

400 Chestnut Street Tower II

July 2, 1981

Mr. James P. O'Reilly, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region II - Suite 3100
101 Marietta Street
Atlanta, Georgia 30303



Dear Mr. O'Reilly:

SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2 - EXCESSIVE OUTPUT FLUCTUATIONS OF
FOXBORO INSTRUMENTATION - NCR SWP-79-S-5 - ADDITIONAL INFORMATION

The subject deficiency was initially reported to NRC-OIE Inspector M. J. Gouge on August 28, 1979 in accordance with 10 CFR 50.55(e). Interim reports were submitted on September 26 and October 30, 1979, February 5, and August 11, 1980, and February 9 and March 24, 1981. This nonconformance report was closed for unit 1 by inspection report 50-327/80-16 and for unit 2 by inspection report 50-328/81-23. Enclosed is additional information. We consider 10 CFR 21 applicable to this deficiency.

If you have any questions, please get in touch with D. L. Lambert at
FTS 857-2581.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Regulation and Safety

Enclosure

cc: Mr. Victor Stello, Director (Enclosure)
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

IE27
S11

8107310327 810702
PDR ADOCK 05000327
S PDR

ENCLOSURE

SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2 EXCESSIVE OUTPUT FLUCTUATIONS OF FOXBORO INSTRUMENTATION NCR SWP 79-S-5 10 CFR 50.55(e) ADDITIONAL INFORMATION

Description of Condition

Employees at Sequoyah Nuclear Plant have noted erroneous output signals coming from Foxboro equipment containing magnetic amplifiers (current/current repeaters and square root converters). This instrumentation was supplied by Westinghouse on the NSSS contract. The equipment is not performing according to the specifications in the Foxboro Equipment Manual which specifies that this equipment is to have an accuracy of $\pm 1/2$ percent with input voltage variations of ± 10 percent. Tests have shown that 1.5 and 4.5 percent input variations resulted in 5.0 and 15.5 percent output current changes. These excessive output variations have caused spurious operations of plant equipment by producing erroneous safety injection signals. Some of the Foxboro units are used to actuate safeguards equipment and to initiate reactor trip signals. There are 168 modules per unit containing magnetic amplifiers at Sequoyah Nuclear Plant.

Safety Implications

These Foxboro components are a part of essential safety-related circuits. Erroneous safety injection signals and spurious operation of safety-related equipment are degrading to these safety systems and could adversely affect the safe operation of the plant during certain operational modes.

Additional Information

TVA has thoroughly investigated this problem and has met with Westinghouse and Foxboro to determine the causes of the problem and to discuss possible solutions. The following conclusions were made by Westinghouse:

1. The magnetic amplifier with its line voltage compensation circuitry is an inherently slow device. The compensation circuit can correct for line voltage deviations of ± 10 percent only if the voltage fluctuation is very slow. The modules cannot correct for the type of voltage transients and fluctuations that normally occur in the line voltage.
2. The magnetic amplifiers will perform acceptably if they are supplied with a closely regulated power source.

With these conclusions in mind, TVA has replaced the inverters at Sequoyah in order to better regulate the power supply. Tests have shown that the magnetic amplifier fluctuations can be limited to approximately one percent with the improved power supply. This change of inverters enables the magnetic amplifiers to perform acceptably under present inverter loading conditions.

At TVA's request, Westinghouse has developed and tested a field modification kit for the Foxboro I/I repeaters. Test results indicate a significant improvement in performance of the I/I repeaters. The modification involves regulating the output of the module's dc power supply which is the primary source of magnetic amplifier instability. Westinghouse is also developing a modification for the square root converters which is scheduled to be tested in the near future. TVA will implement this field modification of the Foxboro instruments. Field tests will verify the Westinghouse test results. These modifications constitute the final corrective action for this deficiency.