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June 14, 1994

Docket No. 50-213
B14860

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

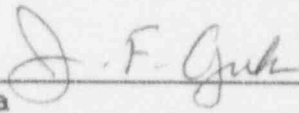
Haddam Neck Plant
Response to Request for Additional Information
Foxboro SPEC 200 Micro Card Failure

The purpose of this letter is to respond to a verbal request from the NRC Staff for information on the March 24, 1994, failure of the Foxboro SPEC 200 Micro Card at the Haddam Neck Plant. The NRC Staff's questions and Connecticut Yankee Atomic Power Company's responses are contained in the attachment to this letter.

If you should have any questions on the attachment, please contact Mr. T. G. Cleary at (203) 665-5700.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY



J. F. Opeka
Executive Vice President

cc: T. T. Martin, Region I Administrator
A. B. Wang, NRC Project Manager, Haddam Neck Plant
W. J. Raymond, Senior Resident Inspector, Haddam Neck Plant

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Attachment 1

Haddam Neck Plant

Foxboro SPEC 200 Micro Card Failure

June 1994

Question

1. Discuss the function of the Foxboro SPEC 200 Micro Card FAIL LED.

Response

1. Foxboro Maintenance Instruction MI 280-300 states that the function of the red fail lamp is to indicate an abnormal card condition to the user. The lamp has three possible states, off, blinking, and steady on. When the red fail lamp is off, the card is gathering measurements, processing blocks and producing outputs to control the process. When the fail lamp is blinking, the on-line diagnostics within the control card has detected a system error that could potentially corrupt the ability of the control card to properly execute a block algorithm and may send a faulty output signal to the control card outputs (unsecured process control). Typically, a system error will occur. Control is halted and the card output states fail per user jumper configuration. The microprocessor is able to reset itself if it passes diagnostics. In this case, CYAPCO would verify the card's database, investigate the faulted condition reported by the card and restart the card, all using a remote PC. When the fail lamp is steady on, the microprocessor diagnostics have detected a fault which could result in an unsecured process control (due to a software or hardware related failure). Control is halted and the card output states fail per user jumper configuration (with the exception of certain hardware failures which could prevent this). The microprocessor is unable to reset itself and pass diagnostics. The card is not able to communicate its condition or failure mode to a remote PC. In this case CYAPCO would replace the card and take steps to determine the failure mechanism.

Question

2. Differentiate between software and hardware failures (In that a hardware failure may fail as-is but the software failure is fail-safe).

Response

2. In the event of a software failure, the card is designed to fail safe or to the tripped condition. This is not always the case involving hardware failures. Certain hardware failures on a SPEC 200 Micro card can be detected by the microprocessor diagnostics program, and subsequently this results in the card outputs moving to the fail safe or tripped state. Other hardware failures can only be detected during routine surveillance procedures. The component may fail in the safe

position or may fail "as-is". It should be emphasized that the failure mode of a component failing as-is has not been eliminated by the replacement of analog components with digital ones. However, replacing analog components with digital upgrades has added redundancy for protection and control and has improved the system's tolerance to single hardware or software failures.

Question

3. Provide information about the recent failure (results of investigation).

Response

3. The root cause of the card failure as determined by Foxboro, the manufacturer, was an isolated hardware failure. A tantalum capacitor in the card's RAM memory power supply circuit failed and caused the module to enter the reset state. Both the analog and logic outputs are designed to hold to the last value. CYAPCO has determined that based on the as-found logic states of the card following the failure, SG#1 narrow range level had to be below the low level trip setpoint while SG#2 narrow range level had to be above the low level trip setpoint. These generator levels would be required at the time of the failure for the card logic outputs to fail to the as-found states. CYAPCO reviewed the SG#1 and SG#2 narrow range level recorder charts and identified that this condition occurred at least one time following the last performance of SUR 5.2-124.4, "Reactor Trip Logic Cabinets B2/4R Coincidence Test (Six Week)." The last performance of SUR 5.2-124.4 was the last time the card was known to be functioning properly.

CYAPCO has surveillance procedures in place at this time which will identify failures of this type which are not apparent or are blind to the operators. Presently, a weekly preventative maintenance has been initiated by CYAPCO as a conservative action to verify LED status of each SPEC 200 Micro card in the Reactor Protection System (RPS). This action is beyond the requirements of the technical specifications. CYAPCO will continue to assess the need and/or frequency of this activity. Additionally, an analog channel operational test is performed on each RPS cabinet every four weeks. A single card failure, which could only affect one RPS train, would be identified during the performance of these surveillance procedures.