



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

Report Nos.: 50-390/90-24 and 50-391/90-24

Licensee: Tennessee Valley Authority  
 6N11 B Missionary Place  
 1101 Market Street  
 Chattanooga, TN 37402-2801

Docket Nos.: 50-390 and 50-391 License Nos.: CPPR-91 and CPPR-92

Facility Name: Watts Bar 1 and 2

Inspection Conducted: September 22, 1990 - October 19, 1990

Inspectors:	<u><i>[Signature]</i></u>	<u>Dec 13, 1990</u>
	G. A. Walton, Senior Resident Inspector Construction	Date Signed
	<u><i>[Signature]</i></u>	<u>Dec 13, 1990</u>
	M. W. Branch, Senior Resident Inspector Operations	Date Signed
	<u><i>[Signature]</i></u>	<u>Dec 13, 1990</u>
	S. P. Burris, Senior Resident Inspector Operations	Date Signed

Consultant: G. W. Bethke - COMEX Corporation (Paragraph 6)  
 P. L. Reagan - COMEX Corporation (Paragraph 6)  
 M. A. Wastlund - SAIC/AMSEC (Paragraph 6)

Approved by: *[Signature]* Dec 13, 1990  
 K. P. Barr, Section Chief  
 TVA Projects Date Signed

SUMMARY

Scope:

The inspection consisted of reviews of cable testing and rework activities on cable, employee concern commitment implementation, fire prevention and protection, preoperational testing, and reviews of previously identified inspection items.

Results:

Two violations and one unresolved item\* were identified in paragraphs 2, 4, 5, and 6.a concerning failure to follow procedures (three examples) and improper

**Result:**

Two violations and one unresolved item\* were identified in paragraphs 2, 4, 5, and 6.a concerning failure to follow procedures (three examples) and improper corrective actions (two examples). The first violation identified that inadequate work controls have occurred on ongoing work activities, particularly in the electrical area. The first two examples concern inadequate identification or work in progress. The third example identifies failure to document a deficient condition. The second violation identified two examples of inadequate corrective action. The first example concerned evaluation of improper fabrication practices on box anchors in lieu of field rework to correct the problems. The second example concerned the extensive time that an audit finding has been open without any corrective actions being taken to address the audit finding.

The inspectors conclude that there has been insufficient management attention to assure adequate work controls are being implemented and to assure conditions adverse to quality are being resolved in a timely manner.

Review of work control concerns identified in the Employee Concern Special Program indicates that not all corrective actions outlined in the program are being completed in a timely manner consistent with on-going construction activities.

\*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

- \*J. Garrity, Site Vice President, Watts Bar
- S. Crowe, Site Quality Manager
- D. Douthit, Modification & Facilities Manager
- \*W. Elliott, Engineering Manager, Nuclear Engineering
- \*E. Fuller, Chairman, Program Team
- \*R. George, Engineering and Modifications Manager
- \*R. Grau, Prestart Test Manager
- \*L. Jackson, Operations Manager
- \*M. Jones, Startup and Test Manager
- L. Nolan, Construction Manager
- C. Nelson, Maintenance Support Superintendent
- \*P. Pace, Compliance Licensing Support Supervisor
- \*J. Scalice, Plant Manager
- \*R. Stevens, Site Licensing Manager

Other licensee employees contacted included engineers, technicians, nuclear power supervisors, and construction supervisors.

\*Gary W. Bethke, COMEX Corporation (NRC Inspector/Contractor)

\*Attended exit interview

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

### 2. Work Control Commitment Implementation (T12512/15)

The inspector reviewed the licensee's actions on an employee concern commitment documented in Employee Concern Report 11200, to determine compliance and implementation of the corrective actions specified by the report, and its effect on the on-going work control activities. The commitment to employee concerns are documented in the report as Corrective Action Tracking Documents (CATDs). The CATD audited by the inspector was number 11200-WBN-09. This CATD was discussed in Employee Concern Subcategory Report 11200 which describes problems with construction work activities.

Based on the reviews performed by the inspector, it was determined that the licensee failed to implement follow-up actions to licensee audit findings which identified problems with the work control program in 1985 (over 5 years ago). Meanwhile, the licensee has continued work on Unit 1 without evaluating the adequacy of active work plans and work control activities, or determining whether defective hardware exist on Unit 1.

Background:

To reach the conclusion discussed above, the inspector reviewed Nonconformance Report SCR 6497, the "Corporate Study" that evaluated the Unit 1 applicability, the Employee Concern Subcategory Report 11200, CATD 11200-WBN-09, and licensee issued internal correspondence on the issue.

The employee concern report specifically discusses Unit 2 Nonconformance Report Number SCR 6497 that documents unauthorized work performance on Unit 2. The CATD 11200-WBN-09 states that SCR 6497 should be evaluated to determine if it is applicable to Unit 1. Further, the CATD states that previous responses from Office of Nuclear Power have not established a credible basis on which to assert that unauthorized work was not also performed on Unit 1. The CATD further states that SCR 6497 was reviewed by licensee management for applicability to Unit 1 and it was determined that the SCR did not identify a condition adverse to quality on Unit 1. It also stated that lack of proper work control does not necessarily indicate a condition adverse to quality. The licensee's basis for determining that a condition adverse to quality did not exist was as follows:

- (1) Work control is a program to be utilized to ensure that an end is achieved. On Unit 1, the end of the construction has been achieved in that all the systems required for Unit 1 have been transferred to the operating organization.
- (2) The system transfer process for Unit 1 included numerous reviews and walkdowns which would have identified and corrected any work control problems.
- (3) The preoperational testing program has virtually been completed and the systems have been proven to be operable through the performance of various surveillance instructions.
- (4) Configuration control could be the only conditions adverse to quality resulting from poor work control and it was already being addressed by SCR 6497.

Additionally, the licensee committed that all NCR's generated as a result of work release program on Unit 2 will be evaluated for applicability on Unit 1 and a "Corporate Study" was being performed to determine the applicability to Unit 1.

The inspector obtained a copy of the "Corporate Study" from the licensee. The "Corporate Study" was actually an audit performed by one Project Engineer from the Procedures and Standards Group. The audit was completed on March 16, 1987, and documented in a report dated March 26, 1987.

The "Corporate Study" concluded the work activities were done with the same personnel using the same procedures for both WBN 1 and 2 and the condition is definitely generic to Unit 1.

The report also discusses the term unauthorized work. The report indicates the problem was not unauthorized work, but lack of inspection requirements.

To address and resolve the "Corporate Study" report and the audit findings on March 27, 1987, a letter documented the generic applicability for Unit 1. It was sent to the Construction and Modification Managers for action by April 10, 1987. On May 30, 1989, two years later, the Construction Manager documented the following corrective action plan to initiate actions to address the findings for the audit conducted in 1985. The following plan was established:

- (1) Randomly select 64 work releases from each of the five functional areas during construction (Mechanical, Electrical, Instrumentation, Civil and Startup Engineering Units).
- (2) Compare the work described on the release to the records and the hardware.
- (3) Any discrepancies found will be evaluated to determine if any other corrective action program would have discovered the discrepancy.
- (4) All discrepancies not covered under an existing corrective action program will be identified on a Condition Adverse to Quality Report and evaluated for further corrective action.

The letter further states the corrective action is anticipated to be completed by December 1, 1989.

The inspector reviewed Employee Concern Subcategory Report 11200 to establish the background behind the employee concerns, basis for the "Corporate Study" and the licensee's basis for issuing the CATD work control. ECP Report 11200, Paragraph 5 "Collective Significance" concluded:

"Ninety-six of the one hundred concerns correlated with work control were identified at Watts Bar. If there is a programmatic work control problem at any TVA plant, Watts Bar is that plant. Watts Bar management acknowledged the existence of work control program deficiencies when SCR 6497 was generated. SCR 6497, which was titled "Inadequate Construction Work Control", upgraded 18 NCR's describing a significant condition adverse to quality in that "unauthorized work performed on documented features resulted in discrepancies between the as-constructed condition and documentation as reflected by the RAP." (Note: RAP stands for Records Accountability Project).

#### Employee Concern Report Conclusion:

"Upon review of the history of work control at Watts Bar, it is apparent that management's failure to systematically monitor and analyze work performance has necessitated a trial and error approach

to improvements in the work control program. QCI 1.60 was issued to upgrade the work control program only after overwhelming evidence from diverse sources forced recognition of deficiencies in the work control program."

The report notes the concerns were not limited to Unit 2 even though SCR 6497 is for Unit 2; rather, they are nonspecific. As stated on page 40 of the report, the evaluators do not agree with the TVA management's conclusion that it was not generic to Unit 1. Therefore, the CATD was issued to cause the review on Unit 1 to evaluate and determine if Unit 1 work control was abused like Unit 2 apparently was. The Employee Concern Report also states in numerous places that the problem is resolved for future work because of the issuance of QCI 1.60, "Work Control." One example of the better control of the process discussed in the report is stated on page 37 paragraph 2. It states, "The size of the workplans has been limited. Future workplans must not exceed 3,000 manhours. In the past, bulk packages presented tracking difficulties and it was easier for the inspection requirements and test statusing to be overlooked."

#### Findings:

The inspectors review of procedure QCI 1.60 found it has been deleted and replaced with a different procedure AI-8.8 "Control of Modification Work After Transfer." AI-8.8 contains the following requirements for the control of the size and duration of current workplans. Workplan activities which exceed 3,000 man-hours or 12 week duration will be reviewed for possible further breakdown so no activity exceeds 3000 manhours or 12 weeks duration." However, AI-8.8 is not applicable to Unit 1. Administrations Instructions (AI) apply to plant operational activities but do not apply to construction activities. The inspector noted that CAQR WBN900175 documents several workplans that exceed the 3,000 manhours. Workplan number K-PO3002A-1 issued September 21, 1989, has 25,327.5 manhours charged against it.

In a meeting on September 19, 1990, the inspector met with a licensee task force assigned to investigate the issue. The inspector requested the licensee provide information on the following items:

Documentation of the reviews that have been performed when the workplans exceed the 12 week duration or 3,000 manhours.

Results of the 64 reviews for each of five disciplines that was required to determine the significance of the employee concerns on Unit 1.

The inspector was advised on the first issue that documentation was not available. Also, the inspectors review of recently issued procedure changes to AI-8.8 found an "Instruction Change," Number 90-520, dated September 21, 1990, that deleted all requirements for limiting manhours on workplans. This is contrary to the "lesson learned" identified in the ECP Report 11200 that stated the work control problem was solved on future

work partly because of the restrictions required for workplans, such as 3,000 manhours. The licensee was unable to provide a technical justification for deleting the requirements other than the 3,000 manhour requirement did not appear to be valid. It is the inspectors understanding that the workplans were too large and cumbersome and for lack of a better method of limiting the size of workplans, the 3000 hours was selected. Deletion of the requirement without substituting another control or justifying the control is not necessary circumvents the original corrective action to limit the size of workplans so they are manageable.

On the second issue that required extensive reviews of Unit 1 to determine the extent of problems due to ineffective work control, the inspector was advised the effort had not yet started. The task force also advised that the completion of the work was tied to the completion and turnover of the Group 5 systems. The Group 5 system is next to the last group required to be completed and turned over to operations.

Meanwhile, the licensee has continued with work activities on Unit 1 without evaluating the extent of work control issues surfaced in 1985, evaluating the adequacy of active workplans and work control activities, or determining whether possible defective work exists.

Failure to perform reviews and take any needed corrective action in a timely manner for deficiencies identified approximately five years ago (October 1985 - October 1990) is identified as the first example of Violation 50-390/90-24-02, Ineffective Corrective Action.

### 3. Mechanical Components (50074B)

The inspector, in the process of verifying that P21 Report 85-01 was satisfactorily closed for WBN, noted that the electric lubricating oil pumps for the diesel are improperly labeled. Discrepancies are as follows:

- The foundation mounted AC oil pump which is labeled "Soakback Pump" is, in fact, the Circulating Oil Pump.
- The skid mounted AC and DC pumps which are labeled "Auxiliary Oil Pumps" are, in fact, the Turbo Soakback Pumps.

These labeling problems will be tracked under IFI 50-390, 391/90-24-03, Adequacy of Labeling.

### 4. Work Control (Electrical - 51053)

- a. During a plant tour on September 14, 1990, the inspector noted that junction box 1JB-4153 was open and seven cables in the box had been

cut apart. The ends were not taped and the work activities that caused the cables to be cut were not identified on the cable or the junction box. Additionally, there were no work activities or workers in the vicinity, which indicated the work had been done on a previous shift. The licensee later identified that the work activities were associated with recent hi-pot testing of recently pulled cable and workplan KMO-8302A-1 controlled the activity.

The inspectors review of this issue found that the controlling procedure, WBN-CPI-8.1.8-E-102, Installation of Low and Medium Voltage Power, Control, and Instrumentation Cables, paragraph 5.11 requires that immediately after pulling each run of cable, the cable should be temporarily identified. Also, paragraph 6.4.2 requires that each end of the spared or abandoned cable shall be capped with a properly sized Raychem Thermofit end cap or other method approved by engineering. Paragraph 6.4.3 states that each end of the spared or abandoned cable is to have a tag affixed as near the end as practical giving the spare or abandoned cable number.

The inspector determined that failure to tag the work activities and tape or seal the ends of spare or abandoned cable is identified as the first example of violation 390/90-24-01, Failure to Follow Procedures. The unresolved item 50-390/90-22-10, Tagging Work Activities, that originally identified this issue is closed.

- b. In a follow-up visit to the area where the cables were cut as discussed above, the inspector noted that the conduit and cable (cable was missing) for the main steam pressure transmitter 1-PT-1-26C-B was disconnected. The panel is identified as 1-L-251, steam generator number 4. The recent cable and conduit activities that removed them were not identified with a tag that identified the work or workplan applicable to the work. There were no workers or work tools in the area indicating the work was done earlier and no work was in progress. The inspector revisited the area on subsequent visits and no work was ongoing.

The inspector determined that failure to tag the work activities is identified as a second example of violation 50-390/90-24-01, Failure To Follow Procedures.

- c. During this inspection period the inspectors reviewed work activities associated with Work Plan KMO-8515 A-1, in which the licensee construction craftsmen were required to reterminate two wire ends (cables 2-3PL-067-3907-B and 2-3V-067-3998-B) in cabinet 2-MCC-214-B1-B Compartment 4E due to termination lug damage. During the process of implementing this work plan the licensee personnel noted that a white conductor from cable 2-3V-067-3995-B, not associated with this work plan, was not terminated in accordance with the wiring diagram, 45B2772-4E. The white conductor was terminated on terminal number 24EY and should have been terminated on terminal 24E7.



The inspectors were informed that this item had been discussed in detail between the craft, craft supervision and the QC inspector, however, it appeared that each group thought the other should document the deficiency. Later, after reviewing the installation in question, the inspectors noted that the white conductor had been moved back to its proper location.

The inspectors reviewed Administrative Instruction 2.8.15, "Corrective Action-WBN," Revision 0, Section 3.1, "Identifying and Documenting CAQs," which required that the licensee identify and document conditions adverse to quality. However, after observing a wiring discrepancy between the actual plant configuration and a controlled wiring diagram, the licensee informed the inspectors that this deficiency had not been documented as a CAQR, but instead had been corrected using the Work Plan Revision Process. Review of General Construction Instruction WBN-GCI-8.1.05-01 C, "Work Control," Revision 1, Section 6.12.3, found that in-process deficiencies identified during the work process shall be evaluated against the conditions adverse to quality criteria identified in AI-2.8.15. If this as-found condition meets the criteria of AI-2.8.15, then the licensee shall initiate a CAQR instead of a work plan revision. The specific condition meets the criteria in AI-2.8.15 for a CAQR in that the condition represents a hardware deficiency. Contrary to the requirements of WBN-GCI-8.1.05-01 C and AI-2.8.15, the licensee corrected this wiring deficiency using the work control process without evaluating it against the CAQ criteria of AI-2.8.15. This item is identified as the third example of failure to follow procedures, VIO 50-390/90-24-01, Failure to Follow Procedures.

#### 5. Prestart Test (70311)

During this inspection period the inspectors continued to follow the licensee's Prestart Test Program (PTP) activities. Inspection activities included test procedure review, test witnessing, administrative program review, discussions with the PTP management concerning program changes, and attendance of the test program status meetings. Specific activities reviewed during this inspection period are discussed below.

Essential Raw Cooling Water Prestart Test, TI-103.067.01, Revision 2. The purpose and scope of this test was identified as providing detailed instructions for functionally testing proper operation of the various pumps, valves, traveling screens and strainers in the ERCW system.

The licensee's Test Director has completed approximately 35 percent of this procedure to date and continues to test on a daily basis. During the

conduct of this test, three deficiencies have been identified to date. The first two deficiencies involved identification of control status lights which did not illuminate as required when certain system conditions had been established. Both of these items were found to be the result of a different group (engineering and construction) removing the indicating systems from service to perform other work related activities. The third deficiency was identified when the TD could not perform step 9.a of section 6.2.61 which initially closed valve O-FCV-67-360 and then subsequently verified that "the valve will not CLOSE using Handswitch A." The TD immediately stopped the test and identified that a procedural deficiency existed. Discussions with the TD found that this item had been added as a procedural change in a earlier revision, and therefore had received the necessary program revision reviews (cross technical review and Joint Test Group).

The inspectors questioned the adequacy of these reviews which had allowed an inaccurate condition to be established for conduct of the test. The inspectors noted that this type item has been discussed previously in IR 50-390/90-12, Paragraph 4.a. The inspectors identified this item as an unresolved item 50-390/90-24-04, Adequacy of the Test Procedure Review Change Process pending additional NRC review.

The inspectors witnessed the following system 67 test sections during the conduct of testing and did not identify any concerns:

- 6.2.23, 6.2.28, 6.2.34, 6.2.40, 6.2.41, 6.2.43, 6.2.44, 6.2.61, 6.2.67, and 6.3.3.

The inspectors continue to review the status of System 70, Component Cooling Water Test Deficiencies Resolution. The inspectors found that the licensee had generated a CAQR WBP900334 to document a test deficiency which was identified during the conduct of testing. While testing the functionality of the Thermal Barrier Booster Pump, the TD found that a relay would not actuate and therefore could not perform its intended function. The TD properly generated a test deficiency and subsequently issued a CAQR to resolve this item. Currently the licensee is still evaluating this item.

#### 6. Action on Previous Inspection Findings (92701)

- a. (Closed) URI 50-390/90-22-07, Box Anchor Rear Plates Fused To Pipe by Welding

The licensee initially reported the subject deficiency to the NRC on February 3, 1986, in accordance with 10 CFR 50.55 (e) as NCR 6264.

The inspector reviewed the closure package and opened unresolved item 390/90-22-07 and documented it in Inspection Report 390/90-22.

During this inspection period, the inspector performed further reviews of the licensee's actions on this issue.

The licensee reported that box anchors installed as pipe supports only required welding of the pipe to the box anchor on one end (the front plate) of the box anchor. The box anchor was then connected to the floor or wall to support the piping. The other end (the rear plate) of the box anchor was designed to be free of the pipe (with an unwelded snug fit) to allow expansion or contraction of the piping due to thermal effects. The reported problem is that some of the box anchors were inadvertently welded to the pipe on the end intended to be free. The licensee reported that in instances where pipe to rear plate fusion occurred, such fusion could restrain the thermal expansion or contraction of the supported piping and, depending on the amount of restraint, this could cause damage to the piping, thereby causing loss of safety related components serviced by the piping. This in turn could adversely affect plant safety. The licensee has reported that the piping is located in various cooling water systems.

The details of the inspectors efforts are documented in IR 50-390/90-22 and are not repeated in detail here. The inspector's findings in that report indicate the following problems with the licensee's actions on this issue:

- (1) The checklist of Potential Effects on Design Documents showed that a seismic analysis would be required. The inspector determined the licensee had not performed this analysis.
- (2) A review of the OE calculation CEB-CAS-173 found the calculations were for basic thermal expansion (displacement) between the pipe and the tube steel in the support. Also, the displacement values calculated were not used in any computation of fusion point stresses or pipe wall tension/compression.

In that inspection, the inspector concluded that the licensee had not adequately addressed the issues due to the lack of seismic analysis (or demonstration that none is required), and the lack of rigorous analysis for thermal effects. Unresolved item 50-390/90-22-07 was opened to the track future licensee corrective action.

During this inspection period, the inspector further reviewed the licensee's actions taken since the last review to determine if the issue was resolved. Since the last inspection, the licensee has performed additional calculations that the inspector reviewed. The calculations were preliminary and the inspector's review found the calculations attempted to calculate the stresses in the box anchor plates. The inspector believes those stresses are not a significant concern, but what is a concern are the stresses in the pipe wall at the point of fusion of the rear plate to the pipe. To date the licensee could not demonstrate to the inspector that adequate consideration and analysis were performed to demonstrate the fusion condition is acceptable as inadvertently made. Further, the inspector has determined that the licensee has not considered all

requirements of the ASME, Section III Code, when welds are integrally attached to a Class I, II, or III piping system.

Specifically, ASME, NC/NB 3600 requires that if deviations occur to design requirements, then stress calculations are required to determine if corrective actions are required, or if stress calculations cannot be performed (due to complexity of defect) then experiments or tests are required to demonstrate acceptability of the design. Further, the inspector determined that several sections of the ASME Code [i.e., NC3624.1, NC3611.1 (b.3), NC3645, and NC3673.4] prohibit welds with restraints between two points, like the situation on the box anchors, without providing bends, expansion joints, flex pipe, etc., to allow for displacement.

Also, the ASME Code requires controls when welding temporary or permanent attachments to code class piping. The welding procedure and welder must be qualified to specific requirements before welding on piping material. The licensee has not demonstrated that the weld procedure and welder were qualified (to the combination of weld configuration and materials) for the specific welds in question. Further, the ASME Code requires that structural and pressure boundary welds must be nondestructively examined to determine acceptance. This was not done on the welds inadvertently fused to the piping material.

Failure to adequately address the calculational requirements, or perform experiments and/or tests and failure to consider the ASME Code requirements for welder and procedure qualifications, and failure to perform the code required nondestructive examinations is identified as the second example of violation 50-390/90-24-02, Ineffective Corrective Actions. Unresolved item 50-390/90-22-07 is closed.

- b. (Closed) CDR 50-390/87-09, HVAC Duct Weld Deficiencies
- (Closed) URI 50-390/90-05-01, HVAC Duct Weld Deficiencies

NRC staff from the Office of Nuclear Reactor Regulation conducted a special team inspection at Watts Bar, documented in Inspection Report 50-390/90-05, to review the resolution of the technical issues in the CAP related to Heating, Ventilating, and Air Conditioning Systems. As part of this activity, the team reviewed the licensee's resolution of the issue that HVAC duct welds were welded as partial penetration welds and should have been full penetration welds. These deficiencies are documented in the reports referenced above. This issue had been partially reviewed by the NRC inspection team and documented in Inspection Report 50-390, 391/89-04.

The teams found the licensee has adequately addressed the issue and this issue is closed. The specifics regarding the teams inspection efforts and findings are documented in a "Safety Evaluation Report"

titled, "HVAC Duct Weld Deficiencies," that is in the Public Document Room under Dockets 50-390, 391.

c. (Closed) IFI 50-390, 391/89-21-01, Seismic Issues

On August 6-9, 1990, NRC staff from the Office of Nuclear Reactor Regulation conducted an on-site audit of the licensee's response to the open issues discussed in inspector follow item 89-21-01. As a result of this inspection effort, the NRC was satisfied that the licensee has adequately addressed the seismic issues and this IFI is closed. The specifics regarding the issues, inspection efforts and findings are documented in a report titled, "Special Calculation Audit Relating to the Seismic Analysis Corrective Action Program Plan and Implementation," which is in the Public Document Room under Dockets 50-390, 391.

d. (Closed) CDR 50-390/86-45 and 50-391/86-43, Deficiencies in Sampling and Control of Concrete

The subject deficiency was initially reported to the NRC on April 2, 1986, in accordance with 10 CFR 50.55(e) as NCRs WBN 6719, 6720, and 6721.

In an interim report, dated April 30, 1986, the licensee identified the following deficiency:

- TVA General Construction Specification No. G-2 for plain and reinforced concrete specified that the compressive strength of concrete be monitored and controlled. During some time periods, the percentage of concrete strength tests with results less than the specified strength, exceeded the allowable.
- Bedding mortar was used in concrete placements for congested areas joint preparation. Sufficient strength tests were not performed on bedding mortar during initial construction (December 1972 to July 1975). When strength tests were performed after 1975, low strength test results were encountered.
- TVA General Construction Specification No. G-2 for plain and reinforced concrete specified the frequency for in-process testing of concrete during production. On some occasions, the frequency of sampling was less than specified.
- The deficiencies related to implementation of TVA General Construction Specification No. G-2 were not generic to other TVA plants. The deficiency related to the use of bedding mortar could exist at other TVA plants since G-2 did not address the use of bedding mortar.

- Because concrete and grout were neither tested as required, nor met established strength requirements, there was a potential that structural members may not be acceptable. While neither concrete nor grout failures were identified, it was assumed that failure of safety-related structural members could occur and safe operation of the plant could be affected.

The following corrective actions were established by the licensee:

- Review concrete strength test results (NCR WBN-6719):
  - Identify when compressive strength test results did not meet requirements of G-2.
  - For above period, determine equivalent strength for use in design evaluations.
  - Identify all concrete placements represented by concrete with equivalent strengths less than used for design.
  - Perform structural evaluations on all concrete members that had concrete placements with equivalent strengths less than used for design.
- Review concrete production records (NCR WBN-6720):
  - Identify concrete placements that included significant volumes of bedding mortar.
  - For above placements, determine the equivalent compressive strength.
- Determine when the sampling frequency was less than specified in G-2 (NCR WBN-6721):
  - Determine if any mixes did not receive random sampling.
  - Identify concrete placements that were not adequately represented by test results.
  - Develop appropriate corrective actions.

In a final report, dated August 19, 1986, the licensee established the following additional corrective actions related to the review of concrete strength test results:

- Determine a conservative long-term strength gain to add to the equivalent concrete strength to obtain the in-place concrete strength.

- Evaluate concrete anchorages for surface mounted plates and embedded plates. •

In its final report, the licensee stated that:

- A procedure was developed to conservatively estimate in-place strength of concrete. A consulting panel reviewed and agreed with the procedure.
- Because of the high fly ash content of TVA concrete, significant strength gains with age were realized. That strength gain with age, coupled with the adequacy of most of the strength test results, limited the need for detailed engineering review to localized areas and building features.
- Design calculations were reviewed and TVA concluded that the concrete was structurally adequate.
- Detailed information pertaining to the resolution of NCRs WBN 6719, 1720, and 6721 was contained in Civil Engineering Branch (CEB) report CEB-86-19-C, "Watts Bar Nuclear Plant - Concrete Quality Evaluation."

TVA's final report stated that it determined the subject deficiencies to be acceptable and that it no longer considered 10 CFR 50.55(e) applicable.

TVA report CEB-86-19-C, "Watts Bar Nuclear Plant - Concrete Quality Evaluation," Revision 1, dated May 6, 1987, stated in part, that:

- TVA General Construction Specification G-2 predated industry standards for concrete. Industry standard ANSI N45.2.5 was issued after the submittal of the Preliminary Safety Analysis Report for WBN and after more than fifty percent of the WBN concrete was placed.

The inspector questioned if all concrete design drawings for category I structures were revised to incorporate a reference to ensure proper concrete design strengths were used in future design evaluations. The licensee stated that all such drawings were appropriately revised.

Based on a review of the aforementioned licensee documentation, the inspector concluded that the subject deficiencies were adequately resolved. CDRs 50-390/86-45 and 50-391/86-43, Deficiencies in Sampling and Control of Concrete, are closed.

- e. (Closed) 50-390/86-BU-02 and 50-391/86-BU-02, Static "0" Ring Differential Pressure Switches

NRC IE Bulletin 86-02 informed licensees and construction permit holders of a potentially serious safety issue involving series 102 and 103 differential pressure switches supplied by SQR, Incorporated (formerly Static "O" Ring Pressure Switch Company). The bulletin described the erratic behavior of SQR series 103 differential pressure switches that were installed at LaSalle 2 in mid-1985. All power reactor facilities holding either an operating license or construction permit were required to take action to prevent similar events from occurring at their facilities.

Bulletin 86-02 required licensees to submit a report on the extent to which SQR model 102 and 103 differential pressure switches were installed (or planned) as electrical equipment important to safety. In a letter from R. L. Gridley to the NRC dated November 20, 1986, the licensee stated that TVA determined that no such switches were either installed or planned to be installed as electrical equipment important to safety.

The inspector found the licensee's action on NRC IE Bulletin 86-02 adequate. Item 86-BU-02, Static "O" Ring Differential Pressure Switches, is closed.

- f. (Closed) P21 89-14, Foxboro Model N-E11 and N-E13 Pressure Transmitters Containing 10-50ma Type Amplifiers May Experience Current Output Oscillations Due to Workmanship Deficiencies

This issue involved a potential deficiency, reported by the Foxboro Company in a letter dated October 6, 1989, concerning Foxboro model N-E11 and N-E13 pressure transmitters containing 10-50ma amplifiers (part no. B0142EC) manufactured between January 1, 1988, (date code 2B8801) and September 1, 1989, (date code 2B8936). That letter required replacement of such transmitters and stated that similar model transmitters and amplifiers of the 4-20ma output type were not affected.

The Foxboro Company identified the deficiencies in workmanship located in a particular area of the amplifier board in the subject transmitters. The Foxboro Company stated that transmitter operation could be affected in the form of current output oscillations that may suddenly occur. The Foxboro Company also stated that the January 1, 1988 to September 1, 1989, time frame was identified through return failure analysis and stock inspections as the only period wherein the subject amplifier (part no. B0142EC) had the identified deficiency.

In a TVA letter from M. C. Brickey, dated October 30, 1989, the licensee stated it concluded that no material was received at WBN with the subject deficiency. The licensee reviewed the power stores inventory status and determined that all Foxboro model N-E11 and N-E13 pressure transmitters and amplifier part nos. B0142EC were received prior to January 1, 1988.



In a TVA letter from L. Moreland, dated March 8, 1990, the licensee stated that contracts 89NLC-42564B and 89NLG-75331A-01 were awarded by TVA to the Foxboro Company during the period January 1, 1988 to September 1, 1989. The inspector questioned if those contracts involved any of the subject transmitters and amplifiers. The licensee stated those purchase orders were for only capacitors and instrument scales, respectively.

The inspector questioned what measures the licensee had established to ensure the subject transmitters and amplifiers would not be used at WBN at a future date. The licensee stated that administrative instruction AI-1.47, "Nuclear Experience Review Program," Revision 3, dated May 4, 1990, ensured that lessons learned were integrated into WBN programs to enhance nuclear safety and reliability. The licensee also stated that the requirements of AI-1.47 were implemented, in part, by TVA standard STD-1.3.1, "Managing the Nuclear Experience Review Program," Revision 0, dated August 18, 1989. STD-1.3.1 stated, in part, that information from the nuclear experience review program was used when developing corrective actions for resolving technical and safety issues and when making procurement decisions. The licensee stated that Part 21 information was included with the NER program and would be used when making future procurement decisions.

Based on a review of applicable licensee documentation, the inspector concluded that the subject deficiencies did not exist at WBN. The inspector also concluded that the licensee had established acceptable measures to ensure the subject transmitters and amplifiers would not be used at WBN at a future date. Part 21 Report P21 89-14, Foxboro Model N-E11 and N-E13 Pressure Transmitters Containing 10-50 MA Type Amplifiers May Experience Current Output Oscillations Due to Workmanship Deficiencies, are closed.

- g. (Closed) P21 90-04, Rosemont Resistance Bridges Can Exhibit Premature Long Term Degradation Under Certain Combinations of Humidity, Power, and Duration

This issue involved a potential deficiency, reported by Rosemont, incorporated in a letter dated October 10, 1989, concerning precision resistors used in Rosemont model 710DUOTT master trip cards (known as 710 masters). Under certain combinations of humidity, temperature, power, and duration, the precision resistors would increase resistance value and could fail in an electrically open state. Those conditions could cause shifts of varying magnitudes in the reset differential adjustment. If undetected, that could cause a trip unit to lose the stability feature provided by the reset differential circuitry. Affected components were identified by Rosemont to be four model 0710DUOTT units that were shipped to the TVA Browns Ferry Nuclear Plant. In a TVA memorandum from R. E. Rogers, dated October 18, 1989, the licensee stated that the four units were found in the BFN warehouse and were appropriately tagged as non-conforming items.

In a letter dated December 7, 1989, Rosemont, Incorporated provided additional information regarding the subject deficiency. Rosemont stated that it had done extended testing and identified additional components that could exhibit premature long term degradation. The defective precision resistors were used in Rosemont model 710DU's (known as 710 masters and slaves) and model 414 E/F resistance bridges. In the model 710 masters, the subject deficiency could cause shifts of varying magnitudes in the trip point, high gross fail setpoint, low gross fail setpoint and reset differential. In the model 414 E/F, the subject deficiency could cause errors of varying magnitude in the final resistance bridge output. Affected components were identified by Rosemont to be four model 0710DUOTT2 units and one model 071DUOTS which were shipped to BFN.

In TVA Nuclear Experience Report 891050, "10 CFR 21: Rosemont Model 710 Trip/Calibration Units," dated June 26, 1990, the licensee stated that the subject deficiency was applicable only to General Electric nuclear power plants and Rosemont did not supply any such units to TVA for use at WBN. That statement was based on TVA discussions with Rosemont.

Based on a review of applicable licensee documentation, the inspector concluded that the subject deficiency was not applicable to WBN. Item P21 90-04, Rosemont Resistance Bridges Can Exhibit Premature Long Term Degradation Under Certain Combinations of Humidity, Power and Duration, are closed.

- h. (Closed) P21 89-01, Brown Boveri K-Line Circuit Breakers Delivered Prior to 1974 Need Rebound Spring Added to Slow Close Lever

This issue involved a potential deficiency, reported by ASEA Brown Boveri (ABB), previously ITE, in letters to the NRC dated January 13 and February 16, 1989. The NRC issued Information Notice (IN) 89-29, "Potential Failure of ASEA Brown Boveri Circuit Breakers (CBs) During Seismic Event," dated March 15, 1989, to all holders of either operating licenses or construction permits for nuclear power reactors. IN-89-29 stated that the subject deficiency involved ABB K-Line CBs, model numbers K-225 through K-2000, that were delivered to customers before July 1974. Those CBs had a slow close lever that could move during a seismic event and prevent the CBs from closing up on an electrical demand. ABB recommended that all users of the subject CBs add rebound springs to the slow close levers. TVA was not listed by ABB as a user of K-Line CBs delivered prior to July 1974.

In a TVA memorandum from J. T. Hutson, dated May 23, 1989, the licensee stated that it searched its equipment information system (EQIS) for ITE, ASEA, and Brown Boveri CBs at WBN, SQN, and BFN. The EQIS did not identify any K-Line CBs purchased before 1974 in use at those plants.

In a TVA memorandum from P. R. Mandava, dated September 11, 1989, the licensee stated that ABB K-Line type K-1600S CBs were used at WBN in the auxiliary diesel generator unit supply board (C-S) but, the licensee stated that equipment was purchased on contract 80K5-825409 and the date of manufacture stamped on the breaker nameplates was June 1982.

Based on a review of applicable licensee documentation, the inspector concluded that the subject deficiency was not applicable to WBN. Item P21 89-01, Brown Boveri K-Line Circuit Breakers Delivered Prior to 1974 Need Rebound Spring Added to Slow Close Lever, is closed.

- i. (Closed) CDR 50-390/88-02, and CDR 50-391/86-49, Failure to Implement G-32 Requirements for Concrete Chipping (re: Grouted Anchor Bolts installed in large holes or chipped out areas)

The licensee initially reported this deficiency to the NRC in accordance with 10 CFR 50.55 (e) for WBN unit 2 on May 8, 1986, as SCR-WBN-6762. The problem came to the licensee's attention as a result of a similar finding at the Bellefonte construction site. The deficiency was later (in the second interim report) determined to apply to WBN, and was reported for WBN unit 1 under NCR-W-434-P.

The basic deficiency involved the fact that since February 1, 1981, Appendix D of TVA Construction Specification G-32, "Bolt Anchors Set in Hardened Concrete," had required the clear distance between existing concrete and the bolt head of a grouted anchor being installed in a hole, or in a slope-sided chipped out area, to be at least three times the bolt diameter for single anchors and six times bolt diameter for multiple anchors. Through an oversight, this requirement of G-32 was not added to the WBN Quality Control Procedure WBN-1.14 until July 31, 1985.

In the first interim report, dated June 6, 1986, the licensee reported that a review of all anchor bolt test data for affected anchor bolts on unit 2 had been completed, and recommended that all unit 2 anchor bolts be accepted in a "use-as-is" condition. Grouted anchor test data at WBN is recorded on Attachment D, "Grouted Anchor Test Data" to procedure WBN-QCP-1.14, "Inspection and Testing of Bolt Anchors Set in Hardened Concrete and Control of Attachments to Embedded Features." Grouted bolt anchors may be tested by either a proof load pull test, or by a torque test. The licensee also reported that the deficiency was being reviewed for applicability to WBN unit 1.

The licensee submitted a second interim report on February 26, 1988. In this report, the licensee added the fact that the G-32 requirements had not been added to M&AI-1, "Modification and Addition Instruction," for unit 1 until January 15, 1985. The applicability of the deficiency was extended to unit 1 under NCR-W-434-P and a commitment made to take corrective actions for unit 1 similar to

those taken for unit 2. This report stated: "Single-grouted anchors with acceptable proof load tests are being dispositioned "use-as-is." For installations utilizing multiple anchors installed with concrete or other cases with no anchor proof load and torque tests, further evaluation will be performed to determine acceptability."

The licensee submitted the final report on August 7, 1989. In the final report, TVA stated that: "TVA has evaluated the affected anchors installed during that time period (i.e., 1981 - 1985) and has determined that they are acceptable for use-as-is. As such, the subject condition would not have adversely affected the safety of the plant. No further action is required. Consequently, TVA no longer considers 10 CFR 50.55 (e) applicable to this item."

The inspector reviewed the subject deficiency, the licensee's responses, and most of the voluminous TVA internal correspondence and documentation associated with this deficiency. The closure package for this issue was provided to the inspector in five folders. Much of the documentation (e.g., internal TVA memorandums) required to evaluate this issue was duplicated several times in the folders, while other important documentation (e.g., proof load test results) was missing. The following problems were noted by the inspector, and communicated to the licensee for resolution:

- In a memorandum (SL 26 C-K) dated October 6, 1986, the Project Engineer stated that, "The Division of Nuclear Engineering (DNE) will review the basis for the installation procedures added to TVA General Construction Specification G-32 in 1981 and determine if the actual installation procedures are compatible with this basis." The results of this review were not specifically provided in the closure package, and the inspector found only one mention (in an April 27, 1989 memorandum) that the three bolt diameter clearance was based on engineering judgment. The plan to conduct this review was also set forth in the February 5, 1988 draft of the final report, but neither the plan to perform the review nor the results of such a review appeared in the version of the final report submitted to NRC on August 7, 1989.
- Watts Bar Engineering Project memorandum (ET SLE 26P-K) dated April 27, 1989, stated that "Nuclear Construction (NC) installation methods assured that a gap of at least 3/4 inch to 1 inch existed between the bolt head and the excavated concrete. This assured the maximum stress not being applied at the interface between the existing and new concrete." The inspector inquired as to which 1981 - 1985 timeframe NC procedure or document contained this guidance. No documentation supporting the existence of this construction guidance was provided in the package for the inspectors review.

- The closure package contained no copies of any of the anchor bolt tests for unit 1 or 2. The second interim report stated: "Single-grouted anchors with acceptable proof load tests are being dispositioned "use-as-is". For installations utilizing multiple anchors installed with concrete or other cases with no anchor proof load and torque tests, further evaluation will be performed to determine acceptability." No discussion or documentation showing how the single-bolt test data from unit 2 was expanded (in the period February 26, 1988 to August 7, 1989) to cover multiple bolt installations at both units was provided in the closure package. The documentation provided contained no discussion of reviews of unit 1 anchor bolt test data, or of the results of testing of multiple bolt installations on unit 1 or 2.
- The closure package documentation provided no information as to following: which type of test (proof load or torque) had been applied to the anchors; whether attachment plates or load bearing devices were used in the test (i.e., the test apparatus configuration); quantification of the number of anchors potentially affected by the problem; how many anchors on each unit have been tested; or any synopsis of test results (e.g., maximum and average residual elongation).

The licensee responded to the inspector's questions, in a timely manner, by performing additional research and providing the following additional information:

- Prior to 1981, the G-32 procedure required grouted anchors to be installed in holes with diameters two to three times the diameter of the anchor bolt. These configurations had been validated by laboratory testing. About 1981, due to rebar interferences, holes had to be chipped larger than the G-32 requirement, and therefore larger than the holes enveloped by the testing program. Appendix D was added to G-32 to require that chipped out holes be deepened or widened to assure at least 3 bolt diameters between existing hardened concrete and replacement concrete or grout. An analytical program showed that providing a clear distance of at least three bolt diameters assures that the ultimate capacity of grouted anchors will not be reduced by close proximity to a potentially weaker old concrete/new concrete failure plane.
- TVA substantiated their position that Nuclear Construction was using a specification in the 1981 - 1985 timeframe which required a 3/4 to 1 inch clearance between anchor bolt heads and excavated concrete. Quality Control Procedure (QCP)-2.02 (series) referred to section 3 of Construction Specification G-34 which required approximately a 1 inch clearance for bolts and bars installed between hardened and replacement concrete.

- Test data for 53 grouted anchor bolts was assembled by TVA and reviewed by the inspector. All anchor bolts underwent satisfactory torque tests which were properly computed and documented. Based on this sample, the inspector concluded that TVA Engineering's "use-as-is" disposition had proper technical justification.

The inspector concluded that the additional information provided by the licensee was sufficient to provide confidence that the extent of the potential problem had been quantified; that earlier construction guidance would assure at least 3/4 inch clearance; that a representative set of multiple bolt installations had been tested; and that current installation guidance has been justified by technical analysis and field testing. These items, CDR-50-390/88-02 and CDR-50-391/86-49, are closed.

- j. (Closed) URI 50-390/88-04-01, Code Compliance of Hydrostatically Examined Welds

This URI was initiated by an NRC inspector's review of the WBN hydrostatic test documentation for piping subassemblies that were fabricated off-site by a vendor, and hydrostatically tested after being installed in the system. The inspection identified one field weld, number FW-15, in the ERCW system which was not accessible for visual inspection during the system hydrostatic test. The subject weld was contained within a box anchor which had already been filled with grout. The licensee had documented the inaccessible weld on NCR 5490, developed an alternative method of testing the weld (hole drilled in grout and a one hour pressure drop test), and upgraded the NCR to "significant." The upgrade to "significant" was construed by the licensee as notification and, by lack of a negative response from NRC, exemption from the ASME Code Section III requirement for direct visual examination of the weld.

Although this URI was opened for a specific weld (1-067C-T300-15), TVA investigated other welding related NCRs which had been upgraded to significant during the period June 1, 1982 to March 13, 1985, to determine if any were upgraded under the same misconception of obtaining ASME Code exceptions. Eight additional cases of the deficiency were identified, and were documented on CAQR WBP 880535.

The inspector reviewed the documentation for the repair of weld 1-067C-T300-15, the hydrostatic test procedures, the N-5 Data Reports, and the dispositioning of the other eight cases of code deviation with the following results:

- Weld 15 was exposed for hydrostatic test visual examination under MR 1067-A060-67-112. Under this MR, the back plate of the box anchor was cut off, the grout surrounding the pipe and subject weld removed (chipped out), the hydrostatic test

satisfactorily completed, the back plate re-installed, and the box anchor re-grouted.

- The hydrostatic test results (hydro 1-067-47W845-3-2-05) were reviewed and found satisfactory.
- A review of the associated ASME N-5 data report for the weld, (last revision dated May 14, 1984), showed that it was never corrected by the licensee to indicate that weld 15 should be excepted until satisfactorily tested. Since the same series of hydro procedure was used for the re-test of the system in May 1990 as was originally used in 1984, the N-5 is now correct.
- The status of the other eight welds identified by TVA in the CAQR was as follows for Revision 5:

Weld No.	Requirement Violated	Corrective Action Planned
0-067J-T178-01	Missing Documentation	Replace Valve & Re-hydro
0-067J-T178-02	Missing Documentation	Replace Valve & Re-hydro
00-067H-T044-06C	Missing Documentation	Documentation Found
1-067B-D217-03	Welder Purge Qual.	Cut Out, Re-weld & Re-hydro
1-070B-D173-05	Welder Purge Qual.	Radiographed for Welder Qual.
1-070B-D177-01	Welder Purge Qual.	Radiographed for Welder Qual.
1-070B-D170-06	Welder Purge Qual.	Radiographed for Welder Qual.
1-070B-D170-03A	Welder Cert. Lapse	No repairs needed

Based upon the review of applicable documentation for weld 1-0 67C-T300-15, and the licensee's planned action under the CAQR for the remaining welds, this unresolved item is closed.

- k. (Closed) URI 50-390/89-05-01, Drawing Confusion (re: 47A056 Series Conduit Support Drawings)

This deficiency was noted in April 1989, by an NRC inspector who attended selected classroom training being conducted for TVA and

contract personnel who were to perform walkdowns for the Corrective Action Program on conduits and conduit supports. Specifically, the inspector observed that notes and aides contained in the 47A056 series conduit support drawings were confusing and open to varying interpretation.

The licensee has revised the subject drawings via DCN P-03095B to clarify notes and details. The sections of the drawings which have been revised are now much easier to understand. The inspector reviewed each of the drawings which was revised, and raised additional questions concerning specific cable loadings for varying sizes of conduit, span, and strut length. Licensee personnel provided a satisfactory explanation for all questions raised. This item is closed.

1. (Closed) CDR 50-390/86-48 and CDR 50-391/86-45, Leakage in Lower Seals of the Essential Raw Cooling Water Clutch (ERCW) Assembly

The licensee initially reported this deficiency to the NRC on April 18, 1986, in accordance with 10 CFR 50.55 (e) as NCR W-377P.

This deficiency was identified by the licensee during a routine maintenance inspection of newly replaced antireverse Formsprag-Warren clutches on the B train ERCW pump motors (E-B, F-B, G-B, and H-B). The lower seals on the clutches were found to be leaking oil into the upper bearing reservoir and splashing oil on the clutch. The grease in the oil could increase the oil viscosity, thereby potentially over-heat the upper bearings. The possibility of common mode failure on all eight ERCW pump motors was the basis for the safety concern.

The licensee submitted an interim report on May 16, 1986. TVA reported the results of meetings with the motor and clutch manufacturers' representatives, wherein they determined that the clutches ordered had improper seals for use in a vertical application. Manufacturers' representatives also indicated that some amount of grease purging by the clutches is normal, and recommended a modification to the oil baffle to prevent purged grease from leaking into the oil reservoir.

The licensee submitted their final report on October 20, 1986. Corrective actions taken or planned included:

- Siemens-Allis had supplied a drawing for the modified oil baffles. TVA issued Field Change request WBEP-5 to install the baffles in each of the ERCW pump motors.
- TVA obtained the proper part number for vertical application seals, and entered the number in the item description of the TVA computer data base (MAMS system).



- New clutch assemblies had been obtained, and a commitment made to install the new clutches and modified oil baffles before unit 1 fuel load.

Since submission of the final report, TVA has completed the modifications to all eight of the ERCW pumps. The inspector reviewed Work Plan (F-WBEP5-2), which was completed on August 23, 1989, to verify that new clutches and modified oil baffles had been installed on each ERCW pump, and that all post work testing had been completed satisfactorily.

Based upon the review of documentation which demonstrates that the commitments made in the final report have been completed, these two items are closed.

- m. (Closed) CDR 50-391/81-15, Auxiliary Power System [re: Inability to achieve required grid voltage from offsite (preferred) power to safety related buses]

The licensee initially reported this deficiency to the NRC on September 25, 1980, in accordance with 10 CFR 50.55 (e) as NCR WBN EEB 8006. Originally, the deficiency was identified for both WBN units as 50-390/81-16 and 50-391/81-15.

The licensee submitted a total of three interim reports, one final report, two revised/supplemental final reports, and a supplementary information letter for this deficiency between September 1980 and December 1983. A summary of corrective actions is provided below:

- The initial modifications consisted of: installing two new common station service transformers (161 KV to 6.9KV), replacing 480 shutdown board current limiting transformers with higher interrupting capability circuit breakers; recabing several 480 volt motors with additional or larger cables; splitting the 480 volt boards and supplying them with additional breakers from the 6.9 KV boards; and reassigning power supplies to some loads within trains.

Ultimately, the splitting of the 480 volt boards with additional feeds from the 6.9 kV boards was reversed. The final design cascades a 1600 section of each board from the 3200 section via a new panel and breaker (12D). The starting sequence time for component cooling water, following an SI was also increased by 8.0 seconds.

Based on a review of corrective actions and documents by an NRC inspector in 1984, the unit 1 deficiency (50-390/81-16) was closed in inspection report 390/84-38. The current inspector could find no documented reason, or explanation from the licensee, as to why the deficiency was not closed for unit 2 at the same time. An administrative oversight is the most obvious cause, since the plant modifications which corrected this deficiency proceeded in parallel.

The inspector reviewed all of the relevant ECNs, FCNs, Technical Specification revisions, FSAR chapters, and plant electrical drawings to verify that the modifications had been completed on both Watts Bar units. The inspector also discussed the matter with the TVA electrical engineer who was responsible for the modifications in the 1981 - 1983 timeframe. This discussion provided further confidence that the modifications were satisfactorily completed. One of the final steps in the corrective actions was to re-route the cascaded supply within the 480 volt shutdown boards via breaker 12D (versus the planned 12B) because it was determined that a Westinghouse DSL-416 breaker in the 12B position could not be seismically qualified. The ECN for the work indicated that the 12B position breakers should be removed and stored in the warehouse. The inspector performed a walkdown of the 480V shutdown panels to verify that this step in the work had been completed. The walkdown revealed that the 12B positions on both unit 2 shutdown boards have spare breakers installed; but on unit 1, the spare is installed on 1B-1B and missing from 1A-1A. The inspector requested that TVA determine why the breaker was missing from 1A-1A, and if the breakers should in fact be removed from all 12B positions (e.g., for a II/I concern).

TVA personnel located and provided a December 1983 report, "Westinghouse Seismic Qualification Report for Selected 480V Low Voltage Metal Enclosed Switchgear Cubicles for TVA Watts Bar Plant," which showed (in section 8.1.1) that the DSL-416 breakers were eventually qualified in both the upper (12B) and lower (12D) positions in the cubicles. Based upon this additional information, this deficiency WBRD-50-391/81-15, is closed for unit 2, and the associated deficiency, WBRD-50-390/81-16 for unit 1 will remain closed.

- n. (Closed) CDR 50-390/85-29 and CDR 50-391/85-28, Defective 480V Westinghouse Switchgear Breakers

The licensee initially reported this deficiency to the NRC on July 25, 1985, in accordance with 10 CFR 50.55 (e) as NCR W-218-P.

The deficiency was discovered by TVA personnel, when on four occasions electrically operated Westinghouse type DS switchgear breakers would rack in, but would not close electrically. Troubleshooting revealed three cases of broken spring release latches and one instance of a broken roller constraining link.

TVA determined, as a result of correspondence with Westinghouse, that the spring release latch breakage was caused by improper heat treatment on three batches produced in 1975 - 1978. The roller constraining link breakage was determined to be random.

TVA submitted a final report on September 9, 1985, in which they listed the other breakers (total of 29) in the plant which could be affected by this problem, and committed to a schedule of mandatory

replacements before fuel load and mode four operation. Westinghouse re-designed the spring release to increase the radii at stress points and to lower the acceptable Rockwell hardness limit.

Because of delays in expected fuel load, TVA was able to receive all re-designed parts and conduct repairs on all affected breakers. All work was completed by March 25, 1986, under MR A-581006.

Based on a review of completed MR packages, and verification by the licensee that all work has been completed, these items are closed.

- o. (Closed) P21 89-19, Potentially Defective Pressure Reducing Sleeves on DRESSER 2" RL Model Pumps

This item involves potential cracking of pressure reducing sleeves because some sleeves were apparently flame hardened throughout the thickness of the material, rather than just being surface hardened. If such sleeves are used in safety related injection pumps, they may fail within an hour of operation, causing high vibration of the pump. DRESSER reported to TVA and to the NRC that such pumps were installed at only one nuclear plant in the U.S. and that none were installed at TVA sites. The Watts Bar Nuclear Experience Review (NER) staff searched their data base to further confirm that the deficiency is not applicable at WBN. This item is closed.

- p. (Open) P21 89-11, Morrison-Knudsen Diesel Generator Starting Air

The item was reported by Morrison-Knudsen Company on September 14, 1989. They reported that the control logic on certain tandem diesel generators would, in the event of a loss of one of the redundant air systems, cause continuous recycling of the remaining air system start sequence. The recycling would prevent the system from performing its safety function of starting the diesel engine. TVA became aware of this problem prior to the Morrison-Knudsen Part 21 notice. The problem is applicable to the original four diesel generator sets at WBN, but the new fifth diesel was delivered in the configuration recommended by Morrison-Knudsen as correct to eliminate the recycling problem.

However, since TVA had tested their first four diesels in the old configuration, they modified the fifth diesel air start logic to conform to the other four thereby introducing the logic problem reported in the Part 21. As of the date of this report, TVA had documented the problem on CAQR 89-376, and were in the process of developing DCN 5840 to correct the problem on all five diesel generators. This item will remain open pending completion of the logic modification on all five WBN diesel generators.

- q. (Closed) P21 88-09, Potential Misalignment of Limitorque 90 Degree Operators (with H-BC gears) on Xomox Tuflin Plug or Butterfly Valves

(Closed) CDR 50-390/87-23 and (Open) CDR 50-391/87-27, Potential Failure of Operator-to-Valve Engagement on Xomox Supplied Valves

In October 1987, Xomox Corporation notified TVA that another licensee had made a 10 CFR 21 notification to the NRC concerning the potential for drive disengagement on the subject Xomox valves. TVA documented the existence of 12 such valves in each unit's ERCW system on CAQR WBP 87-1207 (unit 1) and CAQR WBP 87-0904 (unit 2). TVA also reported the deficiency to the NRC on December 4, 1987, in accordance with 10 CFR 50.55 (e).

Xomox notified all holders of such valves that replacement parts (adapter, key, and spacer) to correct the problem would be provided. TVA submitted an interim report, dated December 29, 1987, and a final report dated December 9, 1988. In the final report, TVA committed to; (1) install replacement parts in the identified deficient valves, and (2) to verify operation of each modified valve.

The inspector verified that as of June 1990, the modification had been completed on all unit 1 valves under WP K-P0158A-1, and that the valves had undergone post modification testing. Modifications had not yet been completed on unit 2 valves. This deficiency was being tracked on three different entries in the NRC open items list. Based on the inspectors findings, the following status applies to this set of deficiencies:

- P21 88-09 is closed
- CDR 50-390/87-23 is closed
- Pending verification that modified adapters have been installed on all unit 2 valves at WBN, item CDR-50-391/87-27 will remain open.

r. (Open) P21 89-12, Failure of Limitorque SMB-000 and SMB-00 Cam-Type Torque Switches with Fiber Spacers

This defect was reported by Limitorque Corporation as the result of two failures in the subject torque switches in valves at Clinton and Fermi. Stationary contact screws on the fiber washer side of the switches loosened and either caused premature contact opening (premature trip) or failure to trip (resulting in locked rotor). TVA identified over 170 installed valves installed in about 10 systems at WBN units 1, 2, and common. The potential defect was assigned CAQR WBP890660 for unit 1 and CAQR WBP890661 for unit 2. TVA added a step to the Limitorque preventive maintenance procedure (performed on an 18 month cycle) to inspect for and remove/replace the subject fiber spacers. TVA set a target completion date of September 28, 1990, to complete the inspections. As of the date of this report, the in-plant inspections have not been completed. The inspector did verify that inspection and removal of the subject switches and valves

from warehouse spare parts has been completed. Pending completion of the in-plant inspection program, this item will remain open.

s. (Closed) URI 391/88-05-02, Accountability of ASME Welds

(Open) URI 390/88-05-02, Accountability of ASME Welds

This deficiency was identified when an NRC inspector reviewed the records for eight ASME Code welds which had been deleted from the unit 1 ERCW system piping. The welds had been deleted when their associated valves were removed in December 1987 and sent to the Sequoyah Plant. The inspector discovered that the "Weld Accountability Program (WAP)" and the ASME Code Data N-5 program did not reflect the deleted status of the eight valves. The reason for the failure to update the records was traced to the fact that the appropriate form (Appendix 1) from procedure AI-9.4.2, "Control of Weld Documentation," had been filled out, but not forwarded to the QA Code Data Unit and the WBN Document Control Section. At the time, Unresolved Items were opened for both WBN units under URI 390/88-05-02 for unit 1 and 391/88-05-02 for unit 2.

In the course of taking corrective actions, TVA realized that the URI was only applicable to WBN unit 1, because the welding records for unit 2 at that time were being controlled by separate Construction Engineering Procedures (CEP-4.03 and CEP-1.40-5). The CAQR (WBQ 880496) written to identify and correct the subject deficiency is applicable to unit 1 only. The inspector verified the accuracy of the above information. URI 391/88-05-02 is closed, but 390/88-05-02 remains open pending the final review and correction of unit 1 deleted weld data by the licensee.

t. (Closed) URI 390/89-03-01, Adequacy and Completeness of Corrective Action Programs (CAPS)

This deficiency was identified when an NRC inspector audited the contents of the licensee's submitted CAPs against issues identified in their nonconforming reporting system (i.e., NCR, SCR, PIR, and CAQRs). The following items appeared to be generic and/or programmatic, but not included in an associated CAP:

- (1) The equipment seismic CAP failed to include and address URI 86-18-05 regarding the installation of approximately 75 valves, shown on drawings 47A054-41 and 47A054-42, which were not installed in accordance with the valves' seismic qualification requirements.
- (2) The cable issues CAP did not include electrical terminations and terminal lugs. A review of nonconforming reports revealed generic problems in that area.

- (3) The instrument line CAP failed to discuss nonconforming conditions regarding minimum instrument line separation on redundant safety-related lines. That item had been identified as nonconforming on auxiliary feedwater lines, and subsequently determined to be generic to other instrument lines.

The Watts Bar Project Team performed CAP revisions, developed CAP matrices, and performed Systematic Evaluations to assess completeness of CAPs and to identify additional programmatic issues. With respect to the three specific issues constituting this URI, the following resolutions were reached:

- (1) The equipment seismic CAP does address the issues identified in URI 86-18-05, concerning the installation of valves under 47A054 series drawings.
- (2) During meetings with the NRC Resident Inspectors, it was concluded that the termination and terminal lug problems were adequately addressed in WBNPP Volume 4, and they need not be added to the Electrical Issues CAP.
- (3) The instrument line separations issue was added to the Instrument Line CAP (see submittal to NRC dated June 27, 1989).

Based upon the above findings, this URI 390/89-03-01 is closed.

- u. (Closed) BU 50-390/88-02, Rapidly Propagating Fatigue Cracks in Steam Generator Tubes

Bulletin 88-02 was issued to all holders of operating licenses or construction permits for Westinghouse reactors with steam generators having carbon steel support plates. The Bulletin required a response by all affected licensees detailing the status of their compliance in the three action areas which are summarized below:

- (A) Review the results of most recent steam generator inspection data for evidence of denting at the uppermost support plate. Implement an enhanced primary to secondary leak rate monitoring program as detailed in action item C.1 in cases where evidence of denting or corrosion were discovered.
- (B) Commitment to review future steam generator inspections for evidence of denting.
- (C.1) Implement an enhanced primary to secondary leak rate monitoring program, and develop administrative procedures for power reduction and shutting down to cold shutdown (based on time dependency, instrument delay times, out of service radiation monitors, and other factors).

- (C.2) Long term corrective actions (e.g., preventive plugging and stabilization of potentially susceptible tubes).
- (C.2.a) Analysis of stability ratios.
- (C.2.b) Analysis for depth of penetration of Anti-Vibration Bars.

TVA responded to the Bulletin in a submittal dated March 31, 1988, which applied to both the Sequoyah and WBN units. The specific response for WBN units was as follows:

- Because the WBN units were projected to start commercial operation after 1990, it was concluded that the recommendations of paragraphs A and C of the subject Bulletin were not applicable to WBN units 1 and 2. Paragraph B was considered applicable (i.e., future inspections) and would be addressed by WBN's existing inservice inspection program.
- TVA further committed to evaluate lessons learned from Sequoyah and other plants to determine future programs (i.e., enhanced monitoring) that would apply to WBN. TVA also committed to provide a description of any necessary programs in a supplemental response by March 1, 1989.

TVA submitted a supplemental report dated March 1, 1989, wherein they stated their intentions to conservatively implement the long term corrective actions discussed in paragraph C.2 of the Bulletin. The three major corrective actions planned were:

- Evaluate eddy current data to determine the penetration depths of anti-vibration bars on the WBN steam generators.
- Use the above data to perform a thermal-hydraulic analysis of the steam generators to identify susceptible tubes.
- Implement long term corrective actions for susceptible tubes such as stabilization, hardware modifications, or operational changes.

In a bulletin close-out letter to TVA dated June 7, 1990, the NRC stated that TVA's actions for WBN were fully responsive to Bulletin 88-02. The letter was based on NRR's review of TVA's earlier March 31, 1988, initial response, rather than on the upgraded response set forth in TVA's March 1, 1989, supplemental report.

TVA submitted a letter to NRR on August 16, 1990, advising the NRC of the following:

- The fact that TVA's March 1, 1989, supplemental response to the bulletin had apparently not been reviewed by NRC prior to issuance of the June 7, 1990, close-out of the bulletin.

- TVA had completed the analysis commitments set forth in their March 1, 1989, supplemental report, had identified one tube in the unit 1 steam generator 1 as being susceptible to fatigue induced cracking, and had completed plugging and installation of a cable damper in that tube as of February 1990.

Discussions with the TVA Steam Generator Group indicate the status of response to the bulletin for WBN unit 2 is as follows:

- The Westinghouse Thermal-Hydraulic code developed for WBN unit 1 will be applicable to unit 2, once the unique internal arrangements for unit 2 steam generators is entered in the code.
- TVA has not yet performed the eddy current testing to determine the anti-vibration bar depths in the unit 2 steam generators.
- No exact timeframe is set for completion of unit 2 response to Bulletin 88-02.

Unit 2 will remain open pending TVA's completion of the additional work discussed above.

v. (Closed) Violations 50-390/85-64-02 and 391/85-53-03, Failure to Submit Written Reports Within Required Time

These violations were identified when inspectors determined that the licensee had failed to submit reports to NRC, in accordance with 10 CFR 50.55 (e) and 10 CFR 2.201 (a), within the specified 30 day timeframe. The violations were based on failures to submit the required reports for eight reportable Construction Deficiency Reports and for two previous violations.

The closure package provided to the inspector for these violations was very complete, even though most of the corrective actions took place two to four years ago. The inspector reviewed the regulatory responses to each of the tardy items identified in the violation and found them complete. A variety of revised and new program improvement memos, procedures, and Nuclear Performance Plan excerpts were also reviewed to ensure that continued emphasis is being placed on the tracking and completion of regulatory correspondence associated with deficiencies and violations. Licensee performance in this area has been satisfactory over the past six months, with only one instance of a required report being late (by two days). Violations 390/85-64-02 and 391/85-53-03 are closed.

w. (Closed) Violations 50-390, 391/89-08-03, Improper Records Vault Storage Conditions

These violations, issued on August 10, 1989, were initiated when an NRC inspector discovered that the onsite Lifetime Records Storage Vault humidity exceeded that specified in TVA procedures. At the



time, Part III, Section 4.1 of the Watts Bar Nuclear Quality Assurance Manual, STD-5.9.80, Revision 0, Quality Assurance Records, and Administrative Instruction, AI-4.1, Revision 19, "Processing and Storing Records," Appendix H, "Care and Handling of Radiographic Film," required that radiographs be stored and handled in an area where the humidity is maintained between 30 and 50 percent, and the temperature maintained between 32 and 75 degrees Fahrenheit. Contrary to procedures, the inspector found that humidity in the vault had constantly been above 50 percent for the period May 14 through July 18, 1989, and that the average humidity during that period had been above 60 percent.

In the initial response to the violations, dated September 13, 1989, the licensee attributed the reason for the violations to the following; (1) the deletion of temperature/humidity monitoring requirements from an April 3, 1989, revision to procedure AI-4.1, and failure to incorporate such a requirement in a new procedure DCRM-I-817.1, "Document Control and Records Management;" (2) a recent organizational change affecting vault management; and (3) a clogged HVAC condensate drain and system imbalance. TVA committed to providing a supplemental response by October 1, 1989.

In the supplemental response, dated October 1, 1989, the licensee provided the following additional information and report of corrective actions taken:

- Confirmation that insufficient communication during the vault management reorganization, and the recent transitions in procedures were the primary causes of the problem.
- Results of a review of the vault management transition did not identify other areas in which requirements were not passed to the new management.
- Discussions were held with DCRM managers to emphasize the need to communicate procedural requirements and responsibilities between managers.
- An item was added to the site preventive maintenance tracking system to perform a weekly verification of the performance of vault monitoring.

The inspector reviewed the procedure revisions and other corrective actions taken by the licensee to alleviate this problem. A review of the past six months temperature and humidity records for the vault showed that humidity levels had frequently exceeded 50 percent (but not 60 percent) for periods of up to five weeks. Further research revealed that the specifications for temperature and humidity listed in the vault logbook were different than those in effect at the time of the violation and the time of the final report. The inspector found

that an instruction change had been issued on November 1, 1989, changing the AI-4.1, Appendix H limits to 30 - 60 percent humidity and 35 to 70 degrees Fahrenheit temperature. A search for the basis for these specifications led to the film manufacturer's storage recommendations. The inspector also noted that the most recent revision (Rev 20) to AI-4.1 had not been entered in either the vault temperature/humidity logbook or the vault copy of the procedure. The licensee took the following actions to satisfactorily close these violations:

- Informed document control personnel of the radiograph film manufacturer's recommendations for storage conditions.
- Entered the latest revision (Rev 20) of AI-4.1 in the vault copy of the procedure and the vault logbook.

Based upon these reviews and findings, and the subsequent corrective actions taken by the licensee during the closure process, these violations, 50-390, 391/89-08-03 are closed.

- x. (Closed) Violations 50-390, 391/87-13-01, Failure to Comply With 10 CFR 50.55 (e)

These violations were issued on February 24, 1988, as a result of an NRC inspector reviewing several 10 CFR 50.55 (e) reports associated with Watts Bar Construction Deficiency Reports (CDRs), and determining that the licensee had failed to include all of the requirements for reporting as specified in 10 CFR 50.55 (e). The inspector concluded that ten sets of CDRs did not provide the description or analysis of the deficiency and the corrective action taken to permit analysis and evaluation of the deficiencies by NRC.

The licensee submitted their initial response to the violation on March 31, 1988. They agreed that 6 of the 10 CDR reports cited in the violation clearly lacked the required information. Five of the six were written to document the fact that TVA had reviewed the deficiencies and no longer considered them to represent a safety concern. The sixth report did not adequately address differences between the interim and final reports. TVA stated that the remaining 4 reports (of 10) did not represent inadequate reports, but rather a miscommunication with the inspector. It appeared to TVA that the inspector interpreted the CDR final reports as notification that the items were ready for review and potential closure; when it was TVA's policy to not request actual closure until necessary corrective actions were complete and verified (The 4 CDRs had not been presented to the Watts Bar NRC Resident Inspectors for closure). TVA reported several corrective actions that had been taken or were in progress. Examples included:

- Revision of Program Management Procedure (PMP) 0600.03 to require approval by the Site Director and the Director of

Licensing and Regulatory Affairs for each 10 CFR 50.55 (e) report.

- Revising site procedure PMP 0600.03, "Evaluation and Reporting of Construction and Design Deficiencies," to establish the content of 10 CFR 50.55 (e) reports.
- Issuance of PMP 0605.01, "Commitment Management and Tracking," to detail the tracking of commitments, actions, and closure packages.
- Plans for additional procedure development and reviews of open CDRs.

The licensee submitted a supplemental report on July 11, 1988, which identified (through TVA's review) 4 additional sets of CDRs with inadequate reports. The report provided a commitment and schedule for making revised final reports for these CDRs.

The inspector reviewed licensee actions on the CDRs which initiated the violation, and found that subsequent reports adequately met the requirements of 10 CFR 50.55 (e). Reports associated with CDRs reviewed for closure in the past two months have been consistent in format and meet the technical content reporting requirements of 10 CFR 50.55 (e). Based on the review of documentation provided, as well as numerous other CDR reports, these violations, 50-390, 391/87-13-01, are closed. Closure of these violations does not imply agreement/approval by the NRC as to the readiness for final closure of the remaining open CDRs which contributed to these violations, but rather provides concurrence that the licensee has taken the appropriate corrective actions to upgrade and formalize the CDR reporting and closure process at Watts Bar. As of the date of this report, the NRC open items list reflects an open status for the following CDRs which contributed to the violations:

- CDR 390/85-43, 391/85-42, regarding questionable compression fittings on instrument tubing
- CDR 390/86-29, regarding discrepancies identified during walkdowns of instrument lines
- CDR 390/86-16, 391/86-34, regarding extreme wear on Westinghouse switchgear breakers
- CDR 390/86-34, regarding questionable qualification of installed type-N Raychem material (Note: This CDR should be closed in IR 90-22.)
- CDR 391/83-31, regarding reactor trip breaker design error

As with all CDRs, the above open CDRs are required to be submitted individually to the NRC Resident's office for closure consideration.

y. (Closed) CDR 50-391/81-47, Pipe Support Mounting Deficiencies

This deficiency was initially reported to the NRC on May 16, 1981, in accordance with 10 CFR 50.55 (e) as NCR WBN 3128R. The basic deficiency consisted of a determination by TVA that; (1) various component cooling water and residual heat removal system hangers had been attached to the shield building when isometrics and load tables specified attachment to the auxiliary building, and (2) hangers representing a single seismic node in the safety injection system had been attached to the auxiliary building in one direction (i.e., X, Y, Z) and to the shield building in another direction. The licensee submitted a series of interim, final, and revised final reports as follows:

June 5, 1981: First Interim Report

August 14, 1981: Second Interim Report

October 6, 1981: Final Report

January 25, 1982: Supplemental Information

July 15, 1982: Additional Supplemental Information

March 31, 1983: Revised Final Report

Licensee corrective actions included:

- Redesign of hangers and revision of drawings
- Review of all piping supports in the vicinity (i.e., auxiliary building to shield building interface) to verify attachment to the proper building
- Modification of improperly located hangers

The subject work for WBN unit 1 was reviewed by the NRC and the associated CDR (390/81-49) closed in inspection report 390/83-05. The licensee's revised final report stated that unit 2 work would be completed by July 1, 1984. The inspector reviewed the contents of ECN 2878, under which the corrective actions were completed, and verified that unit 2 physical work was completed in May 1985, and the ECN formally closed on February 3, 1986. The inspector also reviewed a sample of area hanger drawings to verify that corrections had been made, and reviewed two memos cautioning mechanical supervisors and hanger designers of their responsibilities for care in recognizing this

problem at the auxiliary/shield building interface. This unit 2 CDR 50-391/81-47 is closed.

- z. (Re-open) CDR 50-390/82-103, Venting of High Points in ERCW Systems  
(Open) CDR 50-391/82-97, Venting of High Points in ERCW System

The subject deficiency was initially reported to the NRC on September 30, 1982, in accordance with 10 CFR 50.55 (e) as NCR WBN MEB 8202. The basic deficiency involved the licensee's lack of an analysis to identify points in the ERCW system which may require automatic venting under accident conditions (i.e., to vent air which may come out of solution at elevated temperatures).

The licensee submitted four interim reports, between October 28, 1982 and July 27, 1983. The final report was submitted on September 26, 1983, and summarized the results of an extensive two phase flow analysis for the ERCW system (MEB 83-0829-302) which had been performed by the TVA Engineering Design Department (Water System Development Branch). Based on the report, the licensee concluded that two loops of the ERCW system (Emergency Gas Treatment Room cooler and Upper Containment Ventilation coolers) would be susceptible to transition from bubbly flow to slug flow, with slug flow in the Froude number range which may cause pulsing and vibration in the system.

In the final report, TVA committed to bring the EGTR cooler loop discharge lines within the bubbly flow regime by moving the modulating valves to a point about 13 feet lower. The modifications were to be completed under ECN 4238 by April 2, 1984. The corrective action for the UCV loops was to involve moving the cooler discharge throttle valves from inside containment to a point outside containment and about 85 feet lower in elevation. The UCV modifications were to be made under ECN 4239 for unit 1 and ECN 4240 for unit 2.

Based upon a review of the licensee's final report, discussions with responsible licensee personnel, and observation of work in progress, an NRC inspector closed the subject open item (LII 390/82-103) for unit 1 in inspection report 390/84-25 dated April 24, 1984. Subsequent to closure of the unit 1 open item, the licensee submitted a revised final report dated August 20, 1984, wherein they reported that existing valves in the UCV discharge lines had been identified (outside containment) that could serve as throttling valves, thereby eliminating the need to move the 67-583-A, B, C, D valves. ECNs 4239 and 4240 were revised to show the change in function of the appropriate valves (67-588- A, B, C, D). In the process of identifying these valves (588s) as the new throttle valves, TVA determined that those valves along with eight other valves on the ERCW drawings had been improperly shown as gate valves, when in fact

they were globe valves. Drawings were corrected to indicate both the new functions and the proper valve type.

TVA provided a closure package dated October 12, 1990, to support closure of the unit 2 open item (WBRD-50-391/82-97). The inspector determined that work on the EGTR loop of ERCW had been satisfactorily completed under ECN 4238. A review of the engineering calculations upon which the determination as to degree of slug flow in the various ERCW loops had been made revealed several possible problems including:

- Calculations assumed maximum reservoir water temperature for solubility of nitrogen and oxygen. Use of colder winter temperatures would have been more conservative (as cold water can absorb more gases).
- Calculations assumed cooler outlet temperatures in the range of 45 to 68 degrees Fahrenheit, versus more conservative and realistic values in the 90 to 100 + degree range.
- The basic process of attempting to quantify void fractions and Froude numbers in a complex piping system by hand calculation is difficult and subject to considerable error because of the unique characteristics of individual components (e.g., throttle valves, heat exchanger tube bundles, etc). Such analysis is more accurately performed using empirical data, or computer codes which have been verified with full scale models.

The inspector later discovered that TVA had performed such empirical analysis and documented the results in a December 1983 report entitled "Watts Bar Nuclear Plant Investigations of Cavitation in ERCW Throttling Valves." This study involved the actual measurement of pressures, flows, vibration levels, and sounds of bubble formation and cavitation at most major system throttling valves. The report author made several recommendations based upon observations of actual system operation. The more important recommendations included:

- A recommendation that the emergency diesel generator cooler observations be repeated with the diesels in operation (thus providing a realistic heat load).
- A recommendation that the UCV throttle valves be moved lower.
- A recommendation that EGTR throttle valves be moved lower.
- A recommendation that major valve modifications or a series of throttle valves be used in the ERCW discharge of the CCS system heat exchangers to eliminate the considerable cavitation and vibration observed. The report further stated that some CCS system ERCW pipe supports had already been damaged and repaired,

fasteners retorqued, and snubbers removed to prevent damage from vibrations.

The recommendations in the December 1983 report for the UCV and EGTR cooler discharge lines agreed with the findings in the calculation based analysis. Corrective action in the form of moving EGTR valves and re-designating the UCV throttle valves had been completed. However, the inspector could find no evidence that the licensee has acted upon the other two recommendations for the diesels and for the CCS system.

The inspector performed a walkdown of portions of the ERCW system and found that the 12 valves in the UCV return line (67-587/588/589 A, B, C, D), which the licensee had believed to be globe valves, were in fact Xomox Tufline plug valves. Plug valves are not typically used as throttle valves, as is intended for valves 67-588 A, B, C, D. The inspector also noted a potential hanger deficiency, in that the tube steel on the line C hanger is much thinner (1/8 in) than that on the other three ERCW return lines for UCV.

The inspector obtained a copy of procedure TVA-18C (RT) Revision 0, "Essential Raw Cooling Water - Flow Balance," which was approved for use on May 17, 1990. A review of this procedure revealed, on Data Sheet 5.1, that the designated throttle valves for the UCV portion of ERCW were the 67-583 series valves (contrary to the ECNs included in the closure package which redesignated the 67-588 series valves as the throttle valves).

Based on the numerous problems and discrepancies described above, item CDR 50-391/82-97 will remain open for unit 2, and the previous CDR 50-390/82-103 will be re-opened to track licensee action in this matter for Watts Bar unit 1.

aa. (Closed) CDR 50-390/86-09, Incorrect Tubing Configuration on Containment Isolation Valve (CIV) Actuators

(Open) CDR 50-391/86-08, Incorrect Tubing Configuration on Containment Isolation Valve (CIV) Actuators

This deficiency was originally reported to the NRC on December 10, 1985, in accordance with 10 CFR 50.55 (e) as SCRs WBN MEB 8546, MEB 8550, and MEB 6328. The deficiency was discovered by TVA when two containment isolation valves in the ventilation system (2-FCV-30-10 and 2-FCV-30-40) failed to meet their FSAR closing time specification. The causes of slow operation were determined to be:

- Valve 2-FCV-30-10 exhaust airline tubed to solenoid
- Valve 2-FCV-30-40 exhaust line of excessive length

Investigation of the problem also revealed that all system 30 valves (except 2-FCV-30-10) had speed control valves installed in the quick exhaust valves (speed control valves should only be installed in the supply air line).

The licensee submitted an interim report dated January 16, 1986, wherein they committed to re-route the exhaust line and add a quick exhaust valve to 2-FCV-30-10, shorten the exhaust line on 2-FCV-30-40, remove the speed control valves from other system 30 valve exhaust ports, re-test all valves, and revise the applicable system drawings.

A second interim report, submitted on February 28, 1986, contained the following determinations for the cause of the deficiency:

- Insufficient tubing configuration details on some vendor drawings (mostly Posi-Seal) to support field assembly/reassembly of air operator supply and exhaust lines.
- Insufficient schematic details to reflect the installation of a quick exhaust valve on single and double cylinder air operators.
- Failure to require accurate vendor drawings for source inspection and release for shipment.
- Failure of TVA Office of Construction to request Engineering clarification to design requirements prior to initiating work activities.

Corrective action commitments included drawing and specification revisions, valve modifications, and re-training of instrument engineers.

The final report was submitted on April 9, 1986, and contained essentially no new information beyond that supplied in the second interim report.

The inspector reviewed all of the revised procedures, drawings, and training plans associated with correction of this deficiency and noted no problems. The licensee performed a review of procurement and warehouse records to ensure that the deficiency would not re-appear later in plant life. A review of Workplan E6209-1, which controlled the physical modifications to the unit 1 containment isolation valve operators, revealed no problems. Test data for valve timing tests shows that all unit 1 valves operate within their specified range.



The following modifications are outstanding for unit 2:

- There was no indication in the completed workplan that the exhaust line on the 2-FCV-30-10 valve had been re-routed to bypass the solenoid valve.
- There was no indication in the workplan that a quick exhaust valve had been installed on valve 2-FCV-30-10.
- There was no indication that the exhaust line tubing on valve 2-FCV-30-40 had been shortened.

This item, CDR 50-390/86-09, is closed for unit 1. The associated item, CDR 50-391/86-08, remains open for unit 2.

- bb. (Open) IFI 390/86-01-01, Three Hour Protected Raceways Supported by Unprotected Steel

In a final report, the licensee identified the following deficiency:

- When a conduit or cable tray is wrapped with Thermal Science Incorporated (TSI) fire barrier material, the raceway supports should be wrapped a distance of at least 18 inches measured from the outer surface of the wrap around the raceway. Two conduit supports in the Additional Equipment Building are not wrapped per this recommendation.

Corrective actions taken by the licensee consisted of the following:

- The two conduit supports identified in the IFI were wrapped under Significant Condition Report (SCR) WBN MEB 8643.

A walkdown of the area in question by the inspector revealed these supports were not wrapped in accordance with the TSI technical recommendations specifying the 18 inch minimum criteria. The supports were wrapped to the junction of the support with the support beam only which was approximately nine inches.

Based on the inspectors findings, the licensee initiated Conditions Adverse to Quality Report (CAQR) No. WBP900455 identifying these two raceway supports as not meeting the eighteen inch minimum requirement. Workplan M5791-9 addressing breaching and resealing of electrical fire stops, cable coatings, pressure seals, and water seals will be used by the licensee for the rework of the affected supports. At the time of this inspection, rework of the supports had not been completed, therefore, this item remains open pending NRC review of corrective action completion by the licensee.

- cc. (Closed) URI 390/89-03-03, Adequacy of Pipe Supports

During an inspection conducted February 1 through March 31, 1989, NRC inspectors questioned the adhesion of plastic grout material used in the repairs of concrete under the support baseplate for pipe support

74-1RHR-R75. The material under the support baseplate had a hollow sound when lightly tapped by the inspector.

It was later discovered by the licensee that some of the anchor bolts for this support were anchored in the plastic cement mortar repair area. Based on this discovery, the support was removed as part of the snubber reduction program under CAQR WBP 890101.

During review of this item, the inspector reviewed the following chronology of events:

- April 15, 1982, Nonconforming Condition Report (NCR) 3791R R1 was written documenting the discovery of several patches of plastic cement mortar around hangers and threaded rods in the auxiliary building and reactor building having been found to have cracks and hollow sounds.

A sampling of expansion anchored supports was performed to determine the frequency of occurrences of expansion anchors expanded in patches and the percentage of supports that would not carry their design loading because of installation in patches. 300 supports in the plant were inspected for evidence of patching and 12 were determined to be installed in patches. The results of the sampling showed less than four percent of the anchors were expanded in patches and less than one percent would not support their maximum design loading. The licensee concluded this sampling program proved the adequacy of their installation procedures and there were no longer safety concerns with this item.

- July 13, 1982, Memorandum from J. C. Standifier, Sequoyah and Watts Bar Design Project Manager, to G. Wadewitz, Project Manager, Watts Bar Nuclear Plant addressed NCR 3791R R1. In this, hollow sounding or cracked plastic cement mortar patches were determined to not be nonconforming conditions unless anchors are anchored or expanded in the patch material.

Additionally, all anchors that are anchored or expanded in plastic cement mortar repair material must be tested per G-32 specifications. This requires that if two or more anchors are in one patch, they must be tested individually and then simultaneously. If this is not possible or impracticable then the anchors have to be replaced with anchors reaching the required distance into sound concrete. Those anchors that fail must be reset in sound concrete behind the patch material. For the anchors that test adequately, it can be assumed that sufficient bond has developed between the patch and concrete, and the anchors may be used "as-is."

This memorandum closes with stating that discontinuing the use of plastic mortar cement is not necessary; and the disposition

of the NCR with specifications contained in G-32 would be sufficient to cover this type of repair.

- April 6, 1989, CAQR WBP 890182 was issued that documented violation of TVA General Construction Specification G-34 Section 3.1.1. This requires the removal of all defective, porous, contaminated, or deteriorated concrete. This requirement additionally explains that often the full extent and type of repair required cannot be determined until the concrete has been removed. Once loose concrete has been removed, sounding with a metal rod will be done in order to locate dull or hollow sounding areas; which will be further removed until sound concrete is obtained. The CAQR indicates plastic cement mortar patches are not bonding as they should to existing concrete, and some patches were showing signs of cracking and sound hollow with age.

Evaluation of this CAQR by the licensee revealed the above requirement was not violated because it is not applicable to this condition. Additionally, this condition had previously been reviewed and dispositioned for NCR 3791 R1 and had been found acceptable. Evaluation on the CAQR indicated that the QA programmatic deficiency was determined to not be valid explaining "...this CAQR is being issued to document deteriorating plastic cement mortar patches. G-34 gives guidelines for the repair of these areas. However, because there are not specific bonding requirements for these patches, a procedural failure does not exist." This CAQR was invalidated on May 31, 1989.

- April 11, 1990, CAQR WBP 890101 was initiated on pipe support 1-HGR-074-1RHR-R75. This was initiated after submission of the inspection report identifying the hanger as noted above. The requirement violated states "expansion shell anchors shall be completely embedded into structural concrete with a maximum size aggregate equal to or greater than 3/8 inch," identified in CPI-8.1.8-G-100 (MAI-1) Section 5.4.2.

Corrective action was to satisfactorily complete a pull test on all four anchors to 5400 pounds under Maintenance Request (MR) No. A-607599. Continued use of the hanger was allowed based on the satisfactory pull test.

- DCN P-05704A removed hanger 074-1RHR-R75 under the TVA snubber reduction program.

The inspector examined the area of repair where pipe support 74-1RHR-R75 had been located and found the area of repair to be free of cracks and solid sounding when tapped.

Four areas of plastic cement mortar repair completed within the last year were chosen at random by the licensee and evaluated by the inspector. Locations and remarks were as follows:

- (1) D/G 1A-A Room Diesel after end upper wall. Pipe support. Two anchors in the repair area with modified bolts in these areas. Solid sounding, no cracks seen.
- (2) Twelve feet west of C-10 at Q9 elevation 708'. Conduit floor penetration, containing conduits 3N669 and 3N668. Cracks and possible slight hollow sound.
- (3) Southside U-line wall; 1 feet 6 inches east of A3 elevation 732. Large support. Of the six anchors, three were in the repair area. Slightly hollow sound.
- (4) Number 4 accumulator room, center column, elevation 721 az. 305 inches. Pipe support on a concrete beam. Two of the four anchors were in the repair area. The repair area consisted of most all of the beam corner on the right hand side of the support. Repair area appeared deep.

A further detailed evaluation of two of the above supports was completed utilizing past workplans to determine the extent of repair and ascertain the measure of compliance with applicable procedures and standards in effect. Although records were difficult to retrieve by the licensee and at times required specific personnel working on the job to explain them, the inspector observed that repairs performed were conducted in accordance with proper procedures and met all applicable specifications.

The anchoring of 074-1RHR-R75 into the repair area without documented pull tests was felt by the inspector to be an isolated event and concluded that although previously authorized by the licensee, anchoring bolts in plastic cement mortar was not a common practice and specifications currently in place for repair of cement and knowledge of qualified quality control personnel will prevent this from occurring.

The inspector has concluded through walkdowns of selected areas, review of plant historic records and interviews with cognizant plant personnel all corrective actions in connection with this item have been adequately addressed. Unresolved Item 390/89-03-03, Adequacy of Pipe Supports, is closed.

- dd. (Closed) CDR 390/85-48, 391/85-47, Inadequate Overcurrent Protection for Cables

In a final report dated November 14, 1985, the licensee identified the following deficiency:

- When a safety injection (SI) signal occurs, some motor operated valve (MOV) overload relays are electrically by-passed. Design study, DS0684E2, took credit for use of these overload heaters as a means of protecting the MOV's power cable, but the study failed to consider the effect of an SI signal.
- DS0684E2 had identified 480V and 6900V class 1E cables whose protective schemes were required to have thermal overload heaters in order to prevent the cable insulation rating from being exceeded during an overload of faulted condition. However, neither the development procedures for the design study, nor the results of DS0684E2 considered or required the examination of the control circuitry where the overload heaters are bypassed during an SI, thereby resulting in the aforementioned deficiency. In these instances, the fault current is greater than the cable's ampacity rating but less than the branch circuit breaker's current rating. This could result in the cable's insulation being damaged and in turn could damage adjacent cable leads. Damage to adjacent cable(s) could adversely affect plant safety as other safety-related equipment could be prevented from operating.

Corrective action initiated by the licensee:

- Time-current curves of all circuits whose overload heaters are bypassed during an SI were reviewed to determine if the cable insulation rating would be exceeded if an overload occurred while the MOV was in the bypass mode.
- Three instances in each unit were identified where the bypassed overload relays of an MOV leave the MOV's cable unprotected in the event of an overcurrent condition. These MOV's have had their circuit breakers replaced with thermal-magnetic breakers sized to provide the required cable protection detailed under ECN 5912 for unit 1, and ECN 5913 for unit 2. The six cables identified, location, conductor size, and breaker size replaced were located at the 480V MOV Boards and are as follows:

<u>MOV Board Identification</u>	<u>Cable No.</u>	<u>Cable Size</u>	<u>Breaker Size</u>
1A1-A	1V1920A	#10	EF3-B040
1B1-B	1V2343B	#12	EF3-B020
1B1-B	1V1900B	#10	EF3-B040
2A1-A	2V1920A	#10	EF3-B040
2B1-B	2V2342B	#12	EF3-B020
2B1-B	2V1900B	#10	EF3-B040

The inspector reviewed the licensee's corrective action and documentation associated with the deficiency. Actual thermal

trip testing documentation at 300 percent and 1000 percent of rated current was available for unit 1 breakers conducted between August 1986 and October 1986. Unit 2 testing documentation consisted of similar testing data sheets for breakers 2-BKR-213-2B1-B/9B and 2-BKR-213-2B1-B/15A with testing last accomplished in July of 1976 and April of 1976 respectively. Testing data was not available for breaker 2-BKR-2A1-A/14B.

In discussions with licensee personnel, unit 2 MOV Board components (i.e., breakers) will be tested in accordance with MI-57-20, "Periodic Inspection of 480V and 6900V Switchgear Bus and 480V MCC Bus," and MI-57.27, "Initial Testing of Molded Case Circuit Breakers," when the systems and boards are transferred from Construction to Operations. This was verified in AI-6.5, "Procedure for Initial Operation, Testing, and Transfer of Permanent Plant Equipment, Systems, and Features," and will be conducted during the April to May 1991 time frame. This action will ensure accurate and updated records exist for all breakers assuring all protective mechanisms associated with the devices operate properly.

Based on the commitment of satisfactorily testing the subject breakers during turnover of the MOV boards from Construction to Operations in accordance with above listed administrative and maintenance procedures, CDR 390/85-48, 391/85-47, Inadequate Overcurrent Protection for Cables, is closed.

- ee. (Closed) Deviation 390, 391/88-03-02, Failure to Implement Commitments Made in a Violation Response

In inspection report 50-390, 391/86-25, the NRC identified the following discrepancy:

- Procedure OC-QAP-16.1, Revision 8 was ineffectively implemented in that major rework was in process on instrument racks to restore them to compliance with drawings and 10 CFR 50, Appendix B, yet the NCR's were evaluated as non-significant. This was identified as violations 390/86-25-07, 391/86-25-05.

The licensee committed to modify the methodology utilized in determining significance of NCR's through the NCR review cycle; and that these actions would be implemented by the new CAQR program.

A subsequent review of the licensee's CAQR program implementation by the NRC documented in Inspection Report 50-390, 391/88-03 identified the following deviation of the corrective actions to Violations 390/86-25-07, 391/86-25-05:

- The licensee informed the NRC, in a March 6, 1987, response to a NOV issued February 4, 1987, that the new CAQR program would require reevaluation of significance determination after

inspections were performed or after the corrective action had been determined or revised. It was also stated that the new CAQR program would be implemented by March 30, 1987. Contrary to this commitment, the CAQR program had not been implemented at the time of the inspection.

This deviation subsequently closed out violations 390/86-25-07, and 391/86-25-05.

Corrective actions implemented by the licensee:

- At the time of the deviation, TVA felt the intent of the corrective action was met. However, the procedures which implemented the commitment were not accurate. The governing procedures were revised to ensure that the corrective actions were properly implemented.
- Approximately 1,300 NCRs were reviewed by the licensee for appropriate significance determination. Of this group, 101 had corrective action plans added after the significance determination and, in those, no instances were found in which the NCR should be elevated to the significant level based on the addition of corrective action.

The inspector reviewed the following procedures:

AI-2.8.5, Revision 5, "Conditions Adverse to Quality - Corrective Action"

AI-2.8.14, Revision 3, "Corrective Action"

AI-2.8.15, Revision 0, "Corrective Action - WBN"

Audits conducted by the licensee concerning outstanding NCRs were reviewed by the inspector for compliance to significance determination. The licensee had identified three cases where significance determination had not yet been made and corrective actions were adequately being pursued. There were no instances noted by the inspector where improper significance determination was made by the licensee.

Since inception of the CAQR program, procedures and standards, and personnel requirements under this program have been significantly changed. These changes affect the subject deviation and original violation. NRC IR 50-390, 391/90-19 of July 1990, documents in comprehensive detail the changes that have taken place within the CAQR program and results of a thorough inspection effort of this program. Procedures in question have been reviewed under this report and found acceptable for this deviation. However, many other concerns have been identified with these and other procedures administering the corrective action program. Due to these

significant changes and to prevent duplication of issues and inspection efforts, Deviations 390/88-03-02, 391/88-03-02 are closed.

It was determined by the inspector the above procedures adequately address significance determination and adequately address responsible parties for review; and address corrective actions administratively for the CAQR program.

- ff. (Closed) CDR 50-390/86-03, MEB 8543, Unacceptable Appendix R Interaction on Auxiliary Feedwater

In a final report, dated January 22, 1986, the licensee identified the following deficiency:

- Adequate separation of redundant Auxiliary Feedwater (AFW) equipment has not been provided in accordance with 10 CFR 50 Appendix R on auxiliary building elevation 737.0 between columns S-T/A3-A4. This area contains the motor driven AFW pumps steam generator level control valves 1-LCV-3-148, -156, -164, and -171. Unit 1 safe shutdown analysis requires two or more of these normally closed valves to be manually opened to satisfy one possible shutdown path during a fire. This area also contains control circuits for the turbine-driven AFW pumps steam supply line isolation valves which are required for a redundant shutdown path. Interactions between these electrical cables and manually operated valves were not identified during the unit 1 Appendix R safe shutdown analysis.

The following corrective actions were taken by the licensee:

- Cables 1V2623A and 1M1452A (circuitry for turbine driven pumps steam line isolation valves 1-FCV-1-17 and 1-FCV-1-51 respectively) were relocated out of the area.
- Cable 1V2621A was abandoned. Control power for valve 1-FCV-1-17 supplied from alternate route cable 1V2627A.
- Cable 1V2631B was abandoned. Control power for valve 1-FCV-1-18 supplied from alternate route cable 1V2629B.
- Cable 1V1833A was abandoned. Control power for valve 1-FCV-1-15 supplied from alternate route cable 1V1835A.

The corrective actions taken by the licensee at the time were interpreted by the licensee to be satisfactory. However, the above actions were completed prior to issuance of Generic Letter 86-10, "Implementation of Fire Protection Requirements," dated April 24, 1986; which provided guidance and interpretation of certain issues within Appendix R guidelines, which forced the licensee to reevaluate Appendix R issues.



The inspector interviewed plant staff and reviewed records associated with the above item, and it was determined that the overall Appendix R separation actions are being tracked and corrected under CAQR WBP 890392. This CAQR is reportable under 10 CFR 50.55(e) and addresses various Appendix R cables, procedures affecting Appendix R determination, and design reporting procedures. The licensee has cited CAQR WBP 890392 as a specific example of CAQR WBP 870443 and has reported this CAQR as a 10 CFR 50.55(e) item under CDR 390/87-21 and 391/87-25. Item CDR 50-390/86-03, MEB 8543, Unacceptable Appendix R Interaction on Auxiliary Feedwater, is closed.

- gg. (Closed) CDR 50-390/85-32, 50-391/85-31 Welder Recertification Program

On August 23, 1985, the NRC issued a confirmation of action letter concerning inadequate and potentially inaccurate records of welder recertifications at WBN. On September 17, 1985, the CAL was revised on the basis of current events. The CAL was issued when members of the NRC staff conducted a special inspection between July 31 and August 22, 1985, to address employee charges of impropriety in TVA's welder recertification program. This inspection resulted in the issuance of a Notice of Violation that identified that no validation by continuing performance or certification by test were performed. TVA subsequently issued the 10 CFR 50.55(e) report on the subject. TVA submitted a revised final CDR report on September 30, 1987.

The licensee's actions that resolved this issue were reviewed by an NRC team inspection conducted March 5 through April 27, 1990, and documented in Inspection Report 50-390, 391/90-04. The issues were reviewed and closed by the welding team as acceptable in that report. Due to an administrative oversight the associated CDR's were not closed. Based on the previous inspection activities regarding this issue, these CDR's are closed.

- hh. (Open) URI 390, 391/89-08-02, Cable Damage Issues

This is a continuation inspection of cable damage issues discussed in Inspection Report 89-09 with follow-up inspections in 89-11, 89-13, 89-18, 89-20, 90-03, 90-06, 90-12, 90-17, 90-20 and 90-22.

On September 27, 1990, the inspector observed a two member crew performing visual inspections of V-Stub electrical connections. The inspection was being conducted in accordance with MR A667968. The crew was inspecting the connections as part of the Watts Bar cable damage program and was looking for ring cuts associated with the recently installed Raychem Splices. In addition to looking for ring cuts, the crew was verifying the general condition of the splice including cracks, crimps, etc. The cable being inspected was 1-4PL-30-3051A, the power supply for the 1A-A containment spray pump room cooler fan motor. The inspector discussed the inspection with the crew and considered that the work being performed was in accordance with the procedure.

On September 24, 1990, the inspector observed a boroscopic inspection of conduit 1-V3599B. This conduit was suspected of having foreign material inside which the licensee surmised could have caused the cable damage of cable 2PV142B which failed hi-pot testing. The inspector observed the examination of the conduit which did not show any obvious indication of foreign material. However, the conduit did contain residual material used as a fire barrier and material used for damming purposes when the wet hi-pot test was performed. Additionally, there was a small amount of hard material which the licensee was going to evaluate. However, this hard material did not appear to be of a type or quantity to cause the cable damage observed. The licensee is continuing their evaluation of the cable failures and damage that has been noted to date.

This unresolved item remains open.

#### 7. Exit Interview

The inspection scope and findings were summarized on October 19, 1990, with those persons indicated in paragraph one. The inspectors described the areas inspected and discussed in detail the inspection results 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.

<u>Item Number</u>	<u>Status</u>	<u>Description and Reference</u>
391/81-15	Closed	CDR - Auxiliary Power System (Paragraph 6.m)
391/81-47	Closed	CDR - Pipe Support Mounting Deficiencies (Paragraph 6.y)
391/82-97	Open	CDR - Venting High Points in ERCW System (Paragraph 6.z)
390/82-103	Open	CDR - Venting of High Points ERCW Systems (Paragraph 6.z)
390/85-29 391/85-28	Closed	CDR - Defective 480V Westinghouse Switchgear Breakers (Paragraph 6.n)
390/85-32 391/85-31	Closed	CDR - Welder Recertification Program (Paragraph 6.gg)
390/85-48 391/85-47	Closed	CDR - Inadequate Overcurrent Protection for Cables (Paragraph 6.dd)
390/85-64-02 391/85-53-03	Closed	VIO - Failure to Submit Written Reports Within Required Time (Paragraph 6.v)

390/86-BU-02 391/86-BU-02	Closed	BU - Static "0" Ring Differential Pressure Switches (Paragraph 6.e)
390/86-01-01	Open	IFI - Three Hour Protected Raceways Supported by Unprotected Steel (Paragraph 6.bb)
390/86-03	Closed	CDR - Unacceptable Appendix R Interaction on Auxiliary Feedwater (Paragraph 6.ff)
391/86-08	Open	CDR - Incorrect Tubing Configuration on Containment Isolation Valve (CIV) Actuators (Paragraph 6.aa)
390/86-09	Closed	CDR - Incorrect Tubing Configuration on Containment Isolation Valve (CIV) Actuators (Paragraph 6.aa)
390/86-45 391/86-43	Closed	CDR - Deficiencies in Sampling and Control of Concrete (Paragraph 6.d)
390/86-48 391/86-45	Closed	CDR - Leakage in Lower Seals of the Essential Raw Cooling Water Clutch Assembly (Paragraph 6.l)
390/87-09	Closed	CDR - HVAC Duct Weld Deficiencies (Paragraph 6.b)
390/87-13-01 391/87-13-01	Closed	VIO - Failure to Comply with 10 CFR 50.55 (e) (Paragraph 6.x)
390/87-23 391/87-27	Closed Open	CDR - Potential Failure of Operator-to-Valve Engagement on Xomox Supplied Valves (Paragraph 6.q)
390/88-BU-02	Closed	Bulletin - Rapidly Propagating Fatigue Cracks in Steam Generator Tubes (Paragraph 6.u)
390/88-02 391/86-49	Closed	CDR - Failure to Implement G-32 Requirements for Concrete Chipping (Paragraph 6.i)

390/88-03-02 391/88-03-02	Closed	DEV - Failure to Implement Commitments Made in a Violation Response (Paragraph 6. ee)
390/88-04-01	Closed	URI - Code Compliance of Hydrostatically Examined Welds (Paragraph 6. j)
391/88-05-02 390/88-05-02	Closed	URI - Accountability of ASME Welds (Paragraph 6. s)
Part 21 88-09	Closed	Part 21 - Potential Mis-alignment of Limitorque 90 Degree Operators (with H-BC gears) on Xomox Tufline Plug or Butterfly Valves )Paragraph 6. q)
Part 21 89-01	Closed	Part 21 - Brown Boveri K-Line Circuit Breakers Delivered Prior to 1974 Need Rebound Spring Added to Slow Close Lever (Paragraph 6. h)
390/89-03-01	Closed	URI - Adequacy and Completeness of Corrective Action Programs (CAPS) (Paragraph 6. t)
390/89-03-03	Closed	URI - Adequacy of Pipe Supports (Paragraph 6. cc)
390/89-05-01	Closed	URI - Drawing Confusion (Paragraph 6. k)
390/89-08-03 391/89-08-03	Closed	VIO - Improper Records Vault Storage Conditions (Paragraph 6. w)
Part 21 89-11	Open	Part 21 - Morrison-Knudsen Diesel Generator Starting Air (Paragraph 6. p)
Part 21 89-12	Open	Part 21 - Failure of Limitorque SMB-000 and SMB-00 Cam-Type Torque Switches with Fiber Spacers (Paragraph 6. r)
Part 21 89-14	Closed	Part 21 - Foxboro Model N-E11 and N-E13 Pressure Transmitters Containing 10-50 ma Type

		Amplifiers May Experience Current Output Oscillations Due to Workmanship Deficiencies (Paragraph 6.f)
Part 21 89-19	Closed	Part 21 - Potentially Defective Pressure Reducing Sleeves on DRESSER 2" RL Model Pumps (Paragraph 6.o)
390/89-21-01 391/89-21-01	Closed	IFI - Seismic Issues (Paragraph 6.c)
Part 21 90-04	Closed	Part 21 - Rosemont Resistance Bridges Can Exhibit Premature Long Term Degradation Under Certain Combinations of Humidity, Power, and Duration (Paragraph 6.g)
390/90-05-01	Closed	URI - HVAC Duct Weld Deficiencies (Paragraph 6.b)
390/90-22-07	Closed	URI - Box Anchor Rear Plates Fused to Pipe by Welding (Paragraph 6.a)
390/90-22-10	Closed	URI - Tagging Work Activities (Paragraph 4.a)
390/90-24-01	Open	VIO - Failure to Follow Procedures (Paragraph 4.a, 4.b, and 4.c)
390/90-24-02	Open	VIO - Ineffective Corrective Action (Paragraph 2 and 6.a)
390/90-24-03 391/90-24-03	Open	IFI - Adequacy of Labeling (Paragraph 3)
390/90-24-04	Open	URI - Adequacy of the Test Procedure Review Change Process (Paragraph 5)
390/89-08-02	Open	URI - Cable Damage Issues (Paragraph 6 h h.)
390/86-25-07 391/86-25-05	Closed	DEV - Failure to Take Corrective Action (Paragraph 6 ee.)

## 8. List of Acronyms and Initialisms

ABB	ASEA Brown Boveri
AC	Alternating Current
AFW	Auxiliary Feedwater
AI	Administrative Instruction
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
BFN	Browns Ferry Nuclear Plant
BKR	Breaker
BU	Bulletin
CAL	Confirmation of Action Letter
CAQR	Condition Adverse to Quality Report
CATD	Corrective Action Tracking Documents
CB	Circuit Breakers
CCS	Component Cooling System
CDR	Construction Deviation Report
CEB	Civil Engineering Branch
CFR	Code of Federal Regulation
CIV	Containment Isolation Valve
CPI	Construction Process Instructions
CRD	Control Room Design
DCN	Design Change Notice
DCRM	Document Control Records Management
DC	Direct Current
DG	Diesel Generator
DNE	Division of Nuclear Engineering
DNQA	Department of Nuclear Quality Assurance
ECN	Engineering Change Notice
ECP	Employee Concerns Program
EDG	Emergency Diesel Generator
EGTR	Emergency Gas Treatment Room
ERCW	Emergency Raw Cooling Water
FCN	Field Change Notice
FCV	Flow Control Valve
FSAR	Final Safety Analysis Report
GPM	Gallons Per Minute
HVAC	Heating, Ventilating, and Air Conditioning
IFI	Inspector Follow-up Item
IR	Inspection Report
M&AI	Modification & Addition Instructions
MAMS	Mechanical Automated Management System
MEB	Mechanical Engineering Branch
MOV	Motor Operated Valves
NC	Nuclear Construction
NCR	NonConformance Report
NER	Nuclear Experience Review
NQAP	Nuclear Quality Assurance Plan
OE	Office of Engineering
PMP	Program Management Procedure
P21	Title 10 of the Code of Federal Regulations Part 21
QA	Quality Assurance

QCP	Quality Control Procedures
QC	Quality Control
RAP	Radiological Awareness Program
RAR	Records Accountability Program
RHR	Residual Heat Removal
RT	Retest
SCR	Significant Condition Report
SI	Surveillance Instruction
SI	Safety Injection
SN	Sequoyah Nuclear Plant
STD	Standard
TD	Test Director
TSI	Thermal Science Incorporated
TVA	Tennessee Valley Authority
UCV	Upper Containment Ventilation
URI	Unresolved Item
WAP	Welding Accountability Program
WBEP	Watts Bar Engineering Project
WBN	Watts Bar Nuclear Plant
WBNPP	Watts Bar Nuclear Program Plan
WP	Workplan
WR	Work Request
URI	Unresolved Item