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JUL 31 1991

WBRD-50-390/91-12
WBRD-50-391/91-12

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	)	Docket No. 50-390
Tennessee Valley Authority	)	50-391

WATTS BAR NUCLEAR PLANT (WBN) UNITS 1 AND 2 - UNDERSIZED COMPONENT COOLING SYSTEM INSTRUMENTATION FOR REACTOR COOLANT PUMP THERMAL BARRIERS - WBRD-50-390/91-12 AND WBRD-50-391/91-12 - FINAL REPORT

The subject deficiency was initially reported to NRC Region II on March 15, 1991, in accordance with 10 CFR 50.55(e) as Significant Corrective Action Report (SCAR) WBSCA 910170112 (Unit 1). SCAR WBSCA 910196 addresses this deficiency for Unit 2. TVA provided an interim report on April 30, 1991. Enclosure 1 provides TVA's final report. Enclosure 2 provides a list of commitments for this submittal.

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

Very truly yours,

TENNESSEE VALLEY AUTHORITY

John H. Garrity

Enclosures
cc: See page 2

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U.S. Nuclear Regulatory Commission

JUL 3 1 1991

cc (Enclosures):

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ENCLOSURE 1
WATTS BAR NUCLEAR PLANT (WBN) UNITS 1 AND 2
UNDERSIZED COMPONENT COOLING SYSTEM INSTRUMENTATION FOR
REACTOR COOLANT PUMP THERMAL BARRIERS
SIGNIFICANT CORRECTIVE ACTION REPORTS WBSCA 910170112 AND WBSCA 910196
WBRD-50-390, 391/91-12 - 10 CFR 50.55(e) FINAL REPORT

Description of Deficiency

During a TVA internal design audit of the Component Cooling System (CCS) (System 70), TVA discovered that certain pressure and flow instruments (See Table 1) which monitor CCS supply to the reactor coolant pump (RCP) thermal barrier heat exchangers were not designed to accommodate the pressure (2485 psig) associated with a design basis heat exchanger tube rupture. The design pressure of CCS piping in most areas of the plant is 200 psig. However, the subject instruments are installed across a segment of CCS piping designed for a pressure of 2485 psig due to the postulated tube rupture (refer to attached flow diagram). The instruments were procured with a specified maximum design pressure of 300 psig. In the event of a design basis thermal barrier tube rupture, the possibility exists that these transmitters would fail to maintain the integrity of the Reactor Coolant System pressure boundary as required in WBN's FSAR Section 9.2.2.

TVA determined the cause of this deficiency to be an isolated design oversight during the original design of the system in 1971. More specifically, the oversight apparently occurred as a result of poor communication between the Instrument and Controls and Mechanical Engineering departments, in that only the basic system design pressure was communicated; the increased pressure due to the tube rupture was not considered.

Table 1 - Undersized CCS instrumentation

1,2-PDT-70-94	1,2-FT-70-95
1,2-PDT-70-104	1,2-FT-70-105
1,2-PDT-70-117	1,2-FT-70-115
1,2-PDT-70-126	1,2-FT-70-124

Safety Implications

The subject instrumentation is used for indication and annunciation to detect inadequate CCS flow to the four RCP thermal barrier heat exchangers. These functions are not safety-related and are not affected by the deficiency under normal operating conditions. In the event of a thermal barrier tube rupture, CCS is designed to automatically isolate, and the only safety function for these instruments is to maintain the integrity of the reactor coolant pressure boundary.

As a result of the subject deficiency, two failure modes are possible. In the first case, failure of the flow and/or pressure transmitter instrument housings could result in a small-break LOCA inside containment which is within the design basis of WBN.

The second failure mode is applicable to the differential pressure transmitters only, and involves a failure of the low side/high side interface (e.g., bellows, diaphragm, etc.) of the transmitter. This situation could result in exposure of the low pressure CCS piping upstream of the heat exchangers to high temperature/pressure reactor coolant. Based on an informal review, the consequence of this event would be limited to potential leakage (approximately 80 gpm) of reactor coolant inside or outside containment. The leakage outside containment could result from the unlikely failure of the inboard containment isolation check valve (1,2-CKV-70-679) to close under conditions of reverse flow and pressurization. The 80 gpm leakage represents the combined restricted flow rate across the four failed pressure transmitters and sense lines and is well within the ability of the charging system to makeup to the RCS. This situation would not prevent orderly shutdown of the reactor.

Corrective Action

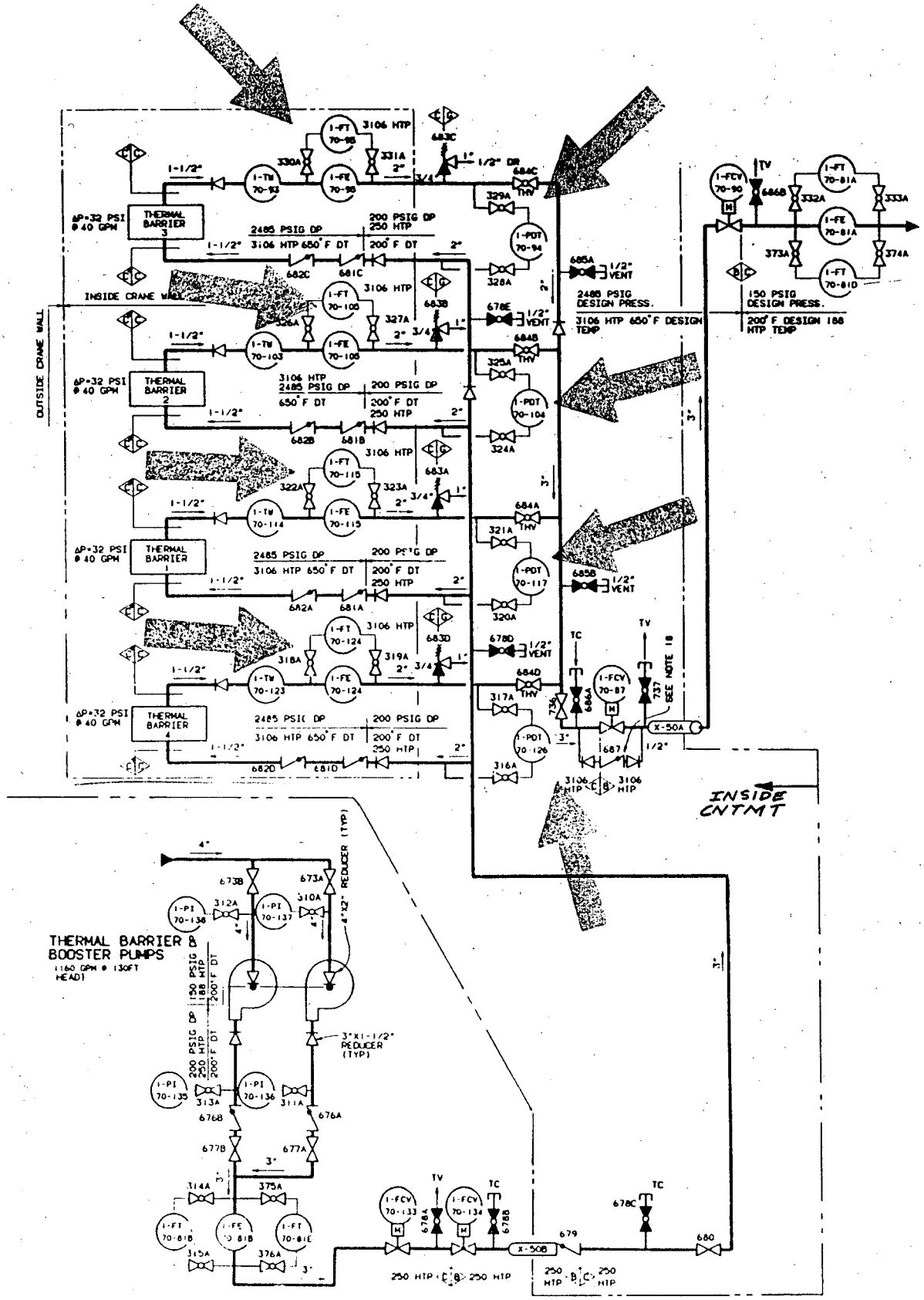
TVA has received verification from the Foxboro Company that the 8 flow transmitters are rated for a desisn pressure of 3000 psig. Therefore, these flow transmitters will be used as installed. With regard to the pressure transmitters, TVA will perform destructive pressure testing for one Unit 2 transmitter. If the test results are successful, the pressure transmitters will be used as installed. If the test results are not successful, Unit 1 pressure transmitters will be permanently removed from service prior to WBN's Group 1 system completion date and Unit 2 pressure transmitters removed from service prior to Unit 2 fuel load. All required changes to design documentation for the final disposition of these 16 instruments will be complete for the 8 Unit 1 instruments prior to September 30, 1991 and by Unit 2 fuel load for the 8 Unit 2 instruments.

To provide reasonable assurance that the subject deficiency was an isolated case, a review was performed of flow diagrams for WBN safety-related fluid systems which have a potential for a high/low pressure interface. The objective of the review was to determine whether other cases may exist where the design of instrumentation failed to consider abnormal pressure demands (if any) in excess of normal/transient pressure requirements. The methodology for this review was to determine whether the specified pressures shown on flow diagrams were based on conditions other than normal/transient operations (pump starts, elevation differences, opening of passive/active valves, etc.), and if so, whether instrumentation was sized appropriately. The review found, with the exception of the subject deficiency, that either (1) design pressures could be attributed to normal/transient conditions and therefore would likely have been appropriately considered for instrumentation requirements during the original design, or (2) instrumentation was appropriate in cases where abnormal pressures exceeded normal/transient pressures.

As a result of post-1985 efforts under WBN's Design Baseline Verification Program in the area of design change control, TVA improved procedures and processes to allow for appropriate consideration of design input requirements including design basis events. Specifically, Nuclear Engineering Procedures (NEPs) 3.2, "Design Input," and NEP 5.2, "Review," and detailed review checklists should significantly reduce the possibility of similar errors.

ATTACHMENT

CCS FLOW TO REACTOR COOLANT PUMP THERMAL BARRIERS



ENCLOSURE 2

LIST OF COMMITMENTS

1. TVA will perform destructive pressure testing for one Unit 2 pressure transmitter prior to September 30, 1991.

2. If the test results are not successful, Unit 1 pressure transmitters will be permanently removed from service prior to WBN's Group 1 system completion date and Unit 2 pressure transmitters removed from service prior to Unit 2 fuel load.

3. All required changes to design documentation for the final disposition of these 16 instruments will be complete for the 8 Unit 1 instruments prior to September 30, 1991 and by Unit 2 fuel load for the 8 Unit 2 instruments.