TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401

5B Lookout Place

JAN 30 1991

WBRD-50-390/90-07
WBRD-50-391/90-07

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 - DEFICIENCY IN THE AUXILIARY BUILDING GAS TREATMENT SYSTEM - 10 CFR 50.55(e) - WBRD-50-390/90-07 AND WBRD-50-391/90-07 - FINAL REPORT

The subject deficiency was initially reported to NRC Inspector Rudolph Bernhard on December 14, 1990, in accordance with 10 CFR 50.55(e) as Condition Adverse to Quality Report WBP 900432. Enclosure 1 to this letter contains TVA's final report. Enclosure 2 lists the commitments made in this report.

The extended submittal date for this report was coordinated with the Region II staff.

If there are any questions, please telephone P. L. Pace at (615) 365-1824.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

Mark J. Burzynski for
E. G. Wallace, Manager
Nuclear Licensing and
Regulatory Affairs

Enclosures
cc: See page 2

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JAN 30 1991

U.S. Nuclear Regulatory Commission

cc (Enclosures):

Ms. S. C. Black, Deputy Director
Project Directorate II-4
U.S. Nuclear Regulatory Commission
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852

INPO Record Center
1100 Circle 75 Parkway, Suite 1500
Atlanta, Georgia 30339

NRC Resident Inspector
Watts Bar Nuclear Plant
P.O. Box 700
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

Mr. B. A. Wilson, Chief, Project Chief
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
DEFICIENCY IN THE AUXILIARY BUILDING GAS TREATMENT SYSTEM
CONDITION ADVERSE TO QUALITY REPORT (CAQR) WBP 900432
10 CFR 50.55(e)

FINAL REPORT

DESCRIPTION OF DEFICIENCY

The Auxiliary Building Gas Treatment System (ABGTS) is designed to maintain the Auxiliary Building Secondary Containment Enclosure (ABSCE) at a negative pressure (negative 0.25-inch water gauge pressure with respect to the outdoors) following any event which could result in a release of radiation to the outside atmosphere. FSAR Section 6.2.3.1.3 states five design bases for the ABGTS. Two of these are directly related to radiation release control:

1. "to establish and keep an air pressure that is below atmospheric within the portion of the Auxiliary Building serving as a secondary containment enclosure during accidents."

2. "to reduce concentration of radioactive nuclides in air releases from the ABSCE . . . below the 10 CFR 100 guideline values."

The 0.25-inch negative pressure is maintained in the ABSCE by modulating dampers located in the two ABGTS vacuum relief ducts.

The ABGTS vacuum relief modulating dampers (0-FCO-30-148 (train B) and 0-FCO-30-149 (train A)) and vacuum relief isolation dampers (0-FCO-30-279 (train B) and 0-FCO-30-280 (train A)) are normally open dampers that can fail in two different ways that adversely affect ABSCE pressure control. In the first case, failure in the closed position could result in excessive ABSCE negative pressure. FSAR Section 7.1.1.1.4 states, "The Auxiliary Control Air System supplies essential control air to safety-related equipment such as . . . dampers in the ABGTS. . . ." Contrary to this requirement, the dampers are incorrectly powered from a nonessential supply of control air making failure in the closed position possible. Excessive negative pressure in the ABSCE could affect the radiation leakage pathways in two manners:

1. Leakage directly from the containment to the ABSCE could increase.

2. Leakage pathways from the ABSCE to the shield building annulus could reverse direction if ABSCE pressure is more negative than the annulus pressure.

In the second case, failure of these devices in the open position could result in a loss of ABSCE negative pressurization. The current system logic allows the isolation dampers to open and the modulating dampers to function during normal plant operation when the ABGTS is not in service. These devices do not receive a signal to close upon an Engineered Safety Feature Actuation Signal (ESFAS), Auxiliary Building Isolation (ABI), or ABGTS fan start signal. A modulating damper failing in the open position can then result in a loss of negative pressurization within the ABSCE during the accident mode. In addition, the loss of negative pressure could affect the performance of the ABGTS to effectively filter radioactive releases.

SAFETY IMPLICATIONS

The four ABGTS dampers affected by this deficiency are designed to fail closed on loss of air; therefore, the loss of nonessential control air will result in the closure of all four dampers. During the operation of the ABGTS, the failure of the isolation dampers in the closed position could cause the Auxiliary Building (AB) negative pressure (normally -0.25 inch w.g. minimum) to go too negative; thus, cause it to approach or exceed the annulus negative pressure (normally -0.50 inch w.g. during the emergency gas treatment [EGTS] fan operation). The decrease in the AB pressure could result in excessive leakage from the containment into the AB. It could also reverse the direction of leakage from the AB to the annulus. This is an unanalyzed condition which could potentially affect the calculated offsite dose, various emission doses, and control room operator doses.

The current control logic for the four vacuum relief line dampers allows them to open (and remain open) during normal plant operation. Thus, when an ABI signal is received and the ABGTS starts, the isolation dampers may still be open because they receive no automatic signal to close. In this mode, a single (mechanical) failure of one of the two modulating dampers in the open position, while its associated isolation damper is open, could render the ABGTS incapable of maintaining the required negative pressure of 0.25-inch w.g. in the AB. This could affect ABGTS performance and may result in a release of radioactivity in excess of 10 CFR 100 limits.

CORRECTIVE ACTION

1. Offsite and control room dose calculations have been revised to reflect 9000 cfm (previously 7000 cfm) of AB exhaust air being processed through the gas treatment (ABGTS) filter units.

   This change was necessary because the modulating dampers, which respond to the AB pressure differential controllers, are designed to operate between the closed and the wide-open positions; and thus, will allow an air flow rate of 9000 cfm to 0 cfm. The calculation results concluded that the offsite doses are below 10 CFR 100, and the Control Room operator dose is less than 10 CFR 50 Appendix A GDC 19 limits.

2. Modify the ABGTS as follows:

   a. Modify the control logic of the ABGTS vacuum relief line isolation dampers to require three signals to open, as follows:

      (1) AB pressure with respect to the outdoors is more negative than the setpoint of -0.25 inch w.g. (e.g.,-0.4 inch)

CORRECTIVE ACTION (continued):

(2) Isolation damper handswitch is in P-Auto position

(3) Associated ABGTS exhaust fan (i.e., train A or B) is running

This will ensure that the isolation dampers are closed during normal plant operation (i.e., ABGTS exhaust fans are not in service)

b. Provide Auxiliary Control Air (safety-related) to the vacuum relief line isolation dampers 0-FCO-30-279 and 280, and modulating dampers 0-FCO-30-148 and 149.

c. Modify the control logic of ABGTS exhaust fans to allow the redundant fan to come on should the operating fan not be able to maintain AB pressure of -0.25 inch w.g., for any reason (e.g., the modulating damper failing in the open position). The condition of the AB negative pressure loss will be annunciated in the main control room.

d. For the event the AB pressure is going too negative (i.e., more negative than -0.4 inch), provide for the redundant train's isolation damper (279 or 280) to open.

3. This condition resulted from inadequate review of the system failure modes and effects analysis (FMEA) on the design of ABGTS vacuum relief line dampers for single failure; the single failure requirements were not adequately addressed. This is a specific design deficiency involving the ABGTS vacuum relief line dampers, in which both relief lines are designed to serve either operating filter train (i.e., train A or B) for added redundancy.

A review of the other filtration systems, which are Control Room Emergency Air Clean up, the Containment Purge Air, and EGTS and their control logics has revealed that none has a vacuum relief feature and all have completely independent trains. Therefore, the independent operation of the redundant filter trains in each of these filtration systems precludes the possibility of a single failure of a component from adversely affecting the operation of the system.

The current design review process is controlled by the Nuclear Engineering Procedure (NEP)-5.2, "Review," which requires that critical design reviews be performed to provide assurance that design documents, such as drawings, calculations, analyses, or specifications, are complete, correct, and satisfactory. Application of NEP-5.2 in the design review process should prevent recurrence of this condition; therefore, no additional recurrence control measures are required.

ENCLOSURE 2

LIST OF COMMITMENTS

1. Modify ABGTS to do the following:

   a. Modify the control logic of the ABGTS vacuum relief line isolation dampers to require three signals to open, as follows:

      (1) AB pressure with respect to the outdoors is more negative than the setpoint of -0.25 inch w.g. (e.g.,-0.4 inch)

      (2) Isolation damper handswitch is in P-Auto position

      (3) Associated ABGTS exhaust fan (i.e., train A or B) is running

      This will ensure that the isolation dampers are closed during normal plant operation (i.e., ABGTS exhaust fans are not in service)

   b. Provide Auxiliary Control Air (safety-related) to the vacuum relief line isolation dampers 0-FCO-30-279 and 280, and modulating dampers 0-FCO-30-148 and 149.

   c. Modify the control logic of ABGTS exhaust fans to allow the redundant fan to come on should the operating fan not be able to maintain AB pressure of -0.25 inch w.g., for any reason (e.g., the modulating damper failing in the open position). The condition of the AB negative pressure loss will be annunciated in the main control room.

   d. For the event the AB pressure is going too negative (i.e., more negative than -0.4 inch), provide for the redundant train's isolation damper (279 or 280) to open.

The above commitments will be accomplished before Group 2A testing.