Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37379

J. L. Wilson
Vice President, Sequoyah Nuclear Plant

January 10, 1992

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

SEQUOYAH NUCLEAR PLANT (SQN) - UNITS 1 AND 2 - CABLE TEST PROGRAM (CTP) ADDITIONAL TESTING RESULTS (TAC NOS. M77129 AND M77130)

Reference: TVA letter to NRC dated October 23, 1990, "Sequoyah Nuclear Plant (SQN) - Units 1 and 2 - Cable Test Program (CTP) Resolution Plan (TAC No. M77129, 77130)"

The purpose of this letter is to provide NRC with the results of the additional cable tests performed during the Unit 1 Cycle 5 refueling outage to satisfy the commitment made in the reference. These tests were conducted in accordance with Special Test Instruction (STI)-142, "High Voltage DC Test for Selected Low Voltage CSSC Cables." While no pullby damage was detected in the tested cables, anomalies were discovered with regard to three tested cables.

Enclosures 1, 2, and 3 provide a description of the cable tests and resolution of the test anomalies for the three conduits tested.

Based on these tests and the results of the 1987 CTP, TVA considers the issue of cable installation at SQN to be resolved.

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ENCLOSURE 1
CONDUIT 1PM2136I

I. BACKGROUND

Conduit 1PM2136I, the highest ranked conduit, contains 22 signal cables that were direct-current (dc), high-potential tested to 6.0 kilovolt (kV). Since all cables are shielded, the tests were conducted "dry." One conductor of a 2/C-#16 American wire gauge, shielded, twisted pair cable (1PM1854I) experienced breakdown at 2.0 kV. This test anomaly is documented in Special Test Instruction (STI)-142, "High Voltage DC Test for Selected Low Voltage CSSC Cables," and Problem Evaluation Report SQPER910348.

II. EVALUATION

The failure of 1PM1854I was isolated in a 1-inch conduit (1PM1854I) located in the annulus. Cable 1PM1854I was the sole cable in this conduit; therefore, it was not subject to pullby damage. Upon removal, a close inspection by TVA Nuclear Engineering personnel determined that at approximately 54 feet from the end device in a conduit fitting, a Raychem Corporation nuclear jacket repair sleeve (NJRS) was installed. No other jacket anomalies and no significant abrasions were found in this 186-foot segment.

Because the point of failure was not obvious, the cable was taken to the University of Connecticut's Electrical Insulation Research Center (EIRC) for further evaluation. EIRC personnel removed the NJRS and found a chevron shaped hole in the jacket with several broken strands of the drain wire protruding through the hole. Beneath the jacket the remaining strands of the wire displayed ductile fractures. Also, the fabric assembly wrap and the aluminum/mylar shield were damaged. Adjacent to the NJRS, in the direction of the end device, a diagonal slit of 1/8 inch to 1/4 inch was noted. The slit penetrated the jacket. When the jacket was removed at this point the aluminum/mylar shield was observed to be broken, the drain wire nicked, and the black conductor exposed. The fabric wrap was also discolored at this point, also providing evidence that this is where the black conductor broke down. The exact cause of the damage and when the damage occurred are not known, but it appears to have been inflicted with a sharp object and not related to pulling activities. EIRC's formal report of its findings has not been received by TVA.

III. RESOLUTION

After the damaged segment of 1PM1854I was removed, the remaining cable was successfully retested. The damaged segment of 1PM1854I was replaced by Work Request C050494. All conductors in the conduit segment of concern passed the test.

ENCLOSURE 2
CONDUIT 1SG266S

I. BACKGROUND

Conduit 1SG266S, the second highest ranked conduit, contains seven active and four abandoned signal and control cables that were direct-current, high-potential tested wet at 6.0 kilovolt (kV) and 7.2 kV, respectively. There were no anomalies, and all the conductors in the subject conduit passed the test.

II. CONCLUSION

No further actions are necessary for this conduit, and the active cables have been returned to service.

III. RESOLUTION

Both of the failed cables were restored by Design Change Notice M07924B. This modification replaced 1PM616II in its entirety with the spare signal cable of the same mark number, contract number, and route. Cable 1PM691II was cut near the failure point and spliced on to a spare signal cable of the same mark number and route, but with a different vendor and contract number. These spares, that were also tested to 6.0 kV and successfully passed, were then meggered, functionally tested, and returned to service. All conductors in the segment of concern passed the subject test.

ENCLOSURE 3
CONDUIT 1PM1192II

I. BACKGROUND

Conduit 1PM1192II, the third highest ranked conduit, contains 21 active and 2 spare signal cables that were direct-current (dc), high-potential tested at 6.0 kilovolt (kV). Since all cables are shielded, the tests were conducted "dry." There were three test anomalies in conductors in two of the cables. One conductor of a 2/C-#16 American wire gauge (AWG), shielded, twisted pair cable (1PM616II) broke down at 3.0 kV. Two conductors of a 4/C-#16 AWG, shielded, twisted cable (1PM691II) broke down at 1.0 kV and 1.5 kV, respectively. These test anomalies are documented in Special Test Instruction (STI)-142, "High Voltage DC Test for Selected Low Voltage CSSC Cables," and Problem Evaluation Report SQPER910348.

II. EVALUATION

The failures were isolated and found to be outside the target conduit in segments that were routed in free air. The damage to 1PM615II was approximately nine inches below the end of conduit 1PM1192II and about six feet from its termination point at Penetration 19 located in the annulus. Cable 1PM691II was damaged approximately two inches beyond the end of conduit 1PM2087II as it entered tray XWII in the cable spreading room.

Cable 1PM616II had a crescent-shaped slice that penetrated the jacket, the aluminum/mylar shield, and the insulation of the white conductor. The cable was cut and removed approximately two inches above the damaged location that was the suspected failure point. The ends of the conductors were separated and taped, and the remainder of the cable passed the high-potential test. This verified the location of the cable failure. The damaged segment of the cable was taken to the University of Connecticut's Electrical Insulation Research Center for further evaluation. Preliminary analysis concluded that the damage appeared to be caused by a sharp object such as a pocket knife, possibly during flame-retardant coating removal. EIRC's formal report of its findings has not been received by TVA. Both the location and morphology of the damage confirm that it was unrelated to installation (initial or pullby).

The apparent failure point of 1PM691II was examined in situ because of its location and the initial intent to repair it in place. This cable had a 1/2-inch longitudinal split in the side of its jacket and was flattened for approximately one inch at a point just outside the end of a horizontal run of conduit 1PM2087II in the cable spreading room. The split appeared to be rupture damage that could have been caused by an impact by a heavy, blunt object. When the jacket was removed, the same type of damage was observed in the aluminum/mylar shield and the black and green conductors' insulation.

Both the location and the morphology of the damage confirm that the damage was unrelated to installation (initial or pullby). The damaged insulation was taped and the cable was retested and passed. This confirmed the cable failure location.

No commitments are contained in this submittal.

Please direct questions concerning this issue to Keith Weller at (615) 843-7527.

Sincerely,

J. L. Wilson

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Enclosures
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