UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

50-259/260/296

December 22, 1994

Mr. Oliver D. Kingsley, Jr.
President, TVA Nuclear and
Chief Nuclear Officer
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING GENERIC LETTER 92-08, ISSUED PURSUANT TO 10 CFR 50.54(f), BROWNS FERRY NUCLEAR PLANT UNITS 1, 2, AND 3 (TAC NOS. M85523, M85524, AND M85525)

Dear Mr. Kingsley:

On May 10, 1993, the Tennessee Valley Authority (TVA) submitted a revised response to Generic Letter (GL) 92-08, "Thermo-Lag 330-1 Fire Barriers." This response included a request for exemption from requirements of Section III.G.2.b of Appendix R to 10 CFR Part 50. TVA sought this exemption for residual heat removal service water (RHRSW) cables in the Browns Ferry Nuclear Plant (BFN) Intake Pump Station which do not satisfy physical separation requirements of this regulation. For all other components, TVA stated that modifications would be made which allow BFN to comply with Appendix R requirements without relying on Thermo-Lag fire barriers.

On January 18, 1994, the NRC staff denied the exemption request, and requested additional information describing what measures TVA would take to ensure long-term compliance with 10 CFR 50 Appendix R at BFN. TVA responded on March 10, 1994, and indicated that the RHRSW cable barriers would be upgraded to configurations similar to those tested as part of the Watts Bar Nuclear Plant Thermo-Lag qualification test program. The staff accepted this commitment on May 11, 1994, contingent on completion of review of the WBN program.

On September 29, 1994, the U.S. Attorney for the District of Maryland and the NRC Inspector General (IG) announced the indictment of Thermal Science, Incorporated (TSI), the company that manufactures and supplies Thermo-Lag fire barrier materials, and its president, Mr. Rubin Feldman. The indictment alleges that TSI and Mr. Feldman conspired with Industrial Testing Laboratories, Incorporated (ITL), and others to make false statements and conceal material facts within the jurisdiction of the NRC and to defraud the United States by impeding, impairing, obstructing, and defeating the NRC's administration of the Atomic Energy Act. ITL had pleaded guilty in U.S. District Court in Maryland in April 1994.

In a letter of November 7, 1992, TSI informed the staff that pre-shaped Thermo-Lag conduit sections received by Texas Utilities Electric Company

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(TU Electric) for Comanche Peak Steam Electric Station, Unit 2 (CPSES 2) showed signs of delamination and voids. The NRC staff was concerned that the use of such materials could affect the results of TU Electric's fire tests and the performance of the Thermo-Lag barriers installed at CPSES 2. In a letter of December 15, 1992, TU Electric described the actions it had taken to ensure that the fire barrier materials used in its fire test program were representative of the materials installed at CPSES 2, and described how it had addressed the delamination and void concerns. On the basis of its evaluation of the TU Electric submittal, the staff concluded that the fire test specimens were representative of the materials installed at CPSES 2 and that TU Electric had adequately addressed the delamination and void concerns. The IG has informed the staff that TSI may not have implemented certain measures to correct the void and delamination problems even though it had informed TU Electric that it had done so. Specifically, we believe that TSI representatives informed TU Electric that it had trained its employees to repair the delaminations, cracks, and voids and that it had provided TU Electric with signed training certificates to document this training. In fact, we believe that TSI may not have trained its employees to perform these repairs. This situation calls into question the reliability of TSI's quality assurance program for Thermo-Lag materials, and the quality of Thermo-Lag materials.

The NRC staff has considered the effect of the indictment on the plans of NRC staff and industry to resolve the technical issues associated with Thermo-Lag fire barriers. In a Staff Requirements Memorandum of June 27, 1994, "Options for Resolving the Thermo-Lag Fire Barrier Issue," the Commission approved the NRC staff recommendation to return plants to compliance with existing NRC requirements. The indictment does not alter this decision. Licensees planned to use information and data supplied by TSI to demonstrate that Thermo-Lag fire barrier installations conform to NRC regulations. However, the concerns and issues underlying the indictment and the TU Electric experience sharpened concerns previously expressed by the NRC staff to the licensees about the reliability of information and data supplied by TSI that have been or could be used to make judgments regarding Thermo-Lag materials. Therefore, the staff will request licensees to take actions to fully address the technical issues discussed in GL 92-08, independent of information and data supplied by TSI, before the staff makes any determination regarding whether the use of Thermo-Lag fire barriers complies with NRC regulations.

The NRC staff and industry have relied on the results of tests and analyses conducted by NRC staff and industry to draw conclusions regarding the performance of Thermo-Lag fire barrier materials. However, such conclusions require that the materials tested be representative of the broad class of material actually installed in the plant. Judgments regarding representativeness, in turn, require reasonable assurance that appropriate quality assurance measures were taken in the manufacture of the Thermo-Lag materials or, alternatively, that the licensees determine that the properties and quality of the materials are appropriate for their applications and satisfy the staff that the determinations are correct. On the basis of the concerns underlying the indictment and the TU Electric experience, the staff has determined that reliance should not be placed on TSI's quality assurance program for the purpose of assessing the adequacy of Thermo-Lag materials that

are currently installed or that are installed in the future. The staff has also concluded that it is not enough for licensees to rely on generic information on Thermo-Lag materials. The licensee must also have valid information on the specific Thermo-Lag materials installed at its plant if it intends to retain or expand its Thermo-Lag fire barrier installations.

Where the licensees plan to rely on fire endurance test results to draw conclusions regarding the qualifications of specific Thermo-Lag fire barrier installations, such conclusions require that installed materials and configurations be representative of tested materials and configurations. This, in turn, requires that the installation parameters for the tested configuration bounded the installation parameters of the in-plant configuration and that appropriate quality assurance measures were taken in the manufacture of the Thermo-Lag materials, and the construction of the test specimen and the in-plant fire barrier.

The staff has identified 24 important fire barrier installations parameters and eight important cable parameters. At least two of the parameters, panel thickness and conduit panels, are controlled by TSI at the point of manufacture. Other parameters, such as panel rib orientation, tie-wire spacing, and proximity of cables to the unexposed surfaces of the fire barrier, are determined during barrier design and construction. The remaining parameters, such as cable size and type, are established by plant design.

Many licensees have informed the staff that they had not verified some of the parameters and several licensees reported deviations and defects in fire barrier installations that were revealed only after destructive examination of in-plant Thermo-Lag fire barriers. The staff informed licensees of installation deficiencies found at Enrico Fermi Atomic Power Plant, Unit 2, in Information Notice 92-79, Supplement 1, "Deficiencies Found in Thermo-Lag Fire Barrier Installation," August 4, 1994. Later, Grand Gulf Nuclear Station reported installation deficiencies found during destructive fire barrier examinations (Licensee Event Report 94-008).

On the basis of its inspections of Thermo-Lag fire barriers and industry experience finding installation defects during destructive examinations, the staff has concluded that some of the installation parameters cannot be verified or determined by simple walkdowns of in-plant barriers, or by comparing as-built barriers with installation records or with the installation procedures used to construct the barriers. The staff has also concluded that some of the parameters can only be obtained and verified by detailed examination such as disassembling a representative sample of in-plant fire barrier configurations. The licensee must have valid and verifiable information on each of the parameters for its in-plant Thermo-Lag barriers if it intends to retain, modify, or expand its Thermo-Lag fire barrier installations.

The NRC staff and licensees have also relied on information, data, and calculations supplied by TSI to draw conclusions regarding the seismic capabilities of Thermo-Lag materials and barriers. These conclusions are also being reevaluated by the staff.

23. No additional trowel material over sections and joints or additional trowel material applied.

24. No edge guards or edge guards.

25. Cable size and type (power, control, or instrumentation).

26. Cable jacket type (thermoplastic, thermoset) and materials.

27. Cable conductor insulation type (thermoplastic, thermoset plastic) and materials.

28. Cable fill and distribution of cables within the protected conduit or cable tray.

29. Proximity of cables to the unexposed (inside) surfaces of the fire barrier.

30. Presence of materials between the cables and the unexposed side of the fire barrier material (for example, Sealtemp cloth, which is used in the NUMARC test specimens).

31. Cable operating temperature.

32. Temperatures at which the cables can no longer perform their intended function when energized at rated voltage and current.

b. Describe the methodology that will be applied to determine the number and type of representative in-plant fire barrier configurations that will be examined in detail and demonstrate that the sample size is adequate to ensure that the information and data that will be obtained are adequate to assess the total population of in-plant Thermo-Lag barriers. A large enough sample of the total population of configurations should be examined to provide reasonable assurance that the materials and important barrier parameters used to construct the in-plant barriers and any future barrier installations or modifications, are representative of the parameters used to construct the fire endurance test specimens.

c. Submit the schedule for obtaining and verifying all of the important barrier parameters.

d. After the information has been obtained and verified, submit a written supplemental report that confirms that this effort has been completed and provides the results of the examinations and inspections. Verify that the parameters of the in-plant configurations are representative of the parameters of the fire endurance test specimens. Describe any changes to previously submitted plans or schedules that result from the examinations.

Based on the considerations given above, you are required, pursuant to Section 182a of the Atomic Energy Act of 1954, as amended, and 10 CFR 50.54(f), to submit written reports, under oath or affirmation, that contain the information specified in the enclosure to this letter in Sections 1.a, 1.b, 1.c, 2.a, 2.b, and 2.c, within 90 days from the date of this letter. Retain on site all information and documentation used to prepare your response; these may be reviewed during future NRC audits or inspections. This information request applies to all Thermo-Lag installations at BFN because of the potential adverse effects of improperly documented material characteristics on aspects of system design other than Appendix R requirements. You are also reminded of the following GL 92-08 reporting requirement: "When corrective actions have been completed, confirm in writing their completion."

The information collection contained in this request is covered by the Office of Management and Budget clearance number 3150-0011, which expires on July 31, 1997. The public reporting burden for this collection of information is covered by the previous estimate of 420 person-hours plus an increase of 120 perso hours, for a total of 540 person-hours for each addressee's response. This includes time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information and Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0011), Office of Management and Budget, Washington, DC 20503.

If you have any questions about this matter, please contact Joe Williams at (301)504-1470 or Edward Connell at (301)504-2838.

Sincerely,

Original signedby Steven A. Varga for

Roy P. Zimmerman
Associate Director for Projects
Office of Nuclear Reactor Regulation

Docket Nos. 50-259, 50-260, and 50-296

Enclosure: Request for Additional Information

cc: See next page

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REQUEST FOR ADDITIONAL INFORMATION REGARDING

GENERIC LETTER 92-08

"THERMO-LAG 330-1 FIRE BARRIERS"

PURSUANT TO 10 CFR 50.54(f)

BROWNS FERRY NUCLEAR PLANT UNITS 1, 2, AND 3

1. Thermo-Lag Materials

   a. Describe the specific tests and analyses that will be performed to verify that the Thermo-Lag fire barrier materials that are currently installed at the Browns Ferry Nuclear Plant Units 1, 2 and 3, or that will be installed in the future, are representative of the materials that were used to address the technical issues associated with Thermo-Lag barriers and to construct the fire endurance and ampacity derating test specimens. The tests and analyses shall address the material properties and attributes that were determined or controlled by TSI during the manufacturing process and the quality assurance program. The tests and analyses shall also address the material properties and attributes that contribute to conclusions that the Thermo-Lag materials and barriers conform to NRC regulations. These include:

      (1) chemical composition
      (2) material thickness
      (3) material weight and density
      (4) the presence of voids, cracks, and delaminations
      (5) fire endurance capabilities
      (6) combustibility
      (7) flame spread rating
      (8) ampacity derating
      (9) mechanical properties such as tensile strength, compressive strength, shear strength, and flexural strength.

   b. Describe the methodology that will be used to determine the sample size and demonstrate that the sample size will be large enough to ensure that the information and data obtained will be sufficient to assess the total population of in-plant Thermo-Lag barriers and the materials that will be installed in the future. In determining the sample size, consider the time of installation and manufacture of the various in-plant materials and barrier installations. Give the number and types (e.g., panels, conduit preshapes, trowel-grade material, stress skin) of samples that will be tested or analyzed.

   c. Submit the schedule for verifying the Thermo-Lag materials.

   d. After the analyses and tests have been completed, submit a written supplemental report that confirms that this effort has been completed and provide the results of the tests and analyses. Describe any changes to previously submitted plans or schedules that result from the

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tests or analyses.

2. Important Barrier Parameters

   a. Describe the examinations and inspections that will be performed to obtain the important barrier parameters given below for the Thermo-Lag fire barrier configurations required at the Browns Ferry Nuclear Plant Units 1, 2, and 3.

      1. Raceway orientation (horizontal, vertical, radial bends).
      2. Conduit.
      3. Junction boxes and lateral bends.
      4. Ladder-back cable tray with single layer cable fill.
      5. Cable tray with T-Section.
      6. Raceway material (aluminum, steel).
      7. Support protection, thermal shorts (penetrating elements).
      8. Air drops.
      9. Baseline fire barrier panel thickness.
      10. Preformed conduit panels.
      11. Panel rib orientation (parallel or perpendicular to the raceway).
      12. Unsupported spans.
      13. Stress skin orientation (inside or outside).
      14. Stress skin over joints or no stress skin over joints.
      15. Stress skin ties or no stress skin ties.
      16. Dry-fit, post-buttered joints or prebuttered joints.
      17. Joint gap width.
      18. Butt joints or grooved and scored joints.
      19. Steel bands or tie wires.
      20. Band/wire spacing.
      21. Band/wire distance to joints.
      22. No internal bands in trays.

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