TVA

Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402-2801

May 4, 2007

10 CFR 50.54(f)
10 CFR 50.65

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

Gentlemen:

In the Matter of	)	Docket Nos. 50-259	50-260
Tennessee Valley Authority	)	50-296	50-327
		50-328	50-390

BROWNS FERRY NUCLEAR PLANT (BFN) UNITS 1, 2 AND 3, SEQUOYAH NUCLEAR PLANT (SQN) UNITS 1 AND 2, AND WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - NUCLEAR REGULATORY COMMISSION (NRC) GENERIC LETTER (GL) 2007-01: INACCESSIBLE OR UNDERGROUND POWER CABLE FAILURES THAT DISABLE ACCIDENT MITIGATION SYSTEMS OR CAUSE PLANT TRANSIENTS - 90 DAY RESPONSE

This letter with enclosure provides TVA's 90-day response to GL 2007-01, "Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients," dated February 7, 2007. This information is provided pursuant to 10 CFR 50.54(f). There are no new regulatory commitments made by this letter.

Please direct any questions to Kent Brown at (423) 751-8227.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 4 day of May, 2007.

Sincerely,

Beth A. Wetzel
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Enclosure
cc: See page 2

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Enclosure
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ENCLOSURE

GENERIC LETTER (GL) 2007-01: INACCESSIBLE OR UNDERGROUND POWER CABLE FAILURES THAT DISABLE ACCIDENT MITIGATION SYSTEMS OR CAUSE PLANT TRANSIENTS - 90 DAY RESPONSE

REQUESTED INFORMATION

(1) Provide a history of inaccessible or underground power cable failures for all cables that are within the scope of 10 CFR 50.65 (the Maintenance Rule) and for all voltage levels. Indicate the type, manufacturer, date of failure, type of service, voltage classes, years of service, and the root causes for the failure.

TVA Nuclear (TVAN) conducted a review of its Corrective Action database, Maintenance Rule database, and maintenance work order records to identify failures of underground/inaccessible AC power cables within the scope of 10 CFR 50.65 at Browns Ferry, Sequoyah and Watts Bar Nuclear Plants. The results of TVA's review are shown in the attached tables that identify both in-service and test failures at TVAN sites. It is worth noting that this data compilation represents our best effort in that early (historical) cable failure data was not recorded in a manner conducive to identifying specific causes of the failure. However, it is logical to assume that early failures were most likely attributable to manufacturing defects, installation damage, etc., rather than from moisture-induced, age-related degradation.

(2) Describe inspection, testing and monitoring programs to detect the degradation of inaccessible or underground power cables that support EDGs, offsite power, ESW, service water, component cooling water and other systems that were within the scope of 10 CFR 50.65 (Maintenance Rule).

The TVAN Cable Condition Monitoring Program (CCMP) is controlled under *General Engineering Specification G-38, Installation, Modification and Maintenance of Insulated Cables Rated Up to 15,000 Volts*. The TVAN CCMP is consistent with industry practices and recommendations as provided in the Nuclear Energy Institute (NEI) Medium Voltage Underground Cable White Paper (NEI 06-05, ADAMS ML061220137). The program consists of two complementary tests, both performed with a very low frequency (VLF), 0.1 Hertz, power supply. The first test is an age condition assessment technique known as "tan delta," "loss angle" or "dissipation factor." While preferably used as part of a trending program, one-shot readings are also used to predict remaining life or prioritize cable replacement. When the insulation is sound (i.e.; no water trees, voids or moisture), a cable is essentially a long capacitor. In the ideal capacitor, current and voltage are 90 degrees out of phase. If wet service-aged cable contains water trees, voids and moisture, the resistive component of electrical current through the insulation increases. Thus, the dielectric no longer mimics the ideal capacitor and the resultant phase shift will be something less than 90 degrees. How much the dielectric departs from the ideal capacitor is an indication of insulation degradation. Tests have shown that the magnitude of this "loss angle" increases with decreasing power supply frequency. Thus, the sensitivity of such measurements is significantly increased when using a VLF power source. The results of the tests are used to establish the required re-test interval.

While the above method provides an overall assessment of insulation condition, it is not as responsive to highly localized defects. To ensure that cables have not been adversely degraded by localized defects and rendered susceptible to switching induced surges, "VLF withstand" testing is performed. This go-no/go method identifies those localized defects and permits repair/replacement before the cable is returned to service.

The tests are described in greater detail in Guides prepared by the Institute of Electrical and Electronics Engineers' (IEEE) Insulated Conductors Committee; IEEE 400 and IEEE 400.2. TVAN actively participated in the development of these guides.

The above tests are required for all new medium voltage installations and replacements (whether safety-related or non-safety-related) and for all existing underground safety-related circuits. The tests are also recommended for existing non-safety-related underground cables which are important to plant operation.

Browns Ferry Nuclear Plant (BFN)

BFN began commercial operation in 1973. BFN has fewer than 10 medium voltage underground safety-related circuits. Assessment of the condition of those cables at BFN began in the summer of 2005. The condition monitoring program has been used to baseline new cable installations and to assess aged circuits used to support the recovery and power uprating of Unit 1. The program has also been used to assess the condition of aged safety and non-safety-related cables associated with the two operating units. Altogether, the program has evaluated approximately 25,000 conductor-feet of aged cable and 13,000 conductor-feet of new cable with approximately 190 "tan delta" measurements and 185 "withstand" tests. The initial round of testing of safety-related circuits is expected to be completed during 2007.

BFN has one duct bank which contains safety-related cables. The bank was designed such that it sloped from the powerhouse to the Intake Pumping Station (IPS) and was intended thereby to remain water free without the need for active sump systems. The addition of fire barrier materials to the box at the ductbank/IPS interface led to a decision to seal the conduits. A sump pump was subsequently installed to remove water which routinely accumulated behind the seal. An existing site repetitive Work Order on manhole cleaning and maintenance (which covers both safety and non-safety-related duct banks) was revised to include the subject handhole within its scope to ensure that the sump pumps are functioning and that trash accumulation does not render them ineffective. This activity is scheduled every twenty-four weeks.

Sequoyah Nuclear Plant (SQN)

SQN began commercial operation in 1981. SQN has fewer than 20 medium voltage underground safety-related circuits. Assessment of the condition of those cables at SQN (using VLF) began in 2003 following the discovery of water treeing at the site of an in-service failure. The CCMP described above was used to verify that the cables were in acceptable condition and to prioritize replacements of the degraded portions of those circuits. The initial round of tests has been completed as have any indicated replacements. Existing circuits are now subject to retesting at the interval dictated by the results of that initial round of "tan delta" assessments. To date the program has evaluated approximately 304,000 conductor-feet (approximately 196,000 conductor-feet of aged, 108,000 conductor-feet of new) utilizing approximately 275 "tan delta" measurements and 160 withstand tests.

These tests complement manhole inspection efforts which have been in place since the early 1990s when SQN modified their safety-related manhole covers to permit ready assessment of water depth. In addition, a Preventative Maintenance (PM) procedure was written to ensure that a periodic assessment is made of manhole conditions (and thus the performance of the sump systems). This PM is scheduled every four weeks.

Watts Bar Nuclear Plant (WBN)

WBN began commercial operation in 1996. WBN has 20 medium voltage underground safety-related circuits. The initial round of testing for these cables required to support Unit 1 is expected to be completed in 2008. Testing of other cables at WBN in their CCMP began in October 2006. One circuit, approximately 1650 conductor-feet of aged cable, has been tested thus far and found to be in acceptable condition. Shortly before WBN startup, the plant identified the need to strengthen its procedures and performance in keeping manholes dry. As a result, manholes containing safety-related cables were modified to add a rotating light which turns on at high sump level, a second light which provides positive indication that there is power to the pump, and a pump run time meter. Plant Operations checks the status and operability of the rotating lights on a weekly basis. A PM also exists for inspection of these manholes which is scheduled every 6 months to ensure that the sump systems are adequately maintained and that trash is not allowed to accumulate within the duct banks which might subsequently impact sump performance. PMs for other manholes which do not contain safety-related cables (and do not have the positive indication systems described above) are scheduled on 6-month intervals.

Low Voltage Cable

The TVAN CCMP does not specifically monitor low voltage cables for degradation due to potentially wet environments. As evidenced by the failure data provided, there is no indication that there are issues associated with low voltage power cables. Also, there is no consensus diagnostic testing methodology available that can be performed on unshielded cables.

Underground low voltage, safety-related, power cables are installed in the same duct banks as those medium voltage cables described above and thus would benefit from the same water abatement measures.

Attachment 1: Browns Ferry Nuclear Plant - In-Service Failures

Plant	Cable	End Device Name	Normally Energized?	Service Voltage (kV)	Cable Rated Voltage (kV)	Vendor/ Insulation	Date of Failure	Years in Service	Installation Type	Root Cause of Failure.
			Y/N	.48, 4.16, 6.9	.6, 5, or 8			yrs		
BFN	ES88-I	(0-MTR -023-0005) RHRSW PUMP MTR. A2	Y	4.16	5	General - XLPE	2007	Note 1	Duct bank	**In-service failure** - Evaluation in process
BFN	3PL1025	(3-MTR-64-11A) REAC. EXH. FAN 3A	Y	0.48	0.6	Unknown	2005	Note 1	Embedded conduit	**In-service failure** - Unknown
BFN	2PP1127	(2-MTR-27-18) CCWP 2B CAP. BANK FDR.	Y	4.16	Note 3	Unknown - XLPE	2002	Note 1	Buried conduit	**In-service failure** - Unknown
BFN	PP1171	COOLING TOWER UNIT SUBSTATION TRANSFORMER 6D	Y	4.16	Note 3	Note 2	2001	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1172	COOLING TOWER UNIT SUBSTATION TRANSFORMER 6C	Y	4.16	Note 3	Note 2	2001	Note 1	Trench	**In-service failure** - Unknown
BFN	ES325-I	FCV-67-49, POWER FEEDER	Y	0.48	0.6	Brand Rex - XLPE	2001	Note 1	Duct bank, note 4	**In-service failure** - Definitive cause could not be determined. According to the laboratory report, "No evidence of global degradation was noted from any stressor (water, chemical, thermal)."
BFN	ES350-I	KINNEY CAB. A (EECW STRAINER (A) SUPPLY)	Y	0.48	0.6	Brand Rex - XLPE	2001	Note 1	Duct bank, note 4	**In-service failure** - Definitive cause could not be determined. According to the laboratory report, "No evidence of global degradation was noted from any stressor (water, chemical, thermal)."
BFN	ES363-I	KINNEY CAB.D (EECW STRAINER (D) SUPPLY)	Y	0.48	0.6	Brand Rex - XLPE	2001	Note 1	Duct bank, note 4	**In-service failure** - Definitive cause could not be determined. According to the laboratory report, "No evidence of global degradation was noted from any stressor (water, chemical, thermal)."
BFN	K307	EVACUATION ALARM SYSTEM	Y	0.48	0.6	Okonite - EPR	2001	Note 1	Duct bank, note 4	**In-service failure** - Definitive cause could not be determined. According to the laboratory report, "No evidence of global degradation was noted from any stressor (water, chemical, thermal)."
BFN	ES825-I	RHRSW PUMP COMPT A, SUMP PUMP A	Y	0.48	0.6	Rockbestos - XLPE	2001	Note 1	Duct bank, note 4	**In-service failure** - Definitive cause could not be determined. According to the laboratory report, "No evidence of global degradation was noted from any stressor (water, chemical, thermal)."
BFN	ES829-I	RHRSW PUMP COMPT B, SUMP PUMP A	Y	0.48	0.6	Rockbestos - XLPE	2001	Note 1	Duct bank, note 4	**In-service failure** - Definitive cause could not be determined. According to the laboratory report, "No evidence of global degradation was noted from any stressor (water, chemical, thermal)."
BFN	ES833-I	RHRSW PUMP COMPT C, SUMP PUMP A	Y	0.48	0.6	Rockbestos - XLPE	2001	Note 1	Duct bank, note 4	**In-service failure** - Definitive cause could not be determined. According to the laboratory report, "No evidence of global degradation was noted from any stressor (water, chemical, thermal)."

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Plant	Cable	End Device Name	Normally Energized?	Service Voltage (kV)	Cable Rated Voltage (kV)	Vendor/ Insulation	Date of Failure	Years in Service	Installation Type	Root Cause of Failure
			Y/N	.48, 4.16, 6.9	.6, 5, or 8			yrs		
BFN	ES837-I	RHRSW PUMP COMPT D, SUMP PUMP A	Y	0.48	0.6	Rockbestos - XLPE	2001	Note 1	Duct bank, note 4	**In-service failure** - Definitive cause could not be determined. According to the laboratory report, "No evidence of global degradation was noted from any stressor (water, chemical, thermal)."
BFN	2PP1129	CCWP 2C CAP BANK FEEDER (2-MTR -027-0026)	Y	4.16	Note 3	Unknown - XLPE	1999	Note 1	Buried conduit	**In-service failure** - Unknown
BFN	3PP1144	3-MTR-027-0026 CCWP 3C CAP. BANK FEEDER		4.16	5	Triangle - XLPE	1997	Note 1	Buried conduit	**In-service failure** - Laboratory examination concluded that the cable failed due to the presence of contaminants in the insulation. No large water trees were observed.
BFN	PL3216	480V COOLING WATER MOG BD ALT. FEEDER	N	0.48	0.6	Unknown	1996	Note 1	Duct bank	**In-service failure** - Crushed duct bank
BFN	PP1340	COOLING TOWER PUMP 6B	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1341	COOLING TOWER PUMP 6B	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1150	480V COOLING TOWER UNIT SUBSTATION 1A TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1151	480V COOLING TOWER UNIT SUBSTATION 1B TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1152	480V COOLING TOWER UNIT SUBSTATION 1C TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1153	480V COOLING TOWER UNIT SUBSTATION 1D TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1235	COOLING TOWER PUMP 1A	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1236	COOLING TOWER PUMP 1A	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1245	COOLING TOWER PUMP 1B	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1246	COOLING TOWER PUMP 1B	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1175	480V COOLING TOWER UNIT SUBSTATION 5C TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1176	480V COOLING TOWER UNIT SUBSTATION 5D TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown

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Plant	Cable	End Device Name	Normally Energized?	Service Voltage (kV)	Cable Rated Voltage (kV)	Vendor/ Insulation	Date of Failure	Years in Service	Installation Type	Root Cause of Failure
			Y/N	.48, 4.16, 6.9	.6, 5, or 8			yrs		
BFN	PP1312	COOLING TOWER PUMP 5A	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1313	COOLING TOWER PUMP 5A	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1322	COOLING TOWER PUMP 5B	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1323	COOLING TOWER PUMP 5B	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1169	480V COOLING TOWER UNIT SUBSTATION 6A TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1170	480V COOLING TOWER UNIT SUBSTATION 6B TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1171	480V COOLING TOWER UNIT SUBSTATION 6C TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1172	480V COOLING TOWER UNIT SUBSTATION 6D TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1331	COOLING TOWER PUMP 6A	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1332	COOLING TOWER PUMP 6A	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1154	480V COOLING TOWER UNIT SUBSTATION 2A TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1155	480V COOLING TOWER UNIT SUBSTATION 2B TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1159	480V COOLING TOWER UNIT SUBSTATION 2C TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1160	480V COOLING TOWER UNIT SUBSTATION 2D TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1254	COOLING TOWER PUMP 2A, PUMPING STATION NO. 2	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1255	COOLING TOWER PUMP 2A	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1263	COOLING TOWER PUMP 2B	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown

Attachment 1: Browns Ferry Nuclear Plant - In-Service Failures

Plant	Cable	End Device Name	Normally Energized?	Service Voltage (kV)	Cable Rated Voltage (kV)	Vendor/ Insulation	Date of Failure	Years in Service	Installation Type	Root Cause of Failure
			Y/N	.48, 4.16, 6.9	.6, 5, or 8			yrs		
BFN	PP1264	COOLING TOWER PUMP 2B	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1358	COOLING TOWER PUMP 2A CAP BANK FEEDER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1362	COOLING TOWER PUMP 2B CAP BANK FEEDER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1360	COOLING TOWER PUMP 2A CAP BANK FEEDER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1161	480V COOLING TOWER UNIT SUBSTATION 3A TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1162	480V COOLING TOWER UNIT SUBSTATION 3B TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1163	480V COOLING TOWER UNIT SUBSTATION 3C TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1164	480V COOLING TOWER UNIT SUBSTATION 3D TRANSFORMER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1275	COOLING TOWER PUMP 3A	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1276	COOLING TOWER PUMP 3A	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1284	COOLING TOWER PUMP 3B	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1285	COOLING TOWER PUMP 3B	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1366	COOLING TOWER PUMP 3A CAP. FEEDER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1370	COOLING TOWER PUMP 3B CAP. FEEDER	Y	4.16	Note 3	Note 2	1993	Note 1	Trench	**In-service failure** - Unknown
BFN	PP1173	480V COOLING TOWER UNIT SUBSTATION 5A TRANSFORMER	Y	4.16	Note 3	Note 2	1978	Note 1	Duct bank/trench	**In-service failure** - Unknown

Note 1: The year in-service dates cannot be accurately determined.
Note 2: Cable type and manufacturer cannot be verified based on plant documentation.
Note 3: The cable rated voltage cannot be accurately verified based on procurement documentation during this time frame.
Note 4: Failed cables were installed in a single duct.

Attachment 2: Browns Ferry Nuclear Plant - Test Failures

Plant	Cable	End Device Name	Normally Energized?	Service Voltage (kV)	Cable Rated Voltage (kV)	Vendor/ Insulation	Date of Failure	Years in Service	Installation Type	Root Cause of Failure
			Y/N	.48, 4.16, 6.9	.6, 5, or 8			yrs		
BFN	1PP1129	(1-MTR -027-0026) CCWP.1C CAP. BANK FEEDER	Y	4.16	5	Triangle - XLPE	2005	Note 1	Buried conduit	**Test failure** - Cable failed during VLF withstand test at 7 kV after 10 minutes. Cause unknown.

Note 1: The year in-service date cannot be accurately determined.

Attachment 3: Sequoyah Nuclear Plant - In-Service Failures

Plant	Cable	End Device Name	Normally Energized?	Service Voltage (kV)	Cable Rated Voltage (kV)	Vendor/ Insulation	Date of Failure	Years in Service	Installation Type	Root Cause of Failure
			Y/N	.48, 4.16, 6.9	.6, 5, or 8			yrs		
SQN	2PP711B	ERCW MOTOR P-B	Y	6.9	8	Cyprus - XLPE	06/29/2002	24	Duct bank	**In-service failure** - Laboratory analysis determined that the failure was the result of water treeing.
SQN	PP1946S2	START BUS 2B	Y	6.9	8	Okonite - EPR (red)	08/1989	5	Duct bank	**In-service failure** - One phase of the cable (non-Safety Related) failed in service. A test program was conducted to confirm whether water treeing had occurred. Segments of the failed cable were sent to a laboratory where the insulation was examined both near the fault and remote from it. The laboratory report stated, "No electrical or water trees were found in any of the cable sections examined microscopically". Failure was attributed to contamination consistent with a screen pack rupture during extrusion.

Attachment 4: Sequoyah Nuclear Plant - Test Failures

Plant	Cable	End Device Name	Normally Energized?	Service Voltage (kV)	Cable Rated Voltage (kV)	Vendor/ Insulation	Date of Failure	Years in Service	Installation Type	Root Cause of Failure
			Y/N	.48, 4.16, 6.9	.6, 5, or 8			yrs		
SQN	2PP700B	ERCW MOTOR M-B	Y	6.9	8	Cyprus - XLPE	01/25/2005	25	Duct bank	**Test failure** - Cable failed during a VLF withstand test at 14 kV
SQN	1PP674A	ERCW MOTOR J-A	Y	6.9	8	Cyprus - XLPE	05/20/2004	24	Duct bank	**Test failure** - Cable failed during a VLF withstand test at 14 kV
SQN	1PP687A	ERCW MOTOR Q-A	Y	6.9	8	Cyprus - XLPE	11/04/1994	14	Duct bank	**Test failure** - Cable failed during DC hipot testing. Subsequent laboratory analysis showed evidence of a water tree at a cluster of contaminants. Destructive testing of the failed phase with the fault removed and of removed; adjacent, non-faulted phases demonstrated the contamination to be localized.
SQN	2PP675A	ERCW MOTOR K-A	Y	6.9	8	Cyprus - XLPE	08/1994	14	Duct bank	**Test failure** - Cable failed during DC hipot testing at 22kV. Subsequent laboratory analysis showed a water tree at a large manufacturing defect (a cluster of contaminants). Destructive testing of the failed phase with the fault removed and of removed; adjacent, non-faulted phases demonstrated the contamination to be localized.
SQN	2PP675A	ERCW MOTOR K-A	Y	6.9	8	Triangle - XLPE	04/03/1994	14	Duct bank	**Test failure** - Cable failed during DC hipot testing between and 5kV and 6kV. Subsequent laboratory analysis showed a water tree at a large manufacturing defect (a cluster of contaminants). Destructive testing of the failed phase with the fault removed and of removed; adjacent, non-faulted phases demonstrated the contamination to be localized.
SQN	PP1940S2	START BUS 1B, 2B	Y	6.9	8	Okonite - EPR (red)	03/09/1992	8	Duct bank	**Test failure** - Cable failed during DC hipot testing. Subsequent laboratory analysis could not determine a cause for the failure.
SQN	PP1941S2	START BUS 1B, 2B	Y	6.9	8	Okonite - EPR (red)	03/09/1992	8	Duct bank	**Test failure** - Cable failed during DC hipot testing. Subsequent laboratory analysis could not determine a cause for the failure.
SQN	PP1947S2	START BUS 1B, 2B	Y	6.9	8	Okonite - EPR (red)	03/09/1992	8	Duct bank	**Test failure** - Cable failed during DC hipot testing. Subsequent laboratory analysis could not determine a cause for the failure.
SQN	PP1948S2	START BUS 1B, 2B	Y	6.9	8	Okonite - EPR (red)	03/09/1992	8	Duct bank	**Test failure** - Cable failed during DC hipot testing. Subsequent laboratory analysis could not determine a cause for the failure.
SQN	PP1950S2	START BUS 1B, 2B	Y	6.9	8	Okonite - EPR (red)	03/09/1992	8	Duct bank	**Test failure** - Cable failed during DC hipot testing. Subsequent laboratory analysis could not determine a cause for the failure.

Attachment 4: Sequoyah Nuclear Plant - Test Failures

Plant	Cable	End Device Name	Normally Energized?	Service Voltage (kV)	Cable Rated Voltage (kV)	Vendor/ Insulation	Date of Failure	Years in Service	Installation Type	Root Cause of Failure
			Y/N	.48, 4.16, 6.9	.6, 5, or 8			yrs		
SQN	PP1951S2	START BUS 1B, 2B	Y	6.9	8	Okonite - EPR (red)	03/09/1992	8	Duct bank	**Test failure** - Cable failed during DC hipot testing. Subsequent laboratory analysis could not determine a cause for the failure.
SQN	PP1952S2	START BUS 1B, 2B	Y	6.9	8	Okonite - EPR (red)	03/09/1992	8	Duct bank	**Test failure** - Cable failed during DC hipot testing. Subsequent laboratory analysis could not determine a cause for the failure.
SQN	PP1955S2	START BUS 1B, 2B	Y	6.9	8	Okonite - EPR (red)	03/09/1992	8	Duct bank	**Test failure** - Cable failed during DC hipot testing. Subsequent laboratory analysis could not determine a cause for the failure.
SQN	PP1956S2	START BUS 1B, 2B	Y	6.9	8	Okonite - EPR (red)	03/09/1992	8	Duct bank	**Test failure** - Cable failed during DC hipot testing. Subsequent laboratory analysis could not determine a cause for the failure.

Attachment 5: Watts Bar Nuclear Plant - All Failures

Plant	Cable	End Device Name	Normally Energized?	Service Voltage (kV)	Cable Rated Voltage (kV)	Vendor/ Insulation	Date of Failure	Years in Service	Installation Type	Root Cause of Failure
			Y/N	.48, 4.16, 6.9	.6, 5, or 8			yrs		
WBN	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**No failures. See text.**