

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II 26

August 20, 1985

AG: 23

WBRD-50-390/85-27

WBRD-50-391/85-25

U.S. Nuclear Regulatory Commission
Region II

Attn: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Dear Dr. Grace:

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2 - DAMAGED ESSENTIAL RAW COOLING WATER
PUMP FORMSPRAG ANTIREVERSE ROTATION DEVICE - WBRD-50-390/85-27,
WBRD-50-391/85-25 - FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector
Al Ignatonis on July 15, 1985 in accordance with 10 CFR 50.55(e) as
NCR W-240-P. Enclosed is our final report.

A several-day delay of this submittal was discussed with Inspector
A. Ignatonis on August 19, 1985.

If you have any questions concerning this matter, please get in touch with
R. H. Shell at FTS 858-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. A. Dome

G. W. Hufham, Manager
Licensing and Risk Protection

Enclosure

cc: Mr. James Taylor, Director (Enclosure)
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Records Center (Enclosure)
Institute of Nuclear Power Operations
1100 Circle 75 Parkway, Suite 1500
Atlanta, Georgia 30339

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PDR ADOCK 05000390
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ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
DAMAGED ESSENTIAL RAW COOLING WATER PUMP FORMSPRAG
ANTIREVERSE ROTATION DEVICE
WBRD-50-390/85-27, WBRD-50-391/85-25
NCR W-240-P
10 CFR 50.55(e)
FINAL REPORT

Description of Deficiency

During routine inspection activities, one of the eight essential raw cooling water (ERCW) pumps supplied by Siemens-Allis of Norwood, Ohio, was found to have a damaged Formsprag clutch. On motor C-A, the bolts on the clutch arm and clutch were sheared off, the shaft key had begun to shear, and the rotor shaft was twisted approximately 0.010 inch.

A survey of TVA's Sequoyah (SQN) and Bellefonte Nuclear Plants (BLN), INPO's Nuclear Network System, and the Nuclear Plant Reliability Data Base found no reported antireverse mechanism failures. Although several nonconformance reports (NCRs) (2461R1, W-136-P, W-174-P) had been written on the Watts Bar Nuclear Plant (WBN) ERCW pump antireverse device, all involved failures of the old ramp and pin design which has been superseded by the Formsprag clutch. Furthermore, those were wear-type problems rather than reverse rotation failures, as indicated here.

Safety Implications

Should the antireversing mechanism fail during a loss of offsite power, the ERCW motor could receive a restart signal, after onsite power is available, while the pump is rotating in a reverse direction. This could result in the motor tripping out on overcurrent, in which case the ERCW pump would not be available to perform its safety function, thus adversely affecting the safe operation of the plant.

Corrective Action

The clutch was sent to the vendor for evaluation and their determination was that the clutch exhibited material indications consistent with the expected performance of the clutch (i.e., the clutch apparently engaged to prevent reverse rotation as designed). In addition, no significant manufacturing, installation, or maintenance defects were found.

TVA calculated the yield strength of each of the damaged components (shaft, bolts, and key) to determine the force required to produce the observed damage. These results were compared to the loads expected from all static and dynamic events postulated for the ERCW system. In no case did the calculated system loads exceed the yield strength of the damaged components. TVA corroborated this analysis with a test program conducted on another WBN ERCW pump. No abnormalities of any kind were noted.

TVA also consulted with two independent pump experts to validate the scope of

the test program. Both consultants reviewed and concurred with the scope of the tests.

Therefore, TVA concludes that this was an isolated failure not likely to recur and considers the Formsprag clutch suitable for the application. The failed parts on pump C-A will be replaced by September 20, 1985.

However, in reviewing the clutch design, TVA did find the key fastening the clutch to the motor shaft to be too strong. TVA believes, as a matter of good engineering practice, that the key should have been designed as the weak link in the clutch design to protect the major components (i.e., motor shaft, etc.). Therefore, the key will be redesigned and replaced by March 1, 1986.