UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION REPORT BY THE OFFICE OF SPECIAL PROJECTS

EMPLOYEE CONCERN ELEMENT REPORT 229.5(B)

"CONTROL AIR SYSTEM ADEQUACY FOLLOWING PIPE BREAK"

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

1. SUBJECT

Category:	Engineering (2,000)
Subcategory:	22905
Element:	Control Air System Adequacy Following Pipe Break
Employee Concern:	IN-85-348-002

The concern, "Control air system does not appear to have sufficient volume to assure functionality if the system should experience a guilllotine air line break. Individual specifically requested a description of the maximum system volume available and of appropriate backup systems," was first investigated and found to be not valid for Watts Bar Nuclear Plant (WBN). Due to the similarity of the WBN compressed air system design with the Sequoyah (SQN) air system, it was decided by TVA to investigate the concern for applicability to SQN.

The concern does not specify whether a guillotine break was to occur in the Auxiliary Control Air (ACA) or Station Control and Service Air (SCSA) as an initiating event, or was to occur in either the ACA or SCSA subsequent to some other initiating event. The TVA evaluation considered both cases.

II. EVALUATION

As clarified by letter of February 1988, the SCSA system for Units 1 and 2 now contains four air compressors and three air receivers. A fifth (610 SCFM at 100 PSIG) air compressor is planned. Any two of the four SCSA compressors can satisfy all control air requirements during normal two unit operating conditions. The safety-related ACA system consists of two completely redundant sets of compressed air supply equipment and associated supply piping. It serves all safety-related plant components whose active functions require control air.

A TVA calculation is referenced which states that one ACA compressor (64.9 SCFM) under limiting conditions can supply both units with required shutdown air flow with 20 SCFM to spare.

The ACA air compressor is in a standby condition during normal plant operation. The ACA receivers are normally charged from the cross-connected SCSA. On indication of low pressure in the SCSA, the ACA compressors are automatically started. On further decrease in system pressure, both trains of the ACA are automatically isolated from the SCSA.

Guillotine Breaks Originating in the Air System

"High energy" piping is defined as that which normally operates at pressure above 275 PSIG or a temperature above 200°F, "Moderate Energy" piping is that which operates at a pressure and temperature below these values. It is required that both "guillotine breaks" and "critical cracks" be assumed (separately) in high energy piping but that only "critical cracks" be assumed in moderate energy piping. A concurrent Single Active failure is assumed concurrently with the breaks except when the break occurs in a dual purpose moderate energy system; that is, a safety grade moderate energy system that is used during normal operation and to mitigate the consequences of an accident. Reference NUREG-0800, SRP Section 3.6.1.

Air System Pipe Break as an Initiating Event

For the majority of the SCSA and ACA piping the design pressure is 105 PSIG and the design temperature is 100°F. The only exception is the air line from compressor discharge to the heat exchanger, for which the maximum design temperature is 260°F.

The portion of the ACA between the compressor and the heat exchangers is not pressurized during normal plant operation; as such, it falls into a category exempt from postulated piping failures. Therefore, only the SCSA compressor discharge lines to the after coolers require guillotine pipe break assumptions. However, a guillotine break in a SCSA compressor discharge line will not cause loss of system function as each of the compressors are separated from the main system headers by check valves. Each break would not interrupt normal plant operation or the function of the air system.

We may conclude therefore that a guillotine break in the control air system is not a valid initiating event to cause operational upset.

Pipe Break as a Subsequent Event

Another interpretation considered by TVA was a control air failure subsequent to some other initiating event. A "single failure" and a passive failure were each considered relative to postulated initiating events leading to plant shutdown. Functionality to achieve safe shutdown was considered assured through the use of the redundant ACA train.

Pipe Break Caused by the Initiating Event

By this we mean breaks in the air system resulting from a high energy break initiating event. As a result of NRC field evaluations to assess compliance with separation criteria, six nonconformance reports were issued in 1981 identifying inadequate separation of these high energy lines and the essential (ACA) headers both inside and outside containment. A review of two potential interactions was documented in calculation number NEB 810811274, R1. The

review concluded that the interactions were acceptable, because ACA services lost were not required to accomplish safe shutdown following the particular pipe breaks within range of the ACA. The analysis did not account for a concurrent single failure in the unaffected train of the ACA, since this portion of the ACA is a Dual Purpose Moderate Energy System; and therefore, is exempt from a Single Active Failure. Furthermore, the components of the ACA inside containment are designed to be single active failure proof while the components outside containment are accessible to the operators. We may conclude, therefore, that a single active failure following a critical crack in the ACA is beyond the design basis of the plant.

III. CONCLUSION

1. Guillotine breaks in the air system need not be considered as an initiating event.

2. The volume of one air receiver and the flow from one of the air compressors is adequate to support plant shutdown. The loss of all six compressors need not be postulated.

3. The present air system design at Sequoyah is acceptable since it satisfies the guidelines of NUREG-0800, SRP Section 3.6.1.