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SUBJECT: Forwards util position re proposed approach for verifying structural adequacy of cable trays,conduits,HVAC ducting & associated supports.NRC position on encl requested by 910621.

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MAR 13 1991

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

Gentlemen:

In the Matter of the Application of	)	Docket No. 50-438
Tennessee Valley Authority	)	50-439

BELLEFONTE NUCLEAR PLANT (BLN) - TRANSMITTAL OF TVA POSITION REGARDING STRUCTURAL ADEQUACY OF CABLE TRAYS; CONDUITS; HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) DUCTING; AND ASSOCIATED SUPPORTS (TAC #79278)

In accordance with TVA's letter to the NRC staff dated December 4, 1990, enclosed for staff review is the TVA position regarding its proposed approach for verifying the structural adequacy of the BLN distributive systems, i.e., cable trays, conduit, HVAC ducting, and associated supports. TVA requests NRC's acceptance of the criteria and methodology for this verification as described in the enclosed position paper.

A written staff position on the enclosure is requested by June 21, 1991. As discussed with NRC staff and management, timely resolution of key issues such as noted in the enclosure is important to TVA's consideration of the nuclear option at BLN. Should TVA proceed with construction of BLN after staff resolution of this and other positions, the agreements reached will be used to govern design, construction, and operation of BLN and will be incorporated into the BLN Final Safety Analysis Report, as appropriate.

Bruce S. Schofield will contact the BLN project manager to schedule working level meetings to assist in the staff's review of these positions. As discussed in our January 17, 1991 meeting with the staff, the first working level meeting will be scheduled approximately 10 days after staff receipt of this document.

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MAR 13 1991

U.S. Nuclear Regulatory Commission

If you have any questions please contact Mr. Schofield at (205) 574-8058.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

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ENCLOSURE

BELLEFONTE POSITION PAPER

CABLE TRAYS; CONDUIT; HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) DUCTING; AND ASSOCIATED SUPPORTS

TABLE OF CONTENTS

1.0 PURPOSE

This position paper describes TVA's program for reverification of the structural adequacy of Bellefonte Nuclear Plant (BLN) distributive systems, i.e., cable trays; conduit, heating, ventilation, and air conditioning (HVAC) ducting; and associated supports. Part of this seismic reverification will include revision, as needed, of the TVA design criteria and methods for applying those design criteria to distributive systems. TVA requests NRC staff acceptance of the reevaluation criteria set forth in Section 3.2 and the reevaluation methodology described in Sections 3.3 through 3.8.

2.0 SUMMARY AND BACKGROUND

Initial assessments at BLN, including plant walk-throughs by experienced engineers familiar with design of distributive systems at other plants, indicate that the design of distributive systems at BLN has resulted in conservative installations which are generally consistent with Category I structural criteria. The BLN Preliminary Safety Analysis Report (PSAR), in Section 3.2.1, identifies HVAC ducting and cable trays which are seismic Category I. Section 3.10.2 discusses design requirements for Category I conduit. The more detailed design criteria used by TVA in the design of BLN distributive systems have been generally consistent with Category I structural criteria. However, in the case of HVAC ducting, revisions to design criteria and modifications to some installed hardware may be necessary to address open issues or to be consistent with Standard Review Plan (SRP) guidance.

Accordingly, TVA will revaluate the design and installation of safety-related HVAC ducting, cable trays, conduit, and associated supports to provide further assurance that they are structurally adequate to remain functional following a safe shutdown earthquake (SSE). This evaluation will be conducted as follows:

- Existing design criteria and design calculations will be reviewed to identify any issues with regard to the analysis and qualification of distributive systems.
- As a result of this review, reevaluation criteria will be developed. This will include walk-through procedures and criteria for identifying outliers and bounding configurations.
- Walk-throughs will be conducted to identify outliers and bounding configurations.
- Reevaluation criteria will be applied to analysis of the outliers and bounding configurations to verify their structural adequacy.
- Design criteria for distributive systems will be revised, as needed, for future design activities.

3.0 TECHNICAL POSITIONS AND APPROACHES FOR REEVALUATION

The actions which will be taken to provide further assurance that BLN safety-related cable trays, conduits, HVAC ducting, and their supports are structurally adequate are summarized below:

3.1 Identification of Technical Issues

To identify technical issues with respect to the existing design criteria and methods of implementation applicable to BLN, the following reviews will be performed:

3.1.1 Review of Open Items and Applicable Issues at Other TVA Plants

BLN-specific open items, such as CAQs and Employee Concerns, and technical issues identified at other TVA plants relevant to the structural adequacy of cable trays, conduits, HVAC ducting, and their supports, will be reviewed and resolutions will be developed for open items and potential issues affecting the analyses or structural adequacy of safety-related cable trays, conduits, and HVAC ducting at BLN.

3.1.2 Review of Design Criteria

Design criteria for cable tray, conduit, and HVAC ducting in safety-related systems will be reviewed. The reviews will include comparison against regulatory guidance in NUREG-0800 and evaluation of revisions made to similar criteria for safety-related systems at other TVA plants. The particular provisions and editions of the SRP which TVA intends to apply in this review, subject to exceptions noted below are set out in References 2 through 5.

3.1.3 Calculation Review

A representative number of calculations for cable trays, conduit, HVAC ducting, and their supports will be reviewed to verify compliance with the BLN design criteria in use at the time.

3.2 Development of Reevaluation Criteria

The results of the review to identify issues at BLN and actions taken at other TVA plants, and the reviews of safety-related cable tray system, conduit system, and HVAC system structural design criteria will identify any areas of the original design criteria which are considered deficient, as well as areas which are considered to be unrealistically conservative. The results of this review will be used in the development of criteria for reevaluation of selected bounding case configurations from each system. The reevaluation criteria will allow the use of rigorous analyses or tests coupled with the minimum necessary conservatism to realistically assess the structural adequacy of as-built configurations.

Implementing procedures will be applied in a manner that ensures that the following reevaluation criteria will be met:

3.2.1 Supports for safety-related distributive systems shall be shown to meet seismic Category I requirements. Specifically, the allowable stresses for primary load-carrying elements will be 1.6 times American Institution of Steel Construction (AISC) design allowables for combinations of normal operating and SSE loads.

3.2.2 Connections between supports and cable trays for safety-related systems shall be shown to meet seismic Category I criteria. Specifically, the allowable stresses for primary load-carrying elements will be 1.6 times AISC design allowables for combinations of normal operating and SSE loads.

3.2.3 Conduit containing Class 1E cable shall be shown to have margins to failure comparable to that for seismic Category I equipment.

3.2.4 Safety-related cable trays shall be shown to have margins to failure comparable to that for seismic Category I equipment.

3.2.5 Safety-related HVAC duct shall be shown to have margins to failure comparable to that for seismic Category I equipment, including combination of internal pressure and seismic loads.

Elastic and/or inelastic analysis methods, results of tests, and combinations thereof may be utilized for cable trays, conduit, and HVAC ducting to demonstrate structural margins sufficient to assure that the systems will remain intact, and that displacements are limited to acceptable values.

3.3 Development of Critical Parameters and Guidelines For Bounding Configuration Selection

Results of the above reviews and preliminary scoping analyses using the reevaluation criteria will be used in developing (1) a list of critical parameters to be checked and (2) guidelines to select bounding configurations during the walk-through of each Category I system.

3.3.1 Critical Parameters

Measurable limits (e.g., lateral support spacing and axial support spacing) and visual verification criteria based on limits in design criteria (e.g., maximum allowable unsupported span, number of supports on one anchorage base plate or embedment, anchorage type and sizing, and connection details) will be identified as critical parameters. Identification of critical parameters will facilitate screening for as-built configurations that individually require detailed evaluation.

3.3.2 Bounding Configurations

From those configurations that satisfy the critical parameters, selected sets of configurations that are judged to have the lowest seismic margin will be identified as bounding configurations. These will include examples of:

- o Spans and supports at higher elevations,
- o Spans and supports that are most heavily loaded,
- o Fittings, connectors, tees, elbows, wyes, and duct companion angle flanges that are most heavily loaded or introduce the greatest stress intensification,
- o Concentrated loads that are heaviest or span-supported farthest from supports,
- o Concentrated loads that are most off-center, and
- o Anchorages (welded and bolted) that are most heavily loaded.

Unlike the critical parameters, the guidelines for bounding configurations will not be absolute limits, but will depend on the variability of the population. Bounding configurations may include longest unsupported spans, most highly loaded duct companion angle joints, widest rivet spacing in ducts, maximum shear stress, combinations of pressure and seismic loading in ducts and complex geometries. Reevaluation of bounding configurations to demonstrate structural adequacy will also demonstrate structural adequacy of the less limiting configurations in each system.

3.4 Complete System Walk-throughs

Walk-throughs of all safety-related cable tray, conduit, and HVAC systems will be performed by experienced and trained engineers. Detailed criteria and procedures will be developed and used for these walk-throughs. The walk-throughs will:

3.4.1 Check the installed configurations against critical parameters developed in paragraph 3.3.1, above. Configurations that do not meet the critical parameters will be designated "outliers" for subsequent reevaluation.

3.4.2 Select bounding configurations for reevaluation from among configurations that pass the critical parameter screening.

3.4.3 Screen for identified concerns not addressed by the critical parameters (e.g., missing bolts, washers, welds).

3.4.4 Check for seismic vulnerabilities identified in industry earthquake experience and generic seismic test programs.

3.5 Detailed Reevaluation of Outliers and Bounding Configurations

The outliers and bounding configurations identified as a result of the walk-throughs will be reevaluated. The criteria for these reevaluations are described in paragraph 3.2.

Configurations which do not meet the reevaluation criteria will be dispositioned on a case-by-case basis.

In the reevaluation of bounding configurations, if results of the reevaluation of the bounding configurations do not meet acceptance criteria, reevaluation of less limiting bounding configurations will be conducted until reasonable assurance is provided that less limiting configurations are structurally adequate.

3.6 Incorporation of Results of Walk-through/Reevaluation Into Design Criteria for New Installations

If lessons learned during the walk-throughs and reevaluations of the cable tray, conduit, and HVAC systems warrant revisions to the design criteria used for new and replacement installations, the revisions will be completed at this time.

3.7 Resolution of Remaining Open Items

BLN open items that were identified in earlier reviews of safety-related cable tray, conduit, HVAC ducting and their supports and that have not been resolved by the walk-throughs, bounding case reevaluations and design criteria revisions will be resolved.

3.8 Documentation

The reevaluation program, including reevaluation criteria, walk-through results, analyses, and revisions to design criteria, will be formally documented. This documentation will be available for NRC inspection.

4.0 REFERENCES

1. Safety Evaluation of the Bellefonte Nuclear Plant Units 1 and 2, dated May 24, 1974.

2. SRP Section 3.9.2, "Dynamic Testing and Analysis of Systems, Components and Equipment," Revision 2, July 1981.

3. SRP Section 3.7.1, "Seismic Design Parameters," Revision 2, August 1989.

4. SRP Section 3.7.2, "Seismic System Analysis," Revision 2, August 1989.

5. SRP Section 3.7.3, "Seismic Subsystem Analysis," Revision 2, August 1989.