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

Report Nos.: 50-259/93-40, 50-260/93-40, and 50-296/93-40

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

Docket Nos.: 50-259, 50-260 and 50-296

License Nos.: DPR-33, DPR-52, and DPR-68

Facility Name: Browns Ferry 1, 2, and 3

Inspection Conducted: October 25-29, 1993

Inspector: _____ Nov 4, 1993
William P. Kleinsorge P.E. Date Signed
Reactor Inspector

Approved by: _____ 11/10/93
Jerome O. Blake, Chief Date Signed
Materials and Process Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, announced inspection was conducted in the area of Inservice Inspection (ISI).

Results:

The licensee's ISI Coordinator, and Level III examiner were actively involved in the resolution of technical issues and ensuring that all quality objectives were properly addressed by examiners. Identification and resolution of technical issues are being handled in an effective manner.

In the areas inspected, no violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*F. Froscello, Inservice Inspection (ISI)
*J. Johnson, Manager, Quality Assurance (QA)
*J. Maddox, Manager, Nuclear Engineering
*R. Moll, Acting Manager, Operations
*J. Rupert, Manager, Engineering and Modifications
*J. Scalice, Plant Manager
*T. Shriver, Manager, Nuclear Assurance and Licensing
*P. Salas, Manager, Licensing
*R. Wells, Manager, Compliance Licensing
*J. Whitaker, ISI Level III Examiner
*O. Zeringue, Site Vice President

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

Other Organizations

General Electric Nuclear Services

*O. Bragg, GERIS 2000 Project Manager
C. Minor, Level III Examiner
R. Seals, BFN Reactor Pressure Vessel (RPV) Project Manager

Hartford Steam Boiler

*A. Ladd, Authorized Nuclear Inservice Inspector (ANII)

NRC Resident Inspectors

C. Patterson, Senior Resident Inspector
*J. Munday, Resident Inspector
*R. Musser, Resident Inspector
G. Schnebli, Resident Inspector

*Attended exit Interview

2. Inservice Inspection (ISI)

Background

Browns Ferry Units 1 and 3 are in an extended shutdown status, in the third, 40-month period, of the first, ten-year interval. Unit 2 is operating in the third, 40-month period, of the first, ten-year interval (P3,I1) which is scheduled to end February 23, 1993. Unit 1 received its Operating License December 20, 1973, and declared commercial operations

on August 1, 1974. Unit 2 received its Operating License on August 2, 1974, and declared commercial operations on March 1, 1975. Unit 3 received its Operating License on August 18, 1976, and declared commercial operations on March 1, 1977. (While the ten-year inspection interval would normally end on the tenth anniversary of the date of commercial operations, these three units are still considered to be in their first, ten-year ISI inspection interval because the ASME code allows for the extension of inspection intervals to compensate for extended outages.)

The applicable code for ISI, for Units 1 and 3 is the ASME B&PV Code, Section XI, 1974 Edition with Addenda through the Summer 1975 (74S75) for everything except technique. The applicable code for technique is the ASME B&PV Code Section XI, 1986 Edition and no Addenda. The applicable code for ISI, for Unit 2 is the ASME B&PV Code, Section XI, 1986 Edition without Addenda.

For the Reactor Pressure Vessel (RPV) inspections, ASME B&PV Code Section XI, 1989 Edition with Addenda through 1991, which implements the Appendix VIII, "Performance Demonstration For Ultrasonic Examination Systems", is being used for guidance only. The Tennessee Valley Authority (TVA) and General Electric's (GE)'s performance demonstration for qualification of automatic ultrasonic examination personnel, procedures, and equipment for inspection from the I.D. of the vessel, were conducted in the spirit of Appendix VIII.

a. Observation of Work and Work Activities, Unit 3 (73753)

The inspector observed work activities, reviewed certification records of NDE equipment and materials, and reviewed NDE personnel qualifications for personnel who had been utilized in the ISI examinations during this outage. The observations and reviews conducted by the inspector are documented below.

Activities Observed

Ultrasonic Examination (UT)

The inspector observed examiners perform equipment calibrations and ultrasonic examinations for the areas listed below. The examinations were observed to determine whether approved procedures were being followed, if examination personnel were knowledgeable of the examination method and operation of the test equipment, whether welds were properly scanned, and whether examination results and evaluations of the results were recorded, plotted, and dispositioned correctly. The applicable procedures for the examinations were GE-UT-700, GE-UT-701, GE-UT-400, and GE-UT-401. Personnel and equipment certifications were verified by the inspector. The following ISI examinations were observed by the inspector:

Ultrasonic Examinations/System Calibrations Observed

Identification	Area	Activity
Weld C-2-3	Patch[1] 65	Automated Data Acquisition
Nozzle N4E	Inner Radius	Automated Equipment Setup, Calibration and, Data Acquisition
Nozzle N4F	Inner Radius	Automated Equipment Setup

[1] Welds are subdivided into inspection patches to accommodate computer data storage.

The inspector reviewed the certification documentation for the following UT equipment: Transducers S/N 92-826, 92-827, 92-828, 92-829, 92-839, 92-840, 92-841, 92-842, 92-852, 92-853, 92-854, 92-855, 92-865, and 92-866; Thermometer S/N L00437CL.

The inspector reviewed the certification, qualification, and visual acuity documentation for following UT examiners: ROF UT-II, JCG UT-II, CAM UT-III and TK UT-III.

The examinations were performed satisfactorily.

b. Review of Ultrasonic Data and Evaluations Unit 3 (73755)

The inspector reviewed data for the inspection patches on Weld C-1-2, listed below, to determine whether: data was consistent with the acceptance criteria; data recording, evaluation, and disposition of findings were accomplished in accordance with the applicable examination procedures.

Inspection Patch No.
BF-116
BF-117
BF-118
BF-119
BF-120
BF-121
BF-122
BF-123

Documentation for the examination patches listed above was excellent. Evaluation and disposition of recorded indications by the analyst was also performed satisfactorily.

Within the areas examined, no violations or deviations were identified.

3. Licensee Event Report (LER)

(Closed-Unit 2 Only) LER 260/88-037: Inadequate Design Control Procedures In HVAC Duct Work

Pursuant to deficiencies identified at Watts Bar Nuclear (WBN) Plant, the licensee conducted walkdown inspections of Heating Ventilating and Air Conditioning (HVAC) duct work at the Browns Ferry Nuclear (BFN) Plant. The licensee discovered that the duct work had discrepancies between the design assumptions and the duct work test results and/or design standards. The licensee determined the cause of these conditions to be inadequate design controls in place at the time the HVAC systems were originally designed.

As reported in NRC Inspection Report (IR) 50-259,260,296/91-06, the licensee performed a walkdown and evaluation of the systems affected. Repairs or modifications as necessary, to meet the required criteria for operability were completed. The NRC staff reviewed the licensee's actions and determined them acceptable for Unit 2 restart as documented in NUREG-1232, Vol.3, Supp.2. The analysis conducted for Unit 2 refueling and restart used stresses that were deemed satisfactory for "interim" operation. Approximately 12,000' of duct and 509 existing supports were qualified to the interim design criteria. "Long term" operation criteria were established and documented in TVA General Design Criteria BFN-50-C-1704., and approved by NRC letter dated July 16, 1992.

The licensee evaluated the 12,000' of duct and 509 supports qualified to the "interim" operability criteria, for qualification to the "long term" operability criteria. This evaluation compelled the installation of or modifications to 113 HVAC supports. No modification to ducts was required. Ten Design Change Notices (DCN)s were issued to effect this work. The 113 supports have been modified or installed.

To address the issue of inadequate design controls for future design work, the licensee issued the below listed procedures. The generic issue of inadequate design control for existing designs at BFN, is addressed in "The Browns Ferry Nuclear Performance Plan of The Tennessee Valley Authority", Revision 2 (NPP).

The walkdowns, evaluations, modifications, and installations indicated above, apply to seismic Class 1 HVAC duct work only. The NPP indicated that the program to evaluate seismic spectral interactions of seismic Class 2 features installed over seismic Class 1 features including HVAC duct work, will be conducted following the resolution of Unresolved Safety Issue A-46, utilizing the techniques developed by Seismic Qualification Utility Group (SQUG).

To evaluate the adequacy of the licensee's actions the inspector conducted interviews with licensee personnel, reviewed the procedures listed below, and conducted a walkdown inspection of eleven selected modified HVAC supports listed below.

Procedures Reviewed

Identification	Revision	Title
NEP-3.1	2	Calculations
NEP-3.2	1	Design Input
SEP-9.5.6	0	Design Verification

HVAC Supports Examined

Identification	Drawing No.	Support Location
1-SWHVAC-92-37	1-47B930-44	Control Bay Floor el. 593'
1-SWHVAC-94-07	1-47B930-38	Control Bay Floor el. 593'
1-SWHVAC-94-15	1-47B930-42-1	Control Bay Floor el. 593'
1-SWHVAC-92-0113	1-47B930-63	Control Bay Floor el. 593'
1-SWHVAC-71-40	1-47B930-31	Control Bay Floor el. 606'
1-SWHVAC-71-41	1-47B930-32	Control Bay Floor el. 606'
1-SWHVAC-132-07	1-47B930-50	Control Bay Floor el. 606'
1-SWHVAC-132-01	1-47B930-51	Control Bay Floor el. 606'
1-SWHVAC-80-28	1-47B930-192	Control Bay Floor el. 617'
1-SWHVAC-80-31	1-47B930-190	Control Bay Floor el. 617'
1-SWHVAC-71-17	1-47B930-190	Control Bay Floor el. 617'

This LER is considered closed for Unit 2 only, it remains open for Unit Nos. 1 and 3 pending the completion of the walkdowns, evaluations, modifications/installations to the HVAC duct work in those units.

Within the areas examined, no violations or deviations were identified.

4. Review of Actions Taken by TVA for a Reported Steam Leak in the 4" Extraction Steam Line - Followup - Unit 2 (49001)

As reported in NRC IR 50-259,260,296/93-38, on October 6, 1993, TVA notified NRC that they had experienced a steam leak in a weld joining a weld-o-let to a 4" drain line. Because the 4" line was spraying steam and the radiation levels were high in Unit 2, the licensee ultrasonically examined the same fittings in Unit 1 and plans to examine the Unit 3 fittings as part of their regularly scheduled Erosion/Corrosion (E/C) program, to determine whether E/C was the mechanism for the failure in Unit 2. The licensee made an entry into the high radiation area in

Unit 2, ultrasonically examining the weld-o-let to pipe weld and pipe at 90° intervals, at the weld, one inch down from the weld, and two inches down from the weld. Eight of the eleven readings taken, were below nominal pipe wall thickness (0.237"), three of those eight were below 87½% of nominal wall thickness (0.207"). The lowest wall thickness reading was 0.163" measured two inches down from the weld and 180° from the hole. All eleven readings were well above design minimum wall of 0.0187". Approximately one man rem of dose was received in the Unit 2 examination effort. The licensee affected an online repair to the hole using furmanite.

The licensee has ultrasonically investigated the piping on Unit 1. Unit 1 was chosen because it was thought to have the same pipe configuration, operational time, and the worst chemistry conditions. The configuration of the Unit 2 piping is as follows: a vertical 4" weld-o-let is welded to a horizontal 24" pipe run at the 6:00 o'clock position, the lower end of the weld-o-let is welded to a vertical 4" diameter pipe section approximately 2½" long, the lower end of the 4" pipe is welded to a 4"x4"x3" tee with the through 4"x4" leg in the vertical position. The Unit 1 configuration is the same as the Unit 2 configuration except that the 4" weld-o-let is welded directly to the 4"x4"x3" tee. The licensee applied a grid to the Unit 1 tee and ultrasonically examined the same. A review of the data, for a pattern indicative of E/C was inconclusive because of the nonuniform nature of the cross section of tee pipe fittings. All readings were above 87½% of the nominal wall thickness which is 0.207".

As the original leak was noted by an auxiliary operator, while preforming a weekly task, it is the licensee's view that any future leaks in the same location should be similarly identified. The licensee indicated that they would determine the extent of degradation in this area of Unit 2 during the next refueling outage, scheduled for October 1994, and replace piping as appropriate. The licensee further indicated that the same area in Unit 3 will be thoroughly evaluated in the normal course of the Unit 3 E/C program.

It is the inspector's view that the hole was probably a weld defect that was opened up by E/C, because the hole appeared on the weld, a location which is thicker than the surrounding piping. There appears to be reasonable assurance that the piping will remain intact for the remainder of this fuel cycle because of the following: it took six operation cycles for the leak to appear; the piping in this area is well above the design minimum wall value of 0.0187" and; the leaking weld has been encapsulated by a furmanite fixture.

Within the areas examined, no violations or deviations were identified.

5. Exit Interview

The inspection scope and results were summarized on October 29, 1993, with those persons indicated in paragraph 1. The inspector described the areas inspected. Although reviewed during this inspection, proprietary information is not contained in this report. No dissenting comments were received from the licensee.

6. Acronyms and Initialisms

ANII	-	Authorized Nuclear Inservice Inspector
ASME	-	American Society of Mechanical Engineers
B&PV	-	Boiler and Pressure Vessel
BFN	-	Browns Ferry Nuclear Plant
DCN	-	Design Change Notice
DPR	-	Demonstration Power Reactor
E/C	-	Erosion Corrosion
el.	-	Elevation
GE	-	General Electric Company
GERIS	-	General Electric Remote Inspection System
HVAC	-	Heating, Ventilating and Air Conditioning
I.D.	-	Inside Diameter
IR	-	Inspection Report
ISI	-	Inservice Inspection
LER	-	Licensee Event Report
NDE	-	Nondestructive Examination
No.	-	Number
NPP	-	Browns Ferry Nuclear Performance Plan of The Tennessee Valley Authority
NRC	-	Nuclear Regulatory Commission
P.E.	-	Professional Engineer
QA	-	Quality Assurance
RPV	-	Reactor Pressure Vessel
S/N	-	Serial Number
SQUG	-	Seismic Qualification Utility Group
Supp.	-	Supplement
TVA	-	Tennessee Valley Authority
UT	-	Ultrasonic
Vol.	-	Volume
WBN	-	Watts Bar Nuclear Plant