830 Power Building



TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

MAY 2 5 1977

Mr. Norman C. Moseley, Director Office of Inspection and Enforcement U.S. Nuclear Regulatory Commission Region II - Suite 818 230 Peachtree Street, NW. Atlanta, Georgia 30303

Dear Mr. Moseley:

WATTS BAR NUCLEAR PLANT - SEISMIC LOADS FOR REFUELING AND PRIMARY WATER STORAGE TANK PIPE TUNNELS NOT BASED ON SAFETY ANALYSIS REPORT CRITERIA

The subject deficiency was initially reported to NRC-OIE Region II office, Inspector J. C. Bryant, on October 7, 1976, in accordance with 10 CFR 50.55(e). Interim reports were transmitted to your office on November 8, 1976, and February 22, 1977. Enclosed is our final report concerning this deficiency.

Very truly yours,

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J. E. Gilleland Assistant Manager of Power

Enclosure

cc: Dr. Ernst Volgenau, Director (Enclosure) Office of Inspection and Enforcement U.S. Nuclear Regulatory Commission Washington, DC 20555

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FINAL REPORT

Description of the Deficiency

The earthquake loads used in the original design of the reinforced concrete pipe tunnels for the refueling and primary water storage tank pipe tunnels were not based on the seismic criteria for Watts Bar Nuclear Plant. Watts Bar Nuclear Plant was originally intended to be a duplicate of Sequoyah Nuclear Plant, but the seismic criteria was changed during the PSAR review process with NRC. This change resulted in higher earthquake ground motions for Watts Bar Nuclear Plant. The seismic criteria for the pipe tunnels was not changed which resulted in this deficiency. This deficiency was detected during the review process of the design performed within TVA. The construction of the tunnels was halted and an evaluation of the tunnels was begun. The attached outline drawings of the tunnels show the location of the tunnels and the portion of the tunnel which had been constructed.

Safety Implications`

There are two refueling and primary water storage tank pipe tunnels; one for each unit. They contain portions of piping for the ERCW system, the ECCS, and HPFP system. Collapse of any portion of the tunnels could cause loss of flow due to a pinched or broken line in one or more of these systems.

The ERCW system supplies cooling water to various engineered safety features and auxiliary support equipment and also provides the heat sink for long-term shutdown cooling. The ECCS piping supplies borated water from the RWST to the containment spray pumps, residual heat removal pumps, charging pumps, and safety injection pumps during the initial phase of an accident requiring the ECCS. The HPFP system provides the seismically qualified source of auxiliary feedwater to the steam generators.

If subjected to small-to-moderate seismic disturbances, the tunnels would most probably retain their structural integrity. However, if the site experienced a severe seismic event, partial collapse of one or both of the tunnels could occur. If one of the tunnels suffered a partial collapse, ERCW flow for that unit could be lost. However, timely manual realignment to the ERCW system piping in the other unit through the system interconnections could ensure safe shutdown of the affected unit. If a collapse of one tunnel causes the loss of the HPFP piping and the condensate storage tank is not available, the affected unit may not be able to achieve safe shutdown.

If both tunnels suffered sufficient damage to destroy the integrity of the safety-related fluid lines, the following safety functions would be lost:

- 1. Long-term cooling (due to isolation from the Ultimate Heat Sink).
- 2. ECCS injection (due to loss of lines from the RWST).

3. Qualified auxiliary feedwater (due to loss of HPFP lines).

If normal plant systems such as the Condensate and Feedwater Systems are not available or if an accident occurred requiring the ECCS, the plant might be prevented from achieving safe shutdown.

Additional Analyses and Design

A seismic analysis of the tunnels has been performed using the Watts Bar criteria to determine the earthquake soil pressures and structural loads. Also, seismic analyses of the piping in the tunnels have been performed to determine the loads on the tunnels. Based on the above increased seismic loads, a redesign of the tunnels has been performed.

Corrective Action Taken

The following design changes were required due to the revised earthquake loads.

- 1. For the portion of the tunnels which had been constructed, horizontal and vertical structural steel bracing will be used in the tunnel to keep the stresses in the tunnel walls and slabs below the allowable stresses.
- 2. For the portion of the tunnels to be constructed, the base slab was increased from 2 feet thick to 3 feet thick. The tunnel walls and top slab were increased from 1.5 feet thick to 2.0 feet thick.

The revised outline dimensions of the tunnels are shown on the attached drawings (TVA drawings 41N363-1R6 and 41N363-2 R3).

Summary

The effects of the higher seismic criteria on the pipe tunnels at Watts Bar have been determined from additional analyses and design. Revised structural drawings are being issued to implement the required changes and correct the subject design deficiency.

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