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

Report Nos.: 50-259/89-10, 50-260/89-10, and 50-296/89-10

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: February 20, - March 22, 1989

Inspector: for D. R. Carpenter, NRC Site Manager — Date Signed 5/15/89

for W. C. Bearden, Resident Inspector — Date Signed 5/15/89

Approved by: W. S. Little, Section Chief, Inspection Programs, TVA Projects Division — Date Signed 5/15/89

SUMMARY

Scope: This special reactive inspection was conducted to follow up on the problem reported by TVA in which they identified that the flow discharge paths for several safety-related EECW systems were not seismically qualified. This could have resulted in several other safety-related systems being inoperable following a seismic event.

Additionally, inspection was conducted into the inordinate lapse of time between when the knowledge of these conditions were known by the licensee's engineering group and that information being translated into required plant actions.

Results: Two potential violations were identified:

260/89-10-01: Apparent failure to comply with Technical Specification (TS) 3.5.A.5 during Unit 2 core reload. (paragraph 3)

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259, 260, 296/89-10-02: Apparent failure to establish an effective program to promptly identify and correct a known condition adverse to quality. (paragraph 3)

One unresolved item* was identified:

260/89-10-03: Potential failure to assure proper design control. (paragraph 6)

All of the identified apparent violations and the unresolved item must be satisfactorily resolved prior to Unit 2 restart.

The NRC inspectors noted a significant weakness in the area of identification and correction of known significant conditions adverse to quality.

This event constitutes a failure by licensee management to exercise sufficient and proper management controls to ensure that known significant conditions adverse to quality received an adequate level of attention in order to guarantee prompt and effective corrective action. This failure resulted in information concerning this issue not being available to site management and operations personnel from January 16-30, 1989, while the Unit 2 core reload was in progress and operability of certain affected equipment was required by TS. It was not until plant management and operations personnel were informed of the potential degraded condition when the CAQR was issued and sent to PRS for review on February 8, 1989, that appropriate attention and action was taken. The event is similar to the event that occurred in 1984, which resulted in NRC Order Modifying License (EA 85-49), which is still open against Browns Ferry (Docket Nos. 50-259,50-260, and 50-296.) Corrective actions committed to by the licensee appear to have not been successfully implemented and is considered as an additional example of a recurring problem while under an NRC Order to correct that problem.

When the problem was identified to plant operations personnel, the licensee's assessment was considered to be conservative, complete and adequate. Operations personnel acknowledged the full significance of the issue. The interim corrective actions were appropriately conservative, thorough and acceptable. In addition, corporate management conducted a thorough review of the event which led to an aggressive corrective action plan.

*Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve violations or deviations.

REPORT DETAILS

1. Persons Contacted

Licensee Employees:

O. Kingsley, Jr., Senior Vice President, Nuclear Power
C. Fox, Jr., Vice President and Nuclear Technical Director
*J. Bynum, Vice President, Nuclear Power Production
*C. Mason, Acting Site Director
*G. Campbell, Plant Manager
H. Bounds, Project Engineer
*J. Hutton, Operations Superintendent
*D. Phillips, Maintenance Superintendent
*D. Mims, Technical Services Supervisor
G. Turner, Site Quality Assurance Manager
*P. Carier, Site Licensing Manager
*J. Savage, Compliance Supervisor
A. Sorrell, Site Radiological Control Superintendent
H. Crisler, Browns Ferry Engineering Project
*T. Bradish, Plant Reporting Section

*Attended exit interview

Other licensee employees or contractors contacted included licensed reactor operators, quality assurance, design, and engineering personnel.

NRC Resident Inspectors

*D. Carpenter, Site Manager
E. Christnot, Resident Inspector
*W. Bearden, Resident Inspector
K. Ivey, Resident Inspector

NRC Employees

*W. Little, Section Chief
*A. Johnson, Project Engineer

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

2. Description of the Issue and Sequence Of Events

On February 8, 1989, TVA notified the NRC that they had identified three EECW discharge flow paths that were not properly qualified as Seismic Class I. Following an earthquake this could result in the loss of or degradation of cooling to the Units 1, 2 and 3 control bays and the Unit 2 shutdown board rooms, and the subsequent loss of safety-related equipment in these areas. (See paragraph 3 for a detailed description of the equipment that could be lost).

The NRC was very concerned that the EECW system had been reviewed and declared operable per TS prior to fuel loading without identifying this issue, and that once an engineer first identified the problem on January 11, 1989, it took until February 8, 1989, to notify the NRC and to take action required by the TS.

The primary reason that these deficiencies in the seismic design of the EECW discharge flow paths were not identified earlier appears to be because of TVA's reliance on a fuel load position paper prepared by the Civil Engineering Branch in August 1988. (Attachment 1) This paper recognized that the buried EECW piping was required to be operable by TS at fuel load, and that calculations for the buried piping did not exist. The paper justified operability for fuel loading stating:

> There are no known safety issues with the balance of buried piping or conduit and experience with buried structures suggests that no safety issues will be found.

It appeared that the fuel load position paper was relied on during the System Preoperability Checklist (SPOC) process to justify declaring the EECW system operable for fuel load, and could have been used to justify delaying the performance of the DBVP civil calculations for the buried piping.

The following sequence of events that are pertinent to the NRC's concerns were developed based on background material prepared by TVA and NRC interviews with key individuals:

- As part of the ongoing Design Basis Verification Program (DBVP), on August 12, 1988, the licensee identified that no civil calculations could be retrieved for buried yard piping for the Browns Ferry plant. This condition was assessed by the licensee and a fuel load position paper was issued. (See attachment 1.) Effort to regenerate the missing calculations at Browns Ferry was commenced and scheduled to be complete for Unit 2 restart.

- Between August 12, 1988, and January 3, 1989, the licensee completed work, with the exception of the DVBP calculations for the buried yard pipe, needed to declare systems operable that were required for fuel load. This included the RHRSW, EECW and RCW Systems.

- On August 26, 1988, the licensee completed revision 3 to the safety evaluation for Engineering Change Notice (ECN) P0956, which provided new Unit 2 Shutdown Board Rooms "C" and "D" Air Conditioning Units. This revision, the latest to the safety evaluation, states that the resulting new configuration would be seismically and environmentally qualified and would not adversely affect the safety of the plant.

- On January 3, 1989, the licensee commenced Unit 2 core fuel reload.

- On January 5, 1989, fuel loading was suspended due to core monitoring problems.

- On January 11, 1989, as the result of drawing reviews which were part of the DBVP calculation regeneration effort, Stone & Webster Company (SWEC) personnel notified licensee Division of Nuclear Engineering (NE), Civil Engineering Branch (CEB) and Mechanical Engineering Branch (MEB) personnel that vitrified clay piping appeared to be located within the Seismic Category I boundary as defined by TVA. Based on SWEC experience this type of piping was not normally found in seismic applications and there were no code allowances for clay piping per ASME or ASTI.

- On January 16, the licensee restarted the Unit 2 core reload activities after an 11 day delay for resolution of core monitoring problems.

- On January 17, the Mechanical Engineering Branch (MEB) notified the CEB that three specific EECW discharge lines were discovered going into nonseismic Category I RCW discharge headers, and that a potential condition adverse to quality existed.

- On January 18, CEB personnel discussed the issue with the onsite plant system engineer. The issue was discussed as a potential seismic problem with the RCW discharge piping and was not reported to plant management.

- On January 25, licensee MEB personnel determined that a condition adverse to quality existed and started preparing a CAQR.

- Between January 25 and February 3, the CAQR was apparently being drafted with the draft made available for review and concurrence within MEB and/or CEB.

- On January 30, 1989, refueling of Unit 2 was completed.

- On February 2, 1989, the NRC reviewer performing seismic audits of Stone & Websters engineering efforts at Cherry Hill, NJ, was informed that a CAQR was being prepared on vitrified clay pipe in the RCW system.

- On February 3, a potential CAQR was issued for management review.

- On February 8, management review of the potential CAQR was completed and the CAQR was issued and sent to the Plant Reporting Section (PRS) to determine reportability. The condition was determined to be reportable and was reported to the NRC within four hours of their notification of the situation. The licensee took the required actions for the associated LCOs in the TS.

- On February 10, the licensee completed a safety evaluation for interim operation with the proposed compensatory measures established to provide an EECW flowpath through the affected components in the event flow was lost due to a seismic event. An NRC inspector

attended the PORC meeting where this safety evaluation and the associated interim operating criteria were presented for review and approval. Further details are included in paragraph 7.

3. Operability Analysis and Safety Significance

The affected lines are three separate EECW discharge lines which discharge into nonseismically qualified 24 inch carbon steel RCW discharge headers. These EECW lines are a three inch line from the Unit 2 "C" and "D" shutdown board room air conditioning units, a six inch discharge line from the Units 1 and 2 control bay chillers, and a six inch discharge line from the Unit 3 control bay chiller "3A". The two 6 inch lines have existed for some time and are probably part of the original design dating back to plant construction. The 3 inch line associated with the Unit 2 Shutdown Board Air Conditioning Units was a new design that was installed in 1988. Further details regarding the modification in the 3 inch line are included in paragraph 6. The 24 inch RCW discharge headers are routed from the reactor building through the west RHRSW pipe tunnels where they eventually become buried piping and tie into 30 inch vitrified clay piping headers. The clay piping discharges into the 16 ft diameter circulating cooling water (CCW) discharge conduit. Although the 24 inch steel RCW piping was analytically upgraded and classified as Seismic Category I within the reactor building, it was not seismically qualified outside the building. Vitrified clay piping is not known to be seismically qualifiable nor is it used by the industry in Seismic Category I applications. The 16 foot diameter CCW discharge conduits are also not seismically qualified. Although the vitrified clay piping probably has the greatest chance of blockage during an earthquake, any long term corrective action for this problem must take the entire discharge flowpath into consideration.

During a seismic event, of all of the seismically unqualified buried pipe and conduit, the vitrified clay headers would have the highest probability of collapsing underground and blocking the EECW flowpath. No other bypass flow path exists to ensure that adequate EECW flow could be maintained through the associated equipment. These components are essential for maintaining the main control room and/or Unit 2 Shutdown Board room within acceptable temperature limits. Operability of the equipment in these areas is essential for mitigation of all accidents outlined in Chapter 14 of the FSAR.

Licensee operations personnel evaluated the CAQR and performed a review for effects on safety related equipment on February 8, 1989. This review showed that any HVAC systems served by the "3A" chiller could also be served by the "3B" chiller which discharges into a qualified EECW flow path. The most severe consequences of loss of area cooling associated with Units 1 and 2 were shown to be the loss of auxiliary instrumentation to equipment supplied by Unit 2 Shutdown Board Room. The licensee's review further concluded that since the Unit 2 Shutdown Board Room has historically had a much larger heat load than any area supplied by the

Units 1 and 2 Control Bay Chillers, that the Unit 2 Shutdown Board Rooms "C" and "D" equipment would be the most likely to be affected.

As a result, 4 KV shutdown boards "C" and "D" and 480 V shutdown boards "2A" and "2B" were declared inoperable. This directly resulted in the following components being declared inoperable:

- Core Spray pumps "1B", "2B", "1D", and "2D"
- RHR pumps "1B", "2B", "1D", and "2D"
- RHRSW pumps "B2", "B3", "D2", and "D3"
- Standby Gas Treatment System (SGTS) train "B"
- Fire pump "C"
- Unit 2 Standby Liquid Control (SLC) system
- Unit 2 standby coolant supply
- All Unit 2 Emergency Core Cooling Systems (due to the valves in the injection paths being affected)
- Unit 2 Fuel Pool Cooling (FPC) system

RHRSW pumps "A1", "C1", and "D1" and SGTS train "C" were already inoperable for other reasons and when combined with the above resulted in secondary containment and the EECW south header also being declared inoperable. However, since both "A" and "C" SGTS Trains had remained operable throughout January 1989, secondary containment had not been affected during refueling.

Based on this evaluation, the licensee failed to comply with the requirements of TS 3.5.A.5 on and after January 5, 1989. TS 3.5.A.5 requires as a minimum that whenever there is irradiated fuel in the reactor vessel and the reactor vessel head is removed, the Core Spray System is not required to be operable provided the cavity is flooded, the fuel pool gates are open and the fuel pool water level is maintained above the low level alarm point, and provided one RHRSW pump and associated valves for the standby coolant supply are operable. Standby coolant supply provides the capability to supply emergency makeup water from Wheeler Lake by the RHRSW System to the reactor vessel via motor operated valves located in the RHR System. The standby coolant is a redundant source of coolant to back up the >492,000 gallons of water in the fuel pool. The design for each of the three units at Browns Ferry has at least one standby coolant supply flowpath. Unit 2 has two flowpaths, one for each RHR loop. Although RHRSW Pump B1 and the required RHRSW MOVs were available for this purpose both Unit 2 flowpaths were not operable due to the inoperable MOVs in both RHR loops. All MOVs necessary to allow standby coolant flow through both RHR loops could be inoperable following a seismic event, including the

loop injection MOVs. This constitutes an apparent violation (260/89-10-01) of TS 3.5.A.5 during the core reload of Unit 2. Under the conditions that existed at the plant, if a seismic event occurred resulting in the above equipment being inoperable, the standby coolant supply would be needed before the >492,000 gallons of fuel pool water heated up and evaporated to the point that the fuel pool water dropped below safe levels. The failure to have an operable standby coolant supply is considered to be a violation of TS 3.5.A.5. The licensee disagreed with this violation in that they believed that the failure to satisfy TS 3.5.A.5 was the result of their failure to promptly identify the CAQ problem, and should not be considered a separate violation.

The NRC inspector reviewed the licensee's equipment out of service/LCO computer tracking printout to determine the history for the period January 1 - February 8, 1989. No other systems or equipment were noted out of service during that period which would have had further effects on operability of any additional equipment required by TS. The NRC inspector concurs with the licensee's determination that secondary containment was operable on January 16, 1989 when fuel loading was restarted.

Although the NRC inspector agreed with the licensee's assessment of the effects on safety related equipment, this assessment was performed subsequent to plant operations being made aware of the potential problem 28 days after TVA NE personnel at Browns Ferry first learned of the condition. This time frame was excessive considering the potential impact on operability of the SGTS, all Unit 2 emergency core cooling systems, both Unit 2 Standby Liquid Control systems, and both Unit 2 Standby Coolant Supply flowpaths. This constitutes an apparent violation (259, 260, 296/89-10-02) of 10 CFR 50, Appendix B, Criterion XVI which states that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected. (See paragraph 4 for a detailed description of this violation).

4. Response to Noncomforming Conditions

Of concern to the NRC is the timeliness and thoroughness with which the licensee dealt with conditions adverse to quality and the subsequent corrective actions. The present licensee corrective action program is in part the result of changes that occurred due to past poor licensee performance in this area that resulted in a NRC Order Modifing Licenses, EA 85-49, dated June 14, 1985.

EA 85-49 had been issued as the result of a breakdown in TVA's management controls for evaluating and reporting potentially significant safety conditions and was identified as the result of the review of Nonconforming Condition Reports (NCRs).

In the response to NRC Order EA 85-49, dated August 13, 1985, the licensee stated that the problems identified by the NRC Order and confirmed by licensee internal review could be categorized as follows:

- Lack of appropriate management controls and procedural adherence to ensure timeliness concerning the evaluation and correction of potentially significant safety conditions.

- Lack of appropriate management controls and procedural adherence to ensure management awareness of potentially significant safety conditions.

- Lack of appropriate management controls and procedural adherence to ensure that individuals responsible for reporting significant safety conditions to NRC are promptly made aware of potentially significant safety conditions.

The licensee performed an evaluation of Office of Engineering (OE) and site procedures to verify that the above problems were adequately addressed and that various procedural and management control changes were made as the result of the evaluation. The licensee further stated the following:

- That all conditions adverse to quality identified by OE employees are now immediately documented and reported to management.

- For any condition adverse to quality identified by OE that represents an immediate threat to the health and safety at an operating nuclear plant, OE will now immediately notify the affected site director at the time of identification by OE management.

- Revised site procedures will require the condition adverse to quality identified by OE to be immediately transmitted to the operating organization.

As part of TVA's overall committment for improvements in management systems and programs in the Corporate Nuclear Performance Plan and in response to NRC Order EA 85-49, the licensee in a letter to the NRC dated March 2, 1987, outlined the prominent features of their new streamlined corrective action program. The new program reflected a corporate level effort to standardize the method of identification and documentation of conditions adverse to quality on a single CAQR form rather than on many different forms as previously used. The program required: (1) immediate preparation of a CAQR after CAQ identification, (2) management review of the CAQR within three working days, followed by (3) immediate transmittal of the CAQR to the operations staff. The licensee further stated that the commitment for extensive training and employee awareness of the new program would be complete by March 30, 1987. With the implementation of this new corrective action program, their position was that TVA met the required performance improvements delineated in NRC Order EA 85-49.

During the past two years other violations representing failure to take prompt corrective action and failure to implement the CAQR program have occurred:

- 87-38-02, Severity level IV, Failure by NE management to implement corrective actions resulting from ten QA audits between 1985 and 1987.

- 87-41-01, Severity level IV, Failure by NE management to perform prompt corrective actions for a significant CAQR on June 5, 1987, concerning the existence of a high number of delinquent CAQRs. This CAQR was itself allowed to become delinquent. This resulted in the subsequent issuance of two additional significant CAQRs for the delinquency of CAQR reviews.

- 88-21-02, Severity level IV, Failure by the licensee to perform prompt generic reviews of CAQRs identified at the licensee's other facilities.

- 88-24-09, Severity level IV, Failure by the licensee to promptly identify to the NRC that, contrary to the FSAR, the RHRSW pump rooms were not watertight to ground water and that a potential problem existed that could flood all RHRSW pump motors. That condition could adversely effect the ability of the RHRSW and EECW systems to perform their intended safety functions and constituted an unreviewed safety question. This determination was made by DNE on July 25, 1988. The licensee did not report the issue to the NRC until August 18, 1988, 24 days later. A severity level IV violation (260/88-24-04) was also issued for the failure to report the issue within four hours in accordance with 10 CFR 50.72(b)(2)i.

The TVA NQAM, Part 1, Section 2.16, Revision 4, which was in part written to ensure implementation of EA 85-49 committments, provides clear guidance with respect to CAQs.

- Paragraph 2.2.1 - during the CAQ process any condition that has the potential to affect operability shall be immediately reported to PORS.

- Paragraph 2.3.2 - a CAQR shall be initiated when a CAQ is identified rather than waiting for completion of audit, evaluation or receipt of a formal report.

- Paragraph 2.4.1 - management review activities shall be completed within three working days.

- Paragraph 2,4,2 - in no case shall management review take more than 10 calender days.

- Paragraph 2.8 - within 7 working days of origination, a determination of potential reportability shall be made.

The CAQ was first identified on January 11, 1989, however, the CAQR was not initiated until February 3, 1989, 16 working days later (23 calendar days). It appears that there was justification for initiating the CAQR on January 11, 1989, or shortly after identifying that the Seismic Class I boundary included vitrified clay piping. There was even greater justification for issuing the CAQR on January 17, 1989, when it was identified that some of the EECW system (a system required to be TS operational for refuel) discharge flow paths were not seismically qualified. The failure to initiate the CAQR until February 3, 1989, is considered to be a violation of NQAM, Part I, Section 2.16, Paragraph 2.3.1 that states that the "initiator determines, so far as practicable, that the condition is a CAQ and promptly documents the condition on Part A of the CAQR-PRD form." This, in turn, is considered an apparent violation of 10 CFR 50, Appendix B, Criteria XVI for failure to promptly identify a condition adverse to quality (Violation 259, 260, 296/89-10-02). Once the CAQR was initiated, the management review was conducted within the three working days required by NQAM, Part I, Section 2.16.

The NRC is concerned about the number of violations related to the CAQR process that have occurred during the past two years and about the fact that the commitments made in response to NRC Order EA-85-49 on March 2, 1987, have not yet been effectively implemented. The NRC will request a management meeting with TVA to discuss steps being taken to ensure that these problems don't persist.

5. Unreviewed Safety Question Determinations and Reportability

The licensee had not previously identified this deficiency in the seismic qualification of the EECW discharge flow paths even though there had existed several opportunities for that to occur. The deficiency was not identified during the SPOC process on either the EECW or RCW systems since these sections of buried piping were not included within the scope of the fuel load boundaries for either system, and an engineering justification for fuel load had been prepared. The deficiency had not been identified as part of the Restart Test Program or the TVA Safety System Functional Inspection (SSFI) performed during June 1988 on the EECW System. Both programs concentrated on functional aspects with the primary focus on component operability and it was understood that the baseline verification program was in progress to detect design/calculation type problems. No civil engineering personnel took part in the SSFI and seismic qualification was not addressed as an issue. The DBVP identified the lack of calculations for buried piping as part of the discovery phase, however, they developed an engineering justification for fuel loading that erroneously concluded that, based on TVA experience with buried structure, no safety issues would be found with burried piping.

Neither the EECW or RCW systems were originally designed as seismic systems. However, since the original installation, piping contained within the entire EECW system and portions of the RCW system located inside the Reactor Building have been analyzed and upgraded to Seismic Category I. Outside the Reactor Building, RCW piping had not been required to be seismically qualified. Although the three affected EECW discharge lines tie into separate portions of seismically qualified RCW piping within the reactor building, the RCW piping downstream of those tie-ins is subject to failure during an earthquake. This condition does not meet the requirements of the FSAR Section 10.10.2, which states that EECW piping shall be designed to withstand the effects of the design basis earthquake without failure. This deficiency constitutes an unreviewed safety question, and an unanalyzed condition that significantly compromises safety.

The NRC inspector determined from conversations with licensee personnel that, in the original plant design, standpipes were included in the design for the steel EECW discharge lines for the emergency diesel generators and the Unit 3 "3B" Control Bay Chiller due to the presence of seismically unqualified piping which may include vitrified clay piping located in the downstream flowpath. The standpipes allow the system to be qualified as Seismic Category I since they provide a flowpath in the event the downstream piping is blocked.

Even though licensee NE personnel had known about the issue since January 11, 1989, and had determined on or before January 17, 1989, that a potential CAQ existed, CAQR BFP 890099 was not issued until February 3, 1989. The onsite system engineer had been told of the issue on January 18, 1989, during routine weekly contact with the CEB engineer. During this discussion the issue was identified as a potential seismic problem with a RCW discharge line. The system engineer was not able to recall whether the subject discussed specifically included clay piping or that a potential condition adverse to quality could exist. The system engineer had been reviewing 57 separate DCNs associated with seismic issues resulting from the calculation regeneration effort during the same time period and he failed to realize the significance of the issue. He did not identify this condition to his management. After initiating the CAQR on February 3, 1989, the engineering management review of the CAQR appears to have been completed on February 8, 1989, within the three working days following CAQR initiation, as required by NQAM, Part I, Section 2.16, Paragraph 2.4.1. Plant management and operations personnel were not informed of the potential degraded condition until the CAQR was issued and sent to PORS for review on February 8, 1989.

This finding that the three EECW flow discharge paths were not properly seismically qualified is an instance of an unanalyzed condition that significantly compromises plant safety, as defined in 10 CFR 50.72(b)(2)(i), that requires an immediate four-hour report to the NRC. Once the CAQR was initiated, the event was evaluated and reported in a prompt manner. It appears that the reason that the report to the NRC was

not made sooner was because of the untimely issuance of the CAQR. Violation 259, 260, 296/89-10-02 addresses the failure to initiate the CAQR in a prompt manner. Since this addresses the root cause of the issue, an additional violation for failure to make an immediate notification is not warranted and will not be issued. This decision was made after the exit meeting following additional NRC management review.

6. Unit 2 Shutdown Board Rooms Air Conditioning Modification

One of the nonseismically qualified EECW flow discharge paths was a recent modification, while the other two appear to have been part of the original design. The NRC was concerned that the recent modification (Fall 1988) was made resulting in a nonseismically qualified discharge flow path, and that this might be indicative of problems with the current design change control process.

The NRC inspector reviewed Safety Evaluation Number P0956 Rev.3, (B2288 0830 521), dated August 26, 1988; drawing 2-47E859-1, "Unit 2 Flow Diagram Emergency Equipment Cooling Water," which shows the water supply from the EECW system to the Unit 2 shutdown board room air conditioning units (ACUs) and the cross connect to the Unit 2 Raw Cooling Water (RCW); Drawing 2-47E844-2, "Unit 2 Flow Diagram Raw Cooling Water," which shows the piping configuration associated with Unit 2 Shutdown Board Rooms "C" and "D" ACUs including EECW discharge; and Drawing 2-47E831-3, "Unit 2 Flow Diagram Condenser Circulatory Water," which shows the RCW discharge header as it ties into the 16 foot diameter, Unit 2 discharge conduit to Wheeler Lake.

The NRC inspector noted that item 19 of the Safety Evaluation for ECN P0956, stated that the cooling water supply for the ACUs will be provided by the EECW system, System 67, and that this system would provide a safety related source of cooling; item 20 of the safety-evaluation stated that all new equipment, ductwork, conduit, piping, supports and other components will be designed and implemented in accordance with the appropriate criteria for Seismic Class I Systems; and item 20 of the evaluation further stated that the final configuration for Engineering Change Notice P0956 will be seismically and environmentally qualified and will not adversely affect the safety of the plant. A review of the above listed drawings and a walkdown of the system by the NRC inspector confirmed what TVA had reported: that the discharge piping from the A/C units ties into the discharge piping for RCW, System 23, which is not seismically qualified outside the reactor building. This potential violation for failure to adequately control the design of the EECW discharge flow paths for the installation of Unit 2 A/C units for the shutdown board rooms was discussed with licensee management.

The licensee disagreed that this constituted a possible violation in that they stated that their design package properly specified the seismic requirements for the EECW modification, and identified that the Design Baseline Verification Program (DBVP) had identified that calculations did not exist for the buried RCW piping. The licensee stated that the design

change process was adequate within the known seismic boundaries at the time and that resolution of the DVBP buried piping calculation issue would ensure the correct seismic design for the EECW discharge flow path. This issue was identified as an unresolved item and will receive additional NRC attention as part of a future inspection. Specifically the licensee will need to provide documented evidence to support their disagreement that a possible violation existed. This issue will be tracked as Unresolved Item (260/89-10-03), Control of EECW Modification Design Changes. This issue must resolved prior to restart of Unit 2.

7. Licensee Corrective Actions

On February 8, 1989, based on the licensee's review of affected equipment, the licensee declared secondary containment, all Unit 2 emergency core cooling systems, both Unit 2 standby coolant supply flowpaths, and both Unit 2 standby liquid control systems inoperable. Based on this assessment fuel handling and operations over the spent fuel pools and open reactor wells were not permitted by TS until secondary containment could be declared operable. Also, no work was permitted which had the potential to drain the Unit 2 reactor vessel until core cooling systems could meet operability requirements.

On February 10, 1989, the licensee completed a safety evaluation for interim operation with the proposed compensatory measures established to provide an EECW flowpath through the affected components in the event flow was lost due to a seismic event. An NRC inspector attended the PORC meeting where this safety evaluation and the associated interim operating criteria were presented for review and approval. The compensatory measures involved isolating all normal RCW flow to Units 1, 2, and 3 reactor building RCW discharge piping and removing one 24 inch RCW discharge pipe coupling in each RHRSW tunnel and ensuring that a 1/2 inch gap exists between the pipe ends. The licensee performed calculations to show that a 1/2 inch gap would provide adequate flow in the event that the RCW discharge flow path was lost. The NRC inspector reviewed the licensee's calculations that support the adequacy of the 1/2 inch gap and found it adequate. In the event that a 1/2 inch gap could not be obtained between the pipe ends on any discharge header, additional flow area would be created by cutting a six inch diameter hole in that 24 inch discharge header. The NRC inspector reviewed the licensee's safety evaluation and compensatory measures and considered them adequate for the present plant condition i.e., cold shutdown. The NRC inspector noted that the evaluation was stated to be valid only for that condition.

On March 2, 1989, a meeting was held at the Browns Ferry site with members of the licensee management. The licensee and NRC staff present at that meeting discussed the various causes that led up to the failure to identify the problem in a timely manner. During that meeting licensee management committed that as part of the corrective action, specific training would be held for engineers that are part of the Division of Nuclear Engineering and the onsite systems engineering group. This training would include the following:

- Sensitivity training for line engineers and management to cover Browns Ferry TS and engineering personnel's responsibilities to communicate potential problems to management in a timely manner, and training on operability and reportability requirements.

- Plant systems training to enable engineers to better understand overall plant operations.

The training had commenced prior to the end of this inspection. Licensee management met with NRC management on March 14, 1989 to describe their corrective action for permanent technical resolution of the issue. This meeting was documented in an NRC memorandum dated April 3, 1989. Resolution involves connecting the three EECW discharge lines in question to other seismically qualified EECW discharge headers. These modifications will be complete prior to restart.

8. Exit Interview (30703)

The inspection scope and findings were summarized on March 22, 1989, with those persons indicated in paragraph 1 above. 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. The licensee provided dissenting comments pertaining to all but one of the potential violations.

The inspectors stated that the Unit 2 modification in 1988 to the shutdown board rooms air conditioning that resulted in the EECW discharge flow path not being seismically qualified (see paragraph 6) appeared to be a violation of 10 CFR 50, App.B., Criterion III for failure to exert adequate design control. The licensee disagreed that this design change package either was not adequate or was not adequately implemented. As a result of this discussion the potential violation was changed to Unresolved Item 260/89-1-03, pending the NRC's review of the information presented by the licensee in the exit.

The licensee expressed their position that they should not be cited for either the LCO violation (paragraph 3) or the failure to promptly notify the NRC of an unanalyzed condition (paragraph 5) since they both resulted from their failure to take prompt corrective action, which they did not dispute. The inspectors stated that the NRC will take their comments into consideration in developing the final form of the Notice of Violation.

Item	Description
260/89-10-01	Violation, apparent failure to comply with TS 3.5.A.5 during Unit 2 core reload (paragraph 3)

259, 260, 296/89-10-02	Violation, apparent failure to establish an effective program to assure conditions adverse to quality are promptly identified and corrected (paragraph 4)
260/89-10-03	Unresolved Item, Control of EECW Modification Design Change (paragraph 6).

9. Acronyms

AOI	Abnormal Operating Instruction
CAQR	Condition Adverse to Quality Report
CS	Core Spray
DG	Diesel Generator
DBVP	Design Baseline and Verification Program
ECN	Engineering Change Notice
EECW	Emergency Equipment Cooling Water
FSAR	Final Safety Analysis Report
HVAC	Heating, Ventilation, & Air Conditioning
NE	Department of Nuclear Engineering
NOV	Notice of Violation
NPP	Nuclear Performance Plan
NQAM	Nuclear Quality Assurance Manual
NRC	Nuclear Regulatory Commission
OE	Office of Engineering
PORC	Plant Operations Review Committee
PORS	Plant Operating Review Staff
PRS	Plant Reporting Section
QA	Quality Assurance
RCW	Raw Cooling Water
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RTP	Restart Test Program
SGTS	Standby Gas Treatment System
SPOC	System Pre-Operation Checklist
SRO	Senior Reactor Operator
TS	Technical Specifications
TVA	Tennessee Valley Authority
VIO	Violation
USQD	Unreviewed Safety Question Determination

ATTACHMENT 1

BROWNS FERRY NUCLEAR PLANT

CIVIL FUEL LOAD ISSUES

SPECIAL PROGRAM: Calculation Program (Buried Structures)

NPP, VOLUME 8, SECTION(s): III.4.4 and Commitments 78(a) and 78(b) of Attachment IV-2

DISCOVERY COMPLETED: Yes

JUSTIFICATION OF STATUS OF REFUELING:

- The review of the buried structures subcategory identified that calculations for buried structures, piping and conduit, are not retrievable.
- The buried Residual Heat Removal Service Water Piping (System 23) and Emergency Equipment Cooling Water Piping (System 50) are required to be operable by the technical specifications at fuel load. However, the finding on buried structures does not affect operability. The interface between structures and soil, the most critical part of buried piping, has been evaluated. These interfaces have been qualified and documented in calculations. There are no known safety issues with the balance of buried piping or conduit and experience with buried structures suggests that no safety issues will be found.