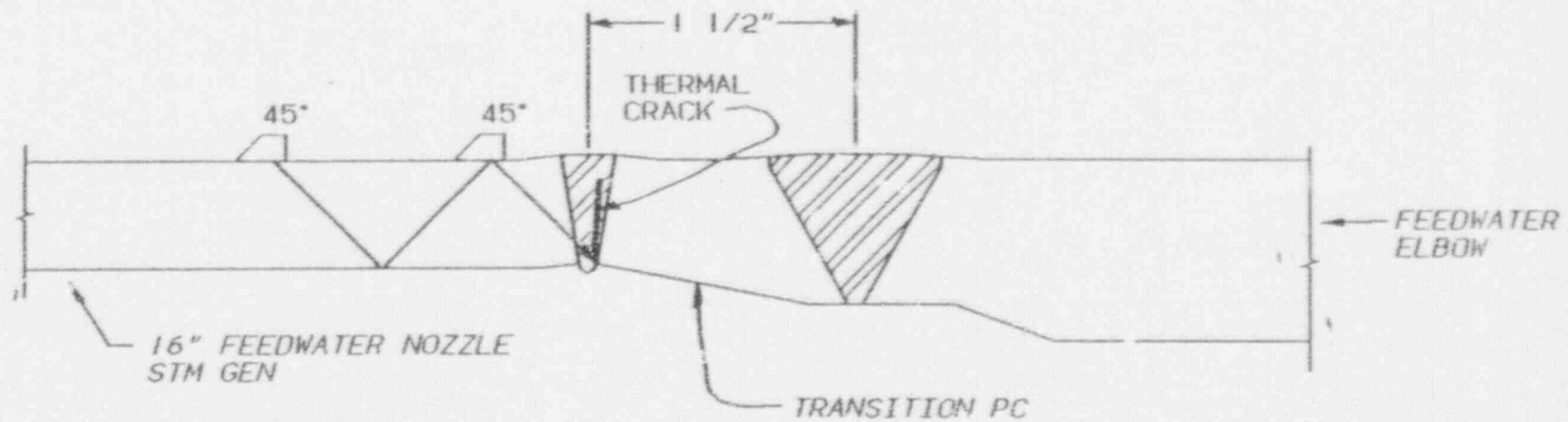


FIG. 3

SEQUOYAH NUCLEAR PLANT  
STEAM GENERATOR/FEEDWATER  
TRANSITION SPOOL PIECE

LOOP 3

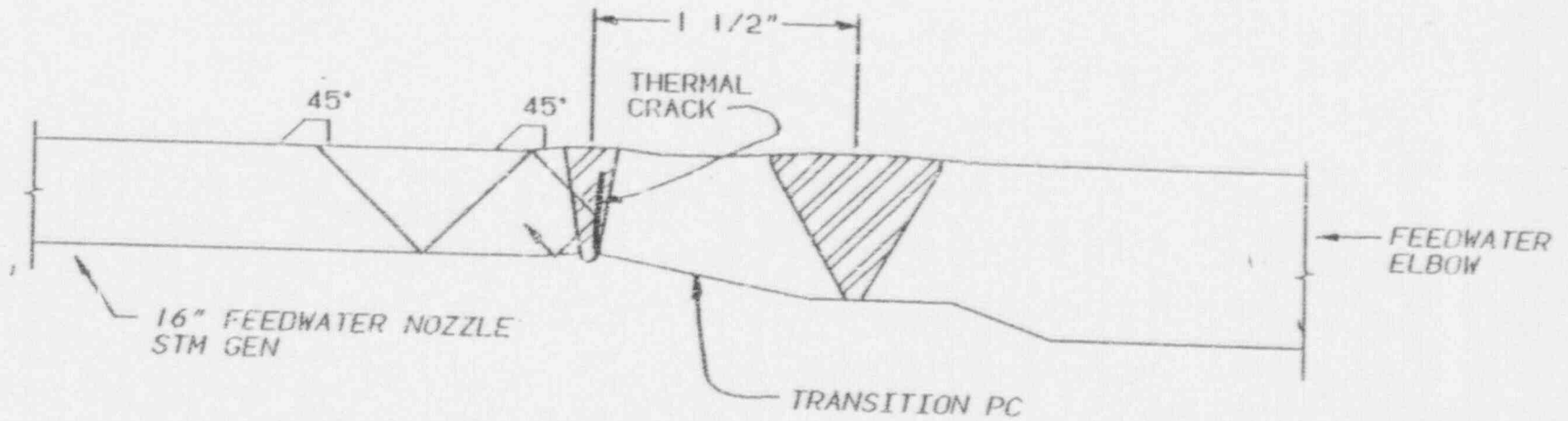


- THERMALLY INDUCED FATIGUE FAILURE CAUSED BY AFW OPERATION
- RADIALLY PROPAGATING CIRCUMFERENTIAL CRACKS
- NO BRANCHING

FIG. 4

# SEQUOYAH NUCLEAR PLANT STEAM GENERATOR/FEEDWATER TRANSITION SPOOL PIECE

## LOOP 3



- THERMALLY INDUCED FATIGUE FAILURE CAUSED BY AFW OPERATION
- RADIALLY PROPAGATING CIRCUMFERENTIAL CRACKS
- NO BRANCHING

FIG. 5

## VI. EXAMINER PERSPECTIVES (CONT'D)

### INDUSTRY RESPONSE/ACTIONS

- EPRI "NDE ALERT" P92-005 TO BE ISSUED
  - VARIOUS TYPES OF CRACKING CAN OCCUR
  - TRAINING REGARDING THERMAL FATIGUE CRACKING RECOMMENDED
  - INITIATION AT PRONOUNCED ROOT PRESENTS A CHALLENGE CONCERNING INTERPRETATION
- EPRI CONSIDERING ENHANCEMENT OF GENERIC TRAINING TO MORE SPECIFICALLY FOCUS ON THIS TYPE OF CRACK PHENOMENON
- INPO NETWORK ENTRY (0E-5216)
- INQUIRIES FROM INDUSTRY ON CRACK MORPHOLOGY
- ASME MOVING TOWARDS CERTIFICATION FOR SPECIFIC CRACK PHENOMENON (ASME XI, APPENDIX VIII)

DID ISI PERSONNEL HAVE SUFFICIENT  
KNOWLEDGE, SKILLS AND EXPERIENCE TO PROVIDE  
THE BEST OPPORTUNITY TO IDENTIFY CRACKS?

YES



## VII. CAUSE AND CORRECTIVE ACTIONS (CONT'D)

### OTHER CORRECTIVE ACTIONS TAKEN OR PLANNED IN RESPONSE TO WEAKNESSES

- WEAKNESS: ISI INTERFACES BETWEEN TVA ORGANIZATIONS
- ACTION: EVALUATE ISI ORGANIZATION WITH FOCUS ON AUGMENTED INSPECTIONS
- EPRI ASSESSMENT OF TVA ISI PROGRAM
- PROVIDE FOCAL POINT FOR NDE-RELATED INDUSTRY EXPERIENCE
- WEAKNESS: INTERFACE BETWEEN LEVEL II AND LEVEL III EXAMINER
- ACTION: INTERFACE REQUIREMENTS MORE CLEARLY DOCUMENTED IN ISI PROCEDURE
- WEAKNESS: PROCEDURAL PROCESS FOR DISPOSITION OF INDICATIONS
- ACTION: CLEARER DOCUMENTATION REQUIREMENTS FOR PARAMETERS THAT MUST BE CONSIDERED WHEN DIAGNOSING INDICATIONS
- WEAKNESS: INDUSTRY FOCUS ON IGSCC DURING EXAMINER TRAINING
- ACTION: INCORPORATE USE OF TVA CUTOUTS (WITH FATIGUE FLAWS) DURING IN-HOUSE TRAINING

## VII. CAUSE AND CORRECTIVE ACTIONS (CONT'D)

### OTHER CORRECTIVE ACTIONS TAKEN OR PLANNED IN RESPONSE TO WEAKNESSES

WEAKNESS: GEOMETRY OF INSPECTION AREA NOT CONDUCTIVE TO UT

ACTION: FEEDWATER WELDS WILL BE GROUND TO BETTER FACILITATE UT  
FROM MULTIPLE DIRECTIONS

EVALUATE ALTERNATIVES TO PERIODIC REPLACEMENT OF AFFECTED  
PIPING

WEAKNESS: BASELINE LIMITATIONS

ACTION: THOROUGH BASELINE UT & RT PERFORMED ON REPLACED  
COMPONENTS

## VII. CAUSE AND CORRECTIVE ACTIONS

### CAUSE?

- BASELINE LIMITATIONS
- ORGANIZATIONAL INTERFACES
- LEVEL II/ LEVEL III INTERFACE
- PROCEDURE/PROCESS
- GEOMETRY OF INSPECTION AREA
- INDUSTRY FOCUS ON IGSCC

VIII. SAFETY SIGNIFICANCE

P. TRUDEL

## VIII. SAFETY SIGNIFICANCE

- ASME SECTION XI, APPENDIX H EVALUATION
- REVIEW OF OPERATING CONDITIONS RESULTED IN TWO BOUNDING CASES:
  1. POWER OPERATION
  2. HOT STANDBY OPERATION
    - CONSERVATIVELY ASSUMED - 10" LONG THROUGH-WALL CRACK IN LOOP
    - PART-WALL STANDARD CRACK MODEL IN OTHER LOOPS
    - CONCLUDED CATASTROPHIC FAILURES WOULD NOT OCCUR UNDER DESIGN BASIS LOADING
- FURTHER EVALUATION NON-MECHANISTIC FAILURES OF THE TWO SIGNIFICANTLY CRACKED U1 LOOPS (LOOPS 3 & 4)
  - NON-DESIGN BASIS EVENT BOUNDED BY EXISTING ANALYSIS
- BASED ON EVALUATIONS, CRACKS HAD MINIMAL SAFETY SIGNIFICANCE

IX. LEAD "F" AND WELD MAPS ISSUES

N. KAZANAS

#### IV. LEAD "F" AND WELD MAPS (CONT'D)

##### OTHER APPARENT VIOLATIONS

- TWO MISSING WELDS (IN ONE WELD MAP) CAUSED BY A WEAKNESS IN THE REPAIR AND REPLACEMENT PROCEDURE (92-09-02)
- PLACING A LEAD LETTER "F" ON THE PENETRAMETER OF FIVE RADIOGRAPHS INSTEAD OF ADJACENT TO THE PENETRAMETER AS NOTED IN TVA'S PROCEDURE N-RT-1 (92-09-04)

#### IV. LEAD "F" AND WELD MAP ISSUES (CONT'D)

##### LEAD "F" ISSUE

- APPARENT VIOLATION: FAILURE TO FOLLOW PROCEDURE REGARDING PLACEMENT OF "F"
- TVA PROCEDURE N-RT-1; LEAD F "ADJACENT" TO PENETRAMETER
- TVA INTERPRETED THIS TO MEAN "ON OR NEXT TO"
- CONSISTENT WITH 1981 CODE INTERPRETATION AND 1986 CODE
- PLACEMENT DID NOT AFFECT RESOLUTION
- NO VIOLATION



## IX. LEAD "F" AND WELD MAP ISSUES

### WELD MAP

- APPARENT VIOLATION - TWO WELDS MISSING ON 1 ISI WELD MAP - NOT MISSING ON PLANT WELD MAP
- ISOLATED OCCURRENCE - ISI WELD MAPS REVIEWED, NO ADDITIONAL MISSING FIELD WELDS
- NO SAFETY SIGNIFICANCE
- PROCEDURE REQUIRED ISI BE ALERTED TO CHANGES: STRENGTHENING PROCEDURE TO CLARIFY RESPONSIBILITIES
- TVA POSITION
  - ENFORCEMENT NOT WARRANTED
  - REQUESTS ENFORCEMENT DISCRETION

X. SUMMARY/CONCLUSIONS

J. WILSON

## X. SUMMARY/CONCLUSIONS

- ISI PROGRAM DID NOT PERFORM AS EXPECTED ON FEEDWATER NOZZLE WELDS - MISDIAGNOSED CRACK INDICATIONS
- SAFETY SIGNIFICANCE OF ISSUE RECOGNIZED - SAFETY SIGNIFICANCE OF EVENT MINIMAL
- MANAGEMENT ACTIONS TO ADDRESS 79-13 ISSUE GENERALLY PROACTIVE AND AGGRESSIVE
- ISI PROGRAM ELEMENTS WERE WITHIN INDUSTRY STANDARDS AND EXAMINATION PERSONNEL WELL QUALIFIED AS VERIFIED BY EPRI/NRC/SURVEYS
- FAILURE TO PROPERLY CLASSIFY BELIEVED TO HAVE RESULTED FROM COMBINATION OF FACTORS UNIQUE TO SITUATION
- LESSONS LEARNED BEING INCORPORATED INTO PROGRAM - COMMITTED TO IMPROVEMENT
- INDUSTRY BENEFIT RECOGNIZED - GENERIC TRAINING AND ONGOING COMMUNICATIONS/INQUIRIES