TVA

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JUL 2 4 1995

U.S. Nuclear Regulatory Commission
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Washington, DC 20555

Gentlemen:

In the Matter of the Application of	)	Docket Nos. 50-390
Tennessee Valley Authority	)	50-391

WATTS BAR NUCLEAR PLANT (WBN) - CIRCUIT BREAKER TESTING TO ASSURE ELECTRICAL SEPARATION (TAC M89109 and M89110)

This letter submits additional information describing circuit breaker testing requirements at WBN. The information is intended to resolve an NRC issue concerning electrical separation.

TVA previously submitted information describing electrical separation design provisions at WBN in letters dated July 29, 1994, January 11, 1995, and June 5, 1995. The issue was also discussed between the NRC staff and TVA personnel in a site visit on April 6, 1995, and in conference calls on April 12, 1995, June 28, 1995, and July 13, 1995. Although many aspects of the issue have been resolved, the NRC staff has not accepted WBN's minimum allowable separation between a conduit and an open-top cable tray and between a conduit and a free-air cable. In these cases, the design criteria for WBN permit any separation greater than 1 inch without the need to install a special barrier.

TVA has provided several justifications for the 1-inch separation requirement in the aforementioned correspondence. However, in the most recent conference calls, the NRC staff has stated that these justifications are inadequate and that TVA should expand its circuit breaker testing program to encompass all circuits having safety significance. Periodically testing each breaker that serves as an isolation device for a circuit requiring electrical separation increases the functional reliability of the breaker. This, in turn, provides high confidence that the breaker will operate as designed to clear any postulated fault and achieve electrical separation by preventing propagation of the fault to an adjacent cable of the opposite electrical train.

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TVA has previously committed to periodic testing of circuit breakers which serve as isolation devices protecting Class 1E buses from associated circuits and non-Class 1E circuits. This commitment is described in Final Safety Analysis Report (FSAR) Section 8.3.1.4.3 and is restricted to circuits having a single breaker. Justification is provided in FSAR Section 8.3.1.4.3 and Appendix 8E to exempt from testing breakers in circuits with either two breakers in series or a breaker and a fuse.

After evaluating the NRC staff's position that WBN's breaker testing program must be expanded, TVA proposes a change to FSAR Section 8.3.1.4.2 which commits to periodic testing of breakers serving as isolation devices for circuits with Class 1E loads. The proposed change is shown in Enclosure 1. Enclosure 1 also shows a related minor change to FSAR Section 8.3.1.4.3. The expanded testing program adds approximately 400 breakers to the existing test population of approximately 1,000 breakers.

Exemptions similar to those for associated circuits and non-Class 1E circuits apply to periodic testing of breakers serving as isolation devices for circuits with Class 1E loads. Breakers in circuits with either two breakers in series or a breaker and a fuse in series are exempt from the commitment for testing. TVA considers this justified based on the reliability analysis in FSAR Appendix 8E that uses industry methodology from IEEE 500-1977 to demonstrate that the reliability of two breakers in series is essentially equal to that of a single breaker that is periodically tested. In addition, WBN has only a few circuits that use two breakers in series to supply Class 1E loads. Typically, the two-breaker design was chosen for these few cases because the circuit is normally deenergized and under administrative control with the downstream breaker tagged open. One example is the motor control power circuit for each safety injection accumulator isolation valve.

Also, the proposed FSAR change in Enclosure 1 permits another type of breaker testing exemption. TVA can exclude individual breakers from the periodic testing program if the electrical circuits and cables protected by these breakers are shown to satisfy the physical separation requirements of IEEE Standard 384-1992. TVA personnel understood from the conference call with the NRC staff on June 28, 1995, that this type of exemption is acceptable.

Enclosure 2 summarizes the applicable portions of WBN's breaker testing program that relate to assuring electrical separation. Details of the breaker testing program, including test methods, frequencies, and acceptance criteria, were provided during a meeting between the NRC staff and TVA personnel in Rockville, Maryland, on June 29, 1995, and in a conference call on July 13, 1995.

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If you have any questions about the information provided in this letter, please telephone John Vorees at (615) 365-8819.

Sincerely,

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ENCLOSURE 1

PROPOSED CHANGES TO

FINAL SAFETY ANALYSIS REPORT (FSAR)

SECTIONS 8.3.1.4.2 AND 8.3.1.4.3

A conduit carrying cables of one division may cross or run parallel to a cable tray containing cables of a redundant division, provided a minimum separation greater than one inch exists between tray and conduit. * INSERT No. 1

A conduit carrying cables of one division may cross or run parallel to a cable tray containing cables of a redundant division with one inch separation, provided the tray has a cover, solid bottom or side adjacent to the conduit. The tray cover or solid bottom shall extend a minimum of three feet or to the nearest wall, floor, or ceiling on each side of the centerline of the conduit, for conduits that cross cable trays. Likewise, when conduits run parallel with cable trays, the tray cover or solid bottom shall extend a minimum three feet beyond each end of the influenced portion of conduit, or until the tray terminates or penetrates a wall, ceiling, or floor.

If the above separation requirements are not attainable, a barrier consisting of 1/2 inch minimum thickness of Marinite (or its equivalent) may be used between the raceways, provided the trays are enclosed as specified above. The barrier shall be continuous until spacial separation is attained and extend one inch on both sides of the raceway (tray or conduit) as applicable (or to the wall, floor, or ceiling, as applicable).

Main Control Room

Redundant safety-related cables enter the Main Control Room through separate floor openings. Each unit control panel, which has redundant components, has a minimum of three separate vertical and/or horizontal risers (enclosed wireways) from each of the respective terminal block groups to the control room floor (or bottom of walk space). Non-safety-related cables are routed through one or more riser(s), preferably near the center of the control panel. The redundant safety-related cables (train A or train B separation) are routed separately in each of the other two or more risers, preferably one near each end of the control panel. Where possible, risers of like trains of separation have been arranged such that the adjacent panel has a corresponding like train riser (i.e., train A in one panel has train A nearest it in the adjacent panel).

Separation of Class 1E Electric Equipment

All Class 1E electric equipment has physical separation, redundancy, and a controlled environment to prevent the occurrence of an external event that would threaten the safe shutdown of the reactor. No internally generated fault can propagate from Class 1E electric equipment to its redundant equipment during any design basis event. All Class 1E electric equipment that has to operate during a flood has been located above maximum possible flood level unless it is designed to operate submerged in water.

The Class 1E electrical loads are separated into two or more redundant load divisions (channels or trains) of separations. The number of divisions has been determined by the number of independent sources of power required for a given function. The electric equipment that accommodates these redundant divisions is separated by sufficient physical distance or protective barriers. The separation distance has been determined by the severity and location of hazards. The environment in the vicinity of the equipment is controlled or protection provided such that no environmental change or accident will adversely affect the operation of the equipment.

The physical identification of safety-related electrical equipment is in accordance with Section 8.3.1.3.

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AND CABLES IN FR[redacted]R

INSERT No. 1

*Reliability of Class 1E circuit breakers protecting cables in open top Class 1E cable trays is enhanced by periodic testing.

The results of a protection device reliability analysis is discussed in Appendix 8E. This analysis, based on data taken from IEEE 500-1977, demonstrates that each of the following protective schemes has a reliability which is essentially equivalent to that of a single circuit breaker periodically tested:

1. A circuit breaker and fuse in series, or

2. Two circuit breakers in series.

In addition to these protective schemes, IEEE 500-1977 data verifies that for this application a single fuse with no periodic testing has a failure rate which is approximately equal to the failure rate of two circuit breakers in series (see Part B analysis of Appendix 8E). Therefore, a single fuse when used as an interrupting device for cables, does not require periodic testing due to its stability, high reliability, and lack of drift. Thus, WBNP concludes that any one of the following protective schemes for Class 1E cables provides a reliable means of meeting the intent of Regulatory Guide 1.75 to not degrade redundant Class 1E cables:

1. A circuit breaker and fuse in series

2. Two circuit breakers in series

3. A single fuse

4. A single circuit breaker periodically tested

The only exceptions to testing single Class 1E circuit breakers will be where physical separation of specific circuits is shown to meet the requirements identified in IEEE 384-1992. WBNP is not committed to IEEE 384-1992 but will use it as a criteria for exempting individual circuits from circuit breaker testing.

The molded case circuit breakers actuated by fault currents and installed to ensure the intent of Regulatory Guide 1.75 is met for Class 1E circuits will have at least 10% of each type breaker tested every 18 months and will have the recommended maintenance performed on 100% of the breakers within the past 60 months. For any breaker failure or breaker found inoperable, an additional 10% of that type will be tested until no more failures are found or all circuit breakers of that type have been tested. The test will ensure operability by simulating a fault current with an approved test set.

¶ THE MOTOR OPERATED VALVE CIRCUITS THAT UTILIZE TWO CIRCUIT BREAKERS IN SERIES WERE DESIGNED TO MAINTAIN THEIR SAFE OPERATING POSITION BY ADMINISTRATIVELY CONTROLLING ONE OF THE CIRCUIT BREAKERS IN THE OPEN POSITION. SINCE THE MOTOR OPERATORS ARE ELECTRICALLY ISOLATED FROM THEIR POWER SUPPLY DURING NORMAL OPERATION PERIODIC TESTING WILL NOT BE PERFORMED ON THE CIRCUIT BREAKERS.

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Tray and conduit systems located in Category I structures have seismic supports. In addition, a non-safety related cable may be routed with those for essential circuits, provided that the cable, or any cable in the same circuit, has not been subsequently routed onto another tray containing a different division of separation of essential cables.

Nondivisional associated cables that are routed in cable trays designated for Class 1E cables are treated the same as the Class 1E cables. The nondivisional cables are subject to the same flame retardant, cable derating, splicing restrictions, and cable tray fill as the Class 1E cables. Furthermore, these non-Class 1E cables are qualified in the same manner as Class 1E cables and/or protected by one of the protective schemes discussed below. Based on the results of the analyses of associated circuits, it is demonstrated that Class 1E circuits are not degraded.

These analyses include a review of protective devices for ~~non-Class 1E~~ NONDIVISIONAL ASSOCIATED medium voltage power, low voltage power, and control level cables routed in nondivisional raceways in Category I structures. Each of these cables are provided short circuit protection by either a single circuit breaker periodically tested, a single fuse, a circuit breaker and fuse in series, two circuit breakers in series, or two fuses. Energy produced by electrical faults in non-Class 1E cables routed in medium-level signal and low-level signal raceways is considered insignificant and is considered no challenge to Class 1E cables.

The results of the protective device application analysis for associated and non-Class 1E cables are discussed in Appendix 8E. This analysis, based on data taken from IEEE 500-1977, demonstrates that each of the following protective schemes has a reliability which is essentially equivalent to that of a single circuit breaker periodically tested:

1. A circuit breaker and fuse in series, or

2. Two circuit breakers in series.

In addition to these protective schemes, IEEE 500-1977 data verifies that for this application a single fuse with no periodic testing has a failure rate which is approximately equal to the failure rate of two circuit breakers in series (see Part B analysis of Appendix 8E). Therefore, a single fuse when used as an interrupting device for the above cables, does not require periodic testing due to its stability, high reliability, and lack of drift. To further support this position, TVA takes credit for installed cable coating as previously discussed. Thus, WBNP concludes that any one of the following protective schemes for associated and non-Class 1E cables provides a reliable means of meeting the intent of Regulatory Guide 1.75 to not degrade Class 1E cables:

1. A circuit breaker and fuse in series
2. Two circuit breakers in series
3. A single fuse
4. A single circuit breaker periodically tested

All of the installed protective devices and those added to further protect the associated and Non-Class 1E cables are of a high quality commensurate with their importance to safety. For Non-class 1E circuit breakers, this requires

ENCLOSURE 2

CIRCUIT BREAKER TESTING REQUIREMENTS

6.9kV Circuit Breakers

- Protective devices are tested periodically by performing a preventive maintenance instruction.
- Relay calibration -- 36/48-month interval.
- Functional test -- 18-month interval -- performed by manually actuating the protective device and verifying the associated breaker or lockout device trips.

480V Switchgear Circuit Breakers

- Test is performed every 2 years or at the trip count interval for that type of breaker.
- Amptector trip unit test -- tests instantaneous, short-time delay, and long-time delay trips of the amptector unit.
- Functional test -- tests breaker operation by primary current injection at the long-time delay setting.

480V Molded-Case Circuit Breakers

- Existing maintenance instruction performs a breaker inspection and limited testing.
- New maintenance instruction (or revision to existing maintenance instruction) is needed to perform comprehensive periodic testing.
- Current plan is to test the individual trip elements of the breakers.