



Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381

John H. Garrity  
Vice President, Watts Bar Nuclear Plant

NOV 05 1991

WBRD-50-390/91-32

WBRD-50-391/91-32

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 - VIOLATION OF SINGLE FAILURE  
CRITERIA FOR CONTROL BUILDING NORMAL PRESSURIZING SUBSYSTEM -  
WBRD-50-390/91-32 AND WBRD-50-391/91-32 - FINAL REPORT

The subject deficiency was initially reported to the NRC Operations  
Center on June 28, 1991, in accordance with 10 CFR 50.55(e) as Problem  
Evaluation Report (PER) WBP 900366PER. Subsequently, the deficiency was  
upgraded to Significant Corrective Action Report (SCAR) WBSA910234. An  
interim report was provided on July 29, 1991. Enclosure 1 provides TVA's  
final report. Enclosure 2 lists the commitments for this submittal.

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

Sincerely,

John H. Garrity

Enclosures  
cc: See page 2

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U.S. Nuclear Regulatory Commission

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cc (Enclosures):

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 (WBN) UNITS 1 AND 2  
VIOLATION OF SINGLE FAILURE CRITERIA FOR CONTROL BUILDING  
NORMAL PRESSURIZATION SUBSYSTEM  
SIGNIFICANT CORRECTIVE ACTION REPORT WBCA910234  
WBRD-50-390, 391/91-32 - 10 CFR 50.55(e) FINAL REPORT

Description of Deficiency

During an evaluation of a Sequoyah Nuclear Plant (SQN) design deficiency (SQP871126, LER 87-039) for applicability to WBN, it was determined that the potential existed for a single failure of the normal Control Building (CB) pressurization subsystem, when operating during a control room isolation (CRI), to violate General Design Criteria (GDC)-19 of 10 CFR 50 Appendix A, "Control Room," and FSAR Section 9.4.1, "Control Room Area Ventilation System." A single failure in the control system for inlet modulating dampers FCO-31-1A or FCO-31-2A associated with normal pressurizing fans A-A or B-B could result in an excessive air supply to the lower floors of the CB. Given this condition, it is possible that pressure in the lower floors of the CB could exceed the pressure in the main control room habitability zone (MCRHZ)<sup>1</sup> thereby allowing unfiltered, potentially contaminated air to enter the Main Control Room (MCR) or Technical Support Center during accident conditions.

During normal operation, one redundant CB normal pressurizing fan supplies approximately 8200 cubic feet per minute (CFM) of outside, unfiltered air to the CB, of which, 3200 CFM is supplied to the MCRHZ and 5000 CFM is supplied to the lower CB floors (elevations 729, 708, and 692) (See Attachment 1). The building is thus pressurized relative to atmosphere to minimize inleakage. The quantity of air is automatically controlled by the modulating dampers, FCO-31-1A or FCO-31-2A, to maintain approximately 1/8-inch water gauge (wg) positive pressure in the MCRHZ and a slight positive pressure in the remainder of the building. Following a CRI, normal pressurizing fan air flow is isolated from the MCRHZ and the fan operates to divert a reduced quantity (8200 CFM to 3000 CFM) of air to the CB lower floors in order to provide a slight positive pressure relative to atmosphere and to provide makeup air to the battery room exhaust fans. During the CRI, pressurization of the MCRHZ is accomplished using redundant emergency pressurizing fans to supply approximately 325 CFM filtered (via air cleanup fans) air flow to the MCRHZ. A malfunction of modulating dampers FCO-31-1A or FCO-31-2A or their attendant control elements (pressure differential transmitters, differential controllers, differential pressure operators, or solenoid valves) could result in the modulating dampers failing in a full open position or otherwise failing to modulate properly such that air pressure in the CB lower floors could exceed the 1/8-inch wg pressure in the MCRHZ. There are no instruments or alarms in the MCR to alert the operators of this condition.

1. The MCRHZ includes all Control Building rooms on elevation 755'-0" including the Unit 1 and 2 Main Control Room.

### Cause Analysis:

This deficiency was a result of a less than adequate design process for addressing single failure during the original design of WBN systems. The initial design process did not provide appropriate guidance for the incorporation of single failure into system design. Lack of adequate design input was a basic problem identified by TVA as early as 1986 and was one of the reasons for the Watts Bar Design Baseline Verification Program (DBVP), which, in part, developed the Watts Bar Design Basis Document (DBD).

A secondary cause for the deficiency identified that the single failure calculation for System 31 is incomplete and not fully representative of the current system design. An extent of condition review determined that further effort under the WBN calculations program is necessary to confirm that systems appropriately incorporate single failure design requirements.

### Safety Implications

As a result of this deficiency, the increased air flow to the CB lower floors could result in higher than designed air pressures in the lower CB resulting in exceeding the 1/8-inch wg pressure in the MCRHZ. Normal leakage around stairwell doors and wall penetrations could result in unfiltered and potentially contaminated air to infiltrate the MCR and potential radiological exposure to MCR/Technical Support Center personnel in excess of allowable limits specified in GDC-19.

### Corrective Action

To correct the specific deficiency, differential pressure switches are being incorporated into the new upgraded CB pressurizing system (DCN M-10706). These differential switches will detect over-pressurization in the lower floors of the CB and initiate action to prevent the pressure in the lower floors from exceeding the pressure in the MCR. This modification will be complete prior to system transfer for System 31.

Under WBN's DBVP, Design Criteria WB-DC-40-64, "Design Basis Events Design Criteria," was developed as a WBN design basis document. WB-DC-40-64, Appendix B, provides generic single failure criteria to be used in evaluating design changes. Additionally, this criteria contains a requirement that a documented single failure analysis be prepared for safety-related systems (discussed further below). This criteria, along with specific single failure requirements, are identified in WBN's System Descriptions (also design basis documents) for safety-related systems. Further, WBN procedure, Engineering Administrative Instruction (EAI)-3.05, "Design Change Notices," requires the designer to consider failure effects of systems, structures, and components when making changes to the design of any safety-related system. This procedure, WB-DC-40-64, and the system descriptions provide assurance that future design changes will properly incorporate single failure requirements into the system design.

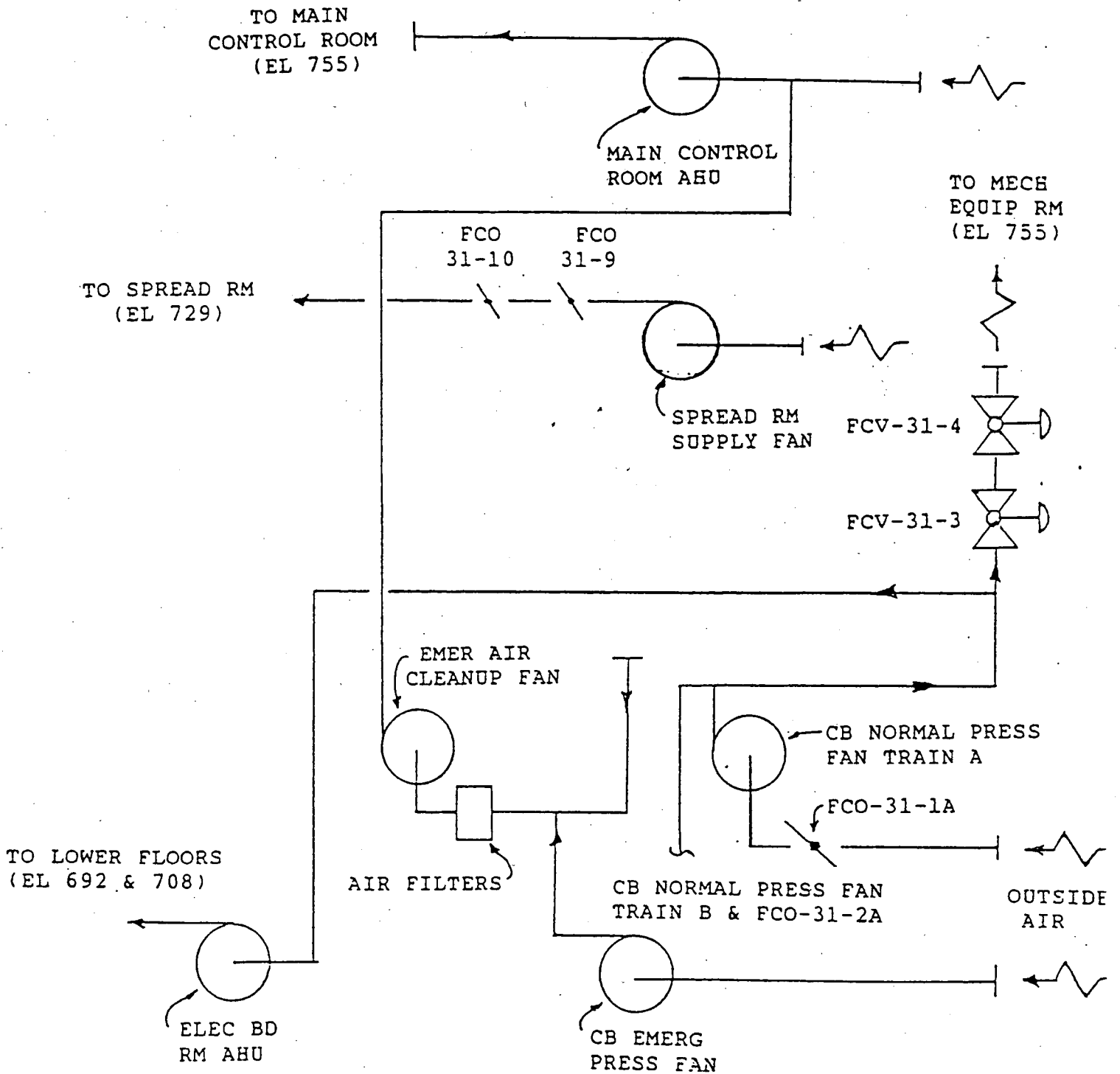
Corrective Action (Continued)

Under WBN's mechanical calculation program, TVA will implement the requirements of WB-DC-40-64 relating to preparation of single failure analyses. This program will review the adequacy of existing single failure analysis calculations and/or prepare single failure analysis calculations as required by WB-DC-40-64 for affected safety-related systems. This activity, including resolution of any single failure design deficiencies, is tracked under SCAR WBP 910055 SCA and will be complete prior to Unit 1 fuel load.

Note:

TVA's interim report for the subject deficiency committed to determine whether the final 10 CFR 50.55(e) report for WBP900432 (WBRD-50-390, 391-90-07, January 30, 1991) required follow-up information to be provided. That report notes that failure to adequately address single failure requirements resulted in a deficient design for vacuum relief line dampers associated with the Auxiliary Building Gas Treatment System (ABGTS). Since the specific deficiency related to a vacuum relief feature on an air cleanup system, it was reasonable to limit the extent of condition review to other filtration systems (Control Room Emergency Cleanup, Containment Purge Air, and EGTS). Because the extent of condition review revealed no other air cleanup system with a vacuum relief line, the condition was appropriately limited to the ABGTS system, and revision of CDR 90-07 is unnecessary. Further, a review of the existing single failure analysis calculation for the HVAC system (System 31) under commitment Number 2 (Enclosure 2) provides confidence that single failure deficiencies in the HVAC design will be identified and resolved.

ATTACHMENT 1



SIMPLIFIED CONTROL BUILDING VENTILATION SCHEMATIC

ENCLOSURE 2

LIST OF COMMITMENTS

1. Differential pressure switches will be incorporated into the upgraded Control Building pressurizing system under DCN M-10706. This modification will be complete prior to system transfer for System 31.
2. Under WBN's mechanical calculation program, TVA will review the adequacy of existing single failure analysis calculations and/or prepare single failure analysis calculations as required by WB-DC-40-64 for affected safety-related systems. This activity, including resolution of any single failure design deficiencies, will be complete prior to Unit 1 fuel load.