



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

26 MAR 1986

Docket Nos.: 50-327
and 50-328

Mr. S. A. White
Manager of Nuclear Power
Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37401-2801

Dear Mr. White:

Subject: Sequoyah Verification Test for Auxiliary Power System Voltage Study

As part of the TVA response to the issues raised on documentation of Sequoyah electrical design calculations, the letter from R. Gridley to B. Youngblood dated February 12, 1986 made reference to a test report dated October 2, 1980 which verified the adequacy of the analytical methods used in the design of the AC auxiliary power systems for Sequoyah by an actual test. The report documented that in all cases the difference between the measured and calculated voltages were within the specified acceptance criteria. Subsequently, TVA concluded that the test verified the adequacy of the analysis and met the requirements of Position 4 of FSAR Question 8.33. Although there have been changes in the auxiliary power system configuration and in the processing systems which were used for the analysis, TVA contends that no additional verification test with respect to Branch Technical Position, PSB-1, is necessary in connection with new Sequoyah electrical design calculations for the AC auxiliary power system.

TVA conducted two tests (July 12, 1980 and July 16, 1980) in which they recorded data (current, voltage, kilowatts) at specified medium and low-voltage buses, and applicable offsite grid buses for two different system load configurations. By inputting the measured loads at the above buses into the computer program, the analysis was performed to calculate the bus voltages which were then compared with the voltages obtained during the test. With good correlation between the analytical results and test results, the validity of the mathematical model and the system electrical parameters would be established. The usage of the model would then be permitted to verify the adequacy of future power systems changes, and thus, no further verification tests for future system changes would be required.

The NRC staff finds that there were discrepancies in the total loads considered between the test and analysis. Also, the loads shown on individual buses (boards) between the test and analysis did not correspond to each other. Finally, the report noted there were problems obtaining consistent readings from the testing equipment due to poor calibration and inaccuracies.

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The staff has reviewed all the modifications made to the Sequoyah auxiliary power system since the last verification test and has evaluated their impact on the electrical design calculations to determine whether it may support the need for a new verification test.

1) Addition of Two Start Buses and One Common Station Service Transformer:

The addition of two new start buses affects the incoming voltage from the offsite 161 KV switchyard to the onsite distribution system voltages which changes the voltage profile for the entire auxiliary power system. This addition also reduces the maximum loading of the common station service transformer. Further, this modification provides an easy access to the third common station service transformer, which was installed as a backup, when such a need arises.

2) Change Out of 100 Valve Motors:

The replacement of valve motors with motors of different electrical characteristics affects the plant transient load which resulted in changes in sequencing of these loads. This requires the new system loadings to be re-analyzed.

3) The Computer Processing System Changes:

The previous voltage study used an analytical model VNEW. It was developed for the main frame computer (Control Data Corporation's time sharing) while the computer programs (RADIAL/VOLT/VOLT 2), which were used for the new Sequoyah auxiliary power system voltage calculations, were run on the personal computer. Therefore, there appears to be a question regarding the comparability of the analytical techniques and assumptions used between the software (VNEW vs. RADIAL/VOLT/VOLT 2) and the hardware (main frame computer vs. personal computer). The validity of the mathematical model used in performance of the analysis can only be re-established by performing a new verification test. Although it has been implied that those software packages have been used to demonstrate Position 4 of PSB-1 for some other TVA Plants, to date the staff has not found where this has been reviewed and approved.

4) Position 4 of PSB-1 Vs. Position 4 of Question 8.33

TVA contends that there are differences in Position 4 of PSB-1 and Question 8.33 (and imply that Position 4 of PSB-1 does not apply to Sequoyah). We find that there are no differences. Other than the fact that PSB-1 is more specific about test procedures and the acceptance criteria, the intent of the two is the same.

In view of the importance of establishing confidence in the analytical methods used to predict the performance of the electrical distribution system under varying conditions of load and voltage, the staff finds that:

- 1) TVA has made numerous changes in both the auxiliary power system and analytical computer software/hardware.

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- 2) Previous tests do not adequately demonstrate the capability to accurately predict performance in that load values used in the analysis were not as in the tests.
- 3) There is lack of confidence in the previous verification tests due to questionable instrument readings.

Based on the information currently available, the staff cannot conclude that TVA has adequately demonstrated that a new verification test is unnecessary. Therefore, we recommend that TVA perform a new verification test and verify the analytical model with respect to the adequacy of voltage calculations for the Sequoyah auxiliary power system prescribed in Position 4 of PSB-1.

Sincerely,

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B. J. Youngblood, Director
 PWR Project Directorate #4
 Division of PWR Licensing-A

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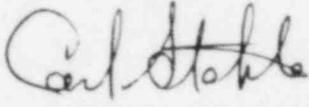
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Based on the information currently available, the staff cannot conclude that TVA has adequately demonstrated that a new verification test is unnecessary. Therefore, we recommend that TVA perform a new verification test and verify the analytical model with respect to the adequacy of voltage calculations for the Sequoyah auxiliary power system prescribed in Position 4 of PSB-1.

Sincerely,


B. J. Youngblood, Director
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