



HELPING BUILD ARKANSAS

## ARKANSAS POWER &amp; LIGHT COMPANY

9TH &amp; LOUISIANA STREETS • LITTLE ROCK, ARKANSAS 72203 • (501) 37

September 20, 1978

2-098-13

Mr. K. V. Seyfrit  
Office of Inspection & Enforcement  
Region IV  
U. S. Nuclear Regulatory Commission  
611 Ryan Plaza Drive, Suite 1000  
Arlington, Texas 76012

Subject: Arkansas Nuclear One-Unit 2  
Docket No. 50-368  
License No. NPF-6  
10CFR50.55(e) Significant Deficiency  
William Powell Valves  
(File: 2-0520)

Dear Mr. Seyfrit:

On August 22, 1978, we reported to Mr. Tom Westerman, Region IV, the failure of 2CV-4950 (a William Powell Co. valve). Attached is a final report on this deficiency.

Very truly yours,

Daniel H. Williams  
Manager, Licensing

DHW:CSF:tw

Attachment

cc: Mr. W. D. MacDonald, Director  
Office of Management Information  
and Program Control  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Dr. E. Volgenau, Director  
Office of Inspection & Enforcement  
Washington, D. C. 20555

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#### A. Description of the Deficiency

The valves in question are in the Chemical and Volume Control System (CVCS) and are associated with the Lo-Lo level of the volume control tank (VCT) and in boration of the reactor coolant system and are manufactured by William Powell Company.

The problem was first identified on valve 2CV-4873 which is located at the outlet of the Volume Control Tank. It is equipped with a motor operator manufactured by Limitorque Corporation. The valve was disassembled after it became stuck and the stem was found to be distorted. The stem was replaced with the spare stem which also became distorted after about 20 open and close cycles. The motor was found to cycle on and off after the valve was run to the closed position, i.e., the valve operator would run to the closed position, the motor stop on torque and a moment later the motor would start again. This cycling continued repeatedly. During this cycling the valve disk did not withdraw from the seat.

The valve specification calls for a maximum of 10 sec. closing time. In order to meet this requirement the Limitorque operator was furnished with non self-locking gearing. Without the self-locking gearing, it is a characteristic of the mechanical train for the stem compression to relax slightly through the non self-locking gearing and allow the torque switch to reclose. This arrangement causes no problem when a momentary contact control system is utilized and the torque switch reclosure will not re-energize the operator and drive the valve "shut". On ANO-2 the valve control system utilizes a continuous, not a momentary contact, which allows the motor to restart each time the torque switch closed.

The valve specification requires that "The motor will stall upon failure of the limit or torque switches without causing damage to any valve component or the motor operator." The material of the original and first replacement stem was 316 stainless steel. It appears that 316 does not have sufficient strength to meet the specification requirement.

Later, the same trouble occurred with valve 2CV-4950. It became stuck and upon disassembly the stem was found distorted. A replacement 316SS stem also distorted in the same manner. An investigation into all of the valves on this order was made to resolve the two problems: (1) electrical control and (2) stem distortion after repeated closures. All the valves in question are equipped with Limitorque operators.

#### B. Analysis of the Safety Implications

The valves involved are 2CV-4916, 4920, 4921, 4950 and 4873. All of the valves except 2CV-4950 receive an SIAS. Valve 2CV-4873, at the outlet of the VCT, closes upon SIAS to prevent dilution of the concentrated boric acid which is coming from valves 2CV-4921 and 2CV-4920 in the gravity drain lines at the outlet of the boric acid makeup tanks (BAMT), and 2CV-4916 at the outlet of the boric acid pumps. Valves 2CV-4921, 2CV-4920 and 2CV-4950 open upon an SIAS.

These valves, along with the charging pumps and boric acid pumps starting open to borate upon an SIAS. No credit is taken in the LOCA safety analysis for this boration. Conservative credit for these actions is taken in the main steam line break safety analysis, but a recent review of the calcula-

tions reveals that the effect of this credit is negligible. Boration for normal operation and for normal shutdown is unaffected by these valves.

Valves 2CV-4873 closes and 2CV-4950 opens upon Lo-Lo VCT level. If this should occur, the operator is informed first by a VCT Lo Level alarm and then by a Lo-Lo level alarm and will be alerted as to whether makeup is actually taking place by noting whether valve 2CV-4873 has opened and whether boric acid is flowing to the suction of the charging pumps by observing flow recorder 2FR-4926. If flow is not taking place, valve 2CV-4930 can be opened to the suction of the charging pumps. If suction to the charging pumps is not maintained and if the pressurizer level control, by terminating letdown, is not able to prevent pressurizer level from falling, ultimately, the reactor will trip on low pressurizer pressure without affecting safety.

The conclusion is that the malfunction does not change the conclusions of the plant safety analysis and has no effect on normal plant operations.

#### C. Corrective Action

The electrical circuitry of all 5 valves has been modified to include an "a" contact from the Limitorque motor controller which prevents torque switch limit cycling, see Figure 3. It opens the circuit when the torque switch opens such that the motor will not re-energize if the torque switch recloses due to the mechanical relaxation of the stem.

To correct the valve stem problem, new stems of heat treated 17-4 ph material have been substituted for the 316 stainless steel stem. Valve 2CV-4920 had been changed during construction to a valve of a different manufacturer and hence only circuit changes were made to this valve. These two actions will preclude the problem discussed.