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TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

February 6, 1981

Mr. James P. O'Reilly, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region II - Suite 3100
101 Marietta Street
Atlanta, Georgia 30303

Dear Mr. O'Reilly:

OFFICE OF INSPECTION AND ENFORCEMENT BULLETIN 80-17, SUPPLEMENT 4 - RII:JPO 50-259, 50-260, 50-296 - BROWNS FERRY NUCLEAR PLANT

Enclosed is our response to your letter dated December 18, 1980, to H. G. Parris which transmitted OIE Bulletin 80-17, Supplement 4. This submittal is an interim response and is intended to inform you of the status of the scram discharge volume (SDV) level continuous monitoring system (CMS) at our Browns Ferry Nuclear Plant.

On January 20, 1981, we submitted a letter from J. L. Cross to you outlining our subsequent program and plans for making the General Electric (GE) CMS operable on all three units. Your January 21, 1981, letter to H. G. Parris confirmed your agreement to allow continued operation of units 1, 2, and 3 at Browns Ferry.

Because of problems encountered in our experiences in attempting to make the GE CMS operable, we have not been able to establish that the GE CMS can provide a reliable, unambiguous indication of water in the SDV at Browns Ferry. Therefore, we are abandoning the GE CMS and are pursuing the permanent installation of the Krautkramer Ultrasonic System which has been in use for the past seven months at Browns Ferry. The dual-monitor Krautkramer System is presently in operation on unit 3 and should be operational on units 1 and 2 by February 17, 1981. We then plan to have the four-monitor Krautkramer System installed shortly after receipt of additional hardware. Purchase requisitions for additional hardware are being expedited in an effort to avoid equipment procurement problems. We will notify you immediately if there are any changes in the above schedule.

We will provide a final response following completion of acceptable testing and operability of the CMS on all three units. Approximately 120 man-hours were expended in preparation and review of this interim report. If you have any questions, please call Jim Domer at FTS 857-2014.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Regulation and Safety

Subscribed and sworn to before me
this 6th day of Feb. 1981.

Paulette N. White
Notary Public

My Commission Expires 9-5-84

Enclosure
cc: Mr. Victor Stello, Director (Enclosure)
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

ENCLOSURE

RESPONSE TO OIE BULLETIN 80-17, SUPPLEMENT 4
BROWNS FERRY NUCLEAR PLANT
FAILURE OF CONTROL RODS TO INSERT DURING A SCRAM AT A BWR

This submittal is an interim response and is intended to inform you of the status of the scram discharge volume (SDV) level continuous monitoring system (CMS) at Browns Ferry Nuclear Plant as related to the subject supplement 4.

Subsequent to installation and calibration of the CMS on the scram discharge headers, we had experienced difficulties similar to those at Dresden Nuclear Power Station and addressed in NRC Bulletin 80-17, Supplement 4. Specifically:

1. As the system was installed, the external noise was large enough to interfere with system operation. We believe the noise problem has been eliminated by increasing the signal strength.

2. Approximately 1/8-inch of water in the SDV header has caused false high water level alarms. This problem apparently results from the increased signal strength.

3. We have found that the system operation is extremely sensitive to transducer location on the headers. This sensitivity may change over a period of time during system operation.

4. Crosstalking had been experienced with the system, but at this time we believe it has been eliminated by the installation of triaxial cable. We are still in the process of determining if crosstalking exists between the temporary TVA-installed system and the General Electric (GE) system.

With our originally installed system, the potential malfunction modes addressed in the supplement were occurring; however, we believe that they may have been caused by low signal strength and not having an optimized system. Additionally, our tests to date indicate that a loss of signal due to turbulence may be an inherent problem of the designed CMS.

We presently have enough equipment to install two Krautkramer Systems per unit, one on each SDV header, with no spares onsite. This design is more conservative, but could lead to a reduced plant availability due to spurious signals. In this system arrangement, our operating procedures would require a manual scram upon receiving a level alarm that will not clear from either of the two monitors.

As additional equipment becomes available, we plan to install four of Krautkramer UT Systems per unit, two on each SDV header. Our operating procedures would then be changed to manually scram on a two out of four alarms (similar to the reactor protection system logic). This would increase both system reliability and plant availability.

The following are our interim actions taken in response to Bulletin 80-17, Supplement 4.

Response to Item 1 - Bench Test of CMS

A. The basic system layout is similar to that of the previously provided information on the GE system. A system description and a schematic of the Krautkramer System is shown on Attachment A.

B. This information was supplied from GE to the NRC on December 12, 1980, and is still pertinent.

C. A calibration standard of the same nominal thickness as the bearing system is used. This standard will be of sufficient capacity to equal or exceed the capacity of the fluid system. A second calibration standard approximately one-fourth to one-half the capacity of the fluid system is also used. With the ultrasonic instrument connected to the transducer mounted on the calibration standard, the instrument sweep is adjusted to represent a minimum of two echos from the pipe wall. The gain of the instrument is then adjusted to set the initial back wall response to approximately 80 percent FSH.

The sweep is then adjusted to show a minimum of one reflection from the back side of the standard. The signal is set such that each major division presents approximately one-inch of water. The transducer is then placed on the smaller standard and the sweep adjusted to measure this water level. This is repeated until sweep linearity is obtained.

The ultrasonic instrument was sufficient gain to amplify the signal obtained to a minimum of 80 percent FSH. The ultrasonic instrument gating system is set at a level that any signal which appears on the screen that represents 1-1/2 inch $\pm$ 1/4-inch of the fluid level greater than 20 percent FSH will actuate the high alarm circuit in the control room.

Connecting cables will be coaxial and triaxial and their lengths limited to less than that at which signal degradation occurs, but will not exceed 200 feet.

D. All personnel performing the calibration test are certified in accordance with ASNT-TC-1A (June 1975) "Recommended Practice For Personnel Qualification And Certification In Nondestructive Testing" to either level I, level II, or level III.

Response to Item 2 - Operability Test of CMS

GE System

On December 29, 1980, testing was performed in an effort to determine the response of the CMS to water in the headers. The test consisted of a multiple (2) rod scram test on unit 2 while in operation. This testing was inconclusive since only a very small amount of water was introduced into the header by the rods.

On December 28, 1980, unit 2 was inadvertently tripped while performing surveillance testing, and no alarm was received from the CMS on either scram discharge header. After the initial trip, a rods-in scram was performed, and the alarm was still not received. Subsequently, the temporary UT sensors were placed near the CMS transducers, and an additional manual trip was initiated. The temporary system indicated that water was present and drained properly, but again the CMS gave no indication.

Following these tests, an oscilloscope and brush recorder were installed to monitor one CMS channel. Additional trips were initiated with no indication on the recorder and only a very small amplitude signal (150 mV) on the oscilloscope. Modifications recommended by GE were implemented, but no improvement in system performance was found.

On December 29, 1980, unit 1 was removed from service due to a generator cooling problem. Before the unit trip, brush recorders and oscilloscopes were installed to monitor the CMS output. Following the trip, the temporary monitors indicated normal amounts of water in the header while the CMS gave no output. Per GE recommendations, the CMS sensors were relocated and a single channel modified to increase sensitivity. An additional trip was performed, and only a very brief pulse of sufficient magnitude to initiate the high-level alarms was indicated, and the alarm immediately cleared.

We have had vendor representatives onsite assisting in system optimization and modification on unit 3 during the refueling outage. Our attempts to prove operability were responsive to the NRC requirements for the 14-day tests, and additional time was granted to continue testing.

Krautkramer System

The reliability of this system to detect water in the SDV header during operation has been demonstrated for the past seven months, and we believe that no further proof is needed regarding operability.

Response to Item 3 - Interim Manual Surveillance

The installed two-Krautkramer System on unit 3 was successfully tested by performing individual rod scrams. Until satisfactory testing of the CMS on each unit is completed, we plan to continue our previous 30-minute checks with the temporary units, which have been found fully acceptable under all normal and transient conditions.

Response to Item 4 - Full Test of CMS to be Conducted During a Planned Outage

This testing will be completed as required by the bulletin.

Response to Item 5 - Operability of CMS During Reactor Operation

The operating instructions have been revised to include the requirements of the bulletin. The instructions are now being held in abeyance pending confirmation of system operability.

Additional, proposed technical specification changes will be submitted by March 1, 1981, for approval.

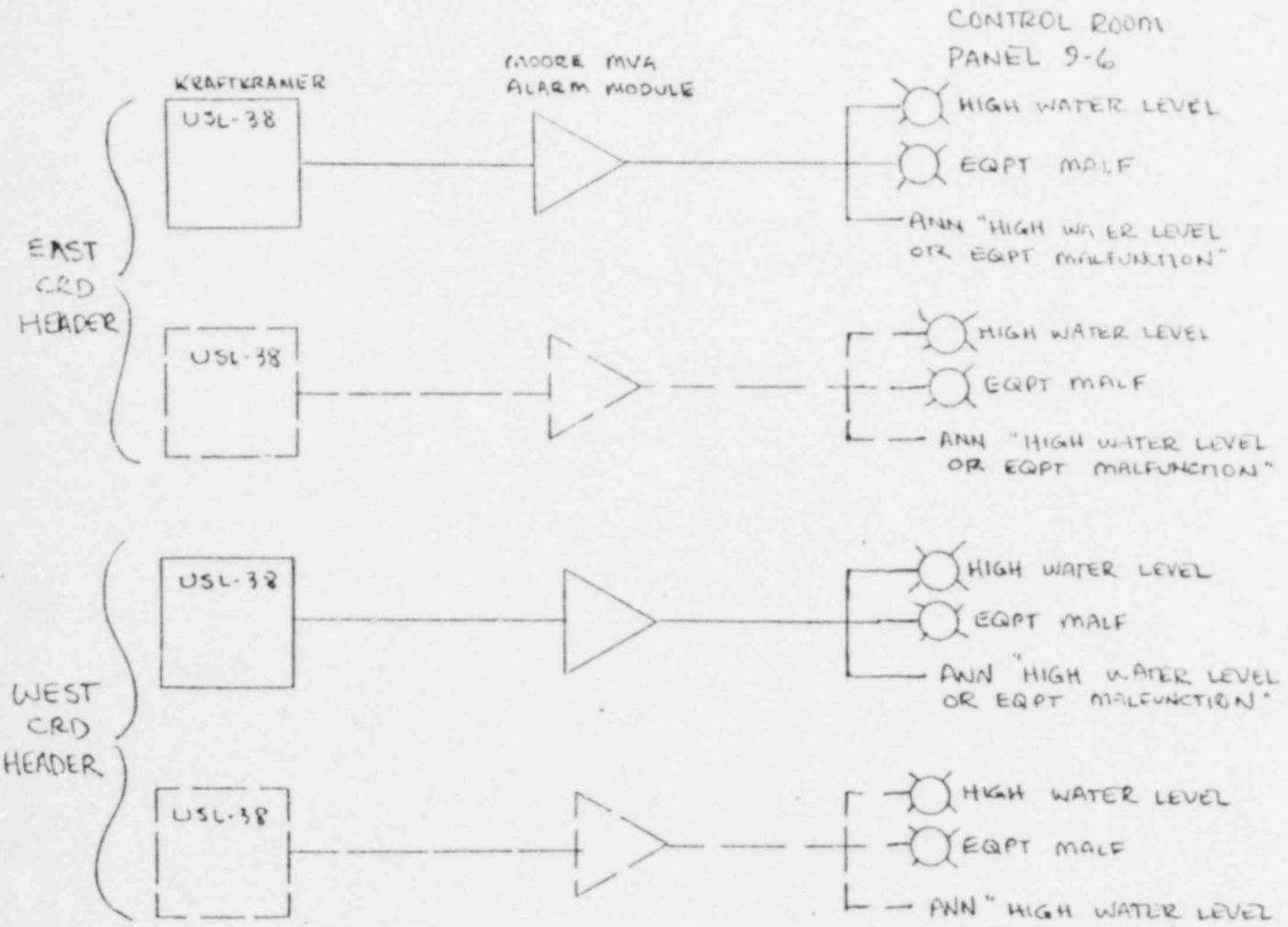
Response to Item 6 - Operating Procedures

Appropriate operating procedures will be developed in response to the bulletin.

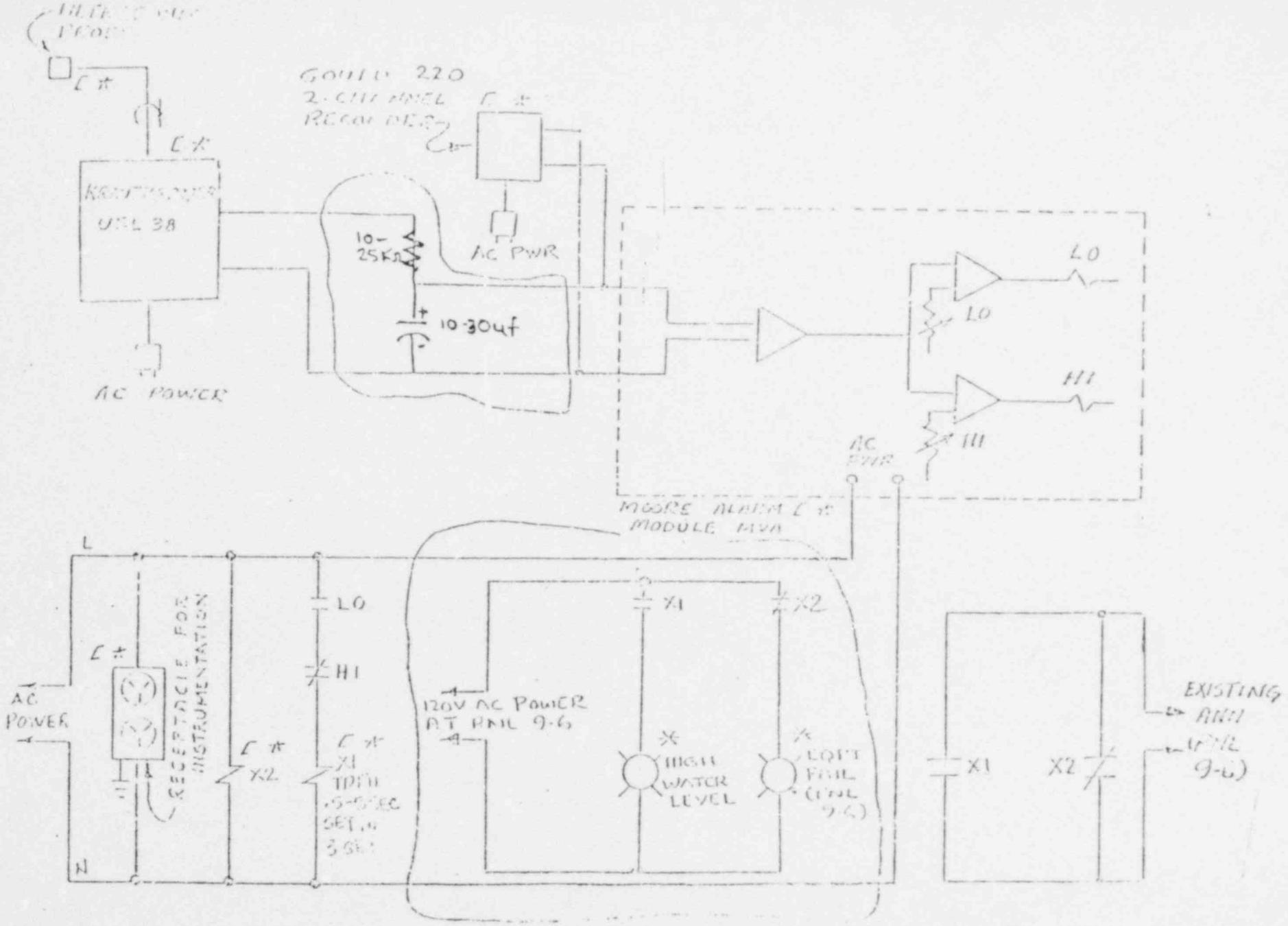
Upon satisfactory operation and testing of the CMS, we will submit a final response to the supplement.

ATTACHMENT A

The "K" scram discharge water level monitoring system will have four redundant channels; two per CRD header. The output of the kraut-kramer USL-38 is supplied to a millivolt alarm module. The output to the MVA module is approximately 5.5 volts when the header is empty; goes through a zero inflection point at about 1/2-inch water and is about 4.5 volts with the header full. The low relay is set at 1-1/4-inch $\pm$ 1/4-inch of water and the high relay is set at greater than full header but less than empty header. Thus, the logic LO-$\overline{\text{HI}}$ to pick-up the time delay relay. The input to the MVA also has a RC network for independence matching and noise suppression. The time delay relay (X1) is set for three seconds and should help eliminate any spurious alarms. Relay X2 provides a malfunction light and annunciator on loss of AC power to the local panel.



SKETCH "A"
BLOCK DIAGRAM
OF "K" SYSTEM



SKETCH B
SCHEMATIC