UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W.
ATLANTA, GEORGIA 30323

Report Nos.: 50-259/89-20, 50-260/89-20, and 50-296/89-20

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 Units 1, 2, and 3

Inspection at Browns Ferry Site near Decatur, Alabama

Inspection Conducted: May 15 - June 15, 1989

Inspectors: for D. R. Carpenter, NRC Site Manager — 8/3/89 Date Signed

for C. A. Patterson, NRC Restart Coordinator — 8/3/89 Date Signed

Accompanied by:
E. Christnot, Resident Inspector
W. Bearden, Resident Inspector
K. Ivey, Resident Inspector
A. Johnson, Project Engineer
B. Long, Project Engineer
D. Moran, Project Manager

Approved by: W. S. Little, Section Chief, Inspection Programs, TVA Projects Division — 8/3/89 Date Signed

SUMMARY

Scope:

This routine resident inspection included the areas of operational safety verification, surveillance observation, maintenance observation, maintenance, control rod drive housing seismic reanalysis, reportable occurrences, action on previous inspection findings, restart test program, Volume III commitments, and site management and organization, and training.

Results:

One violation was identified:

260/89-20-01: Failure to Meet TS Requirements for Operable RHR Pumps, paragraph 2.

One deviation was identified:

260/89-20-05: Failure to Conduct Volume III Training for Modification Engineers, paragraph 12.a.

Two inspector followup items were identified:

259, 260, 296/89-20-02: CRD Seismic Analysis, pargraph 6.

259, 260, 296/89-20-04: Review of Hardware TEs for Procedures RTP-31A, 31B, 74 and 99, paragraph 9.

Four unresolved item were identified:

259, 260, 296/89-20-03: Reportability of Diesel Fire Pump Lockout Relay Single Failure, paragraph 7.a.

260/89-20-06: Restriction of Untrained Personnel From Work Activities, paragraph 12.a.

260/89-20-07: Resolution of Training Discrepancies, paragraph 12.a.

260/89-20-08: Corrective Action for CAQR, paragraph 12.b.

A weakness was identified in electrical maintenance performed during plant modifications. Numerous examples of electrical motors rotating backwards have occurred. This weakness resulted in the TS violation in paragraph 2.

Since most of the restart test program has been completed, the licensee has depended on adequate post modifications testing to ensure that system remain operable. The violation was an example of inadequate post modification testing. The large number of modifications that have been completed after completion of the restart tests, coupled with problems with post modification testing is of concern to the NRC.

REPORT DETAILS

1. Persons Contacted

Licensee Employees:

*O. Zeringue, Site Director
#*G. Campbell, Plant Manager
R. Smith, Project Engineer
#*J. Hutton, Operations Superintendent
*A. Sorrell, Maintenance Superintendent
*D. Mims, Technical Services Supervisor
*G. Turner, Site Quality Assurance Manager
*P. Carier, Site Licensing Manager
*W. Ivey, Acting Compliance Supervisor
#*J. Corey, Site Radiological Control Superintendent
R. Tuttle, Site Security Manager
#T. Dexter, Training Manager

Other licensee employees or contractors contacted included licensed reactor operators, auxiliary operators, craftsmen, technicians, and public safety officers; and quality assurance, design, and engineering personnel.

NRC Staff

#*D. Carpenter, Site Manager
#*C. Patterson, Restart Coordinator
E. Christnot, Resident Inspector
W. Bearden, Resident Inspector
#*K. Ivey, Resident Inspector
*A. Johnson, Project Engineer
B. Long, Project Engineer
D. Moran, Project Manager

*Attended Resident exit interview June 16, 1989
#Attended Training exit interview May 19, 1989

Acronyms used throughout this report are listed in the last paragraph.

2. Operational Safety Verification (71707)

The inspectors were kept informed of the overall plant status and any significant safety matters related to plant operations. Daily discussions were held with plant management and various members of the plant operating staff.

The inspectors made routine visits to the control rooms. Inspection observations included instrument readings, setpoints and recordings, status of operating systems, status and alignments of emergency standby

systems; onsite and offsite emergency power sources available for automatic operation, purpose of temporary tags on equipment controls and switches, annunciator alarm status, adherence to procedures, adherence to limiting conditions for operations, nuclear instruments operability, temporary alterations in effect, daily journals and logs; stack monitor recorder traces; and control room manning. This inspection activity also included numerous informal discussions with operators and supervisors.

General plant tours were conducted. Portions of the turbine buildings, each reactor building, and general plant areas were visited. Observations included valve positions and system alignment, snubber and hanger conditions, containment isolation alignments, instrument readings; housekeeping, proper power supply and breaker alignments, radiation area controls, tag controls on equipment, work activities in progress, and radiation protection controls. Informal discussions were held with selected plant personnel in their functional areas during these tours.

The NRC inspectors reviewed the following issues during this report period:

a. Failure to maintain TS requirements for operable RHR pumps.

On May 23, 1989, during the performance of procedure 2-SI-4.5.B.1.d(I), "RHR System Rated Flow Test Loop I," the licensee identified that there was no air flow from the 2C RHR pump cooler. The licensee then declared the cooler and associated 2C RHR pump inoperable. Further investigation revealed that the cooler fan was rotating backwards and that the fan motor power cable had been replaced during an Appendix R modification on March 17, 1989. The licensee also performed an Incident Investigation (Report 89-38) which determined the root cause of this event to be failure to follow a test procedure and an inadequate procedure.

The NRC inspector held discussions with licensee personnel and reviewed Control Room logs, completed SI packages, the modification package, and the Incident Investigation Report, and determined the following:

- On March 17, 1989, the 2C RHR pump cooler was tagged for Appendix R modification work. Testing performed following the modification included a motor rotation test, which was signed off as acceptable. The personnel performing the work failed to correctly perform the procedure which required counter clockwise rotation of the fan. The instruction did not specify a point of reference for rotation direction and assistance was sought from operations in verifying correct rotation. The modifications engineer and independent reviewer based their signatures on verbal verfication from operations that fan rotation was correct. They did not visually verify counter clockwise rotation of the fan as specified by the workplan.

- On March 19, 1989, the 2C RHR pump cooler was declared operable.

- On May 3, 1989, 2-SI-4.5.B.1.d(I) was performed to return RHR Loop I to service and the inoperable pump cooler was not discovered at that time. Step 7.21 of the SI states, "Locally VERIFY that the RHR Pump C Cooler Fan is operating." There is no step to verify flow.

- On May 10, 1989, RHR pumps 2B and 2D (Loop II) were declared inoperable for scheduled outage activities.

- On May 23, 1989, the licensee identified that the 2C RHR pump cooler was not producing air flow and was inoperable. The 2C RHR pump was also declared inoperable.

- On May 25, 1989, repairs were completed, the operability SI was performed, and the 2C RHR pump and cooler were declared operable.

TS 3.5.B.9 requires that at least one RHR loop with two pumps or two loops with one pump per loop be operable when the reactor vessel pressure is atmospheric and irradiated fuel is in the reactor vessel. TS 3.5.D.1 and TS 3.5.D.2 require that the equipment area cooler associated with each RHR pump be operable at all times when the pump served by that specific cooler is considered to be operable; and when an equipment area cooler is not operable, the pump served by that cooler must be considered inoperable. For the period of May 10-25, 1989, the licensee failed to meet the TS requirements for two RHR pumps since only the 2A RHR pump (Loop I) was operable. The failure to meet TS requirements is identified as violation 260/89-20-01.

From discussions with licensee personnel and other NRC personnel, and reviews of NRC inspection reports and the Incident Investigation Report for this event, the NRC inspectors noted that there have been several instances of improper cable terminations and/or motor rotation.

- Following modifications, during motor rotation verification for valve 2-FCV-74-67, the valve was back seated and thermal protection opened the circuit.

- Following modifications, the drywell equipment sump pumps were found to be rotating backwards.

- Following modifications, conductors A and C of Cable PL 5235-IE were found reversed at the I&C Bus A (Unit 2) 75 KVA step down transformer.

- In April 1988, the 1B CRD pump was allowed to reverse rotate twice causing mechanical damage.

- In October 1988, the 2B-3 drywell blower motor was discovered with reverse rotation.

Collectively, these examples of improper electrical connections are indicative of a weakness in electrical maintenance performed during plant modifications. Checking the proper rotation of an electrical motor is a basic fundamental skill of electrical craftsman. This violation is significant in that there were several examples of reversed motor rotation which were not adequately addressed in the past to correct the problem. Improper workmanship directly lead to a condition where the plant was outside TS requirements. Furthermore, this condition could have been prevented by an acceptable post modification test and operability SI. The corrective action for this violation should address why the electrical connections were not correctly made, why the post modification test did not identify this problem, and why the fan operability SI did not identify this problem. Since many of the restart tests have been completed, it is essential that proper post modification tests are performed on systems that have been previously tested.

One violation was identified in the Operational Safety Verification area.

3. Surveillance Observation (61726)

Surveillance testing activities were observed/reviewed to verify that they were conducted in accordance with requirements. The inspections consisted of a review of the SIs for technical adequacy and conformance to TS, verification of test instrument calibration, observation of the conduct of the test, confirmation of proper removal from service and return to service of the system, and a review of the test data. The inspectors also verified that limiting conditions for operation were met, testing was accomplished by qualified personnel, and the SIs were completed at the required frequency. The inspectors observed/reviewed the following SI performance during this report period:

- The NRC inspector observed portions of 2-SI-4.5.C-1(3), "RHRSW Pump and Header Operability Flow Test," performed on RHRSW pumps "C1" and "C2". The inspector noted that pump "C1" failed the SI because of too much total head. A MR was written previously to address this concern, but had not been completed. No deficiencies were identified with the performance of the SI.

No violations or deviations were identified in the Surveillance Observation area.

4. Maintenance Observation (62703)

Plant maintenance activities of selected safety-related systems and components were observed/reviewed to ascertain that they were conducted in accordance with requirements. The following items were considered during this review: the limiting conditions for operations were met; activities

were accomplished using approved procedures; functional testing and/or calibrations were performed prior to returning components or system to service; quality control records were maintained; activities were accomplished by qualified personnel; parts and materials used were properly certified; proper tagout clearance procedures were adhered to; Technical Specification adherence; and radiological controls were implemented as required. MRs were reviewed to determine the status of outstanding jobs and to assure that priority was assigned to safety-related equipment maintenance which might affect plant safety.

The inspectors observed/reviewed the following maintenance activities during this report period:

- MR# 912862 which was written to perform preventive maintenance on RHRSW Pump "D2" pressure indicator 2-PI-23-26.

- MR# 900636 which was written to align the "1D" DG.

- HO 0-89-374 on the "D3" RHRSW pump and reviewed the clearance log to verify compliance with SDSP-14.9, "Equipment Clearance Procedure." The NRC inspector verified that the clearance isolated the affected portions of the system tagged; the documented components were tagged and in the correct position; and applicable TS LCO were satisfied.

- Modification of Unit 1 spent fuel pool anti-siphon check valves.

No deviations or violations were identified.

5. Maintenance (62700)

a. The BF MIP was submitted to the NRC by letter dated March 15, 1989. The MIP was developed in March 1987 and a presentation made to the NRC. Since March 1987, work has progressed on the completion of the MIP. The program was designed to evaluate existing activities, identify needed improvements, and manage the changes through implementation. The program consists of two parts, programmatic description and action items. The program description is provided by the MIP documents. The action items are provided by the MAP documents which contain the description of the means to assess, plan, execute and verify the improvements needed to establish and maintain the maintenance program consistent with the MIP.

The status of the program on June 8, 1989 was as follows:

Total MAPs developed	340
MAPs required for startup	309
MAPs complete	203

The NRC inspector reviewed the files containing the MAPs. Each MAP has a closure package with the applicable documentation to close the item.

In addition, as part of an overall assessment of the maintenance, TVA conducted a self-assessment team audit of maintenance. This audit, performed in May 1989, was conducted similar to an NRC maintenance team inspection. The maintenance superintendent stated that the overall assessment was that programs are in place but implementation problems exist. A weakness was noted in the control of backlog items. There was a backlog of 7500 maintenance requests with 4500 items designated as startup items. There were 800 late preventive maintenance items.

In summary, the MIP has progressed to at least 65% complete despite several changes in maintenance superintendents. However, implementation of the program needs improvement along with the control of the backlog items. The new maintenance superintendent appeared very knowledgeable of the problem areas in maintenance and of the challenges ahead to correct them.

b. Weld Overlay Repairs

During a review of the plant work items list for June 8, 1989, the inspector noticed that recirculation system weld overlays was a work item. The inspector was unaware of any recent reports of any pipe cracking. In discussion with plant personnel the inspector learned that the NRC's Safety Evaluation of TVA's actions in response to Generic Letters 84-11 and 88-01 addressed a need for a post-IHSI inspection of 71 welds. In a letter to the NRC dated January 12, 1989, TVA committed to inspect the welds and provide the results to the NRC before restart of Unit 2. The post-IHSI inspection found 8 indications - 4 in the recirculation system, 2 in the RWCU system, and 2 in the RHR system. Weld overlay repairs were required for three of the recirculation system indications and the two RWCU system indications. Setup for the repair was just beginning and would be completed by the end of July, 1989. TVA planned to provide a revised response to Generic Letter 88-01 in July, 1989.

6. Control Rod Drive Housing Seismic Reanalysis

On May 17, 1989, the licensee notified the resident inspectors that an apparent discrepancy existed between the moment of inertia (stiffness) used in a recent seismic reanalysis for the CRD housings and the moment of inertia used in the original stress evaluation. The original seismic analysis was to have been superseded by a new reanalysis using more modern methods intended to result in more accurate data. During the seismic reassessment conducted by Bechtel North American, a seismic analysis had been performed using a combined mathematical model of the RPV, RPV internals, Reactor Building structure and internals. The model for the RPV and internals provided by GE incorrectly included two spring constants which represented lateral supports for the CRD housing which are not actually installed at Browns Ferry. The original model for the RPV and internals did not include the two supports.

The original seismic analysis for the CRD housings at Browns Ferry Unit 2, which showed conformance to the code allowable stresses, is documented in the Browns Ferry Final Safety Analysis Report (FSAR). Table C.0-5 in the FSAR shows that the calculated stress met applicable limits.

When the model for the RPV and internals was revised deleting these two spring constants and the analysis performed, the subsequent stress check of the CRD housing revealed that the stiffness of the CRD housing was not correctly accounted for in the revised model. As the result of this reduced moment of inertia, there exists a concern that the design condition might be outside of the BF FSAR licensing basis. This issue is documented by the licensee in CAQR BFP 89414.

The NRC inspectors met with licensee management representatives to determine the impact of this issue on plant activities. The licensee stated that with the plant in cold shutdown with the reactor head removed the seismic bending stresses in the CRD housing using currently available load data are within the FSAR allowables for the DBE and within the interim allowables defined by BFN-50-C-730.3 for Class I piping. The licensee further stated that the full impact of this issue was still under evaluation. The NRC inspector reviewed GE Nuclear Energy Letter dated May 19, 1989 that addressed the issue. In that letter, GE stated although the condition was still part of an ongoing evaluation, that it was their conclusion that the existing CRD housing arrangement was in compliance with the FSAR licensing basis and that it was probable that application of present code acceptance criteria would show that the existing CRD housing arrangement to be acceptable.

The NRC inspector will follow the licensee's progress in this area. An Inspector Followup Item 259, 260, 296/89-20-02, CRD Seismic Analysis will be opened pending further review of generic implications of this issue.

7. Reportable Occurrences (92700)

a. Reportability for Single Failure of Fire Pump Relay

On March 22, 1989, the licensee notified the NRC of a condition caused by a failure to adequately address single failure criteria during the original plant design associated with the AC power fire pump start logic. At that time the licensee stated that a failure of a common lockout relay associated with the three motor driven fire pumps could result in the failure of three diesel generators due to the uncontrolled loading of the diesel generators.

The three BF electric driven fire pumps are supplied from the plant 4160 volt shutdown boards. A common motor driven fire pump start signal is generated by activation of fire protection detectors; this common start logic starts the appropriate fire pump and, if sufficient water pressure is unavailable, starts the two subsequent fire pumps at fifteen second intervals.. In the event of LOP/LOCA, a single lockout relay is actuated that prevents the starting of the

motor driver AC fire pumps. This interlock feature was installed to prevent diesel generator overload caused by additional fire pump load during an accident event. Assuming a single failure of the lockout relay to prevent initiation of fire pumps, the fire pumps are started but due to the accident loads the diesel generators would be overloaded during the first ten minutes.

If the first diesel generator fails due to overload, the fire pump auto start signal automatically sequences to a second fire pump and a second diesel generator. If the second diesel generator fails, the auto start signal moves to a third fire pump and a third diesel generator. Thus, it is possible to sequentially fail three diesel generators due to the uncontrolled loading of the diesel generators due to the single failure of the lockout relay.

The fire protection detectors outside of the drywell are not qualified for the LOCA condition; therefore, they are subject to activation of a fire pump start signal due to the LOCA environment. Fire protection detectors located within the drywell are not associated with fire pump start logic.

The loss of three diesel generators under these conditions is not analyzed.

The failure of this relay during a LOP/LOCA was evaluated by TVA to determine if the FSAR single failure criteria was met. Because fire detectors are heat sensitive, a high energy line break outside containment could cause initiation of the fire detector. An evaluation of the diesel generator loading and plant response for the limiting event, a main steam line break outside of containment, was performed and determined that the condition could possibly cause the overloading of single diesel generator. The loss of a single DG during an accident is within the BF design basis.

A second lock out relay will be added to the circuit to completely eliminate the concern of the single failure criteria not being met. Although this failure was initially reported to the NRC by the ENS phone on March 22, the licensee does not now consider the issue as reportable and did not issue a LER in accordance with 10 CFR 50.73. This will be tracked as URI 259, 260, 296/89-20-03, pending further review of the reportability concern by the inspector.

b. The LERs listed below was reviewed to determine if the information provided met NRC requirements. The determination included the verification of compliance with TS and regulatory requirements, and addressed the adequacy of the event description, the corrective action taken, the existence of potential generic problems, compliance with reporting requirements, and the relative safety significance of each event. Additional in-plant reviews and discussions with plant personnel, as appropriate, were conducted.

(1) (CLOSED) LER 259/85-14, Battery Racks Not Mounted Per Drawings.

This issue is identical to VIO 259, 260, 296/85-28-05, the closure of which is discussed in paragraph 8 in this report. Therefore, this item is considered closed.

(2) (OPEN) LER 296/88-03, Inoperability of Diesel Generators Due to Seismically Unqualified Battery Racks.

This item involves the discovery that several cross-bracing members in safety-related battery racks were either missing or improperly installed, and not in conformance with vendor drawings, thereby placing in doubt their ability to function during a seismic event. To date, the licensee has performed field walkdowns of all battery racks, installed the hardware necessary to bring the racks into conformance with seismic requirements, and identified items requiring further resolution on CAQR's BFP-880924 and BFP 880614.

This item remains open pending completion of corrective actions required in the above referenced CAQR's.

No violations or deviations were identified in the area of Reportable Occurrences.

8. Action on Previous Inspection Findings (92701, 92702)

a. (CLOSED) URI 259, 260, 296/87-04-01, Corrective Actions For Improperly Stored Items.

This item involves the implementation of fully acceptable storage and maintenance requirements for material in storage, and final disposition of improperly stored PSA snubbers. This issue was originally addressed by VIO 259, 260, 296/86-04-01, which was previously closed in IR 87-04.

Regarding the improperly stored snubbers, TVA issued contract TV-73743A to Wyle Labs for the purpose of testing the 406 affected snubbers. Wyle performed this testing in February of 1988 and found that 34 snubbers did not meet the specified acceptance criteria. CAQR BFN880169 was issued to document and disposition these 34 snubbers, which were subsequently shipped off site for repair and retest. The remaining 372 snubbers were found to meet the specified criteria and were placed in level B storage in accordance with newly established requirements discussed below.

Regarding the implementation of fully acceptable storage and maintenance requirements, the licensee has instituted SDSP 16.3, "Handling, Storing, and Shipping of Material, Components, and Spare Parts," which includes specific storage and preventive maintenance requirements for items in storage. A review of Revision 3 of this

procedure, dated March 4, 1989, determined that, if consistently followed, the requirements contained within should provide adequate assurance that items in storage will be able to perform their intended function when needed.

The action taken to upgrade the storage requirements were viewed as long term corrective actions for the original violation. Therefore, no new violation is warranted. This item is closed.

b. (CLOSED) VIO 259, 260, 296/85-28-05, Battery Racks Not Mounted Per Drawings.

This item involves several deficiencies in the mounting and configuration of battery racks observed in April of 1985. These deficiencies included:

- Racks not fastened to floor pedestals per drawing requirements
- Racks not shimmed per drawing requirements
- Improperly installed fasteners in rack assembly
- Improperly installed spacers between battery cells
- Excessive gap between rack supports and battery cells

The licensee issued LER 259/85-14, corrected the above deficiencies, and determined that the racks were acceptable. However, during a post-work QA review of the repair work package, it was discovered that the welded studs used to attach the racks to the baseplates were of an unacceptable material. This condition has been covered by LER 259/85-49 and VIO 259, 260, 296/85-45-08, which have been closed in IR's 88-04 and 87-37, respectively.

In August of 1988, it was discovered that the configuration of several cross-bracing members was not in conformance with the vendor drawings. This condition was documented on LER 296/88-03, which is still open pending final resolution of CAQR BFP880924 and CAQR BFP 880614.

The inspector has reviewed all of the above referenced items and has observed the as-installed condition of two battery racks, and determined that the deficiencies identified in April, 1985 have been corrected, and that any outstanding items are adequately covered within the scope of LER 296/88-03. Therefore, this violation and LER 259/85-14 are considered closed.

c. (OPEN) URI 260/86-06-02, Inadequate Design of HVAC System.

This item involves the licensee's discovery that the original design of plant HVAC systems was inadequate in that their structural integrity could not be assured during a seismic event. Licensee actions taken to date include: 1) a field walkdown of approximately 11,833 feet of installed duct work required to support restart of Unit 2, including 1601 existing supports, 2) submittal to NRC staff

of interim operating criteria for the seismic qualification of HVAC systems, and 3) the determination that 170 additional supports are required in order to meet interim and long-term operating criteria requirements.

NRC staff review of the submitted interim operating criteria determined that the licensee needed to supply additional information in three areas. These three items are identified and discussed in NRC IR 50-260/88-38, and involve Duct Buckling Criteria (item CSG-24), Horizontal Stiffness Calculations (item CSG-29), and increased allowables used during weld evaluations (item CSG-30). As stated in the above IR, item CSG-30 has been adequately resolved and is considered closed, while items CSG-24 and CSG-29 remain open pending additional staff review.

Of the above referenced 170 additional required supports, approximately 120 have been installed, leaving approximately 50 remaining to be completed.

This item remains open pending resolution of the two remaining design issues and the satisfactory completion of the required additional support installations.

d. (Closed) URI 260/86-32-02, Review Preplanned Alternate Monitoring Method Required When High Range Monitor is Inoperable.

This URI was opened when the NRC inspector found that no written procedure existed that described the preplanned monitoring method specified TS Table 3.2.F Note 8. The preplanned action would be implemented when both of the required TS containment radiation monitors strip chart recorders RR-90-272 CD and RR-90-273 CD were inoperable. These instruments record and trend high range primary containment radiation levels from detectors located in the Drywell and Torus for the purpose of detection of significant releases, trending data, assessing instrument performance as well as post accident release assessment; long term surveillance and emergency plan actuation. 2-RM-90-272C and 2-RM-90-273C, the newly installed high range detectors that input to the TS recorders, have not yet been required to be operable. Close out of the system modification and subsequent drawing and procedure updates have yet to be completed.

The TVA action to address the NRC inspectors concern was to develop a surveillance instruction describing an alternate monitoring method. The procedure 2-SI-4.2.F-24, "High Range Primary Containment Radiation Recorders Inoperable" specifies the use of the normal range drywell radiation monitors, 2-RM-90-272A and 2-RM-90-273A (1-1,000,000 R/HR) when the high range monitors 2-RM-90-272C and 2-RM-90-273C (1-10,000,000 R/HR) are inoperable. The -272A, -273A and the -272B and -273B from the torus radiation monitors, along with

the -272C, 273C make-up all of the inputs to the TS recorders 2-RR-90-272CD, -273CD.

The NRC inspector reviewed procedure 2-SI-4.2.F-24, and considered the use of the normal range drywell monitors as a compensatory back up to the high range monitor as satisfactory in meeting the intent of NUREG 0578 Section 2.1.8.b for radiation detection.

In NUREG 0578, the range of 1-1,000,000 R/HR was found to be acceptable for the TMI accident, however instrument upgrades were considered necessary. TVA's installation of the new high range instruments was designed to meet these upgrade requirements for EQ, separation, human factors.

The NRC inspector reviewed the other instrument in table 3.2.F to which Note 8 applied and found that it too had acceptable compensatory alternate monitoring measures in place RR-90-306.

The NRC inspector determined that the proposed TS amendment 266 corrects the instrument number and minor editorial errors in this table for this item.

The NRC inspector determined that no violation of NRC requirements occurred because in this case the use of alternate, already existing equipment monitoring the same parameter would have been a logical and instinctive choice for operations personnel. The development of the surveillance instruction was an exercise in good judgement by TVA to ensure thorough and consistent actions are taken when instrument inoperability is determined.

During the course of reviewing this item the NRC inspector found several minor discrepancies in supporting documentation. These items were discussed with the plant licensing staff for correction. The items were:

- The operating instruction for the radiation monitoring system 2-OI-90, contained typographical errors on page 55. It listed the -273A, -273B and -273C instruments as "373...".

- The 2-OI-90 does not address the startup of -272C or -273C instruments in the Panel Lineup Checklist on page 38.

- The procedure does not address the fact that the 2-RM-90-272A instrument will be removed from service for cycle 5. (Note that the 273A instrument is still available to monitor the Drywell Radiation) see Note 2 on Drawing 2-47E610-90-20, R003.

- SI 4.2.F-24 also has the operator record data from the out-of-service monitor 2-RM-90-272A.

- SI 4.2.F-24 does not log or trend the torus radiation levels when the TS recorder is inop. This aspect of the instrument function is discussed in the TS basis for Table 3.2.F instruments.

- SI 4.2.F-24 does not provide for logging and trending of the high range monitors from local indications if only the remote TS recorder is inop.

e. (CLOSED) DEV 259, 260, 296/87-20-01, Inadequate Anchoring of Control Room Panels.

This item involves the anchoring of control room panels in a manner inconsistent with the seismic qualification parameters. Instead of being bolted to the floor, as described in the seismic qualification documentation, the panels were randomly tack welded to embedded plates. As previously stated in IR 87-46, DCN's B19A, B20A, and B21A were issued for modification of the panel mounting. Since that time, acceptable alternate mounting configurations were approved and issued, and the modifications have been completed. The applicable DCN's and WPs are:

Unit 1:	DCN-W0204A	WP's:	1022-88 & 1042-88
Unit 2:	DCN-W0205A	WP's:	2191-88 & 2271-88
Unit 3:	DCN-W0206A	WP's:	3022-88 & 3054-88

The inspector observed a sample of the as-installed modifications and determined that they are in agreement with the approved details contained in the above design documents. This item is closed.

f. (OPEN) IFI 259, 260, 296/87-33-04, Deficient Welds In EECW Piping Discovered During MIC Inspection.

This item was identified during a review of activities related to the BF MIC program. As the result of this review the following three concerns were documented:

- The original corporate program guidance had been negated and current program policy and direction did not exist.

- No corrective actions had been taken on the known deficiencies.

- Generic implications at other licensee facilities may have not been realized due to lack of corporate direction and involvement.

The first concern has been addressed by way of TVA's submittal dated Sept. 29, 1988, L44 880929803 which provided details of the scope of the proposed BF MIC program. The proposed program includes provisions for detection of MIC bacteria, NDE, leak detection, repair, and evaluating use of biocide and corrosion inhibitors.

Additionally, a major part of the MIC program will be improved monitoring with retrievable coupons and in-line monitors are planned for installation in the susceptible systems to provide information on the condition of susceptible systems.

At BF there are three systems in which MIC has been observed. These are:

High Pressure Fire Protection/Raw Service Water (HPFP/RSW)

Emergency Equipment Cooling Water (EECW)

Residual Heat Removal Service Water (RHRSW)

TVA's proposed program is currently under review by NRR with a SER scheduled to be issued prior to restart. This portion of this item will remain open pending that review.

The second concern was addressed in NRC IR 259, 260, 296/88-35, when the concern had been reviewed by the resident staff and found acceptable for fuel load but remained open pending a scheduled review by NRC staff NDE personnel of radiographic interpretations for 95 identified EECW piping welds. This review was completed during audit on December 18-23, 1988 and the NRC staff concurs with the licensee's fracture mechanics analysis and evaluation that no repairs are required.

The NRC inspector determined from discussions with licensee engineering personnel that the third concern had been resolved by recent changes that were made in conjunction with the initial implementation of the new MIC control program. This includes designation of a MIC representative at each TVA facility. Each representative was selected from that site's chemistry group or system engineering group and is responsible for maintaining a channel of communications with the other site MIC control representatives. This exchange of information is intended to ensure that any generic implications are fully realized. Additionally, TVA is a member of the EPRI SWAP which provides for an interchange of related information between utilities.

Based on the above, the NRC inspector agrees that the first and third concerns have been adequately addressed. Although a new MIC program had been developed by the licensee it had not been reviewed by the NRC staff. This item will remain open pending that review.

g. (CLOSED) IFI 259, 260, 296/86-05-06, Inconsistent TS Surveillance Requirements.

This item involves inconsistencies observed in TS Table 4.2.A, pertaining to Reactor Building Ventilation High Radiation - Reactor Zone and Refueling Zone Instrument Channels. Note 14 to Table 4.2.A (indicated as being applicable to these channels) stated that

"upscale trip is functionally tested...as required by section 4.7.B.1.a and 4.7.C.1.c". Neither of these sections were found to be applicable to radiation monitors; the first involved Standby Gas Treatment System filters and the second involved secondary containment integrity.

The licensee, upon verification that neither of the two referenced sections pertained to the instrument channels in question, initiated TS change requests to delete the inappropriate references. These change requests were submitted to NRC under amendments 147 (Unit 1), 143 (Unit 2), and 118 (Unit 3). The NRC staff has accepted these changes via Safety Evaluation dated March 3, 1988 and the TS for all three units have been revised accordingly. This item is closed.

h. (CLOSED) IFI 259, 260, 296/85-53-01, Inconsistent Readings Between Reactor Water Level Instrumentation.

This item involves a four-inch difference in readings between reactor water level narrow range instruments (GEMAC), as observed in Unit 3 on November 5, 1985. Similar problems had been experienced in the past (ref. URI 259, 260, 296/85-13-02 which has been closed in IR 88-35), and have been attributed to loss of water in the reference leg for the A instruments.

In March 1986, in response to GL 84-23, TVA committed to modifications which will eliminate the possibility of future measurement errors of this type. The completion of these modifications is required prior to the restart of each unit, and is being tracked by IFI 259, 260, 296/87-37-03. Therefore, this item is closed.

i. (CLOSED) IFI 260/88-18-04, Documentation of Offsite Voltage During LOP/LOCA Test B.

This item involves the observation that the incoming grid voltage was not monitored during the performance of Loss of Offsite Power/Loss of Coolant Accident (LOP/LOCA) Test B, performed on June 1, 1988. The scope of the LOP/LOCA testing was to verify the integrated plant response to a selected set of events. Four individual test were included in this overall verification:

- Test A: Loss of Offsite Power
- Test B: Loss of Coolant Accident (with offsite power available)
- Test C: Loss of Coolant and Loss of Offsite Power with a Diesel Generator Failure
- Test D: Loss of Coolant and Loss of Offsite Power with a battery failure.

In order to determine whether it would be necessary to monitor offsite grid voltage in order to obtain meaningful test results, the inspector reviewed TVA's Baseline Test Requirements Document

BFN-BTRD-L/L, Rev. 4. Per this document, the scope of Test B was limited to a simulated LOCA and verification that plant system response is in accordance with the design basis. As previously stated in IR 88-18, the major items of equipment did respond as required by the test objectives. Therefore, it can be concluded that the offsite grid voltage was sufficient to supply adequate power to the onsite components. In addition, it is the intent of Tests C and D to verify plant response in the event that adequate offsite power is not available.

Therefore, it is determined that it is not necessary to monitor offsite grid voltage during Test B in order to accomplish the stated objectives and obtain meaningful test results.

This item is closed.

j. (CLOSED) IFI 260/84-32-02, Torus Narrow Range Level Instrumentation Problems.

This item involves differences in indicated level between Torus narrow range level indicators 2LI-64-54A and 2LI-64-66 greater than allowed by Technical Specifications. The licensee has attributed this problem to height differences in the reference legs of the instrument piping for level transmitters 2LT-64-54 and 2LT-64-66. Engineering Change Notice P5434 was issued to modify the configuration of the instrument piping to correct the problem. The Modifications were completed via Work Plans 2186-87 and 2187-87 in March of 1988. Post-Modification testing performed per 2-SI-3.7.A-1(A) and 2-SI-3.7.A-1(B), and recent as-found data accumulated during weekly performance of SII-2-XX-64-107 indicate that the completed modifications successfully corrected the problem, in that both level indicators consistently read within TS specified limits. The inspector has reviewed the above document and considers them acceptable. This item is closed.

No violations or deviations were identified during the Followup of Open Inspection Items.

9. Restart Test Program (99030B)

The inspector reviewed the following documents and test records for the RHR system (System 074): the Baseline Test Requirement Document BTRD for System 0704, the System Test Specification (STS) 2-BFN-STS-074, RHR System, and the RTP 2-BFN-RTP-074, RHR System. The NRC inspector also interviewed TVA BFNP cognizant personnel about the RTP test of System 074.

The RHR system consists of numerous valves, both motor operated and manual, four 2000 HP motor/pumps, numerous instruments and control devices, and four coolers with associated piping, electrical feeds and

interfaces with other plant systems. As part of this review the NRC inspector utilized the following drawings:

1-47E811-1	Flow Diagram Residual Health Removal System
2-47E811-1	Flow Diagram Residual Heat Removal System
47W1610-74-1	Mechanical Control Diagram RHR System
47W1610-74-2	Mechanical Control Diagram RHR System
2-47W2610-74-1	Mechanical Control Diagram RHR System.

The inspectors review and findings were as follows:

(a) Baseline Test Requirement Document

The BTRD for System 074 reviewed was written as an original, revision 0 and was revised twice as of December 30, 1987. Revisions one and two were written for the most part from site test engineering requests for clarification. This clarification included the lowering or maintaining suppression pool temperature by the use of the torus spray severn modes selected for system. The BTRD listed ten modes of System 074. Seven modes selected for review were:

Mode	Definition
074-01-M-S	Provide core cooling-low pressure core injection
074-02-M-S	Provide containment cooling-torus cooling
074-03-M-S	Provide containment cooling-drywell spray
074-04-M-L	Provide shutdown cooling
074-17-M-I	Provide automatic LPCI initiation signal for Recirculation Pump Discharge Valve closure
074-19-I-S	Provide backup control of RHR System from outside Control Room
074-21-I-I	Provide low reactor water level (L2) signal for RCIC

The BTRD listed a total of ten required tests. Those selected for review were:

074-01-M-S 074-17-M-I	Test initiation logic and automatic realignment for low pressure core injection
074-02-M-S	Test torus cooling mode of containment cooling
074-03-M-S	Test Drywell spray mode of containment cooling
074-04-M-L 074-19-I-S	Test backup controls-including shutdown cooling
074-21-I-I	Test reactor low level (L2) signal for RCIC

The BTRD, Attachments A thru J were the test scoping documents. The inspector reviewed Attachments A thru F and I:

(1) Attachment A, B and C described the scope of testing for system modes 074-01-M-S and 17-M-I. The test objectives included the verification of the following: the system's low pressure coolant injection logic demonstrated the response of standby mode to LPCI, shutdown cooling mode to LPCI (manual LPCI initiation), test mode to LPCI, testing of the 2/3 core height containment drywell spray inhibit and test throttle valve 5 minute delay; demonstrate that RHR valves such as LPCI injections valves, containment spray valves, RHR test line isolation valves, containment cooling (torus spray) valves, and RHR shutdown cooling supply isolation valves, a total of 16 valves will function within the maximum times given; and demonstrate the systems ability to meet injection flow requirements.

(2) Attachment D, TSD D indicated the scope of testing for system mode 074-02-M-S. The test objective included the verification that unimpeded water (air may be substituted) flows from each nozzle in the torus spray piping.

(3) Attachment E, TSD E indicated the scope of testing for system mode 074-03-M-S. The test objective included the verification that the RHR system will provide containment (Drywell) spray.

(4) Attachment F, TSD F indicated the scope of testing for system modes 074-04-M-L and 19-I-S. The test objective included the verification that the RHR system can be operated from outside the control room using backup controls.

(5) Attachment I, TSD I indicated the scope of testing for system mode 074-21-I-I. The test objective included the verification that the RHR system provides a low water level signal (L2) to the RCIC system when the reactor water level is below the Level 2 setpoint.

(b) RTP System Test Specification 2-BFN-STS-074, RHR System

The NRC inspector noted that the initial issue and one revision of the STS were utilized to develop the RTP test procedure. The most significant revision involved testing the torus spray mozzles by blowing air through the mozzles rather than actually using water and demonstrating the ability to cool the suppression pool using the torus spray nozzles. Section 5.0 of the STS outlined test requirements not only from the BTRD (subsection 5.4) but also from other areas as well, such as: subsection 5.2 indicated a requirement that due to past history of leakage and tube failures, a test would be performed to verify flow path and pressure boundary integrity of the RHRSW side of the RHR heat exchangers; subsection 5.3 indicated that two CAQRs 87-0592 and 88-067 would have their respective resolutions verified; subsection 5.1 indicated that a review of Unit 2, cycle 5 ECNs resulted in no testing required to assess interaction between modifications; and subsection 5.5 indicated no additional test requirements from vendor reviews. A review by the inspector of subsection 5.4, DBVP requirements indicated that for each of the system modes specified, a corresponding test was required by the STS.

(c) RTP Procedure 2-BFN-RTP-074, RHR System

The completed RTP procedure was reviewed by the inspector to determine the acceptability of the method of testing, control of testing activities, compliance with test specifications and documentation of test exceptions. This determination included a review of six of the system modes and applicable testing as indicated in both the BTRD and the STS for System 074. The overall purpose of RTP074 was to functionally test the system to verify the LPCI initiation logic, the containment cooling, the ability to operate the system from outside the control room, component automatic actuations, and various interlocks.

The NRC inspector reviewed the test results for six selected system modes required by section 5.0 of the RTP test procedure.

- Modes 074-01-M-S and 17-M-I included: subsection 5.1, valve timing; subsection 5.2, LPCI initiation and RHR component logic; and subsection 5.3, RHR pump flow capacity.

- Mode 074-02-M-S was tested in subsection 5.4, torus spray functional capability.

- Mode 074-03-M-S was tested in subsection 5.5, drywell spray functional capability.

- Modes 074-04-M-L and 19-I-S were tested in subsection 5.6, functional capability of backup control.

- Mode 074-21-I-L was tested in subsection 5.9, reactor water level (L2) trip signal from the RHR system to the RCIC system logic.

The inspector confirmed that the test results verified the following:

- Proper operation of the LPCI auto initiation logic including the low reactor pressure permissive, the recirculation loop selection logic for injection, and the interlock that prohibits drywell and torus spray cooling if the reactor coolant level is less than 2/3 core height.

- Valve actuation times were as specified.

- Torus spray and drywell spray modes functioned properly.

- Backup control capability for the RHR system functioned properly.

- Reactor low level trip of the RCIC.

The performance of Section 5.0 of the RTP resulted in a total of 37 test exceptions being generated. As of this reporting period four of the TEs were still open. TE-11 and TE-35 involved the operation of the interlocks of 2-FCV-74-53. TE-36 involved the fact that Groups 2, 3, and 8 of the Primary Containment Isolation System logic could not be tested due to the Reactor Water Clean-up System unavailability to support this portion of the test. TE 37 involved section 5.11 which was to verify the resolution of CAQR 88-067.

The resolution of the open test exceptions will be reviewed in future inspections and this is identified as Inspection Followup Item (IFI 260/89-20-04) Review of Hardware TEs for Procedures RTP-31A, 31B, 74 and 99.

The inspectors have expressed concerns involving the RTP to senior licensee management on several occasions. Several of these systems had outstanding incomplete modifications when the systems were tested. The licensee indicated either that certain modifications were not needed to adequately test outstanding

portions of the systems or that the post modification tests would adequately test the system. The inspectors have identified several instances in which the tests indicated that a system did not perform up to requirements, i.e., did not meet acceptance criteria. The question as to whether or not a system important to safety tested in 1988 would still be acceptable after numerous modifications in 1990, is of concern. These concerns also involved the practice of using Test Exceptions to close out an RTP test procedure, rather than complete the actual test. In other words if a test is not 100% complete, a test exception is written to document the remaining testing activities and the incompleted test is reviewed, approved, and placed in the QA vault.

10. Volume III Commitments

The inspector reviewed the status of the licensee's closure of commitments made in the NPP, Volume 3. The licensee made a determination of what was a commitment. This was done by reviewing the text in Volume 3 and assigning a tracking number to each item identified as a commitment. For each commitment tracked, operational readiness criteria were developed to further define and provide closure guidance. All supporting documentation to close a commitment was assembled into a closure package. Closure signatures are required by a licensing engineer and principal manager assigned the item. An independent reviewer performs a second party independent assessment. Once these closure signatures are obtained the licensing manager reviews and signs the item as closed. At this point the item is considered closed and acceptable for NRC review.

A total of 231 commitments have been identified by the licensee. As of May 15, 1989, closure packages for 35 items have been completed.

11. Site Management and Organization (36301, 36800, 40700)

Due to the divergence of actual to scheduled work activities in a number of areas during the past several months, the licensee has been unable to forecast a realistic restart date. To focus on more productive accomplishment of work activities the licensee has started two - ten hour work shifts per day for six days a week. This was done to change the attitude concerning work activities to that more like a utility outage attitude with a sense of urgency. On June 16, Browns Ferry will enter a 60 day performance test period during which scheduled activities required to meet specific goals and milestones will be monitored in order to effectively forecast a future restart date. The test period will be a significant indicator of the plant's organization and management ability to work together toward restart as a team to accomplish work activities in a quality manner.

12. Training

Training was inspected during the period of May 8-19, 1989 by the NRC BF Project Engineers and Licensing Project Manager listed on this report cover page.

a. Engineer and Technical Training

TVA committed to engineer and technical training programs for Browns Ferry in the NPP, Volume 3, Section II.2.3.2. TVA stated in the NPP that training had been inadequate for engineers at Browns Ferry. The training program for technical staff and managers was developed to ensure that engineers are properly trained for safety related functions. The program is based on ANSI N-18.1 and ANSI N-18.7.

The training program for technical staff and managers described in revisions 1 and 2 of the NPP consisted of an orientation phase and an advanced phase. The orientation phase was required for all technical staff and managers whose responsibilities may affect the day-to-day safe operation of the plant and the safety of plant personnel or the general public. Orientation training included print reading, TS, regulatory requirements, plant modifications, work control, and familiarization with nuclear plant systems. Completion of the orientation phase training was required before any technical staff member or manager would be allowed full unreviewed responsibility in the pertinent work areas. The NPP stated that newly assigned plant technical staff managers and engineers were required to complete orientation phase training within 18 months of assignment to BFNP, unless a waiver had been granted. Plant technical staff managers and engineers incumbent as of March 28, 1986, were required to complete the orientation phase by August 1, 1987 or have either a waiver or limited assigned duties.

The NPP commitments for training of technical staff and managers was implemented by PMP 0202.17, "Technical Staff and Manager Training for Nuclear Plant Site Personnel"; and by BF 4.14, "Training Program for Technical Staff and Managers." Revision 0 of PMP 0202.17 was effective February 12, 1986 and Revision 0 of BF 4.14 was effective March 28, 1986. BF 4.14 was subsequently superseded by SDSP 4.9, "Training Program for Technical Staff and Managers", effective September 29, 1988. At the time of the inspection, PMP 0202.17, Revision 0, and SDSP 4.9, Revision 1, were in effect. All revisions of each of these procedures listed modifications or site construction personnel among the positions requiring technical staff and manager training. BF 4.14 and SDSP 4.9, all revisions, stated that all technical staff and managers newly assigned to the site must complete orientation phase training before being allowed full unreviewed responsibility in areas concerned with the training topic, unless a waiver is granted in accordance with the established procedures.

Revision 2 of the NPP stated that all incumbent technical staff and managers in the plant organization as of March 28, 1986, had participated in the orientation phase training program prior to

August 1, 1987. Licensee commitment tracking records also showed the NPP commitment for technical staff and manager training as having been completed.

The inspectors reviewed the orientation phase training records as of May 10, 1989, for the individuals in the positions listed in SDSP 4.9 as requiring the training. Although both SDSP 4.9 and PMP 0202.17 specified that modifications engineers required orientation phase training, 167 modifications personnel had neither completed the orientation phase training requirements nor been granted waivers as of the time of the inspection.

The inspectors determined that the failure to provide the required training was due primarily to a management directive which contradicted the procedures which were in effect, as follows:

- On October 20, 1986, the manager of training issued a memorandum requesting departments to submit the names of individuals for whom technical staff and manager training per SP 4.14 was required to be completed or waived within the established time limits.

- On October 31, 1986, the acting modifications manager issued a memorandum to the manager of training which stated that none of the modifications staff directly affected the day-to-day safe operation of the plant, and that the modifications personnel therefore did not require orientation phase training.

- On August 3, 1987, (the approximate deadline for satisfying the NPP commitment) the Chief of the Training Branch issued a memorandum identifying personnel who had not received the required Technical Staff and Manager Orientation training, and stated that the employees should be removed immediately from unreviewed work responsibilities. This memorandum stated that no modifications employees were required to complete the training, based on the October 31, 1986 memorandum. Additional memoranda were transmitted on the same date, which specified individuals who had not satisfied the training requirements of BF 4.14 and stated that the employees should be removed immediately from unreviewed work responsibilities.

- Between January 6 and 11, 1988, a QA audit was conducted to independently verify that the NPP Volume 3 commitment for technical managers and engineer training had been met. The results were issued in a memorandum dated January 29, 1988. This audit reviewed training records for 38 individuals, and identified that one person had neither passed a designated class or been granted a waiver. A subsequent followup audit determined that the individual had not been given independent unreviewed work responsibility prior to passing the training

course. The QA verification of the completion of the NPP training commitment was then closed.

- According to licensee personnel, in approximately May 1988 a related generic employee concern was received at Watts Bar.

- Based on interviews with site personnel, the inspectors determined that informal discussions between licensee organizations regarding the need for orientation phase training for modifications staff were ongoing during 1987 and 1988.

- On September 2, 1988, the Vice President of Nuclear Construction wrote a memorandum to the Vice President of Nuclear Safety and Licensing and the Manager of Nuclear Procedures staff proposing revisions to the NPP and PMP 0202.17. The proposed revisions were to eliminate the requirement for modifications engineer training based on the supposition that modifications work packages initiated by modifications engineers are reviewed by others on a case by case basis for effect on the plant and therefore the modifications engineers do not have a direct effect on the day to day safe operation of the plant.

- On September 16, 1988, CAQR BFP880695P was issued to address the failure to provide the modification engineer training specified in BF 4.14. The CAQR stated that Nuclear Construction and Nuclear Training believed that the training requirement which grouped nuclear construction engineers in with permanent operating plant employees, was an overcommitment and was outside the scope of ANSI-N18.1-1971. The CAQR identified the known date of the CAQ occurrence as March 16, 1988.

- On November 2, 1988, the Manager of Nuclear Licensing and Regulatory Affairs issued a memorandum in response to the request to remove the requirement for site modification engineers to receive technical staff and managers training. The memorandum stated that the requirement was correct, and that TVA fully intended to have any engineers, technical staff, and managers involved in the conduct of actions that affect nuclear safety receive the technical staff and manager training.

- A November 10, 1988 memorandum from the Vice President of Nuclear Support to the Vice President of Nuclear Construction further confirmed that it would be inappropriate to rescind the NPP training commitment or revise PMP-0202.17. The memorandum stated that INPO had reaffirmed the need for such training for site modifications engineers. The memorandum further stated that credit for modification engineer training had been taken in the closure of the generic employee concern from Watts Bar.

- On December 19, 1988, a decision was documented in the CAQR package to begin scheduling modifications employees for the technical staff and manager orientation phase training.

- On March 13, 1989, the modifications manager issued a memorandum directing that orientation phase training be provided to the modifications engineers.

- On March 20, 1989, CAQR BFP880695P was closed based on the appropriate training having been requested.

Licensee management acknowleged that no actions had been taken to assure that the untrained individuals did not have independent unreviewed work responsibilities prior to completing the training, even after the noncompliance with the NPP and implementing procedures had been identified in March 1988. A number of requests for training waivers had been submitted to management, but no action had been taken Senior site management responded that the lack of orientation phase training was considered to be "of no safety significance."

The inspectors disagreed that the lack of training had no safety significance, in that the training program commitment was presented in the NPP as a corrective measure of substance to address an acknowledged deficiency; and licensee internal memoranda documented the necessity for the training. Further, the inspectors reviewed the specific content of the training, and concluded that the material was relevant to assuring plant safety. Specifically:

- The BWR systems portion of orientation phase training utilized the same course material as that used in the BF SRO, hot license, training course.

- The print reading course was devoted to more than training in the BF drawing system. The lesson plan also included a two hour course on configuration management and vendor manual control, The history of BF configuration management problems and lessons learned were discussed. The course taught the purpose of configuration control and the goals for achieving a viable and effective control of BF configuration. The purpose and scope of the vendor manual control program were also addressed. The handling of new vendor manuals received after initiation of their control program was also delineated.

- The print reading course also covered clearance procedures, which contain administrative guidance for the protection of employees who are required to work in and around electrical and mechanical equipment. The course also dealt with procedures for the protection of plant equipment.

- The lesson plan for the print reading course also covered independent verification. This included the education of personnel as to when independent verification is required and who is qualified to perform

independent verification. The lesson plan emphasized the importance of vigilance to minimize human error.

- The print reading course included training on measures for the control and implementation of temporary alterations to the plant to ensure that the plant safety margins are not degraded, and that all affected personnel are made aware of the changes in place and can factor them into their own work. At BF, it is the responsibility of each individual to obtain proper authorization before implementing a temporary alteration.

- The course on Regulatory Requirements included 10 CFR, ENERGY, NUREGs, and Regulatory Guides.

The failure to provide modifications engineers with orientation phase training within the established time limits, and the failure to ensure that the modifications personnel did not have independent unreviewed work responsibilities until the training was completed, was identified as Deviation 50-260/89-20-05. Resolution of this item is a restart requirement.

The inspectors reviewed memoranda from the training department which identified non-modifications personnel who had not completed orientation phase training or retraining within the required eighteen months. The memoranda stated that these persons should immediately be removed from unreviewed work responsibilities. Regarding the initial 18 month period of implementation of the NPP training commitment, the inspectors were unable to determine whether all applicable personnel in organizations other than modifications were restricted from unreviewed work responsibilities until the orientation phase training was completed, as required by the NPP and implementing procedures. This item was identified as URI 50-260/89-20-06 and resolution is required prior to restart.

The licensee provided the inspectors with a May 19, 1989 memorandum documenting an action plan for the completion of the modifications staff training. The licensee commitments were as follows:

By June 2, 1989

- Establish a date for training classes or obtain a waiver in accordance with SDSP 4.9. Priorities to be based on criticality of job position.

- Modifications Manager and critical senior modifications supervisors to attend training module on configuration control.

- All modifications employees to be reevaluated on need for additional technical training.

- Identify those functions performed by modifications personnel that do not, but should, have an overview by qualified individuals or organizations.

- Identify those functions performed by modifications personnel that require training and are not a current part of the four courses for technical staff training.

By July 3, 1989

- All remaining modifications employees performing technical assignments to attend training module on configuration control.

By September 3, 1989

- Review overall training criteria for modifications employees.

- Revise and schedule modifications employees in applicable training modules.

By March 9, 1990

- Complete required technical staff training for all modifications employees as identified in items 2 and 3 committed by June 2, 1989, in accordance with the goals set in CAQR BFP880695P.

In addition to the commitments described above, the inspectors consider that adequate resolution of this issue must include verification that work performed by individuals who had not received the required training did not compromise the quality of safety related work performed at the plant.

In addition to the failure to provide the required training for modifications personnel, the inspectors identified the following apparent discrepancies in the training records for technical staff and managers in other groups:

- In QA, three trainees were scheduled to have finished orientation phase training before May 1989, but there was no record of completion as of the time of the NRC inspection.

- In radiological control, two persons had not completed orientation phase training, but the due date for completion was omitted from the May 10, 1989 training status report.

- In nuclear engineering, two individuals had not completed training prior to the required due date.

  Followup on the training discrepancies listed above to determine whether the training was completed within the required time periods, and to verify that these individuals did not have

unreviewed responsibilities will be conducted in association with URI 50-260/89-20-07

b. TS, Plant Modification System and Work Control Course

The course in TS, Plant Modification System and Work Control was monitored in class by the inspectors. Adequate use was made of lecture material, visual aids and reference material to impart a working knowledge of the use of TS. The lecture material also explained the hierarchy of documents in use at TVA's BF site. The BF site modification and work control system was explained by the use of lecture, realistic examples, workshops and diagrammatic flow charts. The material presented in the course explained the BF change control board operation in detail.

The inspectors interviewed engineers and technical managers to determine their attitude regarding the adequacy of orientation phase training. The reactions of the technical managers were generally positive, and they related positive feedback from their respective staffs. Trainees generally believed the courses were aimed at the correct level of detail. However, some engineers were disappointed as they had expected more depth in the training such as would be found in SRO training. Most managers believed the course material useful for their people. Some technical support staff found the BWR systems course " a lot to remember," i.e. geared to technicians and engineers. However, most stated that the systems courses were appropriate in scope and particularly beneficial to newly assigned personnel. Some specific reactions about various aspects of specific courses included the following:

- The print reading course was worthwhile. The course provided an understanding of the BFN system for drawings, and facilitated locating the correct drawing. Health physicists were enabled to locate piping, valves, pumps correctly and in conjunction with the BWR systems course, were better prepared to respond rapidly to emergencies.

- The BWR Systems course gave health physicists a detailed upgrade in plant layout and operation.

- The Regulatory Requirements course enabled the technical staff to know where to look for regulations applicable to the job at hand. Personnel who were interviewed stated that the course provided more information than they had expected.

Managers did not appear to be hesitant in asking the Training Director for specific training tailored to the managers' specific needs. For example, the RC supervisor requested that the Training Director set up a two day course to provide a systems review for all the RC staff in order to better prepare for Unit 2 restart. The

found these actions positive and a strong indications of acceptance of the orientation phase training.

The inspectors performed a cross check of a listing of management employees onsite to a training status report to verify that employees on site were receiving training. A Management Employee Report dated May 9, 1989 was compared to Training Status Report dated May 10, 1989. There were 483 names on the management listing compared to only 80 on the training report. The inspectors picked 18 job titles from the management report and asked the BF Training Director to verify the 18 were receiving the applicable training. Subsequent to the check, four out of 18 were placed on the training schedule. The inspectors concluded that the entire list should be verified by BF management.

The inspector's conclusions are as follows. The Volume 3 commitment to establish training for technical staff and engineers has been accomplished as to the training facilities, staff, curriculum and lesson plans. The systems and procedures are in place to implement the TSM-0. The curricula and lesson plans appear to be sound and well structured. The training staff appear to be well prepared and professional in their conduct of training. The implementation, although not satisfactorily in the modifications organization, has been carried out by the majority of the site principal managers. The necessary checks and balances are in place as of May 19, 1989. Site Management appears to have taken effective action to correct the modification organization training inconsistencies. The inspectors are still considering the information gathered pertaining to the CAQR and its closure by Browns Ferry according to TVA procedures. Review of the corrective action for the CAQR will be URI 50-260/89-20-08, Corrective Action for CAQR. The inspectors find that Browns Ferry has not met the NPP commitment to train technical staff engineers and managers in the area of the modifications organization. This area will be inspected in future inspections.

c. Operator Training

Operator requalification training was upgraded in response to weaknesses identified by past NRC requalification examinations. TVA's implementation of a comprehensive one-time training program to upgrade all licensed operators has been completed. This upgrade program consisted of topics covered in the plant hot license program with increased emphasis on thermodynamics, heat transfer, fluid flow, reactor physics, mitigating core damage, and plant and reactor transient analysis. Operators who have satisfactorily completed the course were allowed to take the NRC requalification examination. The pass rates on the NRC administered requalification examinations for the four classes to support Unit 2 restart were greatly improved.

Beginning in 1987, annual requalification training for licensed operators was increased from four to eight weeks to maintain operator knowledge.

Weaknesses in simulator training in the areas of utilization of EOI's, use of uncontrolled reference material on the simulator, and communications between operators were identified during simulator examinations given by the NRC. The EOIs have been revised since the last NRC requalification examination and are scheduled to be evaluated during the NRC July 1989 revised requalification examinations.

d. Craftsmen

Before 1984 no formal TVA training for craftsmen existed at Browns Ferry. Training programs for maintenance craftsmen were subsequently developed to increase their knowledge of specific plant equipment and maintenance techniques. Instructors from the various maintenance disciplines who were knowledgeable in their trade taught the below specialized courses. The NRC inspectors observed during this inspection and previous NRC training inspections that the following courses were conducted and documented from 1985 through 1988 by the licensee:

Motor Operated Valve Actuators
Diesel Generators
Crane Troubleshooting
High Pressure Coolant Injection and RCIC Control Systems
Rigging
Refuel Floor Maintenance
Centrifugal Pumps
Positive Displacement Pumps
Valves
Heat Exchangers
Recirculation Pump Seal Maintenance
Feedwater Controls
Recirculation Flow Control
Neutron Monitoring System
Cable Splicing and Terminations
Limitorque Valve Operators

e. Training Accreditation

TVA has achieved INPO accreditation of all ten training areas listed below including the certification of the instructors.

Instrumentation and Controls Technician Training
Radiological Technician Training
Chemistry Technician Training
Nonlicensed Operator Training
Reactor Operator Training
SRO/Shift Supervisor Training
Shift Technical Advisor Training
Technical Staff and Manager Training
Mechanical Maintenance Training
Electrical Maintenance Training

In October 1987, TVA also became a member of the National Academy for Nuclear Training.

f. Training Facilities

A modern training facility has been constructed at BFN. This facility contains approximately 90,850 square feet of space, the majority of which is dedicated to training. This facility includes the BFNP simulator, a mechanical laboratory, an electrical laboratory, and an instrument and control laboratory. Training in the new facility commenced in January 1987.

During the inspection the NRC inspectors observed ongoing training in these facilities covering operator, engineer and, craft training. The inspectors considered the facilities more than adequate.

g. Simulator Modifications

The inspectors reviewed and inspected a sample of training, plant procedures, and modifications to the simulator using Browns Ferry SDSP 8.10, Plant Review of ECN/DCN, Revision 6. SDSP 8.10 was issued as Revision 0 on January 29, 1988, to provide an administrative review of ECN/DCN modification packages during the design review and after work completion. SDSP 8.10, Revision 1, was issued on April 18, 1988, to incorporate Plant Managers Instruction 8.2, Plant Design Change Review, which was the process for tracking needed training, procedures changes and simulator modifications when ECN/DCN modified plant work was completed.

The BF Training Department is in the process of placing these modifications on their computer for better tracking and implementation of the required training and simulator modifications. THe forms in SDSP 8.10 are SDSP-112, Modification Training Notification; SDSP-243, Modification Impact Review Form Technical Support; SDSP-244, Modification Impact Review Form Operations; and SDSP-245, Modification Impact Review Form Maintenance. These forms are used to track required training, procedure changes and simulator modifications from plant modification approval, work completion, and actions required for ECN/DCN final closure. The process was sampled by the inspectors and appears to be working for the samples selected.

There were no apparent deviations or violations identified concerning this section of the inspection. However, for the 169 modifications placed on the computer tracking that required procedure changes

and/or operations training only 42 had been completed as of May 9, 1989. This area of implementation will be inspected in future inspection prior to Unit 2 restart.

13. Exit Interview (30703)

The inspection scope and findings were summarized on June 16, 1989 with those persons indicated in paragraph 1. An exit for training, paragraph 12, was conducted on May 19, 1989. The inspectors described the areas inspected and discussed in detail the inspection findings listed below. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspectors during this inspection. Dissenting comments were not received from the licensee.

Item	Description
260/89-20-01	Violation. Failure to Meet TS Requirements for Operable RHR Pumps.
259, 260, 296/89-20-02	Inspector Followup Item. CRD Seismic Analysis
259, 260, 296/89-20-03	Unresolved Item. Reportability of Diesel Fire Pump Lockout Relay Single Failure
260/89-20-04	Inspector Followup Item. Review of Hardware TEs for Procedures RTP-31A, 31B, 74 and 99.
260/89-20-05	Deviation. Failure to Conduct Volume III training for Modification Engineers.
260/89-20-06	Unresolved Item. Restriction of untrained personnel from work activities.
260/89-20-07	Unresolved Item. Resolution of Training Discrepancies.
260/89-20-08	Unresolved Item. Corrective Action for CAQR

14. Acronyms

ANSI	American National Standard Institute
BF	Browns Ferry
BFNP	Browns Ferry Nuclear Power Plant
BTRD	Baseline Test Requirements Document
BWR	Boiling Water Reaction
CAQR	Condition Adverse to Quality Report
CRD	Control Rod Drive System
DBE	Design Basis Earthquake
DBVP	Design Baseline and Verification Program
DCN	Design Change Notice
DG	Diesel Generator
ECN	Engineering Change Notice
EECW	Emergency Equipment Cooling Water
ENS	Emergency Notification System
EOI	Emergency Operating Instructions

EPRI	Electric Power Research Institute
EQ	Environmental Qualification
FSAR	Final Safety Analysis Report
GE	General Electric
GEMAC	General Electric/Manual Automatic Controller
GL	Generic Letter
HO	Hold Order
HP	Horse Power
HPFP	High Pressure Fire Protection
HVAC	Heating, Ventilation, & Air Conditioning
IFI	Inspector Followup Item
IR	Inspection Report
IHSI	Induction Heat Stress Improvement
INPO	Institute of Nuclear Power Operations
LER	Licensee Event Report
LOP/LOCA	Loss of Power/Loss of Coolant Accident
LPCI	Low Pressure Coolant Injection
MAP	Maintenance Action Program
MIC	Microbiological Induced Corrosion
MIP	Maintenance Improvement Program
MR	Maintenance Request
NDE	Nondestructive Examination
NOV	Notice of Violation
NPP	Nuclear Performance Plan
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
OI	Operating Instruction
PCIS	Primary Containment Isolation System
PMP	Plant Managers Procedure
RC	Radiological Controls
RCIC	Reactor Core Isolation Cooling
RHR	Residual Heat Removal
R/HR	Rad per Hour
RHRSW	Residual Heat Removal Service Water
RPV	Reactor Pressure Vessel
RSW	Raw Service Water
RTP	Restart Test Program
RWCU	Reactor Water Cleanup
SBGTS	Standby Gas Treatment System
SDSP	Site Director Standard Practice
SER	Safety Evaluation Report
SI	Surveillance Instruction
SRO	Senior Reactor Operator
STS	System Test Specification
SWAP	Service Water Assistance Program
TE	Test Exception
TMI	Three Mile Island
TS	Technical Specifications
TSM-O	Technical Staff and Managers Orientation
TS&M	Training Status Report

TSD	Test Scoping Document
TVA	Tennessee Valley Authority
VIO	Violation
URI	Unresolved Item
WP	Work Plan