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GOULD-BROWN BOVERI

April 25, 1980

Mr. Victor Stello, Director
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Stello:

Attached is a follow-up report on our letter to you of February 11, 1980. If you need any additional information on this subject, please call Mr. E. W. Rhoads at (215) 628-7660.

We will continue to keep you apprised of our progress in this matter.

Very truly yours,

D. D. DUVALL
Vice President & General Manager
Switchgear Systems Division

Attachments

copy to: J. P. O'Reilly, Director
U. S. N.R.C., Region II
101 Marietta Street, Suite 3100
Atlanta, Ga.

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April 25, 1980

POTENTIAL PROBLEM IN SAFETY RELATED OVERCURRENT RELAYS

On January 31, 1980, Duke Power Co. telephoned a report to the Director NRC, Region II of a potential problem in safety-related overcurrent relays furnished by Gould-Brown Boveri. This report indicated that a component, an SCR (Silicon Controlled Rectifier), within an overcurrent relay had failed, causing a circuit breaker to open at the Mcguire Nuclear Station.

The Gould-Brown Boveri letter of February 11, 1980 to Mr. Victor Stello, Office of Inspection & Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. incorrectly identified the deficiency as occurring at the Catawba Nuclear Station.

The Duke Power Co. written report to the NRC dated February 29, 1980 describes the deficiency detected at the Mcguire Nuclear Station as follows:

"During relay and trip device acceptance and system startup testing, it was determined that fourteen (14) relays and trip devices did not meet the time-current characteristic specifications of the relay for its application (i.e. the relay or device would trip at a lower level of current or time than its setting). The items found to contain the deficiency were solid state relays manufactured by Gould-Brown Boveri, Horsham, PA and consists of Types ITE-5L and ITE-51Y overcurrent relays and Type SS4G (Power Shield) solid state trip device. The component that has been identified as causing the deficiency was Motorola, Inc. SCR's Types 1379 and 1235. Additional Gould-Brown Boveri relay Types GR-5, ground fault relay, and Type ITE-50, overcurrent relay also contain similar type SCR's."

Prior to the initial report to the NRC by Duke Power Co., Gould-Brown Boveri had been conducting an investigation of some random failures of Motorola, Inc. SCR's. Three units had been returned to the supplier, where they were examined by a scanning electron microscope. These units were determined to have failed due to the migration of copper from the top metal system into bulk silicon material. Small pin holes in a chrome metal barrier, that separate the copper from the silicon, permitted the copper to migrate into the silicon as a direct function of temperature and time, resulting in a failure. One of the SCR's that had been examined in this investigation by Motorola had been returned from the Catawba Nuclear Station. The other two SCR's examined at this time had been returned from commercial operations.

The inspection and screening methods used by Motorola, Inc. were thought to be sufficiently comprehensive to preclude the use of SCR's with susceptibility to this copper migration problem. As an immediate corrective action, Motorola has identified the additional high temperature screening test which is effective in identifying units that are susceptible to copper migration. This test requires baking the units at 150°C for two weeks to identify units that would be susceptible.

Both Gould-Brown Boveri and Motorola, Inc. have checked the existing stock of at least 1,500 SCR's by means of the high temperature bake and all were found to be free of copper migration.

Some of these SCR's are currently being used to change out SCR's in selected devices at Duke Power Co. The changed out SCR's from Duke Power Co. are being subjected to a detailed examination, so that we may more accurately determine the scope of the potential problem. At this date, 327 SCR's have been returned for testing and evaluation at Gould-Brown Boveri and Motorola. Initial tests

of these SCR's have not revealed any failures. Additional evaluation of these units will be performed after a high temperature bake.

In a meeting held on April 10, 1980 with Duke Power Co. and Gould-Brown Boveri, it was determined that an additional selected sample of approximately 50 SCR's from Duke Power Co. is required in order to complete our investigation of this situation. These SCR's are to be returned during May 1980.

To date, we have only three positively identified SCR failures attributed to copper migration. A preliminary review of records of SCR's returned for factory service show less than 0.1% failures for random reasons. The deficiencies still appear to be random in nature.

Because of the time required to bake (two weeks) SCR's, change out SCR's, and then to investigate and evaluate the nature of the deficiency by means of cutting open the SCR and examination by means of the electron microscope, the findings of this evaluation will not be complete until June 1980.