DOCKET-50231--72

GENERAL ELECTRIC

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NUCLEAR ENERGY
DIVISION

BREEDER REACTOR DEVELOPMENT
OPERATION

MASTER

March 2, 1971

Dr. Peter A. Morris, Director
Division of Reactor Licensing
U.S. Atomic Energy Commission
1717 H Street
Washington, D.C. 20545

RE: License No. DR-15
Docket No. 50-231

Dear Dr. Morris:

Attached is a summary report of a condition that was detected at SEFOR on February 21, 1971. This condition has been judged to be reportable under Section 3.C(1) of the SEFOR Operating License. The Regional Compliance Office in Atlanta, Georgia, was notified of this event by telephone.

Very truly yours,

Karl Cohen

Karl Cohen
General Manager

cc: J. G. Davis, Director
U.S.A.E.C., Div. of Compliance
Atlanta, Georgia

MALFUNCTION OF A SAFETY SYSTEM TRIP RELAY

A. Description of the Event:

The reactor was shut down during the period February 6, 1971 through February 25, 1971 to perform modifications required for the transient test program and to perform other maintenance. During the performance of pre-operational surveillance tests[1] on February 21, 1971, the scram chassis test switch for one of the three "High Temperature Core Outlet, Upper Region,"[2] thermocouples failed to initiate a safety system trip (scram) when it was placed in the trip test position. The other two circuits tested satisfactorily. These thermocouples provide for reactor scram, in a one-out-of-three logic, in the event of high coolant temperature in the upper region of the reactor vessel. The failure to initiate a scram signal was caused by mercury-wetted contacts which were stuck closed on relay K5 in the 125 VDC circuit.[3] Other contacts on the same relay functioned properly to provide an annunciator signal, a light on the scram chassis, and a signal to the sequence recorder. The sodium temperature at the time was normal (∿500°F).

The relay was subsequently replaced and proper system operation was demonstrated after appropriate corrective actions (described below) were taken.

B. Conclusions:

1. The most likely cause of the malfunction was a momentary overcurrent condition in the 125 VDC system, which occurred during checkout of system modifications on February 13, 1971.
2. The overcurrent condition was caused by inadvertent installation of low rated voltage capacitors. Properly rated capacitors were subsequently installed.
3. System modifications have been satisfactorily completed and checked out. Therefore, future malfunctions due to similar causes are not expected to occur.
4. The possibility of contact damage due to induced currents when the scram bus is de-energized did exist at the time of the malfunction, although no failures due to this cause have occurred at SEFOR. This

possibility has been essentially eliminated by the installation of selenium contact protectors on all 18 of the scram and containment isolation relays.

5. It is safe to resume reactor operation.

C. Discussion:

1. The most probable cause of the malfunction occurred on February 13, 1971, while the safety system was being modified to provide a time delay, as permitted by paragraph 3.12.B.4 of the Technical Specifications. This time delay consists of an RC circuit installed in parallel with the coil of each of the six scram contactor relays. Three of the six capacitors supplied by the vendor were later found to be of insufficient voltage rating. The system checkout, performed after these capacitors were installed, resulted in a momentary breakdown of one or more of the capacitors and caused a trip of the 125 VDC feed breaker. At the time of the incident, scram buses A and B were open and power was jumpered around their respective scram relay chasses. However, scram bus C was made up (i.e., all scram relay contacts closed) so no jumpering was required. One of the under-rated capacitors was on scram contactor C1, the other two were associated with scram bus A and B contactors. Therefore, when the breakdown occurred, it is conceivable that a surge of current sufficient to cause relay contact damage occurred through scram chassis C. Shortly after this incident, the under-rated capacitors were discovered and were subsequently replaced with units of sufficient voltage rating.

2. Each safety system bus is supplied with 125 VDC power through a number of mercury-wetted relay contacts in series. Bench tests of a mockup circuit at the SEFOR site have shown that the induced current caused by de-energizing the circuit is a potential source of damage which could result in welding or sticking of the mercury-wetted contacts. A system modification to provide selenium contact protectors, which would eliminate this potential source of damage, had been reviewed but was not installed at the time of this malfunction. Therefore, it is possible that the malfunction was caused by high current

pulses which occur during de-energizing of the scram contactor relays. However, all previous malfunctions of mercury-wetted contacts in the safety system have been caused by known malfunctions involving high currents due to short circuits.

3. After completion of Excursion Mode modifications and during performance of pre-operational test procedures on February 21, 1971, which included Reactor Safety System Compliance Test M-0-9, the defective K5 relay in scram chassis C was discovered. All other relays in chassis C performed properly. The chassis was removed and visual inspection revealed no damage to components and wiring. The defective relay was replaced and the unit was satisfactorily tested.

4. Reactor Operation was resumed on February 25, 1971.

D. Corrective Action:

1. The under-rated capacitors were replaced with capacitors of proper rating.

2. The defective relay was replaced.

3. Selenium contact protectors were installed on all 18 of the relays used for reactor scram and containment isolation after bench tests were performed to demonstrate proper system operation, as recommended by the Site Safety Committee.

4. Proper system operation was demonstrated by License Test Procedure M-0-9 after the above actions were completed.

E. References:

1. License Test Procedure M-0-9, "Reactor Safety System Compliance Test".
2. SEFOR Technical Specifications, Table 3.1-1.
3. SEFOR FDSAR, Supplement 2, Drawing No. 197R234.