

August 29, 1996

1996

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

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING THERMO-LAG RELATED  
AMPACITY DERATING ISSUES, WATTS BAR UNIT 1 (TAC NO. M85622)

Dear Mr. Kingsley:

On September 14, 1995 the Tennessee Valley Authority submitted a response to the NRC Request for Additional Information related to Generic Letter 92-08, "Thermo-Lag 330-1 Fire Barriers," for the Watts Bar Nuclear plant. The NRC staff's Electrical Engineering Branch, in conjunction with its contactor, Sandia National Laboratories, has completed the preliminary review of the licensee's submittal, and has identified a number of open issues and concerns requiring clarification. Accordingly, we request that you provide responses to the issues identified in the enclosure so that we may continue our review of the ampacity derating factor issue for Watts Bar.

Sincerely,

Original signed by

Robert E. Martin, Senior Project Manager  
Project Directorate II-3  
Division of Reactor Projects I/II  
Office of Nuclear Reactor Regulation

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Docket No. 50-390

Enclosure: Additional Information

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## REQUEST FOR ADDITIONAL INFORMATION

### WATTS BAR NUCLEAR PLANT

### AMPACITY DERATING ISSUES

#### 1.0 BACKGROUND

Tennessee Valley Authority (TVA, the licensee) has conducted extensive ampacity derating testing of various Thermo-Lag fire barrier configurations at their Central Laboratories Services Department (denoted Phase I tests) in Chattanooga, Tennessee from March 9 to April 6, 1993; April 30 to May 10, 1993; and June 1 to June 22, 1993 and at Omega Point Laboratories (OPL) (denoted Phase II tests) in San Antonio, Texas, from August 16 to August 26, 1994; September 14 to October 6, 1994; November 15 to December 3, 1994; and January 4 to January 23, 1995. TVA's Thermo-Lag 330-1 Phase I and II fire tests were submitted to the staff on July 9, 1993, and April 25, 1995 respectively. Although test results for the new Thermo-Lag fire barrier material 770-1 for three-hour-rated electrical raceway application were to be submitted for staff review at a later date, the staff issued an interim evaluation as delineated in Section 3.7.10 of the Watts Bar Supplementary Safety Evaluation Report (SSER) 18 in October 1995.

The licensee submitted the following test reports to the staff on September 14, 1995: (1) OPL Report 11960-97333 on the Phase 3 tests of a single cable tray with a three-hour fire barrier system comprised of a basic Thermo-Lag 330-1 barrier system supplemented by a Thermo-Lag 770-1 upgrade; and (2) OPL Reports 11960-97337 and 97338 on the Phase 4 tests of the one 1-inch and one 4-inch steel conduits enclosed in a three-hour fire barrier system nominally similar to that of the Phase 3 cable tray.

The staff, in conjunction with its contractor, Sandia National Laboratories has completed the preliminary review of the licensee's submittal and the following questions require response and clarification by the licensee.

#### 2.0 QUESTIONS

##### 2.1 Use of Steel Tray Cover Plate

For Test Item 7.1 (single 24-inch X 4-inch tray with solid sheet steel top cover and 5/8-inch (nominal) 330-1 fire barrier), a steel cover was used as a part of the fire barrier system. The licensee should verify that the subject cover plate was not in place during the baseline

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ampacity derating test for Test Item 7.1 or used as a part of the fire barrier system for Test Item 7.2.

## 2.2 Failure to Achieve the Required Cure Time

The licensee test plan required that a 30-day fire barrier cure period be obtained prior to the performance of the clad or wrapped ampacity tests. This cure period was not achieved in the case of Test Item 7.3 (three stacked 24-inch X 4-inch trays, spaced on 12-inch centers, in a common 5/8-inch 330-1 fire barrier enclosure). Furthermore, there was no indication of barrier moisture level measurements prior to or after the subject test. The licensee should provide an assessment of the impact of apparent shortened cure time on the test results for Test Item 7.3.

## 2.3 Simultaneous Testing of More Than One Test Item

The licensee test procedures specified the testing of two different test articles simultaneously in the same test enclosure. This practice, while not specifically prohibited by the IEEE P848 draft standard, "Procedure for the Determination of Ampacity Derating of Fire Protected Cables," may have influenced some of the temperature responses by the test articles.

For the subject tests, the surface temperatures of the test articles are significantly higher than that of the surrounding (i.e., the air and walls of the test enclosure). This situation may lead to the direct interchange of radiant energy between test articles when more than one article is tested at the same time. The intent of the draft test standard is to ensure that the test articles exchange energy only with the ambient surroundings. Hence, the practice of simultaneous testing may introduce an unanticipated thermal effect which could impact the test results.

To illustrate the possible effects, consider that Test Items 7.1 and 7.4 (three 1-inch diameter steel conduits in a horizontal row surrounded by a common rectangular 5/8-inch 330-1 fire barrier) were tested at the same time. For the clad test, it was also noted that the left conduit of the Test Item 7.4 configuration was the hottest specimen of the three conduits in the configuration. This result is atypical because one would expect the test configuration to exhibit symmetric heat transfer behavior such that the center conduit would exhibit the highest temperature. One possible explanation for this behavior would be the presence of Test Item 7.1, the cable tray specimen, in the test enclosure.

The licensee is requested to describe further, the physical separations (i.e., three dimensional depictions) between test articles and any measures taken to ensure direct radiative heat transfer did not occur between specimens test data. The licensee should also provide an assessment of the impact on the applicable test results due to any non-symmetric heating behavior which would be associated with the simultaneous testing of multiple test articles.

#### 2.4 Confirmation of Installed Ampacity Design Margins

Given the completion of the ampacity derating tests (Phases I, II and III) for the Thermo-Lag fire barriers that are installed at WBN Unit 1, the licensee should confirm that the existing ampacity design margins are adequate and sufficient for each installed fire barrier configuration. The licensee should delineate the minimum excess ampacity derating margins for the various electrical distribution circuits (e.g., 4 kV, 480 V) enclosed by the Thermo-Lag fire barrier material at the Watt Bar Nuclear Plant.

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