

ENCLOSURE

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

Description of Condition

Personnel at Sequoyah and Watts Bar Nuclear Plants 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 this equipment to have an accuracy of  $\pm 5$  percent with input voltage variations of  $\pm 10$  percent. Tests have shown that a 1.5 and 4.5 percent input variation resulted in a 5.0 and 15.5 percent output current change. 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 and approximately 250 modules per unit at Watts Bar Nuclear Plant.

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

Corrective Action

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  $\pm 10$  percent only if the voltage fluctuation is 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 is planning to replace the inverters at Sequoyah before fuel loading in order to better regulate the power supply. Tests have shown that the magnetic amplifier fluctuations can be limited to approximately 1 percent with the improved power supply. This change of inverters will enable the magnetic amplifiers to perform acceptably until they can be permanently modified or replaced.

TVA is still pursuing a permanent solution to this problem for Sequoyah and Watts Bar Nuclear Plants.

This modification will enable Sequoyah unit 1 to be safely operated until the permanent modifications can be made.