ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
POTENTIAL EXCESSIVE WATER HAMMER
FORCES IN THE MAIN FEEDWATER SYSTEM
NCR MEB 79-7
10 CFR 50.55(e)

FINAL REPORT

Description of Deficiency

Westinghouse informed TVA of the potential for excessively high water hammer forces associated with the main feedwater line check valves. This deficiency involves excessively high water hammer forces generated by slamming of the three main feedwater line check valves as a result of a postulated pipe rupture in the other main feedwater line. The water hammer force caused by slamming of the three check valves might be high enough to adversely affect the integrity of those three check valves and hence lead to a multiple steam generator blowdown.

The failure of TVA to evaluate in detail at the design stage the capability of the main feedwater check valves to absorb the water hammer forces associated with a closure of those valves following a postulated break in one leg of the main feedwater system piping resulted in this deficiency.

Safety Implications

If this deficiency had remained uncorrected, a main feedwater line break in the feedwater line to one steam generator would have had no adverse effect on the safety of the plant. A line break could lead either to a single steam generator blowdown or loss of the main feedwater system's ability to supply the four steam generators, dependent on break location. However, these accidents have been analyzed (see FSAR Chapter 15) and the ability of the plant to reach a safe shutdown condition is not adversely affected.

Corrective Actions

TVA has completed a detailed study of the main feedwater check valves installed at Watts Bar Nuclear Plant. Evaluations of the check valves were made using two procedures. The first procedure was a comparison of the energy level that the Watts Bar feedwater check valves are capable of sustaining with the energy levels that similar design check valves used in the main steam system at several other TVA nuclear facilities and at other non-TVA nuclear facilities are

capable of sustaining. The second procedure of the evaluation consisted of analysis of the main feedwater check valve discs by equating the disc strain energy to the disc kinetic energy at closing. A fluid transient analysis of the pipe break/water hammer event was performed to determine the disc kinetic energy at closure. This evaluation shows the closing kinetic energy to be less than the potential strain energy capacity of the disc and a stress slightly above yield at the disc center. This study has shown that the main feedwater check valves at Watts Bar would maintain their integrity and would continue to function as designed following the most severe main feedwater line break postulated. Based on these studies and analyses, TVA is satisfied with the adequacy of the Watts Bar main feedwater check valves to perform their intended function under all expected accident conditions.

Means Taken to Prevent a Recurrence

The analyses of the main feedwater line check valves for all of TVA's future nuclear plants will be documented at the design stage. A verification of the capability of the main feedwater check valves to sustain the water hammer forces resulting from a closure of those valves following a postulated break in one leg of the main feedwater system piping will be made and documented for each of TVA's nuclear plants now under construction.