

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

5N 157B Lookout Place

DEC 11 1989

WBRD-50-390/87-14  
WBRD-50-391/87-15

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 Nos. 50-390  
50-391

WATTS BAR NUCLEAR PLANT (WBN) UNITS 1 AND 2 - CONTAINMENT PURGE AIR BELLOWS  
HAVE NO FIRE RATING OR ENVIRONMENTAL QUALIFICATION - WBRD-50-390/87-14 AND  
WBRD-50-391/87-15 - FINAL REPORT FOR UNIT 1 AND INTERIM REPORT FOR UNIT 2

The subject deficiency was initially reported to NRC Inspector Bob Carroll on  
June 22, 1987, in accordance with 10 CFR 50.55(e) as Significant Condition  
Reports (SCRs) WBP 8777 and WBP 8790. An interim report was provided on  
July 13, 1987. The SCRs have been replaced as Condition Adverse to Quality  
Reports (CAQRs) WBP 870978, WBP 890150, and WBP 890151.

Enclosure 1 contains the final report for Unit 1. A schedule for submitting  
the final report for Unit 2 will be submitted after a Unit 2 completion  
schedule has been established. Enclosure 2 contains a list of the commitments  
made in this report.

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

Very truly yours,

TENNESSEE VALLEY AUTHORITY

*MFRay*  
Manager, Nuclear Licensing  
and Regulatory Affairs

Enclosures  
cc: See page 2

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U.S. Nuclear Regulatory Commission

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cc (Enclosures):

Ms. S. C. Black, Assistant Director  
for Projects  
TVA Projects Division  
U.S. Nuclear Regulatory Commission  
One White Flint, North  
11555 Rockville Pike  
Rockville, Maryland 20852

Mr. B. A. Wilson, Assistant Director  
for Inspection Programs  
TVA Projects Division  
U.S. Nuclear Regulatory Commission  
Region II  
101 Marietta Street, NW, Suite 2900  
Atlanta, Georgia 30323

INPO Record Center  
Institute of Nuclear Power Operations  
1100 Circle 75 Parkway, Suite 1500  
Atlanta, Georgia 30339

NRC Resident Inspector  
Watts Bar Nuclear Plant  
P.O. Box 700  
Spring City, Tennessee 37381

## ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1  
CONTAINMENT PURGE AIR SYSTEM BELLOWS HAVE NO  
FIRE RATING OR ENVIRONMENTAL QUALIFICATION  
SCRs WBP 8777 AND WBP 8790  
CAQRs WBP 870978 AND WBP 890150  
10 CFR 50.55(e)

### FINAL REPORT

#### Description of Deficiency

The heating, ventilating, and air conditioning (HVAC) ducts associated with the Containment Purge Air System have bellows expansion joints installed adjacent to the duct penetrations in the 3-hour fire-rated shield building wall. These bellows joints have no fire resistive rating, and there are no fire dampers installed at the duct penetrations. Fire hazard analysis calculation FSG-CAM-022787 concluded that the 3-hour fire barrier shield building wall would be breached if the expansion joints are exposed to fire. Fire would be supported by combustible materials, such as oil, grease, charcoal, rubber, plastic, and electrical cables. Based on the amount of combustible material, propagation of a fire through the shield building wall is considered likely.

Also, the bellows expansion joints do not have a documented environmental qualification for radiation. The synthetic material used in these bellows (Neoprene) begins to experience change in physical properties when subjected to radiation doses in the range of  $10^5$  rad. The integrated accident dose these bellows will experience is in the range of 2.0 times  $10^5$  to 1.2 times  $10^8$  rad. If this dose were combined with the accumulated 40-year normal integrated dose, the bellows could fail to perform its design function.

#### Safety Implications

The consequences of a failure of the subject expansion joints due to fire is potential exposure of redundant safe shutdown electrical circuits. This exposure to fire could render the systems served by these circuits incapable of performing their intended safe shutdown function.

Failure of the expansion joints due to high radiation levels would adversely affect the following safety-related functions: (a) Emergency Gas Treatment System maintaining negative 1/2-inch water gage (WG) in the annulus when containment integrity is required, and (b) Auxiliary Building Gas Treatment System maintaining negative 1/4-inch WG in the Auxiliary Building secondary containment enclosure during accident conditions.

These conditions could adversely affect the safety of operations of the plant.

### Corrective Actions

The condition of fire barriers penetrated by HVAC ducts without fire dampers has been addressed by Condition Adverse to Quality Report (CAQR) WBP 870978, Revision 1. The approved corrective action plan for this CAQR calls for:

1. Identify all HVAC ducts which penetrate fire-rated barriers and do not have fire dampers.
2. Identify which of these duct penetrations has not been analyzed for Appendix R compliance.
3. Perform and document an Appendix R analysis of any unanalyzed HVAC duct penetrations.
4. Determine and perform corrective actions, if any, that will be required to meet Appendix R requirements.

The condition of the bellows joint materials not having adequate documentation of environmental qualification has been addressed by CAQR WBP 890150, Revision 1. The approved corrective action plan for this CAQR calls for performing mechanical equipment qualification (MEQ)-type aging calculations to determine the useful life of the bellows. If it is determined that the bellows do not meet the pressure, humidity, temperature, and radiation requirements of the application, then the bellows will be replaced before system operation.

### Root Cause and Recurrence Control Actions

For the conditions of HVAC ducts penetrating fire-rated barriers without fire dampers, the root cause was determined to be inadequate design review. During the fire hazards analysis performed in 1984, fire compartmentation cells were identified by a fire protection engineer. A set of HVAC drawings were marked to indicate the location of additional fire dampers. Later, the fire compartmentation drawings (47W240 series) were issued to show the fire cells, but no comparison was made between the HVAC and the fire compartmentation drawings. System modifications were made based on design input which was not properly verified. Further, when verified design input became available, no interface review was performed to detect possible impacts to existing design.

Since occurrence of this condition, TVA has implemented Nuclear Engineering Procedures (NEPs) 3.1, "Calculations"; 5.1, "Design Output"; and 5.2, "Review." These procedures define the relationship between design input, design output, and the responsibilities of the design reviewer. Proper implementation of these procedures will reduce the probability of recurrence of this condition.

For the condition of expansion bellows materials not having adequate documentation of environmental qualification, the root cause has been determined to be that there was no procedure or requirement in place at the time of procurement to design for and specify the environmental conditions for mechanical equipment. Since occurrence of this condition, TVA has issued Watts Bar Engineering Procedure 5.03, "Design Change Notices." This procedure requires that the design input include consideration of the environmental conditions anticipated during storage, construction, and operation. Proper implementation of this procedure will reduce the probability of recurrence of this condition.

ENCLOSURE 2

LIST OF COMMITMENTS

1. Identify all HVAC ducts that penetrate fire-rated barriers and do not have fire dampers.
2. Identify which of the duct penetrations has not been analyzed for Appendix R compliance.
3. Perform and document an Appendix R analysis of any unanalyzed HVAC duct penetrations.
4. Determine and perform corrective actions, if any, that will be required to meet Appendix R requirements.
5. Perform mechanical equipment qualification aging calculations to determine the useful life of HVAC expansion bellows.
6. If it is determined that the bellows do not meet the pressure, humidity, temperature, and radiation requirements of the application, then the bellows will be replaced before system operation.
7. A schedule for submitting the final report for Unit 2 will be submitted after a Unit 2 completion schedule has been established.