



Commonwealth Edison  
1400 Opus Place  
Downers Grove, Illinois 60515

April 19, 1991

DCD

Mr. A. Bert Davis  
Regional Administrator - Region III  
U.S. Nuclear Regulatory Commission  
799 Roosevelt Road  
Glen Ellyn, Illinois 60137

Subject: Quad Cities Nuclear Power Station Units 1 and 2  
Response to a Level IV Violation  
Inspection 50-254/91007, 50-265/91004  
NRC Docket Nos. 50-254 and 50-265

Reference: W. D. Shafer letter to Cordell Reed dated  
March 21, 1991 Transmitting NRC  
Inspection Report 50-254/91007, 50-265/91004

Dear Mr. Davis:

Enclosed is Commonwealth Edison Company's (CECo) response to the subject Notice of Violation (NOV) which was transmitted with the referenced letter and Inspection Report. The NOV cited a level IV violation for inadequacies found in the modification design document and in the post-modification testing with respect to a modification for the standby liquid control pump system.

If your staff has any questions or comments concerning this letter, please refer them to Rita Radtke, Compliance Engineer at 708-515-7284.

Very truly yours,

T. J. Kovach  
Nuclear Licensing Manager

cc: L. Olshan-Project Manager, NRR  
T. Taylor-Senior Resident Inspector-QC  
NRR Document Control Desk

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## ATTACHMENT

### RESPONSE TO NOTICE OF VIOLATION NRC INSPECTION REPORT 50-254/91007; 50-265/91004

#### VIOLATION

10 CFR 50, Appendix B, Criteria III, Design Control, requires, in part, design control measures shall provide for verifying or checking the adequacy of design. Where a test program is used to verify the adequacy of a specific design feature in lieu of other verifying or checking process, it shall include suitable qualifications testing of a prototype unit under the most adverse design conditions.

10 CFR 50, Appendix B, Criterion XI, Test Control, requires in part that all testing required to demonstrate that systems and components will perform satisfactorily inservice is identified and performed in accordance with written procedures that incorporate the requirements and acceptance limits in applicable design documents.

Contrary to the above, in February 1991, a NRC review of modification design document M4-1(2)-85-42 and the post-modification test performed in 1987 found inadequacies. Neither the design document nor the post-modification test adequately specified the water temperature test requirements necessary to verify the design net positive suction head for the standby liquid control system pumps under the most adverse design conditions.

This is a Severity Level IV violation (Supplement I).

#### DISCUSSION

The Standby Liquid Control System (SBLC) was designed to bring the reactor to a shutdown condition from full power at any time during core life, independent of the control rod drive hydraulic system. A neutron absorber solution (sodium pentaborate) is injected into the reactor to bring the reactor from full power to a subcritical condition, i.e., a boron concentration of 600 ppm in the reactor core. Technical Specification 3.4.C requires a minimum tank volume of 3733 gallons and a minimum sodium pentaborate concentration of 14 weight percent. Technical Specification Surveillance 4.4.A.1 requires a minimum flow rate of 40 gpm against a system head pressure of 1275 psig.

To comply with the Anticipated Transient Without a Scram (ATWS) rule (10 CFR 50.62), the SBLC system was modified to provide additional flow capability. This was accomplished by adding a second suction line from the storage tank to the pump suction header, allowing dual pump operation. Post modification testing consisted of the performance of the monthly single pump operational surveillance test, the single pump reactor vessel injection surveillance, and a dual pump test to ensure that the pumps would deliver 80 gpm and be able to operate simultaneously without cavitation.

CECo has reviewed the modification design package (M4-1(2)-85-42), and the post-modification test results, and agrees that the post modification testing was inadequate to demonstrate satisfactory operation of SBLC pumps at the most adverse limits of tank level and temperature.

## ATTACHMENT (continued)

### CORRECTIVE ACTIONS TAKEN AND RESULTS ACHIEVED

In response to NRC unresolved item 50-237/00017-06 dated August 24, 1990, for Dresden Station, which involved the adequacy of the post-modification testing performed on the SBLC system following a similar ATWS modification, CECO retained the services of a reciprocating pump consultant to perform an evaluation of the SBLC pumps at Dresden and Quad Cities Stations. Based on the available design information, the consultant was unable to completely resolve the issues regarding the adequacy of Net Positive Suction Head (NPSH) for single pump operation, or the potential for two pump interaction when the pumps are operating simultaneously. The consultant recommended performing additional testing or system modifications to resolve this issue. Based on the results of this evaluation, two actions were taken: (1) plans were made to perform a test to demonstrate adequate NPSH for single pump operation, and (2) General Electric (GE) was retained to perform an analytical evaluation of the potential for adverse pump interaction.

A single SBLC pump test was performed on February 11, 1991 at Quad Cities Unit 1, to verify adequate pumping capability. The test consisted of operating one pump in the test mode while monitoring the flowrate and solution temperature. In the test mode, demineralized water is recirculated through the test tank. To simulate a NPSH equivalent to pumping from the main tank at the lowest level and highest temperature (120 °F), calculations indicated that a temperature of up to 128 °F was required depending on the tank water level and the barometric pressure. The acceptance criteria for this test was a flowrate of 40 gpm or greater. During the test, the pump flowrate dropped below the 40 gpm limit at a solution temperature of 113 °F. Based on the results of this test, administrative restrictions on the storage tank level and temperature were imposed at Dresden and Quad Cities Stations to ensure adequate NPSH.

	<u>Dresden</u>	<u>Quad Cities</u>
Minimum storage tank level	3680 gallons	3819 gallons
Maximum temperature	95 °F	100 °F
Minimum sodium pentaborate concentration	14 weight %	14 weight %

To resolve this issue, dual pump tests were performed at Dresden Unit 2 and Quad Cities Unit 1 to verify the pumping capability using two pumps. For these tests, both pumps were operated to deliver sodium pentaborate solution from the main SBLC storage tank to temporary storage tanks located on the refueling floor of the reactor building. The test at Dresden Unit 2 was performed with a tank temperature of 95 °F, the administrative limit. The test fully met acceptance criteria of delivering 3329 gallons of solution at a minimum flowrate of 80 gpm, and was terminated when the tank level reached the top of the suction connection. The flowrate remained above the 80 gpm limit throughout the test, without any indication of pump interaction. Three dual pump tests, identical to the Dresden test, were performed at Quad Cities. The first test was performed at a tank temperature of 94 °F, the second at 110 °F, and the third at 120 °F. In each case the test results fully met the established test criteria, without any indication of pump interaction.

## ATTACHMENT (continued)

The Quad Cities Unit 1 SBLC pumps are identical to those used for Quad Cities Unit 2, and Dresden Units 2 and 3. The arrangement of the piping and the tanks is also similar, with the exception of the length of the suction line. One of the suction lines at Quad Cities Unit 1 is approximately 15 feet in length and is the most limiting for NPSH. The suction line for the other units are 12 feet or less, and therefore are bounded by the Quad Cities Unit 1 test results. Based on the results of the Quad Cities Unit 1 dual pump test at 120 °F, the administrative temperature limit was increased to 110 °F for all four units. The difference between the 120 °F test temperature and the 110 °F administrative limit provides a margin to account for differences in barometric pressure and other uncertainties.

### CORRECTIVE ACTIONS TO AVOID FURTHER VIOLATION

1. The Engineering procedures for performing modifications have been revised to reflect a major upgrade to the modification program which began in 1988. Procedure ENC-QE.06.4, Modification Acceptance Testing Evaluation was written to ensure that a thorough review of the modifications is performed to establish adequate post modification testing with appropriate acceptance criteria.
2. To provide additional assurance that this deficiency will not recur, Engineering is developing a "Lessons Learned" presentation on the specification of testing acceptance criteria. This violation will be used as an example of inadequate testing. Engineering personnel performing modification work will either attend this presentation or receive a written copy of the presentation by June 30, 1991.

### DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED

Full compliance was achieved with the completion of the dual pump tests on March 13, 1991, which demonstrated that the SBLC system would perform satisfactorily as required by 10 CFR 50, Appendix B.