

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

1630 Chestnut Street Tower II

June 27, 1985

WBRD-50-390/85-18

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 UNIT 1 - UNDERVOLTAGE CONDITION OF 125V DC VITAL
CONTROL POWER SYSTEM - WBRD-50-390/85-18 - FINAL REPORT

The subject deficiency was initially reported to NRC-JIE Inspector
S. Weise on June 7, 1985 in accordance with 10 CFR 50.55(e) as NCR WPN EEB
8515. Enclosed is our final report.

TVA has determined that this deficiency is applicable to Watts Bar unit 2
and is in the process of issuing a nonconformance report for its
documentation.

If you have any questions, please get in touch with R. H. Shell at
FIS 858-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. W. Hufham
J. 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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ENCLOSURE

WATTS BAR NUCLEAR PLANT UNIT 1
UNDERVOLTAGE CONDITION ON 125V DC VITAL CONTROL POWER SYSTEM
WBRD-50-390/85-18
NCR WBN EEB 8515
10 CFR 50.55(e)
FINAL REPORT

Description of Deficiency

A condition was identified at Watts Bar Nuclear Plant (WBN) unit 1, during a design review, in which some components of the auxiliary feedwater pump turbine (AFPT) control circuit could receive inadequate voltage to ensure their operation. This condition could occur due to a voltage drop in the circuit feeder cable from the 125V dc vital batteries to the affected components. The condition could only occur during a total loss of all ac power when the AFPT control circuit components are to be supplied with power from the 125V vital battery system. The excessive cable voltage drop could cause the vital batteries to discharge at a faster rate than that which is described in the FSAR Section 8.3. (Other components which normally receive power from the 125V DC vital control power system could be affected by this condition. However, their operation/function during a total loss of AC power is not required.)

TVA has determined that this deficiency occurred because the 125V dc vital control power system design was based upon a nominal voltage of 125V dc. However, as described in the WBN FSAR Chapter 8, Section 8.3.2, the system operates through a range of voltages from 105V dc to 145V dc. WBN Design Criteria WB-DC-30-2, "Design Criteria for 125V Vital Battery System," did not define the battery system voltage range. As a result, affected WBN electrical system designers and procurement personnel were unfamiliar with the information. Thus, affected electrical components were not properly specified or purchased at the lower dc voltage limit and cable voltage drop calculations were not performed using the lower dc voltage limit as the source voltage.

Safety Implications

Upon a total loss of all ac power at WBN, both motor-driven auxiliary feedwater (AFW) pumps would be rendered inoperable. The turbine-driven AFW pump would then be required to supply adequate feedwater to the steam generators (SGs) to bring the reactor coolant system (RCS) temperature down and maintain the reactor in a safe condition. This would be required until ac power is restored or until residual heat removal (RHR) system operation is achieved (as described in FSAR section 8.3.2, this is required for 2 hours after the loss of ac power). The subject condition could result in a misoperation of the affected AFPT control circuit components and, subsequently, could adversely affect the operation of the AFPT. This could result in an inadequate supply of feedwater to the SGs and could adversely affect the safe operation of the plant.

Corrective Action

TVA has replaced the normal feeder cable to the AFPT circuit (cable 1SG220A, 1/2C, No. 12) with a larger cable (2/1C, No. 4) to reduce the cable voltage drop. This action will ensure an adequate dc voltage supply to all affected AFPT control circuit components. (There is one affected valve operator motor (1-FCV-1-51/MTR) which had a minimum-rated operating voltage to 112.5V dc. However, the vendor (Limitorque Corp., Lynchburg, VA) has assured TVA that the motor will operate with voltages as low as 100v dc, and has provided a letter of certification to TVA to that effect. Adequate voltage (100 V min) will now be supplied to this motor as a result of the aforementioned cable replacement.) All corrective action was performed under engineering change notice E5696.

To prevent recurrence of this deficiency, TVA has revised WB-DC-30-2 to formally document the voltage range of the vital battery system. All affected design and procurement personnel have been familiarized with this information through the coordinated involvement of the TVA Office of Engineering (OE) electrical, mechanical, and nuclear design branches in the design review analysis of the 125V dc vital power control system.