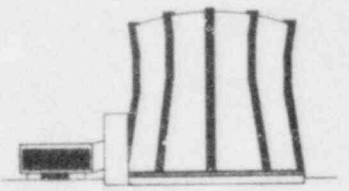
TEXAS ENGINEERING EXPERIMENT STATION

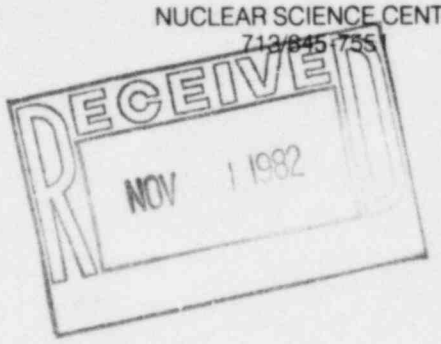
THE TEXAS A&M UNIVERSITY SYSTEM

COLLEGE STATION, TEXAS 77843



NUCLEAR SCIENCE CENTER
713/845-7551

29 October 1982



Mr. G. L. Madsen
Office of Inspection and Enforcement
Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza, Suite 1000
Arlington, Texas 76012

Subject: Failure of Safety Channel Indications During Reactor Operation.
Reported 10-20-82.

Dear Mr. Madsen:

Enclosed is a final report of a reportable occurrence observed during reactor operations of the NSCR. This report is submitted in compliance with Section 6.4 and 1.8c of Change No. 11 of the Technical Specifications, Facility License No. R-83 for the Nuclear Science Center, Texas A&M University.

Sincerely,

Dale Rogers

Dale Rogers, Manager
Reactor Operations

DR/ym

Enclosure

IE22

Final Report of Violation Due to
Failure of Safety Channel Indications
During Reactor Operation

Reportable Occurrence

On October 19, 1982 at 1740 while operating at 1 megawatt the reactor operator noted that power level indication dropped to approximately 15% on both safety channels. Because the instrument had been experiencing intermittent noise problems for approximately one week prior to this event, the operator felt the instrument had failed and commenced an immediate shutdown. There was no scram amplifier alarm present, but there was, however, a servo fault alarm. After evaluating the trace on the Log Channel chart recorder, NSC management felt that a control rod had been dropped but this could not be verified by the reactor operator. An investigation was begun, and since the problem could not be readily located it was reported as an instrument failure by phone/telegram to NRC Region IV on October 20, 1982.

Prior to this event, the Safety Channel instrument had been experiencing intermittent problems beginning on October 12, 1982. On that date there were three occasions in which a "High Power Channel #1" light was received but with no corresponding scram or high power indication. This light is for information purposes only and is triggered by an SCR in parallel with the scram relay. The SCR having a very short response time is very sensitive to noise spikes and could conceivably give the indication seen without causing an actual scram to occur. After the third occurrence the reactor was shutdown, and an attempt to locate the source of noise was begun. It was also verified at this time by applying a test signal that when the light condition did exist, the reactor scram protection was still available. Because of the intermittent nature of the problem and the fact that reactor safety was not affected the reactor was started up and observed carefully for further problems.

Over the next one week period several more intermittent lights appeared, and several attempts were made to locate the source of the noise. Detector leads and circuit boards were swapped in an effort to transfer the problem to Channel #2. The source of noise had not been located as of October 19, 1982 at which time the drop in indication to 15% on both channels was observed.

Corrective Action

Further efforts were made to locate the problem over the next few days, and on October 21, 1982 it was felt that the Channel #1 detector and/or cabling to the reactor bridge could be the source of noise. Both the cabling and detector were replaced and appeared to correct the problem. The reactor was operated for approximately 3.5 hours on October 22, 1982 with no more intermittent light indications. However, on October 25, 1982 after about one hour of operation the "High Power Channel #1" light again appeared. A further investigation of cabling resulted in locating a frayed section in the insulation and also a bad connector to the instrument drawer. In addition, very large noise spikes were located at the output of the Channel #1 high voltage power supply. In moving this supply to Channel #2 the light problem was shifted to the corresponding channel. On

October 26, 1982 NSC management met with a Reactor Safety Board subcommittee to explain the instrumentation problem and to obtain approval for continued reactor operation with the existing power supply since delivery time on a new one would be approximately 10 weeks. (Replacement H.V. supply is on order). It was pointed out to the subcommittee that scram protection would still be available during noise spikes and also in the event of a complete failure of the power supply. As a second alternative the board also approved the use of an external power supply having appropriate current, voltage, and percent regulation ratings.

On October 27, 1982 the reactor was started up using the original power supply. However, at 0826 the reactor operator noticed that Shim Safety (SS) #2 had dropped. The reactor was shutdown and an equivalent external power supply was connected. Again, fluctuations were noted in electromagnet currents and SS #2 dropped. Throughout the day various efforts were made to isolate the source. During a subsequent dropping of SS #1 it was noted that the electromagnet current for this rod went to zero while the other currents stayed at approximately 70 milliamps. This made the electromagnet coil for SS #1 suspect and upon investigation it was found to be bad. This coil was replaced, the rod drive was operationally tested, and the reactor was started up to full power at 1620. It has continued to operate with no further problems noted thus far.

It is felt by NSC management that two significant problems were identified and corrected during this period: a failure of the high voltage power supply for Safety Channel #1 and a failed coil for SS #1. It should be noted, however, that the original report to Region IV pertained to an apparent failure of the Safety Amplifier instrument. After the observations of the past week, it is now our conclusion that the original problem of October 19, 1982 was indeed a dropped rod and not an instrument failure as indicated.