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Subject: Arkansas Nuclear One - Units 1 and 2
Docket Nos. 50-313 & 50-368
License Nos. DPR-51 & NPF-6
10CFR21

Gentlemen:

This report is being submitted in accordance with the provisions of 10CFR21 to provide information concerning Asea Brown Boveri (ABB) model ITE-62L solid state relays.

Very truly yours,

for James J. Fisicaro
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attachment

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A. Reportability Criteria

On October 13, 1992, ANO completed an evaluation regarding inadequacy of the ITE-62L relay with respect to electrical noise immunity and notified the NRC that the condition was reportable in accordance with 10CFR21.

B. Background

During ANO's search for suitable replacements for the existing pneumatic timers in the ANO-2 Emergency Diesel Generator (EDG) engine control circuitry, Asea Brown Boveri (ABB) recommended that its model ITE-62L solid state relay was qualified for the intended application. ABB advised that the ITE-62L relay is environmentally qualified, has been applied in several nuclear facilities and is marketed under the trademark "Circuit Shield" for switchgear application. Purchase Orders (POs) were issued to procure these relays for the ANO-2 EDG engine control circuitry, the ANO-1 service water pump control circuitry, and the ANO-1 Reactor Building (RB) cooler control circuitry. The POs specified the relay model number and invoked the manufacturer's technical specifications. In addition, the RB Cooler PO invoked ANSI C37.90.1 (IEEE Standard Surge Withstand Capability [SWC] Test for Protective Relays and Relay Systems).

The ITE-62L relays were installed in the ANO-2 EDG engine control circuitry during refueling outage 2R8 (February April, 1991) but were removed due to an anomaly which was identified during post modification testing in which the relays inadvertently reset in the presence of surges caused by inductive load switching. ABB subsequently modified the relays to eliminate this anomaly and returned them to ANO.

During ANO-1 refueling outage 1R10 (March-May, 1992), four of the modified ITE-62L relays were installed in the ANO-1 RB cooler control circuitry. All four of the relays passed a post installation test; however, one exhibited early timeout (approximately 38 seconds with a setpoint of 50 seconds) during the pre-startup Integrated Engineering Safeguards (ES) test. This test most closely simulates the conditions under which the relays would actually operate. The failed relay was removed and replaced with an ITE-62L that passed all tests. The failed relay passed a bench test using a portable DC power supply. However, the unexplainable behavior of the relay during the ES test created an engineering concern as to its reliability. Therefore, it was returned to the manufacturer along with fourteen other ITE-62L relays on July 17, 1992, for retest and cause of failure determination.

C. Condition Description

The fifteen timing relays which were returned to ABB were tested by switching two Westinghouse MG-6 interposing relays across the timer power supply while the relay was in its timing mode. The results of the test revealed that the time period of the relays is influenced by the presence and duration of inductive load switching. Non-uniform deviations in set time were observed on all fifteen relays, although no conclusive evidence could be found to explain the timing deviation experienced by the relay during the ES test at ANO.

D. Conclusions

1. Procurement Document Requirements

ANSI C37.90, 1974 (Guides For Surge Withstand Capability Tests) is invoked by ABB's published specifications for the ITE-62L relay. After the first failure of the relays (inadvertent reset), the vendor verbally advised that the fast transient test published in ANSI C37.90.1, 1989, is more stringent and is currently being used by ABB for these relays. ABB tests prototype relay(s) to this standard, but does not subject each relay from the assembly line to the test. Section 2.3 of the revised standard states, "the test wave is applied for not less than two seconds at a repetition rate of not less than fifty pulses per second." Additionally, section 5.1 states, "A test is successful when no erroneous output is present, no component failure occurs, and there is no change in calibration exceeding normal tolerances." ABB interprets the standard to mean that only a two second noise duration test is required. Additionally, they maintain that the ITE-62L relay would have performed within its specified tolerance if the duration of the noise had been limited to two seconds. ABB indicated that based on their interpretation of the ANSI standard, this condition did not constitute a deviation from the technical specifications of the relay. ANO notes that the duration specified in the standard is a "minimum" of two seconds. ANO believes that timer setpoint change due to the presence of surges constitutes erroneous relay output. Based on ANO's interpretation of the standard, ABB incorrectly did not test the prototype relay to determine if its setpoint was affected by surges applied while the relay was in the timing mode. With respect to the issue of noise duration and relay tolerance, ANO notes that the vendor's technical specifications provide expected repeatability due to change of temperature or control voltage. However, nothing in the specifications indicates that setpoint drift should be expected when surges (i.e., de-energizing inductive loads) are present. Therefore, it is ANO's opinion that because the relays exhibit setpoint shifts in the presence of inductive load switching, they do not meet the technical requirements of the procurement document.

2. Safety Evaluation

Currently, there are four ITE-62L relays installed at ANO. These relays are located in the EDG load sequencing circuitry for the ANO-1 RB coolers and are set to actuate at fifty seconds. An engineering evaluation was conducted which concluded that the use of these relays in this application does not impact RB cooler operability or create a substantial safety hazard.

The RB cooler fans are the last load to be automatically sequenced on after an EDG start. The worst possible relay setpoint shift would cause overlap between the starting of the RB cooler fans and the RB spray pump. Existing vendor analysis documents the EDG's ability to successfully accelerate these loads. However, if ANO had implemented the planned replacement of the remaining load sequencing timers using ITE-62L relays, a substantial safety hazard could have been created due to the unpredictability of the timer setpoints, especially if a high degree of relay switching should occur on the DC system while the relays are timing.

It is ANO's opinion that other facilities could be misled by the published information regarding the noise immunity of the ITE-62L relay and apply the relays in a manner that could create a substantial safety hazard.

E. Corrective Actions

The results of ABB's relay testing were reported on Nuclear Network (OE-5556) on September 8, 1992.

The initial 10CFR21 notification of this condition was made to the NRC Operations Center by facsimile at 0311 on October 13, 1992.

A follow-up Nuclear Network entry (OE-5641) was made on October 28, 1992.

The implementation of the plant modifications to replace the pneumatic timers has been deferred until a suitable replacement relay can be procured.

The ITE-62L relays which are installed in the ANO-1 RB cooler control circuitry will be replaced during the first ANO-1 refueling outage following procurement of suitable replacement relays.