

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

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AUG 31 1990

WBRD-50-390/89-06
WBRD-50-391/89-06

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 - INADEQUATE QUALIFICATION FOR
CABLE TRAY SUPPORTS AND FITTINGS - WBRD-50-390/89-06 AND WBRD-50-391/89-06 -
FINAL REPORT

The subject deficiency was initially reported to NRC Inspector Joe Brady on
June 22, 1989, in accordance with 10 CFR 50.55(e) as Condition Adverse to
Quality Reports (CAQRs) WBP 880040 and WBP 880041. TVA's initial response on
this issue was submitted as an interim report on July 26, 1989.

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 (CAP) Plan for Cable Trays and Cable Tray Supports summarizes
the actions implemented to reconcile this issue.

The enclosed final report for WBRD-50-390/89-06 and WBRD-50-391/89-06,
"Inadequate Qualification for Cable Tray Supports and Fittings," reconciles
the issues identified in 1989. It is consistent with the general approach
identified in the Cable Tray and Cable Tray Support CAP Plan.

No new commitments are made in this submittal. Actions identified have been
included with the Cable Tray and Cable Tray Support CAP Plan.

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

Very truly yours,

TENNESSEE VALLEY AUTHORITY



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Enclosure
cc: See page 2

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U.S. Nuclear Regulatory Commission

AUG 31 1990

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ENCLOSURE

WATTS BAR NUCLEAR PLANT (WBN) UNITS 1 AND 2
INADEQUATE QUALIFICATION FOR CABLE TRAY SUPPORTS AND FITTINGS
CAQR WBP 880040, CAQR WBP 880041, AND CAQR WBP 880167

FINAL REPORT

Description of Deficiency

Documented qualification for some cable tray fittings, connectors, and supports has not been located. CAQR WBP 880040 addresses Unit 1 deficiencies and CAQR WBP 880041 addresses Unit 2 deficiencies. Also, concerns related to discrepancies between as-built cable tray configurations and design drawings have been identified. This deficiency (as-built configuration versus design drawings), originally documented as CAQR WBP 880167, has been superseded with Revision 5 to WBP 880040. Revision 5 of WBP 880040 now addresses the extent of the condition covered in WBP 880167. Brief descriptions of these deficiencies are as follows:

- a. The design criteria WB-DC-20-21.1 does not mention the dead weight of attachments or cable drops, nor are there calculations that show that actual loads on specific cable tray runs are less than the standard design load.
- b. Cable trays for WBN were qualified by using calculations for Sequoyah Nuclear Plant (SQN). A 5 percent damping ratio should be used in accordance with WB-DC-20-21.1 for safe shutdown earthquake (SSE) instead of 7 percent as used at SQN for an SSE.
- c. The axial seismic load in the cable tray run riser connector between supports was not considered in the cable tray qualification test.
- d. Existence of design criteria for cable tray is indeterminate.
- e. Calculations are not available, nor did the load capacity testing program for cable tray adjustable connectors take into account the interaction between the longitudinal and shear forces.
- f. Calculations nor testing are available for the type of cable tray splices used at WBN. No calculations are available for notches in splice plates.
- g. Nuts on the bolts used to connect the tray support clips and splice do not have full engagement.
- h. As-constructed cable tray locations differ from the design drawings.

Each of the potentially safety-significant deficiencies in CAQR WBP 880040 can be categorized under the three programmatic deficiencies listed in the corrective action program (CAP) plan for cable tray and cable tray supports. These are reproduced below, with the apparent root causes for each programmatic deficiency also given.

- Lack of documented design qualification for cable tray hardware.

This deficiency was caused by:

Inadequate control and documentation of engineering judgment which specified cable tray fittings in unqualified applications.

Engineering did not completely implement the design criteria.

Inadequate interdisciplinary review.

- Installed configurations not complying with design output documents.

This deficiency was caused by the following:

Lack of emphasis on maintaining and controlling documentation of construction-identified field changes necessary for installation of cable trays and supports. This resulted in field changes that were not approved and documented or incorporated into design drawings.

Failure to consider as essential and, accordingly, to require adequate installations and inspection documentation on miscellaneous attributes such as tray covers, fitting bolts, and fitting types.

- Lack of documentation to verify previous reinspections.

This deficiency was caused by failure to prepare and follow a procedure for the walkdowns used to obtain or reverify configuration attributes.

Safety Implications

Investigations resulting from CAQR WBP 880040 have identified deficiencies which could potentially result in failure of safety-related cables during an earthquake. This could adversely affect the safety of the plant.

Corrective Action

Resolution of these issues is being accomplished using an integrated approach to address the entire population of cable trays and cable tray supports.

CAQR WBP 880040 has been included in the scope of Cable Trays and Cable Tray Supports CAP. The CAP addresses trays containing cables required for Unit 1 operation only; however, the corrective actions for the Unit 2 CAQR (WBP 880041) are expected to be similar for Unit 1. The CAP plan consists of the following actions:

For cable tray supports (Seismic Category I):

- The performance of a design basis review and upgrade of documentation.

The design basis review consists of the performance of special evaluations for configurations not enveloped by the original design basis. These configurations include overloaded cable tray spans, attachments to cable tray supports and cable trays (such as conduit), and distribution of cable loads to supports for vertical riser cable tray segments. The special case evaluations are performed by grouping, identifying and analyzing bounding configurations, and modifying supports as required. As part of this process, the technical adequacy of the original design basis is being confirmed.

For cable trays:

- Cable trays are designated as Seismic Category I(L). Cable trays and fitting hardware are being evaluated for integrity to preclude failure of Category I structures, components, and systems.

Seismic Category I(L) evaluation will be performed for WBN cable trays. The review methodology consists of walkthroughs of the cable trays, critical case evaluations, and modifications of outliers. Critical case evaluations will consider such attributes as long spans and vertical drops, long cantilevers, splice plates, horizontal elbows, tees, and crosses with no independent support.

- Development of the complete design basis for cable trays, cable tray fittings and hardware, and cable tray supports is in progress. The design criteria is a functional criteria, and is supported by correlated test data and analysis. It is utilized to qualify all cable trays and associated hardware.

The dynamic input parameters utilize the appropriate response spectra with 7 percent damping for SSE and accident loadings.

- Calculation WCG-WB-CT-00-01.6 (B18 900627 817) has been issued which documents the acceptability of cable tray bolts with nuts having a minimum (66 percent) thread engagement. Subsequent cable tray and cable tray support walkthroughs did not identify any cases of cable tray bolts with nuts having less than 66 percent thread engagement. Therefore, this condition is acceptable as is, and no further action is required.
- Design output consistent with the complete design basis is in the process of being developed.

- Implementing procedures are being revised as appropriate to include installation, quality assurance, and maintenance requirements from design output. Personnel are being trained.
- The deviations in the cable tray location identified in CAQR WBP 880040 (DR-459) do not cause any separation violations with redundant cable trays. Based on previous evaluations of cable tray separation, it is not anticipated that minor deviations in cable tray location will cause a redundant cable tray separation problem. There is also no effect on structural adequacy with cable trays or supports.

Recurrence Controls

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

- a. Lack of documented design qualification for cable tray hardware:

Nuclear Engineering Procedure (NEP)-3.1, "Calculations," has been issued requiring documentation to support engineering judgments.

NEP-3.2, "Design Input," has been issued which addresses revision and maintenance of the Design Basis Document.

Employees have been trained to revised design criteria and NEPs.

Interface review requirements have been strengthened through issuance of the revised NEPs.

- b. Installed configurations not complying with design output documents:

Procedures are in place which allow the plant configuration to be changed only on the basis of Nuclear Engineering (NE) approved drawings. A request must be submitted to and written approval obtained from NE before deviating from previously approved NE output documents.

For construction issues, affected implementing procedures are being revised to add inspection requirements to verify that correct fittings and connectors are installed consistent with design output documents. Personnel will be trained to the requirements of the revised procedures.

- c. Lack of documentation to verify previous inspections:

Procedures are in place for the performance of walkdowns. Administrative Instruction (AI)-1.16 establishes requirements for development of the walkdown procedures. Any request for walkdown by NE must be handled through walkdown procedures.

The actions stated above are consistent with the general approach identified in the Cable Tray and Cable Tray Supports CAP.