

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

USNRC REGION II
ATLANTA, GEORGIA

January 26, 1982 JAN 28 A 9: 09

WBRD-50-390/81-05

Mr. James P. O'Reilly, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region II - Suite 3100
101 Marietta Street
Atlanta, Georgia 30303



Dear Mr. O'Reilly:

WATTS BAR NUCLEAR PLANT UNIT 1 - LOOSE ELECTRICAL TERMINATIONS ON THE DIESEL GENERATOR CONTROL PANELS - WBRD-50-390/81-05 - REVISED FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector R. W. Wright on December 16, 1980 in accordance with 10 CFR 50.55(e) as NCR W-20-P. Our final report was submitted on March 12, 1981.

In our final report TVA made a commitment which required TVA's Division of Construction (CONST) and Division of Nuclear Power (NUC PR) personnel to jointly conduct test 6-99 of Watts Bar Quality Control Procedure 3.6. However, TVA has reevaluated this commitment. Because the test is completely a CONST activity and is performed before the system is transferred from CONST to NUC PR, CONST again will be entirely responsible for the test. The applicable procedures will be re-revised to account for this change by February 26, 1982. Enclosed is our revised final report which reflects this commitment change.

If you have any questions, please get in touch with R. H. Shell at FTS 858-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills
L. M. Mills, Manager
Nuclear Regulation and Safety

Enclosure

cc: Mr. Richard C. DeYoung, Director (Enclosure)
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

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ENCLOSURE

WATTS BAR NUCLEAR PLANT UNIT 1
LOOSE ELECTRICAL TERMINATIONS ON THE DIESEL GENERATOR CONTROL PANELS
WBRD-50-390/81-05
10 CFR 50.55(e)

REVISED FINAL REPORT

Description of the Deficiency

While personnel from the Tennessee Valley Authority's (TVA's) Division of Nuclear Power (NUC PR) were troubleshooting a problem identified during a preoperational test on the diesel generators, wire No. 312 on TBC-186 of diesel generator set 1A-A was found terminated without a screw and held in place with torque seal. Torque seal is an epoxy-type compound used by TVA's Division of Construction (CONST) to mark and secure torqued terminal block terminations. Subsequent inspection of all remaining electrical terminations associated with this diesel generator set and diesel generator set 1B-B identified no additional missing screws in any terminations. However, approximately 135 terminations, both internal and external, were identified with screws exhibiting varying degrees of looseness which would allow some movement of the wiring at the termination.

Safety Implications

Many of the loose terminations were associated with the voltage regulator circuit controls, governor controls, and the visual and audio alarm circuits. These loose terminations, had they remained uncorrected, could have caused erratic operation of the voltage regulator and governor controls or could have given false visual or audio alarms for the associated circuits necessary to monitor operation of the diesel generator units. Since the diesel generator units are essential for the safe shutdown of the plant following a loss of both the main generator and the offsite (preferred) power system, this condition could have affected adversely the safety of operations of the plant.

As the result of a formal investigation conducted by TVA (see corrective action) and the inspection of the remaining diesel generator sets, TVA does not consider this condition to be of a generic nature. The condition represents a failure to properly implement an existing procedure (QCP 3.5) and is applicable only to Watts Bar Nuclear Plant.

Corrective Action

TVA has taken the following actions to correct the subject deficiency:

1. The screw identified as missing on diesel generator set 1A-A has been replaced.
2. All screws on diesel generator sets 1A-A and 1B-B exhibiting varying degrees of looseness have been tightened.

3. Diesel generator sets 2A-A and 2B-B have been inspected for loose or missing screws and none have been identified.

In an effort to prevent the recurrence of a similar type deficiency, TVA formed a joint CONST/NUC PR investigation committee to investigate the cause of the loose terminations and recommend the necessary actions to prevent recurrence. As a result of their investigation, the following items were identified as factors contributing to the loose terminations.

1. For an extended period, the vendor(s) was on site performing shakedown checkouts that included troubleshooting, repair, modification, and component replacement. While the vendor activity took place under the control or observance of CONST personnel, no formal program to document and check numerous wire lifts was utilized.

It should be noted that CONST recognized in late 1979 that they had no control program for wire lifts, and in March, 1980, a revision to QCP 3.5 was released that established a formal documentation and control program. This revision was interpreted by CONST personnel to be applicable for long term wire lifts and was not utilized for troubleshooting and component replacement work after issue. A review of the wire lift log and jumper log (QCP 3.10) did not indicate any of the loose wires had been covered by either of the two programs.

The vendor activity with no formal control program for wire lifts is the most probable cause for the loose terminations.

2. The fact that a large number of loose electrical terminations were not detected during the punchlist development period before tentative-transfer is significant. The visual inspection of the terminations was not an adequate check to ensure that all system deficiencies were identified and either corrected or added to the transfer punchlist.
3. The large number of problems that CONST and the vendor(s) had experienced during the shakedown phase of the CONST activities delayed the diesel generator completion and transfer to the point of impacting the project critical path. Scheduling pressures to transfer the diesels might have affected the construction engineer's judgment on how to control vendor activities.

This aspect of the cause is of much less significance than the first two but could have been a contributing factor.

The following actions have been implemented in an effort to prevent the recurrence of the above identified events which contributed to the loose terminations:

1. WBNP-CONST revised WBNP-QCP-3.5, section 6.4.20, entitled "Disconnection of Cable for Test Purposes, Circuit Isolation or Safety Considerations" to refer to Procedure WBNP-QCP-3.10. This section was removed and placed in QCP-3.10. The scope of WBNP-QCP-3.10 applies to all temporary wiring conditions instead of only those added. The lift log and procedure contained in QCP-3.5 which covers the lifting and documentation was revised to provide documentation for individual conductors and/or cables which are lifted for troubleshooting purposes for a period of time not to exceed one shift of operation including overtime. A sample documentation form was added for the responsible engineer to list conductors lifted and to document that they were reterminated and the connections tightened. This provides a practical means of documentation for troubleshooting activities performed in support of vendor representatives and/or operational checkout of equipment which has not been recognized previously.
2. WBN-CONST has revised Test 6.99 now included in WBNP-QCP-3.6 to include a checklist which shall be used to inspect all external cable terminations made by TVA and internal equipment wiring terminations made by vendors and/or TVA. This checklist will include termination tightness, proper wiring identification, proper wiring methods, loose or missing parts or damage to equipment and components, etc. At the time of the inspection, construction electrical craft personnel will accompany the CONST engineering personnel making the system or equipment inspection for the purpose of correcting minor deficiencies on the spot such as replacing missing screws, installing missing covers or gaskets, installing missing cable or conduit labels, etc. This revision also specified that after terminations have been inspected for tightness, tamperproof paint will be applied to the screw for a visual indication that the connection had been inspected for tightness and has not been disturbed since the inspection. A similar provision requires the tamperproof paint be applied to junction box, conduit, or other equipment access covers to provide a visible indication that the covers have not been removed since completion of inspection.
3. WBNP-CONST and NUC PR jointly conducted a wire check and developed and issued "as-constructed" electrical drawings for the diesel generator units 1A-A and 1B-B.