Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402-2801

O. J. "Ike" Zeringue
Senior Vice President, Nuclear Operations

OCT 2 4 1995

CDR 50-390/95-06 10 CFR 50.55(e)

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

Gentlemen:

In the Matter of the Application of) Docket No. 50-390
Tennessee Valley Authority)

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - CONSTRUCTION DEFICIENCY REPORT (CDR) 50-390/95-06 - MOTOR DRIVEN AUXILIARY FEEDWATER PUMP DISCHARGE PIPING VIBRATION - FINAL REPORT

The purpose of this letter is to provide a final report for the subject deficiency in accordance with 10 CFR 50.55(e). The subject deficiency was initially reported to the NRC Operations Center on September 28, 1995, as Test Deficiency Notice (TDN) 95-0832. The subject deficiency was subsequently upgraded to Significant Corrective Action Report (SCAR) WBSCA950015.

The enclosure to this letter contains a final report for the subject deficiency. No new commitments are made in this letter.

If there are any questions, please telephone P. L. Pace at (423) 365-1824.

Sincerely,

O. J. Zeringue

Enclosure
cc: See page 2

IE27

OCT 2 4 1995

cc (Enclosure):
INPO Record Center
700 Galleria Parkway
Atlanta, Georgia 30339

NRC Resident Inspector
Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, Tennessee 37381

Mr. P. S. Tam, Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852

U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

ENCLOSURE

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
MOTOR DRIVEN AUXILIARY FEEDWATER PUMP DISCHARGE PIPING VIBRATION
SIGNIFICANT CORRECTIVE ACTION REPORT (SCAR) WBSCA950015
CONSTRUCTION DEFICIENCY REPORT (CDR) 50-390/95-06
FINAL REPORT

DESCRIPTION OF DEFICIENCY

Significant check valve chatter and pipe vibration in the discharge piping for both Unit 1 motor driven auxiliary feedwater pumps (MDAFWPs) were observed during hot functional testing at low feedwater flow conditions.

SAFETY IMPLICATIONS

Auxiliary Feedwater (AFW) System performance is essential for mitigation of several of the events which form the licensing basis for WBN. The AFW System consists of two motor driven AFW pumps and one steam driven AFW pump configured into three trains. Each motor driven AFW pump feeds two steam generators. The steam driven AFW pump supplies a common header capable of feeding all steam generators. The AFW System removes Reactor Coolant System (RCS) heat by assuring the required supply of water to the steam generators when the Main Feedwater (MFW) System is not available and the RCS is above the operational pressure and temperature limits of the Residual Heat Removal (RHR) System.

In the event low flow conditions were to exist for an extended period, TVA cannot confirm that the identified piping vibration would not have affected both motor driven AFW pump trains. Assuming a single failure of the turbine driven AFW pump, and conservatively assuming the failure of both motor driven AFW pump trains, AFW may be rendered inoperable and RCS decay heat may not be able to be removed through the steam generators. The ability to mitigate the consequences of design basis events may have been jeopardized.

CAUSE OF THE DEFICIENCY

The cause for the subject deficiency was improper valve application. The original AFW System design followed commonly accepted industry design practice to mount a check valve in the pump discharge piping to prevent backflow when the pumps are idle. Since the interaction between the discharge check valve, pump, and piping was unknown, provisions were made to incorporate testing for excessive vibration during the preoperational testing phase of construction. During preoperational testing at WBN Unit 1, the AFW pump discharge piping exhibited excessive vibration, primarily due to check valve chatter.

The subject discharge check valves see dual duty. High flow through these valves during filling of the steam generators results in no chatter and is the correct application of a swing check valve. However, a low flow condition is achieved when the AFW level control valves close down upon achieving the required steam generator levels. This condition creates a low flow through the check valves while the MDAFWPs are at nominal operating speeds. Rapid check valve chattering (disc impacting seat) occurs which creates pressure pulsations within the pump and discharge piping with subsequent flow induced vibration

in the discharge piping. The flow induced vibration problem for the MDAFWPs is compounded by the discharge pipe routing and support scheme which permits amplification of the flow induced vibrations. The only alternative to TVA's original design approach would have been to perform an extensive computational analysis, which is not always reliable, for all swing check valve applications during the early design phase of WBN Unit 1. TVA decided to rely on preoperational testing to determine problem valve applications.

During implementation of the WBN preoperational testing program, the MDAFWP discharge check valve chatter and excessive piping vibration was the only incident to have occurred where the check valve disc was removed and pipe supports were shimmed to prevent excessive vibration.

CORRECTIVE ACTIONS

Design Change Notice (DCN) M-38209-A was written to permanently remove the valve disc from check valves 1-CKV-003-0820 and 1-CKV-003-0821 to eliminate excessive pump and pipe vibration. Additionally, the DCN required shimming pipe supports 03B-1AFW-R101 and 03B-1AFW-R105. This DCN has been implemented.

NOTE: Safety Assessment WBPLMN-95-138-0, contained in DCN M-38209-A, justified the removal of the check valve discs.