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1993 ANNUAL REPORT - PRIMARY SAFETY AND RELIEF VALVE CHALLENGES

Dear Sir:

Carolina Power & Light Company (CP&L) hereby submits the 1993 Annual Report on Primary and Relief Valve Challenges as required by Technical Specification 6.9.1.2.4.

This report is being submitted six days late due to an oversight within the organization. Changes are being considered which should preclude this from occurring in the future.

If you have any questions concerning this submittal, please contact my staff.

Very truly yours,

R. M. Krich - Manager
Regulatory Affairs Section

JMM:lst
Enclosure
c: S. D. Ebneter
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1993 ANNUAL REPORT
PRIMARY AND SAFETY RELIEF VALVE CHALLENGES

EVENT: Challenge to Primary Relief Valve

Date: January 31, 1993

ACR: 93-020

DESCRIPTION: Pressurizer Power Operated Relief Valve (PORV) PCV-456 cycled three (3) times to reduce Reactor Coolant System (RCS) pressure. The actuations occurred rapidly over one minute. The unit was at 100% power with no testing in progress. RCS pressure decreased from nominal pressure of 2235 psig to 2205 psig when the PORV stopped cycling. The PORV controller was placed in Manual and RCS pressure recovered to 2235 psig. Multiple alarms were received as expected. Additionally, an unexpected alarm annunciated, APP-006-A4, "HI STM LINE ΔP," which occurred on Steam Line "C".

An evaluation of this event has been performed and the analysis and cause are presented below.

Several Work Requests were initiated to investigate the problems since the PORV should not have actuated with the RCS at normal pressure.

The first Work Request checked the operability of PC-455A (controller for PCV-456). The results and corrective actions are presented below.

1) PC-455A A1X relay coil had failed.

2) Bench test of comparator module PC-455A revealed a failed Triac. This failure caused the circuit to be sensitive to minor instrument bus voltage fluctuations. Further bench testing revealed that if bus voltage was reduced to 116V, then PC-455A would cause the relay to chatter, thus causing the PORV to cycle.

3) The Triac was replaced in the module and the module tested. The test revealed that voltage variations no longer caused the chattering.

4) A new PC-455A was obtained from stock, tested, and placed in the Hagan racks.

The second Work Request investigated the possibility of an instrument bus power supply problem. The results and corrective actions are presented below.

1) A Nicolet oscilloscope was connected to Instrument Bus 3. The scope was set to trigger on bus voltage fluctuations. The scope was installed for two (2) days and no fluctuations were indicated.

2) A pen recorder was connected to Instrument Bus 3 to monitor voltage. The recorder trace indicated a long duration (approximately 21 hours) voltage cycle of approximately 4V. This is well within the $\pm 5\%$ tolerance of the invertor. This indicated that the power supply was functioning normally.

The information from the two Work Requests was used to construct the probable cause for the PORV actuations. The scenario is described below.

1) For unknown reasons, the Triac failed on PC-455A. (This is the first time a voltage sensitive failure of a Triac occurred at H. B. Robinson. Past failures have either been open or short circuits.)

2) As bus voltage went through its normal variation and dropped to 116V, PC-455A caused PC-455A A1X relay to begin to chatter. This caused PCV-456 to cycle. After several cycles, the relay failed, thus stopping the cycling of PCV-456.

It was also determined that the annunciation of APP-006-A4 was caused by the same type failure of a Triac on PC-495.

A Nuclear Plant Reliability Data System (NPRDS) search revealed numerous Triac failures, however, they appeared to be open or short circuit failures.

The Hagan racks are presently being upgraded with current technology equipment through a Plant Improvement Request Project. As this effort continues, the possibility of this recurring will diminish, and when completed, should preclude recurrence.

EVENT: Challenge to Primary Relief Valve

Date: November 2, 1993

ACR: 93-254

DESCRIPTION: Pressurizer Power Operated Relief Valve (PORV) PCV-456 cycled two (2) times to reduce Reactor Coolant System (RCS) pressure. The actuations occurred rapidly. The unit was in cold shutdown, filled and vented (water solid) with the Low Temperature Over Pressure Protection (LTOPP) System in service. Preparations for starting Reactor Coolant Pump (RCP) "A" were in progress. Minimum RCS pressure to operate a RCP is 325 psig. The upper limit for RCS pressure is 400 psig when LTOPP is required to be in service. RCS pressure was being maintained just above 325 psig, and upon start of the RCP, RCS pressure rapidly rose to the LTOPP setpoint. PORV PCV-456 lifted and reseated twice before RCS pressure control could be regained. Following RCP start and prior to the initial LTOPP actuation, the control operator noted that PCV-145, which controls RCS pressure under these plant conditions, was not opening to control pressure. The controller was in automatic and was expected to respond to the RCS pressure increase. The control operator took immediate action to place the PCV-145 controller in manual and reduce RCS pressure. This action was not able to prevent LTOPP actuation.

The cause of the event was failure of the Pressure Controller PCV-145 to respond to the pressure transient in automatic. A Work Request was initiated to investigate the slow response of PCV-145. The gain adjustment of the PCV-145 controller was adjusted to provide faster response to transients. Following the adjustment, PCV-145 has responded as expected.

Two contributing causes have been identified in addition to the controller response time.

Failure to perform timely and effective maintenance on PCV-145 was the first contributor. There already existed a Work Request to address the sluggish behavior of PCV-145. The work was delayed due to the unavailability of the system. The system is required to be in operation at all modes except when the entire core is offloaded to the Spent Fuel Pit. Collectively, the Operations, Maintenance, Technical Support and Work Control Organizations did not communicate and coordinate to the extent necessary to work PCV-145 prior to it contributing to a plant transient.

In tandem with the contributing cause discussed above, another contributor was the failure to dedicate an Operator to address pressure control during the evolution. There was a Deficiency Tag and caution cap on the controller which were available to alert the Operator to the potential problems.