

50-390



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

March 3, 1999

Mr. J. A. Scalice  
Chief Nuclear Officer and  
Executive Vice President  
Tennessee Valley Authority  
6A Lookout Place  
1101 Market Street  
Chattanooga, Tennessee 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT - TESTING OF THE VITAL POWER SYSTEM  
(TAC NO. MA4622)

Dear Mr. Scalice:

This is in response to your letter dated February 4, 1999 regarding testing of the 120 volt Vital Instrument Power system for the Watts Bar Nuclear Plant, Unit 1 (WBN). Your letter identified inconsistencies between current Tennessee Valley Authority (TVA) practices and commitments conveyed by TVA's letter dated September 13, 1991 for testing the vital power system. The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the information provided by TVA in justification of TVA's current test practices and concludes that there is reasonable assurance that the basis for the staff's safety conclusion documented in Supplement 13 to the SER has not been invalidated by TVA's current testing practices. The details of the NRC staff's review are provided in the enclosure and are applicable only to the WBN. The enclosure includes reference to a telephone conversation held with members of your staff on February 11, 1999 to clarify certain parts of your letter of February 4, 1999. Our representation in the enclosure of these matters was confirmed with your staff on February 22, 1999.

We consider that TVA's actions in informing the staff in the letter of February 4, 1999, of the changes in TVA practices from prior commitments represents a proactive approach in TVA's disposition of this matter. However, it must also be noted that the failure to incorporate commitments made in TVA's letter of September 13, 1991, into appropriate procedures for testing the Vital Instrument Power System prior to the licensing of WBN in 1995 represents a weakness in TVA's commitment management program during that time interval.

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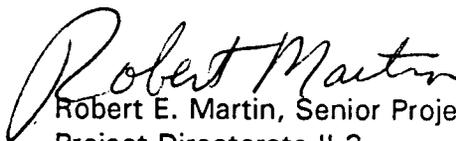
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Mr. J. A. Scalice

- 2 -

We trust that this letter also resolves the concerns expressed in your February 4, 1999 letter regarding the scope of the Unit 1 Cycle 2 outage scheduled to begin later this month.

Sincerely,



Robert E. Martin, Senior Project Manager  
Project Directorate II-3  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure: Staff Review

cc w/encl: See next page

We trust that this letter also resolves the concerns expressed in your February 4, 1999 letter regarding the scope of the Unit 1 Cycle 2 outage scheduled to begin later this month.

Sincerely,

Original signed by:

Robert E. Martin, Senior Project Manager  
Project Directorate II-3  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure: Staff Review

cc w/encl: See next page

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WATTS BAR NUCLEAR PLANT, UNIT 1  
VITAL INSTRUMENT POWER SYSTEM TESTING

Introduction

The Tennessee Valley Authority (TVA), the licensee for the Watts Bar Nuclear Plant, Unit 1, (WBN) submitted a letter dated February 4, 1999, to the Nuclear Regulatory Commission (NRC or staff) which identified inconsistencies between current practices and commitments conveyed by TVA's letter dated September 13, 1991, for testing the vital power system. The NRC staff has reviewed this information provided by TVA in justification of TVA's current test practices to determine if the basis for the safety conclusion made in Supplement 13 to the NUREG-0847 Safety Evaluation Report (SER) for licensing Watts Bar is invalidated.

The vital alternating current (ac) power system provides an uninterrupted (or constant voltage and frequency) source of ac power to safety related instrumentation and control system loads during a loss of offsite power (or loss of ac power) event. At the WBN, ac power is provided through inverters. The inverters are designed with two power feeds, a 480 volt three phase ac source and a 125 volt direct current (dc) battery source. The inverter output to safety system loads is approximately 120 volts ac. During normal operation the 480 volt ac source is rectified to about 142 volts dc, inverted back to ac, and supplied to the safety system loads, while the dc source (i.e., the emergency supply) remains in standby. Upon loss of the ac source, the dc standby source (125 volts dc) is automatically selected, inverted to ac, and supplied to safety system loads until restoration of the ac source. The primary issue of concern involves testing the capability of the inverter to provide a continuous (unchanged or constant) voltage and frequency output when the dc input voltage changes from 142 to 125 to 142 volts dc following a loss of offsite power.

Evaluation

The staff noted during its evaluation of the WBN application for an operating license, that several vital system equipment characteristics and components would be tested before placing the vital power system in operation, but would not subsequently be tested during plant operation. As reported in Section 8.3.1.11 of Supplement 13 of the SER, a substantiating analysis was required to demonstrate that there would be reasonable assurance that the associated equipment would maintain its capability to perform its design basis safety function over the operational life of the plant without further testing of the vital system's equipment characteristics and components.

In response to this requirement, the WBN Final Safety Analysis Report (FSAR) was revised in Amendment 71 to include the following commitment:

"During plant power operation the vital 120V ac control power system will be periodically tested and inspected to ensure its continued capability to perform its operation..."

In addition, the following statements relating to testing of the vital ac system were provided by TVA's letter dated September 13, 1991.

**Enclosure**

- (1) The output voltage and frequency of each inverter is verified every 18 months during load testing.
- (2) The capability of the inverter to deliver 100 percent of its output while operating on either the normal or emergency supplies is tested every 18 months. In the test, the inverter is loaded to 20kW at 1.0 power factor and transferred to the emergency 125V dc supply while maintaining voltage and frequency. The inverter is also inspected for signs of overheating, damaged components, loose connections, and excessive dust on a yearly basis.
- (3) The panel and board mounted instruments are calibrated on an 18-month cycle.

Based, in part, on the above statements, staff concerns relating to test and inspection of the vital power system were considered resolved as reported in Supplement 13 to NRC's SER.

By letter dated February 4, 1999, TVA provided clarification as to their current test frequencies for inverters and instrumentation associated with the vital power system, the output rating of the inverters, and current inspection frequency for inverters.

With respect to inspection frequency for inverters, TVA indicated current Preventive Maintenance (PM) exists for inspection, cleaning, and performance of thermography on a 36-month (versus 18-month) frequency. The PM program controls the established frequency such that it may be adjusted to extend or reduce the frequency as judged appropriate based on the condition of the equipment, problems experienced with the equipment, or industry experience. This process of establishing inspection frequency meets the intent of current regulatory requirements described as part of the Maintenance Rule and is considered acceptable.

With respect to the output rating of the inverters, TVA indicated that Unit 2 inverters are tested at a 15 KVA rating, versus 20 KVA as discussed in the September 13, 1991 letter. The rating is defined in the FSAR as 20 KVA for Unit 1 inverters and 15 KVA for the Unit 2 inverters. The inverters for both the Unit 1 design and the Unit 2 design are utilized for operation of Unit 1. These load ratings reflect the initial design of the system and have not been revised. Therefore, appropriate testing based on these load ratings has been developed. This testing meets the intent of TVA's original commitment and is considered acceptable.

With respect to test (or calibration) frequency for instrumentation associated with the vital power system, TVA indicated that instruments required for compliance with Technical Specification (TS) requirements are tested on an 18-month frequency. The other instruments receive maintenance when required. Thus, instruments utilized for measuring voltage and frequency output of the inverters, if utilized to meet the 7-day TS requirement for testing voltage and frequency output of the inverter, continue to meet the original test frequency commitment. This calibration frequency for instruments utilized to meet TS meets the intent of past, as well as current, regulatory practice and is considered acceptable.

With respect to testing of inverter output voltage and frequency (during transfer from normal to standby power supplies and back from standby to the normal power supplies), TVA indicated that this testing is performed on an 36-month frequency versus the original 18-months licensing basis commitment.

For testing of the switch utilized for transferring from the normal to the standby power supplies, TVA indicated that: (1) the output voltage and frequency from the normal power source is monitored on a 7-day frequency pursuant to TS 3.8.7.1; (2) that an open circuit of the switch would be detected by monitoring that is performed continuously; (3) that a short of the switch would be detected by monitoring that is performed on each shift (once per 12 hours) and, (4) the capability of the switch to transfer from normal to standby power supplies is tested on an 18-month frequency pursuant to TS 3.8.1.11. In addition, the latest guidance supplied to TVA by the vendor for the inverters, Solidstate Controls, Inc., indicates that the reliability of the switch supports a 36-month test frequency. The frequency for testing the capability of the switch meets TVA's original commitment and is considered acceptable.

For testing the capability of the inverter to maintain constant output voltage and frequency during the transfer from normal to standby power supplies and back from standby to normal power supplies, TVA indicated that (1) the output voltage and frequency from the normal power source is monitored on a 7-day frequency, (2) transfer of power from the normal to standby and back from standby to normal is monitored as part of a loss of ac power test performed on an 18-month frequency pursuant to TS 3.8.1.11, and (3) voltage and frequency is monitored on a 36-month frequency during inverter load testing as discussed in the February 4, 1999, letter. In addition, as part of telephone discussions on February 11, 1999, TVA indicated that any significant anomalies that may exist in voltage and frequency during the loss of ac power testing would be noted by equipment performance. TVA also indicated that the inverter has a self diagnostic feature associated with its frequency oscillation card. Failure of this oscillation card or drift in its calibration may affect the capability of the inverter to transfer power. The operability of this oscillation card (or drift of its calibration outside limits) will be automatically flagged by the inverter's diagnostic feature. This inverter alarm flag is monitored daily. This level of inverter testing and monitoring provides reasonable assurance that the inverter will be available and capable during and following a loss of offsite power event and is therefore considered acceptable.

Conclusion

The primary issue of concern identified in Supplement 13 to the SER involved testing the capability of the inverter to provide a continuous (unchanged or constant) voltage and frequency output following a loss of offsite power. The NRC, in its SER, accepted an 18-month test frequency for verifying this capability. TVA's letter of February 4, 1999, indicates that a 36-month test frequency is current TVA practice at Watts Bar. Based on the staff's review, as discussed above, of the information provided and additional telephone discussions with TVA on February 11, 1999, we conclude that there is reasonable assurance that the basis for the staff's safety conclusion documented in Supplement 13 to the SER has not been invalidated by the 36-month test frequency.

Principal Contributor: John Knox

Dated: March 3, 1999

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