

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

5N 157B Lookout Place

NOV 21 1989

WBRD-50-390/89-09

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 )  
Tennessee Valley Authority )

Docket No. 50-390

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - LIMITORQUE ACTUATOR FAILURE CAUSED BY  
EXCESSIVE KEYWAYS DEPTH - WBRD-50-390/89-09 - FINAL REPORT

The subject deficiency was initially reported to NRC Inspector Ken Barr on  
October 23, 1989, in accordance with 10 CFR 50.55(e) as Condition Adverse to  
Quality Report (CAQR) WBP 890532. Enclosure 1 is our final report. We  
consider 10 CFR Part 21 applicable to this deficiency.

Enclosure 2 identifies commitments contained in this submittal.

If there are any questions, please telephone G. R. Ashley at (615) 365-8527.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

*Ralph H. Shell*

for  
Manager, Nuclear Licensing  
and Regulatory Affairs

Enclosures  
cc: See page 2.

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U.S. Nuclear Regulatory Commission

**NOV 21 1989**

cc (Enclosures):

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ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1  
LIMITORQUE ACTUATOR FAILURE CAUSED  
BY EXCESSIVE KEYWAYS DEPTH  
CAQR WBP 890532  
WBRD-50-390/89-09  
10 CFR 50.55(e)  
FINAL REPORT

DESCRIPTION OF CONDITION

While performing maintenance request (MR) A-569483 on the Limitorque actuator of valve 1-FCV-72-21-B, the motor pinion gear was found to have rotated approximately 1/3 of a revolution on the motor shaft. Upon further inspection, the keyway in the motor pinion gear was found to be cut too deep for the size key installed which allowed the motor pinion gear to rotate on the motor shaft. The failure of this connection would result in a loss of electrical operation of the actuator. Manual operation would still be available. This valve supplies the containment spray header from the refueling water storage tank (RWST).

The depth of the motor pinion gear keyway was measured to be 0.111 to 0.106 inches. Using the 0.125-inch square by 0.875-inch long motor pinion key, only 0.014 to 0.019 inches of key interference remained to prevent the gear from rotating on the motor shaft. This inadequate interference resulted in key failure and subsequent gear rotation. The motor pinion gear's setscrew galled the motor shaft, temporarily preventing further gear rotation.

Additionally, inspection of the actuator on the opposite train component (1-FCV-72-22-A) per MR-A-569117 revealed a similar motor pinion gear keyway depth. This key had not yet failed; however, the key had indentions along its length which indicated impending failure.

The affected actuators are model SB-0, manufactured by Limitorque Corporation, Lynchburg, Virginia, provided to TVA by Westinghouse Corporation, Pittsburgh, Pennsylvania, under the Nuclear Steam Supply System contract (71C62-054114-01).

From the maintenance history review performed on the two actuators, it was determined that the two gears have not been replaced or modified by TVA. From conversations with the supplier of the actuators, it was stated that Westinghouse Corporation had not replaced or modified the gears in question. Based on this, it appears that the actuators were assembled by the manufacturer with the defective motor pinion gears.

Through conversation with the manufacturer, TVA ascertained that industry standard sizes are used for the keys and keyways. According to the Machinery's Handbook, the motor pinion gear keyway depth should have been between 0.074 and 0.084 inches for a 0.625-inch diameter shaft. Additionally, discussion with Limitorque indicates that this problem could affect size 0 or 00 actuators with 41-tooth motor pinion gears.

A visual check of the replacement gears stocked at WBN was performed, and these gears were found to be acceptable.

SAFETY IMPLICATIONS

The affected valves are the isolation valves from the RWST to the containment spray system. Failure of both valves would result in failure of an automatic or remote manual open signal to provide water for containment spray. This could result in failure to mitigate the high containment pressures associated with major line breaks inside containment.

CORRECTIVE ACTION

The defective motor pinion gears and keys for the actuators of 1-FCV-72-21-B and 1-FCV-72-22-A will be replaced using the material currently in stock.

Other size 0 and 00 Limatorque actuators with the 41-tooth motor pinion gear will be inspected for this condition, and the gears replaced if needed.

These corrective actions will be completed before fuel load.

ENCLOSURE 2

LIST OF COMMITMENTS

1. The defective motor pinion gears and keys for the actuators of 1-FCV-72-21-B and 1-FCV-72-22-A will be replaced.
2. Other size 0 and 00 Limitorque actuators with the 41-tooth motor pinion gear will be inspected for this condition, and the gears replaced if needed.

These corrective actions will be completed before fuel load.