UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report Nos.: 50-327/95-19 and 50-328/95-19

Licensee: Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket Nos.: 50-327 and 50-328 License Nos.: DPR-77 and DPR-79

Facility Name: Sequoyah Nuclear Plant Units 1 and 2

Inspection Conducted: September 11-15 and 18-22, 1995

Inspector: [signature] 10/13/95
J. L. Coley, Jr. Date Signed

Approved by: [signature] 10/13/95
J. J. Blake, Chief Date Signed
Materials and Processes Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, announced inspection was conducted in the areas of welding, flow accelerated corrosion, inservice inspection, design changes and modifications, and licensee's actions on previous inspection findings.

Results:

In the areas inspected, violations or deviations were not identified.

The inspector's audit of welding activities (both nuclear and balance of plant) revealed that welders as a group are experienced, well qualified, and produce quality welds. In-process welding observed by the inspector revealed that good welding techniques were used, filler materials and tools were controlled, weld profiles and quality were very good.

Flow accelerated corrosion (FAC) activities including pipe replacement observed by the inspector was also considered an area where focused attention by the licensee has produced a strong FAC program and improved plant reliability. The inspector's observation of pipe replacement activities and review of the FAC program, procedures, examiner certifications, welder

Enclosure

certifications, and other applicable documentation revealed that this program is presently well structured and conducted in a very effective manner.

Two augmented inservice inspection activities were conducted by the licensee during the inspection period. Both ultrasonic examination activities were observed by the inspector and found to be satisfactory.

Design changes and modifications, and engineering reactive actions on component failures discovered during in-process outage activities were examined by the inspector. These activities included: the feedwater nozzle pipe replacement activities, the electrical penetration replacement activities, the main steam check valve and main steam isolation valve modifications, the reactor vessel control rod drive mechanism canopy seal weld leaks, the main steam check valve shaft failure, the ruptured main steam sample sink cooler and the cracking detected in the 16 inch outlet nozzle for the 1C3 feedwater heater. The licensee's design changes and modifications appeared to be well engineered.

The inspector also investigated the licensee's corrective actions and closed a previously identified violation.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*B. Adney, Site Vice-President
*J. Bajraszewski, Licensing Engineer
*J. Baumstark, Plant Manager
*L. Bryant, Outage Manager
*M. Burzynski, Engineering and Materials Manager
*M. Cooper, Technical Support Manager
*R. Driscoll, Nuclear Assurance and Licensing Manager
*T. Flippo, Site Support Manager
*J. Guess, Welding Supervisor
*F. Leonard, Manager, Inservice Inspection/ Nondestructive Examination
*K. Meade, Compliance Licensing Manager
*L. Poage, Site Quality Manager
*R. Proffitt, Compliance Licensing Engineer
*R. Shell, Site Licensing Manager
*G. Wade, Inservice Inspection/ Nondestructive Examination Supervisor
*J. Whitaker, Nondestructive Examination Specialist

Other licensee employees contacted during this inspection included craftsmen, engineers, technicians, and administrative personnel.

NRC Resident Inspectors

W. Holland, Senior Resident Inspector
*D. Starkey, Resident Inspector

* Attended exit interview

2. Nuclear Welding (Inspection Procedure No. 55050) Unit 1

Unit-1 is presently in Cycle 7 Refueling Outage. This outage the licensee planned to accomplish several significant plant modifications which required welding. Specific details regarding the modifications are delineated in paragraph 5. However, the inspector's examination of welding for these activities are described below regardless of whether the activity audited is safety related or balance-of-plant (erosion/corrosion pipe replacement) since qualification (SSP-7.52 Rev. 3), weld filler material control (SSP-7.51 Rev. 2) and in-process welding activities (SSP-7.50 Rev. 7) are all conducted in accordance with the same TVA Site Standard Practices. Welding is accomplished by TVA, the owner and licensee, using contracted personnel and supervision from Bechtel. All welding activities are controlled under the umbrella of the TVA QA Program. The construction code of record for existing safety related piping at Sequoyah is ANSI B31.7 1969 Edition with Addenda through 1970. The code of record for the balance-of-plant piping is ANSI B31.1 1967 Edition. Codes for modifications/replacements involving safety related components observed and/or reviewed by the inspector were as follows:

Modification Activity	Applicable Code
ERCW Cooler Piping	ASME Section III Class 3 (86S88)
FW Nozzle Piping Replacement	ASME Section III Class 2 (86S88)
Electrical Penetration Replacement	ASME Section III Class 2 (86W86)

Welding at the Sequoyah Nuclear Plant however, is performed to TVA's Site Standard Procedure No. SSP-7.50 which is in accordance with the latest approved edition of ASME Section IX (presently the 1989 Edition) and the 1977 Edition Summer 1978 Addenda of ASME Section XI.

Areas examined by the inspector included: (1) welder performance qualification activities which included visual examinations of destructive test on side-bend specimens and review of radiographic film, (2) base material and filler metal compatibility, and (3) in-process production welding.

a. Welder Performance Qualification

To evaluate the licensee's program and its implementation for welder performance qualification and certification, the inspector observed two in-process welder performance tests, the side-bend tests, and the subsequent evaluation of the results. The inspector verified that the attributes of the welding procedures were followed and that the individuals taking the test were the individuals listed on the performance test documents. In addition, the inspector reviewed completed Performance Qualification Test Records (PQTRs) for the welders which would perform the welding on the feedwater nozzle piping replacement and the electrical penetration replacement activities. This review included examining the radiographic film of the automatic welding test specimens for the welders certified to weld the feedwater nozzle piping modification. Performance qualification records for the following welders were examined:

Welder ID No.	Activity Specifically Qualified
G. K. #6160	Electrical Penetration Replacement
R. K. #3356	Electrical Penetration Replacement
J. M. #0453	Electrical Penetration Replacement
D. W. #0356	Electrical Penetration Replacement
M. H. #3704	Electrical Penetration Replacement
T. F. #6270	Electrical Penetration Replacement
K. W. #4062	Electrical Penetration Replacement
D. S. #0707	Electrical Penetration Replacement

Welder ID No.	Activity Specifically Qualified
B. M. #5916	Feedwater Nozzle Piping Replacement
J. R. #7266	Feedwater Nozzle Piping Replacement
T. T. #4120	Feedwater Nozzle Piping Replacement
R. B. #5311	Feedwater Nozzle Piping Replacement
J. W. #3756	Feedwater Nozzle Piping Replacement
B. B. #5495	Feedwater Nozzle Piping Replacement
S. H. #3240	Feedwater Nozzle Piping Replacement
C. M. #3753	Feedwater Nozzle Piping Replacement
R. M. #6630	Feedwater Nozzle Piping Replacement
D. A. #8141	Feedwater Nozzle Piping Replacement
D. D. #4241	Feedwater Nozzle Piping Replacement
R. D. #0091	Feedwater Nozzle Piping Replacement
K. W. #5085	Feedwater Nozzle Piping Replacement

b. Base Material and filler Material Compatibility and Control

To evaluate the licensee's program for base material and filler material compatibility and control, the inspector conducted interviews with the licensee and contractor personnel, reviewed procedures, inspected welding consumable issue stations, observed work activities and reviewed records for six heat/lots of welding filler materials. All records were retrievable, legible and consistent with regulatory and procedural requirements.

Welding Filler Materials Examined

Type	Size	Heat/Lot No.
E309-16	.125" Dia.	3F4E-4A
E309	.093" Dia.	464201
ER316	.093" Dia.	CT6289
ER316	.093" Dia.	CT6100
E316L	.093" Dia.	PA474
E316L	.125" Dia.	BE5255

c. Production Welding

The inspector observed ongoing welding activities associated with ERCW Cooler Pipe modifications, the FAC replacement piping for the #2 Extraction Steam, and replacement of the Feedwater Header. Quality records associated with the welds listed below were examined.

Those records included: weld traveler packages, welder qualification maintenance, and welding filler material certification and receiving reports.

Weld No.	Activities Observed
ERCW-6253H	In-Process Welding
ERCW-6253J	In-Process Welding
ERCW-6246H	Completed Weld
ERCW-6246J	Completed Weld
ERCW-6246M	Completed Weld
ERCW-6246L	Completed Weld
ERCW-6246K	Completed Weld
FW-FDF67B	Inprocess Welding
FW-FDF111	Inprocess Welding
ES-#15	Fit-up

The inspector's audit of welding activities (both nuclear and balance of plant) revealed that welders as a group are experienced, well qualified, and produce quality welds. In-process welding observed by the inspector revealed that good welding techniques were used, filler materials and tools were controlled, weld profiles and quality were very good.

Within the areas examined, no violation or deviation was identified.

3. Flow Accelerated Corrosion (FAC) (Inspection Procedure No. 49001) Unit-1

The licensee has established a FAC inspection program (commonly referred to as the erosion/corrosion program) which implements the EPRI (Electric Power Research Institute) CHECMATE/CHECWORKS computer codes, industry and plant experience, and previous inspection data as predictive tools for determining and prioritizing inspection locations. The inspector reviewed procedures, conducted interviews with licensee and contractor personnel, observed work activities and reviewed records as indicated below.

This outage the licensee extends to examine 322 inspection locations and to replace 618 feet of large bore piping and 2125 feet of small bore piping. Large bore piping is generally considered piping larger than two inches in diameter.

Documents Reviewed

Procedure No.	Rev.	Title
SSP-9.54	2	Flow-Accelerated Corrosion Program
0-TI-DXX-000-001.0	2	CHECMATE/CHECKWORKS Modeling, Analysis, and Use
0-TI-DXX-000-002.0	2	Non-CHECMATE Modeling, Analysis and Use
0-TI-DXX-000-003.0	3	Inspection Point Selection and Tracking

Documents Reviewed Cont'd

Procedure No.	Pev.	Title
0-TI-DXX-000-004.0	3	Inspection Data Handling and Analysis
0-TI-DXX-000-005.0	3	Additional Requirements for Flow-Accelerated Corrosion UT Examinations
N-UT-26	15	Ultrasonic Examination for the Detection of ID Pitting, Erosion, and Corrosion
N-UT-24	9	Ultrasonic Measurement of Wall Thickness
N-GP-18	5	Ultrasonic Testing Supplements
N-GP-6	6	Preparation of NDE DATA Sheets

The inspector observed ultrasonic (UT) data collection for the following Components: 102EE044, 102EE041, 106CT051, 106DE114, 103BE094, and 102EE029. UT readings taken on the components verified by the inspector were generally very high indicating minimal wear.

The inspector reviewed personnel certification documentation for nine Asea, Brown and Boveri UT examiners, reviewed equipment and material certifications, and examined the Furmanite and Temporary Repair List to determine if any failures had been experienced which would indicate a weakness in the FAC program. The inspector also observed 13 circumferential outside diameter cracks in the 16" diameter outlet nozzle on the top of the 1C3 Feedwater Heater (Component #102EN031). These cracks had been found by the UT examiners performing the FAC examinations but did not extend to the inside diameter of the pipe. The inspector also reviewed the Problem Evaluation Report (SQ951485), the licensee's expansion sample, the final results, and discussed the indications and their repair with TVA's welding engineer.

The FAC activities including pipe replacement observed by the inspector was considered an area where focused attention by the licensee has produced a strong FAC program and improved plant reliability. The inspector's observation of pipe replacement activities and review of the FAC program, procedures, examiner certifications, welder certifications, and other applicable documentation revealed that this program is presently well structured and conducted in a very effective manner.

Within the areas examined, no violation or deviation was identified.

4. Inservice Inspection (ISI) (Inspection Procedure No.73753) Unit 1

The inspector reviewed documents and records, and observed work activities as indicated below, to determine whether ISI was being conducted in accordance with applicable procedures, regulatory requirements, and licensee commitments. The applicable code for ISI is the ASME B&PV Code, Section XI, 1977 Edition with Addendas thru the Summer of 1978. Unit 1 is presently in its cycle 7 refueling outage which is the last outage of the third period of the first 10-year inspection interval. The first interval third period includes cycle 5, 6, and 7. The Unit 1 reactor pressure vessel examinations as well as nearly all of the piping and components examinations scheduled for the third period were completed in cycle 6. The licensee was using Asea, Brown, and Boveri examiners to perform the the nondestructive examinations, under the umbrella of the TVA QA Program.

Two augmented ISI activities were conducted by the licensee during the time frame of the inspector's visit. Both ultrasonic examination activities were observed by the inspector and are listed below.

Welds Examined	Description of Component Examined
RCF-24P	Draw Bead Weld on 6" Dia. Reactor Coolant Pipe
RCF-24H	Draw Bead Weld on 6" Dia. Reactor Coolant Pipe
FDF-022	Information UT on Steam Generator #4 Feedwater System

In addition to observing the above work activities the inspector reviewed the inspection procedure (N-UT-18, Rev.17), and reviewed the examiners qualifications records as well as the certification of the test equipment. The examination activities as well the documents reviewed were satisfactory.

Within the areas examined, no violation of deviation was identified.

5. Design Changes, Modifications and Engineering Reactive Activities (Inspection Procedure Nos. 37700 & 37550) Unit 1

   a. Review of Designs Changes and Modifications

      The inspector reviewed the plant modifications listed below to: (1) determine the adequacy of the safety evaluation screening and the 10CFR 50.59 safety evaluations; (2) verify that the modifications were reviewed and approved in accordance with the applicable administrative controls; (3) verify that applicable design bases were included and design documents and drawings were revised; and (4) verify that in-process work activities were properly signed-off. Design Change Notices (DCNs) Work Orders (WOs), Drawings, and other required documentation was reviewed for the following plant modifications:

      - DCN M11336 and WOs 95-01978-00 (Loop-1) & 95-02024-00 (Loop-2); Loops 1 & 2 Feedwater Nozzle Piping Replacement

        DCN M11336 was written to replace the Unit-1 loops 1 & 2 elbows located at the Steam Generator Feedwater Nozzles with a Westinghouse custom design elbow which utilizes a integral thermal liner assembly. This change was necessary to elimate the thermal fatigue cracking at the metal/water interface due to thermal stratification resulting from operation of the auxiliary feedwater system. Work activities on this modification were just beginning at the conclusion of the inspector's visit. See Region II Inspection Report No. 94-23 for history of problem and materials used on the Unit 2 replacement activities conducted on Loops 2 and 3.

- DCN M11547A and WO 95-02031-07; Electrical Penetration Replacement

  DCN M11547A replaces the presently installed obsolete canister type penetrations manufactured by Westinghouse with a modular type penetration also manufactured by Westinghouse. The existing signal type penetrations have experienced problems with high resistance in RTD leads and the control and power type penetrations have experienced problems with leakage. Five electrical penetrations will be replaced as a result of this design change.

- DCN M11514 and WO 95-06298-02; Main Steam Isolation and Check Valve Modifications

  DCN M11514A modifies the Main Steam Isolation Valves (MSIVs) 1-FCV-1-4, -11, -22, and -29, and Main Steam Check Valves (MSCVs) 1-1623, -624, -625 and -626, due to excessive problems with abnormal degradation, disc post failures and packing leakage occurring to the MSCVs. This damage to the MSCVs is the result of their close proximity to a highly turbulent area of the Main Steam system, where the MSIVs and piping elbows are located very close to the MSCVs. The MSCV discs oscillate under these conditions causing repeated impacting on the disc posts and arms, resulting in disc post failures.

  To remedy this problem, the DCN proposes removal of the MSCVs internals. This will also require the MSIVs to be modified so that they will be able to close against flow in both directions.

The inspector concluded that the documentation reviewed for each of the modification packages was satisfactory and each modification appeared to be a definite enhancement to the existing condition.

b. Engineering (reactive activities)

The inspector evaluated the licensee's engineering activities regarding the reactive resolution of technical issues from recent plant outage identified discrepant conditions. The inspector verified that regulatory requirements and licensee commitments were properly implemented in the performance of these engineering activities. The inspector also evaluated the appropriateness, timeliness, and effectiveness of the licensee's controls and determined whether there were strengths or weaknesses in the licensee's controls. Engineering actions for the following plants events were examined:

- Borated water leaks on the control rod drive mechanisms (CRDMs) lower canopy seal welds, Problem Evaluation Report No. SQ951482PER

  While performing a general inspection of the reactor head for leakage during the Unit 1 Cycle 7 refueling activities, several CRDM mechanisms were identified with boron build-up around the lower canopy seal weld. A remote visual inspection was subsequently performed and 3 locations out of the 15 identified were confirmed as leaking canopy seal welds. The 3 locations were identified as A-5 (instrument column), E-13 (full length CRDM) and L-13 (full length CRDM). The upper and intermediate canopy welds were examined and did not have any evidence of boron leakage. No degradation of carbon steel parts on the housing were identified. The licensee intends to overlay weld repair the leaking canopy seal welds using approved Inconel 625.

- Main Steam Sample Cooler 1A for Steam Generator # 4 Ruptured, Problem Evaluation Report No. SQ951411PER

  Subsequent investigation by TVA determined that the rupture was created by steam sample flow through the tube side while the shell side (water side) was isolated on both inlet and outlet sides. The sample cooler was likely water solid. The Critique for the Problem Evaluation Report SQ951411 revealed a number of programmatic as well as personnel discrepancies lead to this failure.

- Cracking in Main Steam Check Valve #624 Disc Shaft, Problem Evaluation Report No. SQ951449PER

  The Sequoyah plant main steam check valves (MSCVs) are 32 inch, 600 pound valves, manufactured by Atwood and Morrill Company. The valve disc is pinned to a shaft which is keyed to two counter weights located outside the valve. The valves are required to close against reverse steam flow to prevent blow down from more than one steam generator in the event of a steam line break upstream of the Main Steam Isolation Valve (MSIV). This outage the Unit 1 MSCV discs are being removed and the MSIVs modified to perform the function of the check valve. When MSCV #624 was disassembled to remove the disc, fatigue damage was found at the end of the shaft outside the valve. The damage was in the area where the shaft is keyed to the counter weight arm. Portions of the shaft outside the valve had "peeled" as a result of the fatigue failure. The shaft failure was most likely due to fatigue originating near the root of the key way.

- Thirteen circumferential outside diameter cracks found in 16" nominal diameter outlet nozzle on top of 1C3 Feedwater Heater, Problem Evaluation Report No. SQ9514385PER

The inspector held discussions with cognizant engineers, reviewed evaluations, procedures and other documents, viewed video tapes of the visual inspections performed on the CRDMs canopy seal welds and observed the each failure in the field. As a result of the above reviews, the inspector considered the evaluations conducted and the corrective measures taken to be well engineered.

Within the areas examined, no violation or deviation was identified.

6. Previous Inspection Findings (92701) Units 1 & 2

(Closed) SL-IV Violation No. 50-327, 328/93-24-01, "Failure to Perform and Document Adequate Suitability Evaluation of Replacement Parts In Accordance with ASME Section XI"

TVA's reply dated August 6, 1993, to this notice of violation stated the reason for this violation was that the Repair and Replacement Program was inadequate, in that, it did not require that a suitability evaluation be performed. Based on industry information and experience, it was determined in 1988 that the feedwater nozzles would require replacement in the future. The replacement specified in 1988 did not adequately consider the impact of long-term auxiliary feedwater operation in Mode 3. Replacement of the elbows and transition pieces was initiated in 1988 before the failure occurred and without the metallurgical analysis for the like-for-like material change. Since there was no failure and the original material had performed adequately for several years, a suitability analysis was not performed at that time. Immediate corrective action taken by the licensee consisted of: (1) TVA performed a suitability evaluation on the applicable feedwater components, this evaluation determined that the feedwater piping components were acceptable for at least one fuel cycle. (2) Mode 3 operating procedures were evaluated and determined to be appropriate for minimizing stratification flow conditions. Auxiliary feedwater usage is also monitored to establish trigger points to perform nondestructive examination for cracks. (3) TVA established a Technical Programs and Performance Organization as the single owner for the ASME Section XI program at Sequoyah. The Technical Programs and Performance Organization will assure that adequate suitability evaluations are conducted when repairs or replacements are made on components covered by ASME Section. (4) TVA revised their procedure (SSP-6.9) for the Repair/Replacement of ASME Section XI Components to require that a suitability evaluation be performed and be approved by the ASME Coordinator or the cognizant engineer.

To verify the licensee's corrective action the inspector reviewed the changes to SSP-6.9 Rev. 5 and reviewed the work orders of the Section XI modifications delineated in paragraph 5 of this report to determine if a suitability evaluation was performed. The inspector reviews revealed that the licensee's correction actions appear to be satisfactory. This item is considered closed.

Within the areas examined, no other violation or deviation was identified.

7. Exit Interview

The inspection scope and results were summarized on September 22, 1995, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed below. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

(Closed) SL-IV Violation No. 50-327, 328/93-24-01, Failure to Perform and Document Adequate Suitability Evaluation of Replacement Parts In Accordance with ASME Section XI, paragraph 6