



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

William J. Museler
Site Vice President
Watts Bar Nuclear Plant

OCT 13 1992

WBRD-50-390/92-09
WBRD-50-391/92-09

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 - USE OF NONCONSERVATIVE
MASS AND ENERGY RELEASE DATA FOR MAIN STEAM LINE BREAK ANALYSIS -
WBRD-50-390/92-09 AND WBRD-50-391/92-09 - FINAL REPORT

The subject deficiency was initially reported to the NRC Operations Center
on September 10, 1992, in accordance with 10 CFR 50.55(e)(3) as
Significant Corrective Action Report (SCAR) WBSA920051. Enclosed is
TVA's final report on this subject.

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

Very truly yours,

William J. Museler

Enclosure
cc: See page 2

9210210212 921013
PDR ADOCK 05000390
S PDR

TE27 11

U.S. Nuclear Regulatory Commission
Page 2

OCT 13 1992

cc (Enclosure):

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

ENCLOSURE

WATTS BAR NUCLEAR PLANT (WBN) UNITS 1 AND 2
USE OF NONCONSERVATIVE MASS AND ENERGY RELEASE DATA FOR
MAIN STEAM LINE BREAK ANALYSIS
SIGNIFICANT CORRECTIVE ACTION REPORT (SCAR) WBSA920051
WBRD-50-390/92-09 AND WBRD-50-391/92-09

FINAL REPORT

DESCRIPTION OF THE DEFICIENCY

On September 10, 1992, TVA determined that the mass and energy release from a main steam line break (MSLB) in the main steam valve vaults (MSVVs) produces pressures exceeding the structural design margins of the MSVV and may challenge the structural adequacy of the MSVV concrete slabs and walls. (There are two MSVVs at WBN; the north MSVV and the south MSVV.)

The structural design pressures for the MSVVs, under the most limiting design basis pressure transient, is a double-ended severance of a main steam line inside the vaults. The original calculations to determine MSVV pressure used mass and energy release data submitted to TVA by Westinghouse by letter WAT-D-1499 (1975). The information provided was based on the largest steam generator depressurization rate consistent with high quality (dry) steam discharge.

As a result of the WBN calculation reconstitution program verification of analysis references, Westinghouse was requested to evaluate the data provided in letter WAT-D-1499 (1975) and advise TVA if it was still applicable to the MSVVs. On June 23, 1992, Westinghouse officially advised TVA (telex) that the data supplied in letter WAT-D-1499 (1975) was not conservative and not applicable for a pressure transient evaluation of the MSVV. TVA was also advised that the use of ANSI/ANS 58.2 (1980), Appendix E, was the appropriate methodology and bounded all sophisticated analysis that could be conducted for this type of event. Based on this information, TVA initiated actions to have the pressure/time profile utilized in MSVV structural design recalculated using the ANSI/ANS 58.2 (1980), Appendix E, methodology.

On July 7, 1992, Westinghouse telexed letter WAT-D-8908 to TVA with the results of the double-ended MSLB inside the MSVV using the ANSI/ANS 58.2, Appendix E, criteria. The results of the Westinghouse calculation indicated that the MSVV structural design margins would be exceeded. TVA began evaluating the potential for performing a more sophisticated analysis in order to reduce the mass flow rate to acceptable values consistent with pressure/time profiles utilized in the MSVV structural design.

On July 15, 1992, Westinghouse advised TVA that the ANSI/ANS methodology, although conservative, bounded a more sophisticated analysis captured in WCAP-8822 (Westinghouse proprietary). However, Westinghouse stated that this alternate analysis would not provide substantially lower mass and energy release results and that TVA should proceed on the basis of the data given in letter WAT-D-8908. TVA initiated WBSA 920051 on this date.

From July 15, 1992 through September 10, 1992, TVA evaluated various MSLB mass and energy release models based on MSLB sizes less than a double-ended rupture for the MSVV pressure transient analysis. Each iteration revealed that the mass and energy release produced pressures exceeding the structural design margins of the MSVVs. On September 10, 1992, TVA notified the NRC Operations Center that WBSA 920051 was reportable under 10 CFR 50.55(e)(3).

SAFETY IMPLICATIONS

The design basis event affected by this issue is rupture of the main steam piping. The MSLB is the design basis event for the pressurization and temperature transients within the MSVV. The main feedwater line break is a design basis event for flooding in the valve vaults and is not impacted by this condition. Therefore, a postulated MSLB is the only design basis event which must be examined.

For an MSLB in the valve vaults, the use of ANSI/ANS 58.2 methodology (which utilizes liquid entrainment in the blowdown) significantly increases the mass flow rate and corresponding energy releases presently used in the valve vault pressure calculations. The increase in the mass and energy release produces pressures which exceed the present structural design margins and may challenge the structural concrete walls and slabs of the valve vaults.

Failure of the structural slab or walls could potentially damage equipment or piping housed in the valve vault associated with the feedwater and auxiliary feedwater systems. This could result in a reduction or termination of feedwater flow to the intact steam generators. Reduction of feedwater flow could preclude long term cooldown requirements and subsequent plant recovery.

Additionally, failure of the structural slab or walls could damage the intact main steam line in the valve vault resulting in blowdown of a second steam generator. The present analysis assumes only a single steam generator blowdown with isolation of the non-faulted steam generators. Blowdown of a second steam generator beyond the assumed isolation time will increase the peak power level reached and could reduce the margin to critical heat flux for this event.

Either of the above consequences could have placed the facility outside the current design basis.

CAUSE

The cause of this deficiency was the use of the Westinghouse blowdown data in the initial calculations for the Watts Bar valve vaults. The data was apparently applied without verifying its applicability to vented compartments such as the MSVVs. There is no documentation available which explains why the blowdown data was originally transmitted to TVA in 1975. However, letter WAT-D-1499 (1975) was provided at TVA's request. The break postulated in letter WAT-D-1499 (1975) is a double-ended break in the Turbine Building using high quality steam with flow from both the forward and reverse directions.

At the time the calculations were being developed, it was recognized that for blowdowns inside containment, MSLBs were bounded by loss of coolant accidents for calculating peak containment pressures. Consequently, it was general practice to consider high quality steam for temperature analyses following MSLBs. Given these considerations, the assumption of high steam quality should have been a review variable during the performance of the calculations. Thus, the cause of this deficiency is concluded to be the lack of a TVA technical review in sufficient detail to have determined the problem with application of the Westinghouse data to the MSVVs in terms of break area, model geometry, and steam quality.

A contributing factor for this deficiency was the failure of Westinghouse to notify TVA that more realistic methods had been developed for calculating mass and energy releases during blowdowns.

ADVICE GIVEN TO OTHER ENTITIES

TVA has issued a statement in Nuclear Network on the subject deficiency. Additionally, the subject deficiency was determined to be reportable by TVA's Sequoyah Nuclear Plant staff and was reported to NRC in Licensee Event Report (LER) 50-327/92-013 submitted on August 17, 1992.

CORRECTIVE ACTIONS

1. The subject deficiency was identified through the WBN Calculation Reconstitution Program being administered under Significant Corrective Action Report WBP910055SCA. This program was developed to ensure a systematic review of safety-related, essential calculations and to provide accuracy and consistency between design inputs and design outputs. Significant deficiencies are documented through the corrective action program and screened for potential reportability. Completion of this task will identify similar misapplications of design input, if any.
2. TVA will revise design documentation utilizing appropriate mass/energy blowdowns for the pressure profile transient of the MSVVs. This will include revision of the current calculation, as well as generating any new calculations and implementing any modifications that may be required. This action will be completed by June 30, 1993, for Unit 1. Similar actions for Unit 2 will be developed after a Unit 2 completion schedule is established.