



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

LONG-TERM CABLE BEND RADIUS PROGRAM

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT UNIT 1

DOCKET NO. 50-390

1.0 INTRODUCTION

The staff previously reviewed concerns at Watts Bar which were within the scope of the Cable Issues Corrective Action Program. The staff issued safety evaluations as Appendix P, Supplement 7 of the Watts Bar Safety Evaluation Report (NUREG-0847, SSER 7); a publicly available trip report by H. Garg, dated June 3, 1991; and Appendix Y of SSER 9. Section 2.6.5 of the last document requested TVA to submit a program plan to evaluate the age-related effect of lower-bound bending of cables in mild and harsh environments. By letter dated May 8, 1995, TVA submitted a program plan to resolve the long-term effects of a lower cable bend radius other than that recommended by the Insulated Cable Engineers Association.

2.0 EVALUATION

TVA's cable bend radius program plan includes (1) cable condition monitoring to ensure early identification of adverse trends, and (2) cable testing to determine if synergism exists between physical stress and aging. On June 1, 1995, the staff held a conference call with TVA to discuss the details of the program plan. The staff then reviewed a TVA internal trip report (R. C. Williams, "Cable Bend Radius Vendor Trip Report," B43 950728 005, July 28, 1995) documenting TVA's communication with various cable vendors. The trip report included a "white paper" which describes the TVA program in detail.

The Watts Bar cable condition monitoring program is similar to that for Sequoyah, which includes trending for early identification of adverse conditions, and addresses the issues identified in NRC IE Information Notice 86-49, "Age/Environment Induced Electrical Cable Failures." This program is also consistent with accepted industry standards and practices and is, therefore, acceptable to the staff.

With regard to the test program to determine synergism between physical stress and aging, TVA proposed to test low-voltage power cable insulation specimens

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(controlled and stretched with fixed elongation) by subjecting them to accelerated thermal aging, and measuring elongation to identify possible variations in the rate of insulation aging as a function of thermal aging. In the conference call, the staff suggested that TVA use cable specimens bent on a mandrel subjected to 40-year aging, and then applying dielectric testing to confirm operability of the cable. However, TVA elected not to accept the staff's suggestion after discussions with cable vendors who agreed that TVA's program will adequately confirm cable integrity.

Thus, the staff reviewed TVA's approach as documented in the May 8, 1995, submittal and agrees that Watts Bar meets industry standards for cable bend radius for the containment and main steam valve vault areas, which are subject to the worst-case accident environment. TVA has replaced all low- and medium-voltage cables that were bent below the lower-bound bend radius. Thus, all cables which are subjected to higher stress, because of worst-case environment or lower-bend radius, have either been replaced or meet industry standards. Based on this, the staff finds TVA's cable testing program acceptable.

3.0 CONCLUSION

Based on its review of TVA's cable condition monitoring and cable testing program, the staff concludes that TVA's long-term program plan is consistent with industry standards and practices for cable bend radius, and is, therefore, acceptable.

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Dated: December 1995