



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

September 29, 1988

Docket Nos. 50-327/328

LICENSEE: Tennessee Valley Authority  
FACILITIES: Sequoyah Nuclear Plants, Units 1 and 2  
SUBJECT: MINUTES OF THE SEPTEMBER 15, 1988 MEETING WITH THE TENNESSEE VALLEY AUTHORITY (TVA) ON ITS MICROBIOLOGICAL INFLUENCED CORROSION PROGRAM AT SEQUOYAH

On Thursday, September 15, 1988, a meeting was held at the Office of Special Projects (OSP), NRC headquarters in Rockville, Maryland with the Tennessee Valley Authority (TVA). The meeting was held at the request of TVA to discuss its Microbiological Influenced Corrosion (MIC) Program for Sequoyah. Enclosure 1 is the list of individuals attending the meeting. The following is a summary of the significant items discussed and the actions, if any, taken or proposed.

Sequoyah has experienced MIC in the butt welds of stainless (austenitic) steel piping in the essential raw cooling water (ERCW) system. The MIC attack was initiated at the inside surface of the welds and degradation occurred in the form of voids that became larger, and deeper, and eventually developed into a throughwall leak. The leakage has been small and characterized as drips or moist areas around the butt welds.

TVA developed a MIC program for Sequoyah based upon the data developed through inspection. The MIC program and the engineering evaluation which formed the basis for the program is described in TVA's letter dated January 20, 1987. This program was approved in the staff's Safety Evaluation Report (SER) forwarded by letter dated March 31, 1988.

By two letters, both dated April 4, 1988, and in a clarification letter dated May 4, 1988, TVA submitted a request for relief from the requirements of IWA-5250(a)(2) during the performance of their MIC program. These requirements were determined to be impractical to perform on Sequoyah Units 1 and 2 during power operation of the plants. The staff granted the relief to IWA-5250(a)(2) and issued its SER in its letter dated May 11, 1988.

This meeting was requested by TVA to present the current status of its MIC program at Sequoyah. The agenda for the meeting is the first page of TVA's handout in the meeting (Enclosure 2). TVA stated that the purpose of the meeting was to present the following: 1) the current status of TVA's MIC program at Sequoyah and the implementation of the additional items requested in the staff's SER, 2) TVA's evaluation process if the leakage criteria is exceeded, and 3) TVA's contingency plan for installing a structural sleeve in piping affected by MIC. TVA requested that the staff, based on the meeting, concur in its implementation of the additional items in the SE, its evaluation

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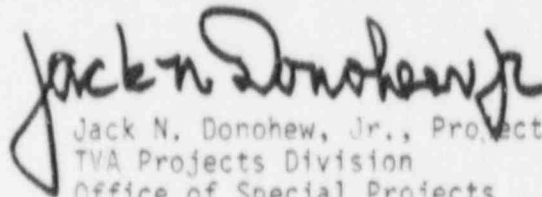
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process if the MIC leakage criteria is exceeded and its contingency plan for installing a structural sleeve. The staff stated that it could not concur on the above based only on the meeting. The staff stated that TVA should submit the details of the MIC program at Sequoyah for the staff's review and approval.

TVA continued its presentation with a discussion of the background of the MIC program and the additional items listed in the NRC SER dated May 11, 1988. These additional items were monthly visual inspection of identified leakers, an assessment of these leakers, verification that the leakage does not exceed the criteria of 0.5 gpm per weld and 2.0 gpm total, and acknowledgement that the use of other than ASME Code repairs, such as the installation of a structural sleeve, requires prior approval by the staff.

TVA then presented the interim repair procedures, including the installation of a structural sleeve, at Sequoyah for MIC damaged welds in ERCW piping and the status of the biocide injection program at Sequoyah.

TVA concluded the meeting stating that it would submit the details of its request for staff approval of the MIC program at Sequoyah in a letter by October 31, 1988. It stated that it would request the staff's approval on the MIC program at Sequoyah and the contingency plans to use structural sleeve for severely MIC damaged ERCW piping.



Jack N. Donohew, Jr., Project Manager  
TVA Projects Division  
Office of Special Projects

Enclosures:

1. Attendance List
2. TVA's Meeting Handout

cc w/enclosures:

See next page

DISTRIBUTION FOR MEETING SUMMARY DATED: September 29, 1988

Facility: Sequoyah Nuclear Plant, Units 1 and 2\*

Distribution

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M. Jimms

J. Rutberg

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D. Smith

ACRS (10)

GPA/PA

GPA/CA (M. Callahan) (5)

F. Miraglia

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B. Grimes

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Senior Vice President, Nuclear Power  
Tennessee Valley Authority  
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Chattanooga, Tennessee 37402-2801

ENCLOSURE 1

LIST OF ATTENDEES  
FOR SEPTEMBER 15, 1988 MEETING ON TVA'S MIC PROGRAM

<u>Name</u>	<u>Affiliation</u>
J. Donohew	NRC/OSP
D. Smith	NRC/OSP
R. Mays	TVA
A. Poole	TVA
D. Goodin	TVA
C. Brimer	TVA
F. Hartwig	TVA

TVA - Tennessee Valley Authority  
NRC/OSP - Nuclear Regulatory Commission/Office of Special Projects

AGENDA

- |   |        |
|---|--------|
| I. INTRODUCTION   | GOODIN |
| II. PURPOSE   | GOODIN |
| III. OBJECTIVES   | GOODIN |
| IV. BACKGROUND  | POOLE  |
| V. DISCUSSION OF ADDITIONAL ITEMS LIST IN NRC<br>SAFETY EVALUATION                  | BRIMER |
| VI. REVIEW OF SQN INTERIM REPAIR PROCEDURES<br>FOR MIC DAMAGED WELDS IN ERCW PIPING | POOLE  |
| VII. CURRENT STATUS OF BIOCIDES INJECTION PROGRAM                                   | GOODIN |
| VIII. SUMMARY   | GOODIN |
| XI. DISCUSSION  |        |

## PURPOSE

- . TO PRESENT THE CURRENT STATUS OF TVA'S MIC PROGRAM AND THE IMPLEMENTATION OF ADDITIONAL ITEMS REQUESTED IN THE MAY 1988 SER
- . TO PRESENT TVA'S EVALUATION PROCESS IF LEAKAGE CRITERIA IS EXCEEDED
- . TO PRESENT TVA'S CONTINGENCY PLAN FOR INSTALLING A STRUCTURAL SLEEVE



## OBJECTIVES

- . OBTAIN NRC CONCURRENCE WITH TVA'S IMPLEMENTATION OF THE  
ADDITIONAL ITEMS
- . OBTAIN NRC CONCURRENCE WITH TVA'S EVALUATION PROCESS IF LEAKAGE  
CRITERIA IS EXCEEDED
- . OBTAIN NRC CONCURRENCE WITH TVA'S CONTINGENCY PLAN FOR INSTALLING  
A STRUCTURAL SLEEVE

BACKGROUND

<u>ITEM</u>	<u>DATE</u>
. TVA AND NRC MEETING	DECEMBER 15, 1987
. T <del>HE</del> WESTINGHOUSE AND NRC MEETING	JANUARY 4, 1988
. TVA LETTER TO NRC ON SQN MIC PROGRAM	JANUARY 20, 1988
. NRC SAFETY EVALUATION	MARCH 31, 1988
. TVA LETTER TO NRC FOR RELIEF REQUEST TO ASME SECTION XI FOR ERCW PIPING	APRIL 4, 1988
. TVA LETTER TO NRC ON CLARIFICATIONS OF SQN MIC PROGRAM	MAY 4, 1988
. NRC ACCEPTANCE OF RELIEF REQUEST SUBJECT TO INCLUSION OF ADDITIONAL ITEMS	MAY 11, 1988

ADDITIONAL ITEMS FROM NRC SER

NRC HAS ACCEPTED THE MIC PROGRAM WITH THE FOLLOWING ADDITIONAL ITEMS:

1. MONTHLY VISUAL INSPECTION OF IDENTIFIED LEAKERS
2. AN ASSESSMENT OF LEAKERS TO ENSURE THAT THE STRUCTURAL CRITERIA IS NOT VIOLATED PRIOR TO SCHEDULED REPAIR
3. VERIFICATION THAT THE LEAKAGE DOES NOT EXCEED 0.5 GPM IN A WELD OR 2.0 GPM CUMULATIVE IN ALL WELDS
4. INSTALLATION OF A STRUCTURAL SLEEVE REQUIRES PRIOR NRC APPROVAL OF METHOD

SER REQUIREMENT

THE FREQUENCY OF DIRECT VISUAL INSPECTION OF WELD-SPECIFIC LEAKS  
IS INCREASED TO MONTHLY.

TVA IMPLEMENTATION PLAN

- . PERFORM MONTHLY WALKDOWN
- . VISUALLY ASSESS LEAKAGE

THIS PROGRAM COMPLIES WITH SER

SER REQUIREMENT

AT THE SAME TIME LEAKAGE IS DETECTED, AN ASSESSMENT IS MADE TO ENSURE THE ACCEPTANCE CRITERION IS NOT EXCEEDED PRIOR TO THE SCHEDULED OUTAGE OR REPAIR.

TVA IMPLEMENTATION PLAN

THE SEQUOYAH INSPECTION PROCEDURE INCLUDES CRITERIA FOR THIS ASSESSMENT UNDER TI-109.

- . A LEAKER IS IDENTIFIED BY WALKDOWN.
- . RADIOGRAPHY OF THE WELD IS PERFORMED.
- . CUMULATIVE DEFECT LENGTH IS COMPARED TO THE LIMIT LOAD ACCEPTANCE CRITERIA.
- . THROUGHOUT THE ANALYSIS, 5/8-INCH MARGIN IS MAINTAINED.

RESPONSE TO MONITORING STRUCTURAL INTEGRITY  
UNTIL CHANGEOUT CAN OCCUR

ACCEPTABILITY BASIS

- . 3/8-INCH/YR DEFECT GROWTH IS BASED ON A WORST-CASE GROWTH RATE FOUND IN 21 WELDS OVER A 9-MONTH PERIOD (ALL THESE WELDS WERE REPLACED).
- . THE AFFECTED WELD WOULD BE REEVALUATED AFTER 6 MONTHS.
- . THE 5/8-INCH CRITERIA MAY BE REVISED DEPENDING ON ON-GOING MONITORING OF LEAKING AND NONLEAKING WELDS.
- . THE LENGTH (LIMIT LOAD) CRITERIA IS BASED ON A SINGLE LENGTH THROUGH-WALL DEFECT WHICH IS A WORST-CASE SCENARIO AND IS NEVER EXPECTED TO BE OBSERVED.

SER REQUIREMENT

VERIFICATION THAT THE LEAKAGE DOES NOT EXCEED 0.5 GPM IN A WELD  
OR 2.0 GPM IN ALL WELDS

TVA IMPLEMENTATION PLAN

. USE THESE VALUES AS THE ACCEPTANCE CRITERIA OF THE MONTHLY  
WALKDOWN

. IF THESE CRITERIA ARE EXCEEDED:

- THE PLANT RESPONSE WILL BE DETERMINED BY THE CAQR PROGRAM
- THE SITE NRC RESIDENT WILL BE NOTIFIED
- OPERABILITY WILL BE BASED ON FLOW TO COMPONENTS AND  
VERIFICATION OF THE STRUCTURAL ADEQUACY (RF > 1.0)
- IF OPERABILITY CANNOT BE ENSURED, THE PLANT WILL ENTER  
APPROPRIATE TECH SPEC ACTIONS
- ROOT CAUSE ANALYSIS WOULD BE PERFORMED TO DETERMINE THE CAUSE  
OF THE INCREASED LEAKAGE RATE

## RESPONSE TO LEAKAGE EXCEEDING CRITERIA

### ACCEPTABILITY BASIS

1. RADIOGRAPHY OF APPROXIMATELY 85 WELDS AND DESTRUCTIVE EXAMINATION OF APPROXIMATELY 60 INDICATIONS IN 12 WELDS HAVE ONLY IDENTIFIED PITTING DAMAGE. NO EVIDENCE OF CRACKING MECHANISMS (SCC OR FATIGUE) WAS FOUND. RAPID GROSS FAILURE OF THE WELD JOINT WILL NOT OCCUR UNDER THESE CIRCUMSTANCES.
2. THE AFFECTED WELDS ARE IN MAIN HEADERS FOR WHICH 0.5 TO 2 GPM LEAKAGE IS A MINOR FLOW REDUCTION, EVEN IN A WORST-CASE ACCIDENT CONFIGURATION.
3. RAW WATER INVENTORY IS INFINITE (ONCE-THROUGH RIVER WATER SOURCE).



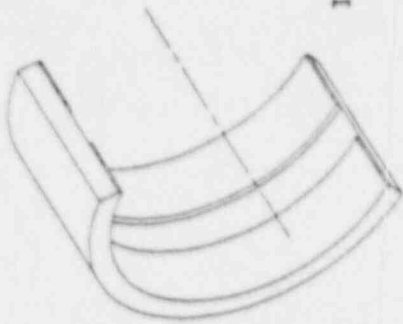
SER REQUIREMENT

INSTALLATION OF STRUCTURAL SLEEVE REQUIRES PRIOR NRC APPROVAL OF METHOD.

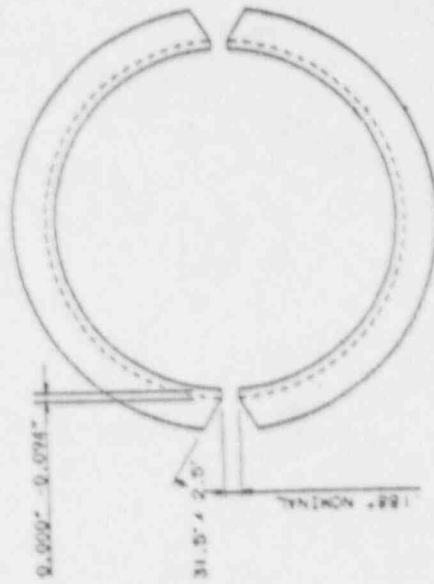
TVA IMPLEMENTATION PLAN

TVA HAS DEVELOPED A PREDESIGNED SLEEVE AS A CONTINGENCY FOR ERCW APPLICATION.

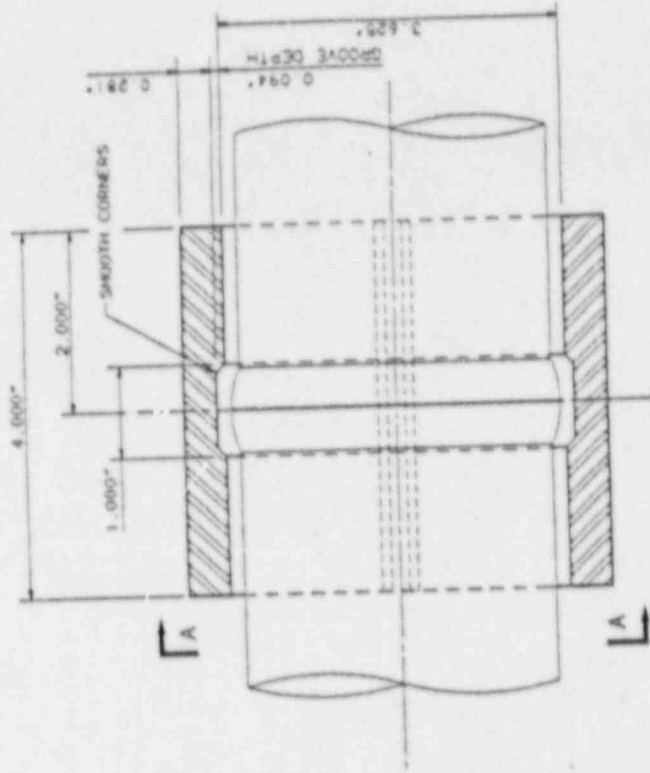
- . TO BE USED WHEN  $RF < 1$  BASED ON RT DATA AND OTHER REPAIR METHODS ARE NOT FEASIBLE FOR CONTINUED OPERATIONS
- . NOTIFY NRC RESIDENT
- . ENTER APPROPRIATE TECH SPEC ACTION
- . REPLACE PIPING SEGMENT AT NEXT REFUELING OUTAGE



ISOMETRIC



SECTION A-A



- NOTES:
1. FOR 3" PIPE, FABRICATE A SLEEVE FROM 4" SCHEDULE 160 PIPE
  2. DIMENSIONAL TOLERANCE IS  $\pm 1/32"$

REVIEW OF SLEEVE WITH REGARD TO  
PIPING ANALYSIS

- . WELDING PROCEDURE AND POST WELD INSPECTIONS PROVIDE PRESSURE BOUNDARY INTEGRITY.
- . WEIGHT OF SLEEVE PROVIDES LESS THAN A 5-PERCENT INCREASE IN THE SINGLE SPAN WEIGHT OF PIPING.
- . SEISMIC ANALYSIS OF PIPING SYSTEM IS NOT IMPACTED PROVIDED THAT THE NUMBER OF SLEEVES PER PIPE SPAN IS LIMITED.
- . THE SLEEVE ATTACHMENT WELD HAS BEEN INCLUDED IN THE PIPING ANALYSIS BY STRESS INTENSIFICATION FACTOR (SIF) (2.1).
- . SLEEVE HAS SECTION MODULUS LARGER THAN ORIGINAL PIPE AND MINIMUM WALL THICKNESS IS LARGER THAN ORIGINAL PIPE.
- . THE ERCW SYSTEM PIPING DOES NOT SEE LARGE THERMAL CYCLES; THEREFORE, THERMAL LOADS ON THE SLEEVES ARE NEGLIGIBLE.

## STRUCTURAL INTEGRITY/SLEEVE ACCEPTABILITY

. THE SLEEVE WAS DESIGNED TO MEET REQUIREMENTS OF USAS B31.1 AND INSTALLATION AND TESTING WILL BE PERFORMED IN ACCORDANCE WITH SECTION XI.

. THE MIC SLEEVE IS A TEMPORARY INTERIM REPAIR AND WILL BE REPLACED AT THE NEXT OUTAGE. SINCE MIC HAS BEEN SHOWN TO BE A LONG-TERM PROBLEM AND SINCE PERIODIC MIC INSPECTIONS WILL CONTINUE TO BE MADE MONTHLY, NO PROBLEMS RELATED TO MIC DAMAGE OF THE SLEEVE ARE ANTICIPATED.

## CURRENT STATUS OF BIOCIDES INJECTION PROGRAM

. INSTALLATION OF THE NEW BIOCIDES INJECTION SYSTEM IS COMPLETE

. SODIUM HYPOCHLORITE

1. INJECTION BEGAN AUGUST 27, 1988
2. INTENDED TO INHIBIT ADDITIONAL MIC ATTACK AND CONTROL GROWTH OF ASIATIC CLAMS

. SODIUM BROMIDE

1. INJECTION SCHEDULED TO BEGIN END OF SEPTEMBER
2. QUALIFICATION TESTING IS NEARING COMPLETION

. MONITORING PROGRAM

MOBILE MONITORING STATION

(ERCW DISCHARGE HEADERS)

SUMMARY

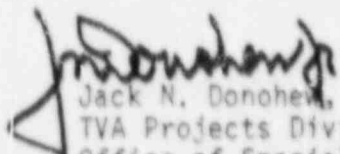
- . TVA HAS PRESENTED THE ADDITIONAL ITEMS THAT HAVE BEEN INCORPORATED INTO THE MIC PROGRAM IN RESPONSE TO THE MAY 11, 1988 AND MARCH 31, 1988 NRC SERs.
  - MONTHLY VISUAL INSPECTIONS
  - ASSESSMENT OF STRUCTURAL INTEGRITY TO ENSURE ACCEPTANCE CRITERION IS NOT EXCEEDED PRIOR TO AN OUTAGE OR REPAIR
  - LEAKAGE DOES NOT EXCEED 0.5 GPM PER WELD OR 2 GPM TOTAL LEAKAGE
- . TVA HAS PRESENTED ITS EVALUATION PROCESS IF LEAKAGE CRITERIA IS EXCEEDED.
- . TVA HAS PRESENTED ITS CONTINGENCY PLAN FOR INSTALLING A STRUCTURAL SLEEVE.

process if the MIC leakage criteria is exceeded and its contingency plan for installing a structural sleeve. The staff stated that it could not concur on the above based only on the meeting. The staff stated that TVA should submit the details of the MIC program at Sequoyah for the staff's review and approval.

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Jack N. Donohew, Jr., Project Manager  
TVA Projects Division  
Office of Special Projects

- Enclosures:  
1. Attendance List  
2. TVA's Meeting Handout

cc w/enclosures:  
See next page

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DATE	:09/27/88	:09/28/88	:09/27/88	:09/27/88	:	:	: