



Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

FEB 28 1991

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

Gentlemen:

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

BELLEFONTE NUCLEAR PLANT (BLN) - TRANSMITTAL OF TVA POSITION REGARDING
SEISMIC INTERACTIONS (TAC #79280)

In accordance with TVA's letter to the NRC staff dated December 4, 1990, enclosed for staff review is the TVA position regarding seismic interactions for BLN. While a written staff position on the enclosure is not requested, TVA would appreciate staff comments on this position by April 28, 1991. As discussed with NRC staff and management, timely resolution of potential issues from your review is important to TVA's consideration of the nuclear option at BLN.

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.

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

Very truly yours,

TENNESSEE VALLEY AUTHORITY

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Enclosure
cc (Enclosure): See page 2

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FEB 28 1991

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Enclosure

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ENCLOSURE

BELLEFONTE POSITION PAPER REGARDING SEISMIC INTERACTION

PURPOSE

This document describes TVA's approach for performing a seismic spatial interaction review prior to the start-up of the Bellefonte Nuclear Plant (BLN). This review will provide reasonable assurance that structures, systems, and components not classified as Seismic Category I will not reduce the functioning of Category I items to an unacceptable level during the safe shutdown earthquake (SSE). TVA provides this description of the seismic spatial interaction review program for the staff's information. While TVA does not request specific staff approval, TVA welcomes any comments the NRC staff might have on the program described herein.

SUMMARY

TVA will perform a seismic spatial interaction review prior to start-up of BLN. The purpose of the review is to identify and resolve interaction hazards to Seismic Category I structures, systems, and components. Plant-specific procedures and review criteria, describing the methodology to be used to identify and evaluate credible and significant interaction hazards, will be developed. As part of the review, walk-throughs will be performed in areas adjacent to and surrounding Seismic Category I structures, systems, and equipment. Experienced, trained engineers will perform the walk-throughs and will disposition potential seismic interaction hazards identified during the walk-throughs in the field as appropriate. Those interaction hazards not dispositioned by engineering judgment in the field will be evaluated and dispositioned on a case-by-case basis. The results of the seismic interaction review will be formally documented.

BACKGROUND

Although there are no specific NRC requirements for performing a seismic spatial interaction review, guidance in this area is provided in Regulatory Guide 1.29 (1). Regulatory Guide 1.29 describes those Seismic Category I structures, systems, and components which are required to be designed to withstand the effects of the safe shutdown earthquake (SSE) and remain functional. Paragraph C.2 of the Regulatory Guide also states that non-Seismic Category I structures, systems, and components, whose failure during an earthquake could reduce the functioning of Category I items to an unacceptable level, be designed so that the SSE would not cause such a reduction in safety function. Seismic spatial interaction, which is the physical interaction of adjacent structures, systems, and components caused by relative motions induced by earthquakes, could jeopardize the continued function of Seismic Category I structures, systems, and components.

With regard to BLN, Section 3.7.2.8 of the Final Safety Analysis Report (FSAR) notes that "Non-Seismic Category I structures with a potential for interaction with Seismic Category I structures are designed to prevent damage to Seismic Category I structures by using . . . analysis techniques . . . or by other methods." Because it is difficult to account for or predict possible seismic

spatial interaction effects during the design phase, a method to verify that adverse seismic spatial interactions do not exist should be implemented after construction is essentially complete. To this end, TVA will perform a seismic spatial interaction review at BLN prior to receipt of an operating license. This approach is consistent with the approach taken at several other nuclear plants (for example, Comanche Peak, Diablo Canyon, and Sequoyah).

TECHNICAL POSITION AND APPROACH

TVA's technical position and approach for performing the seismic interaction review at Bellefonte is as follows:

1. TVA will perform a seismic spatial interaction review consisting of plant walk-throughs and follow-up evaluations to disposition identified seismic spatial interaction hazards. The review will address failures of or relative motions between structures, systems, and components which could lead to a reduction in function of a Seismic Category I structure, system, or component to an unacceptable level. Since there are systems in the plant with significant thermal movements during normal plant operating conditions, thermal displacements will also be included in the scope of the review.
2. Before plant walk-throughs are performed to identify potential seismic spatial interaction hazards, plant-specific seismic spatial interaction procedures and review criteria will be developed. The procedures and review criteria will, in general, be consistent with the interaction criteria used in a Seismic Margins Review (2), and with the criteria developed by the Seismic Qualification Utility Group (3).
 - a. The seismic spatial interaction procedures will define the necessary qualifications of the review team members, the required training for the team members, and the criteria and methods to be used by the review team in evaluating potential seismic interaction hazards.
 - b. The review criteria will include:
 - o Proximity effects (e.g., "shake space" and relative displacements of structures and equipment);
 - o Structural failure and falling (e.g., Non-Seismic Category I over Seismic Category I considerations);
 - o Flexibility of attached distribution lines and cables (including effects of seismic and thermal anchor motions); and
 - o Flooding (or other exposure to fluids) from ruptured vessels, tanks, and piping systems.

The review criteria will also include calculated envelopes of structural displacements for use by the review team members. With these envelopes, the potential for adverse interactions affecting Seismic Category I structures, systems, and components can be evaluated during the walk-throughs.

3. Seismic interaction walk-throughs of areas adjacent to and surrounding Category I structures, systems, and components will be performed by experienced, trained engineers using the procedures and review criteria. Through training or experience, these engineers will be knowledgeable in seismic interaction hazards identified at other plants during past seismic interaction reviews. The review criteria will allow the engineers to exercise engineering judgment to disposition potential hazards in the field as appropriate. For example, impacts between equipment of comparable type and size may be permitted if, in the judgment of the engineers performing the walk-throughs, no unacceptable damage affecting equipment function will result.
4. The structures, systems, and components potentially affected by credible and significant seismic spatial interaction hazards identified during the walk-throughs will be evaluated and dispositioned on a case-by-case basis.
5. The results of the seismic spatial interaction review (including the results of the walk-throughs and follow-up work to disposition hazards identified during the walk-throughs) will be formally documented and maintained in the plant files.

TECHNICAL JUSTIFICATION

TVA plans to develop a BLN-specific seismic spatial interaction review program which is efficient and effective in identifying and dispositioning interaction hazards. This program will utilize realistic criteria (i.e., criteria which are specific to BLN and which are intended to identify credible and significant interaction hazards). The review criteria will be based on extensive surveys of experience in actual earthquakes and will be consistent with the interaction criteria developed for use in the Seismic Margins and USI A-46 programs.

The Seismic Margins interaction criteria are currently scheduled to be included in the methodology which is considered acceptable by the staff for the seismic evaluation portion of the Individual Plant Examination for External Events (IPEEE) (4). Similar experience-based criteria have been successfully demonstrated in pilot reviews of several nuclear power plants.

Experienced, trained engineers will be utilized to perform the walk-throughs to identify seismic interaction hazards in the plant. The use of experienced engineers is considered superior to alternative approaches. Not only will problem which might not have been detected via a checklist be uncovered and fixed, but situations which might not have been foreseen when the checklist was prepared may be discovered and corrected.

In summary, TVA considers the selected approach to the evaluation of seismic interactions will provide better assurance of the design quality and integrity than any feasible alternative.

REFERENCES

1. Regulatory Guide 1.29, Seismic Design Classification, Revision 3, U.S. Nuclear Regulatory Commission, September 1978.

2. NP-6041, A Methodology for Assessment of Nuclear Power Plant Seismic Margin, Electric Power Research Institute, October 1988, Chapter 5 and Appendix I.
3. Generic Implementation Procedure for Seismic Verification of Nuclear Plant Equipment, Revision 2, Seismic Qualification Utility Group, 1990, Section 4.5 and Appendix D.
4. NUREG-1407 (Draft), Procedural and Submittal Guidance for the Individual Plant Examination of External Events for Severe Accident Vulnerabilities, U.S. Nuclear Regulatory Commission, July 1990.