Brown Boveri Electric, Inc.

Manufacturer of I-T-E Electrical Power Equipment

April 3, 1981

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

Dear Mr. Stello:

This report is a follow-up to a 10CFR50.55(e) report issued by the Mississippi Power & Light Company on the Grand Gulf Nuclear Station with respect to problems noted with ring tongued wire terminals in medium voltage metal-clad switchgear and 480V load centers supplied by Brown Boveri Electric, Inc., (formerly known as I-T-E).

This condition was documented in NCR 4851 by Bechtel who is both Engineer and Constructor for the Grand Gulf Nuclear Station. Initially, it was reported that two (2) crimped wire terminals came loose from their control wires in safety related switchgear. BBEL and Bechtel mutually agreed that an inspection should be made to determine that there were no other loose wire terminals in the safety related switchgear wiring. Prior to this inspection an inspection criteria was established. This inspection criteria was to make a visual inspection of the crimped wire terminals to determine that the stranded wire was visible in the barrel of the terminal. If the wire were not visible, this crimped termination was not acceptable. This criteria was verified by tests performed by BBEL.

The results of this inspection which was performed by Bechtel show that there were approximately 15 wire terminals in which the wire was not visible in the end of the barrel, or which had loose wires. Bechtel reported that one of these wires could have affected the overcurrent protection of the equipment.

During the course of this equipment inspection program at the jobsite, there were other wire terminal anomalies which were detected. These included the items listed below.

1. No. 10-12 wire terminals had been crimped to a No. 14 wire.

2. Some wire terminals were bent or deformed.

3. Some wire terminals had been trimmed or cut to fit into a terminal board connection.

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4. Wire was protruding too far from the end of the barrel.

5. In some cases, individual wire strands were bent back and protruding from the rear end of the wire terminal.

Although the wire terminal anomalies listed above do not represent perfect workmanship, the nature of these anomalies is such that they would not result in a safety related problem. It should be noted that the equipment inspection reference so far, and the deficiencies and anomalies noted were found in Unit #1 switchgear which was manufactured during the period of late 1975 through early 1977 at the BBEL Chalfont, Pa. Switchgear Systems Division Operation.

On the average, during the manufacturing of a single cubicle of low-voltage switchgear there are some 282 wire terminal connections which are crimped. In the metal-clad switchgear there are some 240 connections per cubicle in the 5HK equipment and some 297 connections per cubicle in 15HK equipment.

In the Unit 1 switchgear at Grand Gulf there are approximately 36,000 wire terminal connections and approximately one-half of these are in safety related circuits. These figures are based on the "as built" drawings for the switchgear but there have been many additional circuits added to the equipment during field modifications.

Although the deficient wire terminal connections at Grand Gulf are less than 0.1 of one percent, other users should determine the need for inspecting the safety related circuits to assure that wire terminals are not loose and that wire strands are visible when looking into the end of the crimped wire terminal.

The cause of the deficiency at Grand Gulf is improper workmanship. During the time span of manufacturing of the switchgear for Grand Gulf, inspection was performed on a sampling basis. Early in 1977 BBEL procured new and improved crimping tools. These tools were identified by individual serial numbers and were issued to wiring personnel in accordance with a controlled plan. Wiring personnel were retrained in accordance with the tool manufacturers instructions.

Wire terminal inspection procedures were revised and updated. Crimping tool calibration and procedures were revised and updated and during the second quarter of 1977, the wire terminal inspection criteria was changed from a sampling inspection to a 100% inspection for safety related switchgear.

Unit #2 switchgear at Grand Gulf has also been furnished by BBEL. This equipment was manufactured during 1978 and early 1979. A cursory inspection of the equipment was performed at the jobsite during a recent visit and a few minor anomalies such as a single strand of wire protruding from the rear of the wire terminal were noted. BBEL will propose to Bechtel to perform a sample inspection of Unit #2 switchgear wire terminals to determine if any further action is required.

Although the majority of the safety related switchgear has been manufactured at the BBEL Chalfont, Pa. Operation, equipment of the same design has been manufactured at the BBEL Tulsa, Oklahoma Operation and a small amount of equipment has been manufactured at the BBEL Sanford, Florida Operation.

If you require any additional details in this matter, please feel free to contact Mr. E. W. Rhoads at 215-628-7660.

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cc: J. P. O'Reilly
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