

January 13, 2000

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: SEQUOYAH UNITS 1 AND 2 - GENERIC LETTER 92-08 CLOSEOUT REPORT
FOR THERMO-LAG AMPACITY DERATING (TAC NOS. MA3860 AND
MA3863)

Dear Mr. Scalice:

On December 17, 1992, the U.S. Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 92-08, "Thermo-Lag 330-1 Fire Barriers," requesting each nuclear power plant licensee to provide information needed to verify compliance with NRC regulations related to fire protection and electric power systems where Thermo-Lag 330-1 fire barriers are used. One of the NRC's concerns was appropriate electrical current capacity (ampacity) derating of electrical conductors that are enclosed with Thermo-Lag fire barrier material. The ampacity issue has been addressed in many letters from the Tennessee Valley Authority (TVA) regarding the Sequoyah Nuclear Plant (SQN), Units 1 and 2, in response to GL 92-08, most recently in a letter dated June 25, 1997.

The NRC staff has completed its review of the TVA's analytical approach for ampacity derating determinations at SQN. The enclosed safety evaluation constitutes the staff's review and approval of the TVA's ampacity derating test or analyses for installed Thermo-Lag fire barrier configurations. The staff concludes that there are no outstanding ampacity derating issues as identified in GL 92-08 for SQN.

Sincerely,

\RA

Ronald W. Hernan, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-327 and 50-328

Enclosure: Safety Evaluation

cc w/encl: See next page
Mr. J. A. Scalice

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

GENERIC LETTER 92-08 AMPACITY DERATING ISSUES

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

1.0 **BACKGROUND**

By letter dated June 25, 1997, the Tennessee Valley Authority (TVA) (the licensee) made the following commitment regarding the completion of the Sequoyah Nuclear Plant (SQN) Thermo-Lag upgrade program.

Based on results from the TVA Thermo-Lag test program, SQN will upgrade Thermo-Lag 330-1 installation on conduits smaller than three inches, junction boxes, a cable tray and other applicable unique configurations. Included in the upgrade will be the revision to the appropriate design standards and documents prior to initiation of design activities. TVA will perform the field walkdowns and evaluations of important parameters of the existing Thermo-Lag 330-1 Electrical Raceway Fire Barrier System. The walkdowns, evaluations and modifications will be performed in accordance with the criteria described in TVA's responses to NRC Request -2a (NRC Followup Request For Additional Information (RAI) Regarding Generic Letter (GL) 92-08 dated December 22, 1994). The walkdowns, evaluations, and upgrades necessary to resolve the Thermo-Lag issue will be completed by June 30, 1999. Until upgrades are completed, appropriate compensatory measures will remain in place.

During the meeting held on May 30, 1997, between the U.S. Nuclear Regulatory Commission (NRC) staff and licensee representatives, the scope of corrective actions at SQN was described in the following manner:

- Approximately 4400 linear feet of single conduit (one-inch, one and one-half inch, two inch, two and one-half inch, three inch and four inch).
- Approximately 1650 square feet of the following special configurations:
 - Four boxed conduit configurations (three-fourth inch and one-half inch)
 - Twenty junction boxes
 - Three cable trays
- Replacement of approximately 2700 linear feet of Kaowool insulation.

Enclosure

The NRC staff evaluation that constitutes the review and approval of the licensee's ampacity derating test or analyses for the installed Thermo-Lag fire barrier configurations at Sequoyah Nuclear Plant follows.

2.0 EVALUATION

2.1 Ampacity Derating Analysis Review

The licensee utilized Watts Bar Nuclear Plant (WBN) test data to derive the ampacity derating factors for Thermo-Lag configurations installed at SQN and verified that the applicable SQN configurations are representative in terms of design and construction of the configurations which were tested for WBN.

The TVA ampacity derating test methodology followed the guidance in draft Institute of Electrical and Electronics Engineers (IEEE) Standard P848, "Procedure for the Determination of the Ampacity Derating of Fire Protected Cables," Revisions 11, 12, and 14, dated April 6, 1992, February 24, 1993, and April 15, 1994, respectively except, for changes identified in individual test plans.

TVA conducted extensive ampacity derating testing of various Thermo-Lag fire barrier configurations at their Central Laboratories Services Department (CLSD) (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 26, 1994; September 14 to October 6, 1994; November 15 to December 3, 1994; and January 4 to 23, 1995. The results of TVA's Thermo-Lag 330-1 Phase I and II ampacity tests were submitted to the staff on July 9, 1993, and April 25, 1995, respectively. A new Thermo-Lag fire barrier material 770-1 for 3-hour rated electrical raceway application was tested at OPL as part of an upgrade to the basic Thermo-Lag 330-1 barrier system for a single tray (denoted as Phase 3 tests). The Phase 3 tests were documented in an OPL report dated June 30, 1995. Lastly, a 3-hour fire barrier system nominally similar to that of the Phase 3 cable tray was tested for one 1-inch and one 4-inch conduit enclosure (denoted Phase 4 tests). The Phase 4 tests were documented in an OPL report dated August 21, 1996. The licensee submitted the test reports for Phase 3 and 4 tests for the staff's review on September 14, 1995.

The licensee provided adequate disposition of the following concerns which were associated with the review of the WBN test programs:

- Effect of reduced Cure Time for the Thermo-Lag material
- Use of simultaneous testing of more than one test article at one time
- Presence of negative ampacity derating factor test results
- Extension of IEEE P848 methodology for non-standard configurations

The licensee selected, based upon their test results, the ampacity derating factors below (see Table) for the Thermo-Lag enclosed electrical raceways at WBN Unit 1:

Watts Bar Nuclear Plant Ampacity Derating Values

RACEWAY	REPORT NO.	AMPACITY DERATING FACTOR (%)
24" cable tray with ½" TSI configuration	TUE 12340-95169	31.5
Large air drop with 5/8" + 3/8" TSI configuration	TUE 12340-95168	31.7
1" conduit with 5/8" TSI configuration	TVA 93-0501	7.0
1" conduit with 5/8" + 3/8" TSI configuration	TVA 93-0501	8.0
4" conduit with 3/8" + 3/8" TSI configuration	TVA 93-0501	7.0
24" cable tray with solid steel cover, with 5/8" TSI configuration	TVA 11960-97332	40
3-24" trays in a common 5/8" TSI configuration	TVA 11960-97334	36
3-1" conduits in a single row in a common 5/8" TSI configuration	TVA 11960-97335	8
2 rows of 3-1" conduits in a common 5/8" TSI configuration	TVA 11960-97336	26
1" conduit in a 5/8" TSI configuration mounted on a small Unistrut frame	TVA 11960-97768	12
1" conduit in a 5/8" TSI configuration mounted on a large Unistrut frame	TVA 11960-97769	6
2 rows of 3-1" conduits in a common 5/8" TSI configuration mounted on a large Unistrut frame	TVA 11960-97770	9

Note: TSI - Thermal Sciences Incorporated

2.2 Application of Ampacity Derating Methodology

Question 4 from the staff RAI dated August 29, 1996 for WBN posed the following query:

Given the completion of the ampacity derating tests (Phases I, II, 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 Watts Bar Nuclear Plant.

In its submittal of October 24, 1996, for WBN, TVA stated that upon completion of the ampacity test program, its Corporate Engineering organization evaluated the results and established conservative ampacity correction factors for the various Thermo-Lag fire barrier enclosed electrical raceway configurations. In its submittal of March 22, 1995, for SQN, TVA stated that two phases of ampacity derating tests had been performed that are applicable to SQN and that measures were adequate to ensure that the ampacity derating factors used for the Thermo-Lag 330-1 fire barrier materials installed at SQN are consistent with the derating factors developed during the ampacity derating tests. Although TVA's response did not provide the minimum excess ampacity margins data, this information is available for onsite review. The confirmation that the ampacity derating margins are adequate and sufficient for each fire barrier adequately resolves the objectives of the subject evaluation.

Given that the NRC staff has reviewed and approved the ampacity derating test program results for WBN, as specified in References 1 and 2, and the SQN Thermo-Lag configurations are representative of the WBN tested configurations, the staff finds that the licensee has provided adequate information to resolve the ampacity-related points of concern raised in GL 92-08 for SQN.

3.0 CONCLUSIONS

From the above evaluation, the NRC staff concludes that the licensee has provided an adequate technical basis to assure that the Thermo-Lag fire barrier enclosed cables are operating within acceptable ampacity limits. Therefore, the staff finds that there are no outstanding safety concerns with respect to GL 92-08 ampacity issues for the Sequoyah Nuclear Plant, Units 1 and 2.

Principal Contributor: Ronaldo Jenkins, Electrical Engineering Branch

Date: January 13, 2000

REFERENCES

1. Letter from R. E. Martin, NRC, to O. J. Zeringue, TVA, "Supplementary Safety Evaluation Report on Ampacity Issues Related to Thermo-Lag Fire Barriers at Watts Bar Nuclear Plant (TAC NO. 85622)," January 6, 1998.
2. NRC NUREG-0847, "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2," Supplement 18, October 1995.

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