TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
5N 157B Lookout Place

AUG 31 1990

WBRD-50-390/86-14
WBRD-50-391/87-18

10 CFR 50.55(e)

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of the Application of)
Tennessee Valley Authority)

Docket Nos. 50-390
50-391

WATTS BAR NUCLEAR PLANT (WBN) UNITS 1 AND 2 - DISCREPANCIES INVOLVING SAFETY-RELATED CONDUIT SUPPORTS - WBRD-50-390/86-14 AND WBRD-50-391/87-18 - FINAL REPORT

The subject deficiency was initially reported to NRC Inspector Steve Weiss on December 9, 1985, in accordance with 10 CFR 50.55(e) as Nonconforming Condition Report (NCR) WBN 6463. NCR W-333-P, which identified additional conduit support deficiencies, was later added to the scope of the identified deficiency. TVA's initial response on this issue was submitted as an interim report on January 29, 1986.

Since that time, the civil/seismic issues at WBN have been subject to considerable review. Discussions between NRC and TVA as recently as August 2, 1990, have served to formalize the results of this review. WBN's corrective action program for safety-related conduit and conduit supports summarizes actions implemented to reconcile this issue.

The enclosed final report for WBRD-50-390/86-14 and WBRD-50-391/87-18, "Discrepancies Involving Safety-Related Conduit Supports," reconciles the issues identified in 1985. It is consistent with the general approach identified in the Conduit and Conduit Support Corrective Action Program (CAP) Plan.

Enclosure 2 documents new commitments made by TVA that have not been previously included with the Conduit and Conduit Support CAP Plan.

If there are any questions, please telephone P. L. Pace at (615) 365-1824.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

E. G. Wallace, Manager
Nuclear Licensing and
Regulatory Affairs

Enclosures
cc: See page 2

IE27
1/1

AUG 31 1990

U.S. Nuclear Regulatory Commission

cc (Enclosures):
Ms. S. C. Black, Deputy Director
Project Directorate II-4
U.S. Nuclear Regulatory Commission
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852

INPO Record Center
1100 Circle 75 Parkway, Suite 1500
Atlanta, Georgia 30339

NRC Resident Inspector
Watts Bar Nuclear Plant
P.O. Box 700
Spring City, Tennessee 37381

Mr. P. S. Tam, Senior Project Manager
U. S. Nuclear Regulatory Commission
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852

Mr. B. A. Wilson, Chief, Project Chief
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Enclosure 1

Watts Bar Nuclear Plant Unit 1
Discrepancies Involving Safety-Related Conduit Supports
WBRD-50-390/86-14
SCR WBN 6463-S
NCR W-333-P
10 CFR 50.55(e)
Final Report

Description of Deficiency

A physical walkdown and reinspection of selected conduit supports was requested by investigators of the Quality Technology Corporation's (QTC) Employee Response Team as the result of specific employee concerns. The inspection, performed on the Auxiliary and Reactor Building conduit and cable trays, revealed several discrepancies involving safety-related supports. Examples of the identified discrepancies include:

- Installed supports which deviate from the issued drawings with no approved field change requests (FCRs) and/or variances.
- Items not tagged with identifying numbers.
- Items documented as different typical support than those installed.
- Supports with miscellaneous problems.
- Supports documented in a computer printout but not located in the plant.
- Items deleted from the construction accountability program computer printout but still used in the plant.

Additionally, Nonconformance Report (NCR) W-333-P was issued identifying six instances where unsupported spans for conduit in the Reactor Building and the Auxiliary Building mechanical equipment room are greater than spans allowed in Note 35 on drawing 47A056-1D R4. The distances by which allowable spans are exceeded range from 1 foot to 6 feet. Also, a conduit identified as being installed by detail A5 of drawing 45N860-5, which calls for the installation of flex conduit, was installed with four feet of rigid and two feet of flex conduit instead of just the flexible conduit specified.

The root causes of these discrepancies are errors and procedure misinterpretations by craft, engineering, and inspection personnel.

Since the initial reporting of these deficiencies, various additional problems associated with conduit and conduit supports have been identified. The issues associated with these condition adverse to quality reports, employee concerns, and vertical slice items are:

- Discrepancies in the design basis.
- All design requirements not enveloped by the original design.
- Installed configuration and design drawings not consistent.
- Discrepancies between installed configuration and inspection documentation.

Safety Implications

Various supports listed have unknown or undocumented structural capacity or factors of safety. Worst-case loadings on supports could result in concrete anchorage failure and subsequent failure of the conduits. Cables within these conduits could be damaged, thus rendering safety-related systems inoperable. These conditions could adversely affect the safe operation of the plant due to the inability of systems, components, or structures to perform their intended design functions.

Corrective Action

The corrective action for NCR W-333-P has been completed. Identified deficiencies were resolved under work plan N-W333P-1 and closed on July 28, 1989, as indicated below:

- 1-1/2" conduit 1PLC 1918B overspan was corrected by adding a support.
- 1-1/2" conduit 1VC 1247B overspan was corrected by adding a support.
- Rigid conduit 1VC 2584A installed instead of flex was corrected by removing the rigid conduit and installing flex.
- 1-1/2" conduit 1VC 1517 and 2" conduit 1VC 1511 overspan was accepted as-is by DCN P-01609-A.
- 1" conduits 1-PM6309/1-PM6310 overspan was accepted as-is by DCN P-01609-A.
- 1" conduit 1PLC 1590 overspan was accepted as-is by Variance E56-107-54 (reference CEB841129877).

The resolutions of the ten conduit and conduit support issues identified above in the "Description of Deficiency" involve a standard methodology to resolve the generic design criteria and design output issues, and a critical evaluation/walkthrough methodology to resolve the identified installation issues (items A, B, and C below).

A. Design criteria was initially updated by Revision 4 to address design basis problems. Resolution of the outstanding design basis discrepancies has included revisions to design criteria with the aid of:

   - Dynamic testing for qualification of cast iron fittings.
   - A study to resolve concerns regarding alternate analyses methods.
   - Walkthroughs to address the question of thermal evaluations on long, straight conduit runs.

B. Update of design output (to envelop design requirements) includes:

   - An Engineering Requirements Specification, ERS-WBN-CEB-008A, has been issued to detail structural requirements for conduit and conduit support installation.
   - Existing typical support drawings have been reviewed to ensure compliance with updated design criteria. These existing typicals were used for the critical evaluation walkthrough which is described later. The existing typicals have been deactivated for new installations.
   - New typicals have been issued in compliance with updated design criteria and used for new support installations.

- Construction, maintenance, and quality assurance procedures have been revised to incorporate the above changes to design output requirements.

C. Resolution of the remaining issues, involving discrepancies and inconsistencies in the installed configurations, were addressed by a critical case evaluation methodology applied to approximately 20 percent of the installed conduit and conduit supports, which are representative of all the conduit in the plant. This will be followed by detailed walkthroughs of the remainder of the plant using the results of this evaluation. The following basic activities make up the critical case evaluation.

- An engineering walkthrough of the limited population of installed conduit and conduit supports has been performed.
- Potential critical cases identified by the walkthrough have been grouped and categorized for further review to determine final critical cases.
- Final critical cases have been evaluated analytically.
- Final critical cases that did not meet the design criteria requirements will be modified. Designs have been issued.

The walkthroughs were implemented in accordance with procedure WP-51 and provide evaluation of:

- Conduit and conduit support location (elevation and sector).
- Conduit and conduit support dimensions.
- Comparison to typical conduit and support configurations.
- Span configurations.
- Locations of concentrated weights.
- Support hardware, i.e., bolt diameter, spacing, and type.
- Comparisons to allowable spans and cantilevers.
- Initial assessment of need to accept or evaluate further.

Based on the above information, potential critical cases were identified, grouped, and reviewed to determine final critical cases. Grouping consideration included:

- Comparison of potential similarity between span configurations.
- Similar supports or support hardware.
- Comparisons to allowables.

Final critical cases were evaluated using the equivalent static analysis method, a 1.2 modal participation factor, and the revised spectra. Those that met design criteria were used to qualify the remaining critical cases in the group. Modifications will be made as necessary to ensure compliance with the design criteria.

Any item requiring modification was removed from the group, and the next worst case was evaluated to qualify the group.

This assessment resulted in the identification of a finite set of attributes. The set includes L-shaped cantilevers, cantilevers with excessive fittings and flex, T-spans, supports with missing members, nonstandard supports, and conduit overspan.

The remainder of the plant conduit and conduit supports will be walked through for the key attributes resulting from the initial critical case evaluation. Cantilevers with excessive fittings and flex will be addressed in a separate program. Each occurrence in Category I structures will be identified and evaluated for replacement or addition of supports or use-as-is.

This walkthrough will review the conduits and supports against the acceptance criteria which is in the form of a checklist. For those attributes not meeting the acceptance criteria, pre-engineered modifications will be identified. Where pre-engineered modifications are not practical, analytical solutions will be sought. When this is not possible, unique modifications will be made.

Several areas of the plant are not covered by this methodology. These include conduit and conduit supports attached to the steel containment vessel, yard structures, and crane structures. Each area will be evaluated by unique analysis of the attached conduit or by bounding analysis.

In addition, items such as loose or missing clamps or bolts, incorrect clamp bolt length, misalignment of unistrut spring nuts, use of slot head screws in clamps, or unapproved B-line hardware are being identified and corrected through a dedicated walkdown effort.

The actions stated above are consistent with the general approach identified in the Conduit and Conduit Support Corrective Action Program Plan.

Recurrence Control

The recurrence control measures for the programmatic deficiencies have been implemented as follows:

The separation of the construction engineering and inspection responsibilities along with the refining of the quality control procedures (QCPs) has inherently corrected these types of deficiencies by more clearly defining installation requirements and inspection criteria. These programmatic changes that have been developed since the information of the QC inspection concept in 1982 allow construction engineering and inspection personnel to more closely monitor and control field work.

ENCLOSURE 2

LIST OF COMMITMENTS
10 CFR 50.55(e) FINAL REPORT
SAFETY-RELATED CONDUIT SUPPORT DISCREPANCIES

1. Those conduit and supports in areas of the plant not covered by this methodology (attached to steel containment vessel, yard structures, and crane structures) will be evaluated by unique analysis or by bounding analysis.

2. Items such as loose or missing clamps or bolts, incorrect clamp bolt length, misalignment of unistrut spring nuts, use of slot head screws in clamps, or unapproved B-line hardware are being identified and corrected through a dedicated walkdown effort.

Actions will be completed for Unit 1 in July 1991.