TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

August 2, 1984

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

Enclosed is our response to the request by Mr. G. Lainas of the NRC in a meeting on July 20, 1984 with TVA, Duke, and American Electric Power to discuss main steam superheating inside and outside containment. The enclosed response provides a summary of the basis for TVA actions regarding the postulated event.

If you have any questions concerning this matter, please get in touch with Jerry Wills at FTS 858-2683.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills

L. M. Mills, Manager
Nuclear Licensing

Sworn to and subscribed before me
this 2nd day of August 1984

Paulette N. White
Notary Public
My Commission Expires 9-5-84

cc: U.S. Nuclear Regulatory Commission
Region II
Attn: Mr. James P. O'Reilly Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30203

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ENCLOSURE

MAIN STEAM LINE BREAK INSIDE AND OUTSIDE CONTAINMENT AT THE SEQUOYAH NUCLEAR PLANT

INTRODUCTION

In response to an NRC question on Duke Power Company's Catawba Nuclear Station FSAR, Westinghouse reanalyzed the main steam line break (MSLB) blowdown considering the effect of the superheated steam produced when the steam generator tubes uncover. The resultant superheated blowdown, which has a higher specific energy content than was considered in previous analyses using only saturated steam, releases more energy into the pipe break region's atmosphere and thus has the potential for elevating the atmospheric temperature above that for a saturated blowdown. In order to assess the environmental and subsequent operational effects of the MSLB, environmental and heat transfer analyses and safety evaluations were performed for MSLBs both inside the containment and in the main steam valve vaults outside containment.

Inside Containment

The Westinghouse reanalysis of a MSLB, which included superheated steam inside the Catawba containment, predicted a peak containment temperature of 383°F based on traditional licensing assumptions. Westinghouse provided the reanalysis result by a letter to TVA dated December 16, 1983. On December 19, 1983, TVA performed a better estimate analysis for the Sequoyah Nuclear Plant (SQN) using the licensing-type, Westinghouse blowdown for Catawba and more realistic heat transfer assumptions in containment. Our analysis predicted lower compartment and dead-ended compartment temperatures which were equal to or less than the original SQN design basis qualification temperature. TVA also judged that accounting for heat transfer into the ice condenser drain water and the use of a more realistic blowdown would further reduce the predicted temperature to a value significantly below the original SQN qualification temperature. Thus, we demonstrated that no design bases would be exceeded by the MSLB and, therefore, no equipment failures would be anticipated. Subsequent discussions with Westinghouse strengthened our judgment that appropriately conservative assumptions, capable of being justified on a licensing basis, would result in equipment qualification temperatures below the original SQN design basis temperature.

In summary, TVA performed in-house engineering analyses which used better estimate assumptions based on modeling experimental data. These analyses showed that containment temperatures would not approach FSAR values. Further, a significant heat sink not previously modeled (ice condenser drains) could compensate for all the superheat added to the containment and produce temperatures less than those in the FSAR. Utilizing the above information, we concluded that the event was not reportable under the provisions of 10 CFR 50.73.

Outside Containment

TVA determined that the equipment qualification temperatures in the main steam valve vaults at SQN could be adversely impacted by the steam generator superheat issue. As a result of this determination, a failure evaluation was performed to assess its impact on plant safety.

The failure evaluation considered the following:

A. The determination of a revised valve vault atmospheric temperature.

B. What safety-related and non-safety-related equipment was located in the valve vaults.

C. What equipment must operate.

D. The impact of equipment failures.

E. The availability of redundant plant features available to the operators to mitigate the event.

F. The impact of increased temperatures on the civil structures.

Mass and energy release data for MSLBs inside containment at the Catawba plant were available and were used to generate a new valve vault temperature profile. The results showed that the qualification temperature for equipment in the vault would be exceeded when tube uncovery took place at approximately three minutes after a 0.86 ft^2 break occurred. This data was determined to be conservative for use at SQN because no line losses were considered, containment signals would result in an early trip of main feedwater, and because SQN has a larger secondary side inventory. Taking credit for any one of these factors would delay the time of tube uncovery, thus providing margin beyond the three minutes used in the evaluation.

Since the qualification temperatures originally established for the vaults would be exceeded, a detailed equipment evaluation was performed. The equipment evaluations considered both electrical and mechanical failure mechanisms. The impact of the availability of offsite power was considered as was a single failure on one of the unaffected steam generators.

Main steam isolation valves, small secondary valves on the main steam lines, their operators, and appurtenances were examined and it was concluded that these valves, if open, would close before steam generator tube uncovery would occur. It was judged unlikely that the valves would reopen, once closed, but the evaluation considered the failure of any of these valves to close. It was concluded that their failures would not prevent plant cooldown in a controlled manner. Thus, plant safety would not be jeopardized by any potential failure of these valves.

The secondary side power-operated relief valves (PORVs), auxiliary feedwater (AFW) pump turbine steam supply valves, and steam generator level control valves were assumed to fail in the most adverse position. It was determined that plant safety was not impacted due to the availability of redundant systems to offset these failures.

The main feedwater isolation valves will close before the vault temperature exceeds the valves' qualification temperature. Because the valves are motor-operated, it is not expected that the valves could reopen once closed.

Instrumentation located in the vaults is limited to several main steam header pressure transmitters. These transmitters were evaluated and assumed to fail when the vault temperature exceeded the qualification temperature. It was determined that these failures would not impact plant safety because either the instrumentation was not required or, in the case of transmitters which were postaccident monitoring (PAM) instruments, other PAM instrumentation, as well as non-PAM instrumentation, was available to the operator. Additional instrumentation available to the operators not affected by the break includes steam generator level, AFW flow, steam line flow, and cold leg temperature.

Cabling passing through the vaults, but not associated with equipment located in the vaults, was examined. It was concluded that the failure of these cables would not degrade any mitigative function and, therefore, would not impact plant safety.

The concrete walls and structural steel in the valve vaults were also evaluated against the revised temperature profile. The structural steel was found to experience yielding and deformation but would not collapse. No equipment would be damaged by the steel. The concrete walls were found to remain structurally sound for this event.

The failure evaluation showed that all essential actions would be completed before equipment failure would be anticipated due to the increased valve vault temperature. The ability to effectively mitigate the event was maintained even when considering multiple equipment failures. Thus, TVA was able to conclude that plant safety would not be jeopardized in the event of an MSLB in the main steam valve vaults.

In summary, this event involved the increase of valve room temperatures due to Westinghouse's failure to model superheated steam. A safety evaluation was performed by TVA which showed that a functional impairment of the systems required to achieve controlled hot shutdown during this MSLB was not likely. This safety evaluation was based on Catawba (inside containment) mass and energy releases and the fact that line losses between the steam generators and the valve vault rooms provide sufficient time for (1) safety-related equipment to perform their safety function, and (2) sufficient instrumentation exists for the identification and mitigation of this MSLB.

Utilizing the above information along with the fact that this postulated event had been reported on Watts Bar pursuant to 10 CFR 50.55(e) and determined reportable under 10 CFR Part 21, we concluded that the postulated event was not reportable pursuant to 10 CFR 50.73.